WOMEN'S TRAVEL ISSUES

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16. Abstract
Contains 40 peer-reviewed and commissioned papers on gender-differentiated travel patterns and concerns. Most research showed major differences in the travel patterns of men and women, explained only in part by traditional variables (income, employment, occupations) but far more by the roles women and men accept. At the same time, the papers often showed substantial differences among subgroups of women differentiated by race, ethnicity, or country of birth, and these differences were sometimes greater than aggregate differences between the sexes. Five papers discuss overall trends in women's travel, two present historical perspectives, six discuss women's emerging travel patterns, and four describe the interaction of travel and land use. Another four papers focus on race and ethnicity, three on women with special needs, six on women's travel safety and security, four on women in the transit industry, and six on policy concerns. The volume concludes with a discussion of 32 issues in need of additional research.

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FOREWORD

It was a distinct pleasure for the Federal Highway Administration to sponsor the Women's Travel Issues Second National Conference in October 1996. In the last 18 years, the transportation industry has seen significant changes. One of the most important has been the large-scale entry of women into the work force and the corresponding increase in overall travel. FHWA, in meeting the challenges of the new century, recognizes that there are important gender-differentiated trends that will impact how, where, and what the transportation system of the 21st century will need to be.

While women have made great strides in the time between the first Conference held in 1978 and this one, women continue to face the daunting task of balancing their individual, family, and career responsibilities. Women's travel continues to grow not only in the total vehicle miles of travel but also in the number of trips, the frequency of trips, and the length of trips. Women's trip purposes also impact policies to improve air quality. Today, child care responsibilities are still most likely held by women; women must make career and job location decisions in part based on the accessibility to family from those jobs. America's elderly population is a fast-growing segment of the population, and women still make up the majority of that group. Their needs for transportation continue to change. Security issues are still of much interest to women as they travel in their vehicles and as they arrive at their destinations. Welfare-to-work is of real concern for women in transition, not only because they face all of the family constraints discussed above, but because they may lack access to a wide range of destinations, including employment sites.

The Conference offered a rare opportunity in the transportation profession where women were in the majority! Ideas were flying fast and furious, and there was a congenial atmosphere in which participants shared research, discussed the implications of existing policies, and considered new or revised policies to improve the quality of life for Americans, especially women. I hope these proceedings serve as a catalyst for improvements in travel and the transportation industry in the immediate future.

I would like to thank Dr. Sandra Rosenbloom for being idea-woman/advocate, producer/translator of ideas to the Conference, and Chair of the Conference Steering Committee. Her championship of this Conference was untiring, and the results reflect her efforts.

Gloria J. Jeff
Deputy Administrator

July 1998

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INTRODUCTION
Dr. Sandra Rosenbloom

BACKGROUND

The **Women's Travel Issues Second National Conference** was held in Baltimore in October 1996. The number in the title led many people to assume that the Conference was an annual, or at least a frequent, event. In fact, the ***first*** National Conference was held in the fall of ***1978***–a gap of over 17 years. The 1978 Conference brought together scholars from many disciplines for the first time to address a wide range of women's transportation topics, from transit security to how older women got around.

In the following two decades, researchers in fields as diverse as geography, planning, sociology, history, anthropology, government, engineering, and economics have found that otherwise comparable men and women often have very different transportation concerns and travel. Moreover, most researchers concluded that these differences were not explained by traditional factors such as income or employment status. But, significantly, these findings rarely made their way into the traditional transportation planning process, and they rarely affected public policy.

The **Women's Travel Issues Second National Conference**, funded by the Federal Highway Administration and organized by the Drachman Institute of the University of Arizona in cooperation with Morgan State University, had a whole new set of goals. In addition to bringing together the latest research on women's travel issues from a number of disciplines, the Conference was structured to alert policymakers and planners of the need to pay serious attention to the very real differences in the travel behavior and patterns of men and women, and among subgroups of women.

The **Conference** focused on the latest research in many of the same areas addressed almost 20 years earlier—and it is striking how similar the findings were. Current research continues to show major differences in the travel patterns of men and women—which are explained in part by historical and economic trends but, more significantly, by the roles each sex assumes, the responsibilities they accept, and the duties they carry out. At the same time, research suggests that there are substantial differences among subgroups of women—which may be greater than aggregate differences between the sexes. Studies described at the Conference found that variations in the travel patterns of women may result from differences in the residential and labor market opportunities open to various groups of women in a community, as well as differences in the transport options they have. Additional work suggested that race, ethnicity, and country of origin may have profound impacts on the travel behavior of men and women—generally independent of economic factors—and may explain differences among otherwise comparable women travelers.

The **Conference** brought together a series of thoughtful and often challenging papers that identified differences in the patterns of women and men over time, evaluated the potential planning and policy implications of those differences, and presented decisionmakers and planners with a coherent view of the interlinked transportation, economic, social, environmental, and land use constraints facing women and their families.

The Conference organization was guided by a Steering Committee whose members reflect a wide range of interests, affiliations, and perspectives. As an historical note, over half of the members of this Steering Committee were directly involved with the First National Conference in 1978.

This document contains 40 peer-reviewed papers presented at the Conference that fall into nine substantive categories:

- Trends in Women's Travel
- Historical Perspectives
- Women's Emerging Travel Patterns
- Women, Space, and Place
- Gender, Race, and Ethnicity
- Travel Patterns of Women with Special Needs
- Safety and Security Issues
- Women in the Transit Industry
- Transportation Policy Issues with Special Implications for Women

Chapter 41 contains brief abstracts of research presented at Conference Poster Sessions.

The Proceedings conclude with the **Research Agenda** developed by the Steering Committee and Conference participants; research topics in need of exploration were identified in nine categories:

- Women's Travel Constraints, Preferences, and Patterns
- Understanding the Travel Patterns of Women of Color
- Understanding the Travel Patterns of Aging Women
- Understanding Women's Safety and Security Issues
- Women and Technology
- Land Use Patterns and Community Interaction
- Children's Travel Patterns
- Developing Appropriate Research Design and Methods
- Policy Research and Analysis

ORGANIZATION OF CONFERENCE PROCEEDINGS

TRENDS IN WOMEN'S TRAVEL

Five papers presented in this section set the stage for an in-depth analysis of the importance of understanding women's travel. These papers show how women's travel patterns have come to more resemble men's—while at the same time remaining very different in important ways.

Howard V. Hayghe traces the significant trends in women's labor force participation showing that, in many ways, women's overall labor force, employment, and earning experience are coming to resemble men's. At the same time, he shows that there are many subgroups of women whose labor market activity varies considerably with age, ethnicity, marital status, and motherhood.

Sandra Rosenbloom uses census and other data to chart the trends in women's and men's travel patterns over the last decade. Women are closing the gap with men on a wide variety of travel indices—women are almost as likely as men to be licensed drivers, and women have substantially increased the number of miles they travel. At the same time, women make more daily trips than men and, in many cases, are more dependent on the car as a passenger or driver than comparable men.

Sharon Sarmiento reviews a variety of studies to show how the many demands placed on working women—from responding to children's needs to doing the household grocery shopping—severely constrain their travel choices, requiring them to depend on the private car. She shows that women are more likely to chauffeur their children than men with the same worker status and presence of children and they are more likely to link trips together; for example, going shopping on the way home from work. Sarmiento suggests that women face substantial difficulties giving up their cars when faced with demands to carpool or use transit.

Heather MacDonald and ***Alan Peters*** outline traditional explanations for the length of a worker's commute, reviewing the theories and studies that attempt to explain why women traditionally have shorter work trip commutes than men with comparable incomes, occupational status, or educational attainment. They show that explanations that work for urban women don't always explain rural women's travel patterns and that most theories about women's travel are inadequate to explain all the differences between men and women and among subgroups of women.

Gloria J. Jeff and Regina McElroy summarize the remarkable societal changes that challenge us to fashion new and different transportation programs at all levels of government—the deindustrialization of society, the involvement of women with children in the labor force, suburbanization, the growth of the service sector, the concentration of poverty in the inner city. They describe the strengths and weaknesses of local, regional, state, and Federal programs and policy apparatus in responding to women's special needs in the face of these trends.

AN HISTORICAL PERSPECTIVE ON WOMEN, TRAVEL, AND FREEDOM

Martin Wachs presents an engrossing description of women's involvement with personal cars at the dawn of auto history in the U.S.; upper-class women were often the market for electric cars, which had limited range but were easy to start and operate. He shows how car makers early on focused their advertising on women and what these ads reflect about the society in which they were published.

Michael L. Berger shows how the coming of the car—often called a "flivver"—revolutionized rural society and the way in which people related to one another. People could, for example, take

more trips and stay for shorter periods; at the same time, farm families were free to pursue friends who shared common interests rather than those who lived nearby. As a result, farm women developed many more relationships.

WOMEN'S EMERGING TRAVEL PATTERNS

Six articles comprehensively describe how women's travel differs from men's in a number of important ways and how subgroups of women have patterns and needs that differ from one another. ***Martha J. Bianco*** and ***Catherine Lawson*** describe women's complicated travel behavior and their greater propensity to link many trips together. ***Amy Helling*** shows how women's travel patterns are shaped by, and often constrained by, the different locations of the jobs available to them. In a similar vein, ***Elizabeth Burns*** chronicles differences in men's and women's access to major employment locations in the central city.

Merritt Polk considers the environmental implications of women's growing dependence on the private car in Sweden. ***Angela Astrop*** describes the dependence on bicycles and other human-powered conveyances by women merchants in India. Finally, ***Anne Bernard, Annarita Polacchini, Anne-Marie Seguin,*** and ***Yves Bussière*** describe the methods necessary to identify, measure, and analyze the differences between men's and women's travel patterns in different societal contexts.

WOMEN, SPACE, AND PLACE

Four articles describe how land use patterns and the spatial distribution of jobs and homes differentially impact men and women. ***Daphne Spain*** shows how the shape of most American communities requires women to travel longer and make more complicated trips; ***Susan Hanson*** questions how the geographic location of employment opportunities currently affects the way women structure their lives and the possible implications of telecommuting and other technological improvements. ***Ruth L. Steiner*** and ***Susan Handy*** each focus on the non-work trips of women, suggesting how the shape of our communities and neighborhoods impact their travel options.

GENDER, RACE, AND ETHNICITY: TRANSPORTATION INTERACTIONS

Four papers demonstrate that poor women and women of color may face special burdens which constrain their travel patterns. ***Ibipo Johnston*** shows that Black women travel further for low-paying jobs than comparable white women; ***Sara McLafferty*** **and** ***Valerie Preston*** also find these patterns and suggest it is because Black women don't have the luxury of making shorter trips in order to balance home and work. ***Brian Taylor*** and ***Michael Mauch,*** and ***Karen Chapple*** and ***Rachel Weinberger*** also show that women of color have different travel patterns, generally being forced to travel longer to access jobs which match their skills levels.

THE TRAVEL PATTERNS OF WOMEN WITH SPECIAL NEEDS

Three papers consider the needs of households which face special barriers to their travel. ***Jon Burkhardt, Arlene M. Berger, and Adam T. McGavock*** show the serious extent of mobility loss facing older women who can no longer drive. ***Lalita Sen*** examines cross-cultural American women—focusing her research upon cultural differences between immigrants and natives that may impact their demands for alternative transportation as they age. ***Mary R. Lupa*** focuses on a special subgroup of poor and older women—those living in households without a car—and considers what a burden that places on them.

WOMEN'S SAFETY AND SECURITY ISSUES

Six papers focus on both safety and security, two issues of special concern to women travelers. ***Patricia Waller*** reports on the disturbing finding that women are becoming more likely to abuse alcohol than ever before and that drinking is playing a greater role in their accident rates. ***Lidia P. Kostyniuk, Lisa J. Molnar, and David W. Eby*** show that women are becoming greater risk-takers in many driving situations with predictable implications for accident rates. In a similar vein, ***Karl Kim*** shows that women's per capita accident rates are climbing, only partially as a result of the fact that they are traveling more.

Patricia C. Dischinger shows that women have a greater tendency to suffer ankle and foot fractures in accidents because of their stature. ***Flaura Koplin Winston*** and ***Richard Reed***, reporting on a series of 29 serious or fatal injuries in children attributed to airbags, conclude that additional information is needed to develop ways to maximize the effectiveness of airbags for children. They find that, while there is evidence of children's accidents possibly related to airbag deployment, there is no good measure of the actual exposure of children to airbags, so the trade-off between protection and possible injury cannot be assessed. Finally ***Dorothy M. Schulz*** and ***Susan Gilbert*** focus on the way that large transit operators are attempting to make transit travel more secure for women, who often report a special concern for their safety.

WOMEN IN THE TRANSIT INDUSTRY

Four articles deal with how transit operators respond to women employees (and those of color) as well as to women customers. ***Carol Lewis*** reports on a national survey of transit agencies; ***Beverly Ward and Eric Hill*** describe a study showing that women and people of color are moving up in transit agencies. ***Nariida Smith*** and ***Marcus Wigan*** question whether agencies in which women did not play an important role could well serve women customers, while ***Sharon Hanlon*** questions how women's special needs are identified and evaluated by transit systems.

TRANSPORTATION POLICY ISSUES WITH SPECIAL IMPLICATIONS FOR WOMEN

Six articles highlight important areas where governmental programs and policies may differentially impact men and women because of the differences in their travel patterns, attitudes, preferences, and opportunities. ***Hank Dittmar*** discusses the issues and values surrounding transportation education for women. ***Deb Niemeier*** shows that the ways in which regional infrastructure decisions are made and evaluated fail to take women's transportation needs into account. ***Michael N. Bagley*** and his co-author evaluate how women respond to various telecommuting options, while ***Patricia L. Mokhtarian*** and ***Elizabeth L. Raney*** show how men and women react differently to public programs designed to reduce congestion.

Patrick Butler demonstrates that the way in which insurers charge for auto insurance disadvantages women because of the special nature of their travel patterns. Finally, ***Fotini Georgiadou, Kristi M. Branch***, ***Sally Tenney*** *and* ***Michelle C. Silbernagel*** detail the many ways in which travel reduction programs, and the incentives and sanctions they may contain, could seriously disadvantage large groups of women.

POSTER SESSIONS

The advent of poster sessions at the 1996 Conference was widely applauded. Such sessions allowed authors and participants to interact on a more personal level than would be possible in formal sessions. Due to the informal nature of such sessions, additional research and findings could be presented and lengthier discussions and debates could take place.

Over ten authors presented their research findings and papers during the Thursday night poster sessions. Such issues as "career development of African-American women," "patterns of trip behavior in developing countries," "gender-based travel issues" on commuter rail systems, women's safety issues, and "airbags and children" were a few of the poster topics.

I

OVERVIEW

Women's Labor Force Trends and Women's Transportation Issues

Howard V. Hayghe

U.S. Bureau of the Census

WOMEN'S LABOR FORCE TRENDS AND WOMEN'S TRANSPORTATION ISSUES

THE DATA

First, we need to take a brief look at the source of the data I have used as a basis for this talk in order to understand and interpret some of the recent movements in women's labor force trends. The data are based on information collected in the Current Population Survey (CPS), which is conducted for the Bureau of Labor Statistics by the Bureau of the Census. Currently, the CPS sample consists of about 50,000 households nationwide. The survey collects information that is used to determine the employment status of persons age 16 and over in the civilian noninstitutional population. In addition, it collects a wide range of demographic information that is used in studying the labor force activity of various population groups such as women.

While the CPS has been in continuous operation for about a half century, it has undergone several revisions in order to maintain the quality of its data in a changing world and to take advantage of technological and scientific advances in survey methodology. In the late 1980's and early 1990's the Bureau of Labor Statistics, in cooperation with the Bureau of the Census, undertook a major redesign of the CPS questionnaire and survey methodology. The revised survey questionnaire and data collection methodology were implemented in January 1994. One result of these changes, however, is that estimates based on data collected by the revised survey are not strictly comparable with estimates based on the old survey. It has been estimated, for example, that the number of employed women is about 3/4 million greater using the information obtained by the revised questionnaire and methodology than under the old survey. While this makes it difficult to analyze changes between 1993 and 1994, it does not affect fundamentally the interpretation of the broad, long-term trends that are the focus of this talk.

LABOR FORCE PARTICIPATION

Women's labor force participation rate (the percent of women 16 years and over in the civilian noninstitutional population who were working or looking for work) grew from 33 percent in 1948 to 59 percent in 1995. Over the same period, the rate for men fell gradually from 87 percent to 75 percent. As a result, the gap between women's and men's participation shrank from 54 percentage points in 1948 to 16 points in 1995.

The most rapid growth in women's participation occurred from 1975-85. Subsequently, growth slowed and, since 1990, the labor force participation rate for women has been at a virtual standstill. Factors underlying this leveling-off included declines in participation among young women under age 25, the long-term slowing of participation rate growth among women 25 to 44 years old, and an unusually slow employment rebound from the 1990-91 recession.

Contrary to the expectations of some observers, however, declines in participation have not occurred among mothers. Predictions that the leveling-off of women's overall participation rate in the early 1990s presaged a return to family lifestyles of the 1950's and 1960's do not appear to be coming to pass. Indeed, there is some evidence that participation rates for mothers of young children have grown recently.

Turning to individual subgroups, mothers of school-age children posted rapid gains in participation. In 1975, about 55 percent of the mothers whose youngest child was 6 to 17 years old were in the labor force. By 1990, that proportion reached 75 percent, and has been about unchanged since then. Mothers with preschool children also posted very rapid gains. In 1975, just 39 percent were working or looking for work; by 1990, the proportion had reached 58 percent. The rate changed little during the early 1990's, but by 1995 it had reached 61 percent, including 57 percent of those with a child under a year old.

By marital status category, divorced women are the group most likely to be in the labor force—nearly 3 out of 4 in 1995. The fastest-growing group, however, is married women. Wives' labor force participation rate increased by about 20 percentage points between 1970 and 1995, when 3 out of every 5 were labor force participants.

As noted earlier, the slowdown in labor force rate gains for women 25 to 44 years old was an important factor underlying the cessation of women's overall participation rate growth in the early 1990's. As might be expected, women in this age group with no children under 18 have a higher labor force participation rate than those who were mothers—84 percent in 1995, compared with 71 percent. Since 1975, the participation rate for those with no children has not grown very much, only about 6 percentage points. By contrast, the rate for the mothers has increased by 20 percentage points or more over the period.

This has resulted in a sort of "compression" as the gap between the labor force rates of the two groups narrowed sharply (from 29 percentage points in 1975 to just 12 points in 1995). This suggests the possibility that the overall participation rate for women ages 25 to 44 years may be nearing its upper limit, assuming, of course, that the rate for those with no children represents that upper limit.

EMPLOYMENT

Among women who do work, there are two important ongoing trends that have significance from an economic and family standpoint. Women are moving away from lower-paying "traditional female occupations" towards managerial and professional jobs where earnings are higher. Also, they are increasing the amount of time they spend working which affects not only the amount of time they can spend on family-related tasks but also their total earnings.

Currently, 29 percent of employed women are in managerial and professional jobs, 42 percent in technical, sales and administrative support occupations., and 18 percent in service occupations. (By contrast, men are more evenly spread across occupational groups.) Twenty years ago, in 1975, just 18 percent were in managerial or professional specialty jobs, while 46 percent were in technical, sales and administrative support jobs, and 21 percent were in service occupations.

Women are increasing the amount of time they devote to market work by increasing the number of weeks they work over the course of a calendar year. Since 1970, the proportion of employed women who work all year (50-52 weeks) has grown from 51 percent to 67 percent. Contrary to conventional wisdom, however, the proportion of women with work experience during a calendar year who usually work full-time (35 hours a week or more)—70 percent—changed little over the period.

EARNINGS

As women's labor force participation and employment patterns have changed—more nearly approaching men's—so have their earnings. Among full-time wage and salary workers, women's median usual weekly earnings grew from about 63 percent of men's in 1979 to nearly 77 percent in 1993. Subsequently, the ratio drifted lower to a little more than 75 percent.

This downturn does not mean that women's earnings are declining. Rather, it signifies that, for now, men's earnings are growing faster than women's. This may be a statistical artifact, however, and only a temporary interruption in the trend.

The new questionnaire introduced in January 1994 (which was discussed briefly above) included revisions to the earnings questions. And, since changes in questions often result in somewhat different answers, it is possible that the revisions might have had some unanticipated short-term effects on earnings trend data.

Another possible explanation is related to the fact that the distribution of persons with earnings tends to cluster around particular earnings values. This clustering occurs at several different places in the distribution, which are different for men and women. When the median value is in one of these dense clusters, its rate of change is relatively slower than when it is in the relatively unoccupied space between clusters. This is much like the difference between driving in a rush-hour traffic jam and driving on an interstate highway hundreds of miles from any population centers. Hence, if the median for men is in one of the spaces between clusters while that for women is in the midst of a dense cluster, the men's median may race ahead while the women's median advances at a much slower pace. As a result, over the short term the difference between men's and women's earnings can widen abruptly (or narrow, depending on which median is changing more rapidly).

The earnings difference between women and men is lowest among young workers. Twenty- to 24-year old women full-time wage and salary workers earn 92 cents for every dollar men of the same age earn. Among those ages 45 to 54 years, the difference is greater as women earn just 68 cents for every dollar men earn.

The data appear to indicate, however, that the relatively smaller earnings differences among younger men and women may be carried forward—or even reduced—as they age. For instance, in 1983, women ages 25 to 34 earned about 73 cents for every dollar earned by men of the same age. Ten years later in 1993, when these women and men were 35 to 44 years old, the earnings difference was the same. Women who were 35 to 44 years old in 1983 had earnings that were 61 percent of those of men in the same age group; 10 years later, when these men and women were 45 to 54 years old, the women were earning 67 cents for every dollar the men earned. These developments suggest that, taken over the long term, difference between men's and women's earnings overall will tend to narrow.

The difference between women's and men's earnings is much smaller among blacks and Hispanics than among whites. Among blacks and Hispanics, women earn nearly 90 cents for every dollar men earn, while among whites, the figure is about 73 cents. The fact that black and Hispanic women earn nearly as much as their male counterparts, however, is due largely to the fact that the earnings of black and Hispanic men are relatively low, on average.

UNEMPLOYMENT

For more than two decades, it was taken for granted that women were more likely to be unemployed than men. But, this has changed; since the mid-1980s, women have been about as likely to be unemployed as men. The higher unemployment rates for women that prevailed during the 1960s, 1970s, and early 1980s, were largely a result of the huge influx of women into the labor market that occurred during that period. As this influx subsided, and women acquired more labor market experience, their unemployment rates came to resemble men's.

As is the case among men, black and Hispanic women are more likely than their white counterparts to be unemployed. Among mothers, the unemployment rate is highest for those with very young children. For those with children under 3, for example, the unemployment rate was 8.5 percent, just about twice the rate for those whose youngest child was 14 to 17 years old. This undoubtedly reflects the difficulties involved in finding jobs that make it possible to care for very young children.

CONCLUSION

This brief overview of trends in women's labor force activity shows that, on the whole, women's overall labor force, employment, and earnings experience are coming to resemble those of men. It also shows, however, that women are a very diverse group whose labor market activity varies considerably depending on such factors as age, ethnicity, marital status, and motherhood.

Trends in Women's Travel Patterns

Sandra Rosenbloom

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TRENDS IN WOMEN'S TRAVEL PATTERNS

INTRODUCTION

BACKGROUND

Women's travel has changed remarkably in the last three decades. Women are making more trips, more often in a car, covering more miles—all shown in Tables One through Three. Table One demonstrates that women under 65 make more trips daily than do men—and that the gap between the sexes is growing. Between 1983-90, men 16-64 increased their trip-making just over 2% while women's trip-making went up 8%. Women over 65 currently make fewer trips than men but some of this represents the disproportionate number of very old women among seniors. But between 1983-90 older women's tripmaking increased almost 15% while men's barely increased.

Table 1
Daily Person Trips

	1983	**1990**	**83-90 % Change**
Men 16-64	3.21	3.28	+2.2%
Women 16-64	3.25	3.51	+8.0%
Men 65+	2.23	2.25	+0.9%
Women 65+	1.56	1.79	+14.7%

Table Two shows that in 1990 women 16-64 made more of their trips in a private car than did men—although both sexes made almost nine out of ten trips by car. Between 1983-90 women's use of the car went up over 2% for those under 65 and almost 4% for those over 65. An interesting point is that women's use of public transit also went up very slightly while men's went down—although neither sex either under or over 65 made more than 3% of all their trips in a bus, subway, or train.

Table 2
Selected Modes for All Trips

	1983		**1990**		**83-90 % Difference**	
	%Car	%Transit	%Car	%Transit	%Car	%Transit
Men 16-64	87.5	2.6	89.1	2.3	+1.3	-0.3
Women 16-64	87.2	2.9	89.5	3.0	+2.3	+0.1
Men 65+	87.3	2.7	90.3	2.2	+3.0	-0.5
Women 65+	84.3	2.6	88.1	2.9	+3.8	+0.3

Table Three shows one result of the growing dependance on the private car among women of all ages. Although women continue to drive fewer miles than men, women's driving has increased remarkably. Between 1983-90, women both over and under 65 increased their total annual mileage almost 52%—so while men also drove more the gap between men and women has narrowed. In 1983, for example, men 16-64 drove 129% more miles than comparable women; in 1990 they drove only 70% more.

Table 3
Average Annual Miles Driven

	1983	1990	83-90 % Change
Men 16-64	15,370	17,602	+14.5%
Women 16-64	6,722	10,184	+51.5%
Men 65+	7,200	9,414	+30.8%
Women 65+	3,308	5,020	+51.8%

These changes both result from and take place in the context of a number of major and even dramatic changes in society. All of the changing travel patterns of women must be seen in light of the complex interactions of these trends. This paper will first review these crucial factors, some of which may simply be context for the transportation changes we are seeing while others may be explanatory—and all seem inextricably linked. The paper will address three issues which arise from the nexus of many of these trends but which have been poorly or inadequately explored by most researchers: the impact of income, suburbanization, and race and ethnicity on women's travel patterns.

THE ENVIRONMENT

Among the most influential trends that affect or support or create the vast changes we have seen in women's travel behavior are:

- Increasing labor force participation of women, especially those with children
- Staggering growth in the automobility of society
- Suburbanization of homes and jobs
- De-industrialization of the economic base
- Aging of society
- Increasing single adult and single person households
- Growing diversity in the population, especially associated with migration from abroad

WOMEN'S LABOR FORCE PARTICIPATION

From 1970-1990 the labor force involvement of American women increased over 14%—while dropping almost 4% for men[1]. In fact in each of the last three decades, the absolute growth of women in the labor force out paced that of men, sometimes substantially. For example, between 1980-90, almost 14 million women joined the labor force, compared to just under 10 million men.

The participation rate of women 35-44 grew the fastest; in 1992 over three-fourths of women in that age group were in the paid labor force[2]. As a result, almost 60% of all women have paid employment; in 1992 women comprised 46% of the total civilian work force[3]—compared to 38% in 1970[4]. The Bureau of Labor Statistics estimates that by 2005, almost 64% of women but only 74% of men will be in the civilian labor force[5].

Hidden within these figures is the major increase in the labor force participation of *women with children.* In 1986 over 61% of married women with children under 18 worked outside the home—compared to only 27% in 1960. Just as important is the substantial growth of employed married women with very young children. In 1960 only 18% of married women with children under 6 were in the paid labor force; the comparable number was 30% in 1970 and 33% in 1976. Today almost 60% of married women with young children have salaried employment (while almost 75% of married women with children from six to seventeen are in the paid work force)[6].

DEPENDENCE ON THE PRIVATE VEHICLE

Between 1969-1990 the number of licensed drivers went up almost 60%—the largest component of that growth was licensing among women. In 1990 almost 96% of men and 90% of women 30-49 were licensed drivers[7]. Within twenty years there will be no more than a five percentage point difference in the licensing rates of any group of men and women under 70; as a result licensing is growing rapidly among elderly woman as younger drivers age.

The growth in drivers licensing is linked to growth in private vehicle ownership. In 1990 there were more cars than drivers in the US—20% of all households had three or more cars. And while some Americans were car-less, in 1990 only 6% of the entire population lived in households without a car and many of those households were headed by seniors[8]. As the number of cars has increased, the number of people in each car has fallen drastically, so that fewer than one in ten cars has an occupant other than the driver in it at any given time.

Given this backdrop, it isn't surprising that between 1980 and 1990 more people became drive- alone commuters than became workers.

> About 19 million workers were added, and over 22 single-occupant vehicle drivers were added. Effectively, all new workers chose to drive alone, and a few million additional workers shifted from other modes to the single-occupant vehicle. Some alternatives, such as walking and carpooling, declined precipitously, while others, such as transit, declined less dramatically[9].

SUBURBANIZATION

American metropolitan areas are becoming increasingly more suburban. In 1990 50% of all workers lived in the suburbs; between 1950 and 1992 the U.S. population rose 56.1%—but central cities only grew 49.9% while the suburban population grew almost 200%.[10] While the rate of suburban growth slowed in the last decade (and that of central cities went up slightly—to .64% from .09% in the 1970-80 decade), suburban growth is still substantially faster than that of the central city. For example, in the high growth areas of the South and the West annual suburban growth rates exceed 2.2% a year[11]. Not only are suburbs the home of more Americans, they are where the majority of Americans find their jobs. Between 1980-90, the number of suburban jobs grew 65% (and the number of rural jobs

grew 17%) but central city jobs grew only 18%. As a result almost 70% of all new jobs created in the US economy between 1980 and 1990 were in the suburbs[12] . The number of suburban workers grew over thirty percent between 1980-90 in metropolitan areas as disparate as Minneapolis and Norfolk (VA), Indianapolis and Houston, Columbus (OH) and Miami—with suburban job growth rates exceeding 50% in Dallas, Atlanta, San Antonio, and Sacramento[13].

Even within suburban areas, job are de-concentrating, discussions of "Edge Cities" notwithstanding. A major study of six large metropolitan areas found that most office jobs were located in relatively small, low density clusters along highways or what the author termed "the net of beads"[14]. In the Los Angeles region Giuliano and Small found that while there were a few large suburban clusters, most suburban centers were small scale[15].

In fact, a 1994 study found that from 1972-1992 substantial employment decentralization occurred almost everywhere in the US, with the outer suburbs reaching levels of employment previously achieved by inner suburbs[16]. Between 1982-87 metropolitan employment growth was the highest in the outer suburbs for all industrial sectors except manufacturing; for example it exceeded 3% in all metropolitan areas (except Milwaukee) and was over 5% in five large cities.

This outer suburban employment pattern was not a Sunbelt/Rustbelt phenomenon—the highest rate of outer suburban employment growth in the US was in four disparate communities: Houston, Detroit, Philadelphia, and Los Angeles[17].

INDUSTRIAL RESTRUCTURING

The US economy is witnessing major remarkable shifts from production and agriculture to service industries, that is, from work in factories or farms or mines to jobs, for example, in retail sales, public administration, private household work, banking, or communications. In the U.S. the total number of service sector jobs grew 73% from 1970-90 while those in manufacturing grew only 2%—as jobs in agriculture actually fell 6%. As a result, in 1990, there were almost 85 million jobs in the service sector in the US—or 72% of total civilian employment[18]. In part, this growth in service jobs is related to the aging of the population and the substantial increase in salaried women, both of which have created a rapidly growing domestic demand for services in health care, day care, food, and leisure activities.

Women's employment patterns are inextricably bound with the growth of the service sector. For example, retail trade will soon replace manufacturing as the second largest source of total US employment; it is expected to generate over 5 million jobs by 2005. Women have traditionally been the dominant participants in this division accounting for 52% of the jobs in 1990—and holding 68% of the part-time jobs[19]. (Unfortunately this industry is dominated by part-time, low-skill, "demand little" jobs which offer little chance for advancement.)

A key component of the service sector is the flexible labor force, which contains roughly one fourth of all American workers—and a disproportionate share of women workers. So-called flexible workers are those with variable work schedules or those who work at different locations in a given time period, as well as people consistently holding more than one job either permanently or as contingency workers. Some analysts estimate that, by the turn of the century, almost half of the work force will be contingency or flexible workers[20].

A 1994 study of workers with two jobs, or "moonlighters," found that the substantial growth in workers with multiple employers was largely due to increasing rates among women. In 1970 roughly 2% of women but 7% of men moonlighted; men's rates continued to drop and women's to increase slightly so that by 1994 they converged at 5.9%. The study noted,

> Multiple-job holding by women has increased in recent years as a result of the increasing percentage of families headed by females, low relative wages, and stagnant male earnings[21].

These remarkable changes in the economic patterns of the country affect not only where women work but when; most of the changes involve a variety of work schedules. Census data show that almost 40% of all women workers do not have a day shift job (defined as a work schedule where at least one-half of the hours fall between 8:00 AM and 4:00 PM). Twenty-three percent of all full time working mothers and almost 60% of those working part time not only don't work the classic 9-to-5 day, they don't even work most of their hours during that traditional period[22].

THE DEMANDS OF AN AGING SOCIETY

American society is rapidly aging; in 1990 more than one fourth of the entire population was over 60. Indeed, the elderly are the fastest growing component of the US population; the number of those over 65 grew more than 20% between 1980 and 1990. Moreover, in 1990 there were 6.2 million Americans over 85, a number the Census expects to increase over 400% by 2050. By the first decade of the next Century almost half of all elderly people will be over 75—and almost 5% of the entire US population will be over 80[23].

Among the elderly, women outnumber men by 3 to 2 and are over represented among the very old[24]. In 1991 almost 46% of women but only 37% of men over 65 were over 75 while more than one in four older women were over 80 (compared to less than one in five men). The Census Bureau predicts that by 2010 more than half of all women but only 41% of all men will be over 75. Partially because of the age gap between men and women, older women are substantially more likely to be unmarried or to live alone; in 1990 almost 54% of women but only 19% of men over 65 were widowed or divorced while 16% of men but over 42% of women over 65 were living alone.

Today, in contrast to twenty years ago, most older people are drivers; between 1983-1990 the increase in licensing among both older men and women was substantial—not, of course, because older people learned to drive but because younger drivers were aging. In 1992 almost 90% of men and 50% of women over 70 were licensed drivers; more importantly, almost 100% of men and 90% of those who will be over 70 in 2012 are currently licensed drivers.

While many elderly are wealthy, the poor elderly are largely single women, often minorities[25]. A recent Census study concluded,

> Growth in real income [in the '80's] was weakest for elderly single householders, especially women, and those elderly households slightly above poverty. The situation was particularly acute for elderly Black women living alone—a group whose poverty rate changed very little in the decade. Elderly married couple households, on the other hand, appeared to have fared best during the decade[26].

In general, elderly people living alone have the lowest median incomes but elderly women living alone were more likely to have low incomes than comparable men. In 1990, for example, 58% of women over 75 living alone but only 42% of comparable men had incomes under $10,000 while 40% of women over 85 living alone were poor compared to 27% of comparable men. As a result, although women comprised 58% of those over 65, they accounted for almost three-fourths of the poor elderly.

The growing proportion of the population who are elderly has important implications for women of working age—who have been called the "sandwich generation" because they may have responsibilities to both their children and their parents at the same time. Today a 45 year old woman could easily have both a 15 year old child and an 80 year old parent. In fact, the ratio of those 50-64 to those over 85 has tripled since 1950 and will triple again over the coming sixty years[27].

This has created a situation without historical precedent; in 1940 only 1 in 3 fifty year old women had a living mother but that figure had doubled to 2 in 3 by 1980.

> More people will face the concern and expense of caring for their very old, frail relatives since so many people now live long enough to experience multiple chronic illnesses...the oldest old [those over 85] are the most likely to have pressing needs for economic and physical support[28].

NEW HOUSEHOLDS AND HOUSEHOLD STRUCTURES

From 1974 to 1994 the total number of US families increased over 17% but the fastest growth was among single parent families. In fact in those two decades the proportion of all families who were headed by a married couple fell more than ten percentage points while families headed by a woman alone grew by almost the same amount—to account for almost one fourth of all American families[29].

As a result of those trend the percentage of children living with both parents dropped over 15% percentage points between 1960 and 1990 while the percentage of children living with just one parent tripled. In 1990 3% of all children lived only with their fathers while 22% of all children lived with only their mothers.

The Census Bureau recently reported,

> In 1990, one-parent family groups accounted for 22.6% of all White, 60.6% of all Black, and 33.2% of all Hispanic family groups. For Black children, the one-parent family group is now the most common living arrangement. For White and Hispanic children, the one-parent family group is now a common arrangement, but not the most common one.[30]

Families headed by a woman alone have considerably higher poverty rates than any other type of households—in 1994 44% were living below the poverty level[31]. In fact, the income of families maintained by a women with no spouse dropped 5% in real dollars between 1967-1991[32]. As a result, families headed by a woman alone constituted a substantial portion of <u>all</u> poor families—almost 60% in 1994[33]. In order to raise themselves just over the poverty line, the average family headed by a woman alone would require an additional $5,661 per year in 1990 dollars[34] .

DIVERSITY IN AMERICAN SOCIETY

The U.S. population has been becoming more diverse for over three decades largely because of a sustained flow of immigrants from abroad[35]. Large and growing numbers of the U.S. population are from different cultural, racial, or ethnic backgrounds. In 1993 approximately 15% of the population was Black, 11% Hispanic (of any race), 4% Asian and Pacific Islander, and just under 1% were American Indian, Eskimos, or Aleuts[36].

By the turn of the Century the U.S. Census predicts the White population will account for 84% of the total population—down from 87% in 1993—while roughly 13% will be Black, 4% Asian or Pacific Islander, and 11% would be of Hispanic origin (of any race). However, by 2050 Hispanics may well compose 23% of the population while the White proportion will drop to just over half.

Migration is one of the largest causes of this country's population growth and Latin America has been the major source of legal immigration to the US since 1969—the primary country of birth being Mexico. Over 43% of the current foreign born population came from Latin American countries; the bulk of the remainder of legal immigrants has shifted from those of European origin to those from Asia. Today those born in Asia account for 25% percent of the foreign born compared to 21% from European countries. In fact, in the last half of the decade of the 80's, the total number of Asian immigrants even outnumbered those from Latin America—1.32 million Asian immigrants arrived in the US compared to 1.02 million Latin Americans[37].

Most analysts believe that the growth of the Hispanic-origin population will be the major element in total population growth[38]. In fact, much of the growth predicted for the West and South will come from the 8 million Hispanics that will be added to the population before the end of the Century. Almost 81% of that number will reside in those two regions, over half in just Texas and California[39]. This trend explains why Texas in 1994 replaced New York as the nation's second most populous state.

SUMMARY

Overall the significant changes just described may have remarkable implications for aggregate travel and particularly for women's travel patterns. While there is general consensus on how overall societal changes may impact a small area of women's travel—for example, greater use of the car, more person trips—many of the implications of these trends have either largely been ignored by theorists and researchers, and/or they raise a host of questions which need to be addressed. I will focus attention on some of both types of issues in the following section of my paper.

TRAVEL IMPLICATIONS; THE NEED FOR FURTHER EXPLORATION

Unresolved Issues

The societal trends just described are linked both to greater travel by women and greater variation in the travel of different sub-sets of women. Many of these implications will be discussed at great length by a number of papers to be presented at this Conference; here I will touch on three:

- The role of income in women's growing reliance on the car
- The implications of suburbanization for women's travel
- Differences in travel patterns by race and ethnicity

Household Income and the Car

Traditional travel analyses place great reliance on **income** as a predictor of behavior and particularly the use of the car. Moreover, traditional analyses and research have focused on the **household** as the appropriate level of analysis—assuming, for example, that a man and woman in a comparable household will make the same travel decisions. Moreover it has always been assumed that the relationship between income and car use is a proportional one (and that the one between income and alternatives to the car is inverse). In short, theory leads us to expect that car use will increase (and transit use decrease) as household income goes up.

However, Figure one suggests that women's growing use of the car is not well explained by household income. In 1990 in all metropolitan areas, at household incomes below $20,000 women drove alone to work more than men. For example, in households making between $10-15,000 almost 72% of women but only 65% of men drove alone to work. In addition, while both men and women were more likely to drive alone as their incomes increased, women's dependance on the car actually dropped after income reached $40,000—women in households making $20-25,000 were as likely to drive as were women making $60-70,000.

As a corollary, in spite of traditional expectations, women in lower income households were less likely to use alternatives to the car for the worktrip commute than comparable men. Figure two shows that women were less likely to carpool than are men with comparable incomes. In fact, men were more likely to carpool if they lived in households making under $25,000. Even at higher household incomes women were only slightly more likely to carpool than men.

Finally Figure three shows that women in very poor households (with incomes less than $10,000) were less likely to use transit than comparable men—but then are more likely to do so at incomes above $20,000. At the same time, the Figure shows that transit use only drops with increasing income until roughly $40,000—at which time it increases.

These statistics raise many questions about why women in comparable households do use the car more and transit less—is it household responsibility or the location of jobs? Do these findings vary by metropolitan area? We have little information on this.

Figure 1
Driving Alone to Work in Metropolitan Areas by Sex and Income

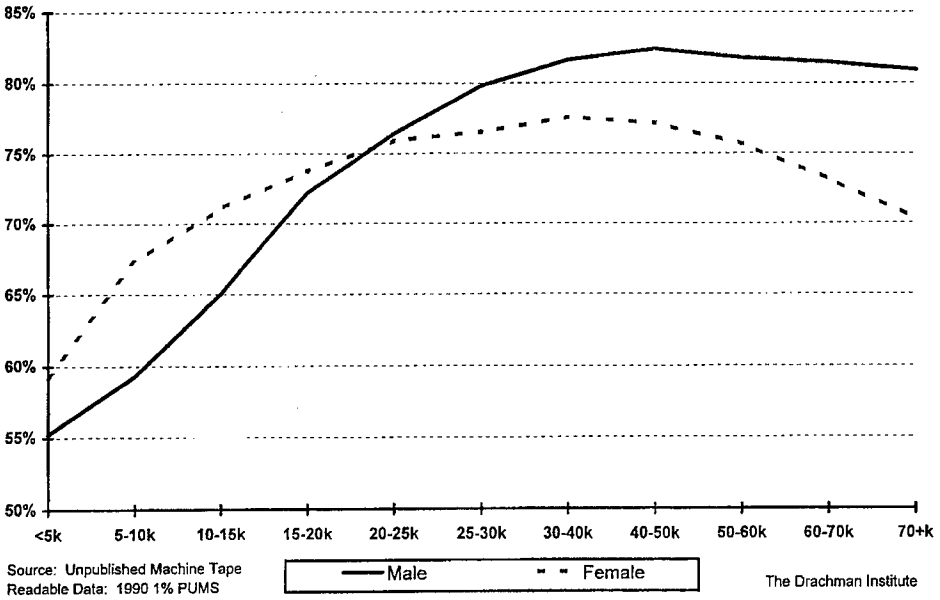


Figure 2
Carpool Use to Work in Metropolitan Areas by Sex and Income

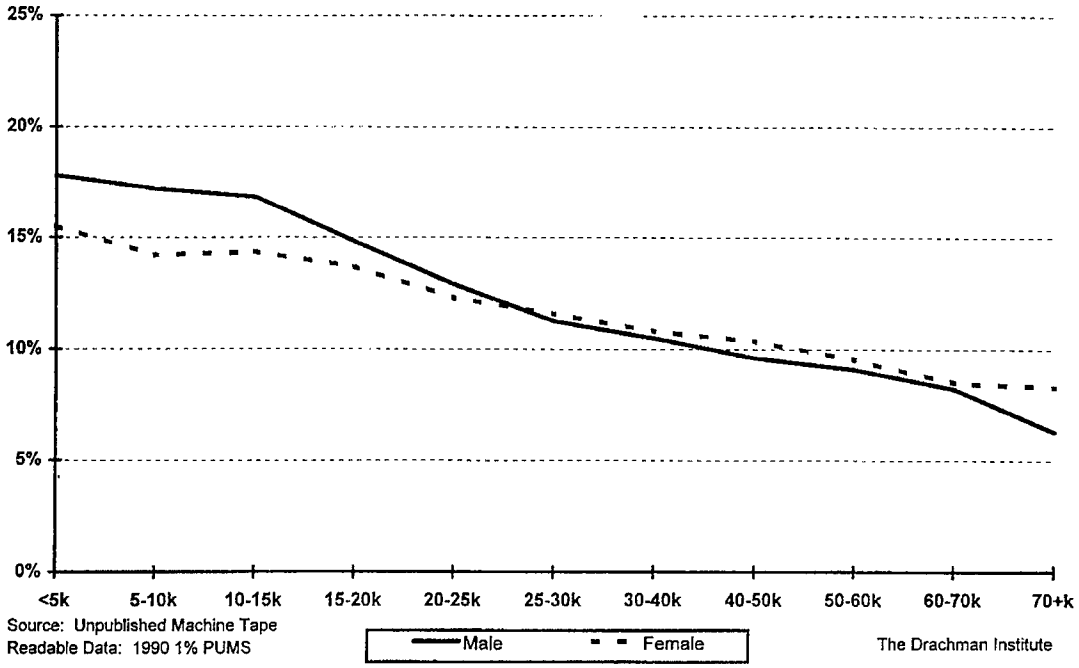
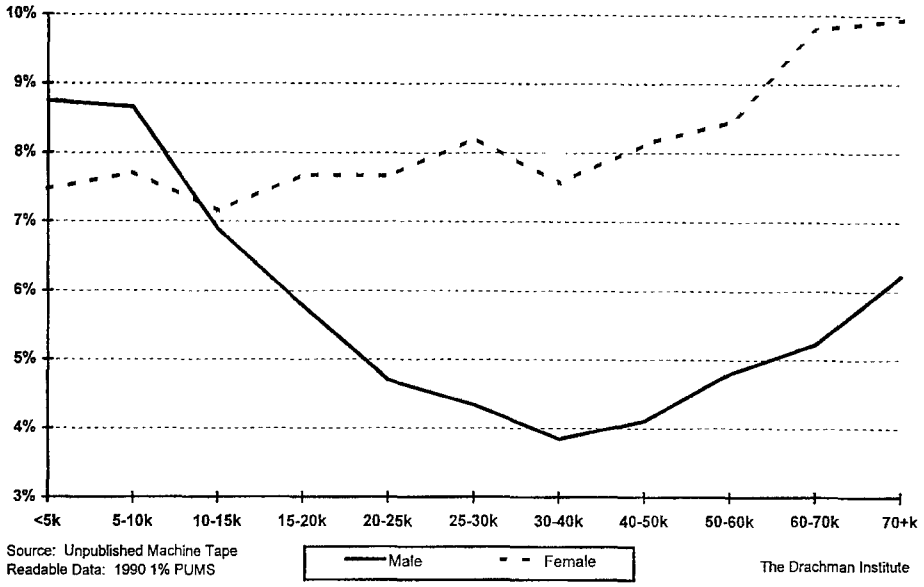


Figure 3
Transit Use by Income and Sex



Suburb, Age and the Car

The growing suburbanization of homes and jobs may have special implications for women's travel, and particularly for older women (who have fewer alternatives if they cannot drive). Table Four looks at both car and transit use for all trips, stressing the differences between central city and suburb[40]. Even in 1983 women 16-64 traveling in the suburbs were more dependant on the car and less dependant on transit than a) women living elsewhere and b) than comparable men. In 1990 car use was highest among women in the suburbs—almost 93% of all trips were made in a car. At the same time transit use among suburban women increased slightly between 1983 and 1990 (while dropping in Central Cities where, presumably, transit services were better).

Table 4
Selected Modes for All Trips, People 16-64

	1983		**1990**		**83-90 % Difference**	
	%Car	%Transit	%Car	%Transit	%Car	%Transit
Total U.S.						
Men	87.8	2.6	89.1	2.3	+1.3	-0.3
Women	87.2	2.9	89.5	3.0	+2.3	+0.1
Central City						
Men	81.7	4.8	84.1	4.8	+2.4	0
Women	79.6	6.0	84.3	5.1	+4.7	-0.9
Suburbs						
Men	88.6	2.4	91.0	2.1	+2.4	-0.3
Women	90.1	2.2	92.7	2.4	+2.6	+0.2

Table Five looks at the same issues among those over 65. While there was no group of elderly women who were more dependant on the car than comparable men, auto use was highest in the suburbs for both elderly men and women. What is striking, however is that auto use 1983-90 went up far faster for women than men both in all areas, jumping faster in the Central City than in the suburb.

Table 5
Selected Modes for All Trips, People 65+

	1983		1990		83-90% Difference	
	%Car	%Transit	%Car	%Transit	%Car	%Transit
Total U.S.						
Men	87.3	2.7	90.3	2.2	+3.0	-0.5
Women	84.3	2.6	88.1	2.9	+3.8	+0.3
Central City						
Men	83.5	5.1	85.3	5.1	+1.8	0
Women	75.8	5.1	83.0	4.9	+7.2	-0.2
Suburbs						
Men	88.1	2.4	89.9	1.5	+1.8	-9.0
Women	85.2	1.9	88.1	3.0	+2.9	+1.1

Given the percentages of suburban trips made in a car, it not surprising that women who live in the suburbs have experienced the fastest growth rate in annual miles driven. Table Six shows that women 16-64 traveling in the suburbs drove 48% more miles in 1990 than they had in 1983—while comparable men drove "only" 12% more. This narrowed the gap between the sexes; in 1983 suburban men drove 124% more than comparable women; in 1990 the gap was roughly half that figure.

Table 6
Average Annual Miles Driven, People 16-64

	1983	1990	83-90 % Difference
Total U.S.			
Men	15,370	17,602	+14.5
Women	6,722	10,184	+51.5
Central City			
Men	13,007	15,730	+20.9
Women	6,380	9,272	+45.3
Suburbs			
Men	15,161	17,005	+12.2
Women	6,774	10,039	+48.2

Table Seven shows that suburban women 65+ increased their annual miles substantially more than non-suburban older women and than younger suburban women, driving almost 75% more between 1983-90—compared to "only" 29% more among comparable men. As a result, the gap between men and women narrowed nationally as the gap narrowed in the suburbs. For example, in 1983, women in the suburbs drove 60% fewer miles than comparable men; in 1990 the gap had narrowed to 47%.

Table 7
Average Annual Miles Driven, People 65+

	1983	1990	83-90 % Difference
Total U.S.			
Men	7,200	9,414	+30.8
Women	3,308	5,020	+51.8
Central City			
Men	6,983	8,188	+17.3
Women	3,087	4,509	+46.1
Suburbs			
Men	7,453	9,681	+29.9
Women	2,950	5,121	+73.6

In addition, suburban women made more person trips than a) comparable men or b) than other women. For example in 1990 women 16-64 in the suburbs made an average of 3.53 trips per day—compared to 3.37 trips by comparable men or 3.43 by central city women. Suburban women also increased their trip-making faster than comparable men from 1983 to 1990—although the highest growth was among central city women (7.65 vs. 9.6%).

The extent to which these are real differences, as opposed to those created by the highly artificial definition of *suburban* used here, is open to debate. However it does seem logical that, to the extent these definitions cover expanded lower density employment opportunities and dispersed residential patterns, women are more likely be affected disproportionately by suburbanization. This may be because of household obligations, or the location or hours of jobs, or because suburban transit alternatives are not as good at serving the employment locations of women service workers as they are at serving those of men (a major manufacturing plant vs. fast food outlets). All of these issues require study and analysis.

Sex, Race, and Ethnicity in Travel

It has been traditional to assume that economic variables, like household income or employment status, or social variables like the assumption of household responsibilities, explain the travel behavior of different groups of people. So obvious differences in the travel patterns of 1) men and women, and 2) whites and blacks, for example, have usually been attributed to differences in income, occupation, and perhaps to residential location. More recently they have been attributed to differences in household structure or roles (i.e. single parent families or salaried women retaining childcare responsibilities).

Yet there is growing evidence of racial and ethnic differences in travel which are not fully explained or explained at all by income or residential location. Some may reflect discrimination in housing or employment opportunities but some differences may also be explained by variations in cultural and ethnic values and norms.

Table Eight shows that white women (and men) 16-64 make more daily trips than people from other backgrounds. White women, for example, made 3.66 trips per day in 1990, or 20% more than Black and 32% more than Hispanic women. At the same time, Black and Hispanic women experienced a much faster increase in their daily trip rates from 1983-90.

Table 8
Daily Person Trips, People 16-64

	1983	1990	83-90 % Change
Men			
White	3.27	3.38	+3.4
Black	2.68	2.92	+8.9
Hispanic	2.66	2.83	+6.3
Women			
White	3.37	3.66	+8.6
Black	2.45	3.04	+24.0
Hispanic	2.45	2.78	+13.4

Figure four shows that white women were substantially more likely to drive alone to work than women from other backgrounds in comparable households. For example, at household incomes between $25-30,000, 80% of white women but only 68% of Hispanic women (of any race) and roughly 62% of Asian and Black women drove alone to work. Moreover, the tendency to drive to work dropped for white women after household incomes of $40,000 while continuing to rise for those from other races and ethnicities. As a result, Black women making more than $70,000 were more likely to drive alone to work than comparable white women.

Conversely, as Figure five indicates, white women were substantially less likely to carpool to work than women from other backgrounds with similar household incomes. For example, in households making between $30-40,000, only 9.8% of white women, but almost 15% of Hispanic and Black women, carpooled to work. Asian women were more likely to carpool than all other women at almost all but the lowest income levels.

Differences among women were even more pronounced for transit use to work. Figure six shows that white women were much less likely to use transit than other women in households with comparable income and that Black women were substantially more likely to do so. While transit use tended to fall with increasing household income for most women, it was the opposite for white women—the higher their income the more likely they were to commute via transit. But even among Asian and Hispanic women the response to increasing income was not very profound; for example, Hispanic women living in households making $50-60,000 were almost as likely to use public transit as Hispanic women in households making $20-25,000.

Figure 4
Women Driving Alone to Work

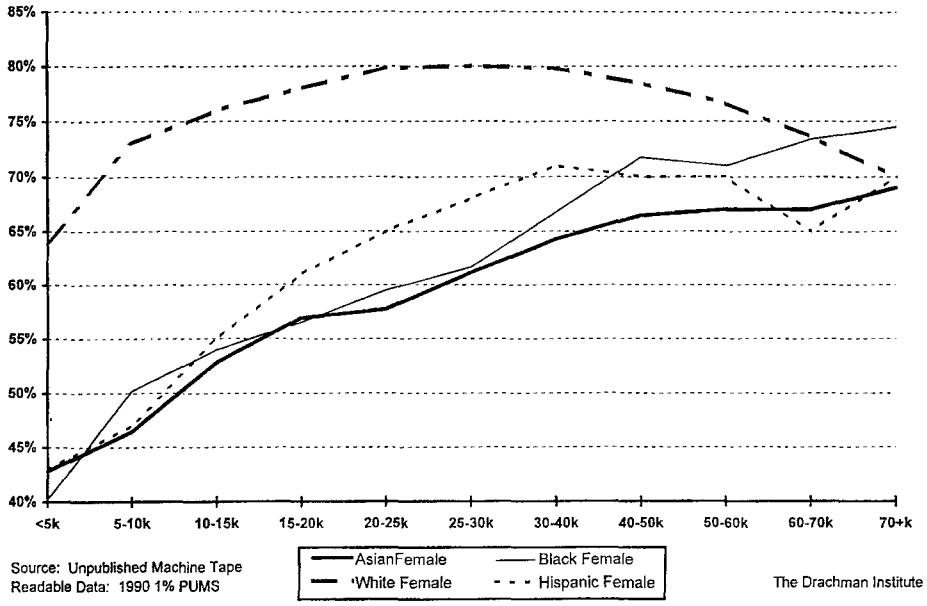


Figure 5
Women Carpooling to Work

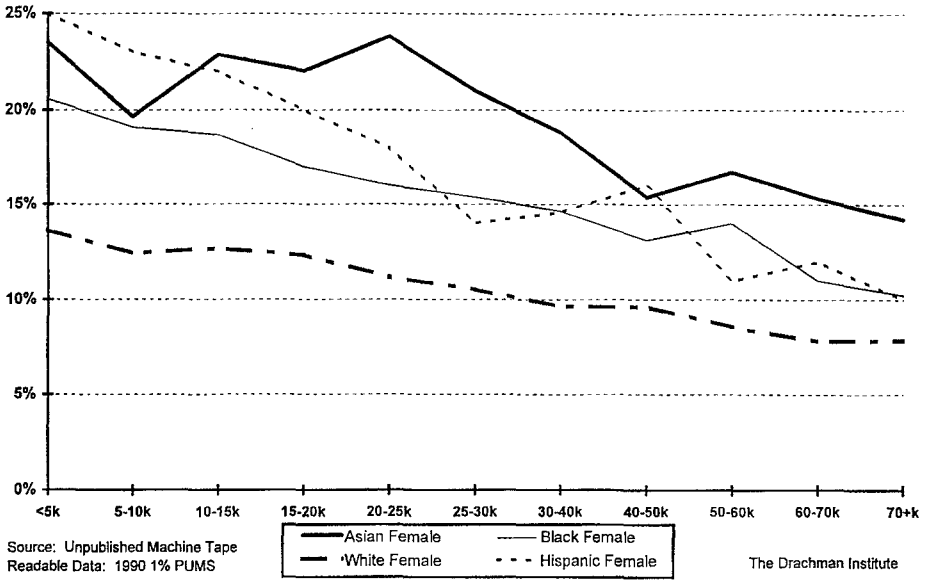
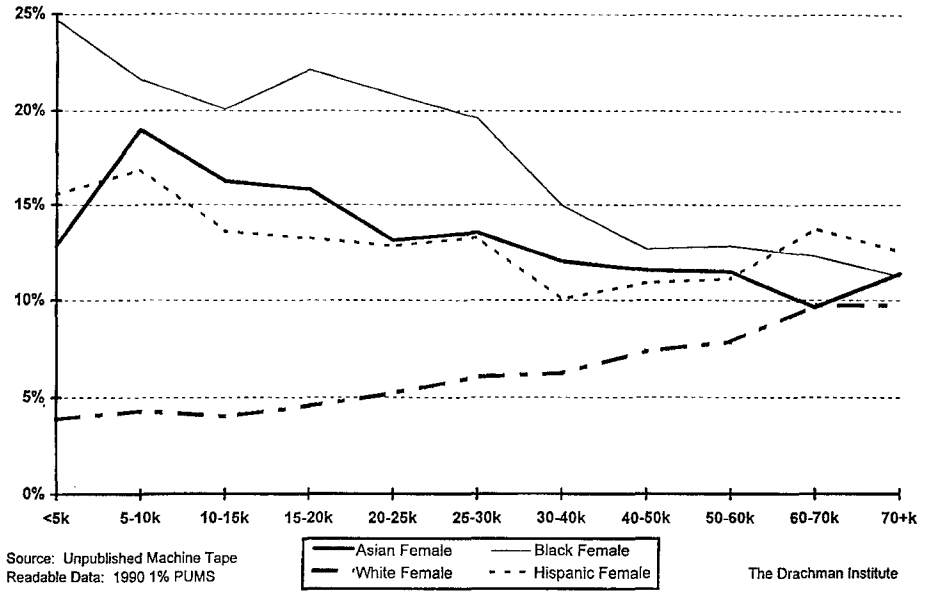


Figure 6
Women's Transit Use by Income and Race



Given these variations, it isn't surprising that there are major differences in the miles driven each year by women from various backgrounds. As Table Nine shows, white women drove more miles each year than Black or Hispanic women, although the rate of increase between 1983-1990 was roughly the same—around 50% in just seven years. There were slightly different patterns among older women as seen in Table Ten; in 1990 Hispanic older women drove substantially more miles than white or Black women. In addition the rates of increase between 1983-90 were very different (although there were some problems with the 1983 Hispanic data).

Table 9
Average Annual Miles Driven, People 16-64

	1983	1990	83-90 % Change
Men			
White	15,693	18,106	+15.4
Black	12,126	15,076	+24.3
Hispanic	12,455	15,141	+21.6
Women			
White	6,830	10,456	+53.1
Black	5,442	8,584	+57.7
Hispanic	6,391	9,416	+47.3

Table 10
Average Annual Miles Driven, People 65+

	1983	1990	83-90 % Change
Men			
White	7,341	9,418	+28.3
Black	4,996	9,022	+80.6
Hispanic	5,146	8,965	+74.2
Women			
White	3,337	4,931	+47.8
Black	2,751	4,689	+70.4
Hispanic	1,809	5,591	+209.1

Certainly both the Census and the NPTS hint that there are other than economic forces at work. If ethnicity or race create differences in the travel behavior of women and men, as the US becomes more diverse, an important issue is the extent to which any travel differences due to cultural values will continue.

CONCLUSIONS

We know a great deal more about the actual differences in the travel patterns of women and men than we do about the reasons for those differences. Women seem disproportionately more reliant on the private car and they do more tripmaking; at the same time they cover fewer miles, even when they have salaried employment. We also know that there are sometimes substantial differences in the travel patterns of subgroup of women; to the extent that these are due to economic circumstances they become the subject of policy discussions—in some ways it makes no difference if Black women travel less because they are poor—if that reduced travel reduces their quality of life or that of their children. But not all differences are bad anymore than all are likely to continue. Unfortunately, we know far less about these issue than we should.

While this Conference will address a body of transportation research questions that arise from women's changing roles in society, I suggest that must press to add to that list questions about the impact and long term implications of race and ethnicity as well as suburbanization and the changing economic structure of our society on the travel patterns of women of various ages and backgrounds.

NOTES

[1]Todd M. Godbout, "Employment Change and Sectoral Distribution in 10 countries, 1970-90," Monthly Labor Review, October 1993, p. 5.
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Household, Gender, and Travel

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HOUSEHOLD, GENDER, AND TRAVEL

INTRODUCTION

With air pollution and traffic congestion becoming a serious concern nationwide, policy makers have experimented with various programs and policies aimed at reducing travel, shifting travel away from rush-hour peaks, and promoting carpooling and transit use. However, the travel demand management programs that have so far been implemented (e.g. ridesharing programs and staggered work hours) proved costly and ineffective in changing travel behavior. In most cases, the programs have targeted the general working population, overlooking differences in the household circumstances and travel constraints of different demographic subgroups — particularly, working women.

Transportation measures do not affect the population uniformly because each individual faces a different set of constraints. Some constraints are a function of income and other economic factors, and these have received considerable attention in the literature. Other constraints are a function of household composition, the male/female division of labor in the household, and the individual's roles in the household. These have received relatively little attention until recently.

Travel is part of a larger structure of household activities (Giuliano, 1992). We take trips to go grocery shopping, to go to the bank, to take clothes to the dry cleaner, and to do many other errands. In bigger households, the constraints are even more complex. The circumstances of other household members affect one's travel choices. Children have to be shuttled to and from the school or day care. A sick family member has to be taken to the doctor. Some household activities need to be performed together with other household members. These impose additional constraints in scheduling individual activities including travel. Gender is an issue to the extent that the division of labor in the household differs between men and women.

Section 2 examines the trends in the division of labor in the household between men and women. The household is a crucial aspect in understanding the environment of women's travel. Understanding women's roles in the household helps us put women's travel behavior into context. Section 3 reviews empirical findings on gender differences in travel patterns. Section 4 presents some results of an empirical test of the effect of household responsibility on travel behavior using Southern California commuting data.

THE DIVISION OF HOUSEHOLD TASKS

Until recent decades, men and women adopted distinct economic roles. (Blau and Ferber, 1986, pp.14-66, and Becker, 1991, pp. 30-53, present interesting expositions on how these roles evolved.) Men worked outside the home, and were solely responsible for earning an income for the household. Women stayed home, and were solely responsible for managing household affairs. They kept their homes clean, cooked food, bore children and raised them.

In the United States throughout the twentieth century and particularly in recent decades, women have been joining the work force, and have been increasingly sharing the responsibility of earning an income for the family (see Figure 1). Between 1950 and 1990 the proportion of adult women working increased from 32 percent to 54.8 percent. In contrast, the proportion of adult men working decreased from 85.1 percent to 73.6 percent (see Figure 1). Most of the growth in women's employment occurred in the past two decades, while the decline in men's employment occurred prior to the 1980s (Table 1).

Figure 1
Civilian Employment Population Ratio, 1950-90 Men & Women Aged 20 and Over

Source: http://www.bls.gov

Table 1
Percentage Point Change in the Civilian-
Employment Population Ratio Men and Women 20 and Over

Period	Men	Women
Between 1950-70	-6.4	9
Between 1970-90	-5.1	13.8
Between 1950-90	-11.5	22.8

Source: http://www.bls.gov

As a result of the growth in women's participation in the work force, the division of labor between men and women in the market is fast becoming more equal. Yet corresponding changes in the division of household responsibilities have been slower to occur. Women, including those who work full-time, continue to retain primary responsibility for housework (Blau and Ferber, 1986, pp. 39, 125-130; Firestone and Shelton, 1988; Hamilton and Jenkins, 1989, p. 25), child care, and even elderly care (Gibeau and Anastas, 1989; Anastas, Gibeau and Larson, 1990). While research findings vary widely depending on the sample and survey method used, estimates of time spent on housework range from 6 to 14 hours a week for men, and 20 to 30 hours a week for women (Hersch and Stratton, 1994, p. 120). Hersh and Stratton finds the same pattern even when the sample is restricted to white, married workers aged 20-64 from the Michigan Panel Study of Income Dynamics for the period 1979-1987 (see Figure 2). Overall men average about 7 hours per week on housework, while the wives average around 20 hours. In households where both spouses work full-time, men average 7 hours per week on housework while women average 17 hours. The gap is even wider when there are children. Working wives spend 5 hours more on housework when they have children, while husbands spend only 1 hour more.

Figure 2
Mean Hours Spent on Housework, White, Married Workers 20-64
Michigan Panel Study of Income Dynamics, 1979-87

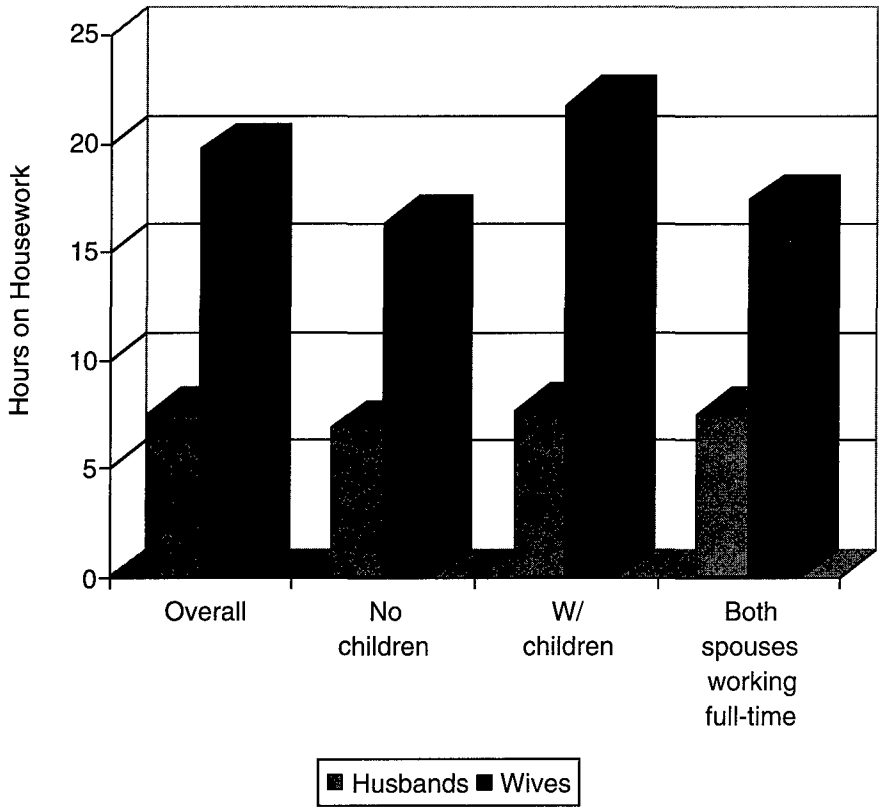


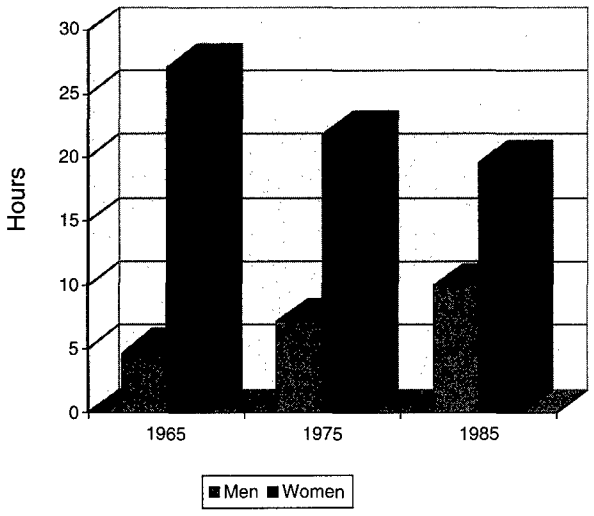
Table 2
Hours Spent on Housework per Week

	Hours Spent on Housework per Week						Ratio Done by Women (%)		
	Men			Women					
	1965	1975	1985	1965	1975	1985	1965	1975	1985
Overall	4.6	7.0	9.8	27.0	21.7	19.5	85	76	67
Working	4.4	5.8	8.1	17.8	14.8	14.7	80	70	64
Nonworking	9.6	10.8	14.7	34.0	26.3	23.6	78	71	62
Married	4.5	6.8	11.1	31.6	24.2	22.4	87	78	66
Unmarried	4.7	7.9	7.9	15.5	17.1	14.9	77	68	65
No children	4.7	7.1	10.4	21.3	20.3	17.9	82	74	63
All children 5 & older	5.3	7.6	10.4	30.3	23.9	19.9	85	76	66
Children under 5	3.9	5.9	9.0	32.0	25.1	22.0	90	82	71

The time men spend on housework tends to increase with the level of the wife's education, employment and earnings (Bumpass, 1990; Blair and Lichter, 1991). The time fathers spend on child care also increases with the mother's hours of work. Husbands and wives agree that the division of household tasks is unfair to working wives; it is most unfair when the wife works part-time (Bumpass, 1990; Dutchin-Eglash, 1988).

Evidence shows that women generally spent more time working at home compared to men. However the gap is narrowing down over time. Men are doing more housework than they used to, and women are doing less. Robinson (1988) compiled the results of three comprehensive surveys of Americans' use of time. The Survey Research Center of the University of Michigan conducted two, one in 1965 and another in 1975. The Survey Research Center of the University of Maryland conducted one in 1985.

Figure 3
Overall Trends in Men and Women's Housework 1965, 1975, and 1985



Overall men aged 18 to 65 spent 5.2 hours more on housework in 1985 than they did in 1965. On the other hand, women in the same age group spent 7.5 fewer hours on housework in 1985 compared to 1965, as more of them took paying jobs and had fewer children. Hence, their share of the housework has gone down from 85 percent in 1965 to 67 percent in 1985 (see Figure 3). What made the difference? One, more women are working; and working women worked less at home than nonworking women. Two, fewer households contain married couples. This has cut housework time overall because married women do much more housework than unmarried women (surprisingly even cohabiting unmarried women (Shelton and John, 1993). But married women also worked fewer hours than they did in 1965 while their husbands worked more hours at home. Three, households now have fewer children (see Table 2).

DIFFERENCES IN MEN AND WOMEN'S TRAVEL PATTERNS

Research in the past two decades found significant differences in the travel patterns of men and women (Rosenbloom and Burns, 1989, p. 83), particularly among those who are married with children. The travel choices of women seem to reflect the need to juggle work and household responsibilities (Wachs, 1988; Hanson and Johnston, 1985).

Total trips

Analyzing 1990 National Personal Transportation Survey (NPTS) data, Rosenbloom (1994) finds that women aged 16-64 years, in both urban and rural areas, made 6-9 percent more person trips per day than men. Using the same data, Al-Kazily, Barnes and Coontz (1994) examine the effect of household structure on men and women's travel, and found that nonworking women over 35 years old made 70 percent more person trips than comparable men. Married women with dependents made over 20 percent more person trips than their male counterparts. On the other hand, single women without dependents made over 20 percent fewer person trips than single men.

Commute distance

Women make shorter work-trips (Hanson and Johnston, 1985; Wachs, 1988; Gordon, Kumar and Richardson, 1989; Rosenbloom and Burns, 1993; Rosenbloom, 1994; Al-Kazily, Barnes and Coontz, 1994). They generally earn lower incomes and work shorter hours, so it does not pay to commute long distances (Madden, 1981). But most of all, they work closer to home because they need to balance work and household responsibilities, and promptly respond to family emergencies (Ericksen, 1977; Madden, 1981; Wachs, 1988; Johnston-Anumonwo, 1992; Rosenbloom, 1994). Data from the 1967 Longitudinal Survey of Work Experience show that married women have shorter commutes than unmarried women, and women's commute distance tends to decrease with the presence of children especially at younger ages (Ericksen, 1977).

Other researchers, however, do not find household concerns a cause of observed gender differences in commuting distance. Using 1977 Baltimore Travel Demand Data, Hanson and Johnston (1985) find that part-time or full-time work status, occupational group, and household responsibility do not explain observed gender differences in commuting distance. Instead women's lower incomes, their concentration in female-dominated occupations, and their greater reliance on the bus and auto-passenger modes explain women's shorter work trip distances. In the extreme case, Gordon, Kumar and

Richardson (1989) find that women tend to have shorter worktrips regardless of marital status, household structure, income, occupation, travel mode, and location using 1977 and 1983 NPTS data. But married workers, especially those coming from two-worker households, generally have longer work trips than unmarried workers. Kim (1993) provides a more thorough review of studies on gender differences in commuting distance.

Non-work trips

With the increased participation of women in the work force, market goods and services have become available to substitute for time spent on housework and child care. However, most of these goods and services are geographically dispersed, so that part of the savings in housework time is offset by time spent on non-work travel (Pickup, 1989). One consistent finding in the literature is that women make more non-work trips than men (Hanson and Hanson, 1980; Rosenbloom, 1988; Gordon, Kumar and Richardson, 1989; Prevedouros and Schofer, 1991). Employed married women in Sweden made more shopping and domestic trips than their spouses, but fewer social and recreational trips (Hanson and Hanson, 1980). Employed women in four Chicago suburbs made twice as many trips as comparable men for errands, groceries, shopping, and chauffeuring children (Prevedouros and Schofer, 1991).

Trip chains

Linking different trips is called trip chaining. A chain can be simple or complex. Complex chains are chains between different anchors (e.g. home and work) consisting of more than one trip, or chains between two like anchors (e.g. home and home) consisting of more than two trips (Al-Kazily, Barnes and Coontz, 1994). Single-person households are the most likely to form complex trip chains. Complex work chains decrease and simple non-work chains increase with the number of persons in the household. Single adults with young children have the highest propensity to form complex trip chains on the way to and from work. They are followed by single adults with school-age children, dual income couples without children, and dual income couples with preschoolers (Strathman and Dueker, 1994; Al-Kazily, Barnes and Coontz, 1994).

Compared to men, women are more likely to trip chain on the way to and from work (Rosenbloom, 1988; Rosenbloom, 1989; Strathman and Dueker, 1994; Al-Kazily, Barnes and Coontz, 1994). Based on 1990 NPTS data, women make stops on their way to and from work 42 percent of the time, while men make stops 30 percent of the time. Even on non-work trips, women link trips 30 percent of the time, while men do only 26 percent of the time (Strathman and Dueker, 1994).

Working mothers are more likely to link trips than working fathers. And they are more likely to link trips when the children are younger. Based on 1982 and 1985 data from France, Netherlands and the United States, 65 percent of working women with children under six years old linked trips to work, while only 42 percent of comparable men did. Men's trip chaining does not seem to be affected by children's age (Rosenbloom, 1989).

Day-to- day Travel Variability

Based on a 1973 seven-day travel diary data from Reading, England, Pas and Koppelman (1987) find that employed married women have substantially more variability in their day-to-day trip frequencies than employed married men. There is little difference in trip variability between employed single men and women.

Travel Mode

In choosing a travel mode, individuals often trade off money for time and flexibility. For example, women generally have lower incomes than men so that they may find cheaper modes like carpooling more attractive. However, women with families and children traditionally have more domestic responsibilities and face more demands on their schedule. Therefore one would expect them to favor solo driving. The evidence on women's mode choices is mixed. The 1977 Baltimore Travel Demand Data used by Hanson and Johnston (1985) show more women relying on bus and auto-passenger modes. The 1990 Southern California commuting data show that women carpool more than men (Brownstone and Golob, 1992). However, women carpooled mostly with household members rather than with other people (Teal, 1987).

The 1983 NPTS data show a higher proportion of women commuting by car, either as drivers or passengers (Gordon, Kumar and Richardson, 1989). The 1990 and 1991 commuting data from Phoenix and Tucson, Arizona show that women are more likely to drive alone than men because of time pressures (Rosenbloom and Burns, 1992 and 1994). Working women with children are even more auto dependent because their multiple obligations require them to combine work trips with nonwork trips. When asked about the effectiveness of policies designed to increase the use of alternative modes, women were more responsive to those addressing domestic responsibilities, e.g. arrangements for child care and guaranteed rides home. Hence the findings on women's mode choices are varied and location-specific. The mode choices depend a lot on the transportation options available in each location.

Trip scheduling

Southern California data show that women's work trips are more clustered around the peak, compared to men (Sarmiento, 1995). And this is particularly true for working women with children. Unmarried mothers have the least flexibility in scheduling work trips (Gordon, Kumar and Richardson, 1989). A third or more of all their daily work trips occur only within two hours, i.e., 7:00-8:00 a.m. and 4:00-5:00 p.m.

TESTING THE EFFECT OF THE HOUSEHOLD AND GENDER ON TRAVEL: SOME EVIDENCE FROM SOUTHERN CALIFORNIA

The literature abounds with evidence of differences in the travel patterns of men and women, particularly among those who have families and children. Using data from the a survey of Southern California Commuters, this study further examines differences in commuting patterns between men and women as a function of differences in household composition and household division of labor. I estimate discrete choice models of side tripmaking, mode choice, and home-to-work departure times to test whether gender differences are statistically significant, and to determine precisely the contribution of household constraints in explaining gender differences in travel behavior.

The data come from the Panel Study of Southern California Commuters which was conducted by the Institute of Transportation Studies (ITS) at the University of California, Irvine. The mail survey ran from 1990 to 1994 completing ten waves. The sample was employer-based. Half of the respondents worked at the Irvine Business Complex, a diversified employment center near Orange County Airport, and the remaining half worked elsewhere throughout the Greater Los Angeles Area. I use data from the first wave of survey which was conducted in February 1990. The first wave respondents were over 2,200, about equally divided between men and women. Men and women who

live only with other adults constitute more than half of the sample; and those who live with children constitute about a third. Most of the respondents drove alone on their most recent trip, and less than one-fifth carpooled to work. Most of the respondents live or work in Orange County where public transit is not a popular mode, and so bus riders constituted an insignificant proportion. Hence I focus only on the choice between solo driving and carpooling, and among different carpool alternatives in examining mode choice.

SIDE TRIPS

Table 3 shows the results of a reduced-form binomial logit model of side trips. Positive coefficients increase the probability of making a side trip. Gender differences in the probability of making a side trip arise mainly from the differential effects of household composition between men and women. For example, the presence of children increases the probability of making a sidetrip for women, but has no effect for men. The presence of another adult in the household generally decreases the probability of making a side trip for men, but not for women. Given the same number of adults, the presence of other workers in the household increases the probability of making a side trip, but not for women. In other words, a man with a nonworking adult household member, say, a wife, can get his wife to make most of his side trips; but a woman with a nonworking adult member in her household does not get a similar advantage. These results confirm that gender differences in side trip making arise mainly from gender differences in household division of labor.

Age, education, and household income are unimportant in explaining the incidence of side trips. Race seems to matter — nonwhites show a lower probability of making a side trip. The other factors that explain side trip making are work schedule and commute characteristics. Commuters who go to work in the morning and those whose work schedules change everyday are more likely to make a side trip. Those who commute longer distances are less likely to make a side trip.

Mode Choice

Table 4 shows the results of a reduced-form multinomial logit model of mode choice. I consider the following alternatives: drive alone, drive with a household member, ride with a household member, driver with a non-household member, and ride with a non-household member. Table 4 shows estimates for the different carpooling alternatives with the drive alone alternative as reference. Positive coefficients increase the probability of an individual choosing a specific carpooling alternative compared to driving alone. On the other hand, negative coefficients decrease the probability of carpooling, and hence, increase the probability of driving alone.

In general, gender differences are significant only when choosing between solo driving and riding with family; and they are explained fully by interaction with the presence of other adults in the household. Having children makes both men and women drive with family, and the presence of other workers makes them drive with family and ride with others.

Commuters are less likely to carpool with family members or ride with others when there are many cars available. In general, they are less likely to carpool when they have a fixed work schedule and their schedule changes everyday. They are more likely to carpool when they commute long distances and, in some cases, when carpooling incentives are available.

Table 4
Conditional Logit Model of Mode Choice (The Reference is Driving Alone)

Explanatory Variables	Drive with family		Ride with family		Drive with others(a)		Ride with others(a)	
	Coeff.	t-statistic	Coeff.	t-statistic	Coeff.	t-statistic	Coeff.	t-statistic
Constant	-3.178	-1.922 *	-2.187	-1.405	-4.619	-3.287 **	-1.997	-1.657 *
Age	-0.036	-2.304 **	0.001	0.058	0.013	1.135	-0.003	-0.255
Income	-0.010	-0.187	0.200	3.073 **	0.069	1.347	0.078	1.389
Education	0.047	0.936	-0.060	-1.045	-0.117	-2.616	-0.128	-2.610 **
Nonwhite race	0.066	0.197	-0.144	-0.328	-0.0005	-0.002	-0.983	-2.068 **
Female	(b)		(b)		0.774	0.880	-0.080	-0.104
Presence of children (c)	0.595	1.706 *	0.128	0.190	0.408	1.094	-0.350	-0.874
Presence of children interacted with female	-0.204	-0.388	-0.578	-0.765	-0.080	-0.163	-0.084	-0.149
Presence of another adult	-0.117	-0.131	-1.079	-0.866	0.500	0.617	0.249	0.369
Presence of another adult interacted with female	-0.052	-0.100	1.458	2.020 **	0.123	0.125	0.451	0.491
No. of workers	0.688	3.543 **	0.301	0.701	-0.105	-0.501	0.392	1.749 *
No. of workers interacted with female	-0.042	-0.158	0.476	1.052	-0.300	-0.985	-0.143	-0.415
No. of cars in the household	-0.703	-3.753 **	-0.862	-4.122 **	0.153	1.088	-0.657	-3.706 **
No. of years in present job	0.074	2.995 **	-0.002	-0.054	0.022	1.140	0.002	0.088
Has fixed work schedule	-0.763	-2.762 **	-0.966	-3.167 **	-0.055	-0.208	-0.911	-3.445 **
Work schedule changes everyday	-0.716	-2.228 **	-0.638	-1.745 *	-1.089	-3.272 **	-1.360	-3.635 **
Worksite size	0.043	1.823 *	0.039	1.530	-0.001	-0.036	0.030	1.304
Reserved parking for carpoolers	0.071	0.231	0.446	1.335	0.489	1.754 *	1.369	4.245 **
Guaranteed ride home for carpoolers	-0.244	-0.530	-0.291	-0.619	0.189	0.546	0.890	2.931 **
Cost subsidy to carpoolers	0.382	1.018	-0.092	-0.194	0.123	0.349	-0.770	-1.502
Other incentives to carpoolers	0.839	2.778 **	0.720	2.086 **	0.726	2.622 **	0.623	2.082 **
Carpool lanes available	0.420	1.489	-0.136	-0.422	0.702	2.913 **	0.966	3.776 **
Commuting distance	0.026	2.874 **	0.034	3.342 **	0.041	5.865 **	0.062	8.793 **
Weekend commute	-1.114	-1.048	(d)		-0.075	-0.102	(d)	
Friday commute	-0.091	-0.329	0.387	1.339	0.237	1.002	-0.074	-0.289
Afternoon commute	-0.803	-0.762	(e)		-0.278	-0.361	(e)	
Log likelihood value = -958.31	Chi-squared (106) = 3,366				Prob > Chi-squared = 0			
Pseudo R-squared = 0.6372								
No. of observations = 8,090 (f)								

** Significant at 95 percent.
* Significant at 90 percent.
(a) The model constrains the choice set of persons who live alone to only 3 alternatives: drive alone, drive with others, and ride with others.
(b) A female dummy was excluded from the explanatory variables for the drive with family and ride with family alternatives because it is collinear with the dummy variables interacting female with the number of children and presence of other adults in the household.
(c) Those who are 15 years old and under are considered children.
(d) In the sample, none of the weekend commuters chose to ride with family or ride with others; hence I exluded these two alternatives from their choice set.
(e) In the sample, none of the afternoon commuters chose to ride with family or ride with others; hence I exluded these two alternatives from their choice set.
(f) The sample consists of 1,735 persons. However, in a conditional logit model, each persons attributes are replicated as many times as the number of alternatives in their choice sets. This is why the number of observations in the estimation sample is a much bigger number.

HOME-TO-WORK DEPARTURE TIME

Table 5 shows the results of a reduced-form multinomial logit model of home-to-work departure times. I consider the following morning departure times: before 6:00, 6:00 to 6:59, 7:00 to 7:59, 8:00 to 8:59, 9:00 and after. The reference departure time is 7:00 to 7:59, which corresponds to the peak period in the sample. Positive coefficients increase the probability of an individual choosing the corresponding departure time compared to the sample peak period. Negative coefficients favor commuting during the peak period.

In general, gender and household composition are unimportant in explaining home-to-work departure times. Departure times are explained mainly by occupation, work characteristics, commute characteristics, and demographic characteristics such as age, income and education. Those in management/administration, secretarial/clerical, and professional/technical occupations are more likely to commute during the peak period over any other times. Those who work full time and have fixed schedules are more likely to leave between 7:00 and 7:59 a.m. than later. Those who work in large worksites, carpool, use freeways, and commute long distances are more likely to leave before 6:00 a.m.

Table 5
Conditional Logit Model of Morning Home to Work Departure Time

Explanatory Variables	Leave before 6:00		Leave 6:00-6:59		Leave 8:00-8:59		Leave 9:00 and after	
	Coeff.	t-statistic	Coeff.	t-statistic	Coeff.	t-statistic	Coeff.	t-statistic
Constant	-1.740	-1.631	-1.058	-1.228	1.385	1.623	1.289	1.074
Age	0.019	2.086 **	0.011	1.654 *	-0.010	-1.247	0.018	1.555
Household income	0.094	2.422 **	0.024	0.881	0.002	0.063	0.011	0.215
Years of education	-0.130	-3.572 **	-0.025	-0.925	0.012	0.361	-0.091	-1.903 *
Nonwhite race	0.156	0.574	0.002	0.010	0.156	0.621	0.460	1.285
Female	-0.379	-0.738	-0.333	-0.927	-0.161	-0.405	-0.430	-0.616
Presence of children (a)	-0.119	-0.448	-0.107	-0.516	-0.130	-0.474	0.326	0.904
Presence of children interacted with female	-0.004	-0.011	0.206	0.697	0.369	1.029	-0.757	-1.361
Presence of another adult	0.129	0.300	-0.148	-0.463	-0.473	-1.227	-0.151	-0.256
Presence of another adult interacted with female	-0.599	-0.979	0.170	0.385	0.201	0.394	1.020	1.212
No. of workers	-0.176	-1.219	-0.046	-0.412	-0.035	-0.237	-0.020	-0.113
No. of workers interacted with female	0.212	0.993	-0.287	-1.619	0.036	0.182	-0.451	-1.459
Management/administrative occupation	-1.055	-2.288 **	-0.644	-1.781 *	-0.706	-1.861 *	-2.422	-4.397 **
Production/manufacturing occupation	1.332	2.308 **	0.746	1.469	(b)		0.405	0.632
Sales occupation	-1.099	-1.538	-0.586	-1.290	-0.430	-0.960	-0.921	-1.550
Secretarial/clerical occupation	-1.396	-2.829 **	-0.762	-2.026 **	0.952	-2.420 **	-2.552	-4.343 **
Construction occupation	0.952	1.069	0.192	0.233	-0.748	-0.613	0.487	0.493
Professional/technical occupation	-0.921	-2.049 **	-0.436	-1.235	-0.475	-1.291	-1.129	-2.465 **
Years in present job	0.056	3.384 **	0.015	1.086	0.041	2.322 **	0.049	2.276 **
Works full time	-0.882	-1.492	0.408	0.759	-0.908	-2.429 **	-2.674	-6.062 **
Work schedule is fixed	0.094	0.468	-0.120	-0.805	-0.677	-3.909 **	-0.361	-1.377
Work schedule changes everyday	-0.140	-0.669	-0.180	-1.154	0.255	1.442	0.722	2.768 **
Worksite size	0.044	2.678 **	0.019	1.461	-0.0007	-0.038	0.029	1.216
Carpool	0.537	2.291 **	0.123	0.620	0.053	0.205	-0.948	-1.946 *
Use freeway	1.071	4.115 **	0.294	1.660 *	-0.211	-0.958	0.396	1.180
Carpool lanes available	-0.503	-2.369 **	-0.176	-1.027	0.258	1.155	0.307	1.002
Other incentives to carpoolers	0.158	0.630	0.594	3.080 **	0.343	1.411	0.106	0.291
Reserved parking for carpoolers	2.392	10.936 **	1.167	7.131 **	-0.559	-2.328 **	0.488	1.557
Commute distance	0.072	9.221 **	0.034	4.796 **	-0.007	-0.675	0.038	3.420 **
Weekend commute	1.546	2.417	0.464	0.750	-0.400	-0.476	3.042	5.414 **
Friday commute	0.252	1.373	0.085	0.621	0.008	0.047	-0.449	-1.599
Log likelihood value = -2,008.07	Chi-squared (131) = 1,525.32				Prob > Chi-squared = 0			
Pseudo R-squared = 0.2753								
No. of observations = 8,578 (c)								

** Significant at 95 percent.
* Significant at 90 percent.
(a) Those who are 15 years old and under are considered children.
(b) None of the production/manufacturing workers chose to leave from 8:00-8:59 a.m.; hence, this alternative was excluded from their choice s
(c) The sample consists of 1,735 persons. However, in a conditional logit model, each persons attributes are replicated as many times as the number of alternatives in their choice sets. This explains why the number of observations in the estimation sample is a much bigger number.

SUMMARY AND CONCLUSION

Different demographic subgroups face different circumstances and constraints that could affect their travel behavior. Working women, in particular, often face income and social constraints arising from the multiplicity of roles in the market and in the household. Although the division of labor between men and women is fast becoming more equal, corresponding changes in the division of household responsibilities have been slower to occur. Women continue to retain primary responsibility for housework. However, the gap is narrowing down over time. Men are doing more housework than they used to, and women are doing less.

Research in the past two decades found significant differences in the travel patterns of men and women, particularly among those who are married with children. The findings on women's travel choices seem to reflect women's need to juggle work and household responsibilities. Women made more trips than men. They make shorter commute trips, and more nonwork trips. Women are more likely to trip chain on the way to and from work, especially when they have younger children. Employed married women show more variability in their day-to-day trip frequencies than employed married men. The findings on women's mode choices are mixed and location-specific; they must depend largely on the transportation options available in each location. Women's work trip schedules tend to be more clustered around the peak; and this particularly true for women with children.

The discrete choice models using Southern California data help explain the different determinants of travel behavior, and clarify observed differences in travel behavior between men and women with different household composition. The results show significant gender differences in the probability of making a side trip. And these gender differences arise mainly from the differential effects of household composition on men and women. In particular, having children increases the probability of making a side trip for women, but not for men. Men are less likely to make a side trip when there is another adult in the household, especially when the other adult does not work. Women do not seem to have a similar advantage.

In general, gender differences are significant only when choosing between solo driving and riding with family; and they are explained fully by interaction with the presence of other adults in the household. Having children makes both men and women drive with family, and the presence of other workers makes them drive with family and ride with others. Mode choice is largely determined by the number of cars available in the household, work characteristics, commuting distance, the presence of carpooling incentives, and individual characteristics such as age, income, eduction and race.

In general, gender and household composition are unimportant in explaining home-to-work departure times. Departure times are explained mainly by occupation, work characteristics, commute characteristics, and demographic characteristics such as age, income and education. The results are useful in assessing the distributional impact of policy. They are also useful to policymakers in designing programs and policies that are more responsive to individual circumstances.

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Distance and Labor Force Participation: Implications for Urban and Rural Women

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DISTANCE AND LABOR FORCE PARTICIPATION: IMPLICATIONS FOR URBAN AND RURAL WOMEN

ABSTRACT

Six explanations for differences in worktrips between men and women and among different groups of women workers are reviewed in this paper. The first argues that women's secondary role in the labor force and the dual roles women assume (combining paid work with domestic responsibilities) reinforce their resistance to long worktrips. The second explanation is that women's economic returns to commuting do not justify long worktrips. A third argument is that women's jobs are more likely to be located closer to their homes than are men's. Fourth, some have argued that spatially segmented labor markets have emerged to draw on pools of conveniently located, cheap female labor. A fifth set of arguments focuses on the relationship between home and work, arguing that it is different for women than for men, resulting in different commuting choices. A final set of arguments is based on the claim that distance imposes varied constraints on women with different levels of skills and resources. Research on each of these explanatory themes is reviewed and evaluated. The subsequent sections of the paper address the comparative position of urban and rural women, the policy implications of these research findings, and identifies future research and data needs.

DISTANCE AND LABOR FORCE PARTICIPATION: IMPLICATIONS FOR URBAN AND RURAL WOMEN

Labor force participation patterns are intimately connected to commuting behavior, but the nature of this link has been the topic of an extended debate in the literature. As women's labor force participation patterns have changed, so too has their commuting behavior. Although there has been some convergence in the work-related travel of men and women, significant differences remain. As more women have joined the labor force, sharper differences have emerged among different groups of female workers. To what extent have commuting preferences or constraints shaped the ways women have entered employment? Alternately, have women's available employment options dictated the patterns of worktrips they undertake? A variety of explanatory themes have been pursued in answering these questions over the past three decades. These competing (and sometimes complementary) explanations (shown in Figure 1) can be summarized as follows.

Explaining the link between Employment And Commuting

Commuting shapes women's employment

Explanation 1: Short work trips minimize conflicts between parenting, household and employment responsibilities.

Explanation 3: Women's jobs are distributed more evenly across space than men's.

Explanation 5: Job search and accessibility may be constrained by residential location.

Employment shapes women's commuting

Explanation 2: Women's economic returns to commuting do not justify long worktrips.

Explanation 4: Employers locate close to residential areas to attract the desired labor supply.

Explanation 6: A woman's labor force participation may be constrained by the relative burden commuting poses for her.

1. Most women are secondary or supplementary wage earners in the household. They are more likely to have part-time, intermittent or seasonal jobs, and have higher job turnover rates. Women fulfill a dual role in the household, combining wage earning with their primary role as mothers and household workers. All of these features reinforce their resistance to long worktrips. Short commuting distances make it easier to combine their conflicting time demands, and the subsidiary role that wage work plays in their lives does not encourage long worktrips.

2. Women earn less than men on average, and wage rates for typically female jobs vary less than men's wages. Women' economic returns to commuting do not justify long worktrips. Unlike men, they will not earn significantly more at some locations within the metro area, and might as well minimize commuting costs, thus increasing their real wages.

3. Women's jobs are distributed more evenly across space than are men's. The sectors in which women are more likely to work are either closely tied to consumers (such as retail, personal services, education or health) or may be decentralized to cheaper back-office locations (clerical and other white collar employment). Men on the other hand are more likely to work in producer services, higher level management or professional, or blue collar industries and occupations, which are best located in concentrations of economic activity downtown or away from residential environments. Thus, women are more likely to find employment closer to home than are men.

4. Labor markets do not operate on a city- or metropolitan-wide basis. They are spatially segmented at quite a fine scale, frequently by the race, skill-levels and gender of the labor pools they draw from. Many employers locate at least partly on the basis of local labor supply characteristics. Highly segmented local labor markets based on particular sorts of labor available constrain and shape the employment opportunities available to women. In some occupations and industries, local labor markets may operate as "ghettos" of female employment, low wage but conveniently located.

5. Home location must be considered jointly with work location if we are to understand commuting patterns adequately. Home and work are intimately entwined in a variety of ways, and these links have different consequences for women than for men.

a) Residential location decisions depend on a complex set of factors. In two-earner families, two different job locations must be taken into consideration. The consumption of different amounts and quality levels of housing, and the choice of residential environments suitable for children of different ages, complicate the relationship between residential and employment location. Women's preferences for shorter worktrips may represent an attempt to accommodate these conflicting trade-offs.

b) In many employment sectors (especially those with lower skill requirements) job search areas may be significantly constrained by residential location. Job searches that depend on personal contacts (more likely for women than for men) mean that many women will choose jobs on the basis of the home location.

c) Residential segregation by race and income may have a variety of effects on job search, job accessibility (depending on the available choice of transportation modes) and even employer preferences. The location of many women (especially female heads of households) in more affordable inner city neighborhoods may constrain labor force participation to a narrow range of particular job types.

6. Distance may pose different kinds of constraints on women with different human capital (skills and job experience) and transportation (drivers' license and availability of a car) resources. The threshold costs of the investment required to commute to a job in a more distant less accessible location, and the likely economic returns to commuting for women with different levels of advantage in the labor market, differ substantially among women. Different women's labor force participation patterns may be shaped, enabled or constrained in quite different ways depending on the relative burden that commuting represents for them.

One problem with comparing and evaluating research results based on data spanning three decades is that significant changes have occurred in women's labor force participation patterns, their access to resources, and the spatial structure of both urban and rural employment and residential locations, over this period. Findings based on data collected in the 1960s may be contradicted or undermined by analyses conducted on 1990 data. Since the mid-1960s, women have entered the labor force in increasing numbers, and these changes have been especially significant among married women with children. The 27% of married women with children who worked outside the home in 1960 had increased to roughly 74% in 1990. The increase in married women with children under six who worked outside the home has been even more rapid - from 18% in 1960 to nearly 60% in 1990 (Lugaila 1992, p. 28).

While household labor has had to be reorganized to accommodate this shift, household incomes have not risen as fast as the increasing numbers of two-earner (and even two full-time earner) households would suggest. For many, household incomes have declined in real terms even as labor force participation has increased. Despite sharp increases in the labor force participation of married women since the 1970s, median family income increased by only 6% (11% among married couples) between 1973 and 1990, compared to a 104% increase between 1947 and 1973 (Lugaila 1992, p. 30). This is important for what it suggests about how the role of women wage earners has changed. Once perceived as discretionary or secondary workers with a less stable attachment to the labor force (and thus a different set of commuting preferences) the meaning of work appears to have changed in fundamental ways, with implications for the relative burden that space poses. The impact of married women's contribution to the household can be seen in the fact that families with children where only the father worked had incomes 36% less than those with two full-time workers (Lugaila 1992, p. 65). For the growing numbers of single mother families (from 11% in 1970 to almost 20% in 1990) work outside the home is anything but discretionary, if childcare responsibilities and a host of other barriers can be surmounted. With a family income approximately 42% less than that of married couples, families headed by women have considerably higher poverty rates (Lamison-White 1992, p.6).

The past three decades have seen equally dramatic changes in the spatial organization of work, and substantial continued changes in residential structure. Jobs have changed their content (and their labor needs) in response both to firm reorganization and to technological change (Chapman and Walker 1987, pp. 109-110). Employment centers have shifted away from the downtown core to suburban office, research and industrial parks. Much of the pink-collar clerical employment in which women are concentrated relocated to cheaper peripheral sites as communication networks became more sophisticated. Retail and consumer service jobs (also overwhelmingly feminized sectors) moved along with decentralizing offices, homes and factories. New consumer needs generated by the rise of two-earner families (for more commercialized household services, for daycare, home care and maintenance, and a variety of previously "unpaid" tasks) have added new kinds of jobs in new, more dispersed locations. While the downtown core may retain a solid employment base, the composition of those jobs have changed to include more sophisticated "command and control" functions, and the

lower skilled support services that must be provided on location (Sassen 1991). Intermediate managerial and clerical positions that once provided the bulk of CBD employment are now far more footloose.

Residential suburbanization has continued, blurring into exurbanization at the edges, reinforced by the dispersed location of new employment centers. In a study of 12 major metropolitan areas between 1980 and 1990, Hughes (1995) found that although all but one had grown, central cities lost population in seven of the metropolitan areas, and suburban residents outnumbered city residents in all twelve. Although minority suburbanization has increased over the past three decades, most suburbs of large US cities exhibit sustained high rates of racial residential segregation, and the segregation of poverty-level households in central cities rose sharply during the 1980s (Massey and Denton 1993; Abramson, Tobin and VanderGoot 1995; Kasarda 1993). Hughes (1995, p. 279) found that disparities in unemployment rates between cities and suburbs ranged from 2% to 11%. In almost every metropolitan area, employment growth occurred disproportionately in suburban counties. In eight of the twelve metropolitan areas he studied, more than 90% of job growth over the period 1980 to 1990 was outside the county where the central city was located (Hughes 1995, p. 282).

Can we identify a parallel set of processes at work in rural America? From an urban perspective, suburbanization has decentralized employment. From the point of view of rural residents however, employment has increasingly centralized on the fringes of metropolitan areas, sharpening distinctions between remote and contiguous rural areas. Spatial, economic and social restructuring (as rural America has evolved from an agricultural to a peripheral manufacturing to a peripheral service region) has transformed the labor force participation patterns of rural women, pushing them into waged employment as family farms declined and differentiating the experiences of women with different human capital resources, occupational sectors and household resources.

Rural-based women's labor force participation rates have risen much faster than those of urban women over the past three decades, and women have thus accounted for a larger proportion of non-metropolitan than metropolitan employment growth (Brown and O'Leary 1977; Lichter 1989). However, rural or non-metropolitan-based women continue to be rewarded at lower rates than urban or metropolitan-based women (McLaughlin and Perman 1991; Bokemeier and Tickamyer 1985), to experience much higher rates of unemployment and underemployment than urban or metro women (Maret and Chenoweth 1978; Lichter 1989), and to experience more marginal, discontinuous work histories (Ollenberger, Grana and Moore 1989), even after controlling for differences in human capital and occupational and industrial sector.

Over the 1980s, non-metropolitan counties (especially in the Midwest) lost population rapidly (Beale and Fuguitt 1986; Fuguitt 1991). Reflecting population declines, consumer-based service, retail and construction sectors stagnated or began to centralize in the suburban fringes of adjacent metropolitan areas where they could serve a larger hinterland of mobile rural consumers (Bluestone and Long 1989; Miller and Bluestone 1988). Recently, some commentators have argued that the new divide in rural America is determined less by the health of the farm economy than by proximity to metro areas (Deavers 1992; Galston 1992; Bluestone and Long 1989). Bokemeier and Tickamyer (1985) similarly argue that the important distinction among women's returns to employment is not locational differences within non-metro regions, but the differences in opportunity structure offered by metro versus non-metro labor markets.

Over the past three decades, women's position in the labor force has changed in quite significant ways, as has the spatial and family structure within which they live and work. To what extent have

commuting patterns been transformed to accommodate the new conflicts generated by these changes? This paper reviews research related to each of the six explanations about the link between work and commuting outlined above, and tries to evaluate how each advances our understanding of the link. The implications of these findings for the relationship between labor force participation and worktrip length are discussed for rural and urban women, and policy options to address the problems identified in the literature are discussed in subsequent sections. The paper concludes with an outline of an agenda for further research.

EXPLANATIONS OF THE LINK BETWEEN EMPLOYMENT AND COMMUTING

Women's secondary wage earner status

This was the initial set of explanations offered for the finding that women had shorter journeys to work than men. As outlined above, it is composed of a few different factors. Early investigations of gender differences in worktrip length focussed on the role of children and marital status in constraining the distances employed women were willing to travel to work. Ericksen (1977) and Madden and White (1978) argued that household and childcare responsibilities gave women the role of dual workers, with conflicting responsibilities that they attempted to balance by keeping the journey to work as short as possible. Madden (1981) argues that employed women have larger household responsibilities than employed men, but found that sex differences in worktrip length do not disappear when household structure is controlled for (Madden 1981, p. 184). Although unmarried and married women with children have comparable work trip lengths, the disparity in their residential location suggests they have very different job locations. Men who make the longest worktrips and women who make the shortest are in the same household category - two-earner with children - implying a sexual division of labor within the household that contributes to differences in worktrip length (Madden 1981, p. 185). Singell and Lilleydahl (1986) too find that the presence of children reduces a women's commute but not a man's.

A substantial amount of cross-national evidence supports the relationship between short worktrips and childcare responsibilities. Fagnani (1987) found that French married women with children were likely to adjust their work schedules and travel patterns to meet their children's needs, while married men were unlikely to. Women with more children were more likely to have shorter worktrips than those with fewer or no children (Fagnani 1987, p. 27). In a comparison of households in the United States and the Netherlands, Rosenbloom (1987) shows that women's responsibility for the travel needs of their children results in significant gender differences in travel patterns, and that the impact on women's travel patterns varies with the age of their youngest child (Rosenbloom 1987, p.20).

Hanson and Johnston (1985), however, challenge what they describe as the "folklore" that ascribes women's shorter worktrips to their greater household responsibilities. They find that the gender gap in worktrip length is not evident for single person households; while this would support an argument that household gender divisions account for other trip differences, the argument would be undermined by their finding that worktrip distances are also not significantly different for men and women with preschool children, presumably the stage at which household responsibilities would be heaviest (Hanson and Johnston 1985, p. 206). In more recent work on the same data-set, Johnston-Anumonwo (1992) concludes that household responsibilities do appear to be related to sex differences in worktrip length, but that the relationship is stronger with marital status rather than parenthood. Johnston-Anumonwo concludes that marriage, rather than the presence of children, imposes household responsibilities that deter

wives from commuting long distances to work (Johnston-Anumonwo 1992, p. 167). Hanson and Pratt's more detailed investigations of the travel patterns of women in Worcester revealed that household responsibilities did indeed pose a significant constraint on the participation patterns and job search strategies of women (Hanson and Pratt 1990).

A related explanation is that women have shorter worktrips because their household responsibilities required them to make numerous linked trips (to the grocery store, to school or daycare) rather than because their household responsibilities required them to be closer to home to deal with emergencies and minimize commuting time (Rosenbloom 1987, p. 19). Hanson and Hanson's (1980) study of travel patterns in Sweden found that employed married women made more shopping and domestic trips than married men, but not as many leisure-related trips. Hanson and Johnston's (1985) study of gender differences in Baltimore did not find significant differences in the amount of non-home, non-work travel men and women engage in, although they did find differences in trip purpose, with women making more household-related (and passenger-serving) trips than men did (Hanson and Johnston 1985, p. 208).

More recent research using 1990 NPTS data has found that although women have shorter worktrips than men, they make far more trips - 3.5 per day in urban areas and 3.6 per day in rural areas compared to 3.3 per day for men. Gender differences in trips per day were sharpest for households with children between six and fifteen; the presence and age of children appears to have a much larger impact on women's trips than it does on men's trips (Rosenbloom 1995, p. 2-32). However, despite the larger number of trips women made, they still travelled fewer person miles than men. Gordon, Kumar and Richardson (1989) do not find any differences in women's worktrip length related to the presence of children, but they do find a significant difference in the number and type of trips made. They speculate that this household-related trip-linking behavior may be an important explanation for women's shorter commutes (Gordon, Kumar and Richardson 1989, p. 508).

A third set of explanations for how women's status as secondary wage earners reduces their worktrip length is related to the structure of the typically "secondary" jobs that women tend to hold. Part-time employees are more likely to have shorter worktrips than full-time employees. Less stable, seasonal and part-time or temporary work does not offer the rewards that would justify long worktrips. However, Hanson and Johnston (1985) find that although women are much more likely than men to work part-time, part-time work is not associated with shorter worktrips - in fact, part-time male workers have worktrips longer than those of men in full-time employment (Hanson and Johnston 1985, p. 201). Gordon, Kumar and Richardson (1989) also found that part-time work status does not explain why women have shorter worktrips.

Thus, although this last explanation may be intuitively attractive, the evidence supporting it is by no means conclusive. This is also an explanation which may have seen the greatest erosion in its validity over time, as women have moved from being secondary or discretionary wage earners to being crucial contributors to the household economy. The evidence on how the age and presence of children affects commuting, however, is mixed.

Women's lower returns to commuting

An alternative explanation of women's shorter worktrips is that typically female jobs offer a very narrow range of salary rewards, irrespective of where they are located. While men may increase their wages by commuting to jobs more distant from residential areas, women will not. According to Madden,

> If women had the same job tenure and weekly work hours and, most importantly, the same wages as their male counterparts in the household, their worktrips would no longer be shorter. In fact, they would be longer! (Madden 1981, p. 191)

Rutherford and Wekerle (1988) find that men indeed earn much more per mile travelled than women do, but the distance-income relationship varies for different groups of women (Rutherford and Wekerle 1988, p. 124-5). When women have access to a car, their rate of income gain per mile travelled is nearly the same as that for men using cars. For choice transit riders the gender gap is quite different - men earn dramatically more per mile travelled while women's earnings are affected very little, although similar proportions of both male and female riders work in the CBD (Rutherford and Wekerle 1988, p. 126). Similar disparities are evident for male and female captive riders, although women's earnings improve somewhat compared to those of female choice transit riders. They speculate that the lack of variation in returns to commuting for some women may indicate that some occupations (service and clerical) have relatively constant wage rates across space (Rutherford and Wekerle 1988, p. 129), and thus:

> .....a promising structural explanation may be that low marginal gains for females may arise from their concentration in occupations with little variation in income, both at a zonal and an individual level. Thus, even when a women might be willing to travel farther for higher wages, the trade-off simply does not exist because the wages in her occupation are basically fixed (Rutherford and Wekerle 1988, p. 134).

However, while this may be true for choice transit riders, it is not necessarily the case for those driving to work. Variations in wage rates across space may not be constant for all women.

Singell and Lilleydahl (1986) find that when comparisons are limited to full-time workers, wage gains from commuting are approximately equal for male and female employees, holding other factors constant (Singell and Lilleydahl 1986, p. 124). But the gap between men's and women's worktrip lengths cannot be explained by household economics alone. Singell and Lilleydahl find that when a wife earns more than her husband, her worktrip length increases while his falls, but that her worktrip length exceeds his by only a small amount (3%) and is still well below (20%) that of males with similarly high incomes (Singell and Lilleydahl 1986, p. 126). Rutherford and Wekerle (1988) find interesting variations in worktrip length by income. Although the least well paid (42.4% of all women) and the best paid (6.6% of women) have shorter worktrips than men in those income categories, this pattern does not hold for women in the middle groups of the income distribution (including 51.0% of all women), who travel further than men with similar incomes (who make up 45.6% of all men) (Rutherford and Wekerle 1988, p. 122). MacDonald and Peters (1993, p. 40) also find that rural women with moderate hourly earnings have longer worktrips than those with high or low wage rates, suggesting that the relationship between earnings and worktrip length is nonlinear.

The bulk of the evidence reviewed here supports the argument that many women have shorter worktrips because the incremental earnings from more distant jobs will not justify a longer worktrip. However, it is far from clear that this relationship has equivalent effects on all women workers.

Women's jobs are distributed more evenly across space

Another line of research examines the impact of the spatial location of particular types of jobs as an explanation of gender differences in worktrip lengths. Women are concentrated in particular sorts of industries and occupations; the fact that many of these jobs (education, health, clerical, retail and services) are more evenly distributed relative to residential locations than are typically male or gender neutral jobs, may account for the shorter worktrips of women.

Hanson and Johnston (1985) investigate whether female job opportunities are in fact distributed more evenly across the Baltimore metropolitan area, or whether the residential distributions of men and women are different enough to account for observed differences in trip length (Hanson and Johnston 1985, p. 209). They find that working women are more likely (and more likely than men) to live in the city rather than the suburbs, and are more likely to work in the city if they live there (Hanson and Johnston 1985, p. 210). However, they also find that one female-dominated employment sector (administrative support) had a more even spatial distribution of jobs than one male-dominated sector (manufacturing) (Hanson and Johnston 1985, p. 211). In their study of Baltimore, they find that when income is held constant, women still travel shorter distances than men. However, within occupational categories, although men do travel farther than women in every category this difference is statistically significant only for professionals and managers. Furthermore, occupation is related to worktrip length for men, but not for women - although women are concentrated in clerical and service occupations, the worktrips of women in these categories do not differ significantly from those in other occupational categories (Hanson and Johnston 1985, p. 203). However, there are statistically significant differences in the worktrip lengths of women in female-dominated jobs compared to those in non-female-dominated jobs.

Singell and Lilleydahl (1986) provide corroborating evidence. They find that jobs that are female sex-typed have lower commute times than those sex-typed male, irrespective of the gender of the person employed in the job (Singell and Lilleydahl 1986, p. 127). Gordon, Kumar and Richardson (1989) dispute these findings, arguing that gender differences in worktrip length (based on the 1977 and 1983 NPTS) persist across most income and occupational categories (Gordon, Kumar and Richardson 1989, p. 509). Thus, although there is fragmentary evidence that women's worktrips are shorter than men's because women's jobs are distributed more evenly relative to residential areas than men's, there is an insufficiently clear relationship between occupation or industry type and worktrip length. It is difficult to draw firm conclusions on how job type affects commuting patterns.

Spatially segmented labor markets

Explanations based on lower returns to commuting and on the spatial distribution of women's jobs relative to men's have produced conflicting evidence as explanations for women's shorter commutes. More recent research has pursued these arguments in more complex ways. Hanson and Pratt (1992) argue that

> Our study clearly demonstrates that space is not a container of different labor market segments but the medium through which different segments are forged. Local labor markets are indeed heterogeneous because of gender, race, and class-based segmentation, as Peck (1989) argues, but they are also spatially segmented through the fine-scaled processes defining labor supply and demand (Hanson and Pratt 1992, p. 404).

A substantial body of research related to this point argues that the delimitation of local labor market areas on the basis of a uniform travel-to-work area is too reductionist - "although spatial proximity may *permit* labor market competition, whether or not such competition actually takes place will depend on the way in which particular local labor markets are segmented" (Peck 1989, 44). Simpson (1987) argues that the job search problem needs to be conceptualized in terms of spatially distinct labor markets (or "islands") that introduce search or mobility costs into explanations of unemployment and wage behavior (Simpson 1987, p. 121). Thus, job searches are "spatially systematic". He argues further that job search depends also on skill levels - that more skilled workers will search for opportunities in their specialty over a much wider range than less skilled workers (Simpson 1987, p. 121).

Hanson and Pratt (1992) examine how employers' and employees' practices create and maintain local labor markets within metropolitan areas and how these narrowly constrained markets exacerbate segmentation of the labor force (and of metropolitan economies). Their study of Worcester, Massachusetts highlights the problems with relying on city-regions or metropolitan areas to approximate local labor markets: "...the size of these areas does not come close to matching an actual journey-to-work space for anyone, save those in well-paying professional, technical, or managerial positions. For the majority of the work force, the set of job opportunities actually available, or seriously considered, is far more spatially constrained" (Hanson and Pratt 1992, p. 375). Many of the practices they identify are explicitly gendered, as employers design jobs with flexible hours to attract women, and firm location decisions reflect employers' understanding of how skills and mobility intersect in providing access to the desired labor force (Hanson and Pratt 1992, p. 382). Recruitment and job search strategies too are tailored to specific areas, and work effectively to maintain spatially segmented labor markets. (Hanson and Pratt 1992, p. 384) Hanson and Pratt find that travel time to work varies not only by gender but also by the spatially defined labor market within which people work. Thus, women in two of the older manufacturing districts they studied travelled much shorter distances to work than those in more suburban employment locations (Hanson and Pratt 1992, p. 393). One consequence of these differences in mobility is the significant differences in wage rates among the three local labor markets they study, with wages highest in the suburban market and lowest in the most spatially constrained inner city market (Hanson and Pratt 1992, p. 402).

Rutherford and Wekerle (1988) examine the concept of captive labor markets in a Toronto suburb. They identify four kinds of labor markets, and find that the largest percentage of women workers are found in captive zones (those with low pay but short worktrips) and "worst" zones - those with low pay but long worktrips (Rutherford and Wekerle 1988, p. 132). Zones with long worktrips attract the largest number of women with young children; "worst" zones also have the highest proportion of transit users and captive transit users (Rutherford and Wekerle 1988, p. 133). They conclude that "the local availability of employment may make it possible for some women to work at all" (Rutherford and Wekerle 1988, p. 134).

MacDonald and Peters (1994a) investigate differences between non-metropolitan and metropolitan labor markets in Iowa. They find that non-metropolitan jobs are more likely to be part-time and seasonal, and less likely to provide health benefits. Rural women working in non-metropolitan, local labor markets do have much shorter commutes and thus lower commuting cost burdens (relative to daily pay) than those commuting to metropolitan jobs (MacDonald and Peters 1994a, pp. 180-181). However, the spatially constrained opportunities offered by non-metropolitan labor markets are declining as employment shifts to more diverse metropolitan locations. More women may have to travel beyond the local labor market in the future to stay in the labor force, and commuting will become an increasing burden for them (MacDonald and Peters 1994a, p. 183).

In urban areas, residential suburbanization has been accompanied by substantial suburbanization of employment - not just in consumer-based sectors like retail but also as an increasing diversity of "back-office" functions are separated off from activities traditionally centralized in the CBD. Some argue this provides an ambiguous set of advantages to suburban women (more likely to be white, married and middle class) - shorter worktrips, but also entrapment in a low-wage local labor market. For instance, Howe and O'Connor (1982) found a high correlation between low average wages and highly feminized work-forces in the suburbs of Melbourne, Australia. Nelson (1986) examines the location of back offices within the San Francisco - Oakland region. She argues that

> ... back office development has avoided areas that satisfy land and linkage requirements if they do not also satisfy the traditional clerical labor demand for educated and docile female workers. The transfer of jobs from central city low-income, predominately minority female work-forces to higher-income, predominately white suburban female work-forces is not an unfortunate side effect of back office relocation necessitated by land cost considerations - it is one of the major reasons for back office relocation (Nelson 1986, p. 166).

Her research shows quite explicitly how employers themselves participate in the construction of local labor markets defined by short commuting distances for female workers:

> To the managers of offices employing large numbers of low-wage clerical workers, a female labor supply associated with areas of growing single-family housing represents a significant lowering of labor costs through reduced turnover, lowered training time, increased productivity, a longer working day, and a reduced chance of unionization. And two important elements of this cost-saving labor supply, its cheapness and attachment to home responsibilities, forfend long commuting distances; therefore firms must locate offices nearby to achieve the potential savings (Nelson 1986, p. 165-6).

Nelson argues that the supply of married, secondary-earner women depends not just on gross job returns, but on women's real or net earnings. If transportation costs are too high working outside the home will not be justified. She quotes a study of married women's participation in the labor force which found that the sensitivity of labor force participation to transportation costs was highest among "current nonworkers for jobs paying the lowest of three earnings levels" (Andrews 1978, p. 18, quoted in Nelson 1986, p. 159). Thus, back office suburbanization increasingly represents a redistribution of job opportunities away from central city workers, in particular low-income minority women, with damaging consequences "not only because of the number of entry level jobs lost, but because these jobs often provide workers with the possibility of entering an internal labor market with bureaucratically regulated advancement, unlike most other low-wage jobs in the central city's growing "service economy" (Nelson 1986, p. 149). McLafferty and Preston's (1991) work on gender, race and commuting in the New York metro area takes up this point. They examine a large sample of service sector workers in the New York metropolitan region and conclude that gender differences in worktrip lengths (measured by time) found for white men and women do not exist for minority men and women. Black and Hispanic women commute as far as black and Hispanic men, and their worktrips are much longer than those of either white women or men (McLafferty and Preston 1991, p. 1), even after controlling for income, occupation and industry. They speculate that the relative scarcity of retail and personal services in minority neighborhoods may require black and Hispanic workers (irrespective of gender) to commute farther to obtain employment in these industries, especially household service jobs located in more distant affluent residential suburbs (McLafferty and Preston 1991, p. 12). For two other producer service industries, distributive and advanced corporate services, racial and race-gender differences in

commuting times may be attributed to the fact that firms are "...able to locate certain functions, such as back offices, to take advantage of a particular labor force. The persistence of the gender and race interaction may result from firms' efforts to locate certain activities near a white, female labor force" (McLafferty and Preston 1991, p. 12).

England (1993) disputes the existence of what she describes as the "spatial entrapment" of women in local, low wage labor markets. Based on in-depth interviews with 30 clerical workers and ten employers in the Columbus suburbs, she argues that job location decisions are too complex to be reduced to the local availability of accessible jobs. She finds that seven of the ten employers did not claim to locate with reference to a preferred labor force, and that many women kept jobs after moving home because they valued the job and felt a longer worktrip was justified. Although there is persuasive evidence that both employers and employees participate in the construction of spatially segmented local labor markets, some women are clearly not "spatially entrapped". Thus far, the evidence suggests that spatially segmented labor markets exist for some, but not all, groups of women workers.

Home and work jointly determine worktrip length

Hanson and Pratt (1988) argue that the home-work link "has been conceptualized in a limited and limiting way that reflects a fundamental, underlying view that the two spheres are essentially separate." (Hanson and Pratt 1988, p. 301). In particular, work is presented as the dominant location, driving the residential location. In its place, they argue for a view of this link that incorporates the importance of home and focuses on the interdependency between the two (Hanson and Pratt 1988, p. 305). Simpson (1987) too argues that a model that considers workplace and residential location jointly explains commuting distance better than models that focus on only one component (Simpson 1987, p. 119). Home and work are interrelated in three principle ways: a) residential location decisions are rarely made solely on the basis of job location; b) job search areas may be significantly constrained by residential locations; and c) residential segregation by race and income may play an important part in shaping labor force participation decisions. Each aspect of this home-work link has different implications for women than for men.

a) Residential location decisions:

Madden argues that two-earner couples are likely to select residential locations according to the specific job location of the husband and a range of potential job locations for the wife; thus, wives in more isolated locations commute further than wives in more central locations, while husbands' commutes do not show this pattern (Madden 1981, p. 190). She finds that suburban residential locations do not prompt men to commute substantially farther but do prompt women to do so (Madden 1981, p. 192). Singell and Lilleydahl (1986) also investigate the extent to which residential location decisions are based on the male head of household's job location (rather than being jointly determined) and thus disadvantage women in the labor market. They find that residential moves tend to benefit men by reducing their worktrips. But only part-time, not full-time, women workers increased their worktrips significantly after a move, which may indicate that residential location decisions in two-earner households are designed to maximize joint net earnings (Singell and Lilleydahl 1986, p. 125). In households where male income dominates, residential location is instead chosen to accommodate family housing demands for more space and a suburban location (Singell and Lilleydahl 1986, p. 126).

Robin Dubin (1991) investigates the effects of firm decentralization on commuting behavior, hypothesizing that individuals with more job and residential mobility will be able to use decentralization to reduce their worktrip length. She finds that women use firm decentralization more effectively than men to reduce their commute time (Dubin 1991, p. 25); similar results are found for sales and service workers, and those travelling by car (as opposed to public transit). Interestingly, she also concludes that white workers have been able to use firm decentralization far more effectively than have black workers.

b) Job search areas:

Drawing on research in Worcester, Hanson and Pratt (1992) show that about two-thirds of their respondents chose their work location on the basis of their residential location. Gender differences are sharp; while 63% of men had chosen employment on the basis of their residential location, 93% of the women interviewed had done so (Hanson and Pratt 1992, p. 306). Reliance on personal contacts and references as a primary job search strategy was more marked for women than for men. Thus, for some groups, "especially women and low-income racial or ethnic minorities, the nature of employment opportunities close to home can play a critical role in the work decision" (Hanson and Pratt 1992, p. 307). Clark and Whiteman (1983) argue that commuting to a growing labor market may not be the optimal choice for residents of a depressed labor market because of constraints on the job search area.

A recent investigation of the economic consequences of racial differences in housing and job location finds that black male workers could improve their economic status by changing job location. The authors conclude that "...racial disparities in [job] information flows would seem to be the more important impediment to suburban employment for black central city residents" rather than an unwillingness to commute a short additional distance to suburban jobs (Hughes and Madden 1991, p. 49). While this survey is limited to male full-time workers, similar job-search area constraints may affect women (especially women heads of household) who are more likely to live in central city neighborhoods.

c) Residential segregation by race and income:

For single parents and single women, minorities, and many low-income households, suburbanization has often remained out of reach. Incomes too low to enable home ownership, suburban environments that are ill-adapted to their needs, or racial segregation and discrimination, have limited the residential choices of many (especially women). However, employment has suburbanized (especially in lower-skilled lower-wage sectors which employ many inner city residents), leading some researchers to identify a "spatial mismatch" between jobs and housing that imposes burdensome worktrips on many inner city residents or keeps many non-suburban residents out of the labor force. While debates over spatial mismatch have focussed largely on the question of "race vs. space", issues of gender, family structure and occupational sector are relevant too. Hanson and Pratt (1992) argue that

> Structured housing and labor markets are mutually reinforcing. The fact that Puerto Rican and Vietnamese households come to the central city to find low-cost housing, for example, is not incidental to the structuring of the inner-city labor market (and vice versa). ...the effect is the creation of overlapping islands of labor market segmentation, as each area develops distinctive occupational and labor force characteristics. (Hanson and Pratt 1992, p. 403).

Spatial constraints have been the focus of a long-standing debate about the role of residential segregation in discouraging labor force participation among inner city minorities. A substantial body of research has resulted from Kain's (1968) argument that residential segregation has limited the labor market choices of inner city minorities, as jobs have decentralized to suburban locations (reviewed in Kain 1992). Arguments against the "spatial mismatch" hypothesis have generally phrased the problem as one of "race, not space" (Harrison 1974; Ellwood 1986; Leonard 1987) - that is, racial discrimination against minorities in the labor market is argued to be the factor that limits their employment options, not their residential location as a result of discrimination in housing markets.

Other commentators (Reid 1985; Price and Mills 1985; Ihlanfeldt and Sjoquist 1989) have argued for a more important role for space, and have provided evidence that the earnings of both black and white low-skilled workers have been reduced by job decentralization, but point out that no firm conclusions can be drawn about the effects of race independent from location. Cooke and Shumway (1991) continue this line of reasoning, arguing that confusions over the role of race versus space stem from an overemphasis on race in the spatial mismatch hypothesis. Instead, Cooke and Shumway focus on the fact that low-wage labor (primarily, those in secondary sector jobs in service, retail and clerical occupations) is much less mobile than are low-wage jobs. The spatial mismatch effects observed for minorities, they argue, may be equally strong for women.

A more recent investigation of the hypothesis, based on a longitudinal analysis of 1977 and 1985 AHS data, concludes that some elements of the spatial mismatch hypothesis are not supported by the evidence (Taylor and Ong 1995). The journey to work distances of whites and minorities converged over this period, even for low-skilled workers. Black and Hispanic workers in predominately minority neighborhoods commuted shorter distances than workers in other locations, and length of the worktrip was not significantly related to leaving the labor force over this period (Taylor and Ong 1995, p. 1469). However, there did appear to be a mismatch, resulting from commute mode rather than spatial location. Blacks were much more likely to depend on public transit (as Rosenbloom (1995) also finds) and commute times were much longer for transit users than for those commuting by car (Taylor and Ong 1995, p. 1471). Inner city residence may affect labor force participation primarily through the kinds of modal choice available to residents. Poor households are less likely to be able to afford cars, and parking, safety and insurance rates may make car ownership more difficult than for suburban residents. Although little of this research has focused specifically on women, the issues raised here are relevant components of an explanation that emphasizes how differences in the home-work link result in different worktrip patterns.

During the initial stages of research on gender differences in worktrip lengths, women were more likely to use public transit than men were. Rutherford and Wekerle (1988) compare the worktrip patterns of men and women who are transit captives (and are thus most likely to form local labor pools) with those of workers who are transit users by choice, and those who commute by car. Their study of a Toronto suburb showed that women make up just over two thirds of transit captives (Rutherford and Wekerle 1988, p. 120); they also find that women work closer to home than men, but travel more slowly to work (Rutherford and Wekerle 1988, p. 122). The proportion of transit users who are captives is higher at all levels for women than for men, and declines less rapidly with increasing income for women than for men (Rutherford and Wekerle 1988, p. 123). Hanson and Johnston (1985) find that women workers in Baltimore too are more likely to use public transit than men, and that they spend more time travelling to work than those who commute by car (Hanson and Johnston 1985, p. 208). However, women still travelled much shorter distances than men no matter what mode they used.

More recent data show that women are now less likely to use public transit than men. Rosenbloom (1995) reports that in 1990, women made only 1.5% of all trips by public transit, while men made 1.9% of all trips by transit. While the use of transit has declined for all groups, it has declined faster for women. Even more significantly, in every income group except the very lowest (under $5,000 a year) women make more of their worktrips by private vehicle than men do (Rosenbloom 1995, p. 2-25). However, these findings do not apply to black and Hispanic women, who make 8.5% and 7.4% of all trips respectively by transit, and are more likely to use transit than black and Hispanic men (at 8.2% and 6.6% respectively) (Rosenbloom 1995, p. 2-40). The automobile mismatch that Taylor and Ong (1995) identify may apply with greater force to minority women. This would also support McLafferty and Preston's (1991) argument that gender differences in worktrip times observed for white men and women do not apply to minority men and women.

Interesting evidence on the ways in which inner city residence may constrain or indeed prohibit the labor force participation of less-skilled minority women is provided by a unique public policy experiment in Chicago. As part of the settlement of a racial discrimination suit against HUD (the Department of Housing and Urban Development) and the Chicago Public Housing Authority, the Gautreaux Program was set up in 1976 to overcome the consequences of the long term segregation of public housing residents by race. Gautreaux provided existing residents of the Housing Authority (who were overwhelmingly female-headed households with poor educational resources and little or no work experience, and thus high levels of dependence on public assistance) with rental assistance certificates and housing placement services that could be used only in communities with less than 30% minority population. In 1981, the program was expanded to enable other recipients to use their certificates to move to revitalizing city neighborhoods, many of which were predominately minority. Clients are offered units on the basis of their rank on the waiting list, and the majority (95%) accept the first unit they are offered irrespective of location. Popkin, Rosenbaum and Meaden (1993) evaluate the outcomes of these moves by comparing the subsequent labor force experiences of those who moved to suburban locations, and those who moved elsewhere in the city.

Although both groups had similar demographic and human capital attributes, suburban movers were 25% more likely to be employed after the move than were those moving to other city neighborhoods. No job training or placement assistance, transportation or childcare assistance was offered to any of the program participants; this was exclusively a housing assistance program. For those who had never been employed, the difference was even more striking: approximately 50% more suburban movers were employed after the move than were city movers (Popkin, Rosenbaum and Meaden 1993, p. 564). Although it is clear that residential location is not the only factor affecting employment prospects, it emerges from this study as an important reason why many lower-skilled, inner city minority residents do not enter the labor force or do not stay in it consistently. Among suburban movers who remained unemployed, lack of public transportation and the difficulty of affording a car were cited (along with difficulties in arranging childcare) as the most significant barriers to getting a job (Popkin, Rosenbaum and Meaden 1993, p. 570). One other finding is interesting too for how it reflects on other research about the existence of captive labor markets. Although suburban movers clearly benefitted by finding employment, suburban moves did not have any effect on increasing earnings of those employed prior to the move (Popkin, Rosenbaum and Meaden 1993, p. 568). The policy implications of these findings (being supplemented currently by evaluations of federal Moving to Opportunity Programs aimed at replicating the Gautreaux experience) are especially rich, as are the theoretical implications for discussions about local labor markets, the links between residential and workplace location, and women's role in an emerging set of complex spatial divisions of labor.

The friction of distance differs for women with different labor market positions

An alternative approach to understanding the link between labor force participation and the worktrip argues that space poses different kinds of constraints for women with different sorts of human capital and transportation resources. A range of research reviewed earlier in this paper supports the argument that worktrip length increases as household income or earnings increase, but that this is not necessarily a linear relationship. Many have identified women with moderate earnings as those likely to commute the longest distance (Rutherford and Wekerle 1988, p. 122; MacDonald and Peters 1993, p. 40; Rosenbloom 1995, p. 2-29). In addition, Rutherford and Wekerle (1988) found that significant subsets of women do indeed commute longer distances for low pay. Fagnani's (1987) study of mothers in France found that women with a higher socio-occupational status were more likely to commute longer distances than were less-skilled mothers with fewer educational resources (Fagnani (1987, p. 29).

While rural women's labor force participation rates have increased rapidly, current economic restructuring trends have been marked by the movement of many lower wage, less-skilled jobs in retail and services (traditionally "feminized" sectors) away from small towns to the suburban fringes of adjacent metropolitan areas, reflecting rural population declines and greater consumer mobility as well as restructuring within those industries. The impact of these changes is likely to fall heavily on lower skilled women who will be forced to commute longer distances or leave the work-force. MacDonald and Peters (1994b) argue that long distance commuting entails different relative burdens and/ or barriers for low wage, less skilled workers than it does for well-paid career employees who remain in rural areas out of choice. Thus, space becomes either a constraint or an opportunity, depending on the individual worker's position in a segmented labor force. Understanding differentiation in the spatial constraints on the rural work-force is important; conflating the impact of the work trip for all rural-based workers is likely to obscure the existence of a significant barrier to stable labor force participation for some (but not all) workers.

This is the argument investigated in a paper based on data collected in a household survey of 646 rural women in Iowa in 1991. MacDonald and Peters (1994b) examine the proposition that women make employment decisions based on different evaluations of a set of job characteristics. Full-time workers, those in executive, professional or blue collar jobs, and those with higher hourly pay, placed less value on a shorter worktrip and more value on job security, satisfaction and the provision of health benefits (MacDonald and Peters 1994b, p. 729). A cluster analysis was performed, grouping respondents by human capital attributes (experience and education), by earnings, and by the value placed on job security, health benefits and convenience of location in their employment decisions. Three quite distinct groups emerged: one with high human capital attributes and income, who placed a high value on job security and benefits and less on a short worktrip. A second smaller group had average experience, schooling and income but placed little value on job security or benefits. A third group (the largest) had low incomes, less than average experience and education, but valued job security and a short worktrip highly. A comparison of the commuting cost burden among the three groups found that the third had by far the highest cost burden, had much older less reliable cars, and that many were unable to satisfy their preferences for a short worktrip given the metropolitan location of the jobs available to them. Space did indeed have different consequences for different groups of women workers, and spatial constraints were most severe for the low-paid, less-skilled (and predominately younger) group of workers identified in the cluster analysis (MacDonald and Peters 1994b, p. 734).

A comparison of this group of transportation-disadvantaged workers with intermittent labor force participants and those currently unemployed showed many demographic and transportation resource similarities, and the authors speculate that the obstacles faced by some respondents currently in the labor force may keep other rural women out of the labor force or in marginal, episodic employment (or underemployment) available at the local level (MacDonald and Peters 1994b, p. 736). This is the point made by Rutherford and Wekerle (1988) when they argue that "An emphasis on captive labor markets should result in increased attention to the conditions under which some workers have greater mobility than others within the context of the regional economy and an examination of the impact of limited mobility on the employment opportunities of certain classes of workers." (pp. 134-5). While further research is needed to determine how the "friction of distance" differs in its impact on the labor force participation patterns of women in other settings, this approach, like the approaches focussed on the spatial segmentation of labor markets, and the varied nature of the home-work link, promises a more fine-grained analysis of how the relationship between work and commuting differs, not only between men and women, but also among groups of women.

IMPLICATIONS FOR URBAN AND RURAL WOMEN

Do the different labor market structures evident in urban and rural areas have different implications for the relationship between urban and rural women's worktrips and their labor force participation patterns? The bulk of research on this topic has focussed on urban areas, but comparisons of the travel patterns of urban and rural men and women suggest that travel behavior is not that different. While rural women were even more dependent on the car than urban women in 1990, both urban and rural (white) women were more dependent on cars than men (with the exception of urban men's worktrips) (Rosenbloom 1995, p. 2-17). Rural women also made slightly more trips per day than urban women, but both categories made more trips per day (though they covered fewer person miles) than comparable men (Rosenbloom 1995, p. 2-21). There is some variation between urban and rural women in the length of the worktrip by household income category, with rural women in all but the $5,000-$10,000 and $15,000-$20,000 category travelling further than urban women at each household income category (Rosenbloom 1995, p. 2-26). Rural men travel further to work than urban men in all household income categories except the lowest (below $5,000).

It is clear that rural dwellers on the whole must travel greater distances than urban workers to participate in the labor market. The spatial structure of labor markets available to rural dwellers differs substantially to those available to urban dwellers; rather than representing an overlapping mesh of labor markets segmented by skill requirements and job rewards, rural dwellers must choose between local non-metropolitan labor markets with limited occupational diversity, more part-time and seasonal jobs with much lower annual earnings, and more distant metropolitan labor markets that offer diversity, job stability and higher rewards, but require significantly longer commutes. As rural America's economy has restructured, more and more workers are travelling longer distances to jobs in metropolitan locations (Fuguitt 1991). The implications for lower-skilled workers (especially women) who will not receive a compensating increase in wages, and who may have difficulty meeting the threshold costs of a reliable car, may be increasing discouragement with labor force participation. Differentials in housing prices between non-metropolitan and metropolitan counties suggest that for those with the fewest household resources, there are significant economic barriers to changing residential location. Many rural women are also part of family farm households, which pose significant non-economic barriers to relocation.

These trends and constraints are similar to those identified in economically disadvantaged inner city neighborhoods. The choice for lower-skilled inner city residents (many of them women) who do not find employment in the CBD, is to undertake time-consuming commutes to new suburban concentrations of jobs. Although the commuting time burden may be eased by investment in a car if threshold costs can be met, those reliant on transit may be forced to remain in a shrinking local labor market with poorer job choices. As the results of the Gautreaux experiment suggest, many are discouraged from labor force participation under these terms. Like rural women from low-income households, there are barriers to residential relocation for poor and minority women, but not only economic ones. Continuing discrimination may limit access to housing in many suburban enclaves (Galster 1991; Massey and Denton 1993).

For higher-income and higher-skilled urban and rural women, distance poses much less of a constraint. In urban areas, middle class suburban women have growing labor markets within easy commuting distance, and appear to have been able to use the decentralization of employment to reduce worktrip length quite effectively. "Spatial entrapment" may not be an appropriate description of the situation of these highly mobile women. Increases in the employment of married women with children over the past three decades may reflect in part the decreasing significance of spatial barriers to combining paid employment with domestic responsibilities. While many middle class rural women appear to have to commute longer distances than their urban counterparts, their good transportation resources and a similar willingness to trade off longer worktrips for better jobs (and in order to maintain a rural life-style) do not suggest that distance poses a meaningful constraint on their labor force participation, as it does for less-skilled rural women.

POLICY IMPLICATIONS AND RESEARCH NEEDS

How will spatial restructuring trends in the future alter the impact that distance has on women's labor force participation patterns? A continuation of current trends towards the metropolitanization and suburbanization of employment will likely exacerbate these class- and skill-based differences. Low-income, low-skilled women will be faced with an increasingly stark choice between investing in a private car and undertaking long commutes, or becoming economically marginalized in stagnant local labor markets. In contrast, a growth in appropriate skill-level CBD employment would improve urban women's options, but it is not clear that CBD employment shifts will provide substantially greater proportions of low-skilled jobs. One element will certainly remain out of the picture - intermediate jobs that low-skilled entry level workers could graduate to in the future. Local economic development in the form of enterprise zones in urban inner cities, or local rural development efforts, aim to reverse the spatial processes at work currently. But intermittent levels of public support for these efforts, and the expense and indirectness of place-based development strategies do not provide much grounds for optimism about a revitalization of local labor markets (Glassmeier and Howland 1995; Fisher 1989).

Telecommuting appears to offer one means of transcending place-based decline and transforming the home-work link, but its practical contribution to resolving spatial friction for less-skilled workers is highly questionable. Handy and Mokhtarian (1993) estimate the extent of telecommuting in California, and conclude it plays a small role in reducing the worktrip one or two days a week for approximately ten percent of employees. Telecommuting's potential is clearly concentrated in a few sectors, and thus offers few prospects to retail or service workers that suffer most from the friction of distance. Instead, it may provide welcome options to precisely the workers who encounter insignificant spatial barriers to labor force participation presently—those in occupations that can be or have

already been decentralized, and who have the white- or pink-collar skills (and perhaps home computing resources) required of telecommuters.

Perhaps the most important implication of research on the relationship between labor force participation and distance is that policy aimed at overcoming the transportation disadvantages of lower-income workers (and prospective workers) may be most effective in the short run. A range of points of intervention can be identified: overcoming the time disadvantage that transit users face, overcoming job search barriers, lowering the threshold cost of a car, or changing residential location. Hughes (1995) outlines three basic strategies to reduce concentrated inner city poverty by addressing employment accessibility. Dispersal (decentralizing the poor population to suburban areas), development (recentralizing employment from suburbs to inner cities) and mobility (connecting the ghettoized poor to suburban job opportunities) may be seen as complementary tools (Hughes 1995, p. 284). He concludes that dispersal has limited potential because it conflicts with existing housing stock investments and would serve few political interests at the local level (in either cities or suburbs). Dispersal is unlikely to be feasible on a large enough scale to significantly reduce the problem of residential concentration. Development strategies, apart from being costly and ineffective, would do nothing to overcome metropolitan segregation and have been widely criticized as relying on a vision of "separate but [un]equal" economic communities (Hughes 1995, p. 288). In support of the mobility strategy, Hughes argues that: "[t]he goal of the mobility strategy is to reconnect the ghetto to opportunity in ways that leverage a variety of local interests. ...The ghetto was once a place of low-cost housing adjacent to entry-level employment. The components of the mobility strategy are designed to restore that connection by exploiting the very incentives created by decentralization" (Hughes 1995, p. 288). The program would have three elements: i) a partnership to connect inner-city residents with suburban employers; ii) a targeted commute that makes suburban destinations accessible, which might include new transit routes, ridesharing, or automobile subsidies; and iii) support services to address issues such as childcare (Hughes 1995, p. 289). Although mobility programs avoid the issue of residential integration and may be vulnerable to many of the criticisms made of dispersal and development strategies, Hughes argues that they represent a politically feasible approach to an apparently intractable set of problems. One thing is clear. Welfare-to-work programs that do not address the spatial barriers that less-skilled women face in participating in the labor force will fail to "reform" the "culture of poverty", and may impose an unacceptable level of punishment on women and their children.

Over and above the policy questions concerning gendered spatial barriers to employment, is there a useful future research agenda on the relationship between the employment and work patterns of urban and rural women? We believe one research path, in particular, requires attention. Recent developments in computer technology for spatial analysis allow for a much broader investigation of work and commuting than has heretofore been possible. What the discussion of work and commuting lacks is a geographically broad time-series analysis of the movement of jobs within the American space-economy and the impact this movement has on the job search behavior and thus commuting and employment patterns of women and men, blacks and whites. Essentially this requires integrating our understanding of labor demand with that of labor supply (and the spatial constraints to that supply). This has been tried for small geographic areas using limited survey data, but because of the obvious workload difficulties, not for wider regions. Such an analysis would provide a much improved understanding of the way labor supply is mediated at the local level by space. It will be useful not only in a better articulation of the relationship between the labor force participation of commuting patterns of women, but will also clarify some related issues, for instance, the current relevance of the spatial mismatch hypothesis to minorities, women and rural dwellers.

In essence, historical business establishment data need to be tied to household structure and commuting data. Geographical information systems technology is probably the most efficient way to provide that link. The problem is that there are no databases ready for the job. Spatial labor demand, or more correctly, where jobs are located currently, is available in one form or another from a variety of establishment databases. Geographically aggregated household structure and commute times are available from the Census of Population. The problem then is to tie, in a methodologically sound manner, knowledge of household structure and commute times to employment location. Obviously, the problem would be much simplified if data on individual persons or individual families were available. Unfortunately, the two databases with such information—PUMS and the National Personal Transportation Survey (NPTS)—are not spatially specific enough to tie to an employment database. The unanswered questions identified in this review require us to redefine data needs to take better advantage of the analytic capabilities of the 1990s.

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Women's Travel: Consequences and Opportunities

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WOMEN'S TRAVEL: CONSEQUENCES AND OPPORTUNITIES

INTRODUCTION

We have a transportation system for one reason: to serve our Nation's citizens. As the circulatory system of society, transportation is the means by which we not only move people, but by which we provide goods, services, programs, and materials. The bottom line is that transportation has a real impact on our quality of life and our standard of living.

Policy makers have a responsibility to deliver a system that is efficient, responsive to user requirements, and sensitive to nonuser concerns. The objective is clear and straightforward. Developing the game plan for achieving the goal, however, is an extraordinarily challenging endeavor.

The challenge arises from a number of different sources. One of the most noteworthy is increasing competition for limited fiscal resources in the public sector. Debts, deficits and restrained tax policies have shrunk the available public-sector spending pie, including that portion intended for transportation.

Further, within the transportation sector there is increased competition. For example, goods movement has not always been a part of transportation planning in the public sector. However, the U.S. economy of the next century will be more dependent than ever on the interstate and international movement of agricultural and industrial goods. There will be increasing pressure to commit funds to create and/or revitalize the Nation's port and internodal freight facilities as well as their highway connections. Funding for these activities will compete with funding for passenger services.

Another significant source of challenge comes from individuals not traditionally part of the transportation decision making process. They are becoming increasingly vocal, reminding us that transportation decisions impact environmental quality and neighborhood cohesiveness. Policy makers are also striving to be more sensitive to certain groups in our population, such as the elderly, the disabled, and the poor, that have special transportation requirements.

Despite the challenges, Americans enjoy one of the best transportation systems in the world. In fact, demand for transportation service is at an all time high: Between 1970 and 1990, trip making increased 40 percent for everyone, 25 percent for men, 58 percent for women and 46 percent for individuals more than 65 years old.[1] Projections indicate that demand will continue to increase well into the future.

The social, environmental and fiscal constraints highlighted above have made it increasingly difficult to respond to current and projected demand for transportation services. Congestion is a serious and growing problem in many cities throughout the country. Commuters facing congested conditions are not just inconvenienced, they also incur increased travel time and vehicle operating costs. In addition, firms find that they must pay more to receive inputs for production as well as to transport their finished product to market. The lack of system reliability characterizing severely congested facilities inhibits implementation of innovative and cost saving logistic practices. The bottom line is that productivity suffers, making U.S. firms less competitive internationally. This effect ripples through the economy and society. For example, the cost of consumer goods increases and the number of employment opportunities declines.

As policy makers and planners address the challenge of maintaining a vital transportation system, the importance of knowing the customer quickly comes to the forefront. On a pragmatic level, the reception of policy initiatives by certain population cohorts can often define overall success or failure. Also, some population groups tend to initiate important social trends which have significant transportation implications. Finally, certain groups, such as low-income community residents, minorities, and the elderly, may require special assistance to avail themselves of needed transportation services.

This paper presents the case for considering women's travel issues in transportation policy development. Examining women's travel requirements and patterns makes sense because women (1) are agents of change, (2) have different activities and travel requirements from men and (3) will account for significant increases in total future travel. Underscoring these reasons is the fact that women represent a large portion of the traveling public.

WOMEN'S TRAVEL: PAST, CURRENT, AND FUTURE IMPACTS

WOMEN ARE AGENTS OF CHANGE

Women are agents of change not only in the context of transportation but also in the context of broader societal patterns. From the time of Ruth, women have been leaders. As we observed the 1996 National Presidential elections, we heard the pundits debating not how the candidates' wives would dress should they become first lady, but rather how and to what extent these women would influence National policy.

The nature and extent of women's participation in the labor force has profoundly changed the fabric of society. For example, the persistent trend of ever increasing suburbanization has been, in part, solidified because of working women.

Women in the workforce

Harry Truman's life ran parallel to a time of great change in the lives of many women. When Harry got his first car, not quite 20 percent of the workforce was female. Of these women, fully a quarter were teenagers and very few were married. By the time President Truman entered the White House in 1945, women, who had done more than bake cookies in support of the war effort, knew that not only were they capable of working for pay, they even enjoyed working outside the home.

Biographer David McCullough relates the following anecdote about Harry Truman. In 1914, Harry Truman's mother, who didn't drive, bought him a

> big, black, five-passenger 1911-model Stafford, hand-built in Kansas City by a man named Terry Stafford. Only three hundred of the cars were ever made. It had a four-cylinder engine, right-handed drive, a high brass-framed windshield, and Presto-Lite lamps nearly the size of the lamps on locomotives. On a good road, Harry soon demonstrated it could do 60 miles an hour. It was a rich man's car. New, it sold for $2,350. Harry paid $650. He *could* come and go as he pleased now, and mostly it was go. In three months he drove 5,000 miles. Not since his first pair of eyeglasses had anything so changed his life.[2]

A women leading a man to new horizons! Four years after taking his first spin in the Stafford, Harry was on his way to France to fight in World War I. The war changed him in profound ways, opening many new personal horizons. Before the War, Harry was a farmer. After returning from Europe, he opened a haberdashery store and drifted into politics. By the time of World War II, Mr. Truman was an U.S. Senator.

World War II was in many aspects a watershed event in the Nation's history. The war caused women in particular to alter their expectations dramatically. Up until the second World War, the mores of the country ran strongly against women entering the for-pay labor force--especially married women with children. However, during the War attitudes toward female employment began changing when increasing numbers of workers were needed to support domestic war production requirements. Women who were employed as part of the war effort were never to be the same again; most of them loved working. "For some, the best part . . . was the sociability of the workplace versus the isolation of domestic responsibilities. For others, the best part was the financial independence . . . . Still others relished the mastery of new skills, the sense of industry, the pleasure of a job well done."[3]

Eleanor Roosevelt predicted the long-term participation of women in the labor force when she declared that ". . . women are fully as capable as men; men and women were meant to work together."[4] Indeed, by 1990, almost half of those in paid employment were women and almost half of all women working outside the home were married.[5] Further, about three-quarters of married women who worked in 1990 had children over five years of age and almost 60 percent had children under age six.[6]

Women and suburbanization

While women began their slow, but persistent entry into the labor force following World War II, the country's landscape was changing in ways that would have dramatic consequences for the transportation system. Large numbers of people began to move their homes from the cities to the suburbs--to land that had once been used for farming. After a while, demand for alternatives to shopping in the city grew. Businesses in search of new markets, lower wages, and less expensive land rents responded. After the businesses moved, the demand for workers increased and employment also became suburbanized.

Edge Cities began sprouting up all over the country in the 1970s as developers began to build big office buildings in the suburbs. In the last half of that decade, over eight million women found work outside their homes. The Edge City offices--in automobile-accessible suburbia--were seen as convenient by women. "A decade later, developers viewed it as a truism that office buildings had an indisputable advantage if they were located near the best educated, most conscientious, most stable workers--underemployed females living in middle-class communities on the fringes of the old urban areas."[7]

Not coincidently, between 1969 and 1990, the number of personal vehicles increased 128 percent. During the same period, the number of licensed drivers increased 60 percent, with 63 percent of the increase attributable to women's licensing.[8] Most of the increase in automobile ownership came as a result of women entering the work force.

The suburbanization trend continues with persistent increases in the number of single purpose neighborhoods and low density communities being established. Today, 50 percent of the Nation's commuters live in the suburbs and over 41 percent of all jobs are in the suburbs.[9] A sizeable portion of all trips now have both suburban origins and destinations. In general, there are fewer concentrated

origins and destinations and fewer corridors of high density demand. "These kinds of patterns require decentralized transportation facilities, programs and services; they are dependent on the automobile."[10]

WOMEN HAVE DIFFERENT ACTIVITIES AND TRAVEL REQUIREMENTS FROM MEN

Women have different activities and travel requirements from men. Women travel fewer miles, on average, than do men. At the same time, women take more trips. Men typically travel more in the context of earning a living; women, on the other hand travel more for family and personal matters.[11]

Household responsibilities

Women typically have different (and more) household responsibilities than do men. As a result, women tend to be more dependent on Single Occupant Vehicles (SOVs). They juggle daycare responsibilities for their children with work responsibilities as well as with household management obligations, often "linking" trips together. For example, they might drop the children at daycare on the way to work or go to the bank on the way home.[12]

Trip chaining travel patterns influence the choice of mode, the hours traveled and routes taken. These patterns have important implications for transportation policy initiatives. For example, women with children often believe they must drive alone because they need a car immediately before and after work to satisfy their child care requirements. In addition, they feel more comfortable having quick access to a car during the day in the event a family emergency should arise.[13] In seeking viable air quality solutions, the impact of this circumstance is important. Reduction of SOV use by women is attainable only if flexible, immediately available alternatives are present.

The "Twinners"

Another factor influencing the way in which women travel is the aging of the population. The U.S. is rapidly growing older. In 1990, more than one-fourth of the entire population was over age 60. By 2010, almost half of the elderly population will be over age 75.[14] As a result, more and more women are becoming "twinners." That is they are looked at to take care of aging parents or aging in-laws while they continue to be responsible for their children:

In the next few decades our society will experience a situation without historical precedent; a substantial number of both middle age and younger elderly people will have very old and frail parents. . . By 2010, the so-called sandwich generation ["twinners"] will be supporting both aging parents and kids in college; there will be 164 college kids or aging parents for every 100 people 45-49.[15]

Responsibility for taking care of the elderly--everything from helping with personal care to household tasks to transportation--generally falls to family members, usually daughters and daughters-in-law.[16]

WOMEN WILL CONTINUE TO ACCOUNT FOR SIGNIFICANT INCREASES IN FUTURE TRAVEL

Immigration

Due to a sustained influx of immigrants from abroad, significant numbers of the U.S. population now have cultural, racial, or ethnicity that differ from the majority. For reasons ranging from variations in cultural norms to employment locations and income levels, these groups have distinct travel patterns. For example, there are significant differences in the proportion of women holding drivers' licenses when viewed by ethnic group. In 1990, over 90 percent of White women (aged 16 through 64) were licensed. However, only 71 percent of Black women and 66 percent of Hispanic women were licensed to drive. When a women obtains a drivers' license, total trip making increases greatly.[17]

It is not clear if these groups will adopt the travel patterns of the majority group or if they will retain their own culturally-based travel patterns. For example, some women come from cultures where females just don't drive; therefore, they may never choose to drive. In addition, there are cultures that are increasingly a part of the U.S. landscape in which cycling is a mode of doing principal business--not just recreation. Policy makers and planners need to think through what the impact of immigrants on transportation patterns will be. The question is not just, "How quickly are they going to adapt to our travel patterns?" but rather, "How might we change our travel patterns to adapt to their cultural expectations?"

The Changing American Household

Associated with each household is a baseline amount of travel. Therefore, trends that point toward increased numbers of households suggest increases in vehicle miles traveled (VMT). The number and composition of American households have also changed in important ways. Between 1969 and 1990, the number of households grew 49 percent and the number of persons per household decreased 20 percent. Most of the growth in the number of households was caused by single-person and single-parent households.[18]

The increase in the number of female heads of family households has been striking. In 1980, they comprised 8.7 million households; by 1995 that number had grown to 12.4 million. The trend holds when non-family households are examined: in 1980, 12.4 million households were headed by women; in 1994, there were 16.2 million such households.[19]

Service Based Economy

The U.S. economy has transitioned from being a production to a serviced based. It is projected that retail trade will soon replace manufacturing as the second largest source of total employment, accounting for over five million jobs by 2003.[20] Employees in service industries are generally referred to as "flexible" workers.[21] Large numbers of women are and will be represented in these flexible positions.

Flexible workers are generally considered temporary, they work variable work schedules, have multiple employers, and work less than 40 hours a week. As many as one-fourth of American workers are in the flexible labor force. Many Americans are now traveling at different hours, on different routes and on different days of the week than comparable individuals two decades ago. Commuter trips occur over a longer portion of the day, with many employees working late at night or starting early in the morning.[22]

In contrast to production industries, service companies do not need to be near one another or in a central area. They also tend to be smaller in size and are less likely to locate along heavily traveled corridors.[23] These characteristics have led to a deconcentration of employment sites and a wide variety of dispersed work destinations.

LOOKING FORWARD: EMERGING TRAVEL TRENDS AND ISSUES

One of the first challenges faced in formulating policy is that of identifying not only the current issues but also predicting future trends. Effective policy has a temporal orientation: although appropriate for the present it reflects a view of potential future issues and objectives. Yet, the future outlook for women is far from clear and the future vision of the Nation's transportation system is equally difficult to define.

This section will approach the future from two directions. First, a "big picture" view of the major trends will be presented. Second, alternative views of the nature of women's participation in the future are explored. The section concludes with some thoughts on how women might respond to or even influence future trends.

THE "BIG" PICTURE

Toward the end of 1995, Federal Highway Administration (FHWA) staff developed alternative future scenarios to describe transportation in the 21st century.[24] Three scenarios were evaluated: "Most desirable," "least desirable," and "most likely to occur." Each scenario spans a time horizon of 25 years, from 1995 to 2020. Varying assumptions were made regarding technological, economic, social and political trends that could impact the future demand for surface transportation services.

A set of assumptions were considered "given" and formed the core of all scenarios[25]:

- Computer and information technology will continue to advance.
- The population will age.
- The population will increasingly become drivers.
- International trade will grow in importance.
- The role of the Federal government in transportation, although still influential, will diminish. The private sector and State and local governments will assume larger roles.
- Demand for personal mobility will persist. Americans will still want to go where they want, when they want.
- Commercial traffic will grow as "just-in-time" inventory and production systems come on-line, in part because of the global nature of economics.
- Demand for alternative fuels will increase to avoid continued dependance on the gasoline-powered vehicle and its companion pollution problems.
- Constraints on transportation funding will persist.

As an example of broad-based scenario development, the "most desirable future" scenario is outlined below. This scenario is characterized by a strong National economy, largely the result of the re-engineering of American industry. Firms are more efficient and are globally competitive. Companies are willing to reinvest their profits in research and development. U.S. citizens share in the prosperity. Therefore, the public is willing to commit the long-term investment required to enhance quality of life and foster future economic expansion.

Under the "Most Desirable Future" scenario, workers use their home computers and video-phone to communicate with clients and coworkers. They go to the office only for an occasional meeting. Real-time, multimodal travel information is readily available and is used for both commuting and long-distance travel. In addition to the acceptance of telecommuting, new technologies providing for automatic billing based on weight/distance and peak period use contribute to reductions in SOV travel. The elderly have access to personalized public transit systems which provide door-to-door transportation to services they cannot access through home computers.

FUTURE WOMEN'S TRENDS

The way women go will influence the way transportation goes. When considering future policy alternatives, it is only prudent to think about what women might be doing in the future and how their actions might influence transportation system requirements. In other words, broad National scenarios should include a women's issues component.

An excellent new book, The Futures of Women, Scenarios for the 21st Century [26], by Pamela McCorduck and Nancy Ramsey, provides some interesting speculation. The authors offer a number of future scenarios. Three are appropriate for our consideration:

- Golden Age of Equality
- Two Steps Forward, Two Steps Back
- Separate--and Doing Fine, Thanks

These alternative views of the future represent extremes; the future will probably not be exactly in accordance with any one scenario. Select elements of each however, will most likely evolve over the next 20 years. Each scenario assumes (1) sustained increases in population growth, (2) an aging population and (3) significant advances in technology.

McCorduck and Ramsey describe, in the "Golden Age of Equality" scenario, a world where grinding work hours are a thing of the past. Men and women work smart instead of working long. Telecommuting is the usual mode of work. Individuals are able to control their time, set their own priorities, and in general, achieve balance in their lives. Efficient use of the new information technology leads to higher wages and families can manage on two half-time salaries or even prosper on two full-time paychecks.[27]

In contrast, the "Two Steps Forward, Two Steps Back" scenario describes women, even professional women, as continuing to have prime responsibility for child care and household maintenance responsibilities. The persistent demands of balancing family, house and work lead to burnout and women workers begin to retire earlier.[28]

Under the "Separate--and Doing Fine, Thanks" scenario women's rights are viewed as relatively unimportant. Women are treated as less than equals. Out of frustration and impatience, many women construct lives for themselves that are distinctly apart from men's. Women begin to establish their own households, often choosing not to marry. In fact, women see, under this scenario, the combination of children and a husband as problematic because men fail to share power or responsibility at home.[29]

WOMEN AND FUTURE TRAVEL TRENDS

The women's future scenarios as well as the general FHWA "most desirable" scenario suggest many interesting questions that planners and policy makers should at least consider as they formulate strategies for improving the transportation system. The following "top ten" list provides a sample.

1. What will **future technology** look like; will it be responsive to women as well as men? How will we integrate it into our lives and how will our everyday lives change? Will new technology reduce or eliminate the requirement for trip-chaining by allowing women to raise their families while they work at home? Is telecommuting a trend that should be encouraged through incentive policies?

2. Will the wave of **immigration** continue? Will female immigrants assimilate into the majority culture? Will their travel patterns begin to approach those of women in the majority culture or will they influence U.S. travel choices to reflect their national patterns?

3. Will **household responsibilities** be shared equally by the men, women and children in a family? If women continue pulling the "second shift," what impact will this have on their long-term career aspirations? What about the willingness of younger women to marry? What impact will changes in womens' societal roles have on **mode choice decisions**? If responsibilities for household management are more equally shared between all family members, will women be more likely to take transit, to carpool?

4. Will the role of husbands and wives continue to move toward parity? What impact might this have on **housing and job choice decisions**? Will the husband's job continue to be considered the "primary" support of the family? What impact would real equality have on miles traveled and trips made by women? What about the persistent trend toward even more **suburbanization**? Will there be a continued shift of jobs and population to the suburbs? Will land use and development patterns change?

5. Will **family friendly work rules** become more extensive leading to wide spread acceptance of flextime schedules? Will providing childcare become a responsibility of the employer?

6. Will the trend toward **smaller households** continue? Will larger numbers of women become the main or sole support for their families? How might this trend impact housing location decisions given that families headed by one parent place an even higher value on time and convenience. Will greater numbers of young women simply choose not to marry?

7. If women's participation in the political process expands, will transportation decision making become more sensitive to **preservation, environmental and community concerns**? How will these concerns be balanced, in a constrained funding environment, against the requirement for increased transportation services?

8. In the future, will **equity** issues be an important part of the transportation policy agenda? Will the Nation be able and willing to afford targeted transportation programs for disadvantaged groups? Will the increasing number of single mothers and aging women benefit from special programs that provide them access when a private automobile is not available?

9. Will the government have sufficient funds to cope with **aging of the population**? Will pension funds be available for the elderly? Will increasing numbers of women be required to care for their children, aging parents and possibly grandparents as well? What impact will this have on the number of women in the for-pay labor force? Will highway fatalities surge upward as a result of increases in the number of elderly drivers?

10. How will potential **policy changes** such as welfare reform, restructuring of social security, and point of delivery for health (e.g., more out patient care, preventative actions, and managed care clinics) impact transportation system user requirements? What impact might non-response to these new transportation requirements have on delivery of these social programs?

POLICY DEVELOPMENT BACKDROP

Americans look for immediate responses to their needs, wants and desires. They place a very high value on freedom of choice, and they view transportation as an entitlement. Consequently, people generally choose to travel alone in a private automobile, especially when commuting to work. The motor vehicle is the indisputable method of choice, in large part because of its flexibility and immediateness.

Policy options designed to be consistent with public sentiment have a much higher likelihood of success than those that are contrary to these firmly held values, beliefs and preferences. However, being responsive to the transportation user and the policy environment does not suggest that decision makers should respond blindly to public demands. Rather the proposed strategy calls for leadership, public dialogue and creativity. The challenge is to fully understand current user requirements and devise alternative strategies to address those requirements.

Transportation's sphere of influence is not understood by Americans. Education campaigns should be waged to inform the public of (1) the distinction between transportation "needs" and "requirements," (2) the appropriate means for satisfying their "needs," and (3) the impact of a safe, efficient, customer responsive transportation system on their standard of living and quality of life.

Transportation policy should also have an element which is unexpected by the consumer. The case of 3M's "Post-It Notes" provides a great example: The consumer didn't know they needed the product and now the typical office can't survive without them.

EFFICIENCY

There are two dimensions to efficiency. The first involves identifying the proper objective, that is doing the "right" thing. The second is crafting a workable policy.

The fiscal, social and environmental constraints facing all levels of government generally inhibits expansion of the highway network via the addition of new lane-miles. In response to these constraints, many are exploring policies to discourage use of the private automobile, improve system throughput, and/or address mobility via non-transportation alternatives.

Reducing the incidence of driving alone is extraordinarily difficult because of (1) the economic, demographic and geographic trends presented earlier and (2) the realities of today's policy context. Despite attempts to the contrary, the private vehicle continues to dominate travel. In 1990 it was used by 100 million of the Nation's 115 million commuters.[30] For women it is difficult to move from the SOV due to personal safety concerns, household responsibilities, parenting duties, and needs of older parents.

Policy makers are faced with the challenge of responding to the trends. However, as outlined in the previous section, the current policy framework is limited by a strong public will to protect their freedom to choose. Alternatives which provide the same range of freedom or that changes the location of needs must be found.

Therefore, alternatives to the SOV must include comparable elements of time, convenience and flexibility. In addition, safety and security are critical factors when individuals decide on a mode of transportation. These rating factors must compare favorably to the automobile before a substitution will be willingly made. Much research needs to be done to define the motivation behind women's mode choice preferences.

EQUITY

The reality of constrained public resources tends to emphasize efficiency in the policy development process. In general, equity considerations are seldom an integral part of the project evaluation process and equity issues related specifically to women are never part of the decision making process. Many women's issues tend to be succumbed under the constituencies of larger social problems and women's groups have not focused on transportation issues.

A number of social issues have been exacerbated by transportation decisions. For example, the increased suburbanization of jobs, facilitated by decisions to expand the highway network, tends to perpetuate the large concentrations of inner city poor by restricting their access to employment. To the extent feasible, transportation policies should be designed to ameliorate these impacts, or at least not to exacerbate them.

Further, there are social service policies that depend on the adequate provision of transportation for their success. For example, the efficacy of recent legislation to move welfare mothers from dependency on the government to self-sufficiency will work only if jobs are found, childcare made affordable, available and accessible, and the transportation to travel to the employment site is available.

The unintended consequences of potential policies can impact certain groups in negative ways. For example, women with young children may not have the option of forming a carpool or using transit given the

requirements imposed by daycare as well as the need for access to a car during the middle of the day should an emergency arise. Policies designed to reduce SOV usage must be sensitive to the practical constraints on mode choice experienced by some user groups.

SAFETY

Fatalities are rising. While our goal is to reduce fatalities, these increases may be due to increased demand for personal and commercial travel, increased incidence of "aggressive" driving, and rising numbers of very elderly drivers.

Women and men drive differently and it is important that our laws and policies recognize the differences. We have not, however, adequately researched the differences in male/female driving behavior. For example, are the safety features in our cars and our highways designed with men in mind? Certainly most women will say that the most prevalent safety feature--the seat belt--seems to be designed for a 6-foot man, not a 5-foot 4-inch women. Is the same true for sight-distance lines in highway alignments, the first step on transit buses, access to subway and light rail systems or lighting and access facilities (e.g., sidewalks) between residential communities and shopping sites?

POLICY IMPLICATIONS

Understanding current and future women's travel requirements will help policy makers shape a transportation system which is (1) efficient (that is, works well), (2) equitable and responsive to its societal role (that is, fair to users, want-to-be-users and non-users), and (3) safe.

Since World War II, women have had a dramatic impact on our transportation system. Current evidence suggests that women, in large part owing to their sheer numbers and the increasing number of women with drivers' licenses, will continue to influence the ability of the system to respond to current and future demands.

The fact that women behave differently than men has important policy implications. For example, while much attention is focused on getting people out of their SOVs and into other modes of transportation, the strategies advanced often fail to account for the multiple and significant array of responsibilities with which many women must cope. Women need the flexibility that will allow them to drop the children at school in the morning, run their elderly parent to a doctor's appointment in the middle of the workday and pickup the dry cleaning before returning home from work. At present, the only way many women perceive that they can have the necessary flexibility is by use of the SOV. These differing kinds of behaviors need to be reflected as potential transportation management strategies are considered.

Increases in travel demand are projected for the future. It is important that we be able to predict the magnitude of that increase as well as understand the components. For a number of reasons, women travelers will be a significant source of growth in future travel demand. First, sustained immigration trends will result in notable numbers of female immigrants, increasing their VMT as their licensing patterns and utilization of the transportation system change. Second, increases in the number of households will result in increases in VMT as each household has a minimum amount of travel associated with household management requirements. Third, the change to a service based economy tends to change travel patterns, to include increasing VMT.

CONCLUSION

As we enter the 21st century, we find many challenges and opportunities in coping with transportation issues. Success in finding the answers will be strongly influenced by consideration of the demands imposed by women on the transportation system as well as the impact of the transportation system on women, especially subpopulation groups of women.

The transportation community needs to think about re-tooling its models. Models that don't consider household characteristics will miss many of the important trends. We need to know:

- Is it a single-person household or a household composed of unrelated people?
- Is it a female-or male-headed household?
- Are there children in the household? Are they male or female? How old are they?

Differences in travel patterns, in travel behavior and travel requirements will not allow us to effectively use the ubiquitous "household" as a flat surrogate for modeling.

In addition, policy makers and planners need to make the analytical tools consistent with emerging employment trends. In the past, it was appropriate for the planning models to assume that workers would stay with their employers for the next 20 years. Now individuals may be fully employed--but have three different employers in a two-year time period. Origin and destination points will change significantly. This will be a significant issue for women in particular.

The future transportation system must be customer responsive and our analysis tools should reflect both current and future requirements. One of the system's biggest customers will be women; we need to understand the nature of their requirements. Further, we need to get the message out about the importance of transportation to all of our various publics. Women will be an integral part of the decision-making process as we enter the 21st century.

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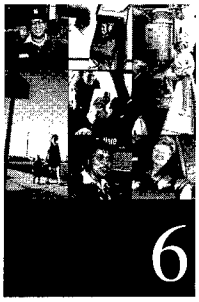
II

A HISTORICAL PERSPECTIVE ON WOMEN, TRAVEL, AND FREEDOM



The Automobile and Gender: A Historical Perspective

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THE AUTOMOBILE AND GENDER: AN HISTORICAL PERSPECTIVE

INTRODUCTION

GENDER STEREOTYPING AND THE MODERN AUTOMOBILE

Many have observed that when men get lost while driving they will seldom stop to ask for directions, while women who are lost will usually pull into a gas station or convenience store or ask a passerby for directions. This supposed gender-linked trait may be an example of simple folk wisdom and may be real or imagined, but it was recently taken very seriously in an open piece by Robyn Meredith in **The New York Times** on August 26th. The article dealt with the emerging technology of intelligent transportation systems, and described some newly available automobile navigation systems and several others that are still in development. The article reported some findings that should be of interest to those of us attending a conference on Women's Travel Issues.

Meredith concluded that on-board navigation systems are useful because men will prefer them rather than to ask for directions. The article quoted Sociology professor Pepper Schwartz of the University of Washington, who stated that in "nine out of ten feminist households, men do most of the driving," and "men find it hard to ask for help because it is a submissive gesture." Support for this position was offered in the article in the form of interviews with technical experts attending a national conference on in-vehicle navigation systems. Professor David E. Cole of the University of Michigan, for example, was quoted as saying that he personally did not need to stop at gas stations for directions because he always brought along a compass.

The article goes on to quote Stephen E. Weilland, an expert on car navigation systems, who supported the development of in-vehicle navigation systems by saying said that sending his wife into a gas station for directions was pointless because she would only misunderstand them."

The article also stated that German engineers, responsible for designing a Phillips on-board navigation system for BMW cars, have concluded that the talking computer that will give directions in future BMWs will have a male voice. Mr. Francis J. Dance, who demonstrated the Phillips system to the reporter, was quoted as saying that the technical decision had been made to use a male voice because "men don't want women giving them directions" (Meredith, 1996).

THE PLACE OF HISTORICAL ANALYSIS AT A CONFERENCE ON WOMEN'S TRAVEL ISSUES

This is a partly humorous and partly serious contemporary example of the influence of gender on travel and transportation systems. As we undertake the Second National Conference on Women's Travel Issues, it is important that we consider the depth and the significance of gender issues in transportation. It would be a terrible mistake to conclude that this conference is only about small differences in vehicle ownership rates between men and women, recent trends in vehicle miles of travel as they differ between men and women, or mathematical models in which gender is one of several independent variables. All of our technical analysis, statistical modeling, and hypothesis testing is really derived from an overarching concept of gender that we should remember to be simultaneously both the cause of and the effect of what we measure in our individual technical studies. We should take note in this opening session of the fact that "gender" is a socially constructed concept. Gender is

very much not the same thing as sex. We are born as males or females, and that's a start at gender but it is surely not all there is to it. Our society, through family, educational institutions, religious institutions and many other social organizations and conventions, attaches to us certain expectations, imbues us with certain roles and behaviors, ways of dressing, ways of speaking, ways of acting, and even ways of traveling. We learn these social roles and teach them, and in the process we create expectations regarding gender. This is true in the realm of travel as it is true in other aspects of our lives.

Economists say that "the demand for travel is a derived demand." That is often taken to mean that we usually travel not for the sake of traveling, but rather because our activities are separated in space and time, and we need to travel in order to participate in a wide range of activities such as work, recreation, and personal business, at times and locations that are separated from one another. This is certainly true, and we can even go farther by saying that the demand for travel is in part derived from social roles that are gender related. The different social roles played by men and women dictate that they travel with different frequencies, at different times, and by different modes.

As we discover these differences by conducting technical studies of the sort that will be reported over the next three days, let's also recognize that these are derived from larger social constructs associated with the concept of gender. Indeed, I would assert that travel patterns are among the most clearly "gendered" aspects of American life. If that proves to be really true, then one of the best ways of finding out about the significance of gender in urban life would be to study travel patterns more explicitly with this issue in mind. And, if this contention is true, is would also be essential to include far more gender-related analysis in our standard study of travel patterns.

GENDER AND AUTOMOBILES IN THE EARLY TWENTIETH CENTURY

During the last century, as the industrial revolution reached more and more people and an increasing proportion of the population began working at places outside of their homes, men and women increasingly came to exist in what historians and social theoreticians have called "separate spheres." While men and women may have worked together on their family farms, with urbanization and industrialization man's arena was increasingly defined as economic production and public life (such as politics or scholarship) and was pursued outside of the home, while woman's sphere was the care of children, the nurturing of the family, the comfort and tranquility of the home, and the moral guardianship of family and religious values. Through the nineteenth century home became more than a unit of economic production. Increasingly it became the ideal of goodness and morality, it provided material comfort and status, and it became increasingly identified as the domain of women far more than of men (Degler, 1980; Wachs, 1991).

The separation of man's sphere from woman's sphere was at least in large part a direct response to advances in transportation technology that took place in the second half of the eighteenth century—from horse cars on rails to electric cable cars and street cars to suburban railway systems and finally the automobile. These innovations made it increasingly possible for more people, mostly men having higher than average income levels, to live and work at locations increasingly distant from one another. People of means wanted their workplaces separated from their residences in part because of the different values that the two represented. It was believed that the aggressiveness and turmoil of the world of work—man's world—should not be permitted to intrude into the peace and tranquility of home—woman's sphere. The density, smoke, and filth of the world of commerce should not be allowed to tarnish the warmth, protectiveness, and pleasantness of the home and the best way to

achieve this was the increasing separation of home and work in space. This counterposition of values is seen in a quotation from Charles Horton Cooley, who wrote in 1884 that:

> Humanity demands that men have sunlight, fresh air, the sight of grass and trees. It demands these things for the man himself and still more earnestly for his wife and children. No child has a fair chance in the world who is condemned to grow up in the dirt and confinement, the dreariness, ugliness, and vice of the poorer quarter of a great city. There is, then, a permanent conflict between the needs of industry and the needs of humanity. Industry says men must aggregate. Humanity says they must not, or if they must, let it be only during working hours and let the necessity not extend to their wives and children. It is the office of the city railways to reconcile these conflicting requirements (Cooley, 1894).

Advances in public transit allowed some people to realize their preference for separation between the locations of home and work, and the automobile enabled even more people to do so. Suburbs, at first very close to the center of the city, and later at substantial distances from the center, were the manifestation of this preference in terms of urban form. While transportation planners often describe suburbanization as an inevitable outcome of transportation improvements, we don't often take note of the fact that suburbs also separated gender roles in space. The commerce and politics of the inner city were for a very long period of time the exclusive domain of men, while the residential life of the suburbs, including shopping and caring for children, was very much the sphere of women.

Society women before 1910 drove for recreation quite as freely as wealthy men—they were called "chauffeuses," but their circumscribed social roles were evident in their driving patterns. They drove downtown more rarely than men, typically staying within their suburban communities, driving to social events, shops and school functions. And, as Virginia Scharff has shown, the electric automobile was clearly marketed to women in recognition of women's particular roles.

Today as we consider the potential market for electric vehicles as a way of addressing air quality and energy policy issues, we hardly pay attention to the early years of the automobile, before about 1912, when electric vehicles were very common and there was genuinely vigorous competition for market share between manufacturers of electric cars and gasoline powered vehicles. The scholarship of Virginia Scharff looks closely at this competition and her work makes it very clear that gender roles were consciously addressed in this competition. The gasoline powered car early in this century was seen to be powerful, it was noisy, it was faster and had greater range than electric cars and starting it required turning a crank. The electric car, by contrast ran more quietly, more slowly, more cleanly, had limited range, and started at the press of a button or turn of a key. It turned out that the early gasoline powered car was widely marketed as being more attractive to men, while the electric car was primarily marketed as a vehicle whose characteristics made it attractive to women. In an article in a popular magazine of the time, **Country Life in America**, for example, author Phil A. Riley urged his readers to understand that the two types of cars were distinctly different from one another. He described electric autos as perfectly suited to the needs of women who traveled shorter distances, stayed nearer to home, and who needed an "ever ready runabout for daily use," leaving extended travel and fast driving to the men in gas powered cars."

Another popular author of the period, C. H. Claudy (as quoted in Scharff, 1991), also promoted electric vehicles as appropriate for women. He actually stated that the electric car was suited to women because it had "a circumscribed radius," and he described how this was appropriate for the accomplishment of domestic tasks that were part of a middle-class homemaker's lifestyle. Of course, he regarded the

activities of a homemaker as inconsequential in comparison with the obligations of professional men. "What a delight it is, he stated, to have a machine which she can run herself, with no loss of dignity, for making calls, for shopping, for a pleasure ride, for the paying back of some small social debt." A gasoline car in the early days needed to be started by turning a crank. It was stated over and over again that cranking an engine was no job for a lady, and the electric cars had the advantage of starting at the touch of a switch. Cranking a gas-powered car could break an arm if one failed to let go immediately and the car backfired. In fact, cranking did not require great strength. The key to properly crank starting a car was in sensing the right position at which to hold the crank when accelerating the speed of rotation. Women were quite as capable as men when it came to crank starting a car, and the notion that women could not or should not do this was promoted pretty much by men.

The power of the association between gender and the source of power of automobiles early in this century is most clearly symbolized in the fact that in the year 1908, the year in which he introduced the Model T Ford to market, Henry Ford bought an electric car for his wife Clara. Ford biographer Allan Nevins mentioned that she used the electric car for short trips around Dearborn, but that she would ride as a passenger in a car driven by Henry or their son Edsel when making longer trips. The gender roles are clearly established: Women's independence was limited and well matched by electric cars. When their lives took them farther afield, it was in the company of men and certainly not alone.

It is clear that many women sought and enjoyed the independence provided by the automobile and welcomed the opportunity to travel. Many books appeared presenting accounts of women's trips across country without men. For example, the first commercially successful book published by Emily Post, who later became a well-known authority on etiquette, was an account of her cross country journey in an automobile (Post, 1916). My favorite book of this genre was republished in 1983, and is rather widely available. Entitled **Travels with Zenobia,** (Zenobia is the name of an automobile): provides a detailed account of a trip by two American women from Paris to Albania in a Model T Ford, in which all their mechanical ingenuity is presented in their own words. One of the two authors, by the way, was the daughter of Laura Ingalls Wilder, author of the "Little House on the Prairie" series (Lane and Boylston, 1983) .

The story of Alice Huyler Ramsey is an instructive one. She was an automobile adventuress, who first became famous by driving across country with three women passengers in a Maxwell-Briscoe Model AA, a gasoline powered car in the low-to-medium price range. This was part of a promotion to sell this type of car to people of modest means for use in their everyday lives (Scharff, p. 81). Soon, Ms. Ramsey was capturing headlines by frequently defeating men in races at county and state fairs, and on the streets of cities. Before long, she was banned from the associations of race car drivers, which from that point onward, only admitted men to membership. Though banned from many national competitions, for more than twenty years Alice Hyler Ramsey was a frequent participant in challenge races against men, winning frequently yet being systematically excluded from the fraternity of auto racers.

When World War I became the dominating event of its era, young women of means, graduates of Vassar and Wellesley, some trained as nurses, seeking adventure and wanting to break out of the stereotype of domesticity, purchased automobiles and had them shipped to Europe. There they volunteered their services as drivers of injured soldiers to military hospitals, joining upper class women from Britain and France who were also providing mobility in association with medical care and in some cases serving as couriers. In a strange sort of way these women both reflected and rejected traditional feminine roles. Their economic privilege allowed them to travel abroad and to have automobiles that

gave them a sense of independence and adventure, but the role of nurse or driver of the wounded also seems in retrospect to be an extension of traditional female roles and functions

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GENDER STEREOTYPING AND THE AUTO IN THE TWENTIES

By the early twenties automobile manufacturers began to realize that the time was rapidly approaching by which most American families would own one car. The demand for "first cars" would then decline, and they were uncertain that the demand for replacement cars could fuel economic growth as substantial as the growth already experienced by the automobile industry. Consequently, the manufacturers began to think about selling second and third automobiles to wealthier American households, and since it was presumed that in most households that had a single automobile the car was part of man's sphere, the marketing of second cars to households largely meant marketing cars that would be used primarily by women. After all, in the twenties women had entered the work force in unprecedented numbers and since 1920 had the right to vote. In addition to small numbers of women who had gone to Europe as drivers in service of the war effort, larger numbers had become truck and bus drivers at home during the war. The image of the flapper was dominating the media, girls bobbed their hair, wore short skirts, were seen drinking and smoking in public, and women were attempting to be increasingly assertive. The automobile was seen by some as a tool that could help liberate women from their traditional roles and help break down the barriers between socially defined gender roles of men and women.

Yet, traditional values were also strong, and the flapper was in reality more a counterculture image than she was the typical housewife of the twenties. Opinion leaders and corporate executives such as those manufacturing automobiles seemed to need more than ever to reinforce the traditional images of women against threats of change. Like conservatives of the current era, they spoke out against the declining importance of family values and home and transformed the very meaning of the liberation of women from a change in their roles to a release from drudgery by applying technology to the reinforcement of traditional female roles. The introduction into the home of electric washing machines, dryers, vacuum cleaners electric and gas ovens and ranges resulted for most women in little change in role and little decline in domestic responsibility. Households spent their rising incomes on such devices, but rather than relieving women of their chores Americans came to expect houses that were more frequently cleaned, clothing that was more frequently laundered, and meals more elegantly prepared. This phenomenon also extended to the automobile, which was used to expand woman's unique feminine sphere to a far greater extent than it was used to allow her to escape from it (Cowan, 1976).

In "The Emergence of the Modern Woman," Barbara Peterson (1982) describes this tendency of the 1920s in these words:

> The decade of the 1920s wanted its women soft and pliant and condoned aggressiveness only in sex and sports...In the era which glorified that "the business of America was business," every woman was told through the media and advertising that she was entitled to an automobile, radio, washing machine, vacuum cleaner, and "total electric kitchen. This was to be her true liberation; with her new leisure she could be a better mother and more beautiful wife.

It is not really surprising, then, that in a world of jazz, rouge, and short skirts, women were deliberately portrayed in extremely traditional roles by those writing advertising copy for the auto industry.

The automobile could play a central role in the nurturing of family, and it was increasingly presented as an opportunity to do a better job of child rearing and as a way to bring family members closer together. An article in **The Literary Digest** of 1927, for example, states that:

> How to bring up children in the city and at the same time keep them strong and healthy has always been a problem difficult for parents to solve. The automobile has presented a solution which is found satisfactory in thousands of instances. And while the parents have been engaged in driving their children into the country, the adult members of the family have also been acquiring added vitality which but for their interest in their children's welfare would not have been obtained. The healthy color which characterizes the countenances of many city children is definitely due in part to their motoring experiences.

Building upon the same theme, a General Motors advertisement of the 1920s, typical of hundreds of ads placed in magazines and newspapers, shows a middle class woman picking flowers with her children; their car is in the background. The text reads:

> Today the members of a family must make a real effort to keep united. I thought a great deal about this as my children began to grow up. I decided that the most important thing I could possibly do would be to plan ways in which they and I could have good times together. My husband agreed, and for that reason we bought a second automobile, since he had to use his car in getting back and forth to business. I can't begin to tell you of the happiness it has given us—picnics together, expeditions for wildflowers in the spring, and exploration parties to spots of historic interest. It's our very best investment. It has helped the children and me to keep on being pals. Every year thousands of families decide that a second car is a saver of time, a great contribution to family happiness and health.

The text suggests that traditional gender roles might be harder to achieve than in the past, but it glorifies them and recommends an automobile as the path to their attainment.

Similarly, in a long series of advertisements that ran throughout the 1920s the Chevrolet was portrayed using many different appeals to traditional feminine role model. One advertisement, entitled "Where Town and Country Meet," states that a Chevrolet enables the city housewife to buy eggs, vegetables, poultry, and small fruits direct from the farmer's wife, fresh and cheap." Another add entitled "Shop with a Chevrolet" begins with words "Chevrolet Utility Coupe is proving a wonderful help to many housekeepers, more than paying its low cost of upkeep through economies of time and money saved in cash and carry shopping." Another ad in the series is entitled "See the children safely to school," and starts with the text: "Why worry about the safety of your little ones on the highways or crossing city streets on the way to school?" while a similar ad is entitled "Motor to Church in Comfort" (Wachs, 1991).

I am not suggesting that we should read too much into such advertisements. They constitute a convenient lens through which we may understand societal values of their time, but advertisements did not create the gender roles for men and women nearly as much it they responded to them. It is important that we realize how pervasive, influential, and persistent these values were, however, and how conscious people were of the values encapsulated in the advertising copy. In a widely quoted and popular treatise of the day, called **The Suburban Trend**, Harlan Paul Douglass (1925) advocated

the continuation of the trend toward suburbanization or decentralization. He described this trend as the solution of most urban ills, and quite precisely enumerated the ways in which suburbanization differentially affected men and women. He stated quite clearly that women would constitute fewer than fifteen percent of the commuters to central cities from suburban locations, and described in 1925 that suburban living assigned to women the roles of driving their husbands to and from the train stations, driving children to and from school and music lessons, and driving to a variety of shopping locations.

The automobile presented an opportunity for women to break out of the social roles that linked them almost exclusively to home and nurturing. The power of the auto was by the twenties equally available to men and women, who could use it to explore new horizons and who could use it to escape from traditional roles. Conservative social movements—those who wanted to preserve and protect traditional gender roles—naturally found themselves rather aggressively countering the threat of the automobile by reasserting the centrality of traditional roles and integrating the automobile into the nurturing and child rearing activities that were traditionally associated with women. Members of the clergy often wrote about and prepared sermons about the dangerous social consequences of the automobile, which included opportunities for young women to escape supervision in ways that would certainly lead to moral decline.

Seeing the potential of the automobile to broaden women's horizons, some conservatives attacked rather bitterly. While women who drove in the first decades of the century were assumed to have at least some interest in the mechanical properties of automobiles, during the twenties in order to preserve the boundaries between mens' and women's spheres it was increasingly asserted that women lacked interest in or aptitude for mechanical devices and this stereotype became especially well developed with respect to the automobile. Women were presumed to be interested only in the color, styling, and upholstery of cars, while men were presumed to be interested only in technical capabilities of autos. An article in the trade journal, **Automobile Topics**, for example, stated that when shopping for a new car: "One of the first things a woman thinks of...is whether the color of the upholstering will harmonize with her personality, coloring, and clothes." The article goes on to state that if she thinks the car will not complement her looks, the salesman "might as well try to sell his cars to an Eskimo" (Wendt, 1925).

In a popular book, Walter Pitkin (1932) reported on the results of a study that showed that women were the principal buyers of 41 percent of all new cars. Despite women's increasing influence on the automobile industry, in a section of his book not too subtly entitled: "Woman—the Economic Imbecile," Pitkin quotes from a **New York World Telegram** article by Alice Hamilton a description of how a woman goes about buying a car:

> When a woman views a motor car and looks as if she were pondering weighty matters the automobile dealer grows elated. "Ah, he thinks, she is considering our wonderful new floating power. She is enchanted by our full pressure engine lubrication. That puzzled look is deceptive. She is not thinking of free wheeling, of automatic clutches. She is wondering if the car is sufficiently impressive to serve as a frame for her as she sits, viewed through the glass by passing admiring multitudes. She considers how her foot, ankle, and calf will look as she steps smartly down upon the running board...Does this fawn gray upholstery go with most of her clothes?

Carrying this type of reasoning even further, Pitkin (1932) rather viciously characterizes the differences in physical abilities of men versus women with respect to the skills needed to operate an automobile. He states that men are more suited by temperament and with respect to motor abilities to tasks like driving a car: "...boys and men on the average greatly exceed women and girls in the ability to manipulate mechanical contrivances," and as a result "women shrink from acting when facing a crisis," "work by fits and starts" when under high pressure, and "work well consistently only when there is no pressure." Consequently, Pitkin (1932) concludes that "women are overcautious, they make poorer drivers than men, and "they cause more accidents on the part of their fellow drivers." He goes so far as to say that "owing to their inferior motor outlets, women succeed best in relatively simple motor activities, such as sweeping, washing, and ironing," rather than more complex motor tasks like driving!

Indeed, the stereotype of the woman driver is one of the most persistent myths of American culture, repeated over and over for decades, systematically reinforcing the gender roles that pervade the larger society. This stereotype has been explored effectively by Michael Berger (1982). Berger points out that the stereotype of the "woman driver" was intended to keep women in their place—i.e. to limit their freedom, and to protect them from corrupting influences in society and in themselves. Over time, through repetition and based on little or no verifiable evidence, women drivers were increasingly portrayed as less proficient, decisive, less aggressive, more flighty, and more unpredictable than men drivers. Comedians and serious social commentators portrayed women drivers as a risk to safety and the cause of congestion and delay. Certainly, many critics—mostly women—railed against this blatant stereotyping; Nancy Barr Mavity wrote in a 1927 article in **Sunset Magazine** that "If a man was non-mechanical, it was a personal accident of temperament; if a woman showed the same deficiency, it was a sex characteristic." But, as Michael Berger pointed out, another author writing in **New Statesman** in the same year of 1927, described women drivers in terms that were more commonly expressed, and that remained a potent image until very recently:

> Women do not commonly possess the nervous imperturbability which is essential to good driving. They seem always to be a little self-conscious on the road, a little doubtful about their own powers. They are too easily worried, too uncertain of their own right of way, too apt to let their emotions affect their manipulation of the steering wheel.

CONCLUSION

IMPLICATIONS OF GENDER STEREOTYPING FOR CURRENT RESEARCH AND POLICY

Over the last few decades a dedicated group of scholars have attempted to raise the subject of women's travel patterns and needs to the level of serious scholarship. Dozens of studies have documented that real differences exist between the travel patterns of men and women, and more of those studies will be presented at this conference over the next three days. The preponderance of evidence shows that women are somewhat less likely than men to hold drivers' licenses and to own cars, but that this is probably a cohort difference rather than a persistent gender-linked difference. By that I mean that differences between men and women in vehicle ownership and miles driven are far greater among older age cohorts and are diminishing over time as younger cohorts mature and become the majority of the population. These particular differences, then, reflect social changes over time in the levels with which men and women have access to mobility. Despite the lessening of those differences over time, other differences remain very persistent over time. Women continue to work closer to home than men, women are more likely to use public transit for work trips than men, women are

far more likely to be responsible for non-work household trips, particularly those involving the chaffering of young children or of elderly parents. It is possible to find some statistical correlates with these patterns in income, age, ethnicity, and educational levels, and those findings do much to add to the historical roots of those patterns. These shed light on the real causes of these patterns. I would assert that the less formal historical evidence, and its consistency with recent experience, such as that presented from the August **New York Times**, demonstrate the persistence of gender roles in our society. While many scholars have written about the persistence of separate spheres in the workplace and the home, few have recognized that this phenomenon is also pervasive on our highways and transit systems. That is one of the important reasons for having the conference on which we are about to embark.

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Farmers, Flivvers, and Family Life: The Impact of Motoring on Rural Women and Their Kin

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FARMERS, FLIVVERS, AND FAMILY LIFE: THE IMPACT OF MOTORING ON RURAL WOMEN AND THEIR KIN[1]

During the 1920s, an investigator from the U.S. Department of Agriculture happened upon a farm family that had recently purchased an automobile even though their home lacked indoor plumbing. Asked to explain why, the wife replied: "Why, you can't go to town in a bathtub!"[2] As much as anything else, this farm woman's comment attests to the tremendous significance of the motor car in transforming the nature of family life in rural America.

The central theme of this essay is that the mass adoption of the automobile in rural communities had a profound impact on the travel that rural Americans undertook, especially for women. Trips to other farmsteads and into "town" became more frequent. Formerly distant recreational sites were transformed into day trips which even the busiest farm family could undertake from time to time. And finally, the overnight, long-distance trip became so common that by 1926 a survey revealed that farmers were the single largest occupational group visiting one national park. As a result, changes were wrought in the manner in which rural Americans perceived the spatial environment in which they lived, the social and economic relationships that developed within it, and the uses to which they put the land on which they lived and worked.

The Yearbook of Agriculture for 1928 reported that while eight million farmers and their families lived within five miles of towns of 2,500 or more, fully twenty million still were even more isolated.[3] A government circular entitled The Farm Woman's Problems revealed that members of the average farm family had to travel three miles to reach the local church, five miles to market, six miles to high school and the family doctor, and fourteen miles to a hospital.[4] "No burden", concluded Edward R. Eastman in the late twenties, "has ever set quite as heavily on farming and upon the farm family as has the curse of isolation and loneliness."[5]

Isolated and lonely, pre-automobile farmers were always on the lookout for new avenues of social contact. While it was true that most farm families made periodic trips into town or to relatives, such journeys were often arduous and lengthy experiences. In addition, as Warren H. Wilson observed, the farm was in constant need of attention: "The claims of domesticated animals upon the farmer are such as to chain his foot to the homestead. He can go from home only so far as will permit him to get back in time to spray his orchard trees or to cultivate his corn."[6]

Of all the members of the farm family, it was the farm wife who felt the isolation most acutely. Her trips beyond the farm were infrequent and her tasks at home repetitious. When the farm woman did leave the farm in a horse-drawn vehicle, it was always at the expense of falling behind in her household chores. The trip itself could be an ordeal, as noted by a Michigan woman: "I am haunted now by the faces of the women I find myself looking for on the street corners, knowing they have to endure the tiresome driving in uncomfortable wagons over heavy roads behind slow and unattractive horses. I see the long list of purchases to be made in town, then the waiting for all the party to get together, the late arrival home, tired, cold, and hungry, and the extra work to do after dark on account of the half day off."[7]

Though isolation was generally seen as a social evil, it did have the effect of making the farm home the focus of leisure time activities. With the motor car came a serious threat to the unity of the family, although this was not clearly seen at the time. "The possession of an automobile means greater frequency of visits and thereby the keeping together of family ties, not a growing apart in ever widening stretches," wrote Ernest L. Ferguson in 1912.[8] In the same year, another country writer observed that: "The pleasure and contentment of the family which the automobile makes possible because of the evening automobile ride for diversion or the exchange of social courtesies and the attendance upon meetings of various kinds is not to be overlooked. The great distance that may be covered, at the same time the fact that the evening pleasure with the automobile does not lessen the efficiency of the farm motive power on the following day, as is the case when the farm team must be hitched onto the pleasure vehicle, is a factor which the student of farm conditions should not overlook."[9]

Yet, the time involved in getting from one place to another by horse-and-buggy had led to prolonged visits once one got there. With the automobile, there may have been less sociability. Rural sociologist James M. Williams observed that: "Instead of coming to stay the afternoon, the farmer's family is out for a long ride to some adjacent city and drives into a friend's yard for a few minutes; then away they go."[10] Thus, the nuclear family may have increased the number and range of acquaintances, but these new friendships were not as strong as those that preceded the automobile.

Furthermore, the introduction of the automobile may have detracted from interest in the farmstead itself. It was, after all, necessary to go away from the home to enjoy the automobile. The Lynds found that in "Middletown" [Muncie, Indiana] the motor car was "making noticeable inroads upon the traditional prestige of the family's mealtimes at certain points; it has done much to render obsolete the leisurely Sunday noon dinner of a generation ago . . . , and during half the year when 'getting out in the car' is pleasant, it often curtails the evening meal to an informal 'bite'."[11]

The automobile also affected the rural attitude toward long distance trips. It offered a means for rapid, direct transportation at minimal cost. In addition, the car delivered you to the door and was faster than a horse-and-buggy, thus allowing longer trips in shorter time. Farmers had traditionally felt guilty about taking such trips, even when the time was available. Their frugal outlook balked at the relative time involved in "gettin' there" as compared to the amount allowed for the actual leisure-time activity. "One of the values of the automobile is that by its use many a farmer has been given a new realization of the value of recreation," wrote Dwight Sanderson in 1922.[12] Horace B. Hawthorn found that in Monona County, Iowa: "Farmers took from six to twelve longer trips a year, which carried them beyond the confines of their community into other counties. Ten to fifteen percent of the people took annual vacation tours in their cars, lasting from a few days to several months. A month's trip to the mountains would be beyond the means of the farm family if railroad fares and hotel bills had to be paid for the four or five members; but with a car and a camping outfit, the expense is greatly reduced."[13] A Department of the Interior study of motor vehicles entering Yellowstone National Park in 1926 revealed that those engaged in "agricultural pursuits" were most numerous, over double that of any other profession.[14]

Such long distance touring, combined with similar activities on the part of urban people, had an homogenizing effect on the total population. Walter Burr noticed that this was true for Kansas in the 1920s: "One who has visited frequently during the past few years in farm homes and conversed with members of the farm family has become accustomed to hear them discuss their experiences in Chicago, New York, San Francisco, Miami, Detroit—at the Grand Canyon, in Yellowstone Park, in

the Yosemite Valley, in the Canadian Northwest—and wherever else there are highways which can be traveled by automobiles. They put up at the same hotels or camp at the same tourist parks used by the city people. Since the city type has dominated in the past, and has been looked up to by country people as being more highly cultured, the tendency is for country people, as they come in contact with them, to become urbanized."[15]

Such travel was an education to the farmer. Professor Harvey W. Peck maintained that: "The average farmer has long been on a lower economic level than the average urban dweller. Yet this fact, since it was unknown to most farmers, was not a cause of discontent. The farmer was in the same economic condition as most of the people he met. But the newer mobility, and the resulting increase of social contacts, have enlarged the scope of his social comparison. The result is the acceptance or recognition of the higher average standard of living."[16]

For example, the motor car seems to have made those who rode within more conscious of their personal appearance. Traditionally, farm families had been made conspicuous in town or city by their distinctive clothing. Such attire had often served as an object of ridicule for the urban observer, lending credence to such terms as "hayseed" and "hick." As Edward E. Eastman observed, the real reason why the farmer had no new clothes was that he had no place to wear them: "He had little money for good clothes and with the exception of church, few places to go where 'store clothes' were needed. Not until recently have farm people been doing much traveling. When they did go, it usually was with a horse and caring for a horse is not particularly conducive to the wearing of good clothes. But the automobile has changed all that. The farmer has become a cosmopolitan. He takes long trips with his whole family as often as anybody else."[17] Charles M. Harger maintained that such changes in apparel signaled a new "self-respect" on the part of the farmer, brought about through the aegis of the motor car.[18]

Not only did travel in the automobile seem to demand different clothing, it also provided a means for securing such goods. As a result, "country stores were no longer scenes of long Saturday purchasing expeditions when fathers and mothers picked out clothes for their children and made them like it," notes Thomas D. Clark. The piece-good trade was on the wane, as ready-made clothes were bought because they were up-to-date, even if they were of inferior quality.[19] It became increasingly difficult to tell farm families from their town and city counterparts by what they wore.

The coming of the automobile affected the activities of the unified family, but it also wrought changes among its different component parts. Although women in general often expressed an interest in driving their own cars, thus giving them the freedom to leave home when they wished, they were often stymied by the necessity of hand-cranking the motor to start it. Although as late as 1924 self-starters were still not standard equipment on the Model T Ford, the car owned by most of the rural population, this did not pose much of a problem for farm women who were used to physical labor and could not rely on men to provide transportation for trips away from the farmstead.

The motor car provided farm women for the first time with a means for independent mobility and they quickly and extensively took advantage of it. As a result, trips to visit with children and family who had moved out of the area or to shop in the larger towns became commonplace.[20] In addition, farm women's clubs were given an impetus by the automobile. It was possible to attend in the afternoon and still be home in time to prepare supper, something which would have been impossible using a horse-and-buggy.[21] Finally, not only could women use the car for social activities and shopping, it also could be employed to widen the range of jobs available to them. For instance, in

increasing numbers they became home demonstration agents traveling from farm to farm on their educational mission for the U.S. Department of Agriculture.[22]

The introduction of the motor car also widened the range of possible contact for rural youth and this soon became a parental challenge. A New York State Commission reported that: "A good many of the (rural) boys as young as 16 either have automobiles of their own or are allowed the privilege of taking out their parents' car whenever they wish and take girls regularly to country dances."[23] Such activities became so common that rural sociologist Newell L. Sims noted: "The complaint is widespread that the younger farmers and country youth are seriously neglecting business on this account,"[24] an echo of earlier attitudes toward the motorized farm wife.[25] Teenagers were more than ever exposed to town and city life, a fact which many rural mothers found troubling: "The farm woman knows well enough that many of these influences are not what she wishes for her children, and yet, as an individual, she is powerless to change them."[26]

While it affected teenage lifestyles in a number of ways, the car's impact on courting behavior was that which most caught the public's fancy. The automobile often replaced the home as the site for serious "spooning." While there were sometimes gender differences as to what was to transpire in the "parlor on wheels," there can be little question that the car had a tremendously liberating effect on youth by allowing them to engage in activities beyond the prying eyes of the local community. Unfortunately, few statistics are, or will ever be, available to document any change in sexual mores brought on by the motor car.

Nevertheless, there can be little question that to many rural residents the automobile represented a threat to the sanctity of the family. No longer need the individual members be dependent on each other for most of their social satisfaction. For instance, the Lynds found that approximately forty percent of the time boys and girls went riding without their parents.[27] According to Professor Jesse F. Steiner, the automobile tended to multiply friendships based upon age, sex, and/or common interests, rather than upon kinship and geographical proximity as was formerly true.[28]

"This change," as Charles R. Hoffer observed, "has increased family responsibility, for somehow the children must be taught to evaluate and interpret the contacts that they have."[29] This new responsibility was not always willingly undertaken. As a team of experienced social workers noted: "The average community considers itself apart from its young people, is quite often ashamed of them, does not understand them, and lays the blame for young people's restlessness to the jazz band and automobile instead of facing the charge of negligence and lack of sympathetic understanding in its own scheme of living."[30] Not surprisingly, a study of girls in Pender County, North Carolina found that in almost one-third of the rural homes there were fights over the use of the car.[31]

We tend to think of travel in terms of movement from a fixed residence to some nearby or distant location and back again. It is also possible to conceive of this in reverse, wherein the ability of people—especially sales people and service providers—to access another's home becomes a "travel issue." For example, while it was true that farm women could now easily journey into town to visit the new Carnegie library, the car also made possible the advent of the "book wagon," which brought more and better reading material than would have been otherwise available to the isolated farmstead.

Similarly, rural health care also felt the impact of the motor car, witnessed by the speed with which doctors could reach patients on farms and in small towns and motorized ambulances could bring the very ill from their homes to the new consolidated hospitals, with the resulting saving of lives and

limbs. The latter is not just a phrase. Amputation, which had been a common practice to avoid infection and gangrene in bad accidents, became much less necessary as patients could be whisked by motorized transportation to a neighboring hospital in time to avoid complications.

These developments in recreation, education, and health care, together with similar ones in religion such as this traveling church, all contributed to the centralization and urbanization of rural America. The larger towns and small cities, not the local neighborhood, became the center of rural social and economic life. Increasingly, the farm family set out from its home to visit not the crossroads country store, village church, or local grange, but to go down the road a piece to the nearest filling station for gasoline and "free air," and then on into a large rural town, which might even have a motion picture house for their amusement.

CONCLUSIONS

Caution is always advisable when assigning fundamental social and economic changes to one technological artifact. After all, the coming of the automobile coincided with the advent of rural electrification, the radio, and motion pictures. Nonetheless, one can still ascertain trends which were accelerated by the motorization of the rural family. For one, the isolation and loneliness cited at the beginning of this essay all but disappeared. For the most part, the farmstead was accordingly transformed into a more enjoyable and worthwhile place in which to live. Leisure-time pursuits, the church, and education were all brought closer, time-wise, to the rural family. The geographic boundaries of the family's interaction beyond the farm were expanded from an area defined by the "team-haul" to one of almost unlimited range and multiplicity. It could also be argued that the quality of these activities was higher than before due to improvements and economies made possible through consolidation of the previously atomized and/or duplicative units.

However, most of these new contacts were of an impersonal nature and involved urban people and institutions. As this interaction increased in intensity, it posed a threat to the nature of the rural family. More and more, the inputs into their lives came from sources over which rural residents had little control and which tended to view the meaning of life in terms different from their own. In addition, since the motor car gave individual family members the opportunity to split off from the whole, the type and degree of these contacts differed from person to person. These were experienced *selectively* by members of the farm family, as the car allowed each one to undertake activities in which he or she alone participated.

Hence, while there was the possibility of a better life, it was different from the traditional farm one, with the locus of control no longer solely within the family and/or the local community. Instead, these traditional institutions found themselves in competition with a more amorphous and potentially more influential urban and national lifestyle. The very breakdown of isolation fostered by the automobile made it increasingly difficult to control actions by bringing familial and/or community pressure to bear. The wider became the effective unit of living, the easier it became to adopt the anonymity of the large town or city.

Finally, the increased mobility that accompanied automobiles and good roads meant that friends, recreation, and even doctors, no longer were determined solely by proximity. Interest, rather than location, became the key factor in associations that were formed by family members and services that were partaken by them. With time no longer the barrier that it once was, decisions in almost

every aspect of life became more complex as the functional rural community became ever larger. The new associations included people from geographically separate units, with differing social, political, and economic viewpoints. Time-honored traditions no longer seemed operative. The rural family was forced to accommodate itself to a new world of uncertainty, caused in large part by the enlargement of their sphere of travel.

ENDNOTES

[1]Portions of this essay first appeared in the author's The Devil Wagon in God's Country: The Automobile and Social Change in Rural America, 1893-1929 (Hamden, Conn.: Archon Books, 1979), pp. 55-74.

[2] Cited in Franklin M. Reck, A Car Traveling People: How the Automobile Has Changed the Life of Americans—A Study of Social Effects (Detroit: Automobile Manufacturers Association, 1945), p. 8.

[3] Cited in George Soule, Prosperity Decade: From War to Depression, 1917-1919, Vol. VIII of The Economic History of the United States, ed. By Henry David et al. (9 vols.; New York: Rinehart & Company, Inc., 1946-47), p. 250.

[4] U.S., Department of Agriculture, The Farm Woman's Problems, by Florence E. Ward, Department Circular No. 148 (Washington, D.C.: Government Printing Office, 1920), p. 12.

[5]Edward R. Eastman, These Changing Times: A Story of Farm Progress during the First Quarter of the Twentieth Century, with a Foreword by L.H. Bailey (New York: Macmillan Company, 1927), p. 7.

[6]Warren H. Wilson, The Evolution of the Country Community (2nd ed., rev.; Boston: Pilgrim Press, 1923), p. 117.

[7] Cited in U.S., Department of Agriculture, Office of the Secretary, Social and Labor Needs of Farm Women, Report No. 103 (Washington, D.C.: Government Printing Office, 1915), p. 40.

[8]Ernest L. Ferguson, "The Rural Motor Vehicle: What Gasoline Means in Agriculture," Scientific American, CVI (February 10, 1912), 133.

[9] H.V. Van Norman, "Rural Conveniences," in "Country Life," ed. by J.P. Lichtenberger, Annals of the American Academy of Political and Social Sciences, XL (March, 1912), 166.

[10] James M. Williams, The Expansion of Rural Life: The Social Psychology of Rural Development (New York: F.S. Crofts & Co., 1931), p. 154.

[11] Robert S. Lynd and Helen Merrell Lynd, Middletown: A Study in Modern American Culture, A Harvest Book (New York: Harcourt, Brace, & World, Inc., 1929), p. 153n. While Muncie, Indiana was clearly a small city at the time of the Lynds' study, there is little reason to doubt that such conditions existed in rural localities as well.

[12] Dwight Sanderson, The Farmer and His Community, The Farmer's Bookshelf (New York: Harcourt, Brace, and Company, 1922), p. 157.

[13] Horace B. Hawthorn, The Sociology of Rural Life (New York: Century Co., 1926), pp. 187-88.

[14] Cited in Frank E. Brimmer, "The Nickel-and-Dime Stores of Nomadic America," Magazine of Business, LII (August, 1927), 152.

[15] Walter Burr, Small Towns: An Estimate of Their Trade and Culture (New York: Macmillan Company, 1929), pp. 42-43.

[16] Harvey W. Peck, "The Influence of Agricultural Machinery and the Automobile on Farming Operations," Quarterly Journal of Economics, XLI (May, 1927), 540.

[17]Eastman, These Changing Times, p. 196.

[18] Charles M. Harger, "Automobiles for Country Use," Independent, LXX (June 1, 1911), 1208.

[19]Thomas D. Clark, Pills, Petticoats, and Plows: The Southern Country Store (Norman, Okla.: University of Oklahoma Press, 1964), pp. 170-71.

[20] See, for example, L.B. Pierce, "The Ohio Farm Woman's Car," Rural New Yorker, LXXVIII (December 6, 1919), 1804.

[21] H.L. Barber, Story of the Automobile: Its History and Development from 1760 to 1917, With An Analysis of the Standing and Prospects of the Automobile Industry (Chicago: A.J. Munson & Co., 1917), p. 160.

[22] Virginia Scharff, Taking the Wheel: Women and the Coming of the Motor Age (New York: The Free Press, 1991), pp. 143-44.
[23] State of New York, Crime Commission, Sub-Commission on Causes and Effects of Crime, A Study of Delinquency in Two Rural Counties, Legislative Document No. 94 (Albany, N.Y.: J.B. Lyon Company, Printers, 1927), p. 410.
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[25] See, for example, "Is this Eggsactly [sic] Right?," Motor Age, XXX (December 28, 1916), 15.
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[27] Lynd and Lynd, Middletown, p. 257.
[28] Jesse F. Steiner, "Recreation and Leisure Time Activities," in President's Research Committee on Social Trends, Report of the Committee, Recent Social Trends in the United States (New York: McGraw-Hill Book Company, Inc., 1933), p. 944.
[29] Charles R. Hoffer, Introduction to Rural Sociology (New York: Richard R. Smith, Inc., 1930), pp. 198-99.
[30] Cited by Edmund deS. Brunner, Gwendolyn S. Hughes, and Marjorie Patten, American Agricultural Villages, American Village Studies of the Institute of Social and Religious Research (New York: George H. Doran Company, 1927), p. 214.
[31] Carl C. Taylor, Rural Sociology: In Its Economic, Historical, and Psychological Aspects (Rev. ed.; New York: Harper & Brothers Publishers, 1933), p. 299.

III

WOMEN'S EMERGING TRAVEL PATTERNS

Trip-Chaining, Childcare, and Personal Safety: Critical Issues in Women's Travel Behavior

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TRIP-CHAINING, CHILDCARE, AND PERSONAL SAFETY: CRITICAL ISSUES IN WOMEN'S TRAVEL BEHAVIOR

INTRODUCTION

> "I have three reasons for driving. One, I must deliver children to school and childcare every morning. Two, mass transit would add an hour per day to a 12-hour class and work schedule. [In addition to working part time], I also have a full-time job taking care of two kids, cooking, cleaning, and doing laundry. I sleep that extra hour...Three, I relied on [mass transit] for several years to get to and from class, until I was assaulted one night on my way to catch a bus."

The comment above was made by a forty-year-old female student at Portland State University as a response to a travel survey in 1989. Many other women students—as well as faculty and staff—made similar comments. Their words highlight the fact that transportation issues for women differ from those for men in that women frequently face circumstances that many men do not. These circumstances weigh heavily in women's decision-making about mode choice and are less important to men's decision-making. In particular, among members of this urban university community (students, faculty, and staff) the determining factors are

- the necessity of making multiple stops (trip-chaining), for the purpose of transporting children to and from school or daycare, running errands, and grocery shopping safety concerns
- the lack of alternatives in lifestyle and transportation mode due to constraints imposed by any one or a combination of low income, single-mother status, or distance of residence

Using samples drawn from the Portland-Metropolitan region and the student and faculty-staff community at Portland State University, this paper studies the relationship between these factors and women's mode choice and propensity to trip-chain. It concludes by suggesting that many of the transportation policies currently under consideration may not fit the needs and limitations that women face and that, if implemented, may result in significant inequities.

BACKGROUND LITERATURE

This section briefly reviews the literature on trip chaining in general, gender differences in travel behavior, childcare and travel, and women and safety. Because a university sample is used for part of the analysis, literature on university transportation is also briefly reviewed.

TRIP CHAINING

The linking of nonwork trips to work trips has been studied by Adler and Ben-Akiva (1); Oster (2); Goulias and Kitamura (3); Golob (4); Kitamura (5); Oster (6); and Nishii, Kondo, and Kitamura (7). Strathman, Dueker, and Davis (8) used the concept of trip chaining to examine the propensity of households to add nonwork trips to the work commute and the allocation of nonwork trips through chaining. They found that workers who commuted in peak periods had a lower propensity to form

work/nonwork trips. They also found that certain household types contributed the largest amounts of peak period chaining behavior: single adults; dual-income couples; dual-income families with preschoolers; and multiworker households. These types of households were also the fastest growing type of household formations. Single-occupant commuters had a higher propensity to add nonwork trips to their commute. Trip-chaining analysis lead to the puzzling conclusion that even with the increase of congestion during peak periods, people continue to trip chain. This could indicate an inelastic demand for the activities and/or locations regardless of the time or monetary price to be paid due to congestion.

Downs (9) points out that many nonwork activities are concentrated in the peak commuting periods, as people take children to school or run errands before and after work. According to Gordon et al. (10), between 1977 and 1983, nonwork trips grew faster than commute trips and grew during peak periods. Richardson and Gordon (11) found that the overall growth in nonwork travel accounted for 70 to 75 percent of all weekday trips. They also determined that in every size of SMSA, nonwork travel grew three to four times faster than work trips. Davidson (12) examined the exact nature of trip chains in a study of employees. Her data defined a full work trip as including stops for meals, shopping, and daycare. The study found that the employees were twice as likely to make stops on their way home from work as they were during the morning commute.

In summary, there is evidence that the work trip has increased in complexity. Workers have incorporated activities involving their children, the need to take care of personal and household business into their commute to and from work. The trend toward including non-work trips during periods of peak congestion brings into question the ability of some workers to participate in transportation demand management programs that limit trip chaining options.

GENDER DIFFERENCES

Wachs (13) cites the history of differences between women and men with respect to transportation. Pas (14) found that gender was a significant factor in daily travel-activity behavior. Using the National Personal Transportation Survey (NPTS), Strathman and Dueker (15) found that women are more likely to form complex commute and non-work chains than men. Madden (16) found that women have a shorter commute than men. Using the NPTS surveys of 1977 and 1983-4, Gordon, Kumar, and Richardson (17) confirmed gender differences found by earlier researchers. They found that the growth of trip-making was greater in females than males, reaching 46 percent for married nonworking wives without children and 32 percent for married nonworking mothers. They rejected the "agenda-driven" explanations for differences in gender travel behavior. Holding other variables constant, they found that women make shorter commute trips and make more nonwork trips. They conclude that time is a scarce resource and that a comprehensive utility maximization model would allocate time as well as income. Thus, shorter commute trips are a result of the incentive to economize on that trip, given the need to make more nonwork trips.

Rosenbloom (18) and Rosenbloom and Burns (19), using the NPTS and numerous local studies, report that women make interconnected travel decisions involving employment and child care locations. Fox (20) looked at the characteristics of travel for working women as well. Gordon, Liao, and Richardson (21), using the 1990 NPTS data, found that in two-worker households, while the majority of the shorter commutes were made by women, men actually made 41 percent of the shorter trips.

Pazy et al. (22), recognizing the changing status of women's careers and the influence this change has on their commuting patterns, found that in their sample, single women made shorter commutes than married women and had shorter commute times. They attributed this to the increased residential mobility of single women. Single women were more likely to live in the central city, while married women were located in the suburbs. Using the NPTS data, Turner and Niemeier (23) found that marriage tended to reduce women's commute times. They also found that having children increased commute distances and times in certain household structures.

Hamed and Mannering (24) found that males were more likely to go directly home after work than females. They cited the role of females and the activities they pursue (e.g., shopping, personal business and recreation) as reasons for this difference. Golob and McNally (25), using a sub-sample of activity data, found a number of significant differences between men and women in their travel times for various purposes. Bhat (26) found that married women were more likely to make stops in their commute than married men. Niemeier and Morita (27) found that women were 1.32 times more likely than men to spend more time shopping.

It should be noted that according to Perry (28), women have a greater propensity to choose part-time employment after the birth of their first child. In addition, the longer the time spent away from employment, the greater the likelihood that when work resumes, it will be part-time rather than full-time. Therefore, transportation patterns related to part-time work will have a greater impact on women.

In summary, although there appears to be some contradictions in the exact nature of the differences in travel behavior between men and women, researchers believe these differences do exist. To the extent that these differences increase or decrease the effectiveness of transportation policies and programs, it is important to better understand the particular circumstances under which men and women make travel decisions.

THE CHILDCARE FACTOR

Using formal daycare outside of the home is an important component in women's work schedule. Caruso (29) looked at three subgroups of daycare options for mothers with two-year-olds (family setting, informal care and formal care). She found that the average number of hours worked for mothers using formal care was significantly greater than when mothers used informal care settings. Formal daycare often has fixed hours, and Presser (30) cites a study indicating that a flexible work schedule is not a solution for women workers when childcare continues to have fixed or limited hours. This situation adds to the stress a woman might feel with respect to balancing childcare and work.

Neal et al. (31) found in their sample of employees that two thirds of all families with children under the age of 18 used some form of out-of-home child care arrangements or activity other than school. In their model, extra travel time for child care had a positive effect on whether an employee was late or left early from work and on interruptions. Extra travel time also increased "caregiving stress" and "difficulty combining work and family."

Presser (32) found a relationship between the type of daycare used and the time of work (regular hours or shift-work). The type of childcare arrangement when mothers work may be both the cause and effect of shift-work status. The use of relatives as the primary caregivers is substantially greater when mothers work nonday rather than day shifts.

Johnson (33) looked at the child's need for transportation to an activity or to home during work hours as an indicator of conflict between employment and childcare for single mothers. Davidson (12) found that among a sample of employees in Brentwood, Tennessee, ten percent of the trips incorporated into the morning commute were related to childcare arrangements, with an additional ten percent attributed to taking older children to school. In the evening commute, more commuters stopped to pick up children from daycare than from school.

For most working parents with young children, at least one of the adults in the household must take the children to daycare before work and pick them up after work. The hours of operation of daycare facilities limit the options parents have and increase the need for parents to make their childcare trip during peak periods.

WOMEN AND SAFETY

SAFETY RELATED TO ENVIRONMENT

The perception of whether or not an environment is safe plays a large part in how people act and react. Klowdasky and Lundy (34) found that women limited their activities on a university campus based on fears. Almost two thirds of academic and student women restricted their movements, while less than one half of the support staff did so. They noted that staff have daytime obligations only, while faculty and students have both daytime and nighttime classes. An even greater proportion of female academics (66 percent) and graduate students (68 percent) were concerned about personal safety than urban women (56 percent) about walking in their own neighborhoods at night. Only undergraduate men were as concerned as urban men (18 percent) while 4 percent of male faculty and 8 percent of graduate students restricted movement due to fear.

Among women students and faculty, age rather than academic status explained differences. Older students were more likely to curtail activity, whereas younger faculty were more cautious. Older women are more likely to take night classes while younger, junior women faculty are more likely to teach night classes.

Transit and Safety

Levine and Wachs (35) point out that nonusers of transit have greater fears than users. They also found that in Los Angeles, in their sample, women were more likely to be victimized than men. Even after controlling for the fact that more women ride the bus than men, the researchers found that women were still more likely to be victimized.

Ingalls et al. (36) found that perceptions of and experience with "problems" around buses did not differ by gender in their survey conducted in Greensboro, North Carolina. The differences in perception were between respondents to their survey who were nonriding residents and those who were bus riders. Residents were three to four times more likely than riders to perceive that more problems

existed on or near buses. Some problems, such as obscene language and drunkenness, had the same response from these two groups. Between 24 and 32.4 percent of the residents felt unsafe in transit waiting areas. More than 40 percent of residents felt unsafe in the downtown bus service areas. Only 6 to 7 percent of riders felt unsafe downtown. Women expressed greater concern than men (15 to 20 percent more than average) for personal safety. However, residents expressed two to five times more concern about personal safety using the bus than riders. The researchers also found that women expressed greater precautionary behavior than men. This was particularly true with respect to traveling alone or after dark.

Benjamin et al. (37) reaffirmed differences between users and nonusers of transit. From a sample of the general public, the situations most frequently perceived as unsafe were waiting for a bus downtown (46.8 percent), waiting at a bus stop downtown (47.7 percent), walking downtown (40.1 percent), walking in a park (37.3 percent) and transferring at a proposed bus terminal (44.4 percent). By contrast, 90 percent of bus users felt safe waiting at a bus stop downtown, walking downtown and transferring.

Lynch and Atkins (38) stated that apprehension or fear affects the travel behavior of women. In their Southampton study, women were asked about safety at bus stops. Sixteen percent of those surveyed felt unsafe by day and 35 percent at night. The authors conclude that women will avoid putting themselves into what they consider to be vulnerable situations, sometimes forgoing travel all together.

Pearlstein and Wachs (39) point out that although most crimes on transit are committed during peak ridership hours, the rates of occurrence are disproportionately high during the evening hours. Levine and Wachs (40) found that determining the real level of crime is difficult due to factors that result in under- and overestimation of transit crimes. Crimes committed at waiting areas may not be reported as transit crimes. In their study they found that 46 percent of transit crime occurred on a bus, 32 percent occurred at the bus stop, and the rest were on the way to or from the bus stop.

Sinha and Forrest (41) found in their Milwaukee, Wisconsin survey that personal safety was less of a concern to passengers than certain service characteristics. Given this, they speculated that increasing security would not be expected to lead to an increase in ridership. They also found that experiences with on-bus crimes did not impact usage in the long run, but did have some effect immediately after an incident. They looked at beliefs about personal safety by sex and found no significant differences. However, a greater percentage of men thought that security on the bus was poor. They found that response rates differed by zones, which had very different socioeconomic characteristics. However, there was a significant difference by age, with younger riders being more likely than older riders to think that bus security was satisfactory. In general, the preference not to ride the bus after dark was driven by fear of going to and from the bus rather than crime on the bus.

Although some of the research on safety as it relates to transit ridership points towards experience on transit as a major predictor, women do face the threat of violence while going to and from a transit stop or to a parking space. A self-selection bias may also play a part in determining the difference between those that use transit and those who perceive the risk as being too great.

UNIVERSITY TRANSPORTATION

As "special generators" of trips, universities have been studied to better understand the effects of various transportation programs (Burns 42; Golob 43; Williams and Petrait 44; Coontz 45). Pearlstein (46) found through a cross-tabulation of mode by gender that the percentage of those who drove alone to work at the University of California, Los Angeles, followed the split in the general population. Of the women surveyed, 14 percent used carpool, 10 percent used transit, but a higher than average, 74 percent drove alone. The author claimed that this was a statistically significant difference from men, 72 percent of whom drove alone, 12 percent carpooled and only 8 percent used transit.

Rosenbloom and Burns (47) studied employees at the University of Arizona in Tucson, and Arizona State University in Tempe, for differences by sex and income. Over 65 percent of the workers at UA and 75 percent at ASU drove alone to work in 1991, an increase from 60 percent and 74 percent, respectively in 1990. Women were more likely than men to drive alone, and fewer women switched *to* alternative modes and more women switched *from* alternative modes. Women also had longer commutes in terms of distance than men. Women spent more time commuting due to the longer distance. However, even when distance was compared with time, women took longer to travel comparable distances. This was explained as a result of women's work trip being combined with other domestic or childcare responsibilities. Women with children were more likely to drive alone than childless women of comparable incomes. Rosenbloom and Burns found that the more children a women has, and the younger the children, the more likely she is to drive to work, regardless of income level.

In summary, women in a university setting, either as students or as faculty or staff, face transportation constraints. Universities have been viewed as "special generators" of peak period congestion. As a major employer and land holder with the authority to mandate transportation programs, universities have instituted transportation demand management programs that place further constraints on transportation options.

THE REGIONWIDE SAMPLE

Methodology

The regionwide analysis used for this study employs two days of regional activity data collected in 1994 from 4,400 households by Metro, a regional governmental agency in the Portland, Oregon metropolitan area. The 1994 Activity and Travel Survey was collected in the form of a detailed diary that recorded what each member in a household did (activity choice), where (location choice), for how long (activity duration), and with whom (activity participation). There were nineteen categories of activities (see Appendix A) in the original data set. This data could not used as the level of detail resulted in too many sparse cells to conduct an analysis. Golob and McNally (25) aggregated the highly specific activities into broad activity types (work, maintenance, and discretionary). A more recent aggregation developed by the Portland Metro Congestion Pricing Project (48) reclassified the data such that work was combined with school activities and meals were considered discretionary. A third set of categories (limited aggregation) combines these approaches in order to disaggregate maintenance activities to allow a closer examination of gender differences with respect to peak period participation.

In order to determine the need for travel, the data was sorted by in-the-home and out-of-the-home activities. To capture trips that occurred in the morning and evening peaks, the out-of-home activities were further sorted in to those occurring between 7:00 and 9:00 A.M. (morning peak) and those occurring between 4:00 and 6:00 P.M. (evening peak). Only those persons 17 years of age or older were used. Cross-tabulations with chi-square statistical analysis were performed based on gender. In addition, those who were employed full-time and those employed part-time were analyzed for this study. An analysis was conducted on a small subset of the sample who were adult students. It was not possible in this study to establish whether the students were attending an urban or a suburban campus.

FINDINGS

Mode of Travel

Respondents reported the number of days they used each mode of travel. The majority of travelers used single occupant vehicle (SOV), with no significant difference (c^2= 9.8, 5, p >.05) between genders for the general sample. For full-time workers, there is a significant difference (c^2 = 11.29, 5, p < .05), with men being more likely to drive than females. However, among part-time workers, women are more likely to drive than men (c^2 = 12.9, 5, p < .05).

There was no significant difference between women and men among those who choose carpooling (c^2 = 10.63, 5, p > .05). Among full-time workers, women are more likely than men to use carpooling (c^2 = 13.45, 5, p < .05). However, for part-time workers, there are so few of either sex that the data could not be analyzed.

In the general sample, women are more likely than men to use transit (c^2 = 16.28, 5, p < .05). This is also true for full-time workers (c^2 = 22.4, 5, p < .005). Other modes, such as walking or bikes, are more likely to be used by men than women in the general sample and among full-time workers (c^2 = 9.8, 5, p < .05). Part-time workers had too few users to be analyzed for either transit or other modes.

Activity Choice during Peak Hours

Using the three major classifications of activities (work/school, maintenance, and discretionary), there are significant differences between men and women in the general sample (c^2 = 311.83, 3, p < .0001), with men being more likely to go to work or school and women more likely to do maintenance activities in the morning peak. For full-time workers, women are more likely to do maintenance activities, while men are more likely to do discretionary activities (c^2 = 34, 3, p < .0001). For part-time workers, women are twice as likely to do maintenance activities than men (c^2 = 30.25, 3, p < .0001).

In the evening peak, for the general sample, women are more likely to do maintenance activities (c^2 = 139, 3, p < .0001). For full-time workers, women are more likely to be doing maintenance activities (c^2 = 88.5, 5, p < .0001). For part-time workers, women are twice as likely to do maintenance than men (c^2 = 28, 3, p < .0001).

To better understand the exact nature of activities in the peak, a limited aggregation data, using eleven categories, was analyzed. In the morning peak for the general sample, women are twice as likely to do household maintenance activities and to pickup or drop off a passenger (c^2 = 411, 11, p <

.0001). For full-time workers, women are still more likely to do maintenance and pickup/drop off activities ($c^2 = 58, 11, p < .0001$). For part-time workers, the same situation occurred ($c^2 = 52, 11, p < .0001$).

In the evening peak, for the general sample, women are more likely to shop, do household maintenance activities and pickup or drop off than men ($c^2 = 243, 11, p < .0001$). For full-time workers, the same pattern occurs ($c^2 = 132, 11, p < .0001$). For part-time workers, women are more likely to shop and three times more likely to do pickup and drop-offs ($c^2 = 61, 11, p < .0001$).

For adult students, both part-time and full-time in the general sample, using the three categories of activities, women are twice as likely to do maintenance activities in the morning peak ($c^2 = 31, 3, p < .0001$). However, there is no significant difference between women and men in the evening peak ($c^2 = 7.12, 3, p > .05$). For part-time and full-time adult students who also worked full- or part-time, women are twice as likely to do household maintenance activities in the morning peak ($c^2 = 11, 3, p < .05$). Again, there is no significant difference between women and men in the evening peak ($c^2 = 1.4, 3, p > .05$).

THE UNIVERSITY SAMPLE

Methodology

The dataset used for this analysis was derived from a travel survey sent out to a random sample of 1600 students and 530 faculty and staff at Portland State University. The names were randomly selected through a computer by using social security numbers. Both full- and part-time students were included; the only restriction was that the student's current Zipcode be in Washington or Oregon. Students were drawn from the fourth-week enrollment list for fall term 1989. The staff and faculty were regularly employed, normal-status employees, both full- and part-time, and, again, Zipcodes were limited to Washington and Oregon.

A total of 963 surveys were returned, representing an overall return rate of 45 percent. The response rate for students (540/1600) was 34 percent; for faculty, it was 43 percent (230/530). Of the 963 surveys, 770 were coded and included in the analysis. The data were analyzed with spreadsheet and statistical packages, and descriptive procedures including means, cross-tabulations, and chi-square were run. Faculty, staff, and students were first analyzed together, and then faculty/staff were analyzed separately. When results for faculty/staff differ from those for the larger sample, these results are noted.

FINDINGS

Mode of Travel

Respondents were asked to identify their primary and secondary modes of travel for all trips and, not surprisingly, a large majority of both women and men indicated that their primary mode was single occupancy vehicle. For students, there was no significant difference between the two genders with respect to the primary mode of travel. There was, however, a significant difference among faculty and staff, with women being more likely to drive and men being more likely to take transit (c^2=11.10, 6, $.p < .10$).[1] There was also a significant gender difference (c^2=12.12, 7, $.p < .10$) among both students and faculty-staff in secondary mode of travel, with men being more likely to indicate SOV

and walking and women being more likely to indicate transit and carpool. When asked specifically about their trip to Portland State, women and men were equally likely to drive alone.

Trip Chaining

Respondents were asked if they made any stops on their way to and from Portland State; they were also asked if they left campus to perform any activity during the day. Both women and men were equally as likely to perform any additional activities either before arriving at Portland State or during the middle of the day. However, of those activities performed before arriving at Portland State, women were much more likely to drop a child off at school or daycare (c^2=12.75, 1, $p < .001$), shop or perform errands such as banking (c^2=4.37, 1, $p < .05$), or keep appointments (c^2=4.38, 1, $p < .05$). Men were more likely to go to a job (c^2=8.07, 1, $p <. 01$). Men and women were equally as likely to engage in these activities during the middle of the day. When faculty-staff were singled out, however, these differences between genders in activities prior to coming to Portland State did not exist.

Unlike the trip to Portland State, the trip *from* Portland State showed a significant difference in women's and men's likelihood to perform some additional activity, with women being more likely to do so than men (c^2=12.63, 1, $p <. 001$). Again, women were more likely to drop off or pick up a child from daycare or school (c^2=5.58, 1, $p <. 05$). These results regarding the activities after PSU appear to be at odds with the regionwide analysis, which showed no significant difference among students in evening peak activities. One likely explanation is that the post-PSU activities are occurring at times other than the evening peak, between noon and 4 p.m. or after 8 p.m., for instance. Another likely explanation is that the regionwide analysis looked at *all* students within the region, not just those at PSU, which, as an urban university serving older students, may exhibit more differential.

Among PSU faculty-staff, there was a no significant difference between the genders with respect to picking up or dropping off a child, although, as stated above, there was a difference with respect to making *some* additional stop after PSU. On the other hand, there was a significant difference between male and female faculty-staff for the activity of picking up or dropping off someone other than a child (c^2=4.40, 1, $.p < .05$), with men being more likely to pick up or drop off someone. This finding is also somewhat at odds with the regional analysis, which revealed women to be more likely than men to pick up or drop off someone else (whether or not the passenger was a child was not indicated). Again, the difference between the university results and the regionwide results may be due to the time of day for the post-PSU activity. It also may be due to the differences in lifestyle among members of a university community versus members of the general population.

In general, though, these findings, as well as those of the regionwide analysis, suggest that women—particularly students—rely on the automobile for childcare and household maintenance purposes. That women need automobiles for childcare was addressed directly with a question asking the university respondents if they were the primary caregiver of a dependent. Women were more likely than men to indicate that they were (c^2=12.23, 1, $p <. 001$). There was no significant difference, however, when faculty-staff were singled out for analysis. All of those who indicated they were primary caregivers were also asked if they were responsible for most of the dependent's transportation, and women—both students and faculty-staff—were more likely than men to indicate that they were (c^2=9.33, 1, $p <. 01$).

The findings also suggest that male students rely on the automobile for the worktrip, as is revealed also in the regionwide analysis. Men are more likely than women to be both full-time students and full-time

employees, although women are more likely to be both part-time students and part-time employees or to be part-time one and full-time the other (c^2=15.52, 4, p <. 01).

Mode-Switching under Constraints

In an effort to gauge how members of the university community might respond to decreased parking availability either through pricing or regulation, respondents were asked what they would do if they could no longer park at or near the PSU campus. Of those who drive to PSU, the majority do park at or near the campus, with no significant difference between the two genders. If, by pricing or regulation, they could no longer park where they currently do, women were more likely than men to indicate that they would switch to carpooling (c^2=3.73, 1, p <. 10), while men were more likely to indicate that they would park on-street, farther away from campus (c^2=2.87, 1, p <. 10). This may reflect men's greater willingness to walk, as well as ability to pay somewhat more for parking. These differences were not significant, however, when faculty-staff were singled out.

Respondents were also asked what they would do if they did not have access to a car. Women were more likely than men to indicate that they would get a ride from someone else (c^2=3.5, 1, p <. 10). Female faculty-staff, though, were not any more likely than male faculty-staff to indicate this option. This is in line with their response to the question about parking, which suggested female students, but not faculty-staff, would switch to carpooling; it is also in line with their stated secondary mode of travel.

Transit Use

The respondents who drove and parked at Portland State were asked to rank their top three reasons for not using transit for the trip to PSU. There was a significant difference between men and women for the Number 1 and 2 reasons. As their Number 1 reason, men were more likely than women to indicate that transit is too time consuming and that the auto is more pleasant than mass transit; women were more likely to indicate that they prefer the safety and security of the automobile and that they have several stops besides PSU (c^2=32.64, 11, p <. 001). The Number 2 reasons cited showed the same trend, with men citing the additional reason that transit scheduling is too infrequent and women adding that they have too much to carry (c^2=19.03, 10, p <. 05). These differences did not appear when faculty-staff were singled out, however.

Whether or not they used mass transit or drove and parked, all respondents were asked to rank the three most unpleasant characteristics about mass transit. Women were more likely to indicate bus exhaust, feeling unsafe on the bus, and finding other riders to be sometimes offensive as the most unpleasant characteristic, while men indicated that the scheduled frequency is too inconvenient (c^2=18.64, 12, p <. 10). Again, these differences did not pertain to faculty-staff when singled out for analysis.

Security and Safety

As noted, women are more likely to cite safety concerns as one of their negative perceptions about mass transit or a reason why they don't use transit. Respondents in this study were also asked to evaluate certain aspects about the provision of parking both on and off campus, and, again, women were more likely to single out issues related to safety.

When asked to rate their satisfaction with the lighting and safety of structured parking on campus, women were more likely than men to indicate that they were either unsatisfied or very unsatisfied (c^2=10.62, 4, $p <$. 05). When asked about their satisfaction with the safety of the walk to and from parking, women were even more likely to indicate some level of dissatisfaction (c^2=27.36, 4, $p <$. 0001). Female faculty-staff did not indicate a greater likelihood than their male counterparts to indicate dissatisfaction with lighting and safety, although they did indicate such a proclivity with respect to the safety of the walk.

Slightly over a quarter of all respondents who drive to Portland State park off campus. These respondents were asked about off-campus parking, as well. Only a handful are faculty-staff, so the findings pertain primarily to students. Women were more likely than men to report paying 50 cents or more per hour, while men reported paying less than 50 cents or nothing (c^2=6.82, 3, $p <$. 10). This finding may be related to men's willingness to walk, thus suggesting they are willing to park at quite a distance from campus and then walk. Women, perhaps because of concerns related to safety and/or having too much to carry, are less willing to walk long distances.

As with on-campus parking, women were more likely than men to express dissatisfaction with the lighting, safety, and security of the off-campus parking location (c^2=23.5, 4, $p <$. 001). They were also much more likely to express dissatisfaction with the safety of the walk to and from off-campus parking (c^2=32.93, 4, $p <$. 00001).

CONCLUSIONS

The results of this study suggest that women are more dependent on the automobile than men because of their responsibilities related to childcare and household maintenance and because of their concerns about safety. The differences appear more marked among university students than among university faculty and staff or among members of the population in general. Men are more dependent on the automobile for their trip to work because they find it more enjoyable and less time consuming than alternative modes. Women's dependency on the automobile appears stronger because they are more willing to use or consider using carpooling as an alternative to the drive-alone mode.

Men's valuation of the automobile may be related to the higher value that is placed on their time. The work men do, for which they need an automobile, is more likely to be compensated monetarily (as a job outside the home), while the work women do is less likely to be compensated monetarily (as caregiving or household work). In addition, men generally earn more than women. The analysis of the university sample used for this study showed a significant difference between the income categories of men and women, with men being more likely than women to be in the upper-income categories (c^2=13.26, 6, $p <$. 05). The difference is even more marked for faculty-staff (c^2=17.62, 6, $p <$. 01). This is not surprising, given that, of the faculty and staff, 73 percent of the men and 33 percent of the women were full-time faculty, while 46 percent of the women and 18 percent of the men were full-time staff. There is no evidence that men are any "busier" than women, only that there is a higher value placed on both their leisure and nonleisure time.

The transportation patterns of part-time workers indicate that women are more likely to need their car. The opportunities for part-time workers to use carpooling, transit or other modes is extremely limited. In addition, there is evidence that women are more likely to choose part-time work under a variety of circumstances, including after the birth of their first child. Part-time women workers do a larger share of the pick-up and drop off activities in the evening peak. The overall trend in the economy towards part-time rather than full-time work would indicate an increase in these travel patterns.

POLICY IMPLICATIONS

Many of the policies currently being considered by planners and policy-makers involve transportation demand management (TDM) strategies that include pricing or strictly regulating automobile travel either directly via a road toll or indirectly via parking programs. The findings in this study suggest that, if implemented, such strategies may be more burdensome on women than on men.
A policy that imposes a price on travel, for instance, will be harder for women to bear because they are more likely to be in the lower incomes. Yet, because of their childcare and household responsibilities, women's dependency on the automobile is so great that they will consider an alternative (carpooling) that men are less likely to consider. Men appear to be more likely to pay a higher price or to be inconvenienced in terms of distance from a destination—for example, they are more willing to park at a distance and walk to their destination—but women are disinclined to consider these options because (1) they cannot afford to pay the higher price and (2) they are unwilling, because of safety concerns, to substitute walking for automobile travel.

Men find automobile travel more pleasant and less time consuming than alternative modes, but these are not as compelling reasons to justify their continued use of automobiles as are women's stated reasons of trip-chaining needs—particularly childcare—and safety.

Thus, policies that seek to limit automobile use must either take into consideration women's special needs or compensate women for the disproportionate burden they might bear if such policies were put into place. Because it is very difficult to target and compensate policy losers—whether women or men—policies that price or otherwise restrict travel should be complemented by strategies that enhance safety and either eliminate the need for trip chains or make them easier.

TDM programs at large employers such as universities are particularly suited for implementation of such complementary programs. Onsite daycare and schooling facilities would greatly ease women's responsibility for transportation of children. In fact, Portland State University recently joined in a partnership with the local public school system and the providers of housing on campus to determine the feasibility of an "urban grammar school," located on the PSU campus, with five stories of "family-style" housing on the top floors. To begin the project, PSU surveyed its staff, faculty and students about their potential use of such a school. Sixty-one percent of all students surveyed and 22.1 percent of all faculty and staff surveyed reported being "very" or "somewhat" interested in seeing the grammar school erected. Of the students who have children under 12 years of age, 64.9 percent expressed a similar interest; of faculty/staff with children under 12 years of age, 58.2 percent expressed a similar interest.

Onsite banking, post office, and grocery shopping would also ease women's (and men's) responsibility for some of the most common household maintenance tasks requiring an automobile. Improved lighting and preferential close-proximity parking for carpoolers would begin to address some of

women's concerns about safety. All of these programs are expensive, however, and would require subsidy from some source—ideally, higher priced parking for SOV commuters.

Although subsidizing complementary programs to compensate potential policy losers can enhance the equity of many transportation policies presently under consideration, such programs must not be thought of as a panacea. Any programs put into place should be evaluated carefully on an ongoing basis to make sure that necessary trips are not being foregone, that children are not being left unattended, and that women's safety concerns are not increasing.

The results of this study point towards the need for the research community to better identify the various characteristics of household structure (gender roles, household size, ages of children, etc.) and employment status with respect to travel behavior. Without this additional information, policy makers will continue to have unrealistic expectations for transportation policies and programs, especially with respect to the travel patterns of women.

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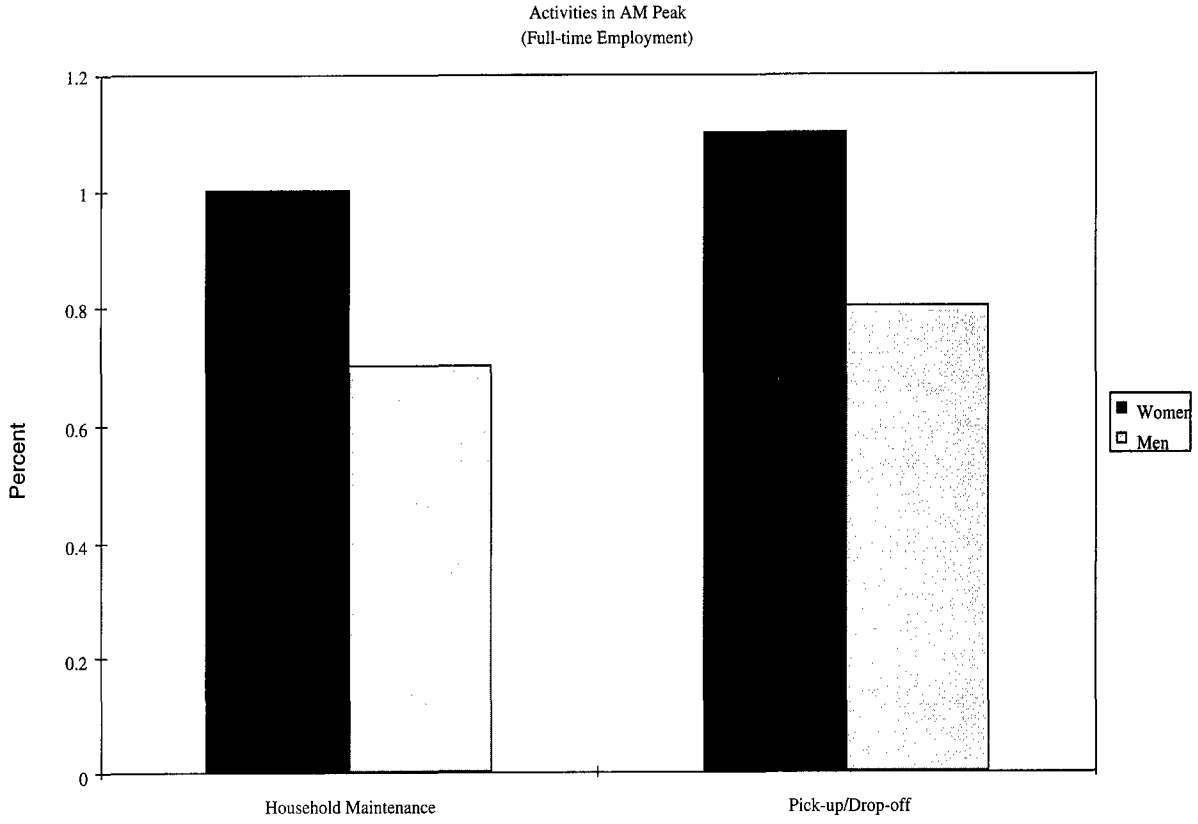
Appendix A

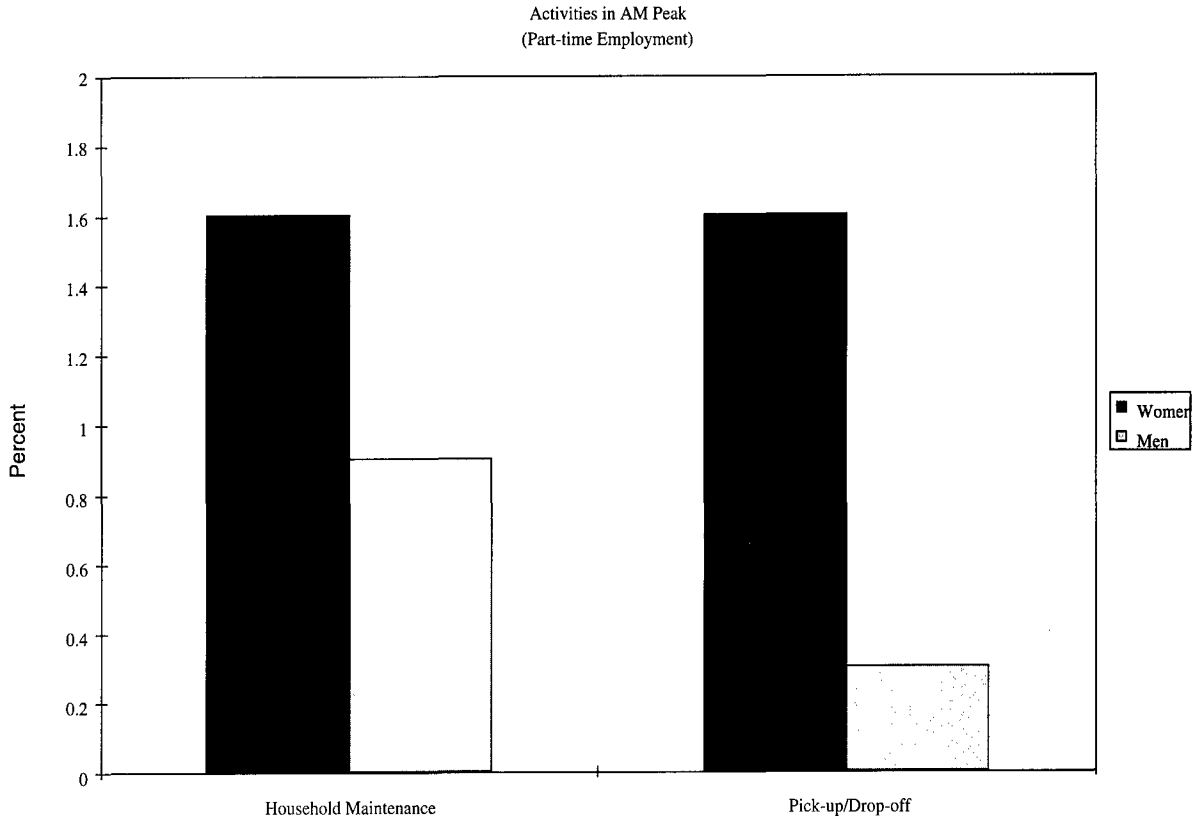
Activity Data Classifications Metro 1994 Analysis

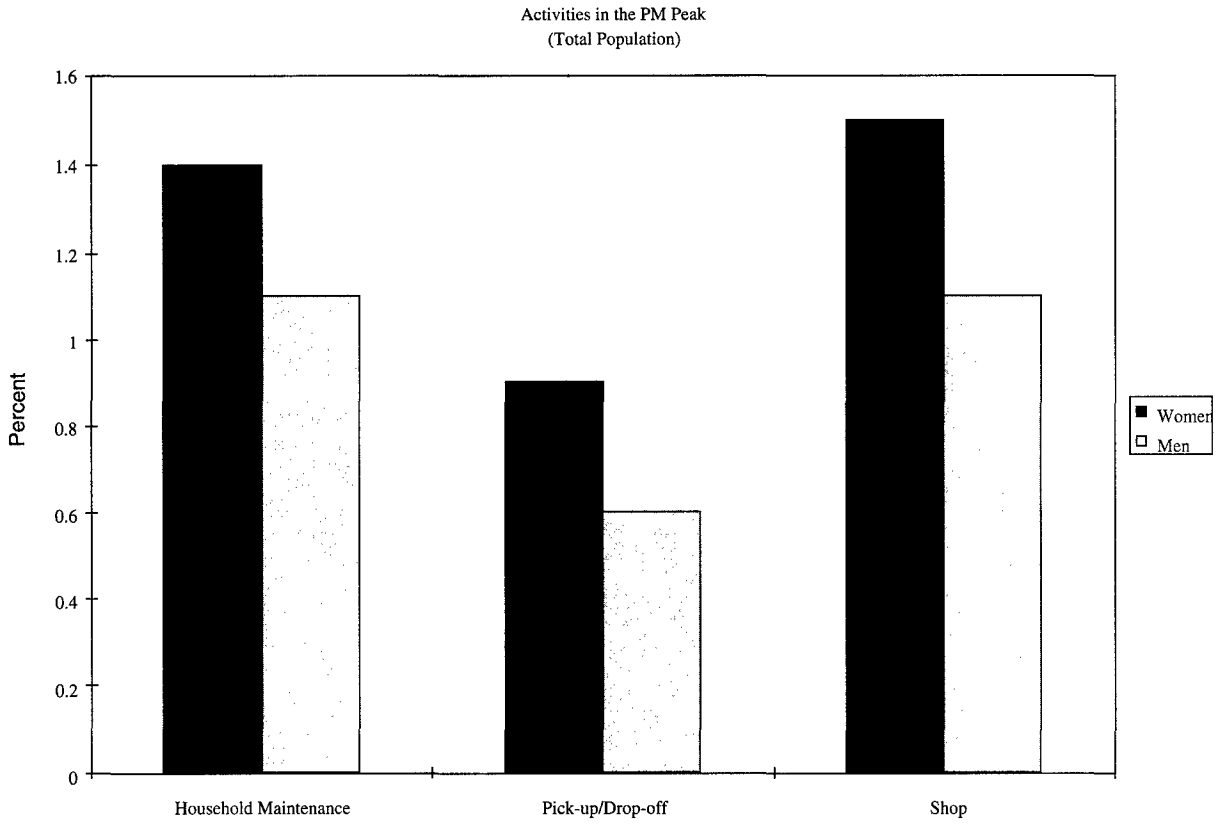
Description of Activities	Aggregate Activities	Limited Aggregation
Meals	Discretionary	Meals
Work	Work/School	Work
Work-related	Work/School	Work
Shopping (general)	Maintenance activity	Shopping
Shopping (major)	Maintenance activity	Shopping
Personal Services	Maintenance activity	Personal Services
Medical care	Maintenance activity	Personal Services
Professional services	Maintenance activity	Professional services
Household/personal business	Maintenance activity	Household/personal business
Household maintenance	Maintenance activity	Household maintenance
Household obligation	Maintenance activity	Household obligation
Pick-up/drop-off passenger	Maintenance activity	Pick-up/drop-off passenger
Visiting	Discretionary activity	Discretionary activity
Casual Entertaining	Discretionary activity	Discretionary activity
Formal Entertaining	Discretionary activity	Discretionary activity
School	Work/School	School
Culture	Discretionary activity	Discretionary activity
Religion/Civil Service	Discretionary activity	Discretionary activity
Civic	Discretionary activity	Discretionary activity
Amusements (at home)	Discretionary activity	Discretionary activity
Amusements (away from home)	Discretionary activity	Discretionary activity
Hobbies	Discretionary activity	Discretionary activity
Exercise/Athletic Activity	Discretionary activity	Discretionary activity
Rest & Relaxation	Discretionary activity	Discretionary activity
Spectator Athletic Event	Discretionary activity	Discretionary activity
Incidental trip	Discretionary activity	Discretionary activity
Tag along trip	Discretionary activity	Discretionary activity

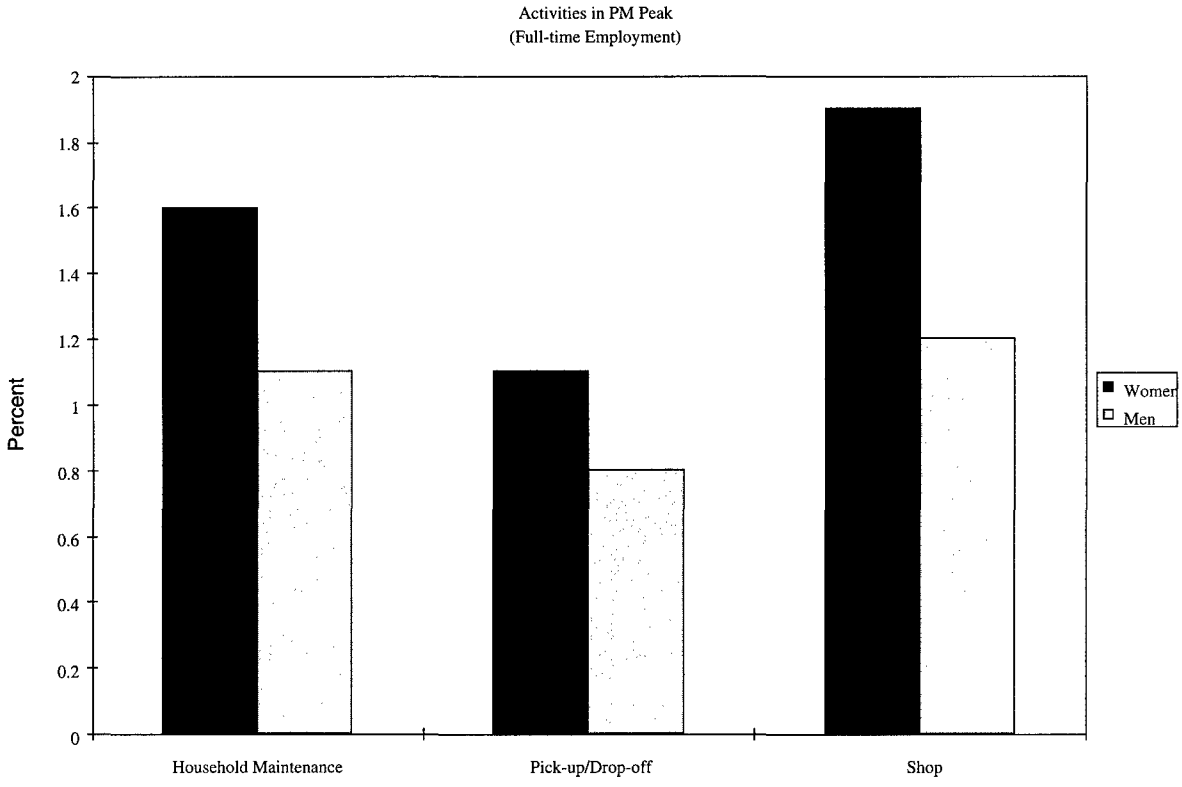
[1]The faculty-staff sample size (207) was insufficient to prevent sparse observations in all cells of the chi-square analysis; thus, this finding may be suspect, although it confirms previous work (Rosenbloom and Burns, 1993).

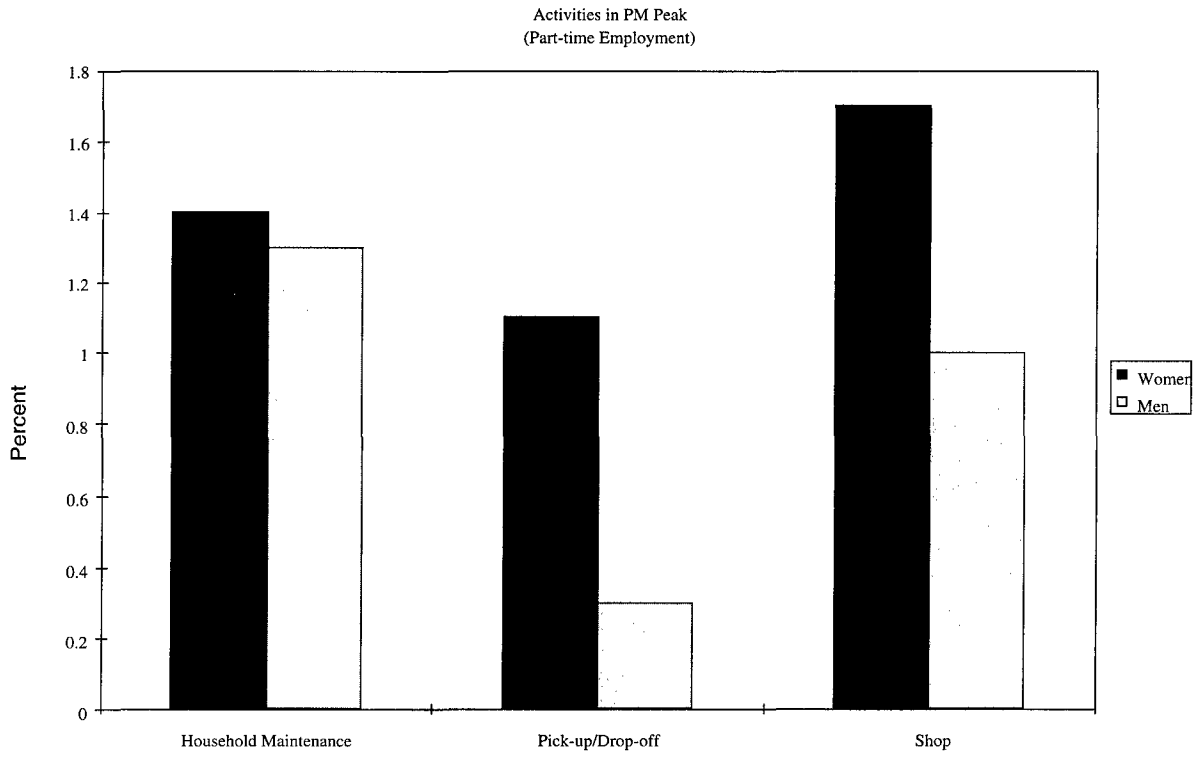
Appendix B
Figures of Activity in AM and PM Peak

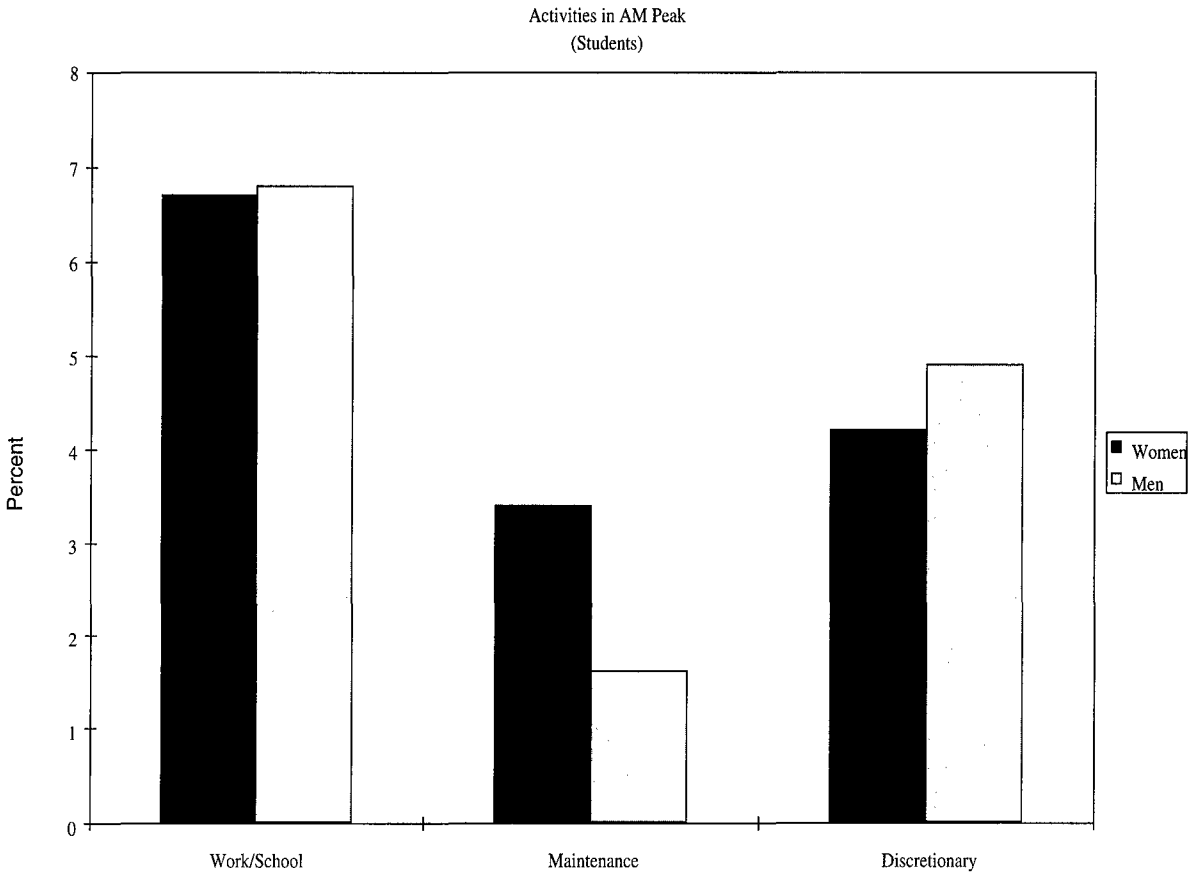





Activities in the PM Peak
(Total Population)
Percent
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Household Maintenance
Pick-up/Drop-off
Shop
Women
Men


Activities in PM Peak
(Full-time Employment)
Percent
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Household Maintenance
Pick-up/Drop-off
Shop
Women
Men


Activities in PM Peak
(Part-time Employment)
Percent
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Household Maintenance
Pick-up/Drop-off
Shop
Women
Men


Activities in AM Peak
(Students)
Percent
8
7
6
5
4
3
2
1
0
Work/School
Maintenance
Discretionary
Women
Men

The Effect of Residential Accessibility to Employment on Men's and Women's Travel

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THE EFFECT OF RESIDENTIAL ACCESSIBILITY TO EMPLOYMENT ON MEN'S AND WOMEN'S TRAVEL

ABSTRACT

This research explores the effect of residential gravity accessibility by automobile to all employment in the Atlanta metropolitan region on the quantity and nature of travel by men and women. The literature suggests that greater accessibility of residential locations is associated with more, but shorter trips, resulting in less travel. Using the Atlanta Regional Commission's 1990 Household Travel Survey, I evaluated household and personal travel behavior and found: (1) individuals and households who live in more accessible portions of the metropolitan area spend significantly fewer minutes in travel; (2) among individuals this effect is seen primarily for employed men; (3) residential accessibility's effect on numbers of motorized trips is ambiguous and often insignificant, though students who were not employed and lived in more accessible locations made significantly fewer home-based school trips by motorized vehicle.

These results demonstrate that residential accessibility does affect travel, reinforcing the belief that land use policy and physical planning to improve accessibility may provide means of manipulating travel demand to achieve higher quality of life, enhanced economic development and more efficient transportation. However, some planning policies aimed at least partly at increasing accessibility (zoning for higher densities, fostering mixed uses, achieving jobs-housing balance) can be costly, unpopular, or both. This research also demonstrates that residential accessibility's effects on travel, though significant, do not affect everyone, suggesting they may not be worth large sacrifices. Finally, though these effects are significant, and gravity measures of accessibility may help transportation planners predict the results of planned and unplanned changes when used with other information, they do not predict travel behavior well when used alone.

INTRODUCTION

Much of planners' and urban designers' strong recent interest in the connection between transportation and land use stems from believing that travel behavior is affected by the physical environment. (Crane, 1996a) Yet this paper is one of very few which test whether this is true, and in particular, whether this is true (1) on a scale broader than the neighborhood or community, (2) in the recent past, (3) in a large and growing U.S. metropolitan area, (4) for more travel than just commutation (5) considering travel using our most common means of transportation, the private car, and (6) distinguishing between men and women, and those who are employed and not employed.

In order to test for significance, a quantifiable indicator of a key dimension of the physical environment is required. The measure used here, a gravity measure of accessibility to all employment in the metropolitan region, is calculated for census tracts, and is intended to measure the physical potential of alternative residential locations for desired interaction, thus operationalizing the concept of physical accessibility at the scale of the metropolitan region. (Helling, 1996a) The effects of this physical attribute on the travel of different groups are then compared using the results of an extensive household travel survey.

REVIEW OF THE LITERATURE

ACCESSIBILITY

Everyone (including individuals, groups and businesses) values the ability to accomplish interactions of interest or importance to them. Though theoretically such interactions might be achieved through either travel or communication, this paper concerns itself exclusively with transport, allowing me to define accessibility as *the potential ease with which destinations can physically be reached for desired interaction.*

The large literature on physical accessibility identifies a number of possible means of measuring it, most of which are at least somewhat congruent with the concept outlined above, although not all are equally good at explaining variation in empirical phenomena. (Helling, 1996c) The detailed operational definition I provide later attempts to quantify a common-sense understanding of "accessibility," and has a number of other advantages, including relative ease of calculation from available data, predictive power, a firm theoretical foundation and a long history of both scholarly and applied use. However, it has the following weaknesses: (1) it is based on aggregate rather than individual or household data, implying that all individuals in the given area have the same accessibility, (2) it has no temporal dimension, implying that accessibility does not vary, for example, by time or day or day of the week, and (3) it is better suited to comparing the accessibility of different locations via the same mode than of those locations via different modes. Nonetheless, it has proven itself capable of explaining observable differences in my previous research in Atlanta. (Helling, 1992; 1996a, 1996b)

TRAVEL AND ACCESSIBILITY

Crane (1996b) has recently posed again the question of what effects the physical environment has on numbers of trips, overall vehicle miles of travel (VMT) and mode split. He uses comparative statics to infer consequences from the design precepts of the new urbanism; shorter travel distances due to streets built on a grid system, slower travel speeds due to traffic calming measures, and enhanced destination attractiveness due to mixed and intensified uses. However this approach doesn't yield a definitive prediction of the direction of the combined effects of these popular policies on car trips, VMT or mode split. I argue that by incorporating travel time and destination weights, a gravity measure of accessibility can function as a simple, straightforward indicator of the combined effects of these three dimensions (proximity, speed and destination attractiveness). Hence this paper contains a method for obtaining an empirical answer to Crane's question, though I have not focused solely on neo-traditional neighborhoods.

Previous research, using several different measures of accessibility, has found that greater accessibility increases rates of trip generation (numbers of trips) (Morris, Dumble and Wigan, 1979; Leake and Huzayyin, 1979; Koenig, 1980), and reduces trip length (Hanson, 1982; Ewing, 1995). Hanson found that when all trips, including walking trips, were recorded, higher densities of destination opportunities (establishments) in the immediate vicinity of home (1 km.) significantly increased the number of trips and significantly decreased their average distance from home for both workers and nonworkers. The effect of accessibility on trip length was negative and greater than the positive effect on trip generation, so that, "People living and/or working in high-density[1] environments make more trips and still manage to travel fewer kilometers," (Hanson, 1982, p. 196). As an explainer of individual travel, home-based accessibility has also been demonstrated to be more important than work-based accessi-

bility. (Hanson and Schwab, 1987) However, it has been unclear whether these conclusions remain true, and whether they are relevant to the U.S. in spite of dissimilarities in culture, urban form and public policy from that in Europe, where Hanson and Koenig obtained their data.

Also, there is evidence that conclusions depend upon the individual and the type of travel. Previous work showed that residential opportunity accessibility to establishments significantly increased the number of discretionary trips taken by all working men and nonworking men with cars, but not by women. Higher values of opportunity accessibility to the place of residence also reduced the length of shopping and personal business trips, but not other discretionary "social" trips (Hanson and Schwab, 1987). Leake and Huzayyin also found that non-commuting trips were more elastic with respect to accessibility than commuting trips, and that measures of accessibility via transit improved prediction of transit trips more than accessibility via auto improved prediction of automobile trips. (Leake and Huzayyin, 1979)

Some oppose planners' attempts to use land use and locational policy to reduce travel, arguing that such intervention will impose new restrictions and costs, but be ineffective. For example, in the Los Angeles metropolitan area, improved jobs-housing balance and freeway capacity enhancements are projected to contribute only a fraction of reductions in vehicle miles and hours of travel needed to reduce future emissions of five major pollutants controlled by the Clean Air Act (Bae, 1993). Increasing residential density in developing areas around the periphery of existing metropolitan areas will have little effect on commuting distances if jobs are widely dispersed in these outer suburbs. (Downs, 1992) And though dispersed employment creates the potential for shorter commutes in Los Angeles, there is much less difference between actual commuting to concentrated employment centers and more accessible, dispersed employment than theoretically possible. Thus "attempts to alter the metropolitan-wide structure of urban land use via policy intervention are likely to have disappointing impacts on commuting patterns..." (Giuliano and Small, 1993, p. 1498)

Some of those who argue for attempting to affect travel through design and controls on the physical environment and location merely assert that their approach should work. Among these are proponents of the new urbanism, maintaining, for example that, "The proximity of daily destinations and the convenience of transit reduces the number and length of trips..." (Duany and Plater-Zyberk, 1994, p. xviii) However, accessibility is a richer and more useful concept than physical proximity and previous research indicates greater accessibility is likely to reduce the length, but not the number of trips, as noted above.

Others who favor using the physical environment as a policy tool draw conclusions based on empirical work rather than philosophical orientation. Cervero and Gorham (1995) conclude that older neighborhoods, which are more accessible by foot and transit because they have rectangular-street-grids and were initially built around rail transit, generate fewer drive-alone trips and more transit and pedestrian trips than the otherwise similar neighborhoods without these attributes in the San Francisco area. This is consistent with Hanson and Schwab's finding that greater accessibility has a significant effect on mode choice, with higher accessibility associated with a greater proportion of trips using non-motorized means of travel (foot or bicycle). (Hanson and Schwab, 1987) Interestingly, Gorham and Cervero found the situation to be less clear in Los Angeles, which they attribute to the overall automobile accessibility of the Los Angeles region, although they are not able to test this hypothesis. "Having transit-oriented neighborhoods in a region strongly dominated by the automobile may very well be of negligible importance." (Cervero and Gorham, 1995, p. 221) This paper addresses this important, and previously untested question: does greater accessibility to an entire

metropolitan area via car also reduce trip length and increase the number of trips, as accessibility at the smaller pedestrian/transit scale of the immediate neighborhood apparently does?

A middle position between those who see the physical environment as all-powerful and those who argue its near total irrelevance seems more reasonable than either extreme. We already know that accessibility depends upon individual circumstances and preferences; "the shape of the spatial environment is generally less influential on travel than are the personal and household characteristics of travelers." (Hanson and Schwab, 1987) Thus the hypothesis of this paper is not so much that physical accessibility alone will explain patterns of travel, as that it may add to an understanding which distinguishes among types of travelers and their travel.

TRAVEL AND GENDER

This study analyzes the effects of accessibility on travel behavior, broken down according to gender and employment status. Janelle, Goodchild and Klinkenberg (1988) compared the relative merits of using cluster analysis or grouping by personal attributes to obtain groups of sample survey respondents which were homogenous on how much time they spent in travel per day (as well as other travel variables). Their data, from a random sample of individuals in Halifax, Canada in the 1970s, indicated that cluster analysis created only marginally more homogenous groupings than separating the sample into men and women or all employed people versus those who were not employed.[2] Other binary categorizations of people (by marital status, the presence or absence of children in the household, homeownership status and automobile availability) were somewhat less helpful than gender and employment status at reducing variation in daily travel time within groupings. In general, they observed that "a priori groupings compared favorably with those based on cluster analysis." (Ibid., p. 904) This is in keeping with the following recent research.

Rosenbloom (1995) argued that gender, employment status and presence and ages of children are very important to explaining variations in travel behavior in 1990. Gender and employment status have special importance. According to the 1990 Nationwide Personal Transportation Survey (NPTS), women aged 16 to 64 made more trips than men of the same age in 1990, though because these trips were shorter, they covered fewer miles in vehicles than men on average. (Rosenbloom, 1995) Although women's trips have historically been shorter than men's, as recently as 1983 men and women made approximately equal numbers of trips. (Pisarski, 1992) This relationship is the same among working men and women. Employed women make more trips than working men, on average, and working women in urban areas travel fewer miles than their male counterparts. Employed people take more trips and travel further, on average, than those who don't work, but the differences are greater among women than among men. (Rosenbloom, 1995)

"The most salient fact today is that most women, and most women with children, are in the labor force, generally retaining substantial childcare and domestic obligations in addition to their jobs. At the same time, a growing number have also assumed duties for aging parents and in-laws. These compound responsibilities have important transportation implications: they create the need for multiple trips in addition to any work trips, they create the incentive to link trips, and they reduce the ability to use alternative modes, like transit, which are inflexible and time consuming. All of these needs are intensified by the low density suburban development of jobs and homes." (Rosenbloom, 1995, p. 2-9) Thus not only are there great time pressures on people, particularly women, with travel critical to carrying out these many responsibilities, but the physical arrangement of residences and work and other destinations potentially play an important role in how successfully these challenges can be negotiated.

Any measure of accessibility to the residence, such as the one used in this study, can be expected to do a poorer job predicting travel for groups who have less home-based travel. Because working women are more likely to form complex work-related trip chains (Dueker, Strathman and Davis, 1994) this suggests that as a group their travel might be less sensitive to the accessibility of home. Although Dueker, Strathman and Davis found home-to-work distance and workplace and residence variables insignificant in their model predicting work commute trip chaining, such trip chaining theoretically holds greater benefits for people who live in inaccessible locations. Thus it seems possible that accessibility might do a poorer job of explaining travel behavior for residents of such locations.

EMPIRICAL ANALYSIS

THE GRAVITY MEASURE OF ACCESSIBILITY

The gravity measure of Atlanta census tracts' accessibility to employment in 1990 used here ($ACCESS^{90}$) is based on modelled peak-hour street and highway network travel times obtained from the Atlanta Regional Commission (ARC). Because the travel times used to calculate this measure assume travel by car, not walking, bicycling or mass transit, it does not measure accessibility via other modes. The 1990 Census demonstrates that this is appropriate for the vast majority of Atlanta workers, since approximately ninety-one percent of the workers over age 16 in the Atlanta MSA commuted to work in a privately-owned motorized vehicle in 1990. Under five percent of all workers in the MSA commuted to work via public transportation, while a little over two percent worked at home and under two percent walked or bicycled to work. (Rossetti and Eversole, 1993)

The measure used in this analysis is defined as:

$$ACCESS_i^{90} = \sum_{j=1}^{n} W_j^{90} * (t_{ij}^{90})^{-b}$$

where:

$ACCESS_i^{90}$ is the gravity accessibility of tract *i* to 1990 employment,

W_j^{90} is the number of jobs in tract *j* in 1990,

$(t_{ij}^{90})^{-b}$ is impedance; a function of the separation in peak travel time (t) in 1990 between tracts *i* and *j*, and

n is the number of tracts in the study area.

An accessibility score was calculated for each census tract in the study area using this measure.[3] Higher values mean a tract is more accessible to all employment in the study area. The form of the impedance function causes nearby employment to increase a tract's accessibility score far more than do more distant jobs. Recent work has demonstrated that gravity measures of accessibility are more accurate at predicting residential density, with which they have a well-defined theoretical relationship, than any other type of accessibility measures, including opportunity measures, which count the numbers of destination opportunities within a specified radius. (Song, 1996; Helling, 1992, 1996a)

Many destinations, including those visited for school, shopping, personal business and some types of recreation are also employment locations, although the ratio of trip attractions to employment varies widely by activity type. Thus this measure of accessibility to all employment is intended to represent accessibility to any and all desired destinations in the metropolitan area, with the amount of employment indicating a general attractiveness to trips, whether for errands, leisure or work. When Atlanta lost over 26,000 jobs in a single year between the first quarters of 1990 and 1991, it had the effect of shuffling the destinations of many thousands of households, reaffirming the importance of accessibility to the entire employment base rather than just a portion of it. Additionally, the nineties have seen strong growth in firms providing temporary employees to many different industries. Since "temps" by definition lack a permanent employment destination, the growth of this segment of the employment base also suggests that the importance of accessibility of residential areas to all employment locations will remain important. Although it might be natural to think in terms of the locational match-up between an individual and his or her current job, an individual's accessibility to *all* employment recognizes that individuals' destinations may change at any time, and in any case are not limited to the workplace.

THE TRAVEL SURVEY

The travel survey which is the source of the trip data reported here was undertaken by Barton-Aschman Associates and NuStats Inc. for the Atlanta Regional Commission in the fall of 1991[4]. Although the survey covered eleven counties, this paper reports data only for those surveyed households residing within the study area shown in Figure 1. This area is made up of the seven counties comprising the central portion of the 18-county Atlanta Metropolitan Statistical Area (MSA). It contained about 2.4 million people in 1990, nearly 84 percent of the MSA population, and about 1.4 million jobs.[5] A sample of 2,433 households, containing 6,351 persons, was drawn from those having telephones in the eleven-county area. After eliminating households living in the four counties outside the study area, households not reporting a residence location and households not reporting income, 2,351 of these households (6,192 persons) remained and are included in the data reported here for the smaller area covered by this study.

The survey consisted of contacting each household to verify basic information and secure their agreement to participate, mailing each household a travel diary and related information, and interviewing each household by telephone to obtain the information recorded in the travel diary within 72 hours of the agreed-upon travel day. The data thus obtained were then edited, coded and entered into a database. The procedures used in conducting the survey are documented in an Atlanta Regional Commission publication titled "1990 Household Travel Study: Final Report." (ARC, 1993)

The ARC travel survey omitted two types of travel. Only trips by persons five years old and older were recorded, which is not likely to be important here. More significantly, only trips in motorized vehicles were recorded except for walking or biking trips to work, of which there were only 19 out of a total of 23,308 trip records. Thus for all practical purposes this survey describes only motorized trips. This means that the hypothesis that accessibility increases the number of trips, but increases the proportion accomplished via foot or bicycle to reduce travel overall, cannot be tested. This may not represent a large loss to this analysis, which hypothesizes the importance of a measure which relates to the whole metropolitan region, and relies on data collected at too coarse a scale to likely be useful at explaining pedestrian trips. However, this lack does reduce the potential for understanding and for effective holistic transportation planning which would recognize pedestrian and bicycle travel as a substitute for and compliment to people's motorized travel.

The seven travel variables listed in Table 1 were assembled from the travel survey data. The individuals reported on were members of the surveyed households and their out-of-the-area visitors staying with them who were five years old or older. Each household was asked to record a variety of information about each trip made on the assigned travel day. Trips were counted two ways; unlinked (each stop defines the beginning of a new trip) and linked (the trips before and after brief stops to serve or drop off a passenger or to change to transit are counted together as one trip). The number of unlinked trips for a person or household is always equal to or greater than the number of linked trips. Trips in private cars exclude trips via vanpools, carpools, taxis, Metropolitan Atlanta Rapid Transit Authority (MARTA) train, bus, school bus, social service or special bus or by walking or biking. Home-based trips include only trips for which the person's home is either origin or destination. Work or school trips included trips to or from work and school and trips which were work-related, omitting personal, shopping, social/recreational, "eat meal" and "other" trips. Minutes spent traveling sums the elapsed time between when trips were reported to begin and end for all trips by an individual or household.

FINDINGS

GENDER DIFFERENCES IN MEANS FOR TRAVEL VARIABLES

Table 1 indicates that women surveyed made significantly more trips in motorized vehicles that did men. The difference was more significant when all trips were counted separately rather than being linked, meaning women made more short stops to connect to transit, drop off a passenger or allow a passenger to run an errand as well as more trips overall. Women also made significantly more home-based trips. Though women also appeared to make more private car trips, the difference from men is not significant. The most significant difference in means for the travel variables considered is between men's and women's numbers of work and school trips, with men making more. Men also spend significantly more minutes in travel than do women.

If earlier research results for miles of travel can correctly be assumed to approximately parallel what I obtained here for time spent travelling, these results confirm that the men and women that participated in the ARC travel survey were not unusual, as these patterns mirror those observed in the 1990 Nationwide Personal Transportation Survey, as described earlier. This is important primarily because, if Atlanta's travel is reasonably similar to that in other large U.S. metropolitan areas, the effects of accessibility on Atlantans' travel may be generalizable as well.

THE EFFECTS OF ACCESSIBILITY ON INDIVIDUALS' TRAVEL

Table 2 indicates that accessibility significantly reduces the time men spend travelling, though this effect is not seen for women. These results are made more specific in Table 3, where minutes spent travelling are significantly reduced by accessibility only for employed men. Thus it appears that, at least for this measure of accessibility, men are the chief beneficiaries of household decisions to pay more for locations which are accessible to all employment. These time savings are not small, though there is clearly much variation which accessibility cannot explain. The coefficient on accessibility suggests that an employed man living in highly accessible location A (near a regional shopping center and a few minutes down Interstate 85 from Atlanta's Hartsfield International Airport) saves about 34 minutes of travel time per day over his counterpart living in location B, where the accessibility index is about 1,000 points lower (a historic in-town neighborhood).

Table 1
Differences of Means Among Travel Variables by Gender

Travel Variables	Women N=3,164	Men (N=3,028	Diff. of Means[1] (t)
Individuals'[2] linked[3] trips in motorized vehicles	3.65	3.52	1.88*
Individuals'[2] unlinked[3] trips in motorized vehicles	3.89	3.70	2.82***
Individuals'[2] linked[3] trips in private cars[4]	3.37	3.27	1.50
Individuals'[2] linked[3], home-based trips in motorized vehicles	2.64	2.57	1.74*
Individuals'[2] linked[3], home-based, work and school trips in motorized vehicles	1.10	1.35	-9.82****
Minutes individuals[2] spent traveling in motorized vehicles	70.63	83.57	-6.93****

* Significant at the .1 level ** Significant at the .05 level *** Significant at the .01 level
**** Significant at the .001 level

[1] Using a two-tailed significance test and assuming unequal variances. A negative result indicates than the mean for men was greater than that for women.
[2] Trips were recorded only for persons aged 5 and older.
[3] When trips are linked, two types are combined with others; (1) those in which once traveler "makes a trips to serve the needs of another traveler," such as dropping a child off at school, unless it is part of a "serve passenger tour" or the stop at the passenger's destination lasts longer than six minutes, and (2) those which provide access to a different travel mode, such as a car trip to a transit station. Unlinked trips count all trips, including these types, separately.
[4] Travel in private cars includes drivers and passengers, but not self-identified members of carpools or vanpools.

By contrast, it appears that the gravity accessibility of a man's or woman's residence has no significant effect on the number of linked or unlinked, motorized trips they make. The signs of the coefficients on residential accessibility are sometimes positive and sometimes negative for the first five travel variables in Table 2, reinforcing the idea that accessibility's effect on the number of motorized trips is uncertain. This is consistent with the conclusion that "the individual's location within the city plays a relatively minor role in explaining travel frequency but plays a more important role in explaining travel distances" (presuming the latter correspond approximately to travel time). (Hanson, 1982, p. 197) And it is not necessarily inconsistent with previous findings of increased numbers of trips, since non-motorized trips, which were not included in the survey, may be higher among those who live in more accessible locations.

Table 2
The Effects of Home-based Gravity Accessibility on Travel Variables by Gender

Travel Variables	All N=6,192	Women N=3,164	Men N=3,028
Individuals'[2] linked[3] trips in motorized vehicles	0.000129 (0.73) r = 0.01	0.000080 (0.30) r = 0.00	0.000171 (0.73) r = 0.01
Individuals'[2] unlinked[3] trips in motorized vehicles	0.000227 (1.20) r = 0.02	0.000220 (0.77) r = 0.01	0.000228 (0.92) r = 0.02
Individuals'[2] linked[3] trips in private cars[4]	0.000156 (0.85) r = 0.01	0.000078 (0.28) r = 0.01	0.000228 (0.93) r = 0.02
Individuals'[2] linked[3], home-based trips in motorized vehicles	0.000022 (0.19) r = 0.00	-0.000026 (-0.14) r = -0.00	0.000066 (0.42) r = 0.01
Individuals'[2] linked[3], home-based, work and school trips in motorized vehicles	-0.000100 (-1.45) r = -0.02	-0.000056 (-0.55) r = -0.01	-0.000140 (-1.45) r = -0.3
Minutes individuals[2] spent travelling in motorized vehicles	-0.01671 (-3.27)*** r = -0.04	-0.006690 (-0.99) r = 0.02	-0.025760 (-3.41)**** r = -0.06

* Significant at the .1 level ** Significant at the .05 level *** Significant at the .01 level
**** Significant at the .001 level

[1] Regression coefficients on the gravity measure of accessibility to employment when it predicts listed travel variables, followed by t scores in parentheses, and correlation coefficients.
[2] Trips were recorded only for persons aged 5 and older.
[3] When trips are linked, two types are combined with others; (1) those in which once traveler "makes a trips to serve the needs of another traveler," such as dropping a child off at school, unless it is part of a "serve passenger tour" or the stop at the passenger's destination lasts longer than six minutes, and (2) those which provide access to a different travel mode, such as a car trip to a transit station. Unlinked trips count all trips, including these types, separately.
[4] Travel in private cars includes drivers and passengers, but not self-identified members of carpools or vanpools.

This appears likely for one result in Table 2 in particular. The numbers of motorized home-based work and school trips men made were reduced by living in an accessible location, though not significantly. The effect for women was much smaller. It seems possible that non-motorized trips, particularly to school, may have taken the place of some of those car trips for men and boys who live in accessible areas. This is reinforced in Table 3, where women and men are further broken down into those who are employed at least part time and those who are not. Among the latter group of both men and women, accessibility significantly reduces the numbers of home-based trips to work and

school. Since nonworking people do not make trips to work, this means that accessibility reduces the number of motorized trips to school for both males and females. Although it is certainly possible that students in accessible areas make fewer school trips, perhaps because they have a different demographic or economic profile, such as being older, with greater discretion and fewer classes, it is also possible that they make an equal number or more, replacing motorized trips with non-motorized trips. Rosenbloom has noted that lower numbers of motorized trips by children may have negative consequences if it means they have fewer opportunities, or are unsafe travelling alone on foot or bicycle. (Rosenbloom, 1988)

Table 3
The Effects of Home-based Gravity Accessibility on Travel Variables by Gender and Employment Status

	Women		Men	
Travel Variables	Employed N=1,696	Not employed N=1,468	Employed N=2,018	Not employed N=1,010
Individuals'[2] linked[3] trips in motorized vehicles	0.000127 (0.36) r = 0.01	-0.000300 (-0.78) r = -0.02	0.000449 (1.53) r = 0.03	-0.000460 (-1.26) r = -0.04
Individuals'[2] unlinked[3] trips in motorized vehicles	0.000290 (0.76) r = 0.02	-0.000230 (-0.55) r = -0.01	0.000500 (1.62) r = 0.04	-0.000400 (-1.01) r = -0.03
Individuals'[2] linked[3] trips in private cars[4]	-0.000074 (-0.21) r = -0.01	-0.000170 (-0.41) r = -0.01	0.000341 (1.15) r = 0.03	-0.000150 (-0.37) r = -0.01
Individuals'[2] linked[3] home-based trips in motorized vehicles	-0.000012 (-.06) r = -0.00	-0.00015 (-0.52) r = -0.01	-0.000240 (1.31) r = 0.03	-0.000280 (-0.96) r = -0.03
Individuals'[2] linked[3] home-based, work and school trips in motorized vehicles	.000000 (0.00) r = 0.00	-0.00032 (-2.22)** r = -0.06	-0.000015 (-0.14) r = -0.00	-0.000420 (-2.58)** r = -0.08
Minutes individuals[2] spent traveling in motorized vehicles	-0.008700 (-1.03) r = -0.03	-0.011500 (-1.08) r = -0.03	-0.033980 (-3.38)**** r = -0.08	-0.013410 (-1.49) r = -0.05

* Significant at the .1 level ** Significant at the .05 level *** Significant at the .01 level
**** Significant at the .001 level

[1] Regression coefficients on the gravity measure of accessibility to employment when it predicts listed travel variables, followed by t scores in parentheses, and correlation coefficients.
[2] Trips were recorded only for persons aged 5 and older.
[3] When trips are linked, two types are combined with others; (1) those in which once traveler "makes a trips to serve the needs of another traveler," such as dropping a child off at school, unless it is part of a "serve passenger tour" or the stop at the passenger's destination lasts longer than six minutes, and (2) those which provide access to a different travel mode, such as a car trip to a transit station. Unlinked trips count all trips, including these types, separately.

THE EFFECTS OF ACCESSIBILITY ON HOUSEHOLDS' TRAVEL

Table 4 shows that when aggregated into households, those who live in more accessible areas spend significantly fewer minutes per day in travel, as was true for individuals. Thus the savings to men are not, as a rule, offset by increased travel by women in the same household. This is important because the household is commonly taken as the unit of analysis in transportation planning. Households are usually viewed as decision-making units, capable of saving travel time for one member by increasing the amount of travel another undertakes. This view is reinforced by these findings. Urban economics has traditionally linked residential location decisions to commutation costs (Muth, 1969) and has proposed a variety of theoretical models for how households might trade off accessibility to the employment location of more than one worker. This study's results for Atlanta in 1990 support the simpler, older view that residential location is most commonly used to reduce the length of trips by working men, rather than accommodating other members of the household.

Table 4

The Effects of Home-based Gravity Accessibility on Travel Variables at the Household Level

Travel Variables	All Households N=2,351
Unlinked[3] trips households[2] made in motorized vehicles	-0.003760 (-4.78)**** r = -0.10
Unlinked[3] trips per adult households[2] made in motorized vehicles	0.000253 (1.06) r = 0.02
Minutes households[2] spent travelling in motorized vehicles	-0.125950 (-7.01)**** r = -0.14
Minutes per adult households[2] spent travelling in motorized vehicles	-0.901070 (-1.82)** r = -0.10

* Significant at the .1 level ** Significant at the .05 level *** Significant at the .01 level
**** Significant at the .001 level

[1] Regression coefficients on the gravity measure of accessibility to employment when it predicts listed travel variables, followed by t scores in parentheses, and correlation coefficients.
[2] Trips were recorded only for persons aged 5 and older.
[3] When trips are linked, two types are combined with others; (1) those in which once traveler "makes a trips to serve the needs of another traveler," such as dropping a child off at school, unless it is part of a "serve passenger tour" or the stop at the passenger's destination lasts longer than six minutes, and (2) those which provide access to a different travel mode, such as a car trip to a transit station. Unlinked trips count all trips, including these types, separately.

Households in more accessible areas also appear to make significantly fewer motorized trips, as indicated by Table 4. This is potentially consistent with earlier findings that both numbers of trips and the proportion of non-motorized trips are higher in more accessible areas. However, further analysis casts doubt on accessibility's ability to reduce the number of motorized trips. In Atlanta, accessibility is positively correlated with two other factors known to be important to household trip generation rates; household size ($r = .60$) and number of motorized vehicles available ($r = .30$) both rise along with accessibility. Removing most of the effect of household size by calculating each household's "trips per adult" (the second travel variable in Table 4) reduces the effects of accessibility on household trip generation to insignificance, as was the case for individuals. Making the same adjustment for minutes households spent travelling yields "minutes per adult households spent travelling," which is still significantly reduced by greater residential accessibility, as it was for individuals.

RESULTS IN COMBINATION WITH OTHER EXPLANATORY VARIABLES

Table 5 illustrates the results when household size, vehicles available, gravity accessibility to employment and household income were used to predict trips in motorized vehicles and minutes spent travelling for individuals by gender and employment status and for households. Table 5 makes it quite clear that accessibility has relatively little power to explain numbers of trips or minutes spent travelling, in spite of the significance of its regression coefficients. The best models are those for households, explaining about 37 percent of the variation in numbers of trips and about 23 percent of the variation in minutes households spent in travel, and far less of the variation in the travel of individuals, even individuals of the same sex and employment status. Nonetheless, the patterns in Table 5 are illuminating.

First, the effect of income on these travel variables is weak and ambiguous. This is consistent with Rosenbloom's findings (1995) and not surprising, since though higher income individuals minimize travel time because of its value to them in other pursuits, the high-income earner's other household members may have fewer time demands and hence less need to minimize travel. These countervailing effects within a single household leave the predicted sign of income's effect in doubt, and Table 5 shows both positive and negative coefficients on income, though all of the significant effects are negative. Significant results were obtained only for numbers of trips by employed individuals, men, and employed men. That employed people would make fewer trips matches the logic suggested above, since they are more likely to have competing uses for their time. However, this alone does not explain the result that this is more true for men than women.

As noted earlier, the positive effects of household size and number of vehicles available on trip-making have long been used to predict trip generation rates. Table 5 illustrates how trips by households increase significantly with increasing household size and the number of vehicles available, with income held constant. Household size and the number of vehicles available also significantly increase the minutes households spend travelling. Thus each additional member adds about 3 trips or 52 minutes of travel time to the household total per day. Interestingly, however, men's trips and minutes spent in travel are significantly diminished by increasing household size. This could happen if men undertook little travel to serve other members of the household and passed off to others travel responsibilities they would have undertaken themselves if they lived alone. Alternatively, perhaps family responsibilities cause men with larger households to minimize travel, by working, recreating and running errands closer to home than men with few or no dependents. The effect of household size on women's travel was to significantly increase the number of trips made, while having no

significant effect on minutes spent travelling, so neither of the hypotheses proposed to explain the results for men would serve to explain the results for women. Meanwhile, Table 5 shows that employed women travel less, the more vehicles are available to the household, a possibility if employed women make fewer trips to serve others in the household when those others have vehicles of their own. Table 5 (following page) shows that more vehicles mean significantly more trips for men, a more common result.

Although multicollinearity with these other powerful explanatory variables, household size and number of vehicles available is clearly potentially troublesome, accessibility appears to have significant effects on travel for several of the groups. In predicting minutes spent travelling, the coefficient on accessibility is negative and significant for all individuals, men, employed men and households even after variation due to household size and number of vehicles available is separated out. In fact, accessibility's effects on minutes spent travelling is negative in every case in Table 5, though many of these effects are not statistically significant. This is consistent with the earlier results, which showed accessibility reducing trip lengths, and reinforces the idea that households often allocate the travel savings from accessible residential location to their employed male members.

Table 5 also shows accessibility to have a significant positive effect on numbers of trips for all individuals, employed individuals and employed men when incorporated into a model with household size, vehicles available and income. All of accessibility's significant effects on numbers of trips are positive. This is a stronger result than obtained by evaluating accessibility's effect on trips by itself, when its coefficient was positive but insignificant for all individuals as well as employed women and men. As noted earlier, a complete picture of the effect of accessibility on number of trips cannot be determined from the travel survey, since non-motorized trips were, for the most part, not reported.

IMPLICATIONS AND CONCLUSIONS

Evidence from Atlanta demonstrates that intrametropolitan accessibility to employment does affect travel. Persons who live in locations which are more accessible spend significantly fewer minutes in travel overall than do those who live in less accessible locations, as do their households. This conclusion is consistent with previous empirical work, but extends it to a metropolitan scale in the U.S. for a recent year, while providing detail on gender and work status. Confirming that metropolitan accessibility and time spent travelling are inversely related is very important for planning, as it suggests that policy which increases the overall accessibility of residence to all employment will reduce travel.

However, these effects are far from uniform among all persons. John Kain advocated testing the effects of accessibility to employment on males and females separately because, "there is reason to believe that differences in employment access would affect them differently." (Kain, 1992, p. 393) Women rely particularly heavily on travel to accomplish many responsibilities under very severe constraints on time and sometimes income and location. Yet this paper has demonstrated that the reduction in minutes spent travelling which appears to be such a robust result of greater residential accessibility accrues more to men than to women, and particularly to employed men. Thus policy aimed at improving accessibility ought to specifically consider that it may have fewer benefits for women than for men.

Exploring which other individual differences are important to accessibility's effects on travel is an obvious next step toward better understanding. Multi-worker households are increasing in number, and are particularly prevalent in low-density areas of large metropolitan areas. The number of workers

Table 5: Possible Models for Predicting Travel Variables Using Accessibility

Dependent Travel Variables	N	Household size	Vehicles avail.	Accessibility	HH Income[1]	Adjusted R2
Unlinked trips in motorized vehicles						
All individuals	6,192	0..3	0.09	0.0004	-0.01	.001
		(1.26)	(2.47)**	(1.90)*	(-0.94)	
Employed	3,714	0.17	-0.06	0.0006	-0.05	.008
		(4.73)**** (-1.28)	(2.26)**		(-2.48)**	
Not Employed	2, 478	0.07	0.11	-0.0001	0.01	.003
		(2.02)**	(1.94)*	(-0.43)	(0.50)	
Women	3,164	0.12	0.02	0.0004	0.01	.003
		(3.34)**** (0.28)	(1.27)	(0.41)		
Employed	1,696	0.37	-0.26	0.0004	-0.02	.023
		(6.40)**** (-3.38)****	(0.94)	(-0.78)		
Not employed	1,468	0.15	0.09	-0.0000	0.03	.009
		(3.22)***	(1.22)	(-0.05)	(1.15)	
Men	3,028	-0.07	0.17	0.0003	-0.04	.004
		(-2.00)**	(3.57)**** (1.37)		(-1.88)*	
Employed	2,018	0.03	0.10	0.0006	-0.06	.004
		(0.66)	(1.64)	(2.05)**	(-2.52)**	
Not employed	1,010	-0.05	0.12	-0.0003	-0.02	.000
		(-1.06)	(1.48)	(-0.73)	(-0.71)	
Households	2,351	3.11	0.62	0.0010	0.02	.367
		(31.93)****	(4.64)**** (1.54)		(0.34)	
Minutes spent travelling						
All individuals	6,192	-2.40	3.30	-0.0152	-0.34	.004
		(-3.63)****	(3.37)**** (-2.90)***		(-0.91)	
Employed	3,714	-0.12	0.36	-0.0233	-0.62	.003
		(-0.11)	(0.27)	(-3.35)	(-1.17)	
Not employed	2,478	0.42	1.75	-0.0100	-0.53	.001
		(0.50)	(1.28)	(-1.36)	(-1.06)	
Women	3,164	-0.82	1.32	-0.0058	-0.43	.000
		(-0.96)	(1.03)	(0.83)	(-0.88)	
Employed	1,696	0.98	-2.91	-0.01221	-0.36	.001
		(0.77)	(-1.71)*	(-1.37)	(-0.56)	
Not employed	1,468	1.60	2.32	-0.0078	-0.56	.001
		(1.36)	(1.20)	(-0.71)	(-0.79)	
Men	3,028	-4.00	4.62	-0.0248	-0.30	.010
		(-3.94)****	(3.14)***	(-3.22)***	(-0.52)	
Employed	2,018	-1.08	2.39	-0.0326	-0.95	.005
		(-0.73)	(1.21)	(-3.17)***	(-1.18)	
Not employed	1,010	-1.47	0.65	-0.0139	-0.44	.000
		(-1.32)	(0.35)	(-1.49)	(-0.67)	
Households	2,351	52.26	18.37	-0.0359	0.34	.233
		(21.15)****	(5.42)**** (-2.18)**		(0.28)	

*Significant at the .1 level ** Significant at the .05 level ***Significant at the .01 level **** Significant at the .001 level

in a household may sometimes explain travel behavior better than does household size, the more traditional variable. But this has been studied relatively little empirically, and does not often figure into transportation demand models. (Soot, Sen, Marston and Thakuriah, 1995) Similarly, new operational definitions of household structure and person roles may prove useful to further research in this area because gender has been found to have a different effect on trip frequency for different person roles. (Al-Kazily, Barnes and Coontz, 1995)

The results reported here reinforce the belief that land use policy and physical planning to improve accessibility may provide means of manipulating travel demand to achieve higher quality of life, enhanced economic development and more efficient transportation. They indicate that greater accessibility benefits both individual households and society as a whole. Households benefit from greater residential accessibility because, though they retain great freedom to make their own travel decisions, they also get to devote less time to travel, while apparently making the same or greater numbers of trips. Meanwhile society benefits from shorter trips, reducing the acknowledged externalities of car travel. Yet residential accessibility's effects on travel, though significant, do not affect all individuals. Though metropolitan accessibility does have the hoped-for effect overall, it leaves much variation in travel behavior unexplained.

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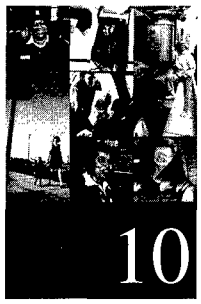

Women's Travel to Inner City Employment

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WOMEN'S TRAVEL TO INNER CITY EMPLOYMENT

ABSTRACT

While the concept of a spatial mismatch between low skill inner city residents and suburban employment is widely discussed, the travel implications of a skills mismatch between these residents and nearby jobs remain unclear. This study reveals the attraction of inner city employment in metropolitan Phoenix, Arizona and uses an aggregate and comparative approach to describe travel for women residents who commute within and women nonresidents who commute to the inner city of the City of Phoenix. Over 49,000 surveys from the Maricopa County Regional Trip Reduction Program provide 1995 data on full time workers of large companies. The occupations and commuting mode, distances, and times of over 20,000 nonresident women and over 3,000 resident women are compared.

The entire inner city is a destination for metropolitan commuting. Over 85 percent of women employed in the inner city are nonresidents. Nonresident women in high skill occupations travel longer distances and times than nonresident women with low skill occupations, although clerical/secretarial workers travel long distances to the large number of public sector and private jobs. Women inner city residents report lower drive alone use, higher carpool use, and more non-vehicle mode commutes than nonresidents, although commute mode varies by occupational category. Professional/manager resident women report a level of drive alone commutes higher than nonresidents in the same occupational category. Their proximity to employment does not result in reduced driving alone to work. Conversely, resident and nonresident women in manufacturing/production report the lowest levels of drive alone commutes and high levels of carpool use. Resident women in this occupational category have the shortest distance commutes and appear to be constrained to nearby employment. This stratification of women's travel by occupation and mode contributes to the development of separate work and travel environments within the inner city.

WOMEN'S TRAVEL TO INNER CITY EMPLOYMENT

Numerous and diverse jobs remain in central cities, despite the loss of employment in recent decades. The central city continues to provide employment opportunities for nearby residents and remains an attraction for metropolitan residents. At the same time the mismatch between the skills of low income inner city residents and the number and requirements of nearby jobs remains an issue. Increasing suburbanization of employment and inner city concentration of poverty highlight this issue in American metropolitan areas.

As more women have entered the urban labor force, their occupations and commuting have become more diverse. The spatial focus chosen for this study reveals the attraction of inner city employment for women. What jobs do women nonresidents consider worth long commute trips? What jobs are available for women residents unwilling or unable to travel outside the immediate area? This focus on the inner city highlights the traditionally important employment in the metropolitan core—the historic central business, industrial and warehousing districts—and the oldest residential neighborhoods.

This paper uses an aggregate and comparative approach to describe inner city travel for two groups: women residents who commute within and women nonresidents who commute to the inner city. Their travel is examined first in the context of a general spatial mismatch. Then the study describes the inner areas of the City of Phoenix, Arizona where this research is connected to a specific employment setting and data source. The attraction of women's occupations at inner city worksites is then examined. Commute modes, travel times and distances are compared for women inner city residents and nonresidents. The study concludes by discussing the implications from this Southwestern metropolitan area for a broader understanding of women's travel in inner cities.

CONTEXT FOR WOMEN'S INNER CITY COMMUTING

Commuting to and within American central cities is a large, but declining, percentage of all commuting flows within metropolitan areas. In 1990, three commute flows to the central city equaled 44 percent of the total commuting flow of 91.5 million trips. Central city-to-central city commutes were 24.33 million trips (27 percent of the total). Suburb-to-central city trips (15.26 million trips) plus non-metropolitan area-to-central city trips (0.3 million trips) were 17 percent of the metropolitan total. Central city residents increasingly conduct reverse commutes to suburban and non-metropolitan areas. Central city-to-suburb trips (5.9 million trips) and central city-to-non-metropolitan area trips (1.4 million trips) are 8 percent of the total metropolitan commuting flow (1, p. 72). The diminishing relative importance of central city commuting is clear from metropolitan commuting growth trends. Suburb-suburb commutes had the greatest growth (58 percent), while suburb-central city flows grew by 20 percent. The reverse commute, central city-suburb flow, grew by 12 percent, a rate greater than the central city-central city commute growth of 10 percent[1].

These commuting trends reflect metropolitan economic restructuring that has reshaped inner city employment. This restructuring has profound implications for the employment opportunities, and therefore the travel behavior, of inner city residents. Social scientists and policy analysts find that the decline of inner city work in past twenty-five years has a profoundly negative effect on men, women and their families[2, 3]. There is renewed support in American urban policy for the creation of new businesses and job opportunities in disadvantaged urban neighborhoods. Indeed, the first principle of the Clinton/Gore Administration's Empowerment Zone and Enterprise Community Program is the creation of a sustainable economic base in the targeted community, one that offers a larger number and a greater range of jobs for nearby residents. Inner city advantages of accessible locations and available labor attract nonresidents to specialized jobs and employers to inner sites[4].

These broad concerns highlight the question of a spatial mismatch between inner city residents and their employment prospects. Its earliest formulation as a mismatch of low skill, inner city black men and blue-collar suburban jobs remains an appealing hypothesis that deserves additional examination for different groups and spatial areas[5]. Recently, Jencks and Mayer[6] extended this question to examine residential segregation, job proximity, and black job opportunity. Their recommendations for time series data for blacks living in different metropolitan locations can be extended to other demographic groups. This study modifies their specific recommendation for the study of blacks who live in suburbs and in central cities and compares women who live inside and outside the inner city.

Commuting travel to and within the inner city illustrates the skills and spatial mismatches for women. Geographic studies of spatial mismatch have examined women's travel at several scales and, increasingly, for different racial and income groups. While rural-urban travel differences emerge[7], central

city - suburban comparisons are more common[8, 9, 10]. Hodge notes that, while separation of work and residence may not be ideal, the most difficult situation is one in which a person is close to employment but lacks skills to take advantage of these nearby opportunities[11].

Finally, access to an automobile appears essential for labor force participation in low density American cities and suburbs. Previous studies have shown the dependence of employed women in metropolitan Phoenix and Tucson on automobile use, primarily drive alone commuting[12, 13, 14]. While these studies linked women's travel to household income or the women's occupation, they did not disaggregate travel spatially within the metropolitan areas.

STUDY AREA AND APPROACH

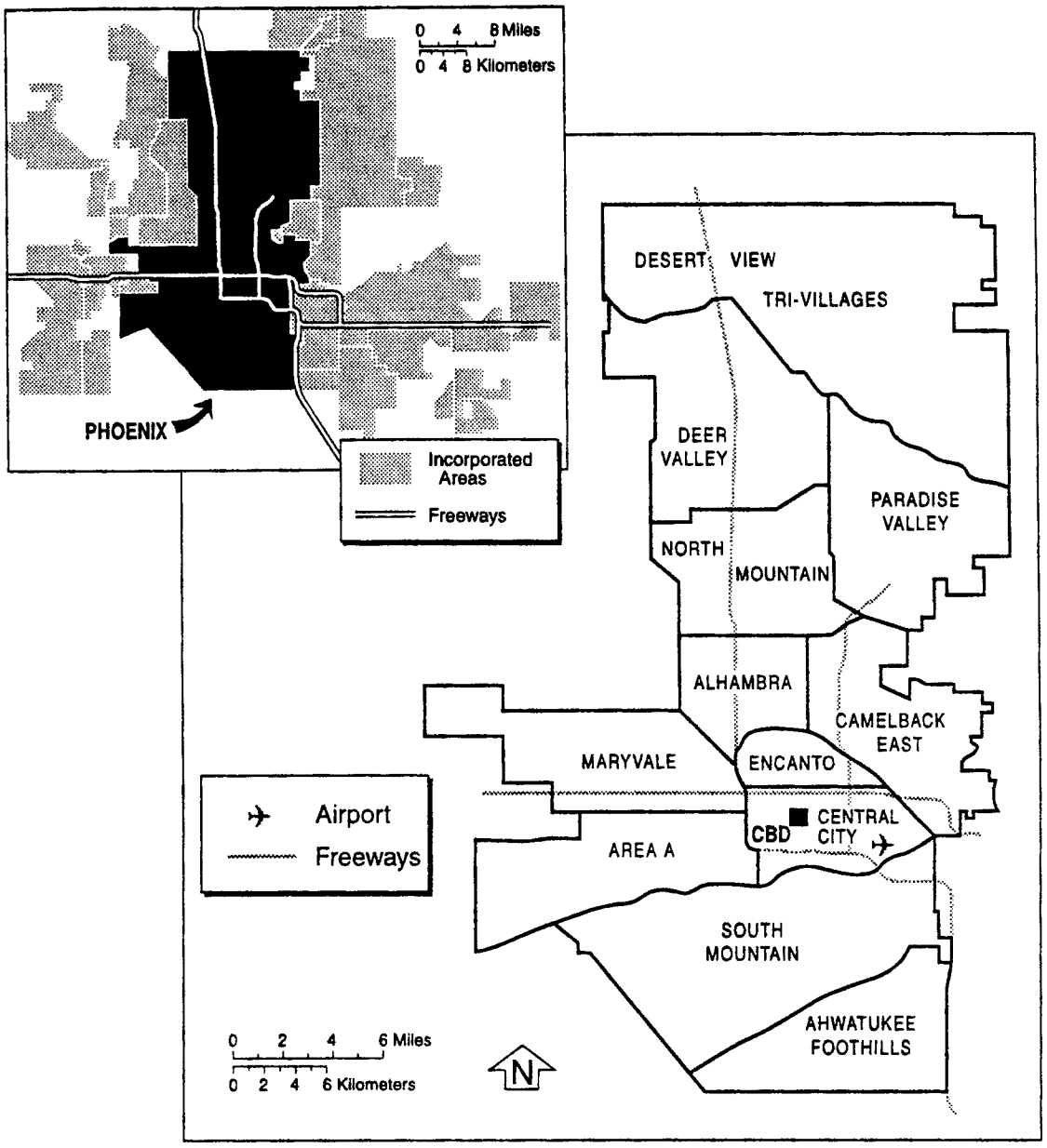
Before moving to describing women's inner city travel, the study area and approach merit discussion. The popular perception of metropolitan Phoenix is a rapidly growing Sunbelt city with 2.6 million population, booming high technology employment, and extensive new housing communities in pristine desert settings. Phoenix's revitalizing downtown is, however, within blocks of neighborhoods with high unemployment, low incomes, and high poverty rates. English is the second language after Spanish in many households, streets are unpaved, and crime is on the rise. In short, the inner city is an area of severe economic and social distress that includes Phoenix's Enterprise Community's neighborhoods.

STUDY AREA

For planning purposes, the City of Phoenix and its 1.1 million population are divided into thirteen districts called urban villages. In theory, the aim of urban villages is to break down this extremely large, sprawling city into more manageable districts; to focus land development, to give residents a sense of local identity, and to reduce travel by encouraging residents to work, shop, and socialize all within the same urban village. This study focuses on the two poorest of the city's urban villages, the Central City Village, which contains the downtown business district, and South Mountain Village, which adjoins it immediately to the south across the Salt River channel (Figure 1).

This population of 135,000 (58,000 in the Central City Village; 77,000 in the South Mountain Village) has characteristics that mirror the problems of inner city populations in other cities. A startling 43 percent of Central City Village's households are below the poverty line, compared to 12 percent of all households in the City of Phoenix[15]. A lower 24 percent of South Mountain households are below the poverty line. Minorities dominate the population structure of both Villages. Hispanics and African-Americans constitute 67 percent of the South Mountain Village population and 73 percent of the Central City in contrast to 28 percent for the City of Phoenix as a whole. More than one-half of the Central City Village population and more than one-third of the South Mountain Village population speak some combination of Spanish and English compared to only 14 percent citywide. Also compared to the City as a whole, the study area has many more persons without a high school diploma, much higher levels of unemployment, lower household incomes, especially in the Central City Villages, a higher proportion of households on public assistance, and a higher proportion of households with incomes below the poverty level.

Figure 1
The Boundaries and Urban Villages of the City of Phoenix, Arizona.



In a more positive view, even though Phoenix has experienced a decentralization of new employment, the downtown and its immediate area remain the metropolitan area's largest concentration of employment. The 1990 Census confirms that some 28 percent of the City of Phoenix's and 15 percent of the metropolitan area's jobs are located in the Central City and South Mountain Villages[15]. Stated another way, inner city Phoenix has 81,499 jobs or an important 18 percent of all Maricopa County jobs provided by employers with over 50 employees at a single worksite[16].

The largest numbers of inner city jobs are in Public Administration and Health, Legal and Other Professional Services. City, county, state, and several federal agencies are concentrated downtown as are related private legal firms and financial institutions. Two economic sectors provide major blue collar employment: durable manufacturing, and transportation and public utilities. Sky Harbor International Airport is two miles east of downtown with nearby ancillary services of ticket sales, car rentals, airport hotels and air express services as well as an industrial park created by urban renewal west of the airport. Outside the downtown and airport areas, industrial districts serve a host of small scale manufacturing firms attracted by the inner city's centrality and good transportation access. Three additional sectors provide lower numbers of jobs: wholesale and retail trade; finance, insurance and real estate, and personal and business services, including medical employment at the Good Samaritan Hospital complex north of downtown and County medical center and State hospital east of downtown. Few jobs are available in nondurable manufacturing or agriculture, mining, and construction.

While the total numbers of jobs are significant, their importance relative to opportunities elsewhere in urban Maricopa County is a strong indication of the attractiveness of inner city employment. When the inner city economic base was evaluated for one-digit Standard Industrial Classification (SIC) categories, only two employment categories had a comparative advantage—public administration and transportation and public utilities employment. These strengths include the offices of the City of Phoenix, Maricopa County, and Arizona state government and related public utilities in the central business district. Moreover, the inner city is central for passenger and freight transportation providers, including railroad, transit, and the Sky Harbor International Airport. Employment gaps include high technology manufacturing which locates in outer sections of Phoenix and elsewhere in the metropolitan area. The lack of retail stores and consumer health and professional services reflects the outward shift of population and purchasing power.

There are detailed (two-digit SIC) categories of inner city employment, however, that have advantages compared to the county. These categories and their economic sector (in parentheses) include: Food and Kindred Products and Printing and Publishing (nondurable manufacturing); Miscellaneous Manufacturing Industries (durable manufacturing); Wholesale Trade—Durable Goods (wholesale and retail trade); Depository Institutions (finance, insurance, and real estate); Personal Services and Auto Repair (personal services); Health Services as well as Legal and Social Services (professional services).

As a result, the large amount of inner city employment and the size of the inner city population make the close linkage between residence and work stated as the planning ideal for City of Phoenix theoretically possible. This link is quite weak, however, for the city's urban villages in general and for the inner city in particular[15]. The 1990 Census reports that about 15 percent of all inner city employees live and work in the inner city. The following section describes this study's data source which confirms that this broad mismatch between jobs and residents holds true for men and women employees. Inner city women residents are 14.8 percent of all women employees in the inner city, large employer labor force.

APPROACH

This study uses data from the 1995 Maricopa County Regional Trip Reduction Program survey[17] which is distributed annually to the employees of Maricopa County employers with more than 50 workers. Employees are asked a range of questions about their commuting behavior (travel mode and

work schedule), their demographic characteristics (age and gender), employment (occupation), and their place of residence (address and zip code). employed in inner city Phoenix.

There are 181 employers within the boundaries of the Central City and South Mountain Villages who returned survey forms from their employees in 1995. Each employer's location was address matched in a geographic information system. Employee residential addresses of the 49,219 employees were sorted by nine zip codes to identify men and women working and living in the inner city. The boundaries of these zip codes are slightly larger than the urban village boundaries used to identify central city employment and slightly overstate the number of inner city residents. There are 20,816 women nonresident employees and 3,364 women resident employees.

There are major advantages in using this existing database which is designed to assist current air quality improvement and to monitor reductions in drive-alone travel. The survey provides a current source of local travel and employment data for full time employees. Survey compliance is high among employees of participating firms. Inclusion of precise addresses facilitates the identification of employee and employer inner city locations. Small businesses and their employees are not surveyed, however, and information on employee racial and ethnicity as well as personal and household income is not requested. This paper presents aggregate findings from this database and does not examine individual employers.

WORK DESTINATION AND OCCUPATION

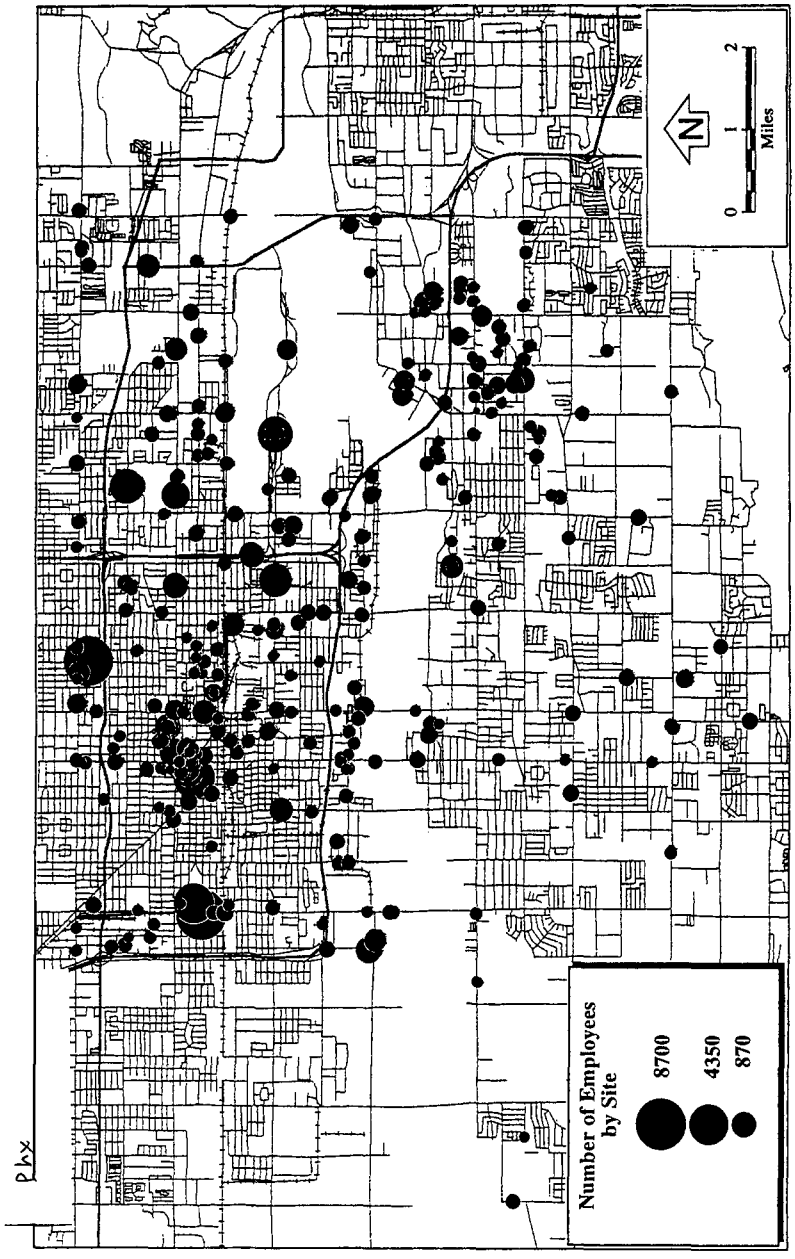
Clearly, the entire inner city is a destination for metropolitan commuting (Figure 2). The overwhelming majority (85.2 percent) of women inner city employees commute from outside the inner city (Table 1). Women and men are employed in almost equal proportions in Phoenix's inner city. For the 47,509 inner city employees who identified their gender, 50.9 percent are women and 49.1 percent are men. Hanson and Pratt note that "the proportions of men's and women's metropolitan wide employment per (census) tract are similar"[18, p. 244] in their study of the occupational structure of Worcester, Massachusetts.

Table 1
Occupation (Percent)

Occupation	Women (n=21,871)	Men (n=20,595)	Nonresident Women Percent (n=19,168)	Resident Women Percent (n=2,998)
Professional/Manager	34.0	39.2	35.8	18.8
Technical/Research	6.7	10.3	6.9	4.7
Sales/Service	10.4	10.1	10.4	10.0
Manufacturing/Production	4.6	10.2	3.0	13.9
Skilled Crafts/Trades	1.7	13.3	3.1	2.4
Clerical/Secretarial	33.3	4.5	32.8	33.0
Other	9.3	12.4	8.0	17.1

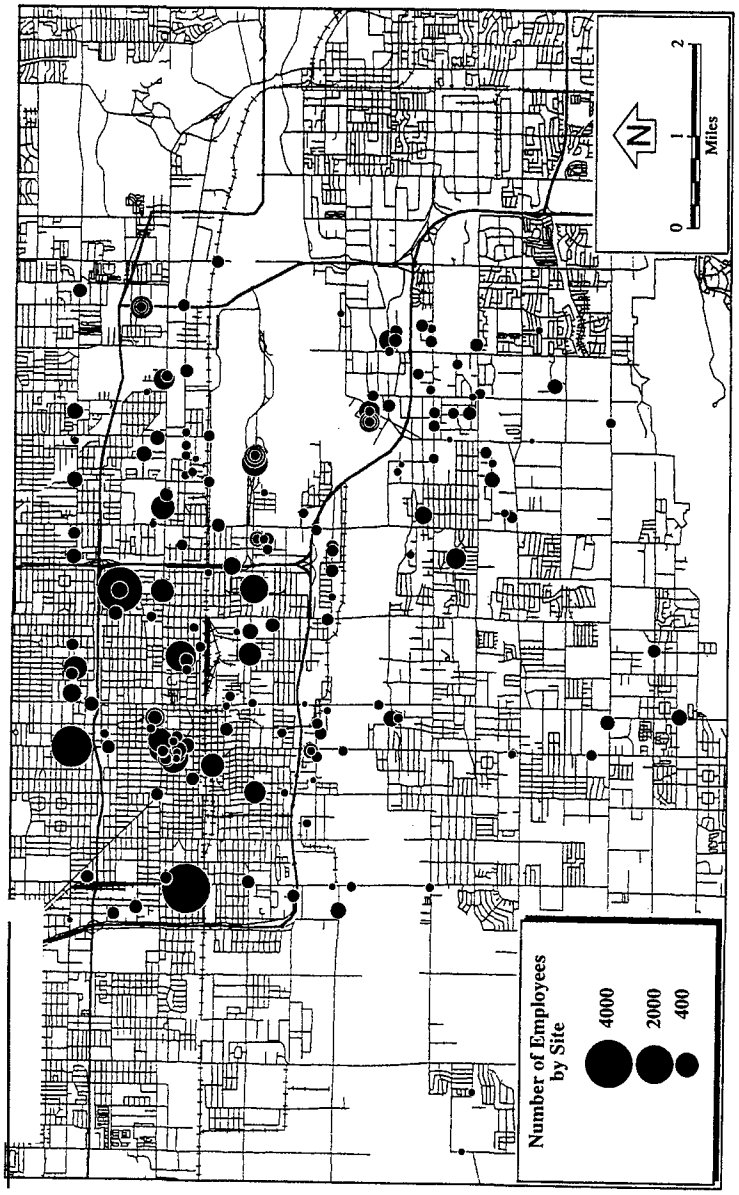
Women employees are concentrated at worksites in economic sectors of public administration, health and professional services, and finance, insurance, and real estate (Figure 3). Men are employed in these same sectors and at the same worksites but are also concentrated at durable manufacturing and transportation and public utilities worksites. While men are employed at a higher percentage in professional/manager occupations (39.2 percent) than any of the groups of women, resident women are employed at a higher percentage (13.9 percent) in manufacturing/production than men (10.2 percent). Three large government employers account for 21,276 employees: State of Arizona offices in the State Capitol complex located west of the central business district; City of Phoenix offices; and Maricopa County downtown offices and medical center.

Figure 2
Employment at Inner City Worksites.



Inner city residents are not distributed evenly across all inner city worksites. The majority of worksites are dominated by nonresidents. One hundred ten (74 percent) of the 181 worksites have no employees who are inner city residents. Sixty four percent (39,439) of all inner city employees work at a site where no inner city residents are employed. Only three worksites have more than 25 percent women inner city residents as employees and these are small sites with 107, 117, and 133 employees. The gender composition of worksites was identified using a modification of the approach developed by Hanson and Pratt[18]. Their study classified occupation types into three groups based on the percentage of female employees. Here, three worksite types are identified by the percentage of female employees in all occupations. Female dominated worksites have at least 70 percent women employees, while male dominated worksites have at least 70 percent men employees. All other worksites are gender integrated.

Figure 3
Women Employees at Inner City Worksites.



Women employees work in both male dominated and gender integrated settings. Male dominated (90 worksites) and gender integrated (86 worksites) situations describe the 181 large employer worksites of inner city Phoenix. Interestingly, there are only five worksites (1,042 total employees) with over 70 percent women employees. Health and professional service locations account for four separated worksites. The largest female dominated site is a major bank's administrative office in the heart of the central business district where women are 92 percent of the 685 employees.

Inner city women are employed at most of the same worksites as nonresident women (Figure 4). They are slightly more likely than nonresident women to work in gender integrated (89.1 percent compared to 87.0 percent) and male dominated (9.3 percent compared to 9.0 percent) worksites. Women inner city residents are less likely to work at female dominated worksites than nonresident women (1.6 percent compared to 4.1 percent).

When occupational categories are compared, women inner city residents appear to have employment requiring less education or training and providing lower incomes than women nonresidents. Women inner city residents have lower percentages in professional/managerial (18.8 percent compared to 35.8 percent) and technical/research (4.7 percent compared to 6.9 percent) employment. Women inner city residents have higher percentages, however, in manufacturing/production (13.9 percent compared to 3.0 percent) and the general category of other jobs (17.1 percent compared to 8.0 percent).

While clear occupational differences emerge, the groups of resident and nonresident women also share some similar occupations. Women inner city residents and nonresidents have similar percentages for three occupations: clerical/secretarial (33.0 percent compared to 32.8 percent), sales/service (10.0 percent compared to 10.4 percent), and skilled crafts/trades (2.4 percent compared to 3.1 percent). Interestingly, similar, but low, numbers of manufacturing jobs are held by both groups: 583 jobs are held by nonresident women and 418 jobs are held by resident women.

COMMUTE MODE, DISTANCE, AND TIME

Commute trips by women inner city employees use travel modes that match closely with travel modes chosen by all women large employer commuters in the metropolitan area (Table 2). Men drive alone more, carpool less, and commute by bicycle more than any of the groups of women. For commute modes used four or more days a week in 1995, 76.0 percent of nonresident women drove alone, 16.4 percent carpooled in a vehicle with two or more persons, and 6.6 percent took the bus. These mode choices closely match the women's metropolitan mode profile. Rosenbloom and Burns[12] found that 77.5 percent of women employees drove alone, 16.0 percent carpooled, and 5.0 percent took the bus.

Figure 4
Women Inner City Residents Employed at Inner City Worksights

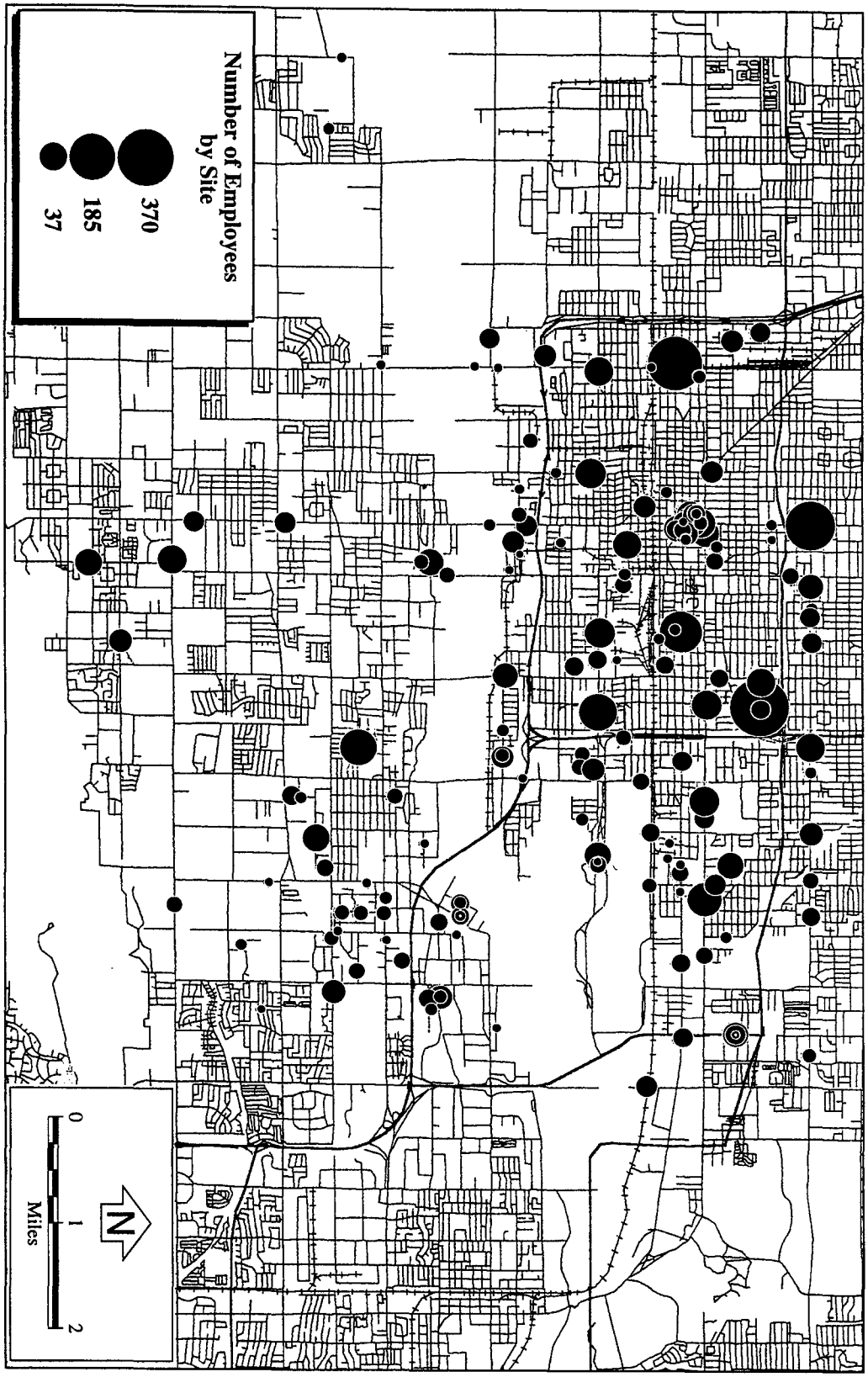


Table 2
Percentage Using Mode to Work.

Mode	Women (n=20,922)	Men (n=20,917)	Nonresident Women Percent (n=18,010)	Resident Women Percent (n=2,912)
Drive Alone	75.1	77.3	76.0	69.1
Carpool	16.6	13.4	16.4	18.0
Bus	6.4	5.5	6.6	5.8
Walk	0.0	0.7	0.2	3.3
Vanpool	0.0	0.0	0.2	0.4
Bicycle	0.0	1.0	0.0	0.7
Other (a)	1.0	1.6	0.5	2.6

(a) Motorcycle and other responses

Commuting by inner city residents appears to require less drive alone use than commutes by nonresidents. Shorter distances are traveled. Parking is not free, particularly in the central business district. Bus service provides regular routes within and suburban express routes to the central business district. Nonresident women drive alone for 76.0 percent of their commutes while residents drive alone for 69.1 percent of their commutes. The use of carpools is higher by resident women (18.8 percent) than nonresident women (16.4 percent). Similar use of the bus is made by nonresident women (6.6 percent) and resident women (5.8 percent). The low rate of drive alone trips by resident women is a promising indication that regular drive alone commutes are substituted for other modes, at least occasionally, when jobs and residences are in spatial proximity. This substitution effect emerges when commute modes that are never used are compared for both groups. Resident women are more likely than nonresident women to never drive alone to work (30.3 percent compared to 20.6 percent). Nonresident and resident women have similar rates of never carpooling, however (77.7 percent compared to 77.6 percent).

As a result, resident women regularly use bicycle, walk, vanpool and other (motorcycle and not otherwise classified) modes at greater rates than nonresident women. Travel by these less common modes, although low in numbers and percentages, reflects the proximity of at least some women to their inner city jobs. For commutes taken four or more days per week (Table 2), 960 resident women walk to work compared to 360 nonresident women. Moreover, bicycle use is over twice as high for resident women (20 women) as nonresident women (9 women). Some 41 nonresident women commuted by vanpool (0.2 percent), a mode choice that reflects their longer travel distances and involves four times the small number of women resident vanpool commuters.

When commute mode is identified by occupation, occupations with higher skills and education and presumably higher incomes show higher drive alone rates for both nonresident (Table 3) and resident women (Table 4). Women nonresidents in sales/service jobs, which often require irregular daily and weekly schedules, have the highest drive alone rate (75.6 percent). Nonresident women in manufacturing employment have the lowest drive alone rate (55.6 percent). Resident women have an even higher drive alone rate for professional/manager jobs (70.6 percent) and a lower rate for manufactur-

ing jobs (47.6 percent). High carpooling rates complement low drive alone rates for manufacturing workers with a rate of 24.0 percent for nonresidents and 28.0 percent for residents.

Table 3
Women Inner City Nonresidents' Commute Mode by Occupation (a)

Occupation	N	Drive Alone	Carpool	Bus	Vanpool	Walk	Bicycle	Other (b)
Professional/Manager	6868	68.9%	11.5%	3.6%	0.2%	0.0%	0.0%	0.2%
Technical/Research	1325	65.8%	14.8%	4.8%	0.2%	0.2%	0.1%	0.4%
Sales/Service	1979	75.6%	9.0%	1.7%	0.2%	0.2%	0.0%	0.5%
Manufacturing/Production	583	55.6%	24.0%	4.5%	0.3%	2.1%	0.2%	2.1%
Skilled Crafts/Trades	287	61.3%	13.6%	2.8%	0.0%	0.0%	1.0%	0.3%
Clerical/Secretarial	6288	60.2%	18.2%	10.2%	0.2%	0.1%	0.0%	0.5%
Other	1530	64.4%	13.0%	4.1%	0.3%	0.3%	0.0%	0.8%
Column Totals	18860	12374	2688	1086	39	30	7	82

(a) Calculated as a percentage of trips taken four or more days a week

(b) Motorcycle and other responses

Resident women have higher rates of bus use than nonresidents, but this use varies by occupational category. Clerical/secretarial workers use the bus for 10.2 percent of trips while professional/manager and technical/research workers use the bus for 3.6 percent and 4.8 percent of their trips, respectively. The group that may be most dependent on use of a car during their jobs, sales/service, has the lowest bus use (1.7 percent). Professional/manager residents use the bus less than nonresident women in the same occupation. Inner city women in sales/service jobs take the bus more than nonresidents, perhaps because their jobs do not require the same mobility. Even women residents in clerical/secretarial occupations use the bus less than nonresident women in the same occupations, perhaps reflecting the frequency, location, and convenience of suburb-to-central city routes.

Table 4
Women Inner City Residents' Commute Mode by Occupation (a)

Occupation	N	Drive Alone	Carpool	Bus	Vanpool	Walk	Bicycle	Other (b)
Professional/Manager	564	70.6%	11.0%	1.4%	0.4%	1.2%	0.7%	1.8%
Technical/Research	140	64.3%	12.1%	3.6%	0.0%	2.9%	0.0%	0.7%
Sales/Service	301	61.5%	12.0%	3.7%	0.0%	5.0%	0.7%	4.0%
Manufacturing/Production	418	47.6%	28.0%	3.8%	0.7%	5.0%	0.7%	2.4%
Skilled Crafts/Trades	73	58.9%	15.1%	5.5%	0.0%	8.2%	1.4%	1.4%
Clerical/Secretarial	990	62.9%	16.8%	7.7%	0.2%	1.0%	0.4%	1.8%
Other	512	51.4%	13.5%	6.4%	0.4%	5.1%	0.8%	3.1%
Column Totals	2998	1801	478	153	9	89	18	68

(a) Calculated as a percentage of trips taken four or more days a week

(b) Motorcycle and other responses

Turning to commute distance and time, commuting distance is higher for high-skill and high-pay occupations for both women residents and nonresidents with some notable exceptions, especially for clerical/secretarial employees. Commuting times are similarly higher for high-skill and high-pay occupations for nonresident women, again with the exception of clerical/secretarial employees, but the travel times of resident women are harder to interpret.

Commuting distance and commuting time show similar patterns for women nonresidents (Table 5). High skill and presumably high pay occupations attract women from longer distances than low-skill, low-pay occupations. Mean one-way travel distance increases slightly from lows kill to high skill occupations. Two exceptions are the manufacturing/production employees, who travel the longest distance (14.5 miles), and clerical/secretarial employees (13.0 miles). The category of other occupations (12.5 miles) has the lowest distance.

Travel times for nonresident women also increase from high skill to low skill occupations. Manufacturing/production (20.9 minutes) employees have the lowest one-way travel time, while professional/manager (28.1 minutes) and clerical/secretarial (28.2 minutes) travel times are the highest. The category of other occupations has a time (24.5 minutes) in the mid-range of all occupations. Clerical/secretarial travel time is high compared to the travel distance. Nonresident women in clerical/secretarial occupations appear to travel shorter distances but take longer to complete their commute trips.

These patterns are partially confirmed for the shorter distances traveled by women residents. High-skill and high-pay occupations held by women residents have generally longer travel distances than low-skill and low-pay occupations. Professional/manager (5.5 miles), technical/research (5.6 miles) are high as is clerical/secretarial (5.6 miles). Manufacturing/production (4.9 miles) and skilled crafts/trades (4.9 miles) are low. The category of other occupations has the lowest distance traveled (4.5 miles).

Table 5
Women's Mean Commuting Distance (One-Way) and Time (a)

Occupation	Miles Nonresident (n=16,461)	Miles Resident (n=2,546)	Minutes Nonresident (n=16,959)	Minutes Resident (n=2,641)
Professional/Manager	13.8	5.5	28.1	12.1
Technical/Research	13.4	5.6	27.2	13.4
Sales/Service	13.8	5.2	22.5	12.1
Manufacturing/Production	14.5	4.9	20.9	11.8
Skilled Crafts/Trades	12.8	4.9	22.4	13.9
Clerical/Secretarial	13.0	5.6	28.2	13.8
Other	12.5	4.5	24.5	11.9

(a) Means calculated to the 90th percentile

The travel times for women residents are somewhat more structured by occupation than by distance. Clerical/secretarial (13.8 minutes) and skilled crafts/trades (13.9 minutes) have the highest travel times. The high-skill, high-pay occupations of professional/manager (12.1 minutes) and technical/ research (13.4) employees are in the middle of the time range. The lowest times are traveled by employees in the manufacturing/production (11.8 minutes) and other occupations categories (11.9 minutes).

In sum, travel times for women residents may be better explained by disaggregate analysis than this study's aggregate approach. Accessibility and bus service vary for different inner city employment districts and for individual worksites. The mix of women's occupations also varies at individual worksites. Women employees are also drawn from different parts of the inner city that range from the gentrified neighborhoods north of the central business district and the larger, but more distant poorer neighborhoods south of the Salt River. It appears that women with high-pay, high-skill occupations do not minimize their distance and time to work. This finding may reflect their ability to live in some of the more desirable neighborhoods within the inner city and travel to dispersed worksites. Conversely, manufacturing/production employees and those women in other nonclassified occupations have the shortest distances and times. This finding may show constraints on their ability and willingness to travel more widely rather than independent choices to work near home.

CONCLUSION

This aggregate analysis confirms that importance of the inner city as an employment destination for women in metropolitan Phoenix, Arizona. Over 85 percent of all inner city women employees commute from residential locations outside the inner city. Professional/manager employment is almost twice as common for nonresident women as for resident women. Clerical/secretarial employment attracts similar shares of both groups. These occupations are spread across public administration, health and professional services, and finance, insurance, and real estate sectors. Women's worksites are primarily gender-integrated (less than 70 percent of employees are either men or women) rather than dominated by male or female employees. Inner city residents are not widely distributed throughout individual worksites, however. Over 84 percent of all worksites and 64 percent of all inner city employees have no inner city residents in their labor force. For inner city Phoenix, these findings suggest a skills mismatch and possibly an English language mismatch that are at least partial explanations for the low percentage of women inner city employees who are inner city residents.

Certain travel issues emerge as indications of possible commuting patterns in other inner city communities. While the commute modes of nonresident women parallel the modes of women throughout the metropolitan area, resident women drive alone less, carpool slightly more, and use the bus about as much as nonresident women. Resident women use commute modes that do not require a personal vehicle (drive alone, carpool) more than nonresident women. In other cities, the level of parking fees required in the central business district, the concentration of metropolitan bus routes, and levels of carpool use will influence this trend as well as the low skill occupations and presumably lower pay of many women residents.

Similarly, high skill, high pay occupations in the inner city are associated with longer commute distance and travel times for nonresident women who are willing to travel for these employment opportunities. The reliance of these nonresident women commuters on driving alone is not surprising given the value of the available employment opportunities. Women in these same occupations who are inner city residents, however, do not always have shorter commutes in distance and time than women residents with less skilled occupations. In general, these high-skill, high-pay residents also have high drive alone rates and appear to be choosing the convenience of a personal automobile even when they live relatively near their employment. There are other possible explanations. Their residential neighborhoods may not be close to the location of dispersed professional/manager jobs or they may have before and after work responsibilities that make use of their own vehicle desirable. Their behavior confirms, however, that residential proximity to employment at the scale of the inner city does not always result in decreased dependence on the automobile.

Finally, low skill, low pay women employees appear to make their travel choices under constrained conditions. They live close to their workplaces. The link of low occupational status to low drive alone rates is clear for both women residents and nonresidents. Interestingly, women in both groups with manufacturing/production employment have low drive alone rates and high rates of carpool use. Moreover, both resident and nonresident clerical/secretarial employees have high rates of bus use. While bus service may benefit these women employees, the manufacturing/production employees appear to have few transit options available at the same time that they have limited access to personal vehicles.

In conclusion, this study suggests that women's travel to inner city employment is strongly stratified by occupation and commute mode for both nonresident and resident women. While mobility may be less of a problem for high skill, high skill employees, travel to work is yet another challenge for low skill, low pay women who already face considerable challenges in identifying, obtaining, and retaining inner city employment. These findings suggest the value of expanded research to compare and contrast individual worksites for nonresident and resident women's commute mode, occupations, travel time, and distance. While these laborsheds can be examined, the commuting fields formed by women's travel from specific neighborhoods can show the residential origins of women workers by occupation, economic sector and commute mode. This aggregate study and future disaggregate studies will together present a more complete picture of the actual patterns and forces that underlie women's travel to inner city employment.

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Swedish Men and Women's Mobility Patterns: Issues of Social Equity and Ecological Sustainability

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SWEDISH MEN AND WOMEN'S MOBILITY PATTERNS: ISSUES OF SOCIAL EQUITY AND ECOLOGICAL SUSTAINABILITY

Present day systems of mass mobility contribute to the degradation of the natural and social environments of Sweden through air pollution, death and injury from accidents, and urban congestion. In response to the social and environmental problems connected to automobility, it is often claimed that certain changes in present mobility patterns and the supporting infrastructure will be necessary to attain a more sustainable transportation system. While the car is often seen as the most flexible form of private transportation, this flexibility depends on the infrastructures which have been built to fulfil the needs of automobility at a cost of other investments in transportation facilities. These investments and their resultant use, takes place within a complex social context where all individuals do not have the same resources, financial and temporal, to use for transportation. The distribution of both access and the resulting 'bads' and 'goods' connected to automobility therefore, directly or indirectly mirror power relationships within a society. If it is assumed that all individuals in Sweden are socially and legally equal and that this results in similar mobility needs in order to fulfil the demands of modern lifestyles, then similar travel patterns between men and women should be implied. However, in travel studies and studies about automobility from the US, Scandinavia, and England the car is explicitly or strongly implicitly discussed as a *male* form of transportation[1, 2, 3].

If the car is seen as a necessity because it is the most versatile form of private transportation which can best fulfil current mobility needs, then a marginalization of certain groups results in limits which have direct social, as well as indirect ecological implications. Some categories of individuals in Sweden use the car disproportionately more than other groups. In different studies, these were loosely identified as well-educated men with a higher than average income[4, 5]. The first aim of this paper is, therefore, to describe some of the differences between men and women's use of the car in Sweden and secondly, to explore how these differences can be understood, and discussed in terms of social equity and ecological sustainability.

Any discussion naming 'sustainable' mobility does so because the use of the car results in the degradation of local, regional and global environments through air pollution, the use of arable land for road infrastructure, oil spills and car production and disposal. Because the complexity of the myriad of other factors relating to sustainable transportation systems are outside of the scope of this paper, sustainability here will only refer to the effects of air pollution from energy production for transportation. In Sweden, approximately one fourth to one-fifth of carbon dioxide, nitrous oxides, and hydrocarbon emissions come from the private use of the automobile[6, p. 21]. It is for these reasons that ecological sustainability is judged to be a necessary part of any discussion of travel patterns in Sweden.

Men and women's mobility patterns will be presented by first describing travel patterns in terms of kilometers driven, overall mode use and purpose. Secondly, possible explanations for men and women's differing use of the car will be explored. Can sex be identified as an important determining factor of car use or are other variables such as income, household composition and/or age of equal or more interest? In conclusion, mode use will be looked at in terms of its impact on the natural environment through the energy intensity that this entails. Can women's travel patterns be judged more environmentally benign than men's? Do men or women have travel patterns which can be seen to be more adaptable to a sustainable transportation system?

THE 1994 SWEDISH TRAVEL PATTERN SURVEY

National travel surveys (RVU) have been conducted in Sweden by Statistics Sweden (SCB) in 1978, 1984/85 and one is currently being conducted which started in 1994 and will run until 1998. The RVU are commissioned by the Delegation for Forecast and Development, under the Transportation Sector of the Department of Communications. The 1994-1998 RVU is being conducted in order to forecast future transportation needs of the country, to establish concrete material to be used as a basis for transportation policy, and to approximate the safety risks involved within the transportation sector for the population in Sweden[7]. The material used in this paper is from the first year of the 1994 national travel survey and covers the quarters included within April 1, 1994 to March 31, 1995, but will be referred to as the 1994 study.

In the first complete year of the 1994 survey, 10,439 individuals between the ages of 6 to 84 years of age were interviewed by telephone. One week before the interview, the respondent received a letter presenting the study and informing them that the interview would take place. The respondents also received a diary and were encouraged to fill in all trips occurring on a designated study day in order to better remember them for the interview. The interview occurred on the day following the designated study day or, when this was not possible, within a week after this date. For seasonal variations, the designated travel study day was spread out over the entire year. The random sample was taken from the Swedish Register of the Population. Children between the ages of 6-14 were indirectly interviewed through a parent. The response rate for the first year was 78%.

Some problems with the Riks-RVU 94 have been pointed out in studies where a comparison of travel patterns were made with earlier travel surveys in Sweden[8,9]. The main methodological problem which affects this work is the likelihood that short trips have been significantly underestimated in the 1994 survey. There has been a systematic decrease in the frequency of trips for all modes, purpose, sex and age groups. This type of trend does not seem to follow real developments. The earlier surveys used personal interviews and the 1994 survey used telephone interviews. The possible reason for the underestimation of short trips is that respondents did not report all their trips in order to shorten the telephone interview. A thorough analysis of the method problems connected to the reporting of short trips is given in Krantz and Vilhelmson[8].

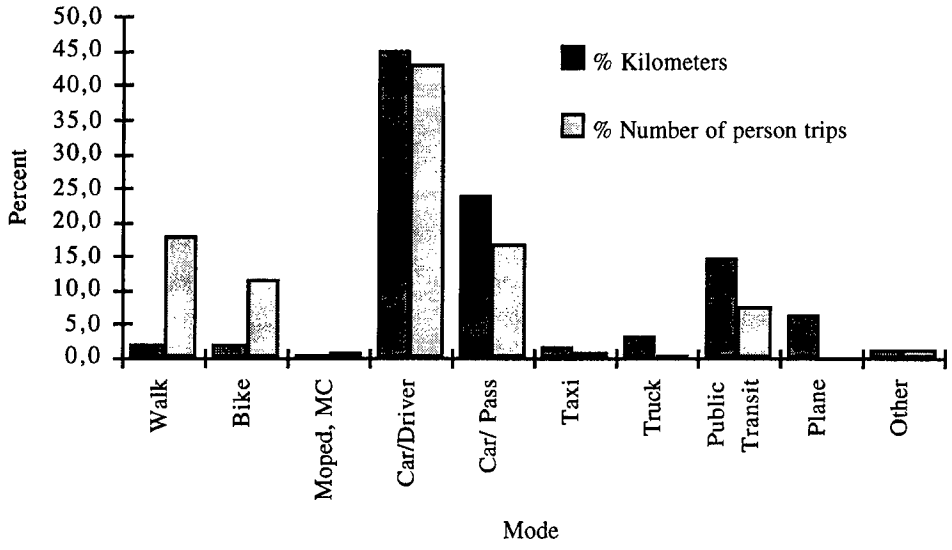
A DESCRIPTION OF MEN AND WOMEN'S TRAVEL PATTERNS IN SWEDEN

In the study year of 1994, the Swedish population between the ages of 6-84 is estimated to have travelled a total of approximately 116 billion kilometers in Sweden. Of these total kilometers travelled, 80 billion kilometers were made in an automobile. 17 billion kilometers occurred using public transportation which includes: commuter trains, trams, subway, buses and regular trains. 6.5 billion kilometers were travelled by plane, 2 billion by walking, and 2 billion kilometers by bike.

The majority of person trips and kilometers travelled in Sweden were made in a car. Of the total kilometers travelled, 69% were made in a car, which represents 60% of the total person trips. Of the total kilometers travelled, 15% occurred using public transportation, which was 8% of the total person trips, and 2.0% of the kilometers were travelled by walking and biking, which stand for 17.8% and 11.4% of the person trips respectively.

A clearer picture of mode use can be seen in Figure 1 where the kilometers travelled and the number of trips are given in the percent in which they are used by the Swedish population. As can be seen in Figure 1, despite the predominance of car use by individuals in Sweden, walking and biking and public transportation still make up 40% of the total trips travelled. The presentation of travel patterns given here describes the overall average use of mode by an idealized 'average' Swedish population, but to what extent do women and men share these patterns?

Figure 1
The Share of Total Numbers of Trips and Total Number of Kilometers Travelled Respectively by Transportation Mode, for the Swedish Population, ages 6-84, in 1994.



SOURCE: Calculated from the 1994 Swedish Travel Survey.

In order to describe the mobility patterns of individuals in Sweden, the number of kilometers travelled during a day and the number of trips made will be interpreted as spatial measures of how individuals relate to their surroundings. One of the most striking differences between men and women's overall travel patterns is the total number of kilometers travelled in Sweden. Men travelled approximately 71 billion kilometers in 1994 which is 61% of the total kilometers travelled. Women travelled 45 billion kilometers or the remaining 39%. In Table 1 below, women are travelling on average 19 kilometers less per day than men.

Table 1
Domestic Kilometers and Person Trips
by Swedish Men and Women, Ages 6-84, in 1984.

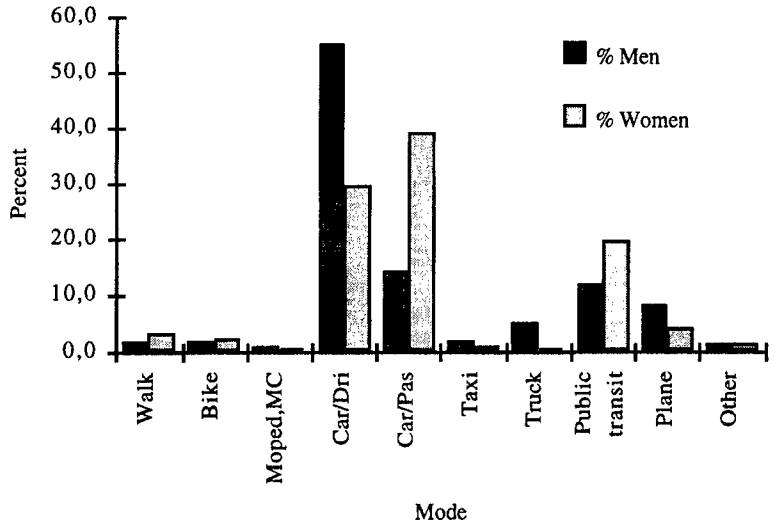
	km (10^9)	% km	Number of Person Trips (10^9)	% Person Trips	Average kilometers per day (km/day)	Per capita trips per day
Men	71	61%	4.4	52%	50	3.0
Women	45	39%	4.0	48%	31	2.8
Total Pop.	116	100%	8.4	100%	40	2.9

SOURCE: Calculated from the 1994 Swedish Travel Survey.

Overall kilometers travelled is one measure of mobility. Another measure is the trips taken per person. In the number of person trips per capita and day, there are small differences between men and women. On this general level, the differences between men and women's travel patterns are predominantly in the extent of travel as measured in kilometers per capita, and less so in the number of trips per day.

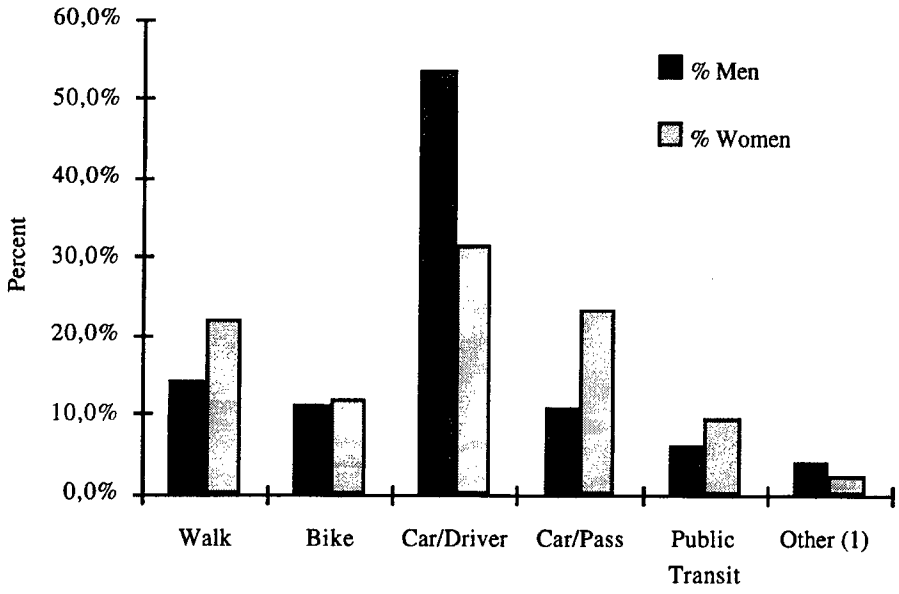
A comparison of the kilometers travelled and the trips per mode can also be used to describe the variety of mode use within the Swedish population in 1994. Women and men are travelling an almost equal share of their total kilometers in a car. This is approximately 69% of their total kilometers travelled. In the number of person trips, women make 54%, and men 64% of their person trips by car. While the total use of the car is very similar in terms of the percent of kilometers travelled, there are striking differences in who drives the car. The study material was collected in terms of who was the driver and who was a passenger. As can be seen in Figure 2, men are travelling 55% of their kilometers as the driver of a car, and 14% as a passenger. Women are travelling 30% of their kilometers as a driver, and approximately 40% as a passenger.

Figure 2
The Distribution of Domestic Kilometers Travelled by Mode,
by Swedish Men and Women, Ages 6-84, in 1994, Percent.



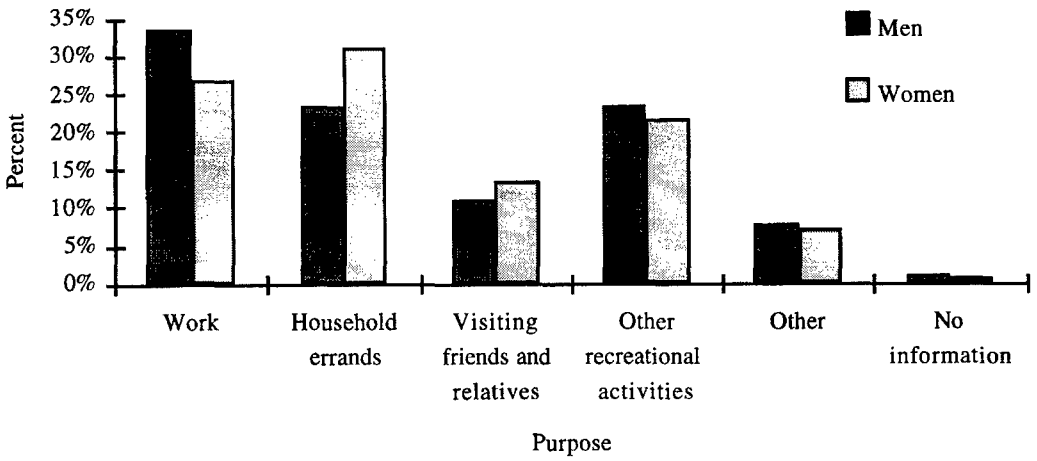
In Figure 3, the frequency of men and women's use of the different modes can be compared. The three most frequently used modes by both men and women are car, bike and public transit. Men and women are, furthermore, each making their largest number of domestic person trips as the driver of a car. Despite these similarities, the distribution of mode use by men and women is slightly different. Women are making more trips by walking and public transportation. Men's dominant use of the automobile overshadows the use of the other modes. The only mode where the percent of men and women's person trips by mode used is almost identical is biking.

Figure 3
The Distribution of Domestic Person Trips by Mode
for Swedish Men and Women, Ages 6-84, in 1994, Percent.



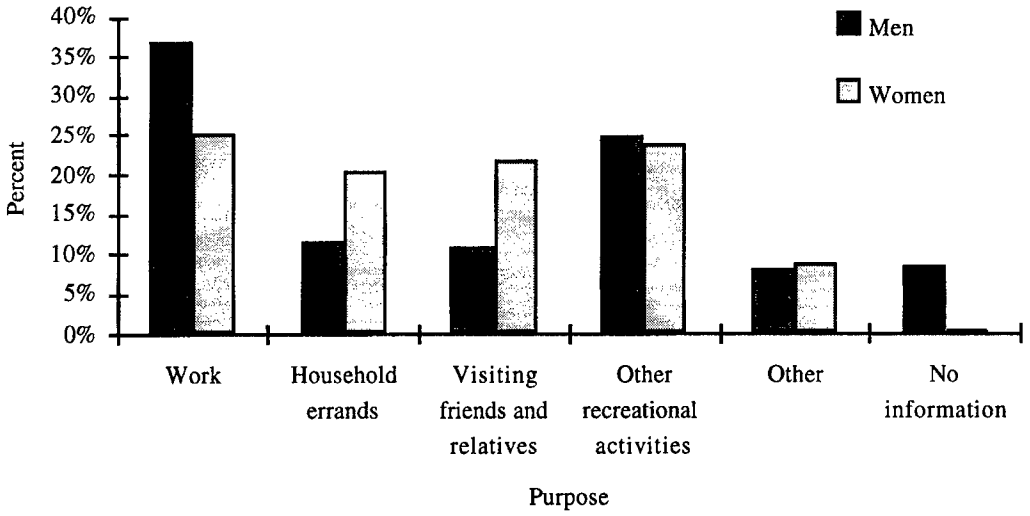
Another important measure of mobility patterns is the purpose for which the trips are taken. Any reduction of the use of the car must concretely take place within an individuals' daily activity patterns. Are some trips more bound in time and space than others? Do all trips need the flexibility that the car offers? The work trip (which includes business trips and the trip to school) while not flexible in time and space, is usually a routine trip with one purpose. Household errands (which include service, health and child care, and shopping trips) are also judged to be routine but not to the same extent as the work trip as they are not as bound to a specific time and place. Trips for visiting friends and relatives and recreational activities are judged to be the most dependent upon individual preferences, and while possibly routine, they are not as externally determined as the work trip. In the survey data, men and women seem to have very similar purposes for their trips. Figure 4 shows that women are making the largest number of their person trips for household errands and second largest to work, while men travel most often to work, and secondly to recreational activities and household errands. The largest differences between men and women are in the number of trips to work and for household errands. As was expected, women are making more trips for household errands. For the entire population, the single largest purpose is the work trip, with household errands with recreational following respectively.

Figure 4
The Distribution of Domestic Person Trips by Purpose,
for Swedish Men and Women, Ages 6-84, in 1994.



The differences in men and women's trip purpose is more pronounced when looking at the kilometers travelled for the different purposes which is presented in Figure 5. Women are travelling an almost equal number of kilometers (from 20-25%) for all of the purposes shown, while men's work trip dominates (37%), followed by household and visiting trips at 11% and 11% respectively. Women and men are travelling and making an almost equal number of trips for recreational purposes.

Figure 5
The Distribution of Kilometers Travelled by Purpose,
for Swedish Men and Women, Ages 6-84, in 1994.



SOCIOECONOMIC VARIABLES : WHY DO MEN AND WOMEN USE THE CAR IN DIFFERENT WAYS?

As has been seen, men and women have similar travel patterns in terms of the overall kilometers travelled by car. Since the previous section has described mobility patterns by grouping men and women as homogeneous groups, this section will deepen the discussion by showing how other factors affect the travel patterns of individuals in Sweden. Since this study of mobility patterns is interested in elucidating the environmental impact of transportation technologies and because the majority of kilometers and person trips are made by car, the following analysis will be limited to kilometers travelled per day by car. While this study will not attempt to unravel the complexities which make up the theoretical discourses surrounding issues of gender, it will attempt to pinpoint the different background variables which can be seen to be connected to mobility patterns. The most important determinant of car use is, of course, access to a car and a driver's license. Driver's licensing rates and access to the car will be presented first. Following this, other background factors which are of interest here will be divided up into those relating to employment status, personal background, life cycle and economic status. The main question to be answered in this section is: Do other background factors besides sex better explain how much men and women use a car on a daily basis?

ACCESS: THE BASIC REQUIREMENTS OF CAR USE

Due to the legal requirement of being 18 or over to attain a driver's license in Sweden, only individuals 18 and older are included in the following presentation concerning access. As can be seen from Table 2, a majority of individuals in 1994, both men and women were licensed to drive in Sweden. For the population between 18-84 years old, 80% had a driver's license. A closer look, however, shows that three-fourths of the unlicensed persons are women and only one-fourth are men.

Table 2
Automobile Licensing Rates of Swedish Men and Women, Ages 18 and over in 1994.

	License			No license		
	Number (millions)	% (men and women)	% of total	Number (millions)	% (men and women)	% of total
Men	2.9	55	89%	0.3	26	9%
Women	2.4	45	71%	0.9	74	27%
Total Pop.		(100)			(100)	
over 18	5.3		80%	1.2		19%

SOURCE: Calculated from the 1994 Swedish Travel Survey.

Licensing rates of women are dependent upon the age cohort to which they belong. The older female age groups have progressively lower licensing rates, than the younger. Of the 1.2 million unlicensed individuals shown above, half of these are elderly women. Those remaining are divided between all the age groups, though in every age category there are more women without a license than men. Women's licensing rates begin to decrease in the age groups 54 and over while men's only decrease a substantial amount in the over 75 age group.

While fewer new cars were being bought in the late 1980s to the early 1990s due to an economic recession, the number of cars on Swedish roads has still increased. From earlier national travel studies in Sweden it can be seen that the percent of households with access to a car has grown from 74% in 1978, to 77% in 1984/85, and to 80% in 1994[8, p. 20]. The number of households with more than one car has also increased. In 1978, 17% of the representative population had access to more than one car in their household. In 1984/5 and 1994, this number had increased to 20% and 26% respectively[8]. There were 2.9, 2.7, and 2.5 individuals per car, respectively, in Sweden in the study years noted above[8, p. 20].

Since there has been a clear increase in the number of individuals who have access to a car, it can be assumed that both men and women in some way share this increase in access to the automobile. While this is the case on a general level, when age is also taken into account, there has not been an increase in car disposition for all age groups. In Tables 3 and 4, these differences can be seen in both the different age groups and in the total population.

Table 3
Percent of Different Age Groups Who Had a Driver's License and Access to a Car in the Household, 1979, 1984/5, and 1994.

Percent of individuals with driver's license and access to a car				
Age	Sex	1978	1984/5	1994
18-24 years	Men	72	73	58
	Women	46	57	46
25-64	Men	84	87	87
	Women	60	69	75
64-84	Men	43	58	77
	Women	7	16	34

Source: Krantz and Vilhelmson, 1996a, p. 21.

In Table 3, it can be seen that for individuals between the ages of 18 and 24, car disposition had decreased for both men and women from 1984/5 to 1994. The reasons for this can be due to the high unemployment rates of this group and the financial limitations which this results in[8]. It is interesting to speculate on what impact this decrease in licensing in the younger age group will have in the future. Will these individuals obtain a license and car as soon as they are financially able, to the same extent as has been the case previously? In the other age groups the differences between men and women is similar to what was noted in the licensing rates. While there has been a decrease in the number of younger individuals who obtain a driver's license, there has been an increase in car disposition in the other age categories. What is interesting to note is that the increases in car disposition of women between 1978 and 1994, while substantial in the older age groups, has still not reached the same level as men. Age cohort effects are more strongly seen in women's access to a car and driver licensing rates than in men's.

In the Swedish population in 1994, 80% of the individuals had access to one or more cars in their household. The percent of individuals with access to a car differs by age, sex and household composition. For all age groups, including children, 77% of the women and 86% of the men had one or more cars. As can be seen from Table 4, 19% of the men and 38% of the women between the ages of 18 and 84 did *not* have access to both a car and a driver's license in 1994. In all age groups, there were more women than men who did not have a car in their household. From Table 3, these differences were noted as being age dependent. However, even with regard to age, women are still not only licensed to a lesser extent than men, they also have less access to a car in comparison to men.

Table 4
Car Disposition for Swedish Men and Women, Ages 18-84,
in 1994, Percent of Total and Percent Men and Women.

	No car access				**Car access**					
	No License		License		No License		License		**Total**	
		total		total		total		total		total
Men	30	7	44	8	23	4	57	82	50	100%
Women	70	16	56	9	77	13	43	62	50	100%
Total	100%	11	100%	9	100%	8	100%	72	100%	100%

Car access can also be analyzed with regard to household type. A majority of households in Sweden are composed of cohabiting couples. Of the Swedish population in 1994, 28% were living in single adult households, and the remaining 72% were living in cohabiting adult households. The largest group of individuals live in cohabiting households with children. This group makes up 39% of the population. The second largest group is cohabiting individuals without children which make up 33%. Of the single households mentioned already, 6% have children. The majority of these are headed by women. As can be seen from Table 5, higher car access is correlated to cohabitation, and to the presence of children. This can be due to the expense of buying and using a car in Sweden and the obvious fact that cohabitation results in an increased income for the household, as well as the fact that children tend to increase the mobility needs of family life. From this study, it is obvious that while the Swedish population is more or less motorized, there are still a large number of individuals who do not have access to a car. Of these, a substantially higher percentage are women.

Table 5
Percent Men and Women in Sweden in 1994,
Ages 6-84, Who Had Access to One or More Cars, by Household Type.

	Single		Cohabiting	
	No Children, %	Children, %	No children, %	Children, %
Men	62	74	92	96
Women	34	60	90	96

SOURCE: Calculated from the 1994 Swedish Travel Survey.

Access to a car can explain the difference in men and women's use of the car in the number of trips which are taken by car as compared to other forms of transportation. It is more difficult to use access to explain the differences in the length of men's travel in comparison to women's. For all households with two or more cars it can be assumed that, in a traditional household, both adult individuals have access to one car. As noted earlier, such households made up approximately one-fourth of the population in 1994. How is car access for the remaining three-fourths of the population? Of the cohabiting households, 60% had one car, 35% had two or more cars, and 6% had no car. It is within the cohabiting households with one car where access to the car is of interest. How is this shown in the length of men and women's daily car travel?

In Figures 6 and 7, household categories for single and cohabiting individuals are given in terms of the average daily travel length by car, and in terms of the number of cars per household. Kilometers travelled per day were calculated from total kilometers travelled by car including both as the driver and as the passenger. Since men are the dominant driver's in Sweden, these figures are different when calculated only for kilometers driven. Because this paper is concerned with the environmental impact of car use, driver or passenger status is not distinguished. For single men and women with one car men are travelling 15 kilometers more per day than women. Though 60% of cohabiting individuals have access to one car, their daily travel lengths by car, show a difference in the extent to which the car is used by men and women. For both single and cohabiting households with one car, men are travelling 50% more than women travel per day by car. As can be expected, cohabiting women in two car households are travelling more than both single women with a car and more than cohabiting women with one car. Cohabiting women with one car are also travelling approximately 10 kilometers more than single women with one car. An interesting difference to note here is the difference in daily travel lengths by car of cohabiting individuals with two cars. Even though women can be assumed here to have equal access to a car, men are still travelling, 15 kilometers more per day by car than women. For households with three or more cars it can be assumed that neither access nor financial pressures limit travel patterns. It is only here, in a group which represents only 5% of the population, that men and women's daily use of the car is very similar.

Figure 6 Average Kilometers Travelled Daily by Car and Number of Cars in Household, by Single Men and Women in Sweden in 1994.

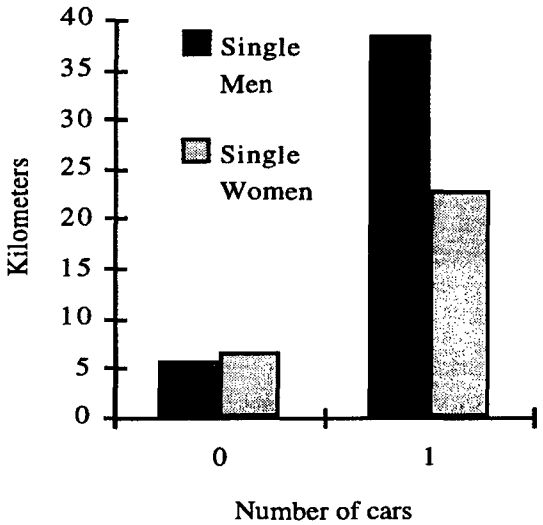
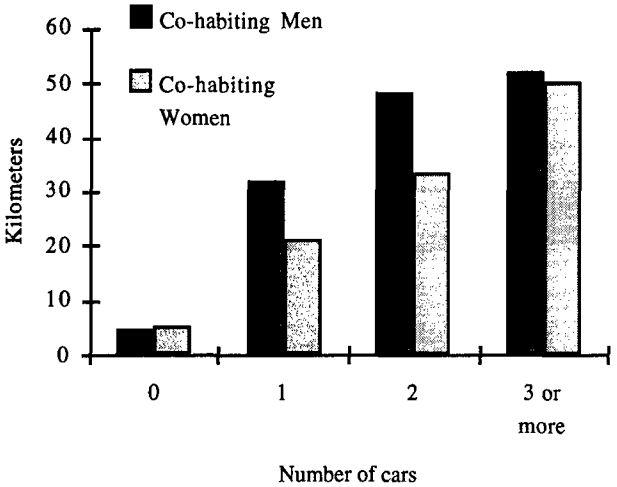


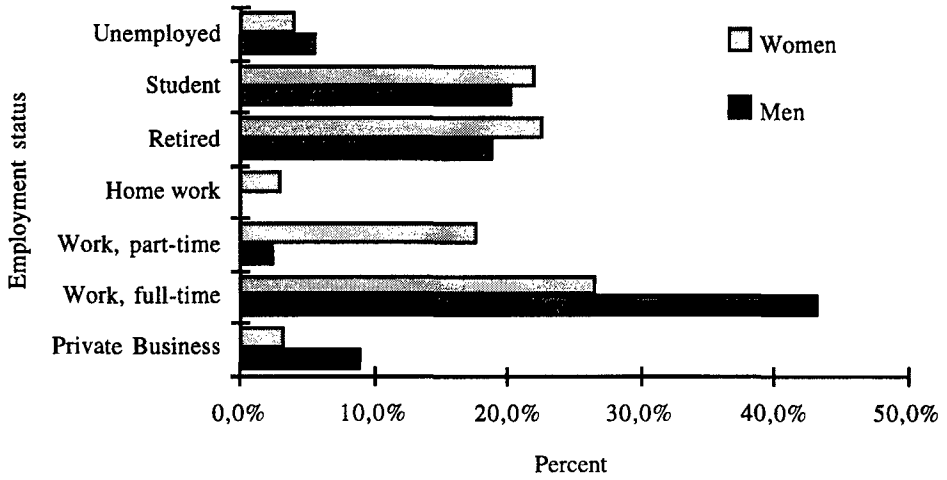
Figure 7 Average Kilometers Travelled Daily by Car and Number of Cars in Household, by Cohabiting Men and Women in Sweden in 1994.



Sweden, despite being considered one of the countries in the world which has the best equality between men and women, still exhibits gendered differences in occupational segregation, hours worked per week and wages. The main difference between men and women's employment is in the number of each who are employed, the type of employment, and the number of hours which are worked per week. In 1995, 80% of women between 20 and 64 were in the workforce, 45% worked full-time, 29% part-time, and 5% were unemployed[10, p. 40]. Though women's participation in the work force has increased greatly from 1970, the largest increase has been in part-time employment. Men's employment has changed most since 1990, with the largest increase in unemployment levels. In 1995 85% of men between 20 and 64 were in the workforce, 71% worked full-time, 7% part-time, and 7% were unemployed (10, p. 41).

As can be seen from these figures, while men and women do not differ greatly in the number who are active in the workforce, there are striking differences in the number of men and women who work part-time. Another important difference between men and women's employment is the job segregation which is still evident in most occupations. Of the 30 largest occupations in Sweden in 1990, *only 3* had 30% or more of the sex which was least represented[10, p. 44]. Traditional women occupations are secretarial, medical, educational and service oriented. Men dominate in most of the remaining occupations. Are these employment and occupational factors connected to the use of the car?

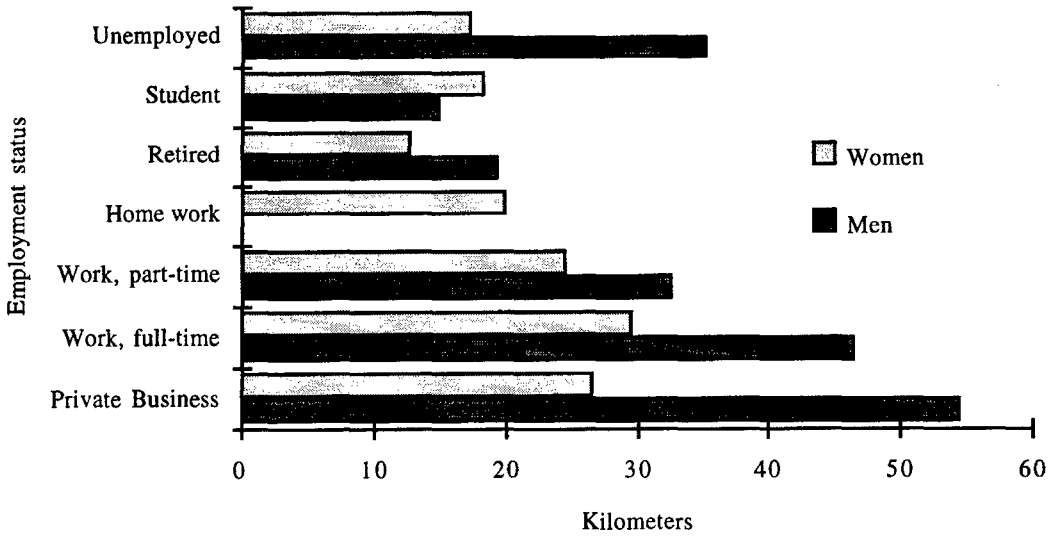
Figure 8
Distribution of Men and Women by Employment Categories in Sweden in 1994, Ages 6-84, Percent.



In the 1994 travel survey data, 54% of the individuals between 25 and 64 were working full-time. This represents 66% of the men and 42% of the women in these age groups. Of the comparative men and women who were working part-time there were 3% and 30%, respectively. The question to be raised, once again, concerns the differences between men and women. If part-time employment is seen as a reason for women's shorter travel lengths, does full-time employment increase it to the comparable lengths of men?

In Figure 9, the average travel lengths per day were calculated by employment status. From this figure, the extent of women's daily use of the car increases only slightly with full-time employment. There is a difference of 5 kilometers between the travel lengths of women working full-time and working part-time. Men working part-time travel, on average, 8 kilometers *more* by car than part-time employed women. The only category where women are making longer trips by car are for studying individuals. Unemployed and retired men are also making longer trips than their respective women, though these are the categories where travel by car is shorter.

Figure 9
Average Domestic Kilometers Travelled Daily by Car, by Employment Category, for Swedish Men and Women, Ages 6-84, in 1994.



An important aspect of women working full-time is the increase in salary that this entails. In Sweden in 1994 women were earning 78% of men's salary within the private sector, and 83% within the public sector[10, p. 55 and 57]. The difference in men and women's wages is often seen as being due to job segregation, where typically female employment, such as teaching, nursing and service jobs, are less paid than men's. Even women with college degrees do not earn as much as their representative men. Within the public sector in Sweden, college educated women earn between 85-89% of men's salary.[10, p.57] Increased hours worked per week does not put women on the same wage level as men, though women working full-time are, of course, earning more than part-time workers.

As seen in the preceding section, access to the car is not adequate in explaining the differences between men and women's daily use of the automobile. Other approaches to this topic in the United States, where the largest amount of research concerning men and women's travel patterns has been conducted, have also analyzed the importance of how the location of home residence and work place affect women's travel pattern lengths. While any sort of direct comparison between Sweden and the United States is inadvisable because of the incomparability of the differences in urban planning and residential living evident in the two countries, an attempt will be made here to draw from research in the US and present what might be applicable to the Swedish case.

Studies concerning the importance of urban planning and employment locations on women and men's geographic mobility have been presented by researchers in various fields. Susan Hanson and Geraldine Pratt, for example, have shown how the geographical dimensions of sex segregated employment differ for men and women in a study done in Massachusetts[11, 12, 13]. Martin Wachs has discussed how men and women's lives in the US have developed within what he refers to as 'separate spheres'[14, 15]. The spatial location of jobs and the suburbanization of America are obviously important factors which structurally constrain women's travel patterns in ways that differ from the constraints that men experience. Hanson and Pratt in 1995 note, when discussing the development and the persistence of the separation of the private and public spheres in America, that:

> The same distance that would pose no problem to men would be an insuperable barrier for women and would suffice, therefore, to prevent their entry into the paid workforce. The urban/suburban-public/private dichotomy rests, then, on the assumption of a profound difference between women and men in their ability to overcome distance and on its corollary that women and men living in the same location are not likely to have access to the same set of opportunities[13, p. 95].

Though it is perfectly clear that women in the US in many ways have overcome the suburban isolation implied in the above quote, there are still significant differences between men and women's travel lengths as has been shown in numerous studies[13, 16]. Suburbanization is a topic which has not received much attention in Sweden because Swedish demographic patterns are instead distinguished by rural and urban living patterns. Approximately 80% of all Swedes live in urban areas. Another important difference between the two countries is the higher density of urban residential and apartment living in Sweden which would not, on initial inspection, lead to the same separation of household and work place which is so evident in the United States. Importantly though, the results of Hanson and Pratt show that: "Spatial fixedness is central to female labor // Geography is also the medium through which the gendering of the matching process between employers and employees occurs"[12, p. 396]. Even though a direct comparison is impossible to make, it is still interesting to suggest that since a large number of women are employed in predominantly female occupations and show shorter work trip lengths, that similar geographical patterns may be evident in Sweden. It is therefore possible to posit that the location of female and male dominated employment in Sweden follows patterns which result in different commuting lengths for men and women. In order to test such an assumption in Sweden, future work is needed to explore these dimensions.

To apply the previous discussion to the Swedish case, in Figure 10 the length of men and women's daily work trip is presented by employment category. The work trip has been defined to also include the trip to school for comparative purposes. As can be seen from this figure, women's worktrip lengths differ considerably from men's. Full time employed men have daily work trip travel lengths which are twice as long as their respective women. Part time employed men have a daily work trip length which is 40% longer than the travel lengths of women who work part time. The travel lengths of students show small differences between men and women.

Figure 10
Average Kilometers Travelled in the Work Trip, Per Person and Day,
for the Swedish Population, Ages 6-84, in 1994.

It is clear from the material that men are travelling longer than women in almost all of the material presented thus far. The work trip was seen to make up 32% of all the kilometers travelled, and this difference has also been looked at in terms of employment. Though the differences in the work trip length are clear, is this enough to explain the differences between men and women's overall travel patterns?

LIFE CYCLE : AGE, HOUSEHOLD COMPOSITION, AND PRESENCE OF CHILDREN

In this section, life-cycle characteristics which include age, household composition, and presence and age of children, will be presented by kilometers travelled by car per person and day. It has already been noted that cohabitation and the presence of children increases car access and travel lengths per day. In the following, the average lengths of car trips per person and day, will be presented for single and cohabiting women and men, with and without children.

In Figures 11-15, the average kilometers travelled by car per person and day was tabulated, for ages of adults and children, and household composition. As can be seen in these figures, men have substantially longer average travel lengths in all categories besides single and cohabiting individuals with older children and for individuals over 65. As was noted in the section on access, cohabitation increases the number of kilometers travelled by car, but in different ways for men and women. While all categories of single individuals travelled less than their respective cohabiting group, the differences between them varied considerably.

Figure 11 Average Daily Domestic Travel by Car, and Access, by Single Men and Women With Children, in Sweden in 1994.

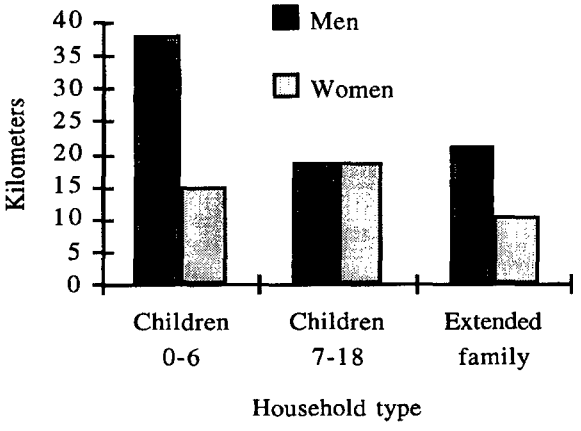
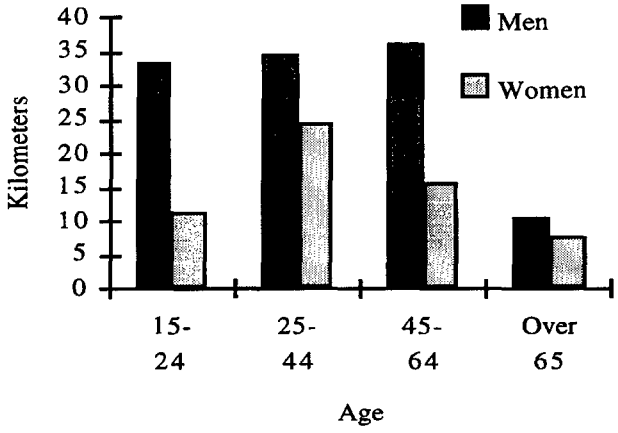


Figure 12 Average Daily Domestic Travel by Car, and Access by Ages of Single Men and Women With No Children, in Sweden, in 1994.



While the pressures of single parenthood are well known, they influence men and women's travel patterns in different ways. It has been shown in studies outside of Sweden, that women are the primary chauffeurs of children in the family and that women's travel is dependent upon the presence and age of children, while men's are determined by other factors.[17, 18] Though respondents were not asked how much they chauffeured their children, it can be deduced from Figure 11 and 14 that because women's daily trip lengths by car increase slightly with older children, and men's decreased, that similar patterns are also evident here. The only time when the daily travel lengths by car between men and women are similar is with single and cohabiting parents with older children.

Figure 13
Average Kilometers Travelled by Age, Per Person and Day,
by Cohabiting Individuals Without Children, in Sweden in 1994.

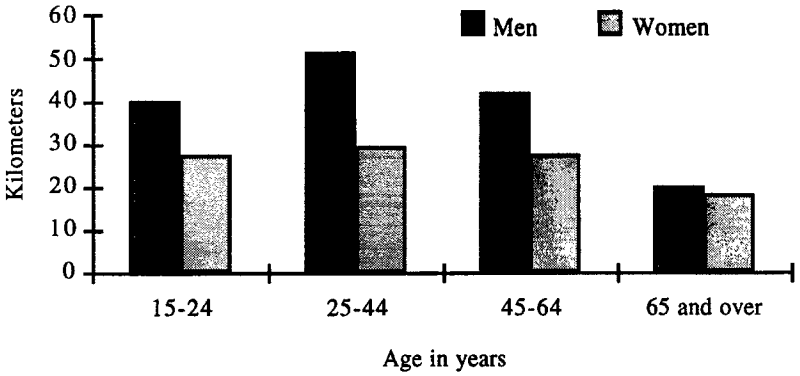
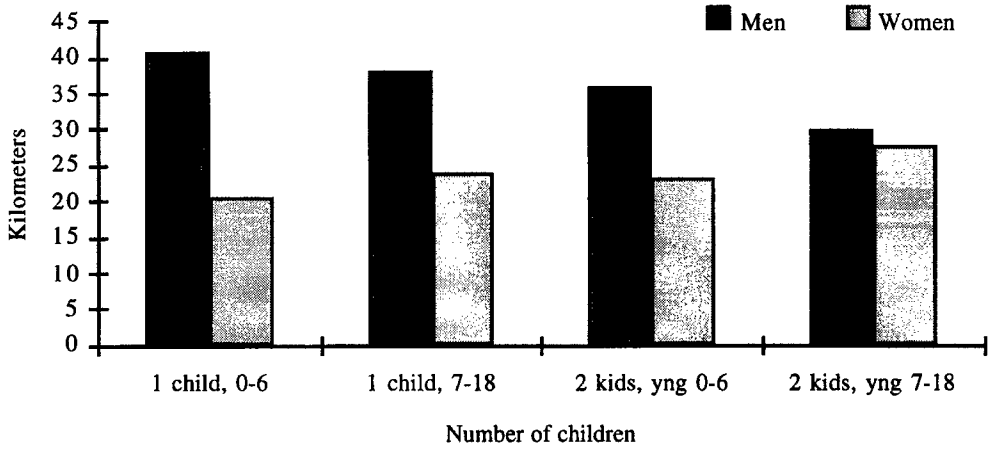
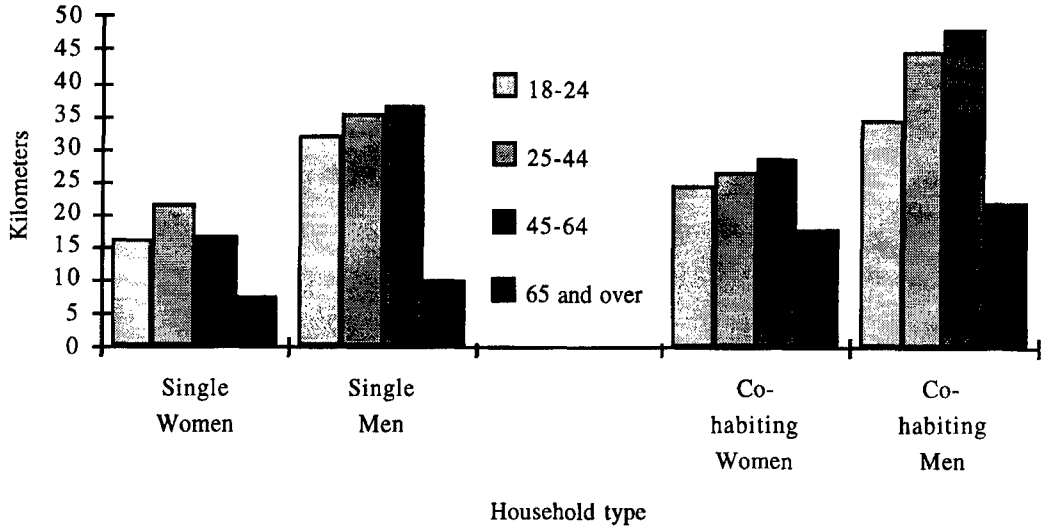


Figure 14
Average Daily Kilometers Travelled by Car, Per Person in Sweden in 1994,
by Cohabiting Individuals With Children, and By Age of Youngest Child.



As is evident in Figures 12 and 15, single and cohabiting men without children under 65 have average daily travel lengths by car which are significantly longer than the respective women. If children were the factor limiting women's travel then these differences would be expected to be less.

Figure 15
Average Daily Kilometers Travelled by Car, Per Person,
by Age and Household Status in Sweden, in 1994.



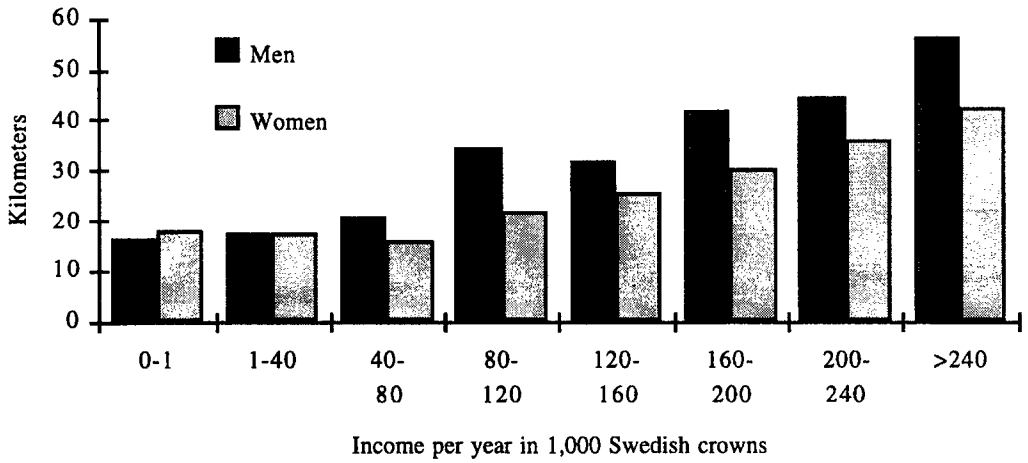
A more direct comparison of the travel lengths of single and cohabiting individuals in Figure 15, shows that cohabiting men, as they increase in age up to 65, have proportionally longer average daily travel lengths than the respective women. From the tables presented in this section, household types and presence of children can be seen to affect the daily travel lengths by car of men and women. Couples with children exhibit longer travel lengths per day, by both men and women, mirroring the spatial complexity that family life demands. While men's travel lengths decrease with the presence of children and the age of their children, women travel farther with older children than with younger. Children in the survey, from the ages of 6-15, are making 45% of their trips as the passenger in a car and 43% by walking and biking. Most urban areas in Sweden have well-developed bike paths which are often completely separated from the roads. Public transportation is also used by children, though to a lesser extent. Of the person trips made by children 1994, 7% were made by public transportation.

If the degree of social equality can be seen in travel patterns, then the above results imply that men and women are not socially equal. If women and men's lifestyles are mirrored in different spatial orientations to their surroundings, then women's lifestyles show a more spatially limited scope of activity. Is this spatial limitation a result of social limitations, or are women more socially limited because they are denied full spatial equality? One way out of this circular causality can be to acknowledge the fact that women and men's social positions are not the same, therefore the fact that their travel patterns are different is to be expected. In Sweden, where sexual equality is considered to be one of the highest in the world, equality between the sexes is still not evident, as was mentioned, in employment status and wages. Since women have traditionally been seen as the main caretakers in a household, this has been cited as a reason for their shorter travel lengths. However, in comparison to many other countries, parents in Sweden are not completely responsible for childcare. Governmental daycare in Sweden is subsidized and considered a right for all, as well as a paid year of parent leave, subsidies for children under 18, rent subsidies for single parents, dental care subsidies for children, medical care coverage and paid sick leave. The current government, as well as the previous, however, is dismantling the Swedish welfare state which has initiated budget cuts by taking away many of the various subsidies which are mentioned here. Despite these recent changes, the combination of working full-time joined with the responsibilities for children should constrain the temporal and spatial resources of men as well as women.

In an earlier study done on men and women's travel patterns in Sweden, it was suggested that travel patterns are more determined by income levels than by sex[19, p. 29]. Since the automobile is expensive to buy, use and maintain in Sweden, it is obvious that higher income could potentially increase the daily use of the car. Because of the substantial taxes on gasoline and on cars, in 1992 Swedes spent between 14-20% of their total income on transportation. Since men were also seen to earn more than women in the population in general, and in comparable salaried jobs, men obviously have more income at their disposal to spend on car use.

Figure 16

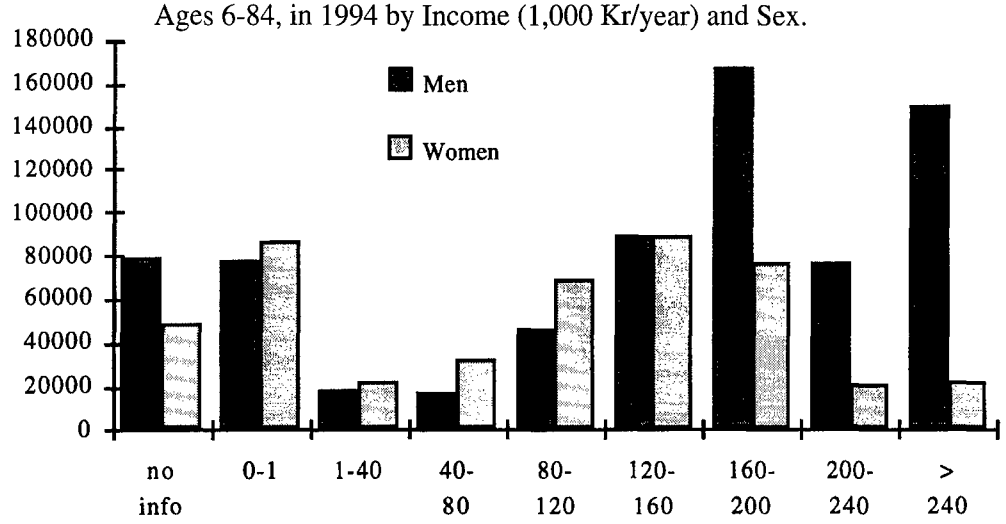
Average Daily Kilometers Travelled by Income (1,000/year) and Sex, for the Swedish Population, Ages 6-84, in 1994.



One of the limitations with the 1994 study is the few number of women in the highest income groups, and the few number of men in the lower. The lowest income group is predominantly children and individuals under 24 years of age. The number of interviewed women in the two highest income groups were very few in comparison to the number of men. While this may well reflect the economic differences between men and women in Sweden, it may not adequately represent their travel patterns. With that limitation in mind, the following will look at kilometers travelled in the different income groups. Do higher income women travel as many kilometers per day as men?

As can be seen in Figure 16 and 17, higher income men travelled a larger number of the kilometers in 1994 than did higher income women. In Figure 16, the average daily kilometers travelled have been calculated for the different income groups to better compare men and women's travel. Income, in Figure 17, is compared to the total kilometers travelled by the different income groups and is not calculated per person. What this table does show is the distribution of kilometers travelled in the population. As is to be expected, higher income is correlated to a larger number of kilometers travelled per day by both men and women. For the population over 18, car disposition also increases with income for both men and women. Higher income women have more access to a car than lower income women and lower income men, but not more than higher income men.

Figure 17
Total Kilometers Travelled in Sweden,
Ages 6-84, in 1994 by Income (1,000 Kr/year) and Sex.



The effects of income, however should not be overestimated. While women's daily travel lengths do increase with income, they are still substantially shorter than their respective men.

ON THE ROAD TO SUSTAINABLE MOBILITY

The two themes that were mentioned by way of introduction, social equity and ecological sustainability, deal with mobility patterns differently. While the previous sections of this paper have presented and analyzed men and women's travel patterns and daily use of the car, this concluding section will place the discussion of travel patterns within the theme of ecological sustainability. The sustainability of transportation is complicated by the fact that there are a variety of different types of transportation technologies that are used today. One thing which many of these technologies have in common is their use of fossil fuels. The impact of fossil fuel consumption on the environment is a well researched topic. The emissions which are seen to be most responsible for environmental and health problems are carbon dioxide, nitrous oxides, and hydrocarbons as well as particle emissions, as was mentioned in the introduction. Preliminary goals by the Swedish government want to return carbon dioxide emissions to their 1990 levels, with reductions after this goal is reached. There has been a 5% increase in carbon dioxide emissions from the 1990 level today. The 1995 goal of a 30% reduction of nitrous oxides was not met, though a 3% reduction of nitrous oxides has occurred since 1993[20, p. 14]. The goals for VOC's reductions were to reach 60% of the 1988 level, and thereafter not increase[21, p. 145-147]. Furthermore, if no increase of carbon in the atmosphere is the goal, than 50-70% reductions of carbon dioxide emissions would be needed[9, p. 43].

In order to reach these national goals, travel patterns must be seen in terms of their contribution to air pollution. Road transportation in Sweden is responsible for 40% of carbon dioxide emissions, and half of these come from the use of the car. Half of all nitrous oxide emissions come from the transportation sector with road traffic as the dominant source. In Table 6, the Swedish Environmental Protection Agency calculated the share of pollutants that come from the private use of the automobile in Sweden.

Table 6
Cars Percent of Emissions in Sweden, Kton

	Car use, kton	Total, kton	Cars percent of total, %
No_X	92	386	24
CO_2	12,000	60,000	20
HC(VOC)	125	500	25

SOURCE: Reproduced from *Biff och Bil? Om hush Œllens miljšval.* Z, p.21.

Any discussion concerning the environmental damage which is inherent in the use of transportation technologies must not only take fuel use and efficiency into consideration, but also the occupancy per vehicle. Since both men and women travel 69% of their kilometers in a car, the occupancy of this mode is important to elucidate. The best estimations of vehicle occupancy that can be obtained from the study material are that men travel approximately 50% of their kilometers and person trips as the single occupant of a vehicle. For women, one fourths of her kilometers were travelled alone. Despite the fact that men and women are proportionally travelling an equal number of their respective trips by car, a closer look at the characteristics of this use shows a difference in the extent that it impacts the natural environment since energy use per person kilometer decreases with higher vehicle occupancy.

Some of the difficulties involved in comparing the environmental impact of the different travel modes are due to: the types of transportation technologies which are used, the presence of a catalytic converter or not in the car fleet, the use of preheaters in the car fleet, the length of the trips made, and a lack of knowledge of the actual loads. One half of the Swedish car fleet, for example, are equipped with catalytic converters, and 30% with engine preheaters. Because of these difficulties, the environmental impact of the modes will be discussed in terms of energy per person kilometer travelled. Following Lenner's 1993 calculations of energy use and emissions for the different transportation modes in Sweden, these modes were compared and categorized into low energy and high energy intensive[22].

There were 24 different possible travel modes which were divided up into three groups. The first group is called *high energy intensity* modes and includes: car as driver and passenger, moped, motorcycle, taxi, truck, plane, snow mobile, tractor, rental car, and limousine. The second group is called *low energy intensity* modes and includes: walk, bike, train, commuter train, tram, subway, and bus. The third group is referred to as *other* and includes: ride to school, boat, sea traffic, and commercial driving. Since the 'ride to school' was stated as such, mode use was impossible to identify. Boat traffic was also minimal and not categorized because of the variety of boat traffic which includes ferries and private boats.

The above categorization is a rough simplification of the differing emissions and energy use per person kilometer which distinguish the above travel modes. The categorization was based upon two observations. First of all, the modes were judged on the basis of their energy use per person kilometer travelled. Using a value of 0.25 kWh/pkm, all modes above this value were placed in the high energy intensive category, and all below in the low energy intensive value. This number was arrived at by comparing the energy used per person kilometer of the different travel modes. Secondly, due to insufficient data, energy use per person kilometer was not judged on the actual load factors which were used, but on a comparison of available figures on average energy use per passenger kilometer[a.] [22, p. 12-17].

Table 7
Kilometers Travelled Differentiated by the Energy Intensity of Travel Modes, and Sex, in the Swedish Population, Ages 6-84, in 1994, Percent

	Low Energy Intensity Modes		High Energy Intensity Modes		Other	
	% km's	% of total	% km's	% of total	% km's	% of total
Men	48.5	14.9	63.6	83.8	51.3	1.3
Women	51.5	24.3	36.4	73.8	48.7	1.9
	(100%)		(100%)	(100%)		
% Total		18.6%		79.9%		1.6%

SOURCE: Calculated from the 1994 Swedish Travel Survey.

In Table 7 it can be seen that of the 71 billion kilometers travelled by men in Sweden in 1994, 84% occur using modes types which are high energy intensive. While men and women travel an almost equal number of kilometers in the low energy intensive modes, this only represents 15% of men's total kilometers, but one fourth of women's. Of the number of person trips made by the different modes, women are travelling approximately half of their trips by the high energy modes, and men two-thirds of their person trips by high energy modes. While women do travel three-fourths of their trips by high energy intensive modes, this is one-third of the kilometers travelled by high energy intensive modes, the remaining two-thirds being travelled by men. Of the 45 billion kilometers which are travelled by women, three-fourths are using high energy intensive modes and one-fourth are made in low energy intensive modes.

CONCLUSIONS

There are many theoretical discussions concerning the reasons behind the differences in men and women's spatial mobility. Differing spatial needs are not only dependent upon women's traditional role in the family, and on women's position as 'socially inferior' with regard to wages and occupational segregation, but also on structural factors such as the location of jobs and access to transportation facilities which limits the available job market of women. Many women may also choose to work closer to home to enable them to spend less time travelling and to be more available for their households should the need arise, but this fact should not limit their access to employment opportunities, nor can it be seen in isolation from the spatial constraints which women face. More specifically, it can be suggested that social inequality has a component of concrete spatiality which is not only a result of individual decisions, but also a result of how society is structurally organized.

This paper has tried to pinpoint the background factors that can be correlated with why men and women have such different travel patterns. It has been seen that household composition, employment, age and income affect the number of kilometers that are travelled daily in a car. In general, the activity patterns of working, middle-aged couples with children are spatially wider in scope than other members of the population, but single men still travel substantially longer per day than both single and cohabiting women. Income is another important factor which, when low, limits the daily travel lengths of both men and women, but when high, increases men's daily travel lengths more than women's. It can be summarized that background factors, especially income, are important in determining daily travel by car. However, in almost all of the material presented and despite the effects of, for example, household composition and income, women are still making shorter daily trips by car.

From the results of this study, women's mobility patterns are judged to be more ecologically benign than men's because of first, the fewer kilometers which are travelled by women, second, the fewer number of kilometers women travel as the sole occupant of a vehicle, and third, the fact that women use high energy intensive modes to a lesser extent than men. This difference in mode use refers to the frequency of women's trips by walking and public transit in comparison to men's. For these reasons, women's travel patterns can be seen to have a higher actual adaptability to a transportation system which is ecologically sustainable and socially equitable. This is due again to the fewer kilometers which are travelled per capita by women and the modes which are used, but also by the fact that women's daily trips by car are, in almost all of the examples given, substantially shorter than men's. An ecologically sustainable transportation system is one in which the private use of the automobile would be much more limited than it is today, and where walking, biking and public transit would fulfil some of the needs which are currently met by the automobile. Shorter daily travel lengths can more easily be substituted by low energy intensive modes, such as walking and biking.

Social equity and ecological sustainability have been the starting points for an analysis of men and women's travel patterns. If it is the case that women are limited socially because of spatial limitations or that they are spatially limited because of differing social roles, one way of increasing women's equality with men could be by increasing women's access to a wider range of spatial activities. Despite the complexity of reasons underlying social inequalities, if social equality is the goal and spatial equality is the means then equal access to transportation technologies can be seen to be a necessity. An increased use of the car would result in increased environmental degradation. If social equality is dependent upon spatial access, then equality between men and women can not be attained with the present transportation patterns and infrastructures in Sweden at the same time that the goals of reducing carbon dioxide, nitrous oxides, and hydrocarbons are met. In other words, the spatial patterns that are seen today in Sweden can only be sustained for a minority of the population.

Any policies which try to reduce travel by car must clearly understand the importance of transportation for present lifestyles in Sweden, and the consequences that the differing impact of political initiatives would have on differing members of the population. Some current proposals for the next national transportation plan in Sweden emphasize economic measures, such as gasoline and road taxes, because they are seen as being both effective in reducing emissions, and politically feasible. Technological developments combined with taxes are one suggestion for reaching the goals for reduced emissions. Such initiatives would especially impact women, children and the elderly by financially limiting their travel. Since these groups already travel less by car, such measures would only increase the inequalities that are already obvious today, and place further financial pressures on lower income individuals and households. Another factor which would need to be studied is the organization of public transportation schedules. Are the transit needs of individuals who work part time being met to the same extent as those that work full time? Peak hour traffic tends to get more resources and attention than off hour traffic. How does this affect the quality of transit that is available for different groups of the society? As stated prior, ecological sustainability can not be reduced to user pay strategies where money determines car use, it must also be reached with as much social equity as is possible and this means supporting and financing forms of transportation that are accessible by all members of the population.

It can, finally, be suggested that the differences which are evident in men and women's use of the car are based on more personal and individual factors having to do with preferences, attitudes, values and experiences which can be related to automobility. Environmental attitudes, for example, have, in other studies in Sweden, been seen to differ on the basis of sex, where women are more often, more environmentally minded than men. Technological systems have also been seen to have symbolic aspects which are more

or less masculine or feminine, ones such as the automobile falling in the prior category. Experiences of technological systems can also be judged to be more or less alienating or suitable for men or women. A questionnaire study has been done in Gšteborg, Sweden by the author to unravel these factors which may better explain women's limited use of the car in comparison to men's. Questions range from general environmental opinions to questions concerning the respondents competence in simple car repairs. The survey material presented in this paper and the questionnaire study mentioned above will be presented in a doctoral thesis being done at the Institution of Interdisciplinary Studies of the Human Condition, Section for Human Ecology.

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* This paper is a background chapter for a doctoral thesis being presented at the University of Gšteborg, Institution of Interdisciplinary Studies, Section of Human Ecology.

ENDNOTES

a. 1993 energy use was averaged with 1995 kWh/pkm. For short trips the following values were used: Car (1.2 passenger)- 0.884, Bus-0.218, Commuter train-0.116, and Tram-0.189. For long trips the following values were used: Car (2 passengers)- 0.321, Bus-0.128, Train- 0.141, and Plane- 0.74-0.92. p. 12-17.

b. This is: ride to school, boat, sea traffic, and commercial driving.

The Urban Travel Behavior and Constraints of Low Income Households and Females in Pune, India

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THE URBAN TRAVEL BEHAVIOR AND CONSTRAINTS OF LOW INCOME HOUSEHOLDS AND FEMALES IN PUNE, INDIA

INTRODUCTION

In many cities in developing countries rapid population growth has meant that housing has developed in areas inadequately served by public transport services. This can have an effect on the quality of life of residents of these areas in terms of access to employment, shopping and medical facilities.

Before resources are allocated to increasing public transport provision in areas inhabited by the urban poor, it is necessary to discover what improvements need to be made to the network. This can be achieved by undertaking surveys of residents on travel demand using a questionnaire to obtain data on frequency and mode of travel, problems incurred when making journeys etc. In addition, it is also necessary to obtain background information on the area studied and the culture of the society being examined as these factors can have a major influence on travel behavior.

As part of an Overseas Development Administration funded Technology Development and Research (TDR) program, the Transport Research Laboratory is undertaking studies of urban travel behavior in three developing country cities: Accra in Ghana, Medellín in Columbia and Pune in India. Pune was selected as a case study for this project as a large number of residents presently use motorized two wheelers, e.g. motorcycles and motorscooters and historically used cycles. In addition, as public transport services comprise suburban rail, stage bus, taxi and auto rickshaws it was thought that the residents would have a wide choice of travel mode from journeying on foot to train services. During the 1980s as well, a cycle network was established to encourage the use of cycles within the urban agglomeration. The network was planned to consist of lanes where cycles would be segregated from motor vehicles. Therefore the low income groups of Pune have access to a wide range of public transport services as well as traffic lanes dedicated to cycles should they own and operate one.

The aim of the research is to discover which factors influence travel demand in low income households. In addition, particular emphasis has been placed on understanding the travel behavior of women, as women are often more disadvantaged than men in terms of access to transport services and infrastructure. The results of the research will provide policy makers with an improved understanding of travel constraints, and will therefore enable them to formulate better transport developmental projects which will in turn, provide improved accessibility to the transport network for low income households (and particularly women) in developing countries.

RESEARCH METHODOLOGY

In order to obtain a complete picture of the travel demand and behavior of household members in Pune, six questionnaire surveys were carried out during May 1996. Firstly a household travel survey was undertaken in nine neighborhoods. All household members aged sixteen years and over were interviewed in respect of their travel behavior; the head of the household also answered a series of questions relating to the travel behavior of any persons under sixteen years of age.

Market trading is a major source of employment for women in India and therefore female market traders were interviewed to ascertain whether their ability to travel to markets with goods was affected by the type of transport available. In addition to these two surveys, interviews of female users of motorized two wheelers (mopeds, motor scooters and motorcycles), female cyclists and women using public transport were also conducted. A number of interviews of male public transport users were undertaken to enable a comparison of public transport usage between men and women.

Both motorcyclists and cyclists were stopped during their journey and interviewed at the roadside. The public transport users (both bus and rail users) were interviewed either on-board the vehicle while travelling, or while waiting at the bus stop or station.

In summary, the six surveys comprised:

	Sample Size
Household survey [number of households]	328 (comprising 1005 residents)
Female Traders	199
Female Cyclists	204
Female motorized 2 wheelers users	587
Female public transport users	788
Male public transport users	227

PUNE METROPOLITAN REGION

Pune is an important regional centre of the State of Maharashtra and is situated 177 km south east of Bombay and covers around 810 square km. The population is now around 2.5 million, compared to 800,000 in 1971, representing an increase of over 200 percent over the twenty-five year period.

The importance of Pune as an industrial centre has grown rapidly since the 1960s when industrial expansion in Bombay was banned. Consequently Pune has become a major centre in the state, having attracted heavy engineering industry such as motor vehicle manufacturing plants (buses, cars and motorcycles). In addition to this, a number of multinational companies such as Phillips have manufacturing bases within the city. The industrial expansion of Pune was further aided by the Maharashtra Industrial Development Corporation who offered incentives to encourage industrial growth. Much of the local industry is concentrated along the main Pune-Bombay highway, enabling manufactured goods to be dispatched and supplies given to the factories without having to access the more congested centre of Pune.

Rural to urban drift and the immigration of people from other regions of India has occurred because of the employment opportunities created by rapid industrialization; this has also led to an acute housing shortage and an increase in slum settlements which are poorly served by transport infrastructure and services. There has been a dramatic increase in the number of educational establishments in Pune over the last 25 years. The corresponding rise in the number of students has placed additional demand on public transport services and the transport system.

TRANSPORT PROVISION

PUBLIC TRANSPORT

Rapid population growth and industrial expansion have placed heavy demands both on the transport infrastructure and public transport services, so that the present transport infrastructure in the city is struggles to keep pace with the increasing population and their travel demands.

Bus services are supplied by Pune Municipal Transport (PMT) and Pimpri-Chinchwad Municipal Transport (PCMT). PMT currently operates 818 buses operating 63,400,000 km of route and transports approximately 227,500,000 passengers per annum; the corresponding figures for PCMT are 248 buses operating 15,500,000 km, and carrying 48,000,000 passengers. Bus fares are charged on the basis of km travelled, and range from the minimum fare of 140 paise for 2 km to 1485 paise for a journey of 60 km.

In more developed countries, bus travel is increasingly viewed as a way of easing congestion in town and city centres, and therefore there has been an increase in the number and variety of bus priority measures in use. However, in Pune, little thought has been given to bus priority measures, and due to the present road layout and driving behavior, implementation of such measures would be problematic. Financial constraints have made it difficult for the bus companies to expand their fleets, to replace ageing vehicles and to generally provide an efficient service. Bus operations are further hindered by congestion, shortage of road space and a lack of road discipline.

In response to a lack of public transport provision, a number of major manufacturing companies have begun providing commuter bus services for the sole use of their employees thereby guaranteeing that their work force arrive on time for their shifts. There are around 4000 company buses in Pune, which is over four times the number of public buses, and therefore suggests that there is considerable under-provision in the public sector service at the present time.

In addition to local bus services, there are also a number of intercity bus routes which offer services between Pune and other major cities such as Bombay, Bangalore and Hyderabad. A number of different standards of service are on offer, ranging from express air conditioned buses to stopping services; the price of the journey is reflected in the quality of the service.

Since 1977 there has been an airport at Pune. As well as daily flights to Bombay (where connections can be made to both domestic and international flights) there are less frequent flights to other destinations in India. The local airport has recently been refurbished to offer a higher quality to aid passenger comfort.

Pune is connected by rail to Bombay, Hyderabad, Madras and Miraj-Kolhapur. Many people use these services to commute daily either to or from Pune. There are currently 2515 taxis in Pune (of which 1900 are tourist cars); these taxis tend not to provide services within Pune; rather they serve intercity routes from Pune to Bombay, Thane, Nasik, Ahmednagar, Kolhapur and Aurangabad.

Auto rickshaws have replaced horse drawn tongas as the major form of intermediate public transport in Pune. They operate anywhere within Pune and are the major operator of taxi services within the city. Auto rickshaws tend to serve areas with poor bus service provision and offer a relatively cheap source of transport; for example, they are used to transport groups of children to school. The growth in the number of auto rickshaws along with other vehicles is shown in Table 1. The data illustrates the dramatic increase in the number of auto rickshaws which has occurred over the last 25 years.

Table 1
Growth in the Number of Registered Mechanized Vehicles

	1960	1970	1980	1994
Public Bus			434	994
Truck	1590	3628	8302	21008
L.C.V.	18	333	2506	5432
Car, jeep, taxi	2658	7565	13962	37208
Autorickshaw	207	2560	11038	22093
Two-wheeler	1315	15048	72040	295008
Other	185	844	1753	2341

PRIVATE TRANSPORT

Historically, Pune was known as the "cycle city of India", however cycling has decreased in popularity as the ownership and use of motorized two-wheelers has increased. There has been rapid growth in the number of motorized two wheeled vehicles so that there are currently around 118 motorized two wheelers per 1000 population compared to 5.0 in 1965. The growth in motorized two wheelers is shown in Table 1. As a result of this growth, lanes dedicated for cycle users are now mainly used by motorized two wheeler users.

The growth in private car ownership has been slow due to the high purchasing and operating costs. In 1975 there were 7.2 cars per 1,000 population, by 1994 this had approximately doubled to 14. This contrasts with 337 cars per 1000 population in Great Britain in 1995 (Dept. of Transport Statistical Services). Clearly, the motorized two-wheeler is the 'motor car' of the middle income of India.

HOUSEHOLD SURVEY

INTRODUCTION

The aim of the household survey was to obtain information about individuals' travel patterns and attitudes and relate them to various household variables such as income, structure and location with respect to the central business district (CBD). Two research tools were developed specifically for this task, both taking the form of an interviewer-administered questionnaire. The first questionnaire (general travel survey) concentrated on information about individuals, the second (head of household survey) sought information about the household.

For the purposes of the study a team of interviewers were employed who were able to speak English, Hindi (the language of Northern India) and Maharati (the local language). This ensured ease of communication between survey supervisors and the survey team, and between the survey team and interviewee.

The survey teams visited households in pairs; one would ask the questions while the other recorded the responses. Such a design allowed the interview to flow without the need for pauses, and gave the process a more 'natural' feel. The team were instructed to administer the first questionnaire individually to all members of the household who were present, over the age of 16 years. When this had been completed the team were then required to administer the second questionnaire to the head of the household, or where this person was unavailable, to the most senior member present.

Design and Subjects

Household income and distance from the home to the CBD are two variables of particular importance to the study. The 328 households (taken from over 100 housing areas) approached were therefore classified in terms of a measure of per capita income and distance from the CBD. The criteria used for classification are as follows:

	Per capita income	**Distance from CBD**
Low/near	Rs 0 - 1250	0 - 3 Km
Mid	Rs 1251-2500	3 - 9 Km
High/far	Rs 2501 or more	more than 9 Km

The number of households and individuals interviewed in each segment of the matrix are given in Table 2.

Table 2
Number of Households and Individuals Interviewed

	HOUSEHOLDS				INDIVIDUALS			
	Income				Income			
DISTANCE	Low	Mid	High	Total	Low	Mid	High	Total
Near	46	23	15	84	174	73	68	315
Mid	55	62	29	146	179	174	76	429
Far	25	52	21	98	73	142	46	261
TOTAL	126	137	65	328	426	389	190	1005

RESULTS

Introduction

While in effect there are eighteen experimental groups (three by three matrix by sex), it was decided that for the purposes of analysis, comparisons between all possible group pairs would be too complicated as well as unnecessary (because the emphasis of the study is on the behavior of the urban poor and females). Accordingly the analysis has been completed on two levels. In Section 5.2.2 the distance grouping have been collapsed, allowing income groups to be compared while section 5.2.3 looks at the low income group, but compares male and female respondents.

Differences Between Income Groups

Demographic differences

Table 3 shows the means for a number of demographic and household variables. It should be remembered that households were assigned to groups on the basis of measured per capita income, defined as income per person over the age of 16 years (not income divided by household size).

Table 3
Demographic and Household Variables

	Income Group		
	Low	**Mid**	**High**
Percentage of male respondents	58%	60%	58%
Mean age of respondent	35.8	36.0	36.9
Percentage of male household heads	95%	90%	81%
Age of head of household	45	43	43
Household size **	6.3	4.7	4.3
Household income (Rs) **	3211	5956	18389
Per capita income (Rs)**	742	1755	5801
Transport expense (Rs)**	446	815	2031
Transport expense as % of household income	15.5%	14.0%	13.5%

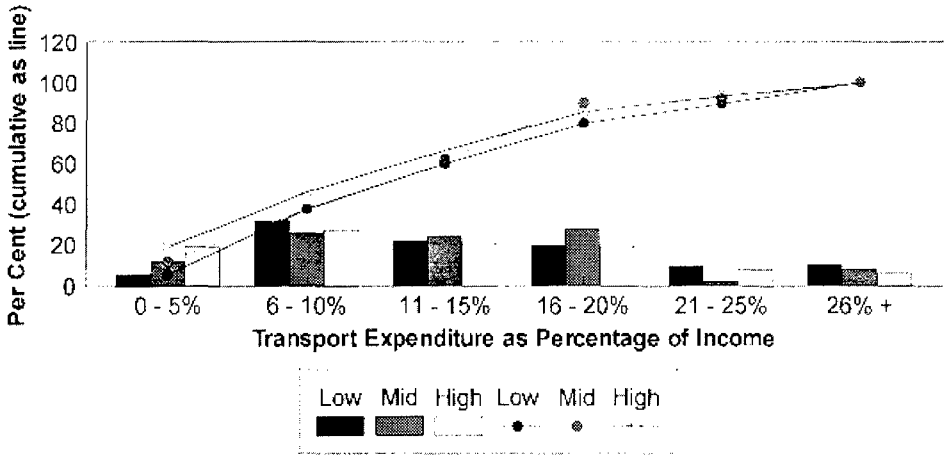
** indicates significance better than 0.1%

Household size decreases from low through mid to high income households. This is as one would expect in the developing world. It is interesting that there is a higher percentage of female household heads in the high income group than in the low income group. This could be related to either household size or household income. Large households are perhaps more likely to be able to provide a suitable male replacement in the event of death or other absence. In relation to the latter, having significant wealth is likely to allow a female rather more independence or respect, and thus the ability to run the household without the need to find a male replacement.

While it is not statistically significant, the final statistic—percentage of household income spent on transport—is interesting and is consistent with the findings of a number of other studies of households in India (e.g. Maunder, 1984). It should be noted that these figures have been calculated using data pairs (income and expenditure) for individual households, rather than using group means. Figure 1 further illuminates the expenditure data, and shows frequency values for the three income groups for grouped percentage expenditure. The line corresponds to cumulative frequency. The graph demonstrates the reason for the non-significance of the result, namely the large spread of figures with respect to the magnitude of the mean.

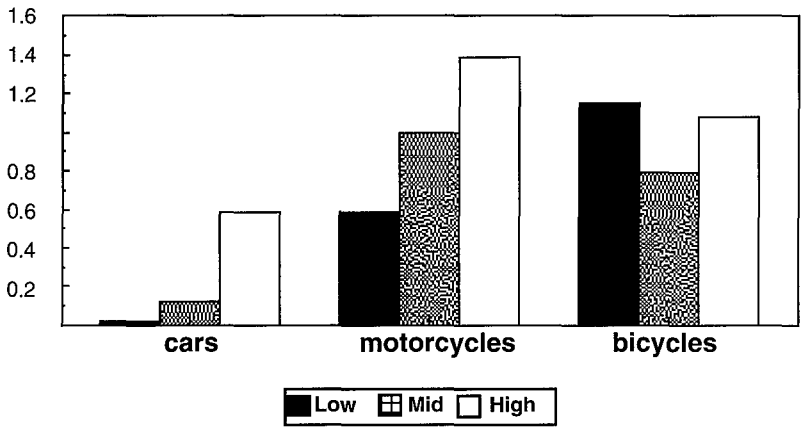
Vehicle ownership varies greatly between groups. This can be seen in Figure 2 which shows the mean ownership rates for cars, motorcycles and bicycles for households in the three income bands.

Figure 1
Relationship Between Income Group and Transport Expenditure



All three groups have a level of bicycle ownership at around one per household. Ownership of both cars and motorized two-wheelers follows the predicted relationship with rising household income; these are expensive item to own and operate.

Figure 2
Vehicle Ownership Levels



General trip characteristics

Respondents were asked a number of questions about the journeys that they make. These questions were posed in two different ways: First respondents were asked about the journeys that they make regularly; secondly they were asked about journeys for specific purposes.

Before commencing detailed analysis of the data it is worth discussing general differences between the income groups. Table 4 shows the mean number of (return) trips made each day by individuals from the three income bands. It can be seen that the three groups are remarkably similar. To find differences in trip rates one must investigate trips for specific purposes (see Sections 5.2.2.3 to 5.2.2.5).

Table 4
Daily Per Capita Trip Rates

	Income Group		
	Low	Mid	High
Number of return trips per day	1.03	1.04	1.02

Modal choice is a variable of considerable interest, since it is likely to be highly affected by income levels. Figure 3 shows the proportion of trips made by the income groups using different modes. There are obvious differences between the groups in modal choice. For instance, the use of motor cars increases with income. The same is true of motorized two-wheelers, although in all three groups a significant number of trips are made by this mode.

The modes incurring little or no cost are favored by the low-income group which is predictable. Interestingly, a higher proportion of trips are made by auto rickshaw by the lower income group than by the higher income group, despite being expensive (compared to the bus). It could be that the higher income groups simply do not like to travel by auto rickshaw, and the decision is not financial. An alternative explanation—supported by the finding that the high income group also make less journeys by bus—is that high income individuals do not need to use these modes because of their high levels of motorized vehicle ownership.

Figure 3
Modal Choice by Income Group; All Trips

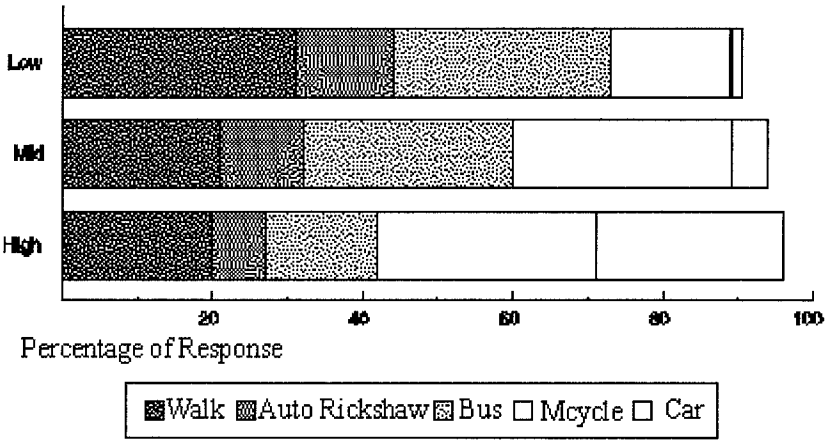


Table 5 shows the mean journey distance by mode for the income groups. As one might expect, the low income group travel further using cheaper, more effortless modes (walk and bicycle) than the higher income groups, although for cycling the difference is only marginal. The high income group travel further by car, motorcycle and bus than the low income group. This difference is reflected in differences in mean journey distance for all modes.

Table 5
Mean Journey Distance, by Mode (km)

	Income Group		
	Low	Mid	High
Private car	3.5	8.0	11.2
M'cycle/scooter	6.9	8.0	8.1
Bicycle	4.3	3.9	4.2
Public Bus	7.9	9.5	10.5
Auto rickshaw	4.0	5.1	3.3
Walk	2.0	1.3	0.9
All modes	5.4	7.2	7.1

Work trips

The frequency of work trips was more or less uniform across the whole population, with most people working five days per week or more. Table 6 gives details about work trip frequency. It should be noted that this Table, and all similar Tables for specific journeys in this report, only includes those respondents who responded that they do make trips for this purpose, and excludes all 'negative' responses. For work trips 48 percent of the low, 53 percent of the mid and 47 percent of the high income groups reported making at least some trips for work purposes.

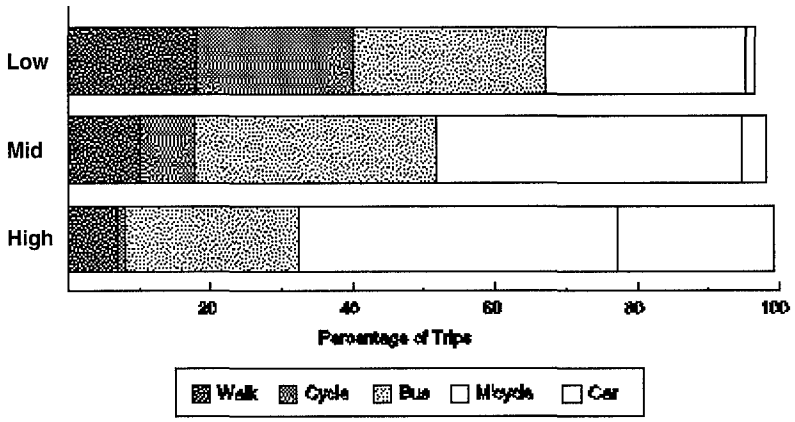
Table 6
Frequency of Work Trips

	Income Group		
	Low	Mid	High
5 times per week or more	92%	96%	90%
2-4 times per week	2%	2%	6%
Once a week or less	6%	2%	4%

Figure 4 shows intergroup differences in modal choice for work trips. It can be seen that walking as a mode of transport is more highly favored by individuals from low income households. Cycling also follows a similar pattern. The opposite trend clearly occurs in relation to travel by car, and to a lesser extent to travel by motorcycle/scooter. It is interesting to note that the most common mode of transport (the modal mode) for all three groups is the motorized two-wheeler (motorcycle), reflecting the rise in ownership of these vehicles.

The percentage of trips made by personal motorized vehicles equates to 30 percent, 47 percent and 67 percent for low, mid and high income individuals respectively. For personal non-motorized travel (walk and cycle) the figures are 40 percent, 18 percent and 8 percent respectively. This relationship is probably related not only to income but also to the distance that the three groups tend to travel for work journeys (6.2 km, 9.7 km and 11.0 km respectively)

Figure 4
Modal Choice by Income Group; Work Trip



Buses, both public and company owned, are utilized for a considerable percentage of work journeys: 27%, 34% and 25% respectively. Therefore, even though utilization of local trains and auto rickshaws for work trips appears to be low, public transport carries a significant number of people to work, regardless of income group.

Shopping trips

Table 7 illustrates the frequency of travel of individuals for shopping purposes. A much higher proportion of the low income group (80 percent) reported making shopping trips than either the mid (53 percent) or the high (47 percent) income groups. This suggests that in low income households there is more sharing of household duties between members.

Table 7
Frequency of Shopping Trips

	Income Group		
	Low	Mid	High
5 times per week or more	11%	2%	6%
2-4 times per week	12%	13%	16%
Once a week	42%	38%	44%
Once a fortnight	7%	9%	12%
Once a month or less	23%	34%	19%
As required	5%	5%	4%

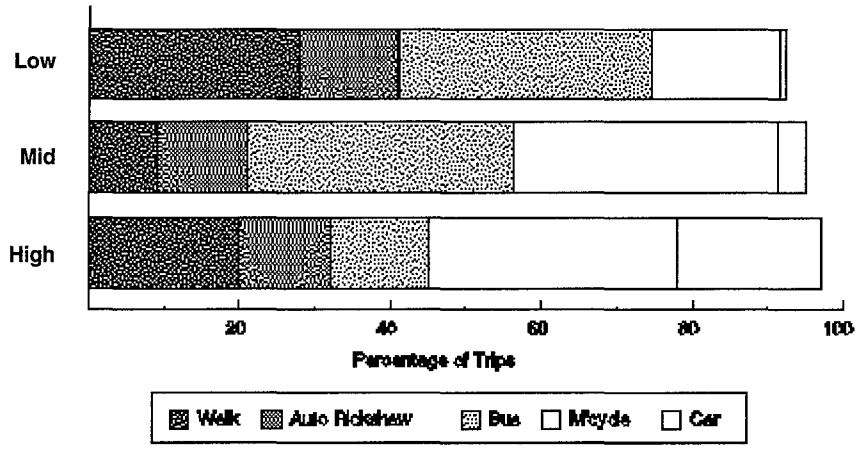
For all three groups the modal frequency response was 'once per week'. The pattern of responses for three groups are similar. However, individuals from low income families are much more likely to shop five times per week or more, compared to the mid and high income groups. Since many low wage jobs are in the informal sector they are usually paid daily, and thus it is often impossible to purchase more than one days supplies.

The pattern of modal choice for shopping trips differs from that for employment purposes, and is shown in Figure 5.

Figure 5

Modal Choice by Income Group; Shopping Trips

The relationship between modal choice and income is not so distinct, especially for less costly modes.



For example, both low and high income groups make a higher percentage of walk trips than the mid-income group. This is likely to be a result of differences in mean journey length, which is 4.5 km, 6.0 km and 3.8 km for low, mid and high income groups respectively.

For high-cost modes—cars and motorcycles—the expected pattern is found; usage increases with income. The percentage of trips made by personal motorized vehicles is 18%, 39%, and 52% respectively for the three groups. The percentage of trips made by personal non-motorized modes are 36 percent, 13 percent and 22 percent respectively. Public transport, in the form of buses and auto rickshaws, is used by many individuals from all three groups, being utilized for 46 percent, 47 percent and 25 percent of journeys respectively.

For shopping trips the three groups differ in terms of the modal mode. For the low income group it is the bus which is most frequently used (32% of journeys); for mid and high income groups it is the motorcycle/scooter (35% and 33% respectively).

Education trips

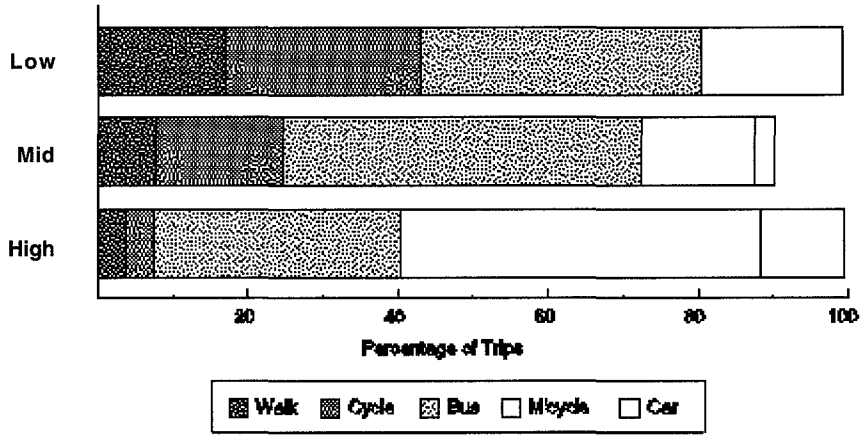
Many of the people interviewed were students (23 percent, 20 percent and 17 percent of the groups respectively reported making trips for education purposes) and therefore information about journeys to education establishments was obtained. Table 8 shows the trip frequency for the three groups. As would be expected a vast majority individuals travel at least five times per week. Only the high income group has a notable number of individuals who travel less frequently for education purposes. The mean age of the high income group is slightly higher than that for the other groups. This fact, combined with the likelihood of this group having more disposable income, could suggest that a higher number of the high income group attend night school, which involves expense, and is unlikely to involve travel more than twice per week.

Table 8
Frequency of Education Trips

	Income Group		
	Low	Mid	High
5 times per week or more	80%	81%	69%
2-4 times per week	3%	3%	10%
Once a week	5%	4%	10%
Less than once a week	12%	12%	11%

Modal choice for education trips is shown in Figure 6. The distribution of modes is similar to that found for work trips.

Figure 6
Modal Choice by Income Group; Education Trips



A considerable number (59 percent) of trips are undertaken by personal motor vehicle by the high income group, presumably a result of parents giving a lift to other young adults. The bus is a popular mode with all three groups, but especially the low and mid income groups. The bicycle is predominantly used by the low income group. Mean journey distances are 6.7 km, 7.3 km and 10.5 km respectively.

Low Income Households: Gender Differences

The results from the household survey suggest that females are not often in a strong bargaining position when it comes to the utilization of vehicles owned by the household. In addition, public opinion, tends to be against women using two-wheelers—the fastest growing transport mode (although these opinions are changing). Therefore one would expect the travel behavior of men and women to differ.

Demographic differences

Table 9 shows the sex split of the low income group and shows mean age. It can be seen that more males than females were interviewed, but enough females responded to have confidence in the data. The men were, on average, slightly younger than the women, but this difference is not significant.

Table 9
Number and Mean Age of Respondents

	Male	Female
Number of respondents	103	74
Mean age	34.6	37.8

General trip characteristics

Table 10 shows the mean trip rates for men and women. Men make significantly more return trips than women. The explanation is likely to be that more men report making trips for work than women (see Section 5.2.4.3) and thus many make an extra five return journeys per week.

Table 10
Daily Per Capita Trip Rates

	Male	Female
Number of return trips per day	1.21	0.79

Figure 7 shows the modal choice (all trips) for men and women. Obvious differences exist; far fewer women ride motorized two-wheelers and bicycles than men. Instead women make a higher proportion of trips by walking and by bus. Possible explanations for this are given in the subsequent sections.

Figure 7
Modal Choice by Sex; All Trips

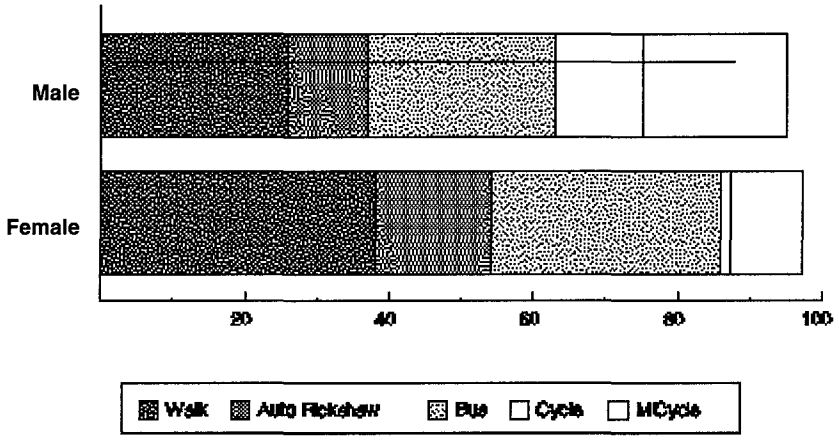


Table 11 gives the mean journey length by mode for the sexes. Men on average have marginally longer journeys than women by 0.5 km. This is mainly due to larger distances travelled by bus. For the other modes the two groups are fairly comparable.

Table 11
Mean journey length by mode

	Male	Female
Motorcycle/scooter	4.2	4.7
Bicycle	2.1	1.0
Public bus	8.4	7.2
Auto rickshaw	3.0	3.3
Walk	2.4	2.4
All modes	4.2	3.7

Work trips

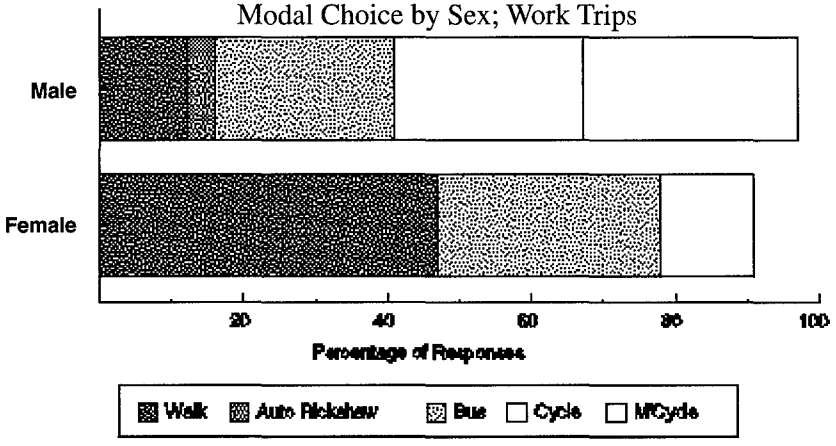
Frequency of making work trips is shown in Table 12. As one would expect the modal response for both males and females is working 'at least five times per week'. It is interesting to note that it is more common for women to work less than five times per week than men, which implies that more women are employed on a part-time basis. A much higher proportion of men than women make work trips: 68 percent compared to 19 percent. Thus from the sample it is evident that far fewer women than men are employed and so need to travel for such a purpose.

Table 12
Frequency of Making Work Trips

	Male	Female
Five times or more	93%	83%
2-4 times per week	2%	3%
Once a week or less	5%	14%

Figure 8 illustrates considerable differences between the sexes in terms of modal choice.

Figure 8
Modal Choice by Sex; Work Trips



The modal mode for women is walking, whereas for men it is the motorcycle or scooter. This difference may be explained in part by the fact that the mean home to work journey is shorter for women than men (4.6 km compared to 6.5 km). However, there are obviously many women who travel considerable distances to work (the *mean* is 4.6km). It would appear that these women take the bus rather than use a bicycle or motorized two-wheeler.

The difference is likely to be for two reasons. Firstly, women tend not to have the same degree of access to family-owned vehicles as men. Secondly, women's perceptions of the safety of bicycles and two-wheelers tend to be lower than those of men (see Section 5.2.3.6). Therefore, even when a woman has access to such modes she may prefer to walk or catch a bus (although this may not be the case for affluent females).

Shopping trips

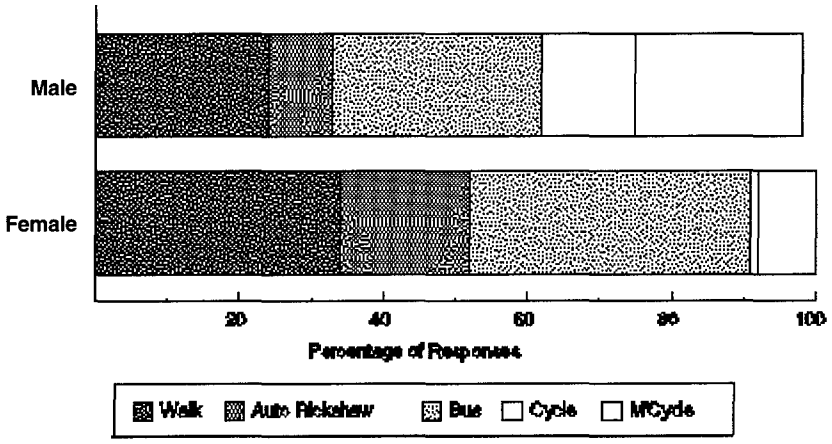
Frequency of making shopping trips is shown in Table 13. As for work trips, the two sexes demonstrate similar frequency patterns, although women do tend to shop slightly more frequently. Similar proportions of the two groups reported ever making shopping trips: 76 percent for males and 79 percent for females.

Table 13
Frequency of Making Shopping Trips

	Male	Female
Five times or more	9%	11%
2-4 times per week	11%	14%
Once a week	41%	43%
Once a fortnight or less	39%	32%

Figure 9 shows modal choice for the two sexes. As with work trips, there are differences in modal choice.

Figure 9
Modal Choice by Sex; Shopping Trips



Unlike work trips, males and females have the same modal mode for shopping trips, namely the bus. Other than this, however, the patterns are largely the same as for work trips; more women than men travel by foot whereas men more frequently use a motorcycle/scooter.

Both sexes make more use of the auto rickshaw for shopping than they do for either work or education trips. This is likely to be due to a trade off between cost and frequency, and the convenience offered by the mode needing to carry a heavy load. Males and females travel approximately the same distance for shopping trips, i.e. males 5.0 km and females 4.3 km.

Education trips

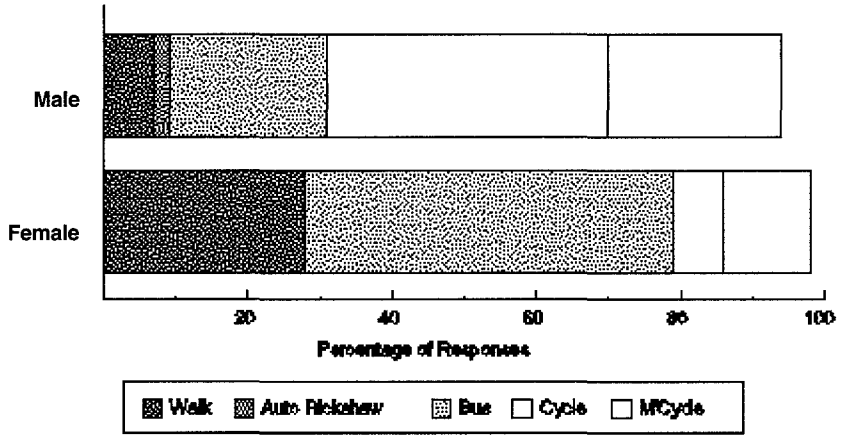
The frequency of making education trips is shown in Table 14. For males 21 percent reported making education trips; for females 23 percent.

Table 14
Frequency of Making Education Trips

	Male	Female
Five times or more	82%	76%
2-4 times per week	4%	2%
Once a week or less	14%	12%

The pattern for the two sexes is similar. As with work and shopping trips, however, the pattern of modal choice differs. See Figure 10.

Figure 10
Modal Choice by Sex; Education Trips

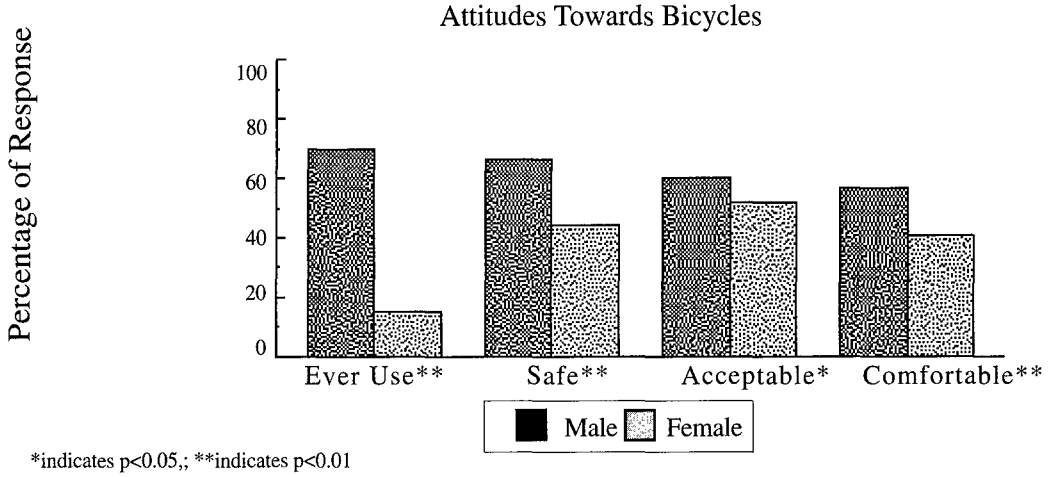


The modal mode for females is the bus, whereas for men it is the bicycle. Few women (19 percent) use either a bicycle or a motorized two-wheeler, whereas 63 percent of men use one of these two modes. This reflects the pattern previously found, i.e. two-wheelers being less frequently used by women and more frequently used by men. For education trips, males tend to travel slightly further than women (7.4 km compared to 6.0 km).

Attitudes towards private vehicles

Figure 11 shows the affirmative responses of males and females in relation to bicycles. Considerably more men than women ever make a journey by bicycle. In addition, men rate bicycles as being significantly safer and more comfortable than women. Quite which of these factors causes the other is impossible to discern.

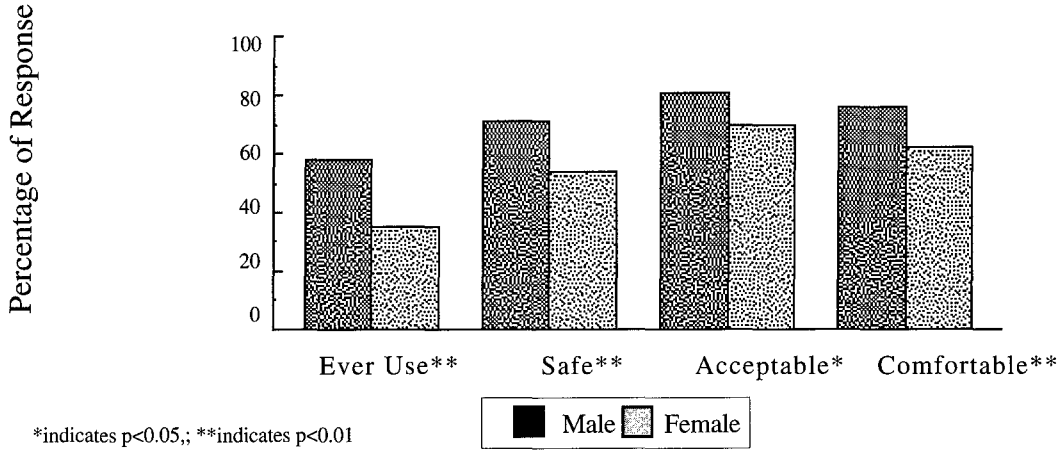
Figure 11
Attitudes Towards Bicycles



*indicates p<0.05,; **indicates p<0.01

Figure 12 shows the responses for motorcycles/scooters. Fewer men ride a motorized two-wheeler than ride a bicycle, whereas the opposite is true for women. Nevertheless, significantly more men ride a motorized two-wheeler than women. As previously mentioned, public opinion has been against women riding two-wheelers, which may in part explain the finding. However, public opinion has been changing over time, and so in future one would expect an increase in the number of female two-wheeler users. Section 6 deals exclusively with women and two-wheeled transport.

Figure 12
Attitudes Towards Motorcycles/Scooters



*indicates p<0.05,; **indicates p<0.01

Similar patterns exist for the other questions. While women rate motorcycles/scooters more highly than they rate bicycles, men remain significantly more positive.

Attitudes towards public transport

Table 15 shows the complaints that males and females have about the use of public transport. The most interesting finding is that a higher proportion of women rate overcrowding as a problem. This is understandable since sexual harassment (known as 'Eve-teasing') is common on public transport vehicles.

Table 15
Problems of Using Public Transport

	Male	Female
Overcrowding	28%	41%
Rude/cheating staff	5%	6%
Too expensive	1%	3%
Not enough buses/routes	14%	8%
Have to wait too long	25%	18%
Irregular	15%	19%
Other	12%	5%

As previously found, suggested improvements (see Table 16) are linked to perceived problems. It is of interest to note however that very few women want to see the introduction of female-only buses (as opposed to the very popular women-only carriages on trains). Instead of single-sex buses, women would like to simply see more buses operating, and thereby reducing the overcrowding which is so evident at times.

Table 16
Suggested Improvements to Public Transport

	Male	Female
Improve regularity	45%	39%
Better staff behavior	3%	5%
More buses	21%	32%
Improve punctuality	13%	11%
Make cheaper	3%	5%
Introduce female-only buses	-	2%
Other	15%	6%

FEMALES AND TWO WHEELED VEHICLES

INTRODUCTION

In many developing countries, bicycles have grown in popularity as a means of personal transport as they offer a relatively cheap form of travel once they have been purchased. As income levels rise however, cycles tend to be replaced by motorized two wheelers such as motorscooters, mopeds and motorcycles, particularly among middle income groups.

In Pune, females are increasingly using these forms of personal transport to travel; and it does not appear unusual for households in middle and higher income groups to have access to both a motorcycle (predominantly used by males) and a moped/motorscooter (for use by females). Thus, females are now having a greater degree of personal freedom regarding travel. As they become less reliant on public transport, they should theoretically have increased accessibility and mobility to better employment opportunities as well as social, leisure and shopping facilities. In order to ascertain whether this hypothesis is correct, questionnaire surveys were carried out for a sample of female cyclists and moped/motorscooter users. Two hundred and four female cyclists and 587 moped/motorscooter users were interviewed. The differences in sample sizes occurred because there were fewer female cyclists observed than moped/scooter users; however the sample sizes are large enough to be representative of the users and to allow statistical analysis.

Cundill (1986) in his research in Kenya noted that the equi-probability income (i.e the income level at which the car ownership level is 50 percent) seems to be falling. This would suggest that car ownership would increase regardless of whether household income increases. This is likely to hold true for motorized two wheelers in India. As the vehicles are manufactured in India and are not subject to high import costs, the 'real' price of manufacturing should decrease and they will be cheaper to purchase. Consequently, it is likely that there will be continued growth in the number of motorised two wheelers in use in India.

PROFILES OF THE RESPONDENTS

Age

Table 17 shows the age-groups of both groups of respondents. As the Table shows, the mean age of motorscooter users is older than that for sample of cyclists. The age distribution is also different for the two samples; a much larger proportion of cyclists are under 20 compared to the motorscooter users. This difference maybe partially attributable to the fact that persons have to be over 18 years of age in order to be eligible for a motorscooter licence, but may also reflect a higher proportion of students among cyclists than the motorscooter sample.

Table 17
Age of respondents

Age	Cyclists	Moped/Motorscooter users
20 and under	56.5%	23.4%
21-30	36.3%	47.4%
31-40	5.7%	21.2%
41-50	1.0%	6.1%
51+	0.5%	1.9%
Mean age	21.5	27.7

Marital Status

In both surveys, a large proportion of the respondents were single, though a higher proportion of motorscooter users were married (see Table 18) probably due to the fact that a larger percentage of the cyclists were below the current marriageable age of 18 years for females, though in practice this legal restriction is not always conformed to.

Table 18
Marital Status

	Cyclists	Moped/Motorscooter users
Single	63.6%	46.8%
Married	36.4%	52.7%
Widowed	-	0.5%
Divorced/separated	-	-

Income, Employment and Education

The respondents were asked their occupation and salary. The results are shown in Table 19. Only 20 percent of the sample of cyclists were in paid employment compared to 60 percent of the motorscooter users (as stated previously, a large proportion of the cyclists were students). The income levels for the cyclists are relatively low suggesting that maybe a large number are in some form of part-time employment, possibly fitting in with their educational commitments. The mean monthly income of the cyclists was one third of that of the motorscooter users.

Table 19
Occupation and monthly income

	Cyclists	Moped/Motorscooter users
Student	68.9%	35.3%
Housewife	9.8%	4.4%
Clerical/admin.	2.9%	9.1%
Tertiary	17.8	43.9%
Professional	-	6.4%
Other	0.6%	0.9%
Mean monthly income	Rs 1505	Rs 4540

The mean cost of purchasing a vehicle was Rs 1275 for a bicycle and Rs 20115 for a Moped/motorscooter. In general, female motorscooter users are more highly qualified than female cyclists and mean monthly income tends to reflect this.

Access to Vehicles and Vehicle Ownership

Vehicle ownership is shown in Table 20. A larger proportion of the moped/motorscooters users than cyclists personally owned their vehicle. Also a much higher percentage of motorscooters than cycles were owned by the respondents' husbands (although, as stated previously, more motorscooter users were married than cyclists).

Table 20
Vehicle Ownership

	Cyclists	Moped/Motorscooter users
Respondent	32.1%	38.8%
Husband	5.7%	21.1%
Family	62.2%	39.1%
Other	-	1.0%

Despite the fact that around two thirds of both samples replied that their vehicle was owned by husbands and other family members, over 90 percent of cyclists and 80 percent of the motorscooter users stated that they had access to the vehicle whenever they wanted it (see Table 21). Thus, the vehicles were only used by other family members when they were not required by the respondent. This appears to contradict the findings of section 5.2.3, which suggests that women take the bus or walk because the men use the motorcycle/scooter. It is important to remember, however, that the two populations are different; Section 5.2.3 looked at all low-income household members, whereas the present section concentrates on women who *actually ride* two-wheelers and thus are not subject to the same constraints. Other key users of the household owned vehicles include husbands, parents and brothers/sisters.

Table 21
Access to Vehicle

	Cyclists	Motorscooter/Moped users
Whenever want it	28.2%	31.2%
Most of the time	63.0%	49.0%
Sometimes	6.6%	18.0%
Rarely	2.2%	1.8%

Table 22 shows that around 60 percent of respondents in both samples had purchased the vehicle themselves. A greater proportion of cyclists than motorscooter users purchased their vehicle using their own funds, but around four times as many motorscooter users as cyclists obtained loans to purchase their vehicle—presumably due to the relatively high purchase cost of the vehicle.

Table 22
How the Vehicle was Purchased

	Cyclists	Moped/Motorscooter users
Own funds	40.2%	34.6%
Loan/ Hire Purchase	5.9%	21.0%
Gifts	13.2%	3.6%
Other	0.5%	1.2%
Vehicle not purchased by respondent	40.2%	39.7%

Table 23 shows other personal vehicles available to the household. The motorscooter users generally have more vehicles available within the household than the cyclists interviewed. They also have around double the number of motorised two wheelers and four times as many cars. This obviously reflects a greater degree of affluence among motorscooter users as illustrated in Table 19.

Table 23
Additional Vehicles Available to the Household

Vehicle	Cyclists	Moped/Motorscooter users
Car	4.9%	21.5%
Other bicycle	46.6%	42.1%
Other motorised two wheeler	38.7%	63.5%

Note: Percentages add up to more than one hundred percent in the motorcycle users column because some households have access to more than one additional vehicle.

PUBLIC TRANSPORT USAGE

Around 75 percent of the female cyclists interviewed and 98 percent of motorscooter users also use public transport services to make journeys. The frequency with which these respondents use public transport is illustrated in Table 24. The motorscooter users tend to use public transport services "as required". This can cover a number of responses ranging from using public transport daily to once a year, but does suggest usage on a non-regular basis. This also suggests a greater degree of affluence among the motorscooter users as they can make use of public transport when they choose to do so. It is also possible that the respondents live in areas better served by public transport.

Table 24
Frequency of Use of Public Transport

	Cyclists	Moped/Motorscooter users
Five times a week or more	-	2.8%
Two - four times a week	24.1%	7.1%
Once per week	22.7%	10.8%
Once per fortnight	12.1%	5.9%
Once per month	7.1%	8.0%
Less than once a month/ occasionally	11.3%	5.9%
As required	22.7%	59.5%

Note: These are responses given by the cyclists and motorscooter users who stated that they used public transport to make journeys, and it includes trips by bus, train and auto rickshaw.

JOURNEY PURPOSE

When interviewed the main journey purpose for female motorscooter users was 'travelling to or from work', and for the cyclists it was for 'educational purposes'. A relatively small proportion of journeys being made at the time of interview for both samples was for 'shopping purposes', but Table 25 shows that for both sets of respondents, shopping trips account for a large proportion of 'other' journey purposes (25 and 60 percent for cyclists and motorscooter users respectively). The higher percentage of shopping trips undertaken by the motorscooter users may be accounted for by the fact that a larger proportion of these respondents are married and therefore the responsibility for buying food for the household is more likely to lie with them than in cases where the respondents are unmarried. In addition, the higher income of the motorscooter users may mean that they are more likely to undertake shopping as a leisure activity. Other activities using the two wheelers include social, medical and educational activities, the latter mainly by cyclists (see Table 26).

Table 25
Purpose of the Trip Being Made

	Cyclists	**Moped/Motorscooter users**
Travelling to/from work	30.8%	46.5%
Shopping	8.7%	14.7%
Social	3.1%	2.6%
Medical	1.5%	3.9%
Education	48.2%	29.6%
Other	7.7%	2.7%

Table 26
Additional Journeys Made Using the Vehicle

	Cyclists	**Moped/Motorscooter users**
Travelling to/from work	14.2%	6.8%
Shopping	25.0%	60.0%
Social	25.5%	10.7%
Medical	10.8%	4.3%
Education	33.8%	5.8%
Other	7.8%	4.9%

Note: the columns add up to more than 100 percent because some respondents made additional journeys for more than one purpose.

The benefits that the respondents perceive from using their vehicle rather than public transport are shown in Table 27. For female cyclists, the modal response was that it was cheaper. However, for the female motorscooter users the modal response was that "by using their vehicle they would save time", or "arrive at their destination on time." As stated previously, a large proportion of motorscooter users were

making work journeys and therefore ensuring that they arrive on time is obviously important. Cost is clearly of marginal importance to motorcycle owners as opposed to comfort and convenience which are far more important.

Table 27
Benefits of using the vehicle (percent)

	Cyclists	Moped/Motorscooter users
Time saving/arrive on time	9.8	51.4
Cost saving	51.6	6.5
Comfortable/easy to ride	17.4	24.0
Exercise	12.1	-
Convenient	9.1	18.1
TOTAL PERCENT	100	100
TOTAL RESPONSES	132	691*

*Some respondents gave more than one answer to this question.

Although there are a number of benefits to using cycles and motorscooters, the respondents also reported a number of disadvantages. These are shown in Table 28.

Table 28
Lack of benefits of using the vehicle (percent)

	Cyclists	Moped/Motorscooter users
Unsafe	23.9	15.1
Not useful for long journeys	18.3	2.9
Tiring	18.3	-
Time consuming	7.0	0.3
Uncomfortable	28.3	
Expensive to buy/		
Operate and Maintain	61.9	-
Traffic/parking problems	12.5	-
Other	4.2	7.3
Total percent	100	100
Total responses	142	344

Both sets of respondents thought that their own safety when using the vehicle was a major problem, but other than this cyclists and motorscooter users have very different concerns. For the motorscooter users, the costs of buying, operating and maintaining the vehicle is a major issue, however, for the cyclists, this is not a reason for concern. Parking motorcycles is a major problem in central area of Pune. The major concern of cyclists was that cycles are uncomfortable, tiring to operate and not particularly suitable for long journeys.

Although there is a lack of benefits to using both cycles and motorscooters, the benefits must outweigh the disadvantages of making the journey by another mode of transport. Table 29 shows why the respondents chose to use their vehicle rather than public transport for the particular journey they were making when interviewed.

As Table 29 shows convenience is a major factor influencing the respondents decision to use their own vehicle. Comfort and savings in time are also key reasons for motorcycle owners.

Table 29
Reasons for Not Using Public Transport for This Journey (percent)

	Cyclists	Moped/Motorscooter users
Own vehicle is convenient	30.5	29.1
PT expensive/cheaper to use own vehicle	22.4	4.3
PT offers irregular services/inconvenient	17.2	5.0
Own transport readily available	4.6	0.9
No waiting with own vehicle/ saves time/ lengthy wait for PT	20.1	23.8
Easy to drive own vehicle	4.0	8.3
Comfortable	0.6	24.3
Safe	0.6	4.3
Total percentage	100	100
Total responses	174	703*

*Some respondents gave more than one answer to this question.

SURVEY OF FEMALE TRADERS

INTRODUCTION

Within many developing countries there are a growing number of female traders, particularly in the informal trading sector such as at urban markets and roadside locations. The revenue generated by these female traders can play a valuable contribution to the family income.

A one day survey of female traders was carried out as part of the field surveys. In total, 199 were questioned on a number of issues regarding their travel and purchasing arrangements. This section of the report analyses the results of the questionnaire.

TRADING

The respondents were asked about their trading arrangements. In response to the question "how often do you trade here", 93 percent of the respondents stated that they traded on five or more days a week. In order to determine why the particular markets were attractive to the respondents, they were questioned as to why they chose the particular market location. The results of this are shown in Table 30.

Table 30
Reasons for Trading in the Particular Market

	Number of responses
Convenient	52
Easy to sell goods/good profits	37
Nearby/saves travel costs	65
Large number of customers	12
Central place in Pune/good market	22
In front of road	4
Frequent market	11
Other	10

Note: the numbers add up to more than the sample size as some respondents gave more than one reason for choosing the particular market.

Distance to the point of trading and convenience are the main considerations for the sample of traders; the market being 'nearby' was the modal response to this question. Obviously, a consideration in deciding where to trade is the amount of potential custom and location. In total, 71 persons responded that it is "easy to sell goods" at the location, that there are a "large number of customers" or that "the market is central in Pune."

Around 18 percent of the respondents also trade in other markets. Thus it appears that female traders have a main market for trading purposes, and for those who do trade at other locations, they probably visit these markets when their main market is closed.

Travelling Time to the Trading point and Distance Travelled to Purchase Stock

The mean travelling time to the trading point was 16.3 minutes and the mean distance travelled 4.6 km, illustrating that the respondents tend to trade within local areas and travel short distances, i.e. generally less than 10 km. However, almost 17 percent had travelling times in excess of 30 minutes. This may be for a number of reasons, i.e they may live further away from trading places, they may trade in specific goods or the return they receive outweighs the lack of benefits of longer travelling times and higher transportation costs.

Mode of Travel

The most frequently used mode for both the outward and return journey to the marketplace was foot (58 and 67 percent for outward and return respectively). A higher percentage used auto rickshaws and trucks for the journey to the marketplace than for the return home. This is probably because at the end of the days trading there are fewer goods to transport home, and there is no time constraint. In addition, a number of traders store goods in a lockup at the point of trading or may have arrangements with suppliers on a sale or return basis.

Eighty-four percent of the sample carried their goods to the marketplace, this is possibly because of the short distances travelled.

Cost of Travelling

The cost of travelling to and from the place of trading is shown in Table 31. Around 58 percent of the sample did not respond to the question. In view of the distances and modes to the marketplace, it is not unreasonable to suppose that these respondents did not incur any travel costs. Therefore two mean values have been calculated, i.e the mean for the sample of respondents who answered this question, and a mean to include those for whom the cost was assumed to be zero.

As distances travelled are generally short, travel costs reflect this and are relatively low. The mean fare for the return journey is less than that of the outward, reflecting the fact that more traders return by foot compared to the outward, and therefore do not incur any travel costs.

Table 31
Cost of Travel to and From Market Place

Rupees	**Travel to Marketplace**	**Travel from Marketplace**
0-5	9.5%	9.5%
6-10	12.5%	8.0%
11-15	6.0%	4.0%
16-20	3.5%	3.0%
21-30	4.0%	4.0%
30+	6.0%	3.5%
Not applicable	58.5%	68.0%
Mean cost (Rs)	16.1	14.3
Mean (all respondents)	6.9	4.8

Income

The monthly income generated by the traders is shown in Table 32. In 1994 GNP per capita in India was US$ 310 per year (World Bank Atlas 1996), which equates to around Rupees (Rs) 10,500. The average annual earnings of the market traders assuming that they work for 11 months of the year would be Rs 21 000.

However, the results of the analysis should be treated with some degree of caution. Firstly, these figures equate to gross earnings, from which the cost of goods and travel must be subtracted, and secondly, as trading does not offer a fixed salary income levels can fluctuate considerably. Despite this, female traders can clearly generate significant income to augment the household budget.

Table 32
Monthly Income

Rupees	Percent
Less than 1000	13.7%
1001-1500	42.6%
1501-2000	19.8%
2001-3000	10.6%
3001+	13.3%
Mean income	1914 Rupees

PUBLIC TRANSPORT PASSENGER SURVEY

INTRODUCTION

Due to the relatively low levels of personal transport ownership in developing countries, public transport is a major mode of travel for urban residents, but especially for the urban poor and females. In order to assess how effective public transport is in terms of meeting users' travel needs, questionnaire surveys were conducted of users of local stage bus and train services. These interviews were conducted either on board the bus/train or at bus stops/train stations. To ascertain whether males and females have different attitudes, needs and problems regarding public transport use, a sample of male and female passengers were interviewed and their responses are compared in this Section.

USER PROFILES

Age

On average, the bus passengers were older than train passengers; the mean age for the male and female sample of bus users being 30.7 and 31.5 respectively, compared to 28.1 and 26.2 for the train users. There were a much higher proportion of train users in the 21-30 age group compared to the bus users, and a much higher percentage of bus users in the 40 plus category.

EMPLOYMENT AND INCOME

A much higher proportion of train users are in paid employment (see Table 33) compared to the bus users; around 64 percent of female bus users are either students or housewives/housepersons compared to around 44 percent of train users. Thirty-one percent of male bus passengers and 15 percent of train passengers were either housepersons or students.

Table 33
Occupation

	Bus Passengers		Train Passengers	
	Male	Female	Male	Female
Student	26.4%	18.6%	14.9%	33.2%
Housewife/houseperson	4.2%	45.7%	-	12.4%
Clerical/admin.	2.1%	0.3%	-	-
Tertiary	56.8%	29.5%	85.1%	44.9%
Professional	2.8%	2.9%	-	1.1%
Secondary	2.8%	-	-	8.4%
Retired	4.9%	0.2%	-	-
Other	-	2.8%	-	-
Mean monthly income	Rs3109	Rs3384	Rs2569	Rs2293

Bus passengers have a higher mean income than train passengers. Trains are often used to make longer journeys, and in developing countries the urban poor tend to live a considerable distance from the city centre and therefore have to travel long distances into the centre. This may account for the lower mean income of train passengers compared to bus passengers.

Female bus users have a higher mean income than males. This may be because males with higher income levels are able to afford some form of motorised personal transport and therefore travel using their own vehicle. For females, issues such as safety are a consideration, and there maybe some constraint due to public opinion (though the strength of this seems to be decreasing). Conversely, the mean income of the male train users is higher than that of the females. This is presumably because a much higher proportion of male than female train users were in paid employment.

Table 34 shows the purpose of the journey being made when the respondent was interviewed. The main journey purpose for all users was for employment. However, a higher proportion of males were making work journeys compared to females; around a third more male train passengers were making work journeys than females, and almost twice as many male bus passengers compared to females.

A large proportion of female bus passengers were housewives/housepersons. This probably accounts for the high percentage of female bus users making shopping trips.

Table 34
Journey Purpose

	Bus Passengers		Train Passengers	
	Male	Female	Male	Female
Work	52.0%	28.1%	64.5%	46.9%
Shopping	7.3%	17.6%	0.0	8.9%
School	20.7%	13.6%	18.4%	29.6%
Social	4.0%	9.6%	-	1.6%
Recreation	3.3%	4.2%	-	0.5%
Hospital	4.7%	4.0%	-	1.6%
Religious	3.3%	7.6%	17.1%	3.6%
Other	4.7%	15.3%	-	7.3%

USER ATTITUDES TO BUS AND TRAIN SERVICES

The respondents were asked questions regarding their attitudes to a number of different features of public transport. They were asked to rate their responses on a 5 point scale ranging from "very good" to "very poor".

Male bus users were more inclined to give bus services a higher rating than females. For example, 32 percent of male respondents stated that reliability was very good compared to 10 percent of the female sample. Less than one percent of females stated that overall the bus services were 'very good' compared to 9 percent of males.

These ratings highlight the fact that the female respondents perceive or experience more problems using bus services than the male respondents. The females were particularly concerned by the behavior of drivers/ conductors and other passengers.

The attitudes of the female train passengers were similar to those of their bus counterparts in that they were concerned about the behavior of drivers and other passengers. However, in contrast to female bus passengers, 40 percent of the train users interviewed rated the behavior of other passengers as 'very good' or 'good' (the corresponding figure for the bus users was around 31 percent). This may be because on certain local train services females have access to female-only carriages, and are therefore segregated from males.

Female train users also rated the 'comfort' and 'convenience' of train services and the 'availability of connecting services' more highly than male respondents.

Overall, the female train users rated the service more highly than males. For example 55 percent of females stated that overall, the train service was either 'very good' or 'good' compared to 1 percent of male respondents. In contrast 97 percent of males classified the service as being 'average' or 'poor' compared with 44 percent of females.

SUMMARY AND CONCLUSIONS

The rapid development of Pune has led to substantial demand for travel both within the CBD and between residential areas and manufacturing centres. Despite a considerable expansion of public transport services, the fleet has not kept abreast of demand. In response to this many of the leading manufacturers in Pune now operate large fleets of buses (both chartered and privately owned) to ensure their work force arrive on time and thus production is not interrupted.

With rising affluence, ownership of motorised two-wheelers has quadrupled in the last 15 years and as a consequence cycle usage has declined. The cycle network established during the 1980's is therefore shared by cyclists and riders of motorised two-wheelers. The bicycle however continues to be an important mode for students from the low- and mid-income households.

The survey findings illustrate that considerable differences exist between males and females in terms of access to and the use of the various travel modes on offer. Females are much more likely to walk or take the bus, and this may be linked to the types of journeys they make, e.g. local shopping trips and escorting children to school. Although such trips are essential for the 'survival' of the household, they are not wage earning, and thus are afforded less priority in terms of access to private vehicles.

In higher income households which own a number of vehicles, such constraints do not appear to exist. There has been a growth in the number of women riding two wheeled vehicles, usually motorscooters and mopeds. This suggests that attitudes and traditions are beginning to change. Social and economic changes are therefore making it both increasingly acceptable and increasingly affordable for females to have a greater degree of personal mobility and independence.

Women perceive the bus service in Pune to be inferior to the local train service in terms of convenience, comfort and safety. This is largely due to the existence of female-only carriages on the trains. Interestingly, however, women appear disinterested in the idea of female-only buses (perhaps due to earlier unhappy experiences when sections of buses were caged for female security) and would prefer to see the provision of more buses. A higher service frequency would as a consequence create a less crowded and safer environment in which all, but especially females can travel in comfort.

Distances travelled throughout Pune are comparatively short, hence the high percentage of trips undertaken on foot. Even a large percentage of female market traders walk to the market despite having to carry their goods. Although for most this journey is short, around 15 percent of the respondents who walked to their trading point walked in excess of 30 minutes. This may be a result of inadequate public transport facilities, or may be a financial constraint. However, some of the more successful market traders are able to afford to travel by auto rickshaw.

Clearly, looking to the future, the public transport system needs to be developed and the fleet increased to keep pace with the ever-growing size and travel needs of the population. Women appear to favor the train over the bus. Restrictions in rail-route planning make it unlikely that the rail network will expand, and thus it is the bus fleet and route network which needs to be expanded.

As incomes rise and attitudes change females are increasingly able to travel by moped or motorscooter. Thus the motorised two wheeler fleet in Pune is likely to grow substantially in the coming years. The road network needs to be planned accordingly.

The low income communities will continue to rely on inexpensive public transport services and travel on foot to meet their mobility requirements. The bicycle will continue be an important means of personal transport for low income households for a number of years to come, though in low income households, females do not generally have access to the household bicycle.

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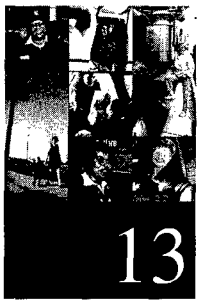

Household Structure and Mobility Patterns of Women in O-D Surveys: Methods and Results Based on the Case Studies of Montreal and Paris

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INTETS

HOUSEHOLD STRUCTURE AND MOBILITY PATTERNS OF WOMEN IN O-D SURVEYS: METHODS AND RESULTS BASED ON THE CASE STUDIES OF MONTREAL AND PARIS

ABSTRACT

The importance of household structure on mobility patterns in urban areas has been revealed by many studies. However, data for this type of analysis are not always available even though the need for taking into account family structure may be extremely important in the explanation of differences in travel behavior, namely in the comparative analysis of different socioeconomic or cultural contexts. Furthermore, the interest of studying the mobility patterns in relationship to household structure may give important insights into structural patterns of mobility behavior useful for forecasting. It would also give useful results for gender analysis.

Telephone travel surveys are widely used because they are cheaper and often easier to realize but, due to the short duration of the interview, they usually do not contain direct information on family structure more easily obtained from longer at-home interviews. This paper is an attempt to validate and generalize a methodology presented elsewhere (Séguin and Bussière, forthcoming, 1996) for the Montreal region which reconstructed the variable of household structure from the telephone Origin-Destination (O-D) Travel Survey of 1987 which did not include questions on family ties between individuals living in the same household. We are presenting here the validation of the typology of household structure which was done on the basis of the Enquête Générale de Transport (EGT) 1991-92 survey of Paris and the 1993 O-D survey of Montreal and we present a few comparative results. Being confronted with the lack of the variable of the activity of the population in the survey of Montreal, we defined a working person as a person making at least one worktrip (or for business affairs) the day of the survey. We analyzed the differences in the relative distribution of family forms and the travel behaviors of individuals by sex, type of household, activity (working or not) with the help of a few global parameters (total mobility, mobility by mode).

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INTRODUCTION

The importance of household structure on mobility patterns in urban areas has been revealed by many studies. However, data for this type of analysis are not always available even though the need for taking into account family structure may be extremely important for the explanation of differences in travel behavior, namely in comparative analysis of different socioeconomic or cultural contexts. Furthermore, it may be an important explanatory factor in forecasting future demand.

Telephone travel surveys are widely used because they are cheaper and often easier to realize but, due to the short duration of the interview, they usually do not contain direct information on family structure, more easily obtained from longer at-home interviews. This paper is an attempt to validate and generalize a methodology presented elsewhere[1] for the Montreal Metropolitan Area (MMA), which reconstructed the variable of household structure from the telephone Origin-Destination (O-D) Travel Survey of 1987; the survey did not include questions on family ties between individuals living in the same household. This methodology seemed to give interesting and valuable a priori results but we felt the need of a more rigorous validation of the methodology. To do so, we needed to apply a similar methodology to a case study where transportation data including family forms were available. This appeared possible with the Paris region where such data exist. On the basis of the EGT of 1991-1992 (Enquête globale de transport) in the metropolitan region of Paris (Île-de-France) we will use the same methodology as the one applied in Montreal on the basis of a typology of eight types of households (and a residual category) and then compare the results with those obtained from the observed family ties of the EGT. For the comparison of work trips, we identified a working person as a person making at least one worktrip (or for business affairs) the day of the survey, this being used as a proxy. With the Paris data, we were able to compare the value of this proxy with the data on active population. The comparison will permit the validation of the methodologies which, we think, will open a wide field of comparative analysis of mobility by sex, activity and household structure in different geographical and cultural contexts.

We will first present some of the findings about women's travel patterns and household structure as seen in the literature, clearly showing the importance of family forms and gender in travel behavior. Secondly, we will describe the data we used for our study and the methodology. Thirdly, we will present the validation and a few comparative results between Paris and Montreal, the latter results being based on the O-D survey of 1993. We will highlight differences in the relative distribution of family forms and their respective travel behavior with the help of a few global parameters.

DATA

BACKGROUND: SOME FINDINGS ABOUT MOBILITY, WOMEN'S TRAVEL PATTERNS AND HOUSEHOLD STRUCTURE

Historically, the evolution of transportation modes had an important impact on societies in general and on the family in particular. Berger[2] examining the *impact of the car* on the American family during the first decades of the century, noted that

> "...the car, more than any other transportation device before it, allowed individual members of the nuclear family, to have lives of their own, of which the particulars, and sometimes the entire experience, could remain private. No longer need the individual members of a family be dependent on each other for most of their recreational activities."

The importance of the car in the constitution of the dynamics of families and their daily life was often underlined in studies. Rosenbloom[3] examining America's increasing reliance on the private car, looked at the various responsibilities which influence the travel patterns of working parents, in particular those of women, and at the way the needs of children are embedded in those patterns:

> "two-worker and single-parent households, struggling to balance their daily activities and faced by continually decentralizing job opportunities, a dispersing urban infrastructure, and the lack of safe and responsive transportation options for children, have little choice—the car is the only practical option".

Many studies revealed the *differences in travel patterns between men and women.* The results of these studies confirmed the existence of a division of tasks in the household on the basis of gender, with the men mainly responsible for going to work outside the home and the women for domestic tasks. Wachs[4] distinguished four main differences by sex in mobility patterns: women make shorter work trips, greater use of public transit, more trips for the purpose of accompanying and serving another person's travel needs, and drive fewer miles per year than men. He attributed these differences to the evolution of separate spheres that determine the social responsibilities of men and women.[See also 5, 6; 7; 8; 9].

As the *participation of women in the labor force* grew rapidly, many authors refined the analysis of mobility by sex by taking into account this dimension, and the presence of children in the household[10]. Hanson and Hanson[11] found that Swedish working women had a significantly different travel behavior compared to their spouses; these women were making more shopping and domestic trips, fewer social and leisure trips, and were using public transportation more often. Women with the most demanding home roles and household responsibilities (defined according to the marital status and the presence of young children) were found to spend the least amount of time travelling to work[12]. The results of the investigation of Johnston-Anumonwo[13] contributed to the general interpretation that household responsibilities lead women to have weak labor-force attachment and a preference for convenient work trips. Fagnani[14], examining the impact of the presence of children on the worktrip length of female workers, found that the greater the number of children, the closer to home women worked[see also 15]. The data and analysis presented by Rosenbloom[16] showed that American women have significantly different travel patterns than comparably situated men because of their acceptation of responsibilities for the travel needs of their children. These responsibilities appear to be lighter as children grow older[see also 8]. The author concluded:

> "if women continue to bear a disproportionate share of the direct or emergency responsibility for their children, travel differences between the sexes will not disappear, regardless of other economic and occupational changes."

Pickup[17] distinguished three factors explaining the low mobility that occurs among women and these factors are a result of their *gender role*: the impact of family roles on patterns of women's car availability, the impact of gender-related tasks on women's access to opportunities and low mobility deriving from the conditions under which women travel (coping with children while travelling, coping with safety issues particularly in public transport). While the situation has been slowly changing with women

progressively having more access to the automobile, many studies showed that women use public transit more than men and that women are frequently car passengers. Even if there is not a consensus on that point, some authors related the fact that women live closer to their work to their more frequent use of public transit for work trips[7].

The Great London Council survey[18] revealed that women's use of private transport (car, taxi, mini-cabs and walking) was largely unaffected by the fact that they have care of a young child or not. The results also showed that women with young children were less likely, compared with women without young children, to travel to paid work, to go shopping for nonessential items or to go out for leisure; however, they were more likely to shop for essential items and to respond to others travel needs[18]. The National Travel Survey (NTS) of 1975-76 in the United States revealed that housewives' travel patterns distinguished them from the rest of the population because they made less than the average number of car journeys and a greater than average number of walk journeys (cited by Pickup[19]. It was also found that many housewives who lived in car owning households did not have access to the car during normal working hours and that most of the independent journeys by housewives were made during this period. In fact, a large proportion of journeys by housewives were short walk journeys[19]. In regard to the transportation mode, the study of Séguin and Bussière[1] showed that generally men are much more frequent car users than women and that the utilization rate of public transit is much higher for working women than for working men. Globally, the distances travelled to work by men were found to be higher than those of women; in fact, in all types of households, men travelled further than women. It was found that the rate of automobile ownership was extremely stable for working men (around 80%) and surprisingly high for working women who live alone (51%) and for those who are single parents (around 63%)[1].

Camstra[20] distinguished three reasons found in the literature to explain the *shorter commuting distances for women*: generally women have a weaker position in the labor market; they have a weaker position in the household and a limited access to the car; and, finally there is an overrepresentation of working women in central cities. He also added another reason, the lifestyles:

> "A lifestyles dominated by labor aspirations will probably tolerate larger commuting distances, and still more men than women have a labor-dominated lifestyles."[20]

In the 1990 NTS, the data showed that in the U.S., women 16 to 64 years old, made more daily trips per person than men in urban as well as in rural areas (Rosenbloom[21]). It was also found that women made shorter trips. The 1990 NTS data suggested that:

> "overall, traditional travel variables—household income, license-holding, employment—did more to explain the differences among women and among men than they did to explain the differences *between* comparable men and women." (Rosenbloom[21]).

The results of the 1990 NTS showed that the worktrip distance from home was longer for low income people of both sexes in urban areas than it was for comparable people from wealthier households. It also showed that while the presence of children had an impact on travel patterns of both sexes, having children had a great impact on the trip rates of women and a far lesser impact on those of men:

> "Married women made more person trips than all categories of married men, including those who are not parents; however, they travelled fewer person miles and made fewer vehicle trips than comparable men. Married women with children under six made more person trips, travelled fewer person miles, and made the same number of vehicle trips as single mothers with children under six. However, once their youngest children were school-age, single mothers made more trips, travelled fewer person miles, and made more vehicle trips than comparable married mothers. In a few categories, single women even made more trips than comparable married men." (Rosenbloom[21]).

Furthermore, it appears that neither marital status nor household income explained the differences between women and mens' travel patterns[(Ibidem)].

The *dimension of culture and race* was also taken into account in some studies. Focussing on racial differences in the commuting behavior of women, Johnston-Anumonwo[22] examined travel behavior of non-mothers and mothers (women with dependent children at home) and found that European American women with long commuting distances are less likely to be mothers compared to African American women. Rosenbloom[8] examining women's travel patterns in the United States and in the Netherlands found that in the Dutch context, where non-car options are safer and more available compared with the American context: working mothers were still playing an important role in their children's travel patterns, in particular due to their accompaniment role.

The results of the 1990 NTS permitted the description of the *relation between the household structure and travel behavior* (Al-Kazily, Barnes and Coontz,[21]):

> "To evaluate ability to differentiate travel behavior, household structure was compared with household income, number of vehicles in the household, number of persons in the household, age of dependents, and travel mode (...). Both household structure and person role were found to be effective in differentiating values for travel variables. The number of vehicle owned by the household, number of persons in the household, and work status were the only conventional variables which are comparable to household structure and person role in this respect."

Among the results, the analysis of travel behavior by household type revealed that trip frequency and travel distance per household were the highest for households with dependents, and tend to vary with household size; that trip lengths increased with the number of independents adults, but decreased with the presence of dependents (Al-Kazily, Barnes and Coontz[21]).

The results of the study of Séguin and Bussière[1] for Montreal showed that two factors clearly affect the pattern of mobility by household type for both working and nonworking adults: the smaller the number of adults in the household, the higher the mobility rate per person; and the presence of minor children in the household significantly increased the mobility rate of the adults as primary caretakers of the household. Looking at the mobility by purpose of the trips, the study revealed a greater number of trips for shopping for working women than for working men (with one exception: the households with female single parents with minor and major children) and equal rates of mobility for leisure purposes for working men and women.

It appears to us that the factors explaining gender differences in travel patterns are complex. The domestic and professional responsibilities are not automatically related to gender but rather to household and socioeconomic roles. Numerous studies insist on the presence of children in the household to explain differences in travel behavior. This factor is important but in many cases it has to be analyzed in

conjunction with the employment status. The complexity of factors at play invites more exploration. In this paper, we will focus on how to reconstitute the household structure when this variable is missing in the data base of a survey. The validation of the method will permit us to present elements for a comparative analysis of mobility in two different contexts: a North-American medium-size metropolitan urban area (Montreal, Canada: 3.2 million) and a large European metropolis (Paris, France: 11 million).

DESCRIPTION OF THE DATA

The 1993 Montreal O-D survey is a telephone home survey done for a large sample (59,942 households and a sampling rate of 4.6 %) during the autumn. The trips of the day before (a weekday) are counted for each member of the household aged 5 years and over. The person interviewed is usually one of the adults responsible for the household. In Paris, the 1991-92 EGT is a survey made at home by an interviewer. It is done between September and May on a sample of 11,000 households (sampling rate of 0.3%). This survey counts all the trips of the preceding day (weekday) done by all the members of the household aged 6 years and over. However, each person is interviewed personally except in certain cases for the very young.

The O-D survey of Montreal contains the essential information necessary to analyze transportation patterns. It describes all the trips made the day before the interview by each person of the household aged 5 years and over with some information on the household and on each trip. As for the *household*, the main variables are the following: total number of persons in the household, number of persons aged 5 years and over, age of each person, sex, possession of drivers' licence for those aged 15 and over, age and sex of the person interviewed, residential location, number of motorized vehicles. However, we have no information on the family ties between each member of the household. The information on *the trips* is very detailed: origin and destination of each trip made the day before, the purpose, the time of departure; the different modes of transportation used and their sequence; the lines of public transport used, driver or passenger for car use, mode of payment of parking, crossing of bridges, etc.

The variables in the 1991-92 EGT of Paris are much more detailed, the interview being made at home by an interviewer. For example, as to the household, we have the following information: age and occupational category of the household head (called the person of reference), location of the household, year of entry in the dwelling; type of dwelling and size, number of handicapped persons, number of adults, number of persons aged less than 6 years and 6 years and over, number of absent persons for a long period, number and type of vehicles in the household; parking facilities. For each *individual* in the household, we have similar information as in Montreal (age, sex, possession of driver's licence) which is complemented however with many other socioeconomic variables such as: economic activity, profession, social category, location of work or study, home-work distance, hours of work, main occupation, level of education, parking at work, professional status, ... We also have direct information on the family ties between each member of the household and the household head or person of reference. Finally the information on the *trips* and the travel modes contains the classic information (origin, destination, purpose, mode, transit line, etc., for each trip), which is complemented by much more detailed information such as: transportation of heavy objects or of animals, bridges, etc.

In Paris, the information on family ties is very detailed: visitor; person of reference; spouse; child, sister, brother, son-in-law and daughter-in-law, sister and brother-in-law; grandparents, parents-in-law, grandchildren; other parents; salaried servant lodged; other non parents'. This information on family ties between members of a household is absent in the telephone O-D survey of the MMA, we have reconstituted this variable and validated it with the Paris data which allows for comparative analyses between the two case studies.

METHODOLOGY

DESCRIPTION OF THE METHODOLOGY

The validation of the methodology (reconstitution of the variables relating to "household structure" and "activity"—working or not) was done with EGT data since they permitted a comparison between the constructed typology and the real data.

The household structures

The typology used here was derived from Séguin and Bussière[1]. The 1993 O-D of the MMA was composed of a limited number of variables, as we have seen, and from which two were chosen to construct a typology which gives a good approximation of the types of households involved even though the telephone survey does not take family ties into account. Séguin and Bussière[1] first constructed a typology of the most familiar household structures and then refined them with the help of different criteria retained from a certain number of studies, particularly those of Hamel and others[22]. For each type of household, a series of conditions for which the different types would have to qualify in order to be assimilated into a type of household was constructed.

The construction of the typology which was done with a computer program was explained in detail in Séguin and Bussière[1] and we will just mention here the main characteristics of the model.

The two concepts constituting the basis of the typology are the couple and generational notions. The typology is presented in table 1 which defines the eight types of reconstructed household structures (+ a residual category). This typology was applied to the 1991-92 survey data in Paris, for validation, and to the 1993 O-D data in Montreal, for comparative analysis of travel behavior patterns in both case studies.

The working status of the individual

Furthermore, as we noted, many authors revealed the impact of working or not on travel patterns, and we retained this notion in our analysis of the mobility. As the variable existed in the EGT survey of Paris and did not in the O-D survey of Montreal, we had to define it in a way that would permit comparisons in the two contexts. We defined a working person as a person who made at least one worktrip (either home-to-work or for a professional purpose).

STEPS IN THE APPLICATION OF THE METHODOLOGY

Validation of the typology of household structures on EGT data

(i)- Construction of the typology on the basis of real data from the EGT survey (computer program);
(ii)- Construction of the typology using the concepts of age gap between members of the household and sex; computer program applied to EGT and O-D data survey;
(iii)- Comparisons.

Proxy of the working population on EGT data

(i)- Identification of the working population on the basis of real data from the EGT survey (computer program);

(ii)- Identification of the working population with the proxy of one worktrip (or business trip) during the day; computer program applied to EGT and O-D data survey;
(iii)- Comparisons.

Comparative analysis between MMA data and EGT data:

(i)- Impact of household structure on women's mobility;
(ii)- Impact of household structure on mode use.

RESULTS

VALIDATION OF THE TYPOLOGY OF HOUSEHOLD STRUCTURES AND THE DEFINITION OF THE WORKING POPULATION ON EGT DATA: ANALYSIS OF THE STRUCTURE OF POPULATION.

Validation of the typology of household structures

The first thing to note is the similarity of the structures of population in Paris whether we used the methodology of reconstitution of household structure based on the two notions of age gap and sex or the real data of the EGT survey (Table 2: columns 1 and 2). In the two cases, we find the same three categories of household constituting the majority of the population: couple with minor children (category 6) with about 27% of the population, couple (category 2) with 26%, and couple with minor and major or only major children (category 8) with about 20% (Table 2: columns 1 and 2). The fact that in the two contexts, the structures of the population by type of household are very similar means a *validation of our methodology of reconstruction of the variable.*

Proxy of the working population

With the one worktrip definition, the person who made at least one trip to go to work or for business affairs was defined as a working person. We applied this definition to the O-D survey in Montreal and the EGT in Paris, while the variable of working and nonworking existed in Paris.

Comparing EGT data with the results of the application of the one worktrip definition, we found an underestimation of the working population with the one worktrip definition in Paris among the population aged 6 and over (Table 3: columns 1 and 2). In fact, the people who were interviewed for the survey did not always declare a worktrip for the week day before even if they were really working people (teachers, part-time workers...). This appears especially for working women.

As expected, the proxy used underestimated the working population (of about 20%).

Table 1
Elements of Definition of the Household Typology

Type	Type of household	Nb.of persons/household	Nb.of adults/household	Of opposite sex	Nb.of children (£17 years)	(2 generations) Gap>15 years between adults and children	(2 generations of adults) Gap>15 years between adults	(1st generation of adults - couple or not of opposite sex - Gap 15 years)
1	Single person	1	1					
2	Male and female of s	2	2	yes	0		no	
34	Several adults without	>1>1	>1>1	nono	0		noyes	
5	One adult with minor	>1	1		[3]1	yes		
6	Male and female with	>2	2	yes	[3]1	no	no	
7	One mature adult with	[3]2	[3]2		[3]1	yes	yes	no
8	Couple with minor an	>3	[3]3	yes	[3]1	yes	no	yes
9	Residual category	-	-	-	-	-	-	-

* Children is understood as referring to one or more children. Note: We define a minor child as a child less than 18 years old and an adult as a person of age of 15 years or less.

Source: Derived from Séguin and Bussière (1).

COMPARATIVE ANALYSIS OF THE TYPOLOGY OF HOUSEHOLD STRUCTURES AND THE DEFINITION OF THE WORKING POPULATION WITH THE O-D DATA, MONTREAL: ANALYSIS OF THE STRUCTURE OF POPULATION.

Typology of household structures

As we compare the two structures of population in Montreal and Paris by type of household, it is remarkable to notice a great similarity. The three most important categories in terms of percentage of population, are the couple with minor children (category 6; 30% in Montreal and 27% in Paris), the couple (category 2; 23% in Montreal and 26% in Paris) and the couple with minor and major or only major children (category 8; 21% in Montreal and Paris) (Table 2: columns 2 and 3).

Definition of the working population

The comparison of the structures of the population (proportion of working and nonworking population, by sex) reveals differences in the two contexts. The results show a majority of working people in Montreal (59% of the population) while the opposite situation is observed in Paris (nonworking: 58% of the population) (Table 3: columns 2 and 3). These results may be explained by the category of children among the nonworking population and should be clarified in another study.

As we noticed before, the proxy of one worktrip gives an underestimation of the working population. This means that the working population may represent more than 59% of the population in Montreal. While this underestimation plays a role in the two contexts, this reinforces the differences between the two structures.

The variable defining activity of the population is important since it is known to have an influence on mobility patterns. And we cannot reconstruct it easily when it is lacking; it is thus important to take it systematically into account in transport surveys.

Table 2
Structure of the Population (6 years +) by Type of Household

Data from the EGT 1991-92 (Paris) and Application of the methodology in Paris (1991-92) and Montreal (1993).								
Description			Paris - EGT Data		Paris - Methodology		Montreal - Methodology	
			Volume	%	Volume	%	Volume	%
Single person			1 386 432	14	1 386 432	14	336 633	12
Couple			2 497 552	26	2 489 670	26	661 717	23
Adults without children			392 500	4	180 311	2	92 873	3
Adults with major children			335 414	3	373 252	4	125 514	4
Adult with minor children			277 173	3	291 208	3	116 798	4
Couple with minor children			2 701 507	28	2 640 486	27	874 418	30
Adult with minor & major children			102 466	1	89 550	1	15 478	1
Couple with minor & major or only major children			1 857 607	19	2 051 876	21	618 414	21
Residual			80 223	1	126 519	1	71 894	2
			9 630 874	100	9 630 874	100	2 913 757	100
GT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-urbanisation.								

Table 3
Working and Non-working Population (6 Years and +)

1991-92 EGT Data (Paris) and Application of the one work-trip definition in Paris (1991-92) and Montreal (1993).							
		Paris - EGT Data		Paris -1 Work-trip definition		Montreal -1 Work-trip definition	
		Volume	%	Volume	%	Volume	%
Working	Men	2 574 499	27	2 244 783	23	931 718	32
	Women	2 171 327	23	1 770 696	18	773 142	26
	Total	4 745 826	50	4 015 479	42	1 704 860	59
Non-workir	Men	2 008 087	21	2 373 918	25	483 375	17
	Women	2 812 628	29	3 241 477	34	725 522	25
	Total	4 820 715	50	5 615 395	58	1 208 897	41
Total		9 566 541*	100	9 630 874	100	2 913 757	100
* The difference between the two totals (9 630 874 and 9 566 541) is explained by the existence of two variables ("sans objet" and "non renseigné") in the EGT.							
Sources: EGT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-urbanisation.							

THE IMPACT OF HOUSEHOLD STRUCTURE ON WOMEN'S MOBILITY AND MODE USE

The study of mode use for working and nonworking adults reveals the importance of car-driving in Montreal and Paris, especially for men and especially in Montreal. Car-driving appears to be the most frequent mode used, except for the nonworking women in Paris (where walking is for them the first mode to be used). It also reveals the importance of urban transit and walking in Paris (Figure 1).

The mobility is defined as total daily trips per person. For the mode of *walking*, we can notice that the mobility of women is higher than the one of men, for working as nonworking persons, in Paris as in Montreal (Paris: Men= 0.73 and Women= 1.21 ; Montreal: Men= 0.21 and Women= 0.29). Compared to Montreal, more trips are made by walking in Paris; this may be associated with the urban form and the transport network (smaller distances to go from one place to another) which may also imply the greater use of car in the Montreal region (Figure 2).

For working women, the mobility by walking is the highest for women from households composed of adults without children (category 3; Paris: 1.31; Montreal: 0.47), adult with minor children (category 5; Paris: 1.09 ; Montreal: 0.39) and single person (category 1; Paris: 1.08; Montreal: 0.44). For nonworking women, the categories are 6 in Paris (couple with minor children: 2.05) and 5 in Montreal (adult with minor children: 0.75). For men, the presence of minor children do not appear to influence their mobility by walking, in Paris as in Montreal (Figure 2).

As expected, the mobility by *urban transit* is higher for women than for men, especially among the working population, in Paris as in Montreal (working population: Paris: Women= 1.04 and Men= 0.80; Montreal: Women= 0.77 and Men= 0.48). In Paris, the mobility by urban transit is especially high for working women who live alone (category 1: 1.33) or with others adults (category 3: 1.64). In Montreal, the working women making the most trips by urban transit are living with minor and major children (category 7: 1.25) or with adults without children (category 3: 1.12). For working men, we find the same categories in the two contexts but the level of mobility is lower (Figure 3).

For the mode of *car-driver*, the mobility of men (working or not) is a lot higher than that for women, in Paris as in Montreal (Paris: Men= 1.91 and Women= 1.23; Montreal: Men= 2.11 and Women= 1.37). However, working or not, men or women, in Paris as in Montreal, the persons who have the highest mobility rate as a car-driver are living with minor children (categories 5 and 6) except for nonworking men in Paris where the category 5 is replaced with the 2 (couple). This reflects the great influence of the presence of minor children on mobility by car in the two contexts (Figure 4).

As *car-passengers*, women are making more trips than men (Paris: Women=0.38 and Men=0.17; Montreal: Women= 0.48 and Men= 0.17). The fact they are working or not does not really influence the level of their mobility in the two contexts. Considering the household category, we can observe that mobility is the highest for women (working or not) living in a couple without children (category 2) (Figure 5).

The comparison of the use of *other modes* of transport (motorcycles, bicycles...) is less significant, the survey being made in the fall in Montreal when the usage of these modes drops. We may still note that for men these trips are more frequent (Paris: Men= 0.15 and Women= 0.04; Montreal: Men= 0.06 and Women= 0.03). However, the levels of mobility are still very low for those modes (Figure 6).

These results which clearly reveal the impact of the presence of minor children on individual mobility, especially for working women and for the car-driver, confirm the interest of taking into account the household structure in an analysis of mobility and the necessity of a methodology to reconstruct this variable when it is lacking in a survey.

CONCLUSION

We fully validated a methodology which uses the notions of age gap and sex of the members of the household to remediate a missing variable which plays an important role in the analysis of individual mobility: the household structure of the population.

Even though the proxy used to analyze working population trips underestimates the working population, the comparison of the results obtained from the proxy and the real data of working population revealed similar behavioral patterns.

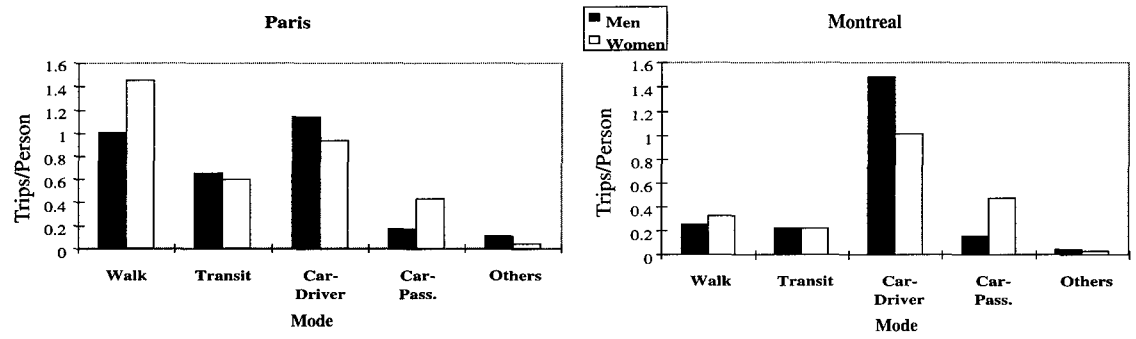
While comparing the impact of household structure on women's mobility and mode use in Paris and Montreal, the results showed the importance of the presence of minor children and the differences of mode use by sex and status of activity. As sociocultural differences may persist in the two contexts (family roles, mode use, occupation...), we revealed interesting similarities, especially for the mode of car-driver for working women with minor children.

The study of the mobility patterns in relationship to household structure may reveal extremely interesting results not only for describing present travel behavior but also for forecasting, especially in contexts where the family forms may change considerably with economic growth, as in developing countries.

Figure 1

Daily Trips per Person by Mode for Working Adults (18-64) by Sex, Paris, 1991-92 and Montreal, 1993.

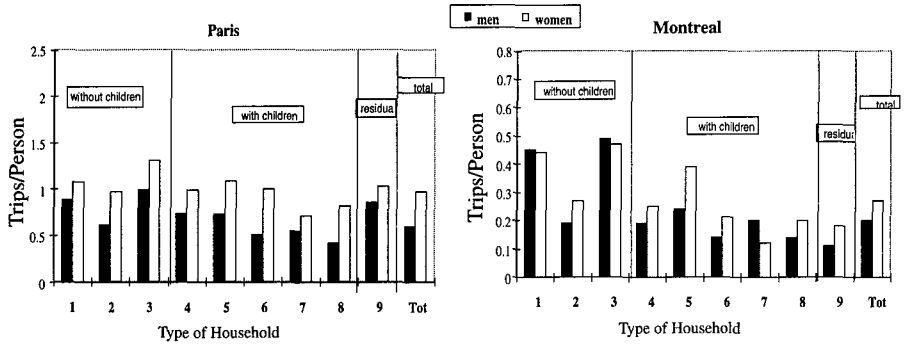
Daily Trips per Person by Mode for Non-Working Adults (18-64) by Sex, Paris, 1991-92 and Montreal, 1993.



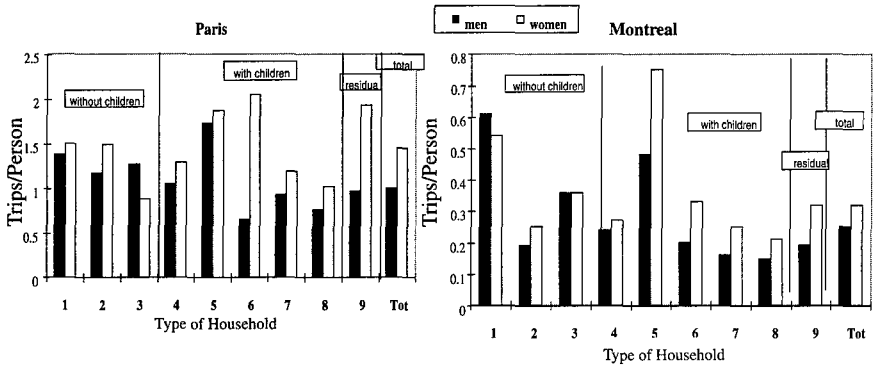
Sources: EGT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-Urbanisation.

Figure 2

Daily Trips per Person by Walking for Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



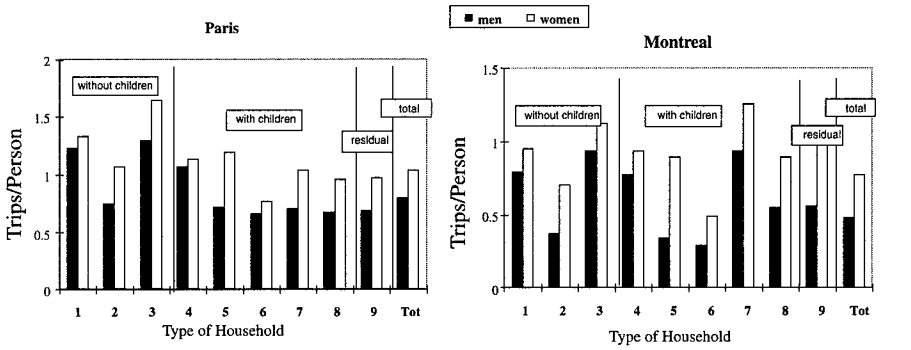
Daily Trips per Person by Walking for Non-Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



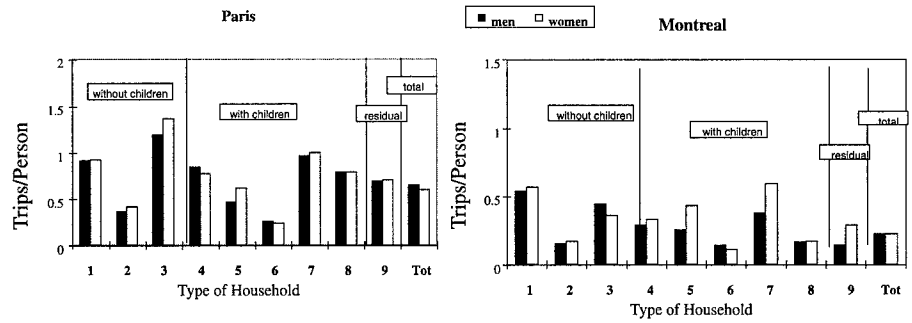
Sources: EGT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-Urbanisation.

Figure 3

Daily Trips per Person by Urban Transit for Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



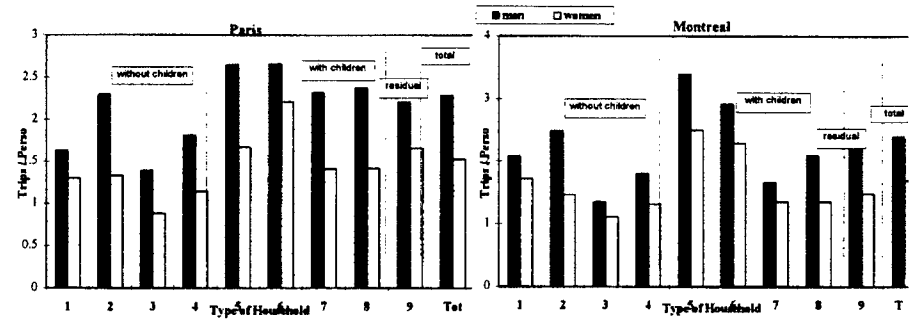
Daily Trips per Person by Urban Transit for Non-Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



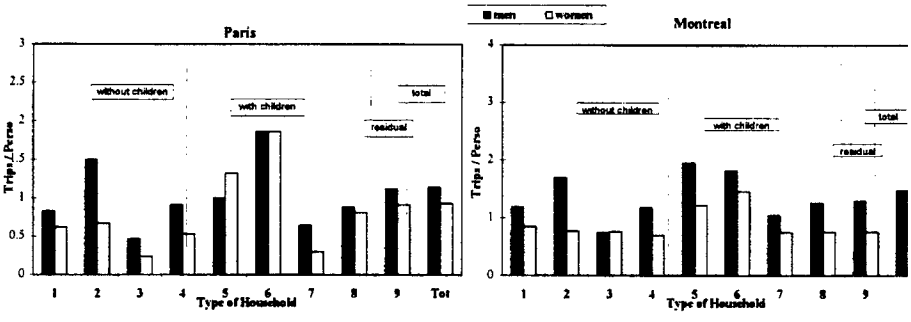
Sources: EGT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-Urbanisation.

Figure 4

Daily Trips per Person by Car (Driver) for Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



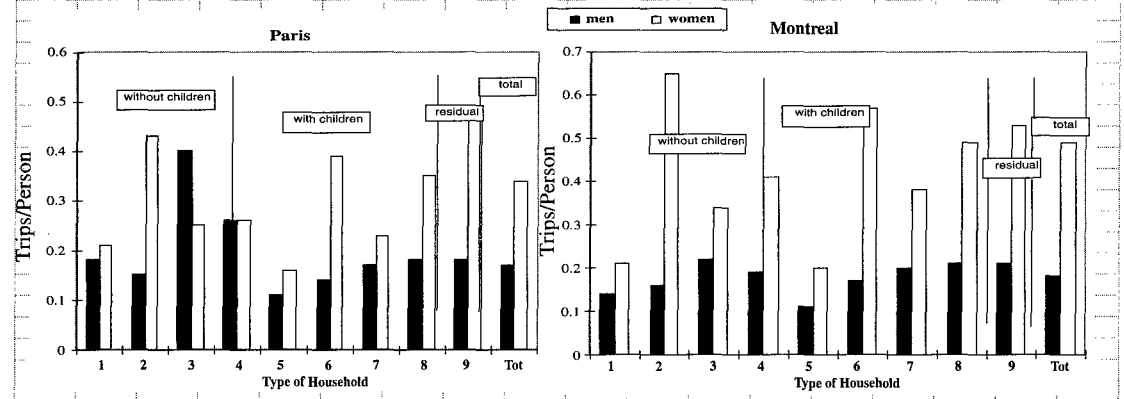
Daily Trips per Person by Car (Driver) for Non-Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



Sources: EGT 1991-92, Paris; O-D 1993, Montreal; INRETS; INRS-Urbanisation.

Figure 5

Daily Trips per Person by Car (Passenger) for Working adults(18-64) by sex and type of household, Paris, 1991-92, and Montreal, 1993.



Daily Trips per Person by Car (Passenger) for Non-Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.

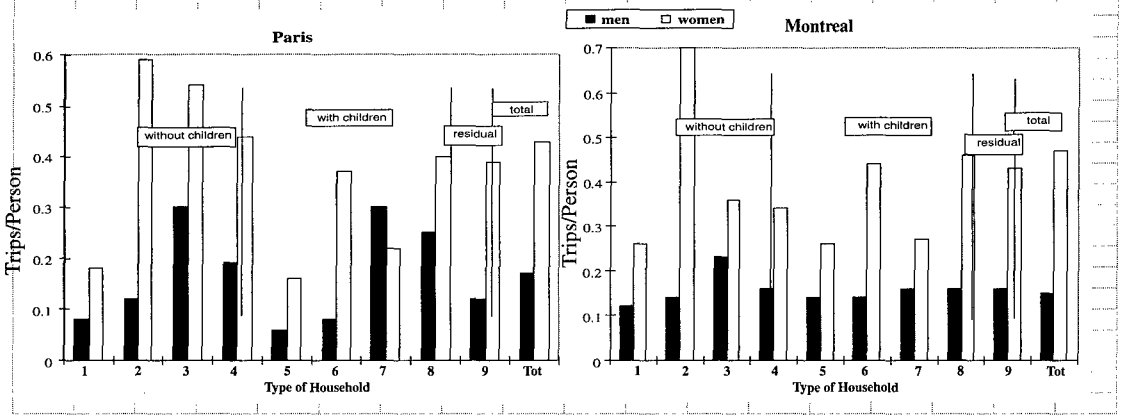
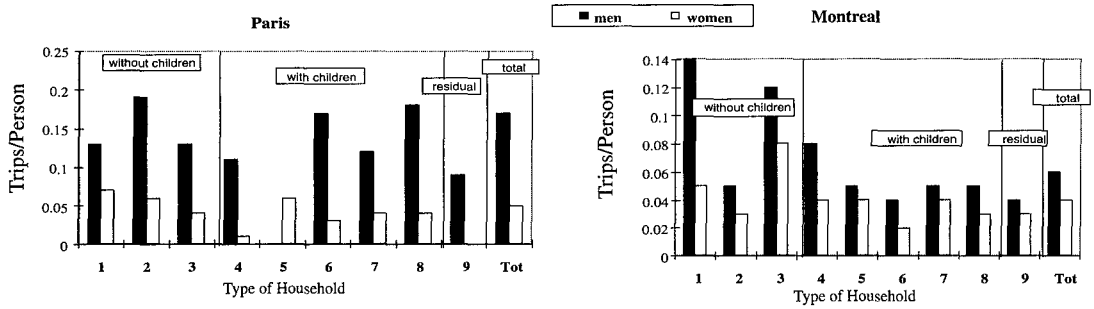
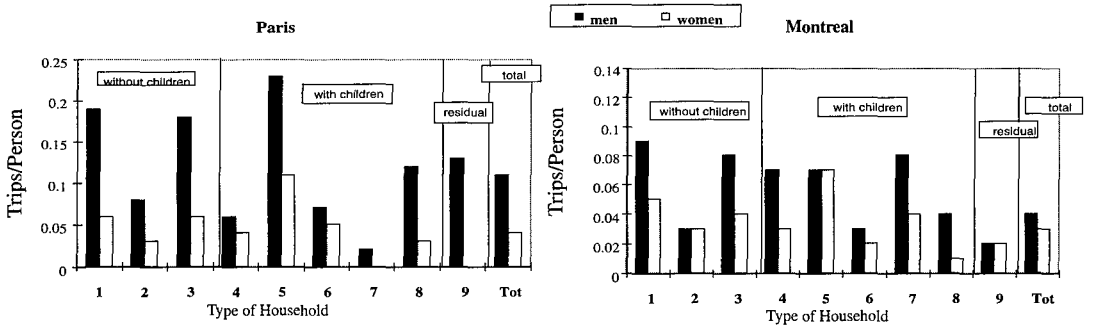


Figure 6

Daily Trips per Person by Other Modes for Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



Daily Trips per Person by Other Modes for Non-Working adults (18-64), by sex and type of household, Paris, 1991-92, and Montreal, 1993.



Sources: EGT 1991-92. Paris; O-D 1993. Montreal; INRETS; INRS-Urbanisation.

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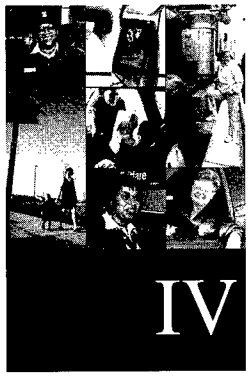

WOMEN, SPACE, AND PLACE

14

Run, Don't Walk: How Transportation Complicates Women's Balancing Act

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RUN, DON'T WALK: HOW TRANSPORTATION COMPLICATES WOMEN'S BALANCING ACT

Think about something we all do every day—crossing the street. We stand on the sidewalk waiting for the light to change, and then we cross. It seems like a simple enough act, but how easily it is accomplished varies. For example, those who make it quickly across the street within the average allotted fifteen seconds typically are wearing flat shoes rather than high heels, carrying a briefcase rather than pushing a baby stroller, and walking alone instead of leaning on someone's arm.

The different ways in which women and men negotiate such common travel demands reflect many other aspects of our gendered society. The quest to produce "seamless travel" and reduce the costs of mass transit and highways has led traffic engineers to simplify urban transportation systems by marginalizing non-work trips. But this emphasis on efficiency ignores, and sometimes actually hinders, the type of nonlinear travel most women engage in. "Run, Don't Walk" is the message many women internalize, whether negotiating a city street corner or combining employment and family obligations.

The purpose of this paper is to analyze women's travel issues in the context of women's changing social status. As formal education and employment have been added to the domestic responsibilities expected of women, many feel they must run faster just to stay in place. In the past, being a wife and mother was the constant in a woman's life and employment was a variable. But now paid work has become a necessity for most women and their marriage and childbearing decisions are more flexible. Because in some ways women's lives are becoming similar to men's, while in other ways they remain very different, this paper describes why women's and men's travel patterns both converge and contrast. By understanding how women's travel is embedded in its social context, transportation planners may be able to accomplish more for women than just adjusting the timing of traffic lights.

POINTS OF CONVERGENCE

Women's lives have become more like men's in three important ways. One is that women are more likely to participate in the public sphere, via college and the labor force, than in the past. The second is that high out-of-wedlock births and divorce rates have made a significant proportion of women economically responsible for their families. The third is that the "gender gap" in driver's licenses has almost closed for the young and middle-aged and has substantially narrowed for the elderly. Thus transportation forms a vital link between private and public spheres for both women and men.

COLLEGE AND EMPLOYMENT

Almost one-fifth of all American women have college degrees now compared with only 6 percent in the 1960s. Nearly two-thirds of both women and men who graduate from high school enroll in college, and women now account for a slight majority among college students. One-quarter of women and men between the ages of 25 and 34 have college degrees (Spain and Bianchi 1996).

Although women's and men's college experiences are increasingly similar, the typical female student is older, more likely to take classes part-time, and more likely to attend a community college than the typical male student (Spain and Bianchi 1996:60). This profile suggests different travel patterns for women and men. Older, part-time students are more likely than younger, full-time students to be employed or to have family responsibilities. And attendance at a local community college generates more short-distance trips than residence at a four-year institution. Thus, female students are more likely than male students to need transportation that provides maximum flexibility in combining tasks.

Just as the gap between women's and men's educational attainment has narrowed, so has the difference between women's and men's labor force participation rates. Among people in the prime working ages between 25 and 54, women's labor force participation has increased dramatically and men's has declined slightly. In 1960, 43 percent of prime-working age women and 97 percent of working-age men were in the labor force (for a female-to-male ratio of. 44). By 1994, 75 percent of working-age women and 92 percent of men were in the labor force (for a ratio of .82) (Spain and Bianchi 1996:82).

Women therefore are becoming more similar to men in their tendency to work outside the home. But the jobs in which women are concentrated (teaching, clerical, and nursing occupations) differ from men's in one important respect: they are typically closer to home and require less business travel. Thus women's paid work generates shorter trips and greater dependence on public transit than men's paid work (Turner and Niemeier n.d.). Although these are often the types of work that mothers choose as compatible with child rearing responsibilities, they actually lack the very flexibility and control that parents need to balance work and family obligations (Bielby and Bielby 1988; Glass 1990; Glass and Camarigg 1992).

Telecommuting, a growing alternative to office work, may provide employed women with greater flexibility. On the other hand, telecommuting might also reinforce social isolation and responsibility for domestic tasks while perpetuating lower wages and fewer benefits for its participants (Gurstein 1996).

FEMALE HOUSEHOLDERS

Women are more likely now than in the past to maintain their own households. Delayed age at first marriage, divorce, widowhood, and non-marital childbearing have all contributed to the growth in female householders. One-half of all women now delay marriage until age 24, approximately one-half of all marriages are expected to end in divorce, nearly one-half of all women aged 65 and over are widowed, and one-third of births now occur outside of marriage. Since the 1970s, the proportion of all households maintained by women has risen from 21 to 29 percent and the proportion of families with children under 18 maintained by women has risen from 10 to 22 percent. Nearly one-half of black families are now maintained by women compared with 25 percent of Hispanic, 13 percent of Asian, and 14 percent of white non-Hispanic families (Spain and Bianchi 1996).

Women who maintain their own households face the same economic responsibilities as men. Almost three-quarters of single mothers are in the labor force, the majority of whom work part-time (Spain and Bianchi 1996:147). These women, even more than married mothers, require transportation that serves both family and employment needs because they have no spouse with whom to share responsibilities. Yet zoning separates residential from business districts and makes it unlikely that job, child care, and shopping facilities are in close proximity (Hayden 1984; Ritzdorf 1988). Laws implemented to protect property values in an earlier era were premised, in part, on husband-wife couples in which only the man was employed. Now that so many women maintain families alone, in addition to working outside the home, the transportation needs of families have changed.

It is not surprising, therefore, that the proportion of women using public transit and carpooling has declined and the proportion of women depending on private cars has increased over time (Rosenbloom 1995a). Women need the flexibility a car offers in order to reach work on time and to run errands. It is not just that cars are more convenient than public transit, it is that public transit often presents actual obstacles to women. The escalators and turnstiles in subway systems, for example, are almost impossible to navigate with a baby stroller or toddler in tow. Women's lives have become more complicated, but their transportation options are still limited: a private car provides one of the few ways to meet both family and employment obligations.

Transportation is like contraception: it is ultimately a woman's responsibility for which society provides few alternatives. Just as we might well ask why, in the 1990s, we are still engaged in emotionally-charged debates about the evils of abortion when abortion could be avoided if women had access to RU486 or if male contraceptive technology had advanced beyond the often ineffective condom and the irreversible vasectomy, we might also wonder why, in the 1990s, we are still wringing our hands over the evils of private cars. We know that safe, sensible alternatives exist to both abortions and cars, yet we are stuck in a time warp: If only women would get married, stay home, and have children the way they did in the 1950s, there would be less demand for abortion and for private cars. But blaming women for complex social changes that have propelled them out of the home brings us no closer to solutions regarding either contraceptive or transportation choices.

GENDER AND DRIVING

Jokes about women drivers were popular during the 1950s when only about one-half of adult women had driver's licenses. Now that nearly 100 percent of adult women have driver's licenses, the frequency of those jokes has declined. The dramatic growth in women's labor force participation rates is credited with this rise in licensing rates (Stone 1996:4). The increase in women workers changed public attitudes about appropriate roles for women (Spain and Bianchi 1996:181,183), and now the increase in women drivers has changed our definitions about appropriate topics for humor.

Studies show an increase in licensing rates for women, but trend data may overestimate past gender differences in driving patterns. Like Ms. Ramsey, the female race car driver discovered by Professor Wachs, much of women's driving history before the 1950s has been obscured. If the accomplishments of a barnstorming performer could be erased from public memory, recognition of the errands run by the majority of wives and mothers never even existed.

Historian Ruth Schwartz Cowan (1983) identifies the demise of home delivery services during the 1930s with an increase in the number of women behind the wheel. Once grocery stores and butcher shops eliminated deliveries in order to compete with supermarkets, the burden of providing transportation was shifted from the seller to the consumer—typically women. The perception that fewer women drove at mid-century may be due to the fact that fewer women than men were formally licensed, since a driver's license was not required in all states until 1954 (Nock 1993:57). In More Work for Mother,

Cowan notes that:

> By mid-century the time that housewives had once spent in preserving strawberries and stitching petticoats was being spent in driving to stores, shopping, and waiting in lines... The automobile had become, to the American housewife of the middle classes, what the cast-iron stove in the kitchen would have been to her counterpart of 1850—the vehicle through which she did much of her most significant work, and the work locale where she could most often be found. (Cowan 1983:85)

The proportion of women with driver's licenses has risen in every age group and is especially notable among the elderly. Used car salesmen once promoted vehicles previously owned by little old ladies as real bargains: the cars had low mileage and were in mint condition because they'd been kept in the garage for many years. That stereotype has become less applicable as elderly women retain their licenses longer. In 1992, nearly 100 percent of men and 80 percent of women in their sixties had a valid driver's license, and licensing among seniors is expected to be nearly universal for both sexes by 2010 (Rosenbloom 1995b:3-14).

The increased independence that accompanies possession of a driver's license may come with a cost. The elderly are more likely now than in the past to rely on cars for transportation and less likely to walk (Rosenbloom 1995b). As older women drive more and walk less, the health benefits of walking (e.g. in the prevention of osteoporosis) may fade. Additionally, since car accidents are more likely to be fatal for older than younger persons, as more elderly women drive they will experience a greater risk of death by automobile than in the past. Finally, female drivers have an injury risk approximately 50 percent greater than male drivers, due partially to their shorter height (placing them closer to the steering wheel with a poorly-fitted seat belt). Since women tend to lose bone mass and actually become shorter as they age, vehicle characteristics that are inadequate for younger women may become even less satisfactory for older women (Stone 1996). Just as women's death rates from cancer increased as they copied men's smoking patterns, their death rates from automobile accidents may rise as they adopt men's driving (and drinking) habits.

AREAS OF CONTRAST

Women's and men's lives may be converging in reference to labor force participation, economic responsibility for children, and possession of a driver's license, but significant differences persist. Women are more likely than men to work part-time, to be responsible for child care and housework, and to perform tasks that are considered inherently "interruptible". The division of paid and unpaid labor and the assumption that women's work (paid or unpaid) can be interrupted may shape women's travel patterns in ways that men do not experience.

DIVISION OF PAID AND UNPAID LABOR

Employed mothers are now the rule rather than the exception, and the majority of mothers work part-time. In 1990, three-quarters of women with preschoolers and 60 percent of mothers with children aged 6 to 17 worked part-time. Although no statistics exist for father's labor force attachment, men are almost twice as likely as women to work full-time (Spain and Bianchi 1996:88,152). Women's greater reliance on part-time work means that their transit use is more likely to coincide with "off hours" than "peak hours" of operation.

The hours women spend in unpaid housework and child care are double those that men spend, while men spend almost twice the hours in paid labor that women do. This division of labor makes economic sense in a world in which women earn only 71 percent what men earn: if the wife works part-time, foregone earnings will be lower than if the husband works part-time. Yet this logic creates a self-fulfilling prophecy that penalizes women economically. Part-time employees receive fewer benefits, accrue less seniority, and earn lower wages than full-time employees. Further, following a strategy appropriate for a married-couple with children makes a woman more economically vulnerable if divorce or widowhood occurs (Spain and Bianchi 1996: Chapter Five).

Working part-time is one way in which employed mothers reconcile competing family and work obligations; another is the use of paid child care. All working mothers rely more on day care outside the home now than during the 1960s, and mothers who work full-time are most likely to use group facilities. Approximately one-quarter of children with mothers who work full-time are currently in group centers compared with 8 percent in 1965; 15 percent of the children whose mothers work part-time are in day care facilities compared with 3 percent in 1965 (Spain and Bianchi 1996:178). Travel to childcare facilities generates one more type of short-distance trip, which may partially account for the higher number of trips among both single and married mothers (Rosenbloom 1995a). [Interestingly, no census data exist for the childcare arrangements of working fathers, another indicator of the implicit assumptions about women's and men's different responsibilities.]

Child care facilities located at transit transfer stops may be one solution to this dilemma. Montgomery County, MD, a suburb of Washington, D.C., is trying this approach with its innovative KidStop, a child care facility built in 1994 at the Metrorail station. Funding was provided by the Foundation for Working Families, Inc., a public-private partnership of county government, the school system, and eleven area companies. The Foundation raised construction money that was matched by the state, the Washington Metropolitan Area Transit Authority gave the group a 30-year lease on 2.2 acres at one of its stations for $10, and corporate donations allowed firms to reserve slots at the center for employee's children for the next ten years. Kidstop—dubbed "Kiss and Cry" rather than "Park and Ride" or "Kiss and Ride"—served 60 children that year and has capacity for 120. Similar efforts to simplify parents' schedules are being tried in Illinois and California (Daniels 1995).

Children can create travel demands by participating in organized recreation. As more mothers enter the labor force, fewer women are at home during the day to supervise children's play. The solution has been a "bureaucratization" of sports in which children join after-school teams for hockey, soccer, basketball, or swimming. Ironically, this alternative has proved double-edged, because practices and league tournaments create their own set of transportation requirements on weekdays and weekends. Since few cities provide public transportation that young children can use alone, and most suburbs require cars, the recreational needs of children soon generate travel demands on parents (Tranter 1994).

Limitations of urban and suburban structure play only one part in this web connecting children's needs with adult travel. Expectations of appropriate behavior for children and adults have also changed over time. When I was young I spent every summer on my grandparents' farm in North Carolina. My cousins (all boys) knew how to drive tractors and trucks by the time they were ten. By age sixteen they were driving school buses. Although contemporary city streets may be more dangerous than rural roads were thirty years ago, adolescents were expected to be self-sufficient and teenagers were expected to take responsibility for others when it came to transportation. Such assumptions freed adults for more important work. Now, however, adults (especially women) are responsible for their own paid and unpaid work and for ferrying children around (Rosenbloom 1995a).

Reduced responsibility for transportation is only one component of children's declining contribution to household chores (Goldscheider and Waite 1991).

The transportation implications of the division of domestic labor are that men can travel from home to work and directly back again, but women typically must combine commutes to work with trips to the dry-cleaner, grocery store, or day care center. Men's linear focus on reaching work and returning home would be a luxury for most women. Women's trips, like the rest of their lives, are characterized by interruptions.

THE INHERENT INTERRUPTIBILITY OF WOMEN'S WORK

Part of the reason "woman's work is never done" is that it is interrupted so often. Women who work as secretaries, teachers, and nurses hold "open floor" occupations that subject them to constant surveillance and frequent interruptions (Spain 1992). Women who perform unpaid work in the home are "on call" for spouses, children, and service or delivery people. Women working at home also are likely to be asked to pick up medicine for an elderly neighbor, drop books off at the library, or volunteer at a child's school (Milroy and Wismer 1994). These expectations and requests qualify as interruptions to daily routine even for the forty percent of adult women who are not in the labor force. For the sixty percent of women who are in the labor force, such activities constitute another way in which their paid work is interrupted. Telecommuting may prove to be the epitome of interruptible work.

Women (employed or not) may welcome such diversions as a way of caring for a family, maintaining friendships, or establishing relationships within the community. Nevertheless, added together they create time and travel demands that depart from the linear goal orientation that reaps rewards in the marketplace. For example, a man may use uninterrupted commuting time to prepare for or review the day's tasks, while a woman is more likely to be mentally reviewing the contents of her refrigerator to decide whether she has to stop for groceries on the way home.

Women's travel patterns reflect and reinforce the same message of interruptibility that characterizes their work. The fact that wives and mothers make more trips, but travel fewer miles than husbands and fathers, suggests that women are running numerous errands close to home (Rosenbloom 1995a). We do not know if trip-linking is more prevalent among women who work part-time than among those who work full-time. It is logical, however, to expect that the multiple trips made by women are generated by their greater flexibility in regard to structured work since women are more likely than men to work part-time. But similar to the self-fulfilling prophecy regarding trade-offs between household work and paid labor, once a wife's availability for errands is institutionalized (even on logical economic grounds that her time is worth less, financially, than her husband's), it is difficult to alter that pattern to free women for more remunerative pursuit.

CONCLUSION

Women face a delicate balancing act between home and work, and urban transportation systems can make their negotiations easier or more difficult. To the extent that women's lives are becoming more like men's, current arrangements premised on linear trips may suffice. Men and women are becoming more similar in regard to labor force participation, responsibility for a family, and possession of a driver's license. But to the extent that women's lives are still very different from men's, current systems are inadequate to their needs. Women, for example, are more likely than men to work part-time, to have responsibility for household chores and childcare, and to occupy an interruptible space. The result is that women need more travel flexibility than men.

Cars seem to provide that flexibility. Women are now navigating between the private and public spaces of cities the same way in which most men do—by private car—but they are also stopping in between in "meso-spaces" for activities that are neither completely private nor totally public. Cars are uniquely suited to move through this meso-space as small, enclosed, personalized containers. If public transit could meet women's needs to move in and out of family, voluntary, and employment spheres equally well, women might use it more.

Cars also allow women some control over whom they come into contact with, thus enhancing their sense of safety. Automobile advertisements that once promoted the pursuit of freedom to men now sell security to women. A recent television ad depicted a businesswoman leaving the airport and walking across an empty, rainy parking lot at night. She used her remote key to open the door and turn on the lights of her car, her "best friend" under such conditions. If public transit promised the same sense of protection, women might use it more.

Automobile manufacturers have done more than tap into women's search for safety. They have been quick to recognize the simultaneous demands on women's schedules and have adapted their marketing strategies accordingly. The minivan that holds several children in addition to groceries and pets is marketed to women while sports utility vehicles are marketed to men. The first image invokes responsibility and efficiency; the second image invites escape fantasies. A current television ad for a minivan begins with the observation that all species have to carry around their young; it starts with images of a lion carrying a cub in its mouth and ends with a minivan driving off into the sunset. If public transit recognized that females are still largely responsible for carrying around their young, women might use it more.

This paper began with the observation that women feel they must run constantly to keep up with the demands in their lives. In this scenario, private cars make more sense than public transit. To become relevant and useful to women, public transit must be flexible and safe. Such a system would go far toward allowing women the time to walk, not run, between their obligations.

These suggestions, however, only tinker with the margins of the transportation issues women face. The central question is really why, in the 1990s, women perform more of a balancing act than men. If women have special transportation needs because of their roles as wives, mothers, and employees, is it enough to adjust the small details of transportation to make daily life easier, or should women step back and reassess the whole system that requires such a balancing act?

For example, if women perform more unpaid work than men because their time is worth less in the market, then the wage structure needs to be changed. If it is currently difficult to quantify the value of women's unpaid time, then measures need to be created that will add the value of women's family and volunteer activities to the equation used to calculate the productive time lost in traffic jams. Finally, we may expect too much from the public sector and demand too little from the private sector. If Cadillac could retool its production line at the turn of the century to market electric-starter (rather than crank-starter) cars to women, and if most automotive manufacturers can switch from stick-shift to automatic, why not also expect them to institute wage and family policies that insure comparable promotion opportunities for women and men, timely collection of child support, and childcare facilities or subsidies for employees?

A National Conference on Women's Travel Issues allows us to address both the large and small issues regarding women's balancing act. The short-term goal of such a conference is to improve parts of the transportation system that women depend on; the long-term goal should be to question the social system that has created difficulties for women in the first place.

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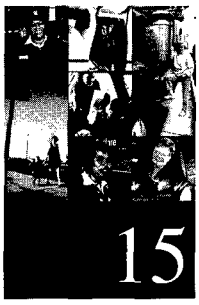

Gender, Work, and Space in an Information Society

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GENDER, WORK, AND SPACE IN AN INFORMATION SOCIETY

Over the past 20 years or so we've learned a lot about the crucially important role of gender in shaping travel activity patterns and—I'd argue—about the ways in which travel patterns mold gender relations. To recapitulate, in a pistachio-sized nutshell, what we've learned: we know that, first, despite their labor force participation, women continue to bear a disproportionate share of the domestic workload and that this uneven division of labor in the home is implicated in divisions of labor in the paid work force (primarily taking the form of gendered segregation). Second, we know that time-space plays a pivotal role in enabling people (particularly women) to combine waged work and domestic work; those with heavy domestic responsibilities, usually but not always women, trade off higher wages and better job opportunities for greater proximity, resulting in shorter journeys to work, lower overall travel distances, and smaller activity spaces than those with lighter domestic workloads (usually men). Third, we know that place-based networks of personal contacts (friends and acquaintances, relatives, neighbors, and co-workers) are important in connecting people to housing, jobs, child/elder care, shopping, and recreational opportunities. We know that the spatial nature and extent of the knowledge exchanged through these networks is instrumental in shaping the locational choices people make and consequently the size of their activity spaces. Finally, we know that all three of these processes are interlinked, and that they combine to shape gender and labor markets differently in different places.

I want to speculate here about how advanced information technology (IT)[1] might change all this. What we seem to have learned in the past 20 years is how very gendered the friction of distance is and how very real that friction is for most women. A bevy of books has appeared in the past year or two on the advent of cyberspace and the space-transcending, frictionless wonders of the information superhighway. Just a few among these are: The *Way Ahead*, by Microsoft CEO Bill Gates; *City of Bits,* by architect and urbanist William Mitchell; *Being Digital*, by the head of MIT's MultiMedia Lab, Nicholas Negroponte; *Nattering on the Net*, by feminist Dale Spender; and *Virtual Geography,* by cultural theorist McKenzie Wark. These authors and others herald the despatialization of interaction, the unmooring of community from place, and the end of the tyranny of distance. All are convinced that the Internet and associated information technology (IT) are profoundly and irrevocably reshaping society, much as the printing press ushered in a new era some 500 years ago. The essence of the IT revolution —what will make the future radically different from the past—is, according to them, nothing less than the death of geography. Place and location—where things are, where you are on the ground, how far away you are from other people, places, and things—do not matter in cyberspace and therefore, so the logic goes, won't matter in the information society.

What interests me more than these authors' extreme (and not entirely pleasurable) predictions of life lived in cyberspace is how the Internet and IT will intersect with and no doubt change—though not eliminate—the importance of location and place. And because I believe that at least in the short run—and contrary to some predictions—we shall continue to have gendered bodies and forms of paid and unpaid work, I want to speculate about how IT might alter what we've come to accept as received wisdom on location, place, gender, and work.

If, as several scholars have argued (e.g., Baron, 1991; Hanson and Pratt, 1995; Peck, 1996), gender and labor markets are mutually constituted in place, in large part through the differential effects of distance, might frictionless IT and the move toward an information society shift the contours of gender, work, and place? I want to consider three questions in particular. First, why might we expect IT to stimulate changes in the traditional gender divisions of labor rather than reinforce such divisions? Second, will the placeless networks of IT loosen the bonds of space and place in the networks that shape gender, work, and communities? Third, what are the transportation implications of the processes and the possible changes we are speculating on here?

LOCATION AND THE GENDERING (INTER ALIA) OF WORK

One major impact that IT is already having, and is projected increasingly to have, is to shift the location of paid work away from conventional offices and into homes, neighborhood telework centers, and "office hotels" (computer docking stations where itinerant workers can plug in before moving on). To some extent, particularly in places like Southern California, this locational shift is being driven by the need to reduce auto emissions in order to meet federal air pollution guidelines (and not coincidentally the need to reduce traffic congestion), but the high cost of office space, corporate "downsizing," and workers' desire for more flexibility and less time in their cars also contribute. We know that the *location* of paid work (home/factory/office; city/suburb; region/country) is related—and quite closely related—to other dimensions of work and life. In particular, the location of work is linked to *the type of work* (e.g., the type of technology used; the nature of the "skills" entailed), the *amount of work* (especially whether full time or part time), the *timing or scheduling of work* (how work is distributed over the day, week, month, and year), the *gendering of work* (whether the job is typed as female or male), the *work process* (how work is organized within firms and workplaces), the *stability of work* (permanent or temporary), the *remuneration from work,* and the *meaning of work.* Because the location of work is so closely linked to other aspects of work and life, it's fair to speculate on how a shift in location might stimulate changes in other areas such as the gendering, amount, and scheduling of work.

I am especially intrigued by the possibilities set in motion by a massive movement of paid work, particularly the paid work of men, "back" into the home. Much has been written about home and work as gendered domains (some of this is reviewed in Hanson 1992), which have contributed to the development and support of traditional conceptions of gender through the spatial separation of women and men into different places and different social worlds, complete with differential access to information and knowledge (Meyrowitz, 1985; Spain, 1992). Because large numbers of women have worked outside the home at least throughout this century, the idealization of work as purely masculine has long been one rooted in fiction, but the coding of domestic space as feminine seems to be an amazingly durable feature of our society, and one far more rooted in fact. Whereas women have joined the paid labor force in droves and are increasingly engaged in public life, men have, for the most part, resisted full participation in domestic life. Analysis of a large national survey conducted in the late 1980s in the U.S. shows that among married couples men spent less than half as much time in housework (an average of 18 hours per week) than did women (who spent an average of 37 hours per week in housework) (South and Spitze, 1994).[2] It has been far easier for women to move out of the domestic sphere and into the public world of work than it has been for men to tread the same path in the reverse direction.[3] Might IT be able to change all this by bringing men home? IT work at home poses the interesting hybrid of men working in a "feminine" space using masculine technology.

HOMEWORK

The close links between the location and the gendering of work are especially evident in the arena of homework. Historically, most homework in the U.S. has been industrial contracting out (e.g., sewing, knitting, making jewelry, cigar making), but significant pockets of clerical homework have existed since at least the 1950s. The very existence of paid work in the home challenges the home-work dualism (Boris, 1994, p.2), but, because even paid work at home is assumed to be women's work, home-based work has not challenged the gender division of labor. Indeed homework has been seen as the solution to the conflicts *women* face in their need to combine waged work and domestic work.[4]

Because homework is so strongly coded as female, debates over industrial homework in the U.S. have exposed its contradictory meanings. On the one hand, homework is seen as reinforcing patriarchal structures by maintaining the traditional gender division of labor,[5] while on the other it is seen as holding out the promise of an alternative, even innovative, non-dichotomous organization of home and work (Boris, 1994, p. 9). In an example from the 1980s, conflicting views over the right of women in Vermont to work as contracted knitters in their rural homes pitted women who argued in the name of equal opportunity that it was their right to choose home as the site of work (especially where few other opportunities for paid employment were accessible to them) against other women and feminists who have long argued, also in the name of equal opportunity, for the right to equal work outside the home. Conservatives see homework as supporting "family values" and as a means of keeping women off welfare; it is the way to provide waged work for women who live too far from job opportunities to have "real" jobs or who need to stay home to take care of their families. Opponents argue that homework is exploitative, is not the way to solve the child care problem, and perpetuates women's status as second-class citizens (Boris, 1994).[6]

Industrial homework has been heavily regulated in the U.S. ever since 1884, when the first laws proscribing such work were passed in New York. Boris (1994) has provided a meticulous and engaging documentation of how, in regulating homework, the state has been motivated by a certain ideology of womanhood and motherhood and by visions of what constitutes appropriate home life. Particularly in the late-nineteenth and early twentieth centuries, opponents of homework contended that, in addition to obviating fair labor standards, it undermined domesticity and proper home life.

My point here is that the discourse around homework, including that surrounding legislation outlawing it, has been framed entirely in terms of women and gender-appropriate behaviors. In 1986 Representative Barney Frank's Congressional Committee investigating homework in the context of fair labor practices "called for insuring that the cover of 'protective legislation' [for homeworkers] fell on 'those who choose or are compelled to give priority attention to family obligations by working at home" (cited in Boris, 1994, p. 336). Will the gendered meaning of home and of homework change if large numbers of men begin to work at home? Male homeworkers are most likely to be engaged in some form of IT-related work, as opposed to industrial homework.

ENTER IT

Despite numerous articles with doubting titles like "Resisting the call to telecommute" (Merl, 1995) and "Telework: An innovation where nobody is getting on the bandwagon?" (Ruppel and Harrington, 1995), telework—communicating with co-workers from remote locations—is still touted as the wave of the future. Perhaps because the difficulties in defining telework and telecommuting (terms that seem to be used interchangeably) are legion (Handy and Mokhtarian, 1995; Mokhtarian, Handy, and Salomon, 1995),

the number of current teleworkers reported in the U.S. fluctuates wildly, depending on the source. For example, Link Resources, Inc. estimated a total of 5.5 million U.S. telecommuters in 1991 (only 16 percent of whom telecommuted at least 35 hours per week) and 6.5 million in 1992, a one-year increase of 18 percent (Handy and Mokhtarian, 1995, p. 104); an American Information User survey pegs the number of part-time and full-time telecommuters in 1994 at 9.1 million, up 20 percent from 1993 (Merl, 1995); . Yet a sidebar in the March 18, 1996 issue of *Computerworld* (p.51) announces that "some 55 million U.S. workers will telecommute or work remotely by the year 2000, according to ...an analyst at Gartner Group, Inc." [7]

What is fascinating in light of the gender-infused, indeed gender-focused, discourse on industrial homework has been the near total absence of gender in current discussions, descriptions, and predictions of telecommuting. When gender is mentioned at all, it is tucked unobtrusively into a table that, for example, lists characteristics of teleworkers. Gender has not framed the discourse on IT homework. Most studies of telecommuters in the U.S. have focussed on California, where public policy has encouraged telework, and they should therefore probably not be taken as representative of U.S. trends. Yet those studies (summarized in Mokhtarian, Handy, and Salomon, 1995) and others (e.g, Ruppel and Harrington, 1995; U.S. General Services Administration, 1995) that do record gender report a fairly even male/female division among teleworkers.

Using IT at home is clearly seen as being different from sewing in zippers or addressing envelopes. Many observers, noting the links between power and dominance on the one hand and the gendering of technology and skill definitions on the other, have traced out the gendered natures (and often shifting gendered natures) of various technologies (Hacker, 1989; Cockburn, 1985; Light, 1995). Although computer technology is coded as male, feminists have forcefully made the case that computers need not be a male-associated technology (Light, 1995; Spender, 1995).[8]

I would suggest that the current masculine coding of information technology has shifted the terms of discussion surrounding telework, such that, despite its being a form of homework, telework in general is not seen as feminine. In fact it is a form of homework in which millions of men are now engaged and, if predictions hold, in which tens of millions more soon will be.

And if tens of millions of men do indeed work at home, how might this shift the seemingly immutable contours of the gender division of labor? There is a tantalizing shred of evidence that indeed a more extended male presence at home—especially if he is home alone—might just do that. Analyzing the same national survey on housework I mentioned earlier (described in note 2), Harriett Presser (1994) focused not just on the number of hours that people were employed but on *when* during the 24-hour day people in married-couple households worked outside the home and whether spouses were employed during the same or different hours. She found that the greater the number of hours the husband is not employed (and therefore is presumably at home) while his wife *is* employed (and therefore presumably is not at home) the greater the share of the husband's housework and the greater the reduction in the number of hours contributed by the wife. This pattern was especially strong if the husband was home alone during the day, rather than at night.[9]

But will he be home alone doing the housework and possibly minding the kids along with his telecommuting? If he has a partner, where will she/he be? I have not yet seen any information on the number of telecommuters per household or on the employment status of partners of telecommuters. The assumption seems to be that it's one telecommuter per household (and, remember, half of these are women), but if Presser's analysis is right, men's involvement in the home in married-couple households anyway,

depends at least in part upon his spouse being elsewhere. (This actually makes sense to every woman I've discussed this with.) So—more speculations: will male presence at home and women's reduced involvement in housework lead to women working farther away from home? This possibility stems from the finding that one of the main reasons that white women now work closer to home than men do is their greater responsibility for child care and domestic work (Hanson and Pratt, 1995). The freedom to work farther from home is likely to change the type of work women do and may contribute further to eroding the gender divisions of labor. Clearly we need to know more about who telecommutes within the household and how that affects the distribution and location of paid and unpaid work.[10]

In sum, clearly I see geography at the heart of the reasons why IT might be a stimulus for change in the gender divisions of labor. The shift of paid work away from fixed work locations into the home, along with the advent of the Internet, potentially have implications also for the role of networks in shaping work and communities.

IT, NETWORKS, AND COMMUNITY

In our study of gender and work in Worcester, Massachusetts, Gerry Pratt and I have documented how the place-based and gendered personal contacts and social networks of employers, employees, and potential employees shape highly localized, distinctive, and gendered labor markets; we have also shown how these local labor market practices are interwoven into the fabric of the community (Hanson and Pratt, 1995). The very essence of IT, the Internet, and the information society is the removal of communication networks from spatial context, the deracination, as it were, of interaction. How might the placeless networks of IT alter the place-rooted processes that have shaped gender, work, and communities? How might the increased daytime presence of both women and men—but especially men—in residential neighborhoods and their decreased presence in "regular" workplaces alter the personal networks that have so shaped the labor market?

SOCIAL CAPITAL

At the same time that many people are gleefully announcing the advent of a location-free existence in cyberspace, others are busy demonstrating the importance of social capital, which is, or at least has been, deeply place dependent. Robert Putnam sees social capital as referring to "features of social organization such as networks, norms, and trust that facilitate coordination and cooperation for mutual benefit" (1993, p. 35-36). In her definition, Patricia Fernandez Kelly (1995, p. 216) emphasizes the importance of the group by noting that social capital "resides in the relations between members, not in the individuals who compose it." Portes and Sensenbrenner (1993, p. 1323), who are interested in social capital primarily as it intersects with the labor market, define it as "those expectations for action within a collectivity that affect the economic goals and goal-seeking behavior of its members, even if those expectations are not oriented toward the economic sphere."[11]

Social capital emerges from repeated social exchanges that are usually—and necessarily—face to face, exchanges infused with the expectation of ongoing interaction. Social capital requires, then, a certain level of residential rootedness in real places in order to develop; the nature of a person's social capital depends to a large extent on geographic and social location, a characteristic that Fernandez Kelly refers to as the *toponomical* aspect of social capital (1995, p. 218). It is interesting in this light to note that in 1995, the U.S. Census announced that inter-state residential mobility was as its lowest level since 1950 (Holmes, 1995).

A key question about the social capital of a person, group, or place is how much heterogeneity it embraces; to what extent do the interactions involved in creating social capital bridge people of different

interests, backgrounds, and experiences? To what extent do such interactions cut across established lines of social cleavage such as gender, race, class, ethnicity, language? In Putnam's view (1993), social capital is necessary for the health of civil society, and the civic virtue of social capital lies precisely in the degree to which it succeeds in spanning and encompassing difference; community-based groups such as bowling leagues, choruses, parent-teacher groups, or bicycling clubs are important because they all serve to connect people across lines of social, economic, and demographic difference. The heterogeneity encompassed in one's social capital is so crucial because it governs the diversity of information and norms one has access to. In addition to community organizations, the workplace is, especially for men, an important locus of personal contacts in which information about jobs is circulated.

By connecting people and jobs, social capital plays a crucially important role in the labor market outcomes of individuals and groups (Granovetter, 1974,1995; Wial, 1991; Fernandez Kelly 1994,1995; Hanson and Pratt, 1995). Not only does social capital take root and grow through largely place-based networks; the labor market information exchanged through these networks is primarily—though not necessarily wholly—local[12] and is often biased in terms of gender, race, and class. The very lack of heterogeneity contributes mightily to labor market segmentation, including gendered segregation. On the other hand, as Granovetter (1974;1995) has argued, it is social networks that incorporate others of higher occupational standing that enable people to get better jobs. Hanson and Pratt (1995) document, for example, that men (particularly male family members) play an important role in connecting women to jobs in male-dominated (and therefore better-paying) occupations. In sum, social capital both enables and constrains, depending upon how homogeneous and bounded it is.

ENTER IT

What happens to networks of interaction and the social capital they build in the information age? How might the placeless networks of the Internet and the Web affect the exchange of labor market information? Might IT, for example, promote more heterogeneous, less localized, less gendered social capital? Can social capital be built on the Internet? What happens to social capital when there is no longer a stable workplace away from home?

Because it disconnects interaction from location, the Internet has been touted as an exceptional democratizer: it supposedly will provide everyone with equal access to a wealth of information. The Internet and the Web do offer people the opening to break out of place-based networks and the chance, therefore, to interact with a far greater diversity of others. In short, the Internet holds out the opportunity to increase manyfold the diversity of one's social capital.

I wonder, however, about the extent to which the Internet will succeed in engaging people with more difference and diversity than they have encountered outside of cyberspace. One problem is that not everyone will have access to the information superhighway unless they live in a place that's been wired (as of 1995, about 20 percent of the U.S. population lived out of range of free local telephone access to the Internet; Datz, 1996), unless they can afford a terminal, and unless they have command of written English. A second concern is that the types of interactions fostered by the Internet cater to people's similarities and shared interests without simultaneously engaging them with difference, as would be the case in a bowling league or a community chorus. Because conversations on the Internet (e.g., in its chat rooms) are disembodied, people can split off and present only certain facets of their identities or even invent entirely new personas. These need not, therefore, be conversations between whole people, with all their many-sided identities, as is the case in face-to-face interactions, where a

connection through one shared facet (e.g., singing) necessarily engages the partners in other unshared (and perhaps ill-understood) facets. In this way, communication on the Internet may intensify narrowness rather than broadening horizons.[13]

Another way in which IT, the Web, and the Internet may in fact breed narrowness is through the use of intelligent agents. To save us from drowning in a sea of information each of us will have, according to the IT prophets, our own personalized reference librarian, or intelligent agent, programmed to search the Web and other media for items that match our specified interests. If it's tropical fish and Chaucer we want, it's tropical fish and Chaucer we'll get—and nothing more. What will happen to surprise encounters with unanticipated, unrequested, unwanted information? Will intelligent agents further pare down our abilities to handle difference, surprise, or conflict? With intelligent agents, the body may indeed become, as Virilio (1993) foresees, a communication node like the old city center, but it will be a city center devoid of the diversity and the unplanned encounters that have been the essence of city centers as we've known them. So, I worry that the freeing of interaction from location might not, in fact, lead to increased heterogeneity in social networks but have the obverse effect.

Despite the near universal access to TV in the U.S., networks of place-based personal interaction have continued to flourish and to shape social and economic life, contrary to Meyrowitz's thesis. Of course, this persistence is because people use and rely upon different information channels (e.g., face to face, TV, telephone, the Web) for obtaining and exchanging different types of information, a point that Meyrowitz does not seem to consider in his analysis. And access to certain kinds of information still tends to flow through informal personal contacts rather than through the newspaper or the World Wide Web. This is certainly the case for labor market information whose value depends on the personal experience of the source (e.g., which employers tolerate sexual harassment or racial discrimination; which employers welcome flexibility in the scheduling of work) and on the trust the recipient places in the source.

It seems to me that personal networks—largely rooted in place—will continue to play an important role. As Granovetter (1995) points out, with employment becoming more contingent and less secure (more layoffs, shorter job tenures), the importance of personal networks for connecting people to jobs is likely to grow. Personal networks may increasingly incorporate distant with proximate connections as they intersect with the Internet, but the weight of personal knowledge about the information source will continue to have an impress on labor market processes. With more people (and especially men) in residential neighborhoods during the day, perhaps certain place-based aspects of these networks will even be strengthened.

Clearly we have much to learn about how IT will intersect with place. If IT continues to shake workers loose from fixed work locations and if it leads to home-based work for tens of millions, including tens of millions of men, then I think there is a good chance that IT might help to redraw the gendered contours of home and work and might lead to a rethinking of the place of work in American life. Increased daytime presence in residential areas together with increased use of the Internet and the Web will no doubt affect social networks and the social capital that flows from them, but will IT will necessarily enrich social capital, expand horizons, and increase the diversity of the labor market information that people exchange?

TRANSPORTATION IMPLICATIONS AND RESEARCH AGENDA

All of this may seem far removed from the topic of women's travel, but I'd argue that it's not. If men begin to shoulder a larger share of the domestic workload, women's and men's work trip times and distances and their patterns of travel for other purposes may well converge. We know that women who have work that resembles men's (in terms of higher occupational status and wages), travel as far on average to work as do their male counterparts (Hanson and Pratt 1995, p. 101). There is the possibility that an equal gender division of domestic labor at home would help erase gendered segregation at work and lead to similar travel patterns and activity spaces.[14]

At present there is not much evidence to support the idea that IT will reduce travel demand. Insofar as people continue to value place-based, face-to-face social interaction as a trusted information source—including those interactions based in non-home workplaces—the travel demand generated by the need to sustain such contacts will not decline. Such travel is likely in fact to be central to maintaining or increasing the amount of difference embraced in people's social networks.

Trying to predict the transportation implications of IT highlights our ignorance on these issues and suggests a number of items for the research agenda.

There are many questions regarding the gendered nature of homework and the impacts of such work on gender relations at home and in the nonhome workplace.

- What are the impacts of the proportion of the work week (month) spent at home?
- What kinds of work do men and women do at home? Do they use IT or not?
- What impact does IT homework have on social/economic/political connections outside of home?
- How does men's homeworking affect the domestic division of labor? How does it affect the social life of neighborhoods?
- What is the impact on travel demand?

There are also many questions about IT and the formation of social capital.

- How does homework (with or without IT) affect social capital (especially the heterogeneity represented in social capital)?
- How does IT intersect with place-based social interactions at the workplace, neighborhood, recreation places, churches?
- How are these processes different for women and men?
- Can IT be used strategically to increase the diversification/heterogeneity in social capital of disadvantaged groups (e.g., women, visible minorities, inner-city youth)?

In addressing these questions scholars and policy makers will need to keep in mind that the heterogeneity embedded in the category "homework" (and even within the category "telework") will result in different impacts, notably different transportation impacts, that depend on the nature of the homework or telework involved. The processes I've been speculating on here will play out differently in different places and will therefore yield place-to-place variation at country, regional, metropolitan, and sub-metropolitan scales. Much will depend on how placeless IT intersects with place-entrenched practices to produce new geographies of gender, work, and community.

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NOTES

[1]Following the usage of IT in the recent Office of Technology Assessment report (OTA,1995), I use the term broadly to refer to the transformation of information into electronic form and the distribution and transmission of electronic information.

[2]The data come from the National Survey of Families and Households, collected in 1987-88; housework includes activities such as meal preparation and cleanup, housecleaning, and doing laundry. Child care was not included in "housework." South and Spitze show that marital status does not much affect the number of hours that men spend in housework; all groups of men averaged between 18 and 20 hours of housework per week. Marital status has a much greater effect on women's time spent in housework, with married women spending more time on domestic chores than cohabiting, divorced, widowed, or single women.

[3] This may be because, whereas women have been perceived as improving their status by pursuing paid work, the path from work to home for men is definitely perceived as involving a loss of status.

[4]Of course the meaning of homework and the opportunities it opens or forecloses depend upon the particular conjunction of class, gender, and ethnicity in specific locations. Peck (1996) points to contrasting examples from Los Angeles (where homework is the work of last resort for Mexicana immigrants) and Miami (where homework in the Cuban enclave economy is a means of economic improvement) to illustrate this point.

[5]Historians Thomas Dublin (1979) and Christine Stansell (1986) have argued that the location of women's work outside of the home in the early days of American industrialization was key to freeing young women from patriarchal authority. Stansell's study is set in New York City, and Dublin's in Lowell, Mass., both in the early to mid nineteenth century.

[6]What is so strange in these debates is that those who oppose homework, including feminists, find themselves arguing against what proponents of homework paint as innovative, grassroots, even anticapitalist activities (Boris, 1994).

[7]By my calculations (assuming the 1992 figure of 6.5 million) a 20 percent annual increase yields only 27.6 million by the year 2000, so a lot more people will have to stop resisting the call and start jumping on the bandwagon. Predictions of massive increases in telecommuting all seem to share an assumption of universal access to IT. Yet in the foreseeable future, at least, all places will not have equal access to the information superhighway; the "wiring of America" will follow the urban hierarchy, reinforcing and exacerbating existing spatial inequalities.

[8]In a study of an economic development scheme gone awry in Sweden, Sundin (1996) describes how elusive the gender-typing of technology can be. Wanting to shift the town's identity from heavy manufacturing and mining to "high-tech," town officials attracted what they saw as "high-tech" but what was actually clerical telework. Because such work was coded as female, and therefore seen by others as decidedly not high-tech, their strategy failed to induce the high-tech boom they sought.

[9]Another interesting finding that Presser reports is that the wife's gender ideology (but not the husband's) can increase the husband's hours of housework, suggesting to me that in households consisting of homeworking husbands married to outworking feminists, the men would contribute an exceptionally large share of the housework.

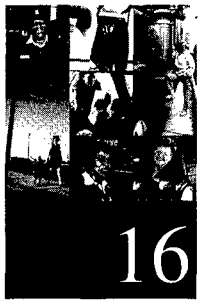
[10]Because at present most teleworkers telecommute only one or two days a week and because longitudinal studies of telecommuting have been running only a couple of years, there is as yet no evidence to suggest that telecommuting induces change in residential location (Mokhtarian, Handy, and Salomon, 1995). It may turn out that the gender coding of IT homework may depend in part on whether IT homeworkers remain largely part time and whether they retain a "real," non-home workplace.

[11]They point to four sources of social capital: (1) value introjection (the socialization into consensually established beliefs); (2) reciprocity exchanges (the norm of reciprocity in face-to-face interaction; (3) bounded solidarity (common awareness); and (4) enforceable trust (rewards and sanctions linked to group membership) (Portes and Sensenbrenner, 1993, p.1323).

[12]The degree to which the information is local varies from place to place.

[13]In the "romance" chat rooms one would imagine a desire to know more than one facet of a potential romantic partner; in fact, I hear from a friend who visits these rooms that the first question posed is invariably and ironically, "where do you live?"

[14]The elimination of occupational segregation would also require significant changes in employers' behavior.



16

Women's Travel for Shopping in Traditional Neighborhoods: How Does a Woman's Role in the Household Affect Activity and Travel for Shopping?

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WOMEN'S TRAVEL FOR SHOPPING IN TRADITIONAL NEIGHBORHOODS: HOW DOES A WOMAN'S ROLE IN THE HOUSEHOLD AFFECT ACTIVITY AND TRAVEL FOR SHOPPING?

INTRODUCTION

In recent years a group of architects, real estate developers, environmentalists have argued for a new form of urban development, called the "New Urbanism" or neo-traditional development. The New Urbanists have developed a set of comprehensive proposals for land use and transportation that are intended to promote a more active public life, an enhanced sense of community, and greater safety for all segments of the population. They advocate a form of development that typically includes mixed-use development, a grid street pattern, and increased density, especially around transit stations (Calthorpe 1993; Katz 1994). Within this new design paradigm, they acknowledge that the New Urbanism is an attempt to recreate many of the elements of the older traditional neighborhoods that were built prior to World War II. They claim that such an urban form literally creates better communities, with a variety of housing for a diversity of housing, well-defined neighborhoods that promote interaction and grid street patterns and transit orientation that facilitate walking, bicycling, and transit use.

The New Urbanists' urban prescriptions for all members of the household include some of the earlier land use prescriptions of Marion B. Fox (1985, 1983). Fox argues that changes need to be made from the existing suburban pattern of low-density and segregated residential development to zoning that permits the development of shops in close proximity to residential areas. Further she argues, this and other land use changes will increase the accessibility of services for women and thus help them to balance the multiple roles related to work, household and children by reducing their need to travel.

This paper considers the differences in the shopping activity and travel of men and women in six traditional shopping areas in the Oakland-Berkeley area of the San Francisco region. These shopping areas were specifically chosen because they have a higher level of density than traditional suburban developments and include the mix of services and residence that should provide the access for women that Fox advocated more than a decade ago.

METHODOLOGY

Data for this paper was collected in six neighborhood shopping areas in the East Bay areas of the San Francisco Region. Each of these shopping areas is surrounded by medium density residential areas (13-21 persons per acre) with households near the regional median income.[1] Two surveys of customers were conducted with approximately equal numbers in each shopping area distributed between weekday afternoons and Saturdays: (1) a brief intercept survey to gather information on travel and shopping activity on the day of the interview; and (2) a mailback from these customers who were willing to provide additional information on household characteristics, attitudes about various factors in the shopping area and their usual pattern of activity and travel for shopping. These samples of approximately 1000 respondents to the intercept survey and 470 respondents to the mailback survey provide the database for the comparisons in this paper.

In this paper the activity, shopping and travel patterns of customers in these shopping areas are compared and contrasted based upon gender and household characteristics. A word of caution is necessary about the household characteristics because of the way in which the data was collected. The gender of the respondents was recorded during the intercept survey and confirmed based upon the response to the intercept survey (see Table 1 for a breakdown of respondents by gender). Although women were more likely to return the mailback survey, there is no evidence of other systematic bias in their responses.

In the mailback survey, the ages of household members was recorded and, respondents were placed into one of the following categories based upon household composition: single person, couple (two adults with no children), single parent, two adults with children, more than two adults with children. Because of the small number of households headed by single parents or more than two adults, all households with children under the age of 18 are included in a single category. Table 2 reports the number of households in each category. As the mailback survey did not request the gender of household members, incomplete information is available about any member of the household who is not the respondent (unless other household members accompanied the respondent when the initial survey was conducted). In addition, the small sample size of respondents to the mailback survey does not allow the analysis of other travel patterns based on income, and other factors that affect travel.

Table 1
Gender of Respondents to Intercept
and Mailback Surveys (Number and Percentages)

	Women	Men	All Respondents
Respondents to Intercept Survey	522 53%	466 47%	988 100%
Respondents to Mailback Survey	309 66%	159 34%	468 100%

Source: Customer Intercept Survey; Customer Mailback Survey

Notes: Gender was recorded for only 988 of 997 respondents.

Statistics: In comparison of gender of respondents to intercept and mailback survey, women are significantly more likely to respond to the mailback than men ($p < .05$).

This paper considers the following three major aspects of gender differences in shopping, activity and travel patterns for shopping: (1) differences in the household responsibilities; (2) differences in the mode choice; and (3) differences in trip chaining. Differences in household responsibilities will be based upon (1) whether children accompany the respondent on the shopping trip; (2) the percentage of overall food shopping done by respondent; (3) the frequency with which respondents go to the shopping area to engage in various activities; and (4) the number and types of stops made as a part of a shopping trip.

Table 2
Gender of Respondents by Household Composition,
Household Employment Status and Respondent Employment Status
(Number and Percentage of Households)

Household Type	Women		Men		Total	
Single	74	62%	45	38%	119	100%
Not Currently Employed	32	76%	9	24%	42	100%
Respondent is Currently Employed	42	55%	35	45%	77	100%
Households with Two Adults	108	62%	65	38%	17	100%
Neither is Currently Employed	34	74%	11	26%	46	100%
At Least One Household Member is Employed	74	58%	53	42%	127	100%
Respondent is Not Employed	10	58%	7	42%	17	100%
Respondent is Employed	64	58%	46	42%	110	100%
Households with Children	81	72%	32	28%	113	100%
Not Currently Employed	6	75%	2	25%	8	100%
At Least One Household Member is Employed	75	71%	30	29%	105	100%
Respondent is Not Employed	19	100%	0		19	100%
Respondent is Employed	56	65%	30	35%	86	100%
Households with More than Two Adults and No Children	45	73%	17	27%	62	100%
Not Currently Employed	6	78%	1	22%	7	100%
At Least One Household Member is Employed	38	72%	15	28%	53	100%
Respondent is Not Employed	10	67%	5	33%	15	100%
Respondent is Employed	28	74%	10	26%	38	100%
Total	308		159		467	100%

Source: Customer Intercept Survey; Customer Mailback Survey
Notes: Subtotals may not equal due to missing information.

This research largely confirms conclusions of previous studies on women's travel behavior with the exception of the men taking greater responsibility for children, especially when the women works. Consistent with the findings of Hanson and Hanson (1980), this research confirms that women take greater responsibility for shopping activities, especially in households with two adults and/or with children in the household. However, in households with children where the woman is employed, men are equally likely to be accompanied by children. The lack of a difference in mode choice and trip chaining between women and men suggests may confirm the greater responsibility that men in this households take with respect to caring for children.

HOUSEHOLD RESPONSIBILITY

Women's greater level of responsibility for the care of children is shown by the higher percentage of female respondents who took children along to the shopping area (see Table 3). While about 11% of all respondents are accompanied by children, 13% of women respondents were accompanied by children. In all households with children, 46% of women are accompanied by children compared to 28% of men in such households. In households in which the woman is employed, men and women were equally likely to be accompanied by children during the trip to the shopping area.

Table 3
Respondents Accompanied by Children during Shopping Trip by Gender (in Percentages)

	Women	Men	All Respondents
All Respondents*			
Shopping Alone or Accompanied by Another Adult	87	92	89
Accompanied by Children	13	8	11
Households with Children in Which at Least One Member is Employed#			
Shopping Alone or Accompanied by Another Adult	54	72	59
Accompanied by Children	46	28	40
Households with Children in Which Woman is Employed			
Shopping Alone or Accompanied by Another Adult	61	73	65
Accompanied by Children	39	27	35

Source: Customer Intercept Survey
Statistics: * - Percentage of women accompanied by children is significantly different than percentage of men ($p < .05$)
- Percentage of women accompanied by children is significantly different than percentage of men ($p > .05$ and $p < .10$)

Women have a greater responsibility within households for food shopping. In households with two adults and/or children women reported being responsible for a significantly higher percentage of the food shopping than other adults, presumably men, in the household. Working women in households with one other adult or with children had a similar level of responsibility. These findings are consistent with those of Hanson and Hanson (1980) that suggest that women take greater responsibility for food shopping.

Table 4
Percentage of Food Shopping by Gender and Characteristic of Household

	Women	Men
Single Person	93	90
Households with Two Adults*	80	59
Households with Children*	81	53
Households with more than Two Adults	65	64

Source: Customer Intercept Survey

Statistics: Women and men are compared in each households category.

* - The percentage of food shopping by gender is significantly different ($p < .05$).

Male respondents go the these neighborhoods shopping areas with greater frequency than women in all types of households except households with children (see Table 5). These differences suggest that woman may be more likely to plan shopping trips more carefully than men and thus require fewer stops per week or men may be engaging in different types of non-shopping activities in the shopping area. In most other ways, men and women of all households types report going to shopping areas with similar frequency for grocery shopping, specialty food shopping and to go to restaurants.

Overall, women make more stops for specialty foods and comparison shopping and total stops for goods (see Table 6)[2]. Among households without children, the number of stops is not significantly different between men and women (see Tables 7 through 10). The only exception to this trend is the higher rate of stopping by men for miscellaneous convenience stores, such as, the hardware store, the pharmacy and the liquor store. Women in households with children make, on average, a larger number of stops especially for comparison goods, like clothing and other less frequently purchased items, and groceries, including specialty foods. The only category stops that men in households with children make at a higher frequency are the relatively small category of stops for other services, such as business offices, insurance agents, travel agents and other types of less frequently used personal service.

ACCESS MODE

The access mode to the shopping area for women and men is not significantly different for any type of household. However, among employed respondents, men are significantly less likely to drive than are women in single person households and household with two adults. Among households with children, men and women are equally likely to drive. These results are not entirely consistent with the finding of Rosenbloom and Burns (1994) that women with children are more likely to drive because of their greater level of responsibility for the care of children. However, to the extent that men with children were equally likely to be accompanied with children on their shopping, this may suggest an equal sharing of household responsibilities.

These results suggest the claims that people will use alternative modes of transportation to go to shopping areas. In each category of household structure about 60% of respondents used the automobile to get to the shopping area. This compares to over 90% of trips for white men and women for shopping trips (Rosenbloom 1995: 2-43).

Table 5
Frequency of Shopping by Gender and Household Characteristics
(Average Number of Times Per Week)

	Women	Men
Stopping in Shopping Area		
Single Person*	2.3	3.9
Households with Two Adults*	2.3	3.3
Households with Children	3.5	3.5
Households with more than Two Adults*	2.9	5.7
All Respondents*	3.1	3.6
Grocery Shopping		
Single Person	1.5	1.9
Households with Two Adults	1.7	2.1
Households with Children	2.5	1.9
Households with more than Two Adults	1.9	2.3
All Respondents	2.1	2.0
Specialty Food Shopping		
Single Person	1.9	1.6
Households with Two Adults	1.8	1.7
Households with Children#	2.1	1.5
Households with more than Two Adults	2.0	2.2
All Respondents	1.8	1.6
Stops at Restaurants		
Single Person	.9	1.3
Households with Two Adults	1.2	.9
Households with Children	.8	.6
Households with more than Two Adults	1.1	.8
All Respondents	.9	1.0

Source: Customer Intercept Survey

Statistics: Women and men are compared men for each type of destination.

* - The frequency of stops for this category differs between men and women ($p < .05$)

- The frequency of stops for this category differs between men and women ($p > .05$ and $p < .10$)

Table 6
Average Number of Stops Made by Type of Stops by Gender of Respondent

	Women	Men	All Customers
Specialty Food Shopping#	.70	.59	.66
Grocery Shopping	.27	.26	.27
Cafés and Coffee Shops	.21	.25	.23
Miscellaneous Convenience	.21	.22	.21
Flowers, Cards and Books	.11	.08	.09
Restaurants	.09	.08	.09
All Convenience Shopping	1.58	1.47	1.54
Convenience Services	.28	.27	.28
Comparison Shopping*	.42	.19	.32
Other Services	.04	.04	.04
Total Stops*	2.32	1.97	2.18

Source: Customer Intercept Survey

Notes: Number of stops is an average number of stops per customer; because customers do not stop at all types of uses, the numbers are less than one stop per customer for most uses. Types of stops are categorized in Steiner (1996).

Statistics: * - Mean number of stops is significantly different at .05.

- Mean number of stops is significantly different at .10.

Table 7
Average Number of Stops Made for Employed Single Person by Type of Stop by Gender of Respondent

	Women	Men
Specialty Food Shopping	1.00	.69
Grocery Shopping	.11	.17
Cafés and Coffee Shops	.26	.31
Miscellaneous Convenience	.31	.28
Flowers, Cards and Books	.09	.03
Restaurants	.03	.14
All Convenience Shopping	1.80	1.62
Convenience Services	.40	.38
Comparison Shopping	.31	.10
Other Services	.06	.03
Total Stops	2.57	2.13

Source: Customer Mailback Survey

Notes: Number of stops is an average number of stops per customer; because customers do not stop at all types of uses, the numbers are less than one stop per customer for most uses. Types of stops are categorized in Steiner (1996).

Statistics: * - Mean number of stops is significantly different at .05.

- Mean number of stops is significantly different at .10.

Table 8
Average Number of Stops Made by Employed Respondents in Households with Two Adults by Type of Stop and Gender of Respondent

	Women	Men
Specialty Food Shopping	.98	.73
Grocery Shopping	.22	.37
Cafés and Coffee Shops	.21	.27
Miscellaneous Convenience*	.07	.29
Flowers, Cards and Books	.09	.15
Restaurants	.03	.00
All Convenience Shopping	1.60	1.80
Convenience Services	.21	.21
Comparison Shopping	.35	.27
Other Services#	.00	.07
Total Stops	2.16	2.37

Source: Customer Intercept Survey

Notes: Number of stops is an average number of stops per customer; because customers do not stop at all types of uses, the numbers are less than one stop per customer for most uses. Types of stops are categorized in Steiner (1996).

Statistics: * - Mean number of stops is significantly different at .05.

- Mean number of stops is significantly different at .10.

Table 9
Average Number of Stops Made by Employed Respondents from Households with Children by Type of Stop and Gender of Respondent

	Women	Men
Specialty Food Shopping*	1.00	.39
Grocery Shopping#	.30	.11
Cafés and Coffee Shops	.15	.14
Miscellaneous Convenience	.15	.32
Flowers, Cards and Books	.13	.07
Restaurants	.07	.04
All Convenience Shopping*	1.79	1.07
Convenience Services	.24	.36
Comparison Shopping#	.48	.18
Other Services*	.04	.21
Total Stops*	2.56	1.82

Notes: Number of stops is an average number of stops per customer; because customers do not stop at all types of uses, the numbers are less than one stop per customer for most uses. Types of stops are categorized in Steiner (1996).

Statistics: * - Mean number of stops is significantly different at .05.

- Mean number of stops is significantly different at .10.

Table 10
Average Number of Stops Made by Employed Respondents in Households with More Than Two Adults by Type of Stop and Gender of Respondent

	Women	Men
Specialty Food Shopping	.56	.90
Grocery Shopping	.24	.20
Cafés and Coffee Shops	.28	.20
Miscellaneous Convenience#	.08	.40
Flowers, Cards and Books	.04	.10
Restaurants	.04	.10
All Convenience Shopping	1.24	1.90
Convenience Services	.52	.60
Comparison Shopping#	.32	.00
Other Services	.04	.00
Total Stops	2.12	2.50

Source: Customer Intercept Survey Notes: Number of stops is an average number of stops per customer; because customers do not stop at all types of uses, the numbers are less than one stop per customer for most uses. Types of stops are categorized in Steiner (1996).

Statistics: * - Mean number of stops is significantly different at .05.

- Mean number of stops is significantly different at .10.

Table 11
Mode of Access by Household Structure and Gender (Percentages)

	Auto	Other Modes
Single Person		
Women	64	36
Men	56	44
All Households with Single Persons	61	39
Households with Two Adults		
Women	67	33
Men	57	43
All Households with Two Adults	63	37
Households with Children		
Women	63	37
Men	66	34
All Households with Children	64	36
Households with more than Two Adults		
Women	58	42
Men	47	53
All Households with More Than Two Adults	55	45
All Respondents		
Women	64	36
Men	57	43
All Households	62	38

Source: Customer Intercept Survey

Statistics: In comparison of men and women with similar household characteristics, the mode of travel is not significantly different.

the origin or the destination. Among single persons, women are more likely to make the simplest type of trip, home to shop to home and men are likely to make more complex trips including trips with home neither as the origin nor the destination. Among households with children and households with more than two adults and no children the pattern of trip chaining is not significantly different between men and women.

Table 12
Mode of Access by Household Structure and Gender for Employed Respondents (Percentages)

	Auto	Other Modes
Single Person*		
Women	69	31
Men	46	54
All Households with Single Persons	58	42
Households with Two Adults*		
Women	77	23
Men	59	41
All Households with Two Adults	69	31
Households with Children		
Women	68	32
Men	63	37
All Households with Children	66	34
Households with more than Two Adults#		
Women	61	39
Men	40	60
All Households with more than Two Adult	56	45
All Respondents*		
Women	70	30
Men	55	45
All Households	64	36

Source: Customer Mailback Survey

Statistics: Comparison of men and women by household type.

* - Mode choice is significantly different ($p > .05$)

- Mode choice by gender is significantly different ($p > .05$ and $< .10$)

Trip Chaining

The pattern of trip chaining is not statistically different for households with children and with three or more unrelated adults in the same household[3]. In households with two adults, men are more likely to make the simplest type of trips, home to shop to home, and the most complex, with home neither as This research lends support to the idea that creating greater accessibility to community services may reduce the burden of travel of both men and women irrespective of the role they take in the household. Among all household types, men and women were less likely to drive to the shopping area than national data surveys suggest. While this may not affect the greater responsibility that women bear for shopping activities, it may reduce the level of travel, or allow them to combine their recreation (a walk in the neighborhood with their children) with shopping activities.

Table 13
Type of Trip by Household Structure and Gender for Respondents (Percentages)

	Simple Home Shop-Home	Work/School Commuteμ	Home-based Complex Chainπ	Other Complex Chainsλ
Single Person#>				
Women	46	10	38	7
Men	29	13	47	11
All Respondents	40	11	41	8
Households with Two Adults*				
Women	34	14	43	9
Men	42	20	22	17
All Respondents	37	16	35	12
Households with Children				
Women	48	12	30	10
Men	41	19	34	6
All Respondents	46	14	31	9
Households with more than Two Adults>				
Women	36	13	33	18
Men	24	24	47	6
All Respondents	32	16	37	15
All Respondents				
Women	41	12	37	10
Men	36	18	34	17
Total	39	14	36	11

Source: Customer Mailback Survey

Notes: > - Due to the small sample size, the comparison was made between the simple, home to shop to home trips and other trips

μ- Included Home-Shop-Work/School and Work/School-Shop-Home

π - Included Home-Shop-Other and Other-Shop-Home

λ - Included Work/School-Shop-Other, Other-Shop-Work/School and Other-Shop-Other

Statistics: A comparison is made between women and men by household type.

* - Pattern of trips is significantly different between men and women ($p < .05$)

- Pattern of trips is significantly different between men and women ($p > .05$ and $p < .10$)

CONCLUSIONS AND OTHER AREAS FOR RESEARCH

This research confirms much of the previous research that suggests that women bear a greater responsibility for shopping activities than men. Women in households with other adults and/or children reported

Table 14
Type of Trip by Household Structure and Gender for Employed Respondents (Percentages)

	Simple Home Shop-Home	Work/School Commuteμ	Home-based Complex Chainπ	Other Complex Chainsλ
Single Person>				
Women	36	12	48	5
Men	31	17	43	9
All Respondents	34	14	46	7
Households with Two Adults#				
Women	27	20	44	9
Men	35	24	22	20
All Respondents	30	22	35	14
Households with Children>				
Women	45	18	29	9
Men	40	20	33	7
All Respondents	43	19	30	8
Households with more than Two Adults>				
Women	43	7	36	14
Men	40	20	30	10
All Respondents	42	11	34	13
Households with More than Two Adults				
Women	37	16	39	9
Men	36	21	31	12
All Households	36	18	36	10

Source: Customer Mailback Survey

Notes: > - Due to the small sample size, the comparison was made between the simple, home to shop to home trips and other trips.

μ - Included Home-Shop-Work/School and Work/School-Shop-Home

π - Included Home-Shop-Other and Other-Shop-Home

λ - Included Work/School-Shop-Other, Other-Shop-Work/School and Other-Shop-Other

Statistics: A comparison is made between women and men by household type.

* - Pattern of trips is significantly different between men and women ($p < .05$)

- Pattern of trips is significantly different between men and women ($p > .05$ and $p < .10$)

doing a higher percentage of the food shopping for the household. Women in households with children made a significantly larger number of stops while shopping especially a grocery stores, specialty food stores and at store that sold clothing and other comparison goods.

Women's greater level of responsibility for children, especially in households with children where both parents work, was not confirmed in this research. Men and women in these household are equally likely to be accompanied by children while they shopped. Contrary to previous research that suggests that working women are more likely to drive and have more complex trip chains than men, the mode choice and trip chains of working men and women with children are similar. This difference could be related to the higher socio-economic status of the households than the general population of the area; households with children had the highest levels of education and income of any household type in this research. While the data collected in this research does not have a large enough sample to explore this question depth, the sharing of responsibility for childcare activities should be explored further.

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NOTES

[1] While it may be desirable to compare households with a diversity of incomes and ethnicities, shopping areas in medium income areas are used to reduce the diversity based upon the shopping market areas. These shopping areas serve customers that are near and slightly above the median income of the region. The customers of these shopping areas are more highly educated, less likely to have children in the household and more likely to be white than other households in the region generally. These samples represent a simple random sample of the customers of each of these shopping areas and, to the extent that customers are from outside of the surrounding neighborhood of any of these shopping areas, do not represent a sample of residents of the surrounding neighborhood. For a more detailed discussion of the sampling method, see Steiner 1996.

[2] Specialty food shops usually provide a small number of types of goods that are of higher quality than might be found in a grocery store. Bakeries, delies, cheese shops, poultry, fish, meat and produce markets are included as specialty foods. Cafés and coffee shops include places, such as ice cream shops, candy stores, and coffee shops, where a customer can pick up something quickly to eat or drink. They are contrasted with restaurants where customers can sit down for a meal. Miscellaneous convenience services include liquor, and drug and hardware stores. Convenience services includes services, such as the video store, post office, dry cleaners, shoe repair, and bank, that are located in many locations within a region and provide services that are used on a routine basis. Other services include services, such as medical, dental and chiropractic offices, real estate and travel agents that are used on a less regular basis. Comparison shopping includes goods that are purchased less frequently and based on a comparison of cost and quality of services. Clothing, jewelry and gift stores are examples of comparison shopping.

[3] Trip chains are categorized into simple and complex chains (see Strathman, Dueker and Davis 1992). By definition all chains begin and end at home. A simple chain is defined as any trip from home to a shopping area to home. Complex chains include all trips with multiple destinations between home, including the shopping area. Within the trip to the shopping area, a respondent could make stops at multiple destinations for different purposes. The different trip purposes within the same shopping area are not considered as a part of the trip chaining. Respondents were asked two question that were combined to define the trip patterns, "Where were you before you came to <shopping area> today?" and "Where will you go after you have made all of your stops in <shopping area>?. Because of the wording of these two questions, three links of each respondent's trip are identified, the stops she made before she went to the shopping area, the stops she made while in the shopping area, and the place she went after she completed her stops in the shopping area. A trip chain is defined for each respondent as a simple chain, home to shop to home, or a complex chain. Complex chains are further categorized into work/school commutes, home-based complex chains, and other chains. Work/school commutes include all trips in which the origin or destination is work or school and the paired destination or origin is home. Home-based complex chains include any trip that has home as an origin or the destination with a location other than home, work, or school. Work/school commutes and home-based complex chains have at least four links in the chain. Trips categorized as other complex chains are potentially the most complicated of all trips; they include all trips in which home is neither the origin nor the destination of the travel. These trips have at least five links in the chain.

Non-Work Travel of Women: Patterns, Perceptions and Preferences

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NON-WORK TRAVEL OF WOMEN: PATTERNS, PERCEPTIONS AND PREFERENCES

INTRODUCTION

In the face of growing levels of automobile travel, especially for nonwork purposes, two very different strategies are currently proposed for reducing automobile dependence: designing neighborhoods so as to bring activities within walking distance of home, and using telecommunications to provide the opportunity to participate in activities—work and nonwork—from home. The goal of both land use and telecommunications strategies is to increase accessibility, by expanding the choices available to individuals as to how they meet their daily responsibilities—and both types of strategies may have special implications for the nonwork travel of women.

Given that women generally face greater constraints on travel than men, due to greater time pressures and greater concerns about personal safety, women may stand to benefit even more than men from the increase in accessibility that these strategies provide. If women take greater advantage of opportunities to participate in activities closer to or in the home, the argument for these two strategies for reducing automobile dependence are strengthened: not only do they increase the opportunity for both men and women to drive less, they provide women with new alternatives for meeting the demands of their daily lives. In fact, the implications of these strategies for individuals may be more important than their implications for total travel.

This paper asks the question of whether women, when presented with the choice, are more likely than men to participate in nonwork activities close to or in the home and explores differences in perceptions and preferences that may explain gender differences in the response to these strategies. This discussion builds on the results of two household surveys. The goal of the first survey, distributed in six neighborhoods in Austin, TX, was to test the relationship between urban form and choices about selected nonwork trips, including walking trips, supermarket trips, and local shopping trips. The survey included a series of questions on perceptions about the neighborhood environment and characteristics of local shopping areas.

The goal of the second survey, sent to a random sample of residents in three cities—Austin, Oklahoma City, and San Jose—was to explore the implications for nonwork travel of emerging telecommunications technologies. The survey focused on trade-offs between in-home and out-of-home versions of selected activities—movies, shopping, and banking—and included a series of questions on attitudes about travel, technology, and time. For this paper, both data sets were analyzed with respect to gender differences in travel and activity patterns and potential explanatory factors.

The results of this analysis show minor differences in travel choices between men and women, but significant differences in motivations, feelings, attitudes, and preferences. The differences between women living in different types of households—defined with respect to marital status and the presence of children—often prove to be more significant than the differences between men and women. While it does not, in general, appear that women take advantage of accessibility opportunities more than men do, the results point to important planning considerations. First, the findings of the land use survey are described; the findings from the telecommunications survey follow.

LAND USE STRATEGIES

BACKGROUND

The New Urbanism movement has sparked a rethinking of the ways in which communities are designed. The goal is to create communities that function more like communities of the past—where residents feel a greater sense of community and where residents have an alternative to driving. The latter goal is achieved, in theory, by two strategies: linking shops and services to residential areas to reduce travel distances, and designing streets for people as well as cars to create walking environments that are safe, comfortable, and attractive. These strategies should lead to better accessibility to services and activities—and a better quality of life.

Some of the strongest arguments for this concept focus on the implications of traditional suburban development for those who can't always drive themselves—the young, the elderly, the poor. Without a car, these people are stuck at home or dependent on others to get them around. Transit may work in some situations but tends to be inefficient in suburban areas and may require long walks on busy streets, and those who can't drive may have trouble using transit as well. The new urbanist strategies are also potentially important for women, who make up a disproportionate share of the poor and the elderly and who often bear the greater share of the burden for transporting children or elderly relatives as well as other household chores.

This section addresses the question: how important these strategies are to women, as either a way to save time or as a way of enhancing quality of life? In addressing this question, several underlying issues are considered. Are women more likely than men take advantage of the opportunity to shop close to home, or the opportunity to walk? When they do, is it a way of saving time or something they simply choose to do? How important a role does accessibility to stores or the quality of environment in the neighborhood play in decisions about where to live?

SURVEY RESPONDENTS

Data on choices about walking and local shopping were collected through a mail-out, mail-back survey administered in late May 1995. The survey included sections on supermarket trips, walking trips, trips to local commercial areas, factors influencing residential location choice, and socio-demographic characteristics, as well as questions on feelings about and perceptions of a variety of urban form characteristics. On the order of 1000 surveys were sent to a random sample of individuals in six neighborhoods in Austin: two neighborhoods were traditional pre-WWII neighborhoods, two were "early modern" 1950s neighborhoods, and two were "late Modern" 1970s or more recent neighborhoods.[1] Only one round of the survey was conducted, because of budget limitations and the concern that changes in weather over a period of time, especially the arrival of summer temperatures, would impact the results of the survey. The overall response rate was 25%.

The data were analyzed by gender, and, for women, by household type defined according to marital status (defined as living with a spouse or partner) and the presence in the household of young children (less than 12 years old). The expectation is that women living with a spouse will have fewer household responsibilities because of the possibility of sharing of chores and that women with young children will have more duties and more constraints on their time, all else equal. In interpreting the results of the analysis, it is important to consider factors other than gender and household type that may lead to differences in what women need, want, or are able to do and thus to differences in responses.

Table 1 summarizes socio-demographic characteristics for the different categories of respondents and highlights characteristics that differ significantly between the categories. Men and women differ significantly on three important characteristics. First, women are more likely to be single and living with young children than are men (6% vs. 1% of respondents), and less likely to be living with a spouse but without young children (35% vs. 41% of respondents). Second, women are less likely than men to be working full-time (68% vs. 79% of respondents) and more likely to be working part-time (13% vs. 6%) or not working (20% vs. 15%). Third, women are more likely to live at lower household income levels than men. The household and income differences suggest greater constraints on shopping and travel choices for women, while the differences in work status suggest potentially greater flexibility.

Table 1
Respondent Characteristics for Land Use Survey

			Women by Household Type...			
	All Men	All Women	Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Household Type*						
Single, no kids	41%	39%				
Single, kids	1%	6%				
Spouse, no kids	41%	35%				
Spouse, kids	17%	20%				
Average Age	44.0	43.8	48.6	38.1	43.3	36.9 ◎
Work Status*#						
Full-time	79%	68%	69%	80%	67%	59%
Part-time	6%	13%	7%	8%	15%	22%
Not working	15%	20%	24%	13%	19%	19%
Avg Persons per HH	2.24	2.32	1.5	2.5	2.4	3.7 ◎
Household Income*#						
< $20,000	10%	10%	16%	26%	3%	4%
$20,000 to $39,000	25%	34%	52%	51%	21%	18%
$40,000 to $59,000	29%	26%	22%	18%	29%	32%
$60,000 to $79,000	18%	15%	6%	5%	23%	25%
>$80,000	19%	15%	4%	0%	25%	22%
Housing Ownership#						
Owner	68%	67%	56%	58%	76%	77%
Renter	31%	32%	42%	43%	23%	22%
Avg Years in Housing Unit	9.1	9.8	12.3	4.9	9.5	7.2 ◎
Avg Years in Nbhd	10.7	11.3	14.1	6.2	10.7	8.1 ◎
Neighborhood Type#						
Traditional (pre-WWII)	40%	37%	45%	30%	36%	25%
Early Modern (1950s)	31%	34%	40%	33%	31%	29%
Late Modern (1970s+)	29%	19%	16%	38%	33%	47%
Avg Number of Vehicles	1.9	1.7	1.3	1.1	2.1	2.1 ◎
Number of Respondents	604	741	286	40	253	146

* Chi-square shows statistically significant differences (1% level) between men and women.
\# Chi-square shows statistically significant differences (1% level) between household types.
◎ F-Statistic shows statistically significant differences (1% level) between household types.

Some differences between women by household type are also notable. Women with young children, for example, are younger on average than those without young children. It is not clear how age might be linked to choices about walking, however: younger women might be in better health and thus more likely to walk, or older women might be more concerned about staying in shape and thus more likely to walk. Women without young children have lived in their current housing units and neighborhoods longer on average—not surprising given their higher average age. Not surprisingly, women living without spouses live in smaller households, have lower household incomes, are less likely to own their homes, and have fewer vehicles available to the household than those with spouses. Single women with young children are most likely to work full-time and thus probably face the greatest constraints on their time.

The percentages of each category of women by household type living in the three neighborhood types also differs significantly. This is important because the differences in urban form in these types of neighborhoods may influence the kinds of choices residents make about walking and local shopping. Single women without children are more likely to live in traditional neighborhoods, for example, where residents in general are more likely to walk to the store, while married women with young children are more likely to live in recent suburbs, where residents in general are less likely to walk to the store. The distribution of respondents by category across the different neighborhoods is consistent with expectations, but must be considered in interpreting the results that follow. Note that the differences between men and women are not significant.

SURVEY RESULTS

Grocery shopping is one of the most frequent and most local of nonwork trips and one of the most regular household chores; all else equal, shoppers are likely to minimize the distance they have to travel to grocery shop. In the survey, gender differences are significant for supermarket shopping (Table 2). Women were more likely than men to report that they do all or almost all of the grocery shopping for their household (although the average number of supermarket trips per week was not significantly different), and married women with young children make significantly more supermarket trips per week (2.6 on average) than other women and than men (note that they are also less likely to work full-time). For this chore, women carry a disproportionate share of the burden.

When asked about the importance of a list of factors which may influence the choice of which supermarket to shop at, women rated every factor higher on the importance scale than men did, perhaps reflecting the greater burden that grocery shopping represents in their lives. For both men and women, the two most important factors are quality and the distance to the store, suggesting that accessibility is an important consideration. Single women with children rate selection and quality as less important than other women do, perhaps reflecting lower incomes and thus less freedom to be concerned about these factors.

Table 2
Grocery Shopping Characteristics

	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Portion of HH's Shopping*						
All or Almost All	55%	79%	90%	88%	66%	75%
About Three-Fourths	8%	9%	3%	8%	15%	12%
About Half	23%	10%	6%	0%	16%	10%
About One-Fourth	9%	2%	1%	5%	2%	3%
None or Almost None	5%	4%	0%	0%	8%	0%
Average Trips per Week	2.4	2.3	2.1	2.4	2.3	2.6 **
Factors in Store Choice (5=importnat; 1=not important)						
Best quality products	3.9	4.1 #	4.1	3.6	4.1	4.2 @
Closest to home	3.9	4.0	3.9	4.1	4.1	4.1
Pleasant atmosphere	3.5	3.9 #	3.9	3.5	3.9	3.9
Widest selection	3.6	3.8 #	3.7	3.5	3.9	3.8 @
Best prices	3.5	3.6 #	3.5	3.7	3.6	3.8
Shortest lines	3.2	3.5 #	3.6	3.2	3.5	3.4
Fewest crowds	3.2	3.5 #	3.5	3.2	3.5	3.4
Easiest parking	3.0	3.3 #	3.4	3.0	3.4	3.1 @
It's on the way home from work/school	2.9	3.3 #	3.3	3.5	3.3	3.2

* Chi-square test shows statistically significant differences (5% level) between men and women.
\# F-statistic shows statistically significant differences (1% level) between men and women.
@ F-statistic shows statistically significant differences between (5% level) household types.
** F-statistic shows statistically significant differences between (1% level) household types.

The survey asked about two types of walking trips: strolling trips and walks to a store or local commercial area. Differences for strolling trips—walking for walking's sake—are subtle (Table 3). Men and women take about the same number of strolls per month, on average, and are equally likely to have strolled at least once in the previous month. Differences between women by household type are significant, however: single women with young children take the fewest strolls, on average, and married women with kids are mostly likely to have strolled at least once in the previous month. In both cases, young children may be a reason to go for a walk, but single women are likely to have little free time to spend doing things like strolling while married women, because they are less likely to work full-time and potentially have someone to share chores with, might have more free time.

Table 3
Strolling Trip Characteristics and Motivations

	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Average Strolls per Month	9.3	9.9	9.6	6.6	10.3	10.8
Percent Strolling at Least Once per Month*	78%	81%	75%	80%	81%	92%
Reasons for Walking*						
Exercise/health	67%	71%	69%	75%	72%	72%
For pleasure/I like to	22%	25%	24%	34%	25%	25%
Walk the dog	22%	22%	25%	25%	25%	14%
Get outdoors/fresh air	8%	9%	8%	6%	6%	17%
Be with friends/family	6%	9%	3%	9%	8%	20%
Walk to store	10%	8%	12%	9%	5%	4%
Relaxation	9%	7%	10%	6%	5%	3%
Reasons for Not Walking#						
Not enough time	30%	31%	25%	39%	29%	46%
Don't feel safe	11%	22%	26%	27%	19%	21%
Physical limitations	10%	16%	17%	0%	17%	12%
Exercise elsewhere	27%	14%	15%	0%	17%	4%
Walk elsewhere	12%	12%	16%	7%	11%	0%
Bad weather/too hot	4%	7%	5%	20%	6%	8%
Too much traffic	7%	4%	2%	7%	6%	8%
Too lazy/tired	6%	4%	4%	7%	2%	8%
Don't enjoy walking	5%	2%	2%	0%	2%	0%

* Chi-square shows statistically significant differences (1% level) between household types.
\# Chi-square shows statistically significant differences (1% level) between men and women.

In open-ended questions, respondents who walk were asked why they walk and those who don't were asked why they don't. Overall, men and women reported the same reasons for walking, although again the differences between women by household type are significant: married women with children were more likely to report that they walk to be with friends or family. Interestingly, differences in reasons for not walking do differ between men and women: men were more likely to report that they don't walk because they get other exercise (27% vs. 14%), while women were more likely to report that they don't feel safe (22% vs. 11%) or have physical limitations (16% vs. 10%). These results suggest that improving the neighborhood environment to help women feel safer walking there could be an important benefit of the new urbanist strategies.

In order to assess the importance of urban form characteristics in the choice of whether and how frequently to walk, respondents were asked to indicate whether they agreed or disagreed with a series of statements about the quality of the walking experience in their neighborhoods (Table 4). On average, women did not agree as strongly as men that they feel safe walking in their neighborhoods, especially at night. On the other hand, they agreed more strongly that the neighborhood has interesting houses to look at and enjoy doing so, and that they see neighbors they know when walking and enjoy doing so, suggesting that the quality of the walking environment is more important to them. Two significant differences between women by household type are important. First, married women are more likely to agree that they feel safe walking at night than are single women; this may partly reflect differences in neighborhoods in addition to the effect of having a spouse along on walks. Second, women with children are less likely to agree that they feel safe walking where there are no sidewalks, perhaps reflecting their concerns about the safety of their children more than their own safety.

Table 4
Feelings About Walking in Neighborhood

Mean Score on 5-Point Scale (5=agree; 1=disagree)	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Feel safe walking in day	4.7	4.6 '	4.5	4.4	4.6	4.6
Feel safe walking at night	4.1	3.5 '	3.3	3.2	3.6	3.7 ⊛
Trees give ample shade	4.0	4.0	4.1	3.6	4.0	3.8 ⊛
Feel OK walking when hot	3.0	2.8 '	2.8	2.6	2.8	2.8
Interesting houses to look at	3.8	4.0 '	4.1	4.0	4.1	3.8 ⁕
Like to look at houses	4.1	4.4 '	4.2	4.3	4.5	4.4
See neighbors when walking	3.1	3.3 *	3.3	3.1	3.5	3.3
See strangers when walking	3.9	3.8	3.8	3.9	3.8	3.8
Like to see people on walks	3.7	3.9 '	3.9	3.8	3.9	3.9
Too much traffic in neighbhd	3.2	3.1	3.1	3.1	3.0	3.0
Feel safe without sidewalks	3.1	2.9	3.1	2.5	3.1	2.6 ⊛

* F-statistic shows statistically significant differences (5% level) between men and women.
' F-statistic shows statistically significant differences (1% level) between men and women.
⊛ F-statistic shows statistically significant differences (5% level) between household types.
⁕ F-statistic shows statistically significant differences (1% level) between household types.

Walks to the store depend on the quality of the walking environment within the neighborhood as well as the distance to the store and the quality of the walking environment around the store. Overall, women walk to the store fewer times per month than men, perhaps reflecting the greater burden of household responsibilities that they bear and thus the less time they have to spend walking when they could drive (2.2 vs. 2.9 trips; Table 5). Single women without children, whose time is likely to be less constrained, walk to the store more times per month than other women, although this may reflect their greater propensity to live in traditional neighborhoods where walking to the store is more likely to be feasible. In fact, within Clarksville, the traditional neighborhood with the highest frequency of walks to the store,[2] single women without children still walk to the store more often on average than other women, but all categories walk more on average in this neighborhood than they do in other neighborhoods. This suggests that household type and neighborhood type both play a significant role.

An important question in understanding the implications of having the option to walk to the store is whether or not these walks replace driving trips. When asked what they would have done had they not been able to walk to the store the last time they did, men and women were equally likely to report that they would have driven, although women were somewhat more likely to report that they simply would have stayed at home. In other words, most walks to the store appear to be substitutes for driving trips, regardless of gender, but a notable share are "induced" trips—ones that would not be made if the walking option did not exist. Because residents sometimes choose to walk to the store when given the option, this must be an option they value and thus one that contributes to quality of life.

Table 5
Walk to Local Store Trip Characteristics

	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Average Walks to Store per Month	2.9	2.2 *	2.5	2.3	1.9	2.1
Percent Walking to Store at least Once per Month	47%	42%	41%	50%	44%	42%
If not able to walk last time walked to store, would have...						
Driven to same place	65%	63%	61%	61%	67%	62%
Driven to different place	9%	7%	9%	7%	7%	4%
Taken transit	2%	2%	4%	7%	1%	0%
Stayed home	10%	15%	15%	11%	10%	23%
Other	3%	4%	3%	0%	7%	3%
Not sure	11%	9%	8%	14%	8%	8%

* F-Statistic shows statistically significant difference (5% level) between men and women.

In order to further assess the importance of urban form characteristics in the choice to walk, respondents were asked to indicate whether they agreed or disagreed with a series of statements about the walking environment in local commercial areas (Table 6). On all but one characteristic, the differences between men and women are insignificant. However, women agreed less strongly that they feel safe walking in store areas; this difference may explain the lower average frequency of such walks (Table 5). Differences between women by household type are also insignificant, with the exception of whether the respondent has to walk along a busy street to reach the local commercial area: single women with children agreed most strongly on this question, perhaps reflecting neighborhood differences, or location within the neighborhood, or more basic differences in perception.

Table 6
Feelings About Local Commercial Areas

Mean Score on 5-Point Scale (5=agree; 1=disaggree)	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Stores within walking distance	3.7	3.7	3.7	3.7	3.7	3.6
Local stores meet my needs	3.6	3.7	3.6	3.6	3.7	3.8
Quality of local stores is high	3.4	3.5	3.4	3.3	3.5	3.5
Feel OK walking to local stores	3.9	3.8	3.9	3.7	3.9	3.7
Hard to park at local stores	2.5	2.6	2.6	2.7	2.5	2.6
Have to walk on busy street	3.4	3.6	3.4	4.0	3.6	3.7 #
Have to cross busy street	3.5	3.5	3.5	3.6	3.5	3.7
Feel OK walking in local stores	4.0	3.6 *	3.6	3.4	3.7	3.7

* F-statistic shows statistically significant differences (5% level) between household types.
\# F-statistic shows statistically significant differences (1% level) between men and women.

Respondents were also asked about factors influencing their choice about where to live (Table 7). As for factors influencing choice of supermarket, women rated every factor as more important than men did; this may reflect a greater concern about the choices—or a systematic gender bias in how respondents answer this type of question, a possibility that merits further testing. Statistically significant differences include: affordability of unit, quality of living unit, quality of schools, attractiveness of neighborhood, level of upkeep in neighborhood, and being close to friends or family. Understandably, women without children rated the quality of schools as being less important (although not unimportant) than women with children did. Investment potential is more important to women with spouses—but remember that these women are more likely to own their homes. Single women without children rate attractiveness of the neighborhood as less important than other women did, probably reflecting their lower household incomes and thus greater constraints on residential location choice. Overall, having stores within walking distance was tied for the least important factor and thus appears to be a relatively minor consideration in the residential location choice; the quality and upkeep of the neighborhood were among the highest factors.

Table 7
Factors Influencing Residential Location Choice

Mean Score on 5-Point Scale (5=important; 1=not important)	All Men	All Women	Women by Household Type... Single, No Kids	Single, Kids	Spouse, No Kids	Spouse, Kids
Quality of living unit	4.2	4.5 *	4.5	4.2	4.5	4.4
Affordability of living unit	4.2	4.4 *	4.5	4.3	4.4	4.4
Attractiveness of nbhd	4.1	4.3 *	4.3	3.8	4.4	4.4 #
Level of upkeep in nbhd	3.9	4.2 *	4.2	3.9	4.2	4.2
Close to work	3.3	3.4	3.4	3.2	3.4	3.6
Investment Potential	2.9	3.0	2.6	2.7	3.3	3.3 #
Stores within walking distance	2.6	2.8	2.9	2.5	2.7	2.6
Quality of schools	2.5	2.8 *	2.1	3.8	2.7	3.7 #
Close to friends or family	2.5	2.8 *	3.0	3.1	2.8	2.7

* F-statistic shows statistically significant differences (1% level) between men and women.
\# F-statistic shows statistically significant differences (1% level) between household types.

TELECOMMUNICATIONS OPPORTUNITIES

BACKGROUND

A number of applications of telecommunications technologies offer the opportunity to reduce travel, by allowing for the substitution of telecommunications for travel. Telecommuting, the substitution of working at home for commuting to the usual work site, is probably the best known and most studied example of this opportunity. Teleshopping and tele-banking would seem to offer similar potential for reducing travel, although the question of substitution is far from resolved. The use of such services may represent an increase in time spent in that activity rather than the elimination of a trip, for example. Nevertheless, the opportunity to participate in an activity from home is an important one, especially for people who are pressed for time.

For women faced with work and household responsibilities, the opportunity to shop or bank from home is potentially an effective strategy for coping. Time saved by not have to travel to the store or the bank is time available for doing other chores—or for leisure activities. Women concerned about safety in public places may prefer the option to bank or shop from home rather than expose themselves to real or perceived dangers. On the other hand, women who spend much of their time at home already, because they don't work or are taking care of children, for example, may value simply getting out of the house and thus prefer the out-of-home versions of shopping, banking, and other activities.

This section addresses the question of whether women are more likely than men to take advantage of the opportunity to bank or shop from home, thereby saving time and hassle. In addressing this question, it is important to determine not only if women make greater use of the in-home versions of these activities but if by doing so, they reduce the numbers of trips they make outside of the home. Decisions about the use of in-home or out-of-home versions of these activities will depend on the characteristics of the different versions, but also on the underlying preferences and attitudes of the individual. Although both technologies and attitudes will evolve over time, an analysis of the current situation provides general insights into the ways in which characteristics of technologies and attitudes of potential users influence the use of technologies.

SURVEY RESPONDENTS

Data on the use of in-home and out-of-home versions of selected activities—movie watching,[3] shopping, and banking—were collected through a mail-out, mail-back survey administered in August, 1995. The survey included questions about the use of currently-available versions of these activities as well as a series of attitudinal questions and questions on socio-demographic characteristics. The survey was sent to a random sample of 1000 individuals in each of three cities—Austin, Oklahoma City, and San Jose.[4] Although a follow-up postcard was sent out as a reminder to complete the survey, the overall response rate was only 16%. The results are thus unlikely to provide an accurate picture of the choices and attitudes of the entire population, but may provide a basis for beginning to understand the kinds of trade-offs that individuals make.

The data collected through this survey were analyzed by gender and, for women, by household types, where household type was defined by the presence and age of children (this survey did not include a question as to marital status). Three household types were defined: those with no children, those with children under the age of ten (including households that also have children over age ten), and those with children over age 10 only. Note that the number of respondents in each of the latter two categories is small, so that the potential for unrepresentative results is high. It is expected that women with young children, all else equal, will be somewhat more likely to take advantage of the opportunity to do something at home rather than make a trip to do it because of the potential time savings.

All else is not equal, however. Characteristics for the different categories of respondents are presented in Table 8. Average age does not differ significantly for men versus women, but, not surprisingly, women with young children are younger themselves on average. Education levels do not vary significantly, but work status does: women are less likely to work full time and more likely to not work, while among women, those with young children are most likely to not work. Women are more likely to live at lower household incomes and less likely to live at higher household incomes than men. Respondents are not distributed evenly across the three cities, with a higher portion of women without children and a lower portion of women with older children living in Austin, consistent with the relatively young demographics of Austin.

Table 8
Respondent Characteristics for Telecommunications Survey

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Average Age	45.9	43.7	46.7	35.5	45.0 #
Education					
< high school	3%	2%	2%	2%	4%
high school/GED	24%	31%	34%	22%	31%
college degree	50%	52%	50%	60%	46%
graduate degree	24%	15%	13%	16%	19%
Work Status*					
Full-time	76%	68%	71%	66%	65%
Part-time	3%	9%	7%	10%	15%
Retired	19%	10%	14%	2%	8%
Not working	2%	13%	9%	22%	12%
Student Status					
Full-time student	4%	4%	4%	6%	0%
Part-time student	10%	10%	11%	12%	12%
Household Income*					
<$20,000	6%	9%	9%	10%	12%
$20,000 to $39,000	20%	35%	38%	30%	31%
$40,000 to $59,000	28%	23%	24%	24%	15%
>$60,000	46%	33%	30%	36%	42%
Average Person per HH	2.6	2.5	1.9	3.5	3.2 #
Average Vehicles	2.3	2.0 @	2.0	2.0	2.0
Subscribe to On-Line Service	25%	18%	17%	16%	25%
City					
Austin	38%	43%	48%	36%	31%
Oklahoma City	35%	28%	24%	34%	39%
San Jose	27%	29%	29%	30%	31%
Number of Respondents	271	200	123	51	26

* Chi-square shows statistically significant differences (1% level) between men and women.
@ F-statistic shows statistically significant differences (1%level) between men and women.
# F-statistic shows statistically significant differences (1% level) between household types.

SURVEY RESULTS

The distribution of respondents by frequency of shopping in stores for items other than groceries did not differ significantly between men and women (Table 9). Differences on factors encouraging and discouraging store shopping were significant, however. Respondents were asked to indicate to what degree a series of factors encouraged them to shop in a store and to what degree a second series of factors discouraged them from shopping in a store. As in the land use survey, the average scores for women are higher than those for men on nearly every factor. Women rated the following factors as more strongly encouraging them to shop in a store than men did: getting out of the house, enjoy that particular store or center, can do multiple things on a shopping trip, and feel like spending money. On the other hand, women rated the following factors as more strongly discouraging them to shop in a store than men did: too many

people or too crowded, and don't have enough time. Differences between women by household type are also interesting. For example, women with young children gave higher ratings than other women to "getting out of the house" and "can do multiple things" as factors encouraging store shopping; this suggests both a need to escape the house for awhile and the need for efficient use of time.

Table 9
Store Shopping Characteristics and Motivations

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Store Shopping Frequency					
Never	2%	1%	1%	0%	0%
< once per month	19%	17%	16%	16%	19%
1-3 times per month	35%	44%	45%	45%	35%
Once per week	27%	24%	23%	22%	35%
> once per week	18%	16%	15%	18%	12%
Factors Encouraging Store Shopping (5=encourages; 1= does not encourage)					
Lots of variety and choices	4.2	4.4	4.3	4.4	4.5
Able to compare prices	4.3	4.3	4.3	4.5	4.4
Able to handle items	4.3	4.3	4.3	4.4	4.4
Can do multiple things	3.8	4.2 '	4.1	4.4	4.1
Enjoy that store/center	3.0	3.4 '	3.4	3.4	3.2
Getting out of the house	2.7	3.0 *	2.9	3.3	2.7
Feel like spending money	2.3	2.7 '	2.8	2.8	2.3
Being around people	2.1	2.2	2.3	2.2	1.8
Factors Discouraging Store Shopping (5=discourages; 1=does not discourage)					
Too many people/crowds	3.6	3.9 '	3.7	4.2	4.2 @
Don't have enough time	3.1	3.5 '	3.4	3.6	3.4
Poor service in stores	3.4	3.4	3.3	3.5	3.7
Difficulty parking	3.1	3.3	3.3	3.3	3.7
Difficulty getting there	2.7	2.8	2.8	2.7	3.1
Hate to shop	2.9	2.5 '	2.3	2.5	3.2 @

* F-statistic shows statistically significant differences (5% level) between men and women.
' F-statistic shows statistically significant differences (1% level) between men and women.
@ F-statistic shows statistically significant differences (5% level) between household types.

In contrast, patterns of catalog shopping do not differ by gender or household type (Table 10). Women make purchases from catalogs somewhat more frequently than men, although the differences are not statistically significant. The impacts of catalog shopping on shopping travel are also consistent across categories of respondents. When asked what they would have done if they hadn't found the last item they purchased from a catalog, most respondents said they would have waited until the next trip to a store to buy that item or would simply not have bought it. This suggests that most catalog shopping represents additional shopping rather than a substitute for trips to a store. Women with young children, however, were more likely to say that they would not have bought the item, perhaps suggesting more impulse buying for this segment. Just over half the respondents, for all categories, reported that they have sometime made a trip to the store because of an item they saw in a catalog, suggesting that catalogs sometimes induce additional shopping travel. These results suggest that women are not using catalog shopping as a way of saving time.

Table 10
Catalog Shopping Frequency and Travel Impacts

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Frequency of Purchases					
Never	19%	13%	14%	10%	15%
< once per year	20%	17%	16%	22%	8%
1-3 times per year	39%	53%	54%	48%	58%
Once per month	17%	15%	14%	18%	12%
> once per month	5%	0%	2%	2%	8%
If hadn't found last item purchased, would have...					
Made trip to store	18%	19%	18%	21%	22%
Waited until next trip to store	40%	41%	47%	23%	48%
Not bought item	33%	31%	28%	43%	17%
Other	0%	5%	5%	5%	9%
Can't remember last time	6%	5%	3%	9%	4%
Ever made trip to store because of catalog?	59%	53%	52%	55%	54%

Shopping channels serve a more limited purpose than either store shopping or catalog shopping, given the limited range of products sold this way. Most respondents reported having access to a shopping channel (Table 11), but most of those who have access reported that they never watch it. Fewer than a third reported ever buying an item from a home shopping channel, but nearly twice the percentage of women as men reported having done so. When asked what they would have done if they hadn't seen the last item they purchased from a home shopping channel, most respondents said they would not have bought the item, suggesting a high degree of impulse buying (the number of respondents for this question is very small, however). As with catalogs, women are not using shopping channels as a way of saving time.

Gender differences are also insignificant for banking habits. The frequency of visits to bank tellers is consistent across categories of respondents, with the greatest share of respondents making trips to the bank one to three times per month. Respondents were asked to indicate to what degree a series of factors encouraged them to complete a transaction with a teller (rather than other ways) and to what degree a second series of factors discouraged them from doing so. As for all other questions of this type, the average scores for women are higher than those for men on nearly every factor, although most differences are not statistically significant. The most important factors encouraging teller transactions for all respondents are: get problems solved quickly, can do multiple transactions, transaction can't be done other ways, and get proof of transaction. The most important factors discouraging teller transactions are: long lines, charges for using a teller, and transaction done more easily other ways.

Table 11
Shopping Channel Frequency and Travel Impacts

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Access to Home Shopping Channel*	70%	77%	73%	84%	85%
Frequency of Shopping Channel Watching*					
Never	76%	69%	71%	74%	54%
< once per month	16%	19%	19%	20%	21%
1-3 times per month	4%	4%	5%	2%	0%
Once per week	3%	2%	1%	2%	8%
> once per week	1%	6%	4%	2%	17%
Ever Made a Purchase from Home Shopping Channel*	17%	30%	26%	27%	50%
Number of Purchases Made	3.2	3.8	2.9	2.8	5.9
If hadn't seen last item purchased, would have...					
Made trip to store	0%	3%	0%	0%	11%
Waited 'til next trip to store	17%	6%	0%	0%	22%
Not bought item	57%	71%	82%	75%	44%
Other	10%	12%	12%	13%	11%
Can't remember last time	17%	9%	6%	13%	11%
Ever made trip to store because of item on TV?	6%	6%	4%	6%	16%

* Chi-square shows statistically significant differences (1% level) between men and women.

Table 12
Traditional Banking Characteristics and Motivations

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Frequency of Bank Teller Visits					
Never	8%	8%	7%	8%	8%
< once per month	28%	31%	34%	28%	19%
1-3 times per month	32%	33%	32%	36%	31%
Once per week	23%	22%	20%	24%	27%
> once per week	9%	8%	7%	4%	15%
Factors Encouraging Bank Teller Visits (5=encourages; 1=does not encourage)					
Can do multiple transactions	3.5	3.7	3.6	3.8	3.8
Can't be done other ways	3.2	3.6 *	3.5	3.9	3.7
Get proof of transaction	3.4	3.6	3.6	3.3	3.6
Problems solved quickly	3.4	3.5	3.4	3.5	3.9
Get to deal with person	3.1	2.9	2.9	2.7	3.0
Used to doing it that way	2.8	2.8	2.9	2.6	2.8
Factors Discouraging Bank Teller Visits (5=discourages; 1=does not discourage)					
Long lines	3.6	3.6	3.4	4.1	4.0 '
Charges for using a teller	3.1	3.2	3.2	3.3	3.2
Done more easily other ways	3.0	3.1	3.0	3.4	2.8
Hard to park	2.6	2.8	2.7	2.9	3.0
Too far away	2.6	2.7	2.4	2.9	3.0 @
Too hard to get there	2.4	2.6	2.4	2.7	2.9

* F-statistic shows statistically significant differences (1% level) between men and women.
' F-statistic shows statistically significant differences (1% level) between household types.
@ F-statistic shows statistically significant differences (5% level) between household types.

Table 13
ATM Use Frequency and Travel Impacts

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Have ATM card	80%	78%	80%	77%	73%
Ever use ATM card	86%	80%	79%	84%	75%
Frequency of ATM card Use at Own Bank					
Never	13%	17%	18%	14%	20%
< once per month	17%	20%	24%	17%	7%
1-3 times per month	36%	35%	31%	39%	47%
Once per week	18%	17%	17%	14%	27%
> once per week	15%	12%	12%	17%	0%
If unable to use ATM last time, would have...					
made trip to bank	49%	49%	49%	54%	41%
waited 'til next trip	19%	9%	11%	3%	12%
done it by phone	2%	2%	3%	0%	0%
done it by mail	2%	2%	1%	3%	0%
cashed checked elsewhere	25%	33%	31%	34%	35%
done it by computer	1%	1%	0%	3%	0%
other	3%	5%	5%	3%	12%

Similarly, use of ATMs do not differ across respondent categories either. Most respondents have an ATM card, and most use it at some time. The most frequently used ATMs are at the respondent's own bank, suggesting that the use of ATMs does not eliminate a trip to the bank, but provides a quicker and easier way to complete certain transactions (like withdrawals) than visiting a teller. Consistent with this interpretation, when asked what they would have done had they not be able to use the ATM the last time, most respondents said they would have made a trip to the bank (which they often would have done anyway to use the ATM). Most of the others said they would have cashed a checked somewhere else. These results suggest that ATMs save time and hassle for bank customers but not necessarily travel.

Telephone banking services also offer the potential to save time, although some transactions—especially getting cash—are not easily accomplished this way. Differences between men and women in access to and frequency of use of such services are not significant (Table 14). For both men and women, the use of telephone banking services appears to substitute for a trip to the bank on a large share of occasions: 40% of respondents said they would have made a special trip to the bank if they had not been able to use the telephone service on the last occasion. Close to a third of respondents said they would have waited until their next trip to the bank, however, suggesting that telephone services may sometimes increase the frequency of banking transactions. In other words, telephone services sometimes save time (by eliminating a trip to the bank) but may sometimes mean more time spent on banking (by increasing accessibility to the bank).

Table 14
Telephone Banking Services Frequency and Travel Impacts

	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Access to Phone Service					
Yes	67%	68%	69%	68%	65%
Don't Know	19%	24%	23%	28%	15%
Frequency of Phone Service Use					
Never	29%	27%	31%	14%	32%
< once per month	30%	32%	33%	34%	21%
1-3 times per month	21%	26%	24%	29%	32%
Once per week	11%	9%	9%	9%	11%
> once per week	9%	6%	2%	14%	5%
If unable to use phone service last time, would have...					
made trip to bank	39%	40%	38%	43%	43%
waited until next trip to bank	25%	33%	36%	30%	29%
made trip to ATM	8%	8%	7%	7%	14%
waited until next trip to ATM	9%	3%	0%	7%	7%
done it by mail	7%	7%	10%	3%	0%
done it by computer	1%	2%	2%	0%	7%
other	11%	8%	8%	10%	0%

The likelihood that individuals will use telecommunications-based, in-home versions of different activities depends partly on their attitudes about a variety of factors, including how they feel about using technology, having to drive, and being around people. Respondents were asked to indicate whether they agreed or disagreed with a series of statements reflecting different attitudes. Using factor analysis, these statements were grouped into six factors: pro-technology, anti-congestion, social/interactive, home body, time pressure, and technology insecurity.[5] The results show some notable differences between men and women (Table 15). For example, men agree more strongly on average that they'll spend money for the latest technologies. Women score higher, on average, on the social/interactive factor, indicating that they agree more strongly that they prefer to spend free time with friends and that they enjoy walking. On the other hand, women agree more strongly that they never have enough time, and that they worry about privacy with computers. These results suggest that women may be less likely to use new technologies and substitute in-home versions of activities for out-of-home versions, although feeling greater time pressure may encourage time saving decisions.

CONCLUSIONS

The results of the land use and telecommunications surveys for the most part show relatively minor differences between men and women in their choices about travel in and around their neighborhoods and their use of in-home versus out-of-home versions of shopping and banking. The more significant differences between men and women appear in their motivations, feelings, and attitudes. The results also show that is important to consider not just gender but the structure of the household: in many

TABLE 15
Attitudes

Mean Score on 5-Point Scale (5=agree; 1=disagree)	All Men	All Women	Women by Household Type... No kids	Kids < 10 yrs	Kids 10-18 yrs
Pro-Technology					
Technology makes my life easier	3.9	3.8	3.8	4.0	3.5
I feel comfortable using computers	3.9	3.8	3.8	4.0	3.7
Technology helps me save time	3.9	3.8	3.8	4.0	3.5
I'll spend money for latest technologies	3.2	2.9 *	2.8	3.0	3.0
I have trouble using new technologies	-2.2	-2.4	-2.4	-2.2	-2.7
Anti-Congestion Factor					
I really hate waiting in lines	4.0	4.1	4.0	4.3	3.8
Traffic drives me crazy	3.4	3.5	3.4	3.8	3.6
I believe people should drive less	3.4	3.3	3.3	3.3	3.3
I enjoy being in busy places	-2.7	-2.6	-2.7	-2.5	-2.7
I enjoy driving, even around town	-3.5	-3.5	-3.6	-3.5	-3.1
Social/Interactive Factor					
I enjoy walking	3.6	3.9 *	3.9	4.1	3.8
I like to interact with other people	3.8	3.8	3.9	3.7	3.9
I prefer to spend free time with friends	3.3	3.5 *	3.6	3.5	3.5
Home Body Factor					
I prefer to spend free time at home	3.6	3.7	3.7	3.7	3.5
I get bored staying home all day	-3.1	-2.8	-2.8	-2.8	-3.0
Time Pressure Factor					
I wish I had more free time	3.9	4.0	4.0	4.2	4.1
I never have enough time	3.3	3.6 *	3.6	3.9	3.6
Technology Insecurity Factor					
I worry about my privacy with computers	3.2	3.5 #	3.5	3.4	3.9
I worry about credit card fraud	3.1	3.2	3.2	3.2	3.2
Technology will change society for worse	2.2	2.3	2.4	2.2	2.3

Note: negative sign means statement reflects attitude opposite to overall factor.
* F-statistic shows statistically significant differences (1% level) between men and women.
\# F-statistic shows statistically significant differences (5% level) between men and women.

cases, women living in different types of households differed more in their choices and their underlying preferences than women overall differed from men. The differences identified point to specific concerns that should be addressed in either land use or telecommunications strategies. Creating walkable environments, where residents have the option to walk to the store or can enjoy a stroll through the neighborhood, helps everyone, both men and women, both single and married women, both women with children and women without children. Creating accessibility environments, were residents are within walking distance or a short driving distance of needed activities, helps everyone.

For the most part, gender, marital status, and the presence of children are not significantly associated with the frequency with which one walks or the likelihood that one walks. But motivations, feelings, and attitudes do vary, with safety a significantly greater concern for women than for men. Land use strategies—new urbanist or otherwise—must address this concern and work to create environments that are safer both in fact and in perception for women and their children.

Providing the option to bank or shop or take care of some other chore from home rather than having to travel outside the home also helps everyone. For the most part, gender and the presence of children are not significantly associated with the frequency of the use of alternative versions of either shopping or banking. And, for the most part, neither women nor men are using in-home versions of banking or shopping as a substitute for out-of-home versions, although this may change as technologies evolve and as the in-home versions improve. But attitudes do differ between men and women, with women somewhat less comfortable with or interested in technology and somewhat more interested in being with other people. Telecommunications strategies may prove to be less important to women than to men, despite the greater time pressures that women often feel.

NOTES

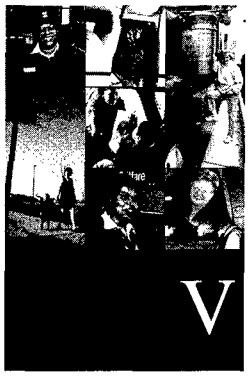
[1]The primary purpose of the survey was to test for differences in travel choices between neighborhoods of different types. Results of this analysis are summarized in Susan Handy, "Urban Form and Pedestrian Choices: A Study of Austin Neighborhoods," forthcoming in Transportation Research Record.

[2] See Susan Handy, "Urban Form and Pedestrian Choices: A Study of Austin Neighborhoods," forthcoming in Transportation Research Record.

[3]The data for movie-watching were not analyzed by gender. Results of the overall analysis are summarized in Susan Handy, "The Impacts of Telecommunications Technologies on Nonwork Travel Behavior," Southwest Region University Transportation Center, the University of Texas at Austin, August 1996.

[4]These cities were selected based on two variables: high-tech culture (San Jose and Austin high, Oklahoma City low) and traffic congestion (San Jose high, Austin and Oklahoma City low). It was hypothesized that a high-tech culture and a high level of congestion might be associated with greater use of in-home, telecommunications-based versions of activities.

[5] For more detail about this analysis, see Susan Handy, "The Impacts of Telecommunications Technologies on Nonwork Travel Behavior," Southwest Region University Transportation Center, the University of Texas at Austin, August 1996.



V

GENDER, RACE, AND ETHNICITY: TRANSPORTATION INTERACTIONS

Location, Race, and Labor Force Participation: Implications for Women of Color

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LOCATION, RACE, AND LABOR FORCE PARTICIPATION: IMPLICATIONS FOR WOMEN OF COLOR

This paper examines racial and ethnic differences in women's labor force participation and in their locational accessibility to employment, and discusses the implications for women of color. General questions that can be raised include the work characteristics of women in different ethnic groups, where they work, and how they get to work. Broad answers to these questions are available from aggregate census data, but analyses of disaggregate data have been able to offer more detailed answers on ethnic and gender differences in work travel behavior.[1]

As female labor force participation has risen, more attention has been given to the locational dimensions of women's employment. Common measures of locational access to employment are the distance between home and work, travel time to work, and suburban versus central city work location. The journey to work is relevant because it connects women's domestic lives with their paid employment. A large body of research indicates that women work closer to home than do men and have shorter commuting times.[2] However many early studies overlooked women of color. Until recently, studies on gender differences in urban travel behavior simply assumed that working women of all racial and/or ethnic groups have shorter work trips than do men. This assumption is unfounded in view of the fact that many studies report significant racial differences in travel patterns.[3]

The literature on racial differences in commuting and spatial access to employment is largely concerned with the spatial mismatch hypothesis. First proposed in 1968,[4] the hypothesis states that African American inner-city residents have poorer spatial access to jobs than do other workers, because of their concentration in segregated residential areas distant from and poorly connected to major centers of employment growth. Lack of access leads to high rates of unemployment and, for persons able to overcome spatial barriers and find work, to long journeys to work.[5] Despite the diversity of findings from empirical tests of the spatial mismatch hypothesis, it is clear that minority workers often differ from European Americans in their commuting patterns and spatial and social access to employment.[6]

Many past studies on racial differences were flawed by not paying sufficient attention to gender differences in the journey to work. More recent analyses of accessibility to employment examine how the unique economic, social, and locational profile of African American and Latina women affect their commuting behavior,[7] but there is as yet very little detailed work on the commuting behavior of Asian and Native American women. Studies indicate that African American women have significantly longer work trips than do White women, especially as measured by commuting time.[8] Another important finding is that unlike European American women, African American women especially, do not have shorter commutes compared to men.[9] This paper provides an overview of findings on racial and ethnic differences in metropolitan women's journey-to-work behavior.

In the first section of the paper, summary statistics from the 1990 U.S. census for metropolitan areas are reviewed to obtain labor force participation profiles of women from different ethnic and racial background. Because of the concentration of ethnic minority groups in the central cities of metropolitan areas, the central city statistics are also provided.[10] The central city/non-central city distinction

is especially crucial in discussions of locational access to employment opportunities. In the second part of the paper, racial and ethnic differences in women's commuting are examined. The information presented in the second section draws on a review of the literature that focuses on research conducted across selected metropolitan areas using disaggregate data bases. The final section of the paper summarizes the findings on racial differences in women's employment accessibility and discusses implications for women of color.

RACIAL AND ETHNIC DIFFERENCES IN FEMALE LABOR FORCE PARTICIPATION AND JOURNEY TO WORK

FEMALE EMPLOYMENT CHARACTERISTICS

Table 1 on female employment characteristics for U.S. metropolitan areas and central cities show well-known and expected distributions. African (Black) American and Asian American women as well as Native American women have slightly higher labor force participation rates than White (European) American and Hispanic (Latina) women, but African American and Hispanic women as well as Native American women have higher unemployment rates than European American and Asian American women. Black and Hispanic women are much more likely to be in service occupations than are White and Asian women. The level of full time employment varies slightly but Asian American women are more likely than other women to work full time year round. The mean incomes of full time White and Asian women are higher than those of other women. Hispanic women have the lowest median income (Table 1).[11]

Over sixty percent of Black women with young (preschool) children are in the labor force. In central cities, compared to other women of color, Black mothers of preschool children are more likely to be in the labor force. The disproportionate number of minority women who are heads of households is well publicized. The data here on the percentage of female heads of households who are employed show that Black, Hispanic and Native American female heads of households are less likely than White and Asian counterparts to be employed. The lowest rate is for Hispanic female heads of households: 50 percent (and 46 percent in central cities (Table 1)).

To summarize, although they are about as likely to work full time as White women, the kinds of occupations that Latina, Native American and African American women hold affect their incomes, so even in households where the husband and wife work, the median incomes of European American families are higher than the incomes of families in these three minority ethnic groups (Table 1). This background on household structure is useful because it shows that an overemphasis on female headed households misses an essential truth about minority women's poverty. As Brewer observed, "Black women are also poor in households with male heads. With or without a male present, there is a strong likelihood that black women and children will be living in poverty in America today".[12] This suggests that the central issue in the well being of women of color is not family structure but access to jobs and income.[13] In light of this point, general measures of the journey to work are now examined.

Table 1
Employment and Household Characteristics of
Women by Race and Ethnicity (1990 Census)

	White	Black	Hispanic	Asian	Native American
US Metropolitan Areas					
labor force participation %	57.8	60.7	56.5	60.2	59.4
% unemployment	4.8	11.8	11.1	5.5	10.8
service occupations %	14.2	24.3	23.0	15.8	21.6
year round full time workers %	35.0	36.3	34.2	40.9	33.8
median income of full time workers $	21,060	19,013	16,528	21,596	18,176
working mothers with child under six %	59.5	63.6	51.8	57.6	54.5
employed female heads of households %	63.0	54.2	50.1	63.1	53.3
median income of families where husband and wife both work $	50,778	44,115	38,093	53,217	39,900
US Central Cities					
labor force participation %	56.7	58.1	54.7	58.5	59.0
% unemployment	5.4	13.2	12.0	6.0	12.3
service occupations %	14.7	25.8	24.4	16.4	22.3
year round full time workers %	34.0	33.7	32.5	37.8	31.7
median income of full time workers $	20,907	18,439	15,790	20,622	17,542
working mothers with child under six %	59.3	60.3	49.7	54.6	53.0
employed female heads of households %	59.2	51.1	46.3	58.9	49.7
median income of families where husband and wife both work $	47,506	42,014	35,394	46,597	37,341

AGGREGATE JOURNEY-TO-WORK CHARACTERISTICS

For journey-to-work characteristics, census information is available about transportation mode and commuting time of ethnic groups in U.S. metropolitan areas and central cities, but breakdowns by sex are rarely provided (Table 2). One consistent finding is that higher proportions of ethnic minority workers depend on public transportation. The figures are highest for African American workers. In central cities, 23% of African Americans use public transportation for their work trip compared to 8% of European American workers (Table 2). It is not surprising then that the average commuting time of central city African American workers is (about 6 minutes) longer than the average commuting time of European American workers. This information about commuting for 1990 agree with earlier studies based on representative national level data that showed differences between European American and African Americans in their journeys to work.[14] It would be useful to examine differences and similarities in the place of work (since this is relevant for showing trends in commutes to non central city locations) and although this information is collected in the census, it is not provided for different ethnic and sex groups in the census summary tables.

Table 2
Commuting Characteristics of Employed Persons by Race and Ethnicity
(1990 Census)

	White	Black	Hispanic	Asian	Native American
US Metropolitan Areas					
% using private vehicles	88.1	74.9	79.1	79.4	83.6
% using public transportation	4.4	17.9	11.9	11.9	6.1
mean travel time	22.6 mins.	26.1 mins.	24.7 mins.	26.0 mins.	23.0 mins.
US Central Cities					
% using private vehicles	82.1 2	69.2	73.0	69.8	77.2
% using public transportation	8.1	23.2	17.4	18.3	10.6
mean travel time	20.8 mins.	26.5 mins.	24.9 mins.	25.3 mins.	21.9 mins.

In short, the aggregated census summary data reveal important racial and ethnic differences in women's labor force participation. The worker characteristics discussed above (i.e., residential location, occupation status, income status, household structure and transportation mode) usually influence access to employment. For example, the commuting literature shows that workers who hold relatively lower status occupations, or earn low incomes have short work trips; while those who use public transportation have longer work trip times. But because of its aggregate nature, the census summary data is of limited use for detailed gender and racial analysis of locational access to employment.

The next section attempts to summarize the evidence on how Black and Hispanic women's travel mode, economic and occupation status, domestic roles, and locational characteristics affect their commuting behavior. The review draws heavily on studies that were based on disaggregate data and multivariate in-depth analyses of specific metropolitan areas.

REVIEW OF RACIAL AND ETHNIC DIFFERENCES IN WOMEN'S COMMUTING

DIFFERENCES IN TRANSPORTATION MODE

Differences in transportation mode are discussed first because disparities in access to an automobile have a fundamental influence on minority women's work trips.[15] Many early studies documented African American women's greater dependence on public transit. In a Baltimore study, over 25 percent of African American women used public transit compared to 14 percent of European American women.[16] In northern New Jersey, analysis of 1980 census data showed that 25 percent of African American women used mass transit compared with 14 percent of African American men.[17] Similar patterns were observed in Buffalo and Rochester New York in 1980 where African American women were much more reliant on public transit than were African American men or European American men or women.[18]

More recent analysis using 1990 data for Buffalo showed that public transportation use for Black women was 27.9 percent compared to 4.6 percent for White women.[19] Similar analyses of census Public Use Microdata Samples (PUMS) data for three metropolitan areas, Kansas City, Detroit and Miami, reveal the following percentages of women in three ethnic categories who use public transit in 1990:

Kansas: Black women 12.7%	Hispanic women 2.1 %	White women 1.4%
Detroit: Black women 10.9%	Hispanic women 1.0 %	White women 0.8%
Miami: Black women 17.5%	Hispanic women 6.7 %	White women 3.2%[20]

The U.S. census PUMS data set from which the above information is obtained is rich in its detailed individual information about labor force participation, household composition, and the journey to work, and starting in 1980, information on travel time to work. All this information is coded by residential and workplace location. However, there is no information about the distance between home and work, and in order to protect respondents' confidentiality, locational information in the PUMS is provided at very large geographical scales such as county or subcounty units, which makes the dataset less than satisfactory for locational analysis. Hence in studying the home-work separation for metropolitan workers, the locational distinctions are often between central city and non central city (suburban) locations.

Even with the crude definitions of central city versus suburban areas, studies using PUMS data support other travel data sets in documenting both an increase in suburban commutes, as well as high levels of racial residential segregation in U.S. metropolitan areas. A variety of datasets with measures of residence and work location show that minorities are still concentrated in central cities;[21] and African American workers living in the suburbs are closer to suburban jobs than are central residents who must reverse commute.[22] Even within the suburbs, residential segregation persists,[23] creating separate geographies of employment opportunities for European American women and women of color.[24]

Because of their relative concentration in central cities, the growth of employment in the suburbs affects Black and Hispanic women's access to jobs. In fact, increasing numbers of African American workers are commuting outward to suburban workplaces.[25] Racial differences both in transportation mode and in the direction of commute affect work-trip length as reported next.

WORK-TRIP LENGTHS

A comparison of journey-to-work length measured both as distance and travel time for the same group of workers drawn from the 1977 Baltimore Travel Demand dataset revealed that African Americans, females and males, had **shorter work-trip distances** than European Americans, but spent **significantly longer times** travelling to work. Specifically, Black males travelled 7.4 miles while White males travelled 7.8 miles, and Black females travelled 4.9 miles while White females travelled 5.8 miles. However, Black males spent 36.9 minutes compared to 25.3 minutes for White males, and Black females spent 29.5 minutes compared to 23 minutes for White females.[26] Studies which examined both of these two measures of travel length report the same trend of shorter average work-trip distance for African Americans but longer average travel time.[27] There are now more studies on women's work-trip time that examine racial/ethnic differences.

RACIAL/ETHNIC DIFFERENCES IN WOMEN'S WORK-TRIP TIME

Ethnic minority women in New York spent about 10 minutes longer than White women in 1980.[28] Similarly, the difference ranged from over 4 minutes between white and black women in Kansas City to, 6 minutes in Detroit and 9 minutes in Miami (see mean travel times below).[29] Researchers agree that African Americans' dependence on slow travel modes, especially public transit, is a major factor in their long commuting times.

Table 3
Women's Mean Travel Time (all travel modes) 1980 PUMS

	Black	Hispanic	White
Kansas City	23.1 mins.	18.7 mins.	18.6 mins.
Detroit	25.5 mins.	19.8 mins.	19.2 mins.
Miami	30.0 mins.	22.0 mins.	21.2 mins.

TRAVEL TIMES OF AUTO USERS

When travel times of auto users are compared, ethnic/racial differences often reduce or disappear. For instance, in Buffalo, the difference between Black and White female auto users in 1990 is small and no longer significant. Similar patterns of reduced ethnic differences in **travel time of auto users** are found in 1990 for Kansas City, Detroit and Miami.

Table 4
Women's Mean Travel Time by Auto Use (1990 PUMS)[30]

	Black	Hispanic	White	Significant Difference
Buffalo				
all modes	21.2 mins.	----	17.8 mins.	a
auto users	18.1 mins.	----	17.5 mins.	ns
Kansas City				
all modes	22.6 mins.	17.2 mins.	20.2 mins.	b
auto users	21.2 mins.	17.2 mins.	20.3 mins.	ns
Detroit				
all modes	23.9 mins.	19.2 mins.	21.1 mins.	a
auto users	22.3 mins.	19.2 mins.	21.2 mins.	a
Miami				
all modes	26.5 mins.	24.0 mins.	22.8 mins.	b,c
auto users	24.1 mins.	23.6 mins.	22.5 mins.	d

a=Blacks longer than Whites
b=Blacks longer than Whites and Hispanics
c=Hispanics longer than Whites
d=Blacks and Hispanics longer than Whites
ns=not significant
----=not available

Thus while the trip times of African American or Latina auto users in some places are still longer than those of European American auto users (e.g., Detroit and Miami in 1990) the difference is small (under 2 minutes), and the general trend is that by 1990 the racial or ethnic difference in the work trip times of female auto users has reduced or become negligible.[31] Taylor and Ong also find that the commuting time of minority workers is not significantly longer than for Whites once automobile use is taken into account (and on this basis they suggest the importance of an "automobile mismatch".[32] The "big picture" that is emerging according to more recent data, therefore, is one of convergence in the overall work-trip times of female auto users.

There is some indication however, that the group with longer work trips (relative to other groups of workers) appears to be White male auto users. For example, White male auto users in Buffalo spent about 2 minutes more than Black men or women of both races.[33] It is useful to digress briefly to the question of whether white men are disadvantaged by their long commutes. In the Buffalo study, a typology of four commute types was developed based on travel times and incomes of full-time workers. Convenient and compensatory commutes which are short and long trips respectively to high wage-jobs were distinguished from compromised and constrained commutes which are short and long trips respectively to low-wage jobs.

Table 5
Typology of Commutes

	short commute (<20 mins)	**long commute (20+ mins)**
high income	convenient	compensatory
low income	compromised	constrained

According to the results, the gender differences were more important than were the race differences. Because of the gender wage gap, women (of both races) not surprisingly, were more likely than men to have compromised and constrained commutes, while men had more convenient and compensatory commutes.[34] The study concluded that the disproportionate concentration of White women in the short trip-low income commute type suggests that their commutes are more accurately characterized as compromised commutes rather than convenient commutes as has been argued in some quarters. However, even though the commutes of women are more similar in their relative concentration in the low-income categories, racial differences in travel times are often still observed among some groups of women. Studies that have examined the commuting times of women in the same income, occupation or family status categories have found some significant racial differences. These are summarized next.

RACIAL DIFFERENCES IN TRAVEL TIME AFTER CONTROLLING FOR INCOME AND OCCUPATION

The effects of wages and incomes on commuting are more complex for African American women than for European American women. As shown at the beginning, Black and Hispanic women earn less, on average, than do White women, and theoretically, this should lead Black and Hispanic women to have shorter work trips. Yet as noted above, in the New York metropolitan area for example, African American women's average commuting time was more than 10 minutes longer than European American women's and the racial difference remained even after controlling for income, occupation, and industry of employment.[35] Among low income women who used a car in Baltimore, Black women spent significantly longer times than White women.[36] The expectation that low incomes will lead Black women to have short work trips is therefore not necessarily borne out by much of the commuting data that has been analyzed.

Research on the relationship between occupational segmentation and commuting for minority women is in its infancy, but initial findings show important differences between White and Black women. To the extent that commuting time is indicative of spatial factors, McLafferty and Preston found that for White women, spatial factors directly affect occupational segmentation, but not for Black women. African American women who worked in occupations typical for their gender/race group did not have shorter commute times than those who worked in other occupations, indicating that proximity to home was not a factor in Black women's concentration in gender- and race-segregated occupations.[37] Findings from other multivariate analyses of racial differences in women's commuting indicate an interaction effect between race and occupation: White women in service occupations have short commutes when compared to other White women, but Black women in service occupations do not.[38] Not only are the work trips of Black service workers longer than those of other Black women, their commutes are also often longer than those of White service workers. Thus the generalization that female-dominated occupations such as service jobs are associated with short commutes holds for European American women but not for African American women.

RACIAL DIFFERENCES IN TRAVEL TIME AFTER CONTROLLING FOR DOMESTIC ROLE

Obtaining a job near the residence continues to be identified as important for women who need to attend to family responsibilities.[39] Yet the limited research about African American women's work trips does not support this otherwise reasonable behavior. In studies of Baltimore, Buffalo, and Rochester, even when they use an automobile for the work trip, African American mothers still travel longer than do European American mothers.[40] In the New York metropolitan region, although the presence and ages of children significantly reduced all women's commuting times, the effects of parenthood were muted for minority women.[41] According to 1990 data, African American mothers in Detroit had slightly longer commutes than European American mothers, and Latina mothers in Miami had slightly longer commutes than European American mothers.[42] From the relatively little evidence available, suffice it to say that family status has less effect on Black women's commuting times. It is possible that current contradictory evidence about the effects of family responsibilities on women's commuting time is due to a tendency to treat women as a homogeneous group, overlooking differences in racial backgrounds, family structures, and places of residence.[43]

RACIAL DIFFERENCES IN TRAVEL TIME AFTER CONTROLLING FOR DIRECTION OF COMMUTE

In light of the stark residential locational differences between European American women and women of color, it is necessary to control for direction of commute in examining racial differences in journey-to-work time. The conclusions reached on ethnic disparities are unfortunately sometimes compromised by small sample sizes particularly of African Americans who live in suburban locations of the study areas, and in the Mid West cities of Kansas City and Detroit by the small sample sizes of Latino workers.[44] However, the comparisons for women who live in central city locations but commute to noncentral city work destinations (i.e., reverse commuters) are based on sufficiently large numbers of respondents and provide reliable information. For instance, a comparison of the trip lengths of Buffalo White and Black women auto users based on city/noncity locations showed that if the workplace is in the central city, there are no racial differences in trip length, but if the work trip is to a suburban destination, the commutes of Black women are longer.[45] The study concluded that suburban work destination has a lengthening effect on Black women's commutes.

RACIAL DIFFERENCES IN TRAVEL TIME OF REVERSE COMMUTERS

A very important dimension in locational access to employment is the situation of workers who reverse commute. This is especially relevant because of the sectoral and spatial aspects of the restructured metropolis. Employment restructuring has meant a marked increase in service occupations as well as in suburban employment. For instance, the highest increase for female workers employed in suburban locations in Buffalo between 1980 and 1990 was among service workers; but there was also a significant racial difference: the percentage of female European American service workers employed in suburban location increased by 7 percent between 1980 and 1990, but among African American female service workers the increase was 15.4 percent.[46] For women of color living in central cities, the long commutes required to access growing suburban employment centers can pose a formidable barrier to finding and keeping a job. According to the data below, among female reverse commuters in Buffalo and Detroit, African American women have significantly longer commutes than European American reverse commuters. The racial gap is even more pronounced among service workers.

Table 6
Mean Travel Time of Female Reverse Commuters (Auto Users only) 1990 PUMS

Kansas City	**Black**	**White**	
reverse commuters (all occupations)	25.2 mins.	23.9 mins.	ns.
reverse commuters (service workers)	24.8 mins.	20.1 mins.	ns.
Buffalo			
reverse commuters (all occupations)	23.5 mins.	19.2 mins.	sig.
reverse commuters (service workers)	25.2 mins.	17.5 mins.	sig.
Detroit			
reverse commuters (all occupations)	25.4 mins.	23.5 mins.	sig.
reverse commuters (service workers)	25.6 mins.	20.1 mins.	sig.

ns=not significant

sig.=significant at p =< .05

The 1980 analyses for Buffalo, Miami, Kansas City and Detroit showed much significant differences between White women and Black women who reverse commute—ranging between 5 and 7 minutes difference for these four cities (tables not shown).[47] By 1990, as shown above, the difference between White and Black women reverse commuters is less, and where significant, it is as little as 2 minutes in Detroit and 4 minutes in Buffalo.

Overall then, while the big picture shows a reduced racial gap in women's journey to work time between 1980 and 1990, detailed subgroup analysis reveals a smaller picture that is masked by the overall trend. The evidence points to a continuing and significant travel time cost for Black women service workers with suburban work locations (about 5 minutes or more longer than White female counterparts). The time cost is not trivial if one considers the two-way trip over a prolonged period. It translates into about a work week over a period of one year. Furthermore, it is important to draw attention to the fact that all these comparisons are among women who use automobiles. The findings thus show that even when access to an automobile is not a hindrance, the need to work outside the central city continues to place a disproportionate commuting burden on African American female service workers. This is the little (but important) picture. The emphasis on workplace location in these analyses represents an important refinement that only few previous studies on commuting differences among women have examined.

RACIAL DIFFERENCES IN THE USE OF PUBLIC TRANSIT FOR REVERSE COMMUTING

Among non auto users, the incidence of reverse commuting for Black women is still quite high. For example, the use of public transit in 1990 ranges from 17.5% and 9.5% to 6% in Buffalo, Detroit and Kansas City respectively for Black women versus under 4% for White women who reverse commute. This racial difference in women's public transit use for reverse commuting is still rarely documented in studies, but it points to the continuing significance of the relative lack of access to private automobiles in Black women's work access difficulties. There is also some evidence that even among suburban residents, African American women and Latinas depend more on mass transit than White women and spend more time commuting.[48]

Table 7
Reverse Commuting by Public Transit (1990 PUMS)
(percent of female reverse commuters who use public transit)

	Black	White
Buffalo	17.5%	3.5%
Detroit	9.5%	1.7%
Kansas City	6.0%	0.7%

To conclude, survey data and disaggregate data on specific metropolitan areas have allowed more detailed gender- and ethnic-specific studies of differential locational access to employment. However the dependence on the Public Use Microdata Samples (PUMS) means that the common measure of locational access that is examined is travel time, and that very large geographical units are used for identifying residential/workplace location. But one should keep in mind that commuting time is a fair estimate of locational access to work because it is a direct measure of the time cost of commuting; and at least one comparison of travel time and trip distance led to the conclusion that "commuting time is more important for workers than commuting distance".[49] One possible explanation for the longer travel times of some African American women is that African American and European American working women live and work in different sub-areas of central city and suburban locations and face different levels of traffic congestion, but this issue cannot be examined using the PUMS data. Inspite of the aggregated definitions of residence and workplace location, and the restrictions of many studies to a single geographical or time context, some general conclusions do emerge.

CONCLUSIONS AND IMPLICATIONS

Studies consistently show that African American women commute longer than do European American women, and the gender gap in commuting, so often noted in the literature, does not exist for African Americans. This review has examined research that explicitly focuses on women and at racial/ethnic differences in commuting and employment access. One important point is that African American women's long commutes are not simply a result of their economic status or domestic roles. In fact, according to conventional wisdom, African American women's disadvantaged position in the labor force and their concentration in female-headed households should lead to shorter work trips, not longer ones. As employed mothers, African American women do not enjoy the relative convenience of short commutes to work, nor do they gain any financial payoff for enduring long work trips. Thus the causes of African American women's long work trips must lie elsewhere—for example, in their lack of access to private transportation or their poorer social and spatial access to jobs.[50]

African American women often incur greater commuting burdens even after controlling for usual racial differences in transportation, sociodemographic, and locational factors. *In spite* of the constraints, many low-income African American women, those with children, or those with suburban jobs still endure longer commutes than do their European American counterparts. The resultant profile of African American women who combine parenthood with wage earning, endure long commutes to suburban destinations, but earn only low incomes (not only contradicts the welfare queen image, but) suggests that a spatial mismatch exists for subgroups of African American women.

Locational and mobility factors are important reasons for remaining racial gaps in women's travel time to work. If more jobs are available in central cities, there would be less need for suburban commutes. Alternatively, if African Americans had unrestricted access to suburban housing, the racial disparity in access to jobs might be alleviated. Support for this speculation comes from Preston et al.'s finding that race has far less effect on commuting times of female suburban residents; and also from Popkin et al. who report better employment outcomes for black respondents who relocated to suburban areas in Chicago[51]. The benefits of suburban residence may therefore be substantial for African American women's employment prospects.

Most African American women do work in central city locations and only a relatively small fraction of African American women reverse commute in 1990; but if the occupational and locational elements of the restructured metropolitan labor market continue to evolve as they have over the past two decades, such that African American women remain concentrated in service occupations and service occupations continue to suburbanize, then compared to other groups of workers, African American women (even when they use a car) are the ones most likely to experience the disadvantage of long commutes to relatively low-waged service jobs in suburban locations. Blackley observed (based on evidence of spatial mismatch for women from 1980 data) that policy efforts should be targeted at reducing the job access difficulties of women residing in central cities of the North East and North Central regions of the United States.[52] Efforts that combine housing and transportation agendas to bridge the residence-workplace mismatch must be pursued. Initiatives at integrating suburban housing patterns should be continued. But since there is evidence that white resistance (although yielding) is still very strong, city governments will need to invest more effort in better transportation for inner city residents. This could take the form of corporate and government sponsored van pools for reverse commuters.

Improving the employment accessibility of women of color is necessary for a number of reasons that affect minorities in particular and society in general. Spending more time to cover the same distance as Whites amounts to a cost (tax) borne by non Whites. It could lead to lower motivation to seek employment, and for those employed it could mean more lateness and absenteeism at work as well as poorer job performance. If these become factors in promotion decisions, this might mean poorer promotion prospects and less economic gains for women of color.

Examining travel time as a measure of access to employment especially highlights the time burden that minority women bear. The cumulative time costs could be considerable as could the economic value if this time was spent on other tasks. In addition to adverse impacts on economic returns, longer commuting times may also be associated with other indirect or hidden costs. Time spent commuting might mean time spent away from home and family obligations, possibly generating tensions and discords in the family. In particular, the African American or Latina working mother compared to her European American counterpart, faces more stringent time constraints and therefore must depend heavily on family or community-based and informal support networks for child care. Women of color may be expending more time and other associated resources (e.g., income, energy and emotional) than European American workers in order to get to work, thus constrained work trips can impact the economic and social welfare of minority households in several ways.

In future research, it would be useful to obtain information for smaller-sized areas for workplace destinations since this may reveal that European Americans and ethnic minority women have different work destinations in suburban locations which could be related to differences in their occupations. Evidence of differences between Whites and non Whites' workplace destinations would then

raise the possibility of differential hiring of White and non White workers due to either differences in qualifications or to employer discrimination. More details on workers' training, educational qualifications, and about ethnic differences in the kinds of jobs held by Whites and non Whites may be linked to differences in their work locations and therefore to the differing travel times.

Although the work trip is an acceptable indicator of access to employment, it is important to emphasize that studies that utilize commuting data focus only on those who have a work trip thus excluding the unemployed (many of whom are unemployed most probably because of difficult locational access to jobs). The focus here on journey-to-work should not mean overlooking the non-spatial factors that influence access to jobs such as gender and racial discrimination, education and training skills, or economic restructuring. Researchers identify policy directions that emphasize both improved spatial access and improved functional access.[53] Merely improving the transportation opportunities and locational access of inner city minority women for reaching suburban low-status service jobs is not a sufficient policy goal; improved education and job retraining as well as retaining the central city employment base and enforcing fair housing regulations are all complementary steps that will ensure spatial and functional access to jobs.

In conclusion, the results of these sex- and ethnic-specific analyses lend weight to the convictions of some feminist scholars that researchers need to recognize racial and ethnic differences among women in order to avoid falling victim to the "myth of universal womanhood".[54] The clear findings about the longer commutes of many women of color indicate that we should not understate the importance of geographical access to minority women's employment outcomes, and that it would be premature to abandon the possible role of locational factors in analyzing female labor force participation patterns. This conclusion rings true today as it did well over a decade ago when Alexis and DiTomaso grappled with the "elusive triad" of race, transportation and employment.[55]

This paper has summarized results of research conducted in different places and time periods. The paper reports the continuation of many previous trends related to race, gender, and work trips.[56] Even though some key socioeconomic and household information are not included in many studies, it is clear that presently, race and ethnicity remain relevant for differentiating the experiences of female commuters. This is particularly true among inner city residents.[57] While some observers have noted that women's short work trips (when compared to men's) are indicative of a form of spatial entrapment, it is very striking that much of the evidence from studies across different spatial and temporal contexts point to the same conclusion reached in the earliest works of McLafferty and Preston that women of color who spend a great deal of time commuting from the inner city to low-wage, low status jobs in the suburbs experience a more insidious form of spatial entrapment.

NOTES

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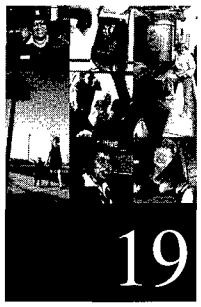

Transportation and Minority Women's Employment: Insights from New York

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TRANSPORTATION AND MINORITY WOMEN'S EMPLOYMENT: INSIGHTS FROM NEW YORK

One of the most significant trends of the past three decades has been the rapid entry of women into the paid labor force. Women's growing labor force participation has affected all aspects of social and economic life, but especially transportation—the "glue" that connects women's economic and domestic spaces. This raises important questions about transportation policies: What are the transportation needs of working women and how can public transportation systems be designed to facilitate women's work trips? Addressing these issues requires a detailed understanding of women's access to and use of various transportation options. Research shows that women's transit decisions are strongly influenced by gender relations at home and in the workplace[1,2]. Yet, class, racial and ethnic divisions overlay gender differences, creating complex, interlocking webs of difference. How do these differences influence transportation access and use?

This research examines the reliance on various transportation modes for women of different race and ethnicity. While the vast majority of working women in the U.S. commute by car, a significant fraction rely on other transportation modes, particularly in metropolitan areas. Using 1990 PUMS data for the New York metropolitan region, we analyze how the mode of transportation used in travelling to work varies by gender, race, residential location, and direction of commuting trip. We also estimate the impacts of economic status, household responsibilities, and access to automobiles on mode decisions for African-American, Latina, and white women. The results, which indicate that differences among women in transit mode are at least as large as the well-known differences between men and women, emphasize the diversity of women's transportation needs.

The research focuses on the New York metropolitan region, an area with a diverse population and an extensive, well-developed mass transit network. New York is an atypical American city: Its size, population density, and high rates of mass transit use set it apart from the auto-dependent cities that exist in most of the United States. Therefore the findings of this research may not be generalizable to all metropolitan contexts. Despite this limitation, the research illuminates the range of planning and policy issues that arise when mass transit is available in an ethnically, racially and economically diverse American city. As governments take steps to reduce reliance on the automobile and improve mass transit, such knowledge provides an important base for designing policies that are sensitive to women's diverse transit needs.

This study extends our previous research in several ways. In earlier work, we uncovered significant gender and race differences in commuting time, indicating that many African-American and Latina women do not work closer to home than their male counterparts[3]. Transportation is the single most important factor accounting for these differences, though other economic and domestic factors are also significant[4,5]. This paper extends our past research to explore the disparities in transportation dependence that so strongly influence commuting times. The first section of the paper presents a brief review of the literature on gender and race differences in transportation access and use. We then describe the 1990 PUMS data for the New York region and the definitions of variables used in the analysis. The final section presents the results of statistical analyses of the effects of economic, geographic, and household factors on gender and race differences in transportation mode.

BACKGROUND

Access to transportation has fundamental effects on women's work trips. At a time when most people travel to work by car, members of households with no private car are at a great disadvantage. Lacking a car, they are forced to either search for work in close proximity to their homes, travel to work by mass transit, or rely on others for their transportation needs. Mass transit typically involves much longer travel times than other transportation modes[4,6], and it offers inferior mobility[7]. Walking to work is an option for many workers, but it greatly limits the geographical range of job opportunities and the spatial extent of job search[8].

Just as with many other aspects of their lives, women's access to transportation is contingent on marital status, age, and family structure, as well as on income. Among households with two wage earners, men are more likely to drive to work than are women[6,9]. Preference is often given to the man in the use of a family car[1]. As a result, married working women are more reliant on public transit for the work trip than are men[7,10,11]. Single mothers, who bear the full economic and domestic responsibilities for their families, have distinct travel patterns. Research indicates that single mother make more trips and travel further than their married counterparts[12,13]. When data are disaggregated by income, single mothers make more person-trips than comparable married women, but they travel fewer person-miles[2].

Historically, these processes led to sharp gender differences in transportation use in the U.S. Many studies conducted in the 1970s and 80s found that women were more reliant on public transit than were men[1,14]. Women drove less than men, both in terms of travel distance and number of trips[7]. Recent evidence indicates that this gender differential is changing. In her detailed analysis of 1990 NPTS data, Rosenbloom found that women are slightly more likely to use a private vehicle for commuting than are comparable men, except in the lowest income category[2]. In part this reflects women's greater tendency to make linked work trips, trips that are more easily accommodated by the car than by other modes. Women are more likely than men to do domestic chores on their journeys to- and from the workplace[15,16]. It also results from the increase in licensing among women, and the general rise in women's incomes[2]. Thus, we are seeing more parity in mode use between men and women, though their worktrips still differ substantially in length, time, and number of trip linkages[1].

The local context alters these relationships. In the U.S., mass transit is only a viable option in medium to large metropolitan areas. Large cities in the northeast and Midwest have the best-developed mass transportation networks. At the core of urban areas served by rapid transit, gender differences in commuting are typically small. Men and women both use public transportation to travel to jobs in the central business district[5,10]. In suburban parts of North American cities, women are far more likely to drive to work than their counterparts living in central cities. Indeed, in suburban areas, the vast majority of workers of both sexes drive to work[5]. Suburban mass transit systems are typically geared to moving workers from suburban residential areas to jobs in the center—a traditionally male commuting trip. The absence of mass transit systems within suburbs makes intra-suburban commuting trips time-consuming and often impossible, except by car. Despite the overwhelming reliance on cars by men and women living in suburban areas, gender differences in work trip times are significant and consistent[17,18]. Compared to men, suburban women drive shorter times to work and are more concentrated in suburban jobs[19].

Given the range of influences on women's mode choices, transportation use is likely to vary considerably among women of different racial and ethnicity. The disproportionate number of African-American and Latina women who are primary providers of their household's incomes and their low average wages mean that they are more likely to rely on public transit than are white women. Studies confirm minority women's greater reliance on mass transit. In northern New Jersey, our analysis of 1980 census data showed that over 25% of African-American women used mass transit, compared with 14% of African-American men and even smaller percentages of white men and women. Johnston-Anumonwo[20] found similar patterns in Buffalo and Rochester, New York. From the national, NTPS sample, Rosenbloom[2] observed that Hispanic and black women in urban areas are three times more dependent on mass transit than are white women.

These differences clearly reflect the diverse social and spatial contexts of women's lives. Compared to white women, minority women typically live in households with lower incomes and with less access to a private car. Rates of licensing and car ownership also vary with race/ethnicity, as do household characteristics such as marital status and the presence of children. The effects of these factors on the transportation decisions of women from different race and ethnicity are explored in the sections that follow.

DATA

In analyzing these relationships, we utilized data from the 1990 Public Use Microdata Samples (PUMS) for the New York metropolitan region. The PUMS data comprise a 5 percent sample of the region's population, drawn from the 1990 Census of Population. Since the research focuses on mode of transportation for commuting, we only included employed workers in the sample, yielding a sample size of over 400,000. The PUMS data provide information for individuals about household and individual characteristics including income, marital status, presence of children, occupation, industry of employment, commuting time, and transportation mode. The data have been widely used in studies of women's commuting patterns[20,21]. A detailed description of the PUMS data for New York is provided in McLafferty and Preston[4].

Although the PUMS data includes information on more than 10 transportation modes, to simplify the analysis we grouped the modes into broad categories. The New York region is crisscrossed by mass transit, including the dense subway and bus networks in New York City, and the far-reaching light rail networks that extend into the New York, New Jersey and Connecticut suburbs. These modes were combined into a single "mass transit" category. Commuting by car and van were treated as a separate "car" category, with drivers and passengers combined. Finally, the modes, walking to work and working at home were grouped together since they represent highly localized work trips. One shortcoming of the PUMS data is that people are asked only about their primary transportation mode; multi-modal trips are not recorded. Therefore our findings only pertain to the principal mode of transportation for individual commuting.

As in all census information, the identification of racial/ethnic groups is problematic. Race typically refers to biological differences of sociocultural significance to a society that "racializes" those differences. Ethnicity refers to cultural differences reflecting religion, national origin, and language. The race variable in the census reports an individual's self identification as a member of a racial group. We used this variable to identify the African-American and white populations. We defined as Latino those people who identified their race as "Spanish," and those persons regardless of race who stated they were of Hispanic origin[4].

The study area consists of the 24 counties that make up the New York Consolidated Metropolitan Statistical Area. It is divided into two parts, the center and the suburbs, that have distinct population patterns and employment trends. The **center** includes Manhattan and the other urbanized counties of New York City and the nearby urban counties in New Jersey, including the cities of Newark and Jersey City. These counties in general have high population densities, high reliance on mass transit, and generally low median household income levels. In contrast, the **suburbs** include all counties outside the urban core. In this group are older suburban counties like Westchester, NY, and more distant ex-urban counties in New York, New Jersey, and Connecticut. The suburban counties typically have moderate population densities, low rates of mass transit use, and relatively high median incomes. However, there is considerable diversity among suburban counties, particularly between the older, high-income suburbs near the center where population and employment are stable or declining, and the ex-urban counties that have grown rapidly in employment and population in the last decade.

RESULTS

Table 1 shows race and gender differences in transportation mode for residents of central and suburban areas. Among those living in the urbanized center of the New York region, women are consistently less likely than men to commute by car. Just 47% of white women in the center travel by car, compared to 56% of white men. Gender differences are even more pronounced for African-Americans and Latinos. Whereas close to half of African-American and Latino men use a car in traveling to work, only one-third of their female counterparts do so. By comparison, women of all race/ethnicity rely much more on mass transit and are slightly more likely to walk or work at home than are men.

Layered upon these gender disparities are significant racial differences in mode use. Our findings confirm the results of other studies which show African-American's and Latino's dependence on mass transit[2, 20]. Overall, nearly half the minority men and women in the center use mass transit for commuting, compared to only 33 percent of white workers. The propensity to walk to work or work at home also varies by race, with African-American men and women being the least likely to utilize these transit options. This may reflect the lack of local job opportunities in some African-American neighborhoods, a factor emphasized in the recent literature on the spatial mismatch hypothesis[22, 23].

Gender and race differences are more muted in the suburbs due to the overwhelming reliance on the automobile (Table 1). Over 70 percent of men and women of all race and ethnicity commute by car in the suburbs. However, as in the center, minority men and women are more reliant on mass transit, and less on the car, than their white counterparts. Interestingly, among white workers in the suburbs the gender differential is reversed, with a slightly higher percentage of women commuting by car than men. This is consistent with Rosenbloom's finding that for women, commuting by car offers the flexibility needed to link trips for domestic purposes with their work trips[2]. In contrast, our results indicate that African-American and Latina women in the suburbs are less able to make these mode choice decisions. Minority women are the least likely of any suburban gender/race group to commute by car.

Table 1
Mode by Gender and Race/Ethnicity (percentages)[1]

Center	Car	Mass Transit	Walk/Home	N
White Men	56.0	31.3	10.6	41222
White Women	46.5	36.3	14.8	34958
Black Men	47.9	45.0	5.9	10995
Black Women	33.5	58.3	6.8	14567
Latino Men	44.7	43.1	10.2	14046
Latina Women	29.5	55.5	13.3	10784
Suburb	**Car**	**Mass Transit**	**Walk/Home**	**N**
White Men	84.8	10.2	4.2	102478
White Women	86.9	6.7	5.8	81802
Black Men	79.2	13.2	6.0	4756
Black Women	71.4	18.1	7.7	5675
Latino Men	78.8	11.8	7.1	5633
Latina Women	75.8	13.4	8.9	4317

As expected, the fraction of suburban residents who work at home or walk to work is much less than that in the center. Just 3% of white suburban women walk to work and a similar percentage work at home. Black and Latina women in the suburbs have a slightly greater tendency to walk to work (5%) but still the rates are low. The low-density suburban landscape, in which residential and nonresidential land uses are highly segregated, does not facilitate localized work trips.

Although well-known gender disparities are apparent in our data, these results also highlight the diversity of women's experiences. Minority women are much more dependent on mass transit than are white women and men of any race or ethnic group. The following sections explore this diversity and analyze some of the reasons for it. To simplify the presentation, we only discuss results for women; though comparisons with men are mentioned when appropriate.

Job locations have important effects on gender/race differences in mode of transportation. Table 2 shows modal splits for four types of commuting flows that represent various combinations of residential location (center/suburb) and job location (center/suburb). All women use mass transit primarily for commuting trips within the center and for trips from the suburbs to the center. This is especially true for white women—less than 10% of white women in the two other commuting flow categories (i.e. intra-suburbs and center-to-suburb) rely on mass transit. In contrast, a comparatively large percentage of black women (30%) use mass transit for reverse commuting trips and for commuting within the suburbs (12%). Similar percentages exist for Latina women (28% and 8% respectively). Thus, minority women rely more on mass transit for the kinds of trips for which it is not well designed—reverse commuting trips from the center to the suburbs and intra-suburban trips. The PUMS data reveal that minority women who rely on mass transit for these trips have long commuting times and lower-than-average wages. For these women, the long times spent on transit systems ill-designed to accommodate their commuting trips garner little economic reward.

Table 2
Transportation Mode by Race/Ethnicity and Commuting Flow
(percentages)

Flow Type	Race/Ethnicity	Car	Mass Transit	Walk/Home
Center-Center	White	41.4	39.6	16.3
	Black	30.1	61.1	7.3
	Latina	26.2	57.8	14.2
Center-Suburb	White	87.7	9.1	2.4
	Black	67.1	29.9	1.6
	Latina	68.1	27.9	3.0
Suburb-Suburb	White	91.3	1.4	6.7
	Black	75.2	12.2	9.3
	Latina	79.2	8.0	10.5
Suburb-Center	White	64.2	35.1	0.3
	Black	53.8	45.0	0.4
	Latina	60.0	38.1	0.9

It is well known that licensing and access to an automobile have significant effects on women's mode choice decisions. Our data set does not include licensing information, but it does contain data on car availability in the woman's household. Table 3 shows these data disaggregated by race/ethnicity and place of residence. Significant racial differences in car availability are evident in the center. Whereas almost 75% of white women in the center have access to an automobile, only 60% of black women and 58% of Latina women have access to a car. Car availability is much more widespread in the suburbs for all race groups. Yet while 98% of white women live in a household with at least one car, only 87% of black women and 92% of Hispanic women do so. Thus, in both central and suburban contexts, minority women have less access to cars than do white women, although the disparity is larger at the center of the region.

Table 3
Percentage of Women with Access to a Car by Race/ Ethnicity and Location

	Center	Suburbs
White	**73.8%**	**97.9%**
African-American	60.3%	87.0%
Latina	58.1%	91.8%

Income is also a significant determinant of mode choice, affecting car ownership and the affordability of different modes. Like many studies, ours finds significant variation in women's mode use with income[7, 11]. In both the center and suburbs, women with low household incomes are least likely to commute by car (Table 4). Latina, and especially African-American, low-income women are highly dependent on mass transit. In addition, low income women of all ethnic/racial backgrounds have a marked propensity to walk to work or work at home. Even in suburban areas, almost one-sixth of all low income women walk or work at home. Increases in household income bring about sharp increases in automobile ownership and use. Typically as income rises, people substitute car use for walking

and mass transit[7]. Thus, we find a general decline in transit use with income for women of all races in both contexts. In the center, two-thirds of minority women in low-income households use mass transit, and this drops to one-half for the highest income households. Transit use is substantially lower in the suburbs and among white women, yet similar trends are apparent. The only exception is for white women in the suburbs. White women in high-income households are most reliant on transit (7.4%, compared to 5.6% for middle- and 5.7% for low-income white women. These high-income white suburban women mainly use mass transit to commute to high wage jobs in Manhattan. Given these women's high access to automobiles, their decisions to use transit appear to be based on choice more than necessity. By comparison, minority suburban women who rely on mass transit tend to have low incomes and to use transit for intra-suburban work trips.

Table 4
Mode by Household Income and Race/Ethnicity (percentages)

Center

Income	Race/Ethnicity	Car	Mass Transit	Walk/Home
< $20000	White	32.1	41.3	23.9
	Black	20.1	67.1	11.3
	Latina	16.5	63.5	18.5
$20000-50000	White	42.3	41.1	14.9
	Black	31.2	61.0	6.4
	Latina	28.6	57.5	12.3
> $50000	White	52.8	33.1	11.5
	Black	42.9	50.8	5.0
	Latina	38.5	50.0	9.7

Suburbs

Income	Race/Ethnicity	Car	Mass Transit	Walk/Home
< $20000	White	79.4	5.7	13.0
	Black	52.8	24.9	15.0
	Latina	62.9	15.5	16.2
$20000-50000	White	88.3	5.6	5.4
	Black	73.1	17.9	5.9
	Latina	77.0	12.7	8.4
> $50000	White	87.9	7.4	4.2
	Black	76.0	16.7	5.7
	Latina	78.7	12.6	7.4

Marital status and the presence of children also influence differences among women in transportation mode. For African-American and Latina women, marriage has significant effects on mode choice (Tables 5a,b). In the center and suburbs, married minority women are much more likely to commute by car than their single counterparts, regardless of the presence of children. The percentage of married African-American and Latina women who travel to work by car is 15 points higher than that for unmarried women. Economic factors are critically important in explaining these disparities based on marital status. The results of logistic regression models (not shown here) indicate that marriage leads to higher household incomes which enable car ownership and use. In fact, when we control for household income and car ownership, the effect of marital status on car use disappears for minority women.

Table 5a
Mode by Race, Marital Status and Presence of Children: Center
(percentages)

	Race/Ethnicity	Car	Mass Transit	Walk/Home
Married, Kids	White	60.4	22.0	15.7
	Black	41.3	52.1	5.6
	Latina	37.7	47.4	13.4
Married, No Kids	White	52.2	32.4	14.3
	Black	42.9	49.6	6.3
	Latina	33.9	51.8	12.7
Single, Kids	White	55.1	27.9	15.3
	Black	29.0	62.2	7.5
	Latina	25.4	57.1	15.8
Single, No Kids	White	37.1	45.2	14.7
	Black	29.0	62.1	7.2
	Latina	23.8	62.5	11.8

Table 5b
Mode by Race, Marital Status and Presence of Children: Suburbs
(percentages)

	Race/Ethnicity	Car	Mass Transit	Walk/Home
Married, Kids	White	89.0	3.7	7.0
	Black	78.2	14.1	5.9
	Latina	82.2	8.2	7.5
Married, No Kids	White	87.4	6.8	5.5
	Black	80.0	14.0	4.7
	Latina	77.6	14.3	6.5
Single, Kids	White	86.2	5.0	7.6
	Black	66.4	19.9	10.2
	Latina	68.7	16.6	12.1
Single, No Kids	White	85.8	5.0	7.6
	Black	65.5	21.7	8.9
	Latina	70.9	16.9	10.1

[1] In all tables, percentages do not sum to 100 because "other" modes (e.g. taxi, motorcycle) were omitted

In contrast, for white women, the presence of children has a much greater impact on car use than marital status. White women with children are more dependent on the car for commuting, irrespective of marital status. This is particularly true in the center where car use varies significantly and mass transit is widely available (Table 5a); however, similar patterns are evident in the suburbs, although the disparity is less (Table 5b). These results for white women confirm findings from other American cities which show that women use the car because of its flexibility for transporting children to school, activities, and child care and for performing other domestic chores[2, 15]. This is true for both single and married white mothers in our sample, suggesting the widespread availability of cars for white women independent of marital status. On the other hand, for African-American and Latina women, economic constraints, as reflected in marital status, have much more powerful impacts on mode choice decisions.

WOMEN WHO WALK AND WORK AT HOME

Although we have emphasized car and mass transit use, our findings show that walking to work and working at home are important transit options for women of all races, especially for low-income women and women living in the center. What are the characteristics of women with these localized work trips? For all race/ethnic groups in both the center and suburbs, single mothers make up a larger percentage of women who walk and work at home than of women who use other modes. Interestingly, the disparity is greatest in the suburbs. For example, for African-American women in the suburbs 30% of those in the walk/home category are single mothers, compared to 23% of those using other modes. For Latinas in the suburbs, the comparable figures are 27% and 18%. Although the numbers are small, they illustrate the dependence of suburban single mothers on localized jobs.

Women who walk and work at home also occupy distinct labor market niches, mainly in consumer services. Between 60 and 80% of women who walk or work at home are employed in this sector, primarily in retailing, personal services, and childcare. Beyond this concentration in consumer services, labor market segmentation differs by race/ethnicity. For white women, 20% of those who walk or work at home are employed in producer services. In the center of the New York region, gentrification has opened up residential areas within walking distance of producer service jobs for many white women. For suburban white women in the walk/home category, those who work in producer services typically work at home. Apart from their concentration in consumer services, minority women who walk or work at home hold jobs in different industries from white women. In the center, over 30% of Latina women who use this mode of transportation work in manufacturing (22% in the suburbs). This suggests the existence of highly localized manufacturing complexes that rely on Hispanic female labor—the spatial expression of gendered, ethnic, "niche," labor market segments[24].

For African-American women there is little evidence of these highly localized labor market segments beyond the consumer services sector. Eighty percent of African-American women who walk or work at home are employed in consumer services. This, coupled with the low percentages of African-American women in the walk/home category, suggests the relative absence of employment opportunities in African-American residential areas and the uniformity of the few job opportunities that exist. Our data offers little evidence for black women of the kinds localized, segmented job opportunities that exist for white and Latina women in the center. Many writers have commented on the absence of employment opportunities in the highly segregated communities where many black Americans live[22, 23, 25].

CONCLUSIONS

Our analysis of 1990 PUMS data reveals significant race and ethnic differences in women's access to and use of various transportation modes for commuting to work. In the center and suburbs of the New York region, African-American and Latina women are more reliant on mass transit and less reliant on the automobile for their worktrips. Low-income and unmarried minority women are especially dependent on mass transit, largely because financial constraints inhibit car ownership and use. These differences are apparent for all types of commuting flows, particularly intra-suburban trips and reverse commuting trips—trips which most mass transit systems are ill-designed to accommodate. For African-American women in the center, walking to work and working at home are less significant transportation options than for Latina and white women. A smaller fraction of Black women walk to work and work at home, and this disparity persists after controlling for household income and domestic responsibilities.

Minority women's reliance on mass transit raises several important policy issues. In urban labor markets, mass transit has contradictory roles as both a catalyst for employment and a barrier to employment for women. On the one hand, mass transit opens up a wide geographical range of employment opportunities, giving minority women access to important employment nodes in Manhattan, central Brooklyn, Newark, and elsewhere. On the other hand, mass transit entails long commuting times. Our previous work shows that transit is the most important determinant of minority women's long commute times and that ceteris paribus, a trip by mass transit takes 20 to 40 minutes longer each way than a similar trip by car[4]. Furthermore, trip chaining for domestic purposes is typically more difficult via mass transit. Thus, the need to rely on mass transit can inhibit employment, especially for low-income women who lack the financial resources needed to organize their lives to accommodate long commuting trips. Wealthier women can afford services like full-day and in-home child care or domestic help, that ease the burden of household responsibilities. How many low-income women are kept out of the labor market by the absence of these services?

Despite the advantages of car travel for women, we do not advocate car-oriented transit policies for the densely populated New York region, because of the social and environmental consequences of auto dependence. We support the continued development and improvement of mass transit as the primary means of addressing the region's transportation needs. However, as this research indicates, transit policies and problems cannot be isolated from other social and economic development policies. For women in particular, transportation and social structures are deeply intertwined. Improving women's access to paid employment calls for integrative policies that recognize the links between transportation, social and retail services, and employment opportunities. Social service policies that support the use of mass transit by low-income women are especially needed. These include providing daycare and after school programs in low-income neighborhoods and encouraging essential health and retail services to locate near mass transit hubs. Such policies are essential for improving access to employment for many African-American and Latina women in central areas.

Our findings also point to the shortage of jobs within walking distance for African-American women in the center of the New York region. Although walking to work and working at home are less visible transit options than driving and using mass transit, our findings show that they are important for low-income women, single women with children, and women who work part-time. They also provide an entry into the labor market for women who need flexible working conditions and employment close to home. The relative lack of such opportunities in African-American residential areas in the center creates obvious barriers to employment and contributes to many other social and economic

problems [25, 20]. Finding and keeping paid employment becomes much more difficult when local job opportunities are absent[8].

Addressing these problems calls for policies to stimulate local employment and create a more diverse set of appropriate job opportunities in inner-city African-American neighborhoods. Policies that provide low-interest loans to new businesses, encourage local entrepreneurship, and improve social/physical infrastructure have important potential benefits. The recently initiated "empowerment zones" policies are intended to address some of these issues by providing government funding for new businesses and community development. In future evaluations of these policies it is critically important to assess the impacts on minority women's employment, impacts that may well differ from those on minority men's employment.

In summary, our analysis demonstrates the urgent need for research and policy development that is sensitive to multiple sources of difference, both social and geographical. Our findings reflect the unique social and spatial structure of the New York urban region, so their implications for other places may well be limited. Additional research is needed to identify and explore how contextual factors influence women's transportation needs. Recognizing the diversity of women's experiences and the multiple layers of difference is an essential foundation for effective transportation policy-making and planning.

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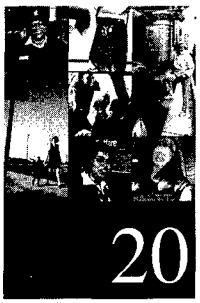

Gender, Race, and Travel Behavior: An Analysis of Household-Serving Travel and Commuting in the San Francisco Bay Area

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GENDER, RACE, AND TRAVEL BEHAVIOR: AN ANALYSIS OF HOUSEHOLD-SERVING TRAVEL AND COMMUTING IN THE SAN FRANCISCO BAY AREA

ABSTRACT

This paper examines how the division of household responsibilities shapes the travel behavior of men and women. In particular, we focus on the influence of socioeconomic factors—gender, race/ethnicity, income, and household structure—in shaping household-serving travel patterns. Using travel data from the San Francisco Bay Area we find that women are, on average, disproportionately responsible for child-serving and household maintenance travel, and that white, Hispanic, and low-income women tend to be, on average, especially burdened with household maintenance responsibilities. We find further that the women's household-serving travel patterns appear to be a function of both socialization and the sexual division of household responsibilities. We see evidence of socialization in the distinctly gendered grocery shopping patterns observed in single adult households with no children. And we find evidence of the sexual division of household labor in the increasing burden of household-serving travel at each stage in the life cycle and robustness of the gender variable in multivariate models of child-serving travel during the journey-to-work.

OVERVIEW

A number of studies have shown that women have significantly different travel patterns than men. Women, for example, tend to have shorter average trip lengths (Giuliano 1979; Gordon, *et.al.* 1989; Hanson and Johnston 1985; Hanson and Pratt 1990; Madden 1981; Michelson 1983; Hu and Young 1993; Pickup 1985, 1989; Rosenbloom 1988; Rutherford and Wekerle 1988), but tend to make more trips than men (Michelson 1983; Rosenbloom 1988, Rosenbloom and Burns 1993; Skinner and Borlaug 1980). Women have also tended to use public transportation more than men, though women's use of transit has been declining (Giuliano 1979; Koppelman, Tybout, and Skyskowski 1980; Michelson 1983, Pickup 1985).

The causes of gender differences in travel behavior have been the subject of a variety of interpretations. Hanson and Johnston (1985) argue that women's shorter commutes are due primarily to spatial and economic factors: lower average incomes, the location of female-dominated occupations in metropolitan areas, and women's greater dependence on public transit. Women account for roughly two-thirds of the new entrants into the labor force in the last twenty years, and rising female labor force participation rates account for a substantial portion of the overall growth in travel and automobile use (Rosenbloom and Burns 1994). According to the 1983 National Personal Transportation Survey (NPTS), the average male licensed driver drove 13,962 miles per year, while the average female driver drove only 6,381 miles per year. Since 1969, the number of female drivers has increased 84 percent, and there has been a 99 percent increase in the number of women in the work force (Hu and Young 1993). Miles driven by males only increased 46 percent between 1969 and 1990, while miles driven by all women increased by 76 percent. Miles driven by women in the 16 to 34 age group rose by more than 200 percent, reflecting those women who entered the work force during this time period (Hu and Young 1993; Rosenbloom and Burns 1994).

While economic and spatial factors clearly play a role in women's home and work location choices, commuting patterns, and employment outcomes, a number of scholars have argued that an unequal division of power and labor in the household is an important determinant of gender variation in travel behavior (Hanson and Pratt 1990; Madden 1981; Preston, McLafferty, and Hamilton 1993). Some argue that women tend to work closer to home to try to reduce commute time, which has likely been inflated due to increased trip chaining. Furthermore, the need to respond to child-related emergencies and child chauffeuring keep women closer to home, child care centers, and schools (Hanson and Pratt 1990). Depending upon the city under study, women's commute distance is typically half to two-thirds the length of the average man's journey to work (Wachs 1992). Even though women's commute distance is generally shorter than men's, their travel times are not proportionally reduced as would be expected (Rosenbloom and Burns 1993). The proportionally longer travel times relative to commute distance substantiates the findings that women must combine work and non-work travel to balance the dual demands of work and home, and these dual responsibilities make it extremely difficult for many women to commute by any mode other than by driving alone (Rosenbloom and Burns 1994). Women who must run errands during lunch to balance complex schedules are even more trapped into driving than coworkers with less complex schedules. As a result, significant differences between male and female travel patterns persist, even between otherwise comparable working men and women:

In summary, traditional travel variables—household income, license-holding, employment—do more to explain the differences among women and among men than they do to explain the differences *between* comparable men and women. The higher person trip rates of women persist through every traditional analysis, as generally does the shorter distances and fewer private vehicle trips. The one major exception: the travel patterns of people from households with low incomes (Federal Highway Administration 1992).

Research shows that married mothers' trip making patterns are very different from the travel patterns of comparable men, and that single working parents' travel patterns are quite different from their married counterparts (Johnston-Anumonwo 1989; Rosenbloom 1988, Rosenbloom and Burns 1993; Rutherford and Wekerle 1989). Several studies have found that women are far more likely than men to commute on public transit in one-car, two-worker households (Giuliano 1979; Koppelman, Tybout, and Skyskowski 1980; Michelson 1983; Pickup 1985). Others have shown that married women make twice as many shopping and errand trips as men (Rosenbloom and Burns 1993; Hanson and Pratt 1990; Skinner and Borlaug 1980). And studies have also found that working women are more likely than men to be responsible for chauffeuring dependents (Michelson 1983; Rosenbloom 1988; Rosenbloom and Burns 1993). The more and the younger their children, the less likely working women are to use alternate modes of transportation. The presence of children and their ages influence the travel patterns of women more than men in all types of households (Rosenbloom and Burns 1994).

Women trip chain more than men, due almost solely to their increased household responsibilities. Trip chaining is the combining of trips into a "chain" in order to get more done in a given time period. Picking the kids up from day care and then dropping the laundry off at the dry-cleaners on the way home from work is a typical example of trip chaining. Carpooling and trip chaining both increase journey-to-work travel times, due to circuitous routing and the addition of intermediate stops. Also, the need for trip chaining reduces the appeal of carpooling, as other riders may not tolerate the inconvenience of additional stops between home and work. Ultimately, the practicality of transit and other non-auto modes substantially decreases as the need for trip chaining increases.

Concludes Michelson (1983, xiii), "Women's commuting trips are a difficult transition between two demanding sets of responsibilities, compounded by a social and commercial structure that is insensitive to women's evolving needs."

With respect to race and ethnicity, most of the gender and travel research has focused on the journey-to-work (McLafferty and Preston 1991; McLafferty, *et.al.* 1992; Preston, McLafferty, and Hamilton 1993; Wilson and Johnston-Anumonwo 1995). In a study of commuting in Detroit, Kansas City, and Miami, Wilson and Johnston-Anumonwo (1995) find that both gender and race/ethnicity are associated with higher commute times and higher levels of transit use among nonwhite women. McLafferty and Preston (1991) argue that gender variations in commuting are substantially greater among whites than nonwhites; in a study of metropolitan New York, they find that, in contrast to whites, the commutes of black and Hispanic men and women to be quite similar. There has been little work, however, on whether the patterns of household serving travel vary by race/ethnicity, or on how gender, race/ethnicity, and other socioeconomic factors are related to household-serving trip-chaining on the journey-to-work. This work, therefore, seeks to link and extend recent gender research on race/ethnicity, passenger-serving travel, and trip chaining by examining travel behavior in the San Francisco Bay Area.

STUDY APPROACH AND METHODOLOGY

This study uses data from a recent household travel survey in the San Francisco Bay Area to examine the roles of race/ethnicity, income, and household structure in explaining gender differences in travel behavior.

Specifically, the study addresses three related questions:

- To what extent, and in what ways, do gender differences in travel patterns vary by race/ethnicity?
- To what extent are these observed travel differences explained by auto availability, education, income, mode of travel, household type, and the presence of children?
- How do household-serving travel responsibilities affect commuting, and how do these patterns vary by household demographics and structure?

The analysis has uses detailed trip diary data from a 1990 survey of San Francisco Bay Area residents to examine the effects of race/ethnicity, income, and household structure on the differences in commuting and household-serving travel among men and women. In 1990, the nine county San Francisco Bay Area was home to over six million people residing in roughly 2.2 million households. According to the Metropolitan Transportation Commission's (MTC's) 1990 Bay Area Household Travel Survey, the 6.6 million Bay Area residents made 17.2 million person trips on a daily basis (MTC, 1994). Of these 17.2 million person trips, 4.5 million (26.3%) of the trips were home-to-work trips, 4.3 million (24.9%) were home-based shopping trips, 1.9 million (11.1%) were home-based social/recreational trips, 1.7 million (9.7%) were home-based school trips, and the remaining 4.8 million (28.0%) were non-home-based trips. Sixty three percent of all trips were made by automobile drivers, with the next largest share (16.2%) being made by automobile passengers. Walk trips comprised 9.9% of all trips. Public bus trips were 4.1%, bicycle trips were 1.5%, and Bay Area Rapid Transit (BART) accounted for 1.5% of the trips.

In 1990, the San Francisco Bay Area Metropolitan Transportation Commission (MTC) collected single-weekday travel data from 21,280 persons living in 9,359 households within the nine county Bay Area. These 21,280 persons collectively made 70,774 trips during the survey period. Travel diary data in general, and the MTC data in particular, are especially useful for examining the activities of individuals and families. The MTC data contain quite detailed accounting of all travel, include trips with multiple purposes and mode. From the 1990 travel survey, we obtained and analyzed a set of six files for this study. These files consisted of a household demographic file, a person demographic file, and four person trip files.

GENDER, RACE/ETHNICITY, AND TRAVEL TIME

Consistent with the growing body of research on gender and travel behavior, the MTC data clearly indicate that there are significant differences between the sexes in average travel times for the work commute and for all travel. For both the work commute and for all travel, women's trips tend to be shorter than men's. Since these findings are not isolated to the work commute, we can speculate that this difference may be linked to factors that are independent of work status. Overall, the average trip made by a women is 21.8 minutes, and the average trip length for men is 24.8 minutes, a 12.9 percent difference. The largest modal difference in mean travel times was for women driving alone vs. men driving alone, with mean travel times of 19.3 minutes and 23.3 minutes, respectively.

As expected, women had shorter commutes than men, regardless of mode. The largest difference in work commute times was between men and women car-poolers. On average, men who commuted between home and work in carpools travel 6.6 minutes (17%) longer than women making the same trip via the same mode. Female workers who carpool tend to be 6 to 7 minutes closer to home than their male counterparts. The largest relative difference in journey-to-work commute times was walk/bicycle trips; women's commute times were 28% shorter than men's, though such trips account for less than 4 percent of all commutes. Table 1 shows the men's and women's mean journey-to-work trip lengths (in minutes) for all Bay Area travel, while Table 2 summarizes mean travel times by gender and mode of travel for all trips.

Table 1
Mean Travel Times (in Minutes) For Journey-to-Work Trips
By Mode of Travel and Gender

Travel Mode	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/M Tr. Times
Drive Alone	24.2	28.7	-4.5 **	0.84
Shared Ride	31.5	38.1	-6.6 **	0.83
Transit [1]	53.9	60.1	-6.2 *	0.90
Bicycle/Walk	15.2	21.2	-6.0	0.72
All Modes	28.6	32.4	-3.8 **	0.88

1 Transit Mode includes School Bus Passengers
* Significant at the 0.05 level
** Significant at the 0.01 level

Table 2
Mean Travel Times (in Minutes), For All Trip Types by Mode and Gender

Travel Mode	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/M Tr. Times
Drive Alone	19.3	23.3	-4.0 **	0.83
Shared Ride	22.2	25.0	-2.8 **	0.89
Transit [1]	47.5	49.4	-1.9	0.96
Bicycle/Walk	14.0	16.4	-2.4 **	0.85
All Modes	21.8	24.8	-3.0 **	0.89

1 Transit Mode includes School Bus Passengers
* Significant at the 0.05 level
** Significant at the 0.01 level

When controlling for race/ethnicity, we observe that women in four major race/ethnicity categories tend to have shorter commutes than comparable men. The largest relative and absolute differences between men's and women's work commutes were found among whites and blacks. Overall, the commutes seen by Asian/Pacific Islanders and blacks were longer than those of Hispanics and whites. Likewise, these patterns hold for the journey-to-work trips. Table 3 shows mean journey-to-work travel times for all trips by race/ethnicity and gender, and Table 4 lists the same for all trips.

Table 3
Mean Travel Times (in Minutes) For Journey-to-Work Trips by Ethnicity and Gender

Race/ Ethnicity	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/M Tr. Times
ASPI	32.6	35.5	-2.9	0.92
Black	32.4	36.7	-4.3	0.88
Hispanic	28.6	30.4	-1.8	0.94
White	27.1	31.6	-4.5 **	0.86

* Significant at the 0.05 level
** Significant at the 0.01 level

Table 4
Mean Travel Times (in Minutes) For All Trip Types by Ethnicity and Gender

Race/ Ethnicity	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/M
ASPI	25.1	28.1	-3.0 **	0.89
Black	25.0	28.0	-3.0 *	0.89
Hispanic	21.4	24.9	-3.5 **	0.86
White	20.9	23.8	-1.9 ** 0.88	

* Significant at the 0.05 level
** Significant at the 0.01 level

When looking specifically at the journey-to-work, and cross-tabulating by gender, race/ethnicity, and mode of travel, the average commute time for women was still shorter than for men in all but two cases. Hispanic women carpooling or bicycling/walking to work were the sole exceptions to this generalization, having longer commutes than their male counterparts. The largest absolute differences in men's and women's commute times were for African American transit riders, where the mean female travel time was 17.8 minutes shorter than the mean male travel time. Next were Asian/Pacific Islanders who carpooled, where the observed mean travel time for women was 10.4 minutes less than for men in the same category (Figure 1). Whites had a larger split between male and female travel times than any other ethnic group, with the men traveling 4.5 minutes longer than women. On average, African-American men travel 4.3 minutes longer than African-American women to get to work, while the split was smaller among Asians/Pacific Islanders (2.9 minutes) and Hispanics (1.8 minutes).

When looking at all travel, the pattern of shorter women's commutes was repeated with one exception; white women riding transit tend to have slightly longer average trip lengths than white men traveling by the same mode (Figure 2).

As noted earlier, McLafferty and Preston (1991) argue that analyses of gender differences in journey-to-work length have largely ignored the intervening effects of race and ethnicity. Their study of service sector workers in metropolitan New York finds little gender difference in the commute times of black and Hispanic men and women. Table 3 would appear to support their findings; male/female commute time differentials are lower among non-whites and are not statistically significant, though the observed mean commute times for Asian/Pacific Islander, black, and Hispanic women are all less than those of comparable men. But the data are far from clear on this issue. In Figure 1, for example, black women have far shorter public transit commute times than black men. And in Table 4, we see that gender travel time differentials for all trips are greater for whites than nonwhites, indicating that non-commuting trips by Asian/Pacific Islander, black, and Hispanic women tend to be substantially shorter than their male counterparts.

Figure 1
Journey-To-Work Times by Gender, Ethnicity, and Mode of Travel

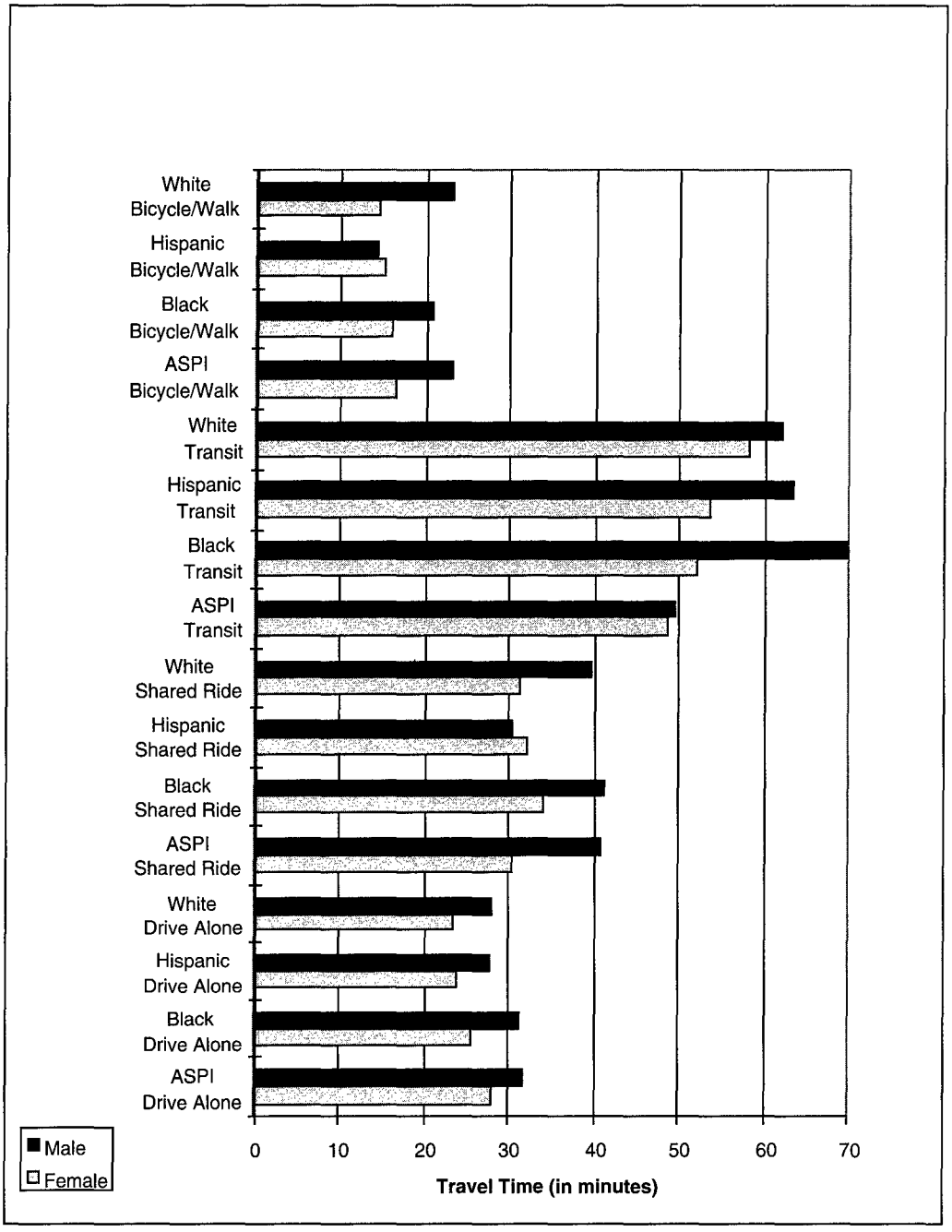
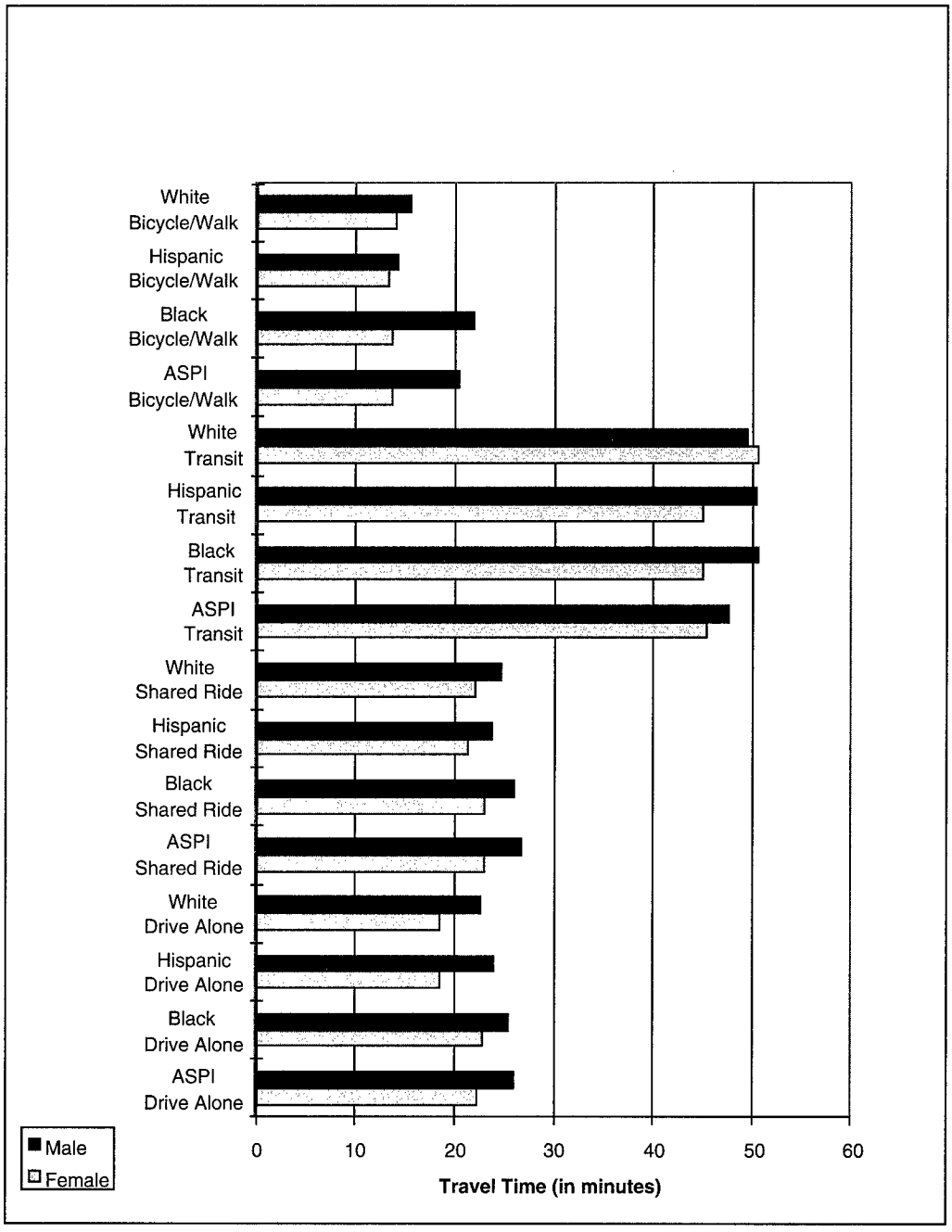


Figure 2
Travel Times For All Trip Types By Gender, Ethnicity, and Mode of Travel



THE EFFECT OF HOUSEHOLD STRUCTURE ON TRAVEL TIMES

Since it has been proposed that the differences in mean travel times are at least partially explained by the sexual division of labor within the household, mean travel times with respect to gender, race/ethnicity, and household type were examined next. For this portion of the analysis, households were categorized into one of four groups:

- Single Adult Households, Without Children,
- Single Adult Households, With Children
- Two-or-more Adult Households, Without Children, and
- Two-or-more Adult Households, With Children.

If differences in travel behavior are explained by the uneven division of labor within the home, then the differences in travel behavior between the sexes should be less pronounced for single adult households with no children, than for any other group. Women living alone and men living alone should have very similar household responsibilities and no child care responsibilities. Assuming that an adult male living alone assumes full responsibility for his own household duties and related travel, and assuming that an adult female living alone assumes full responsibility for her own household duties and related travel, the travel behavior differences between these two groups (single adult males and single adult females) should be smaller, or the travel patterns more similar than any other gender pairs studied. Likewise, travel patterns for single parent households (single female parent households and single male parent households) should be more similar than traditional family households (two-or-more adult households with children).

The findings from the commute time analyses for the journey-to-work, with respect to household types are quite consistent with the theory of uneven distribution of labor within the home. The difference in commute times between women who live alone and men who live alone barely existed when compared to two-or-more adult households and households with children. The difference between male and female single adult households without children was about 0.6 minutes, compared to a 3.8 to 4.5 minute difference for the other household types. In relative terms, the gender difference is about 6.3 to 7.5 times larger for two-or-more adult households and households with children than for adults who live alone (single adult households without children). However, the gender difference in travel times for single parent households was higher than expected (3.8 minutes). Women with children tend to work closer to home than men with children, even in single parent households.

The average travel time for single mothers was longer than the average travel time for single fathers. Otherwise, when combining all trip purposes, and controlling for household type, women's commutes (on average) were shorter than men's. Table 5 shows mean journey-to-work times controlling for gender and household type. Table 6 shows travel time (in minutes) for all trip types controlling for gender and household type.

Table 5
Mean Travel Times (in Minutes) For Journey-to-Work Trips,
By Household Type and Gender

Household Type	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/M Tr. Times
Single Adult, No Kids	29.0	29.6	-0.6	0.98
Two+ Adults, No Kids	28.3	32.8	-4.5 **	0.86
Single Adult, With Kids	28.0	32.4	-4.4	0.86
Two+ Adult, With Kids	29.0	32.8	-3.8 **	0.88

* Significant at the 0.05 level
** Significant at the 0.01 level

Table 6
Mean Travel Times (in Minutes) For All Trip Types By Household Type and Gender

Household Type	Female Tr. Time	Male Tr. Time	Difference (F-M)	Ratio: F/MTr. Times
Single Adult, No Kids	22.4	24.2	-1.8	0.93
Two+ Adults, No Kids	23.2	25.9	-2.7 **	0.90
Single Adult, With Kids	23.7	22.5	+1.2	1.05
Two+ Adult, With Kids	20.3	24.4	-4.1 **	0.83

* Significant at the 0.05 level
** Significant at the 0.01 level

For the journey-to-work, the difference between men's and women's mean travel times by household type varied significantly between the different race/ethnic groups. Figure 3 shows the details of the journey-to-work time analyses by gender, controlling for race/ethnicity and household type. The difference was the most pronounced for whites (4.5 minutes) and African-Americans (4.3 minutes). The difference was less dramatic for Asian/Pacific Islanders (2.9 minutes) and Hispanics (1.8 minutes). These observed variances in travel times between groups raises the question of the role of income in explaining racial/ethnic variation in travel behavior. Since travel times have long been shown to be positively correlated with income (Hu and Young, 1993), much of the observed differences in travel time may be income driven.

Figure 4 compares male and female travel times by race/ethnicity and household type for all trips. As we would expect, male and female travel times for single adult households were more similar than for the other household types. Among single parents, however, the average trip duration for single mothers is both higher than for women in any other group and is 1.2 minutes longer than the average trip duration for single fathers (female headed, single adult households vs. male headed, single adult households), indicating higher levels of non-work travel among single mothers than among single fathers.

Figure 3
Journey-To-Work Times By Gender, Ethnicity, and Household Type

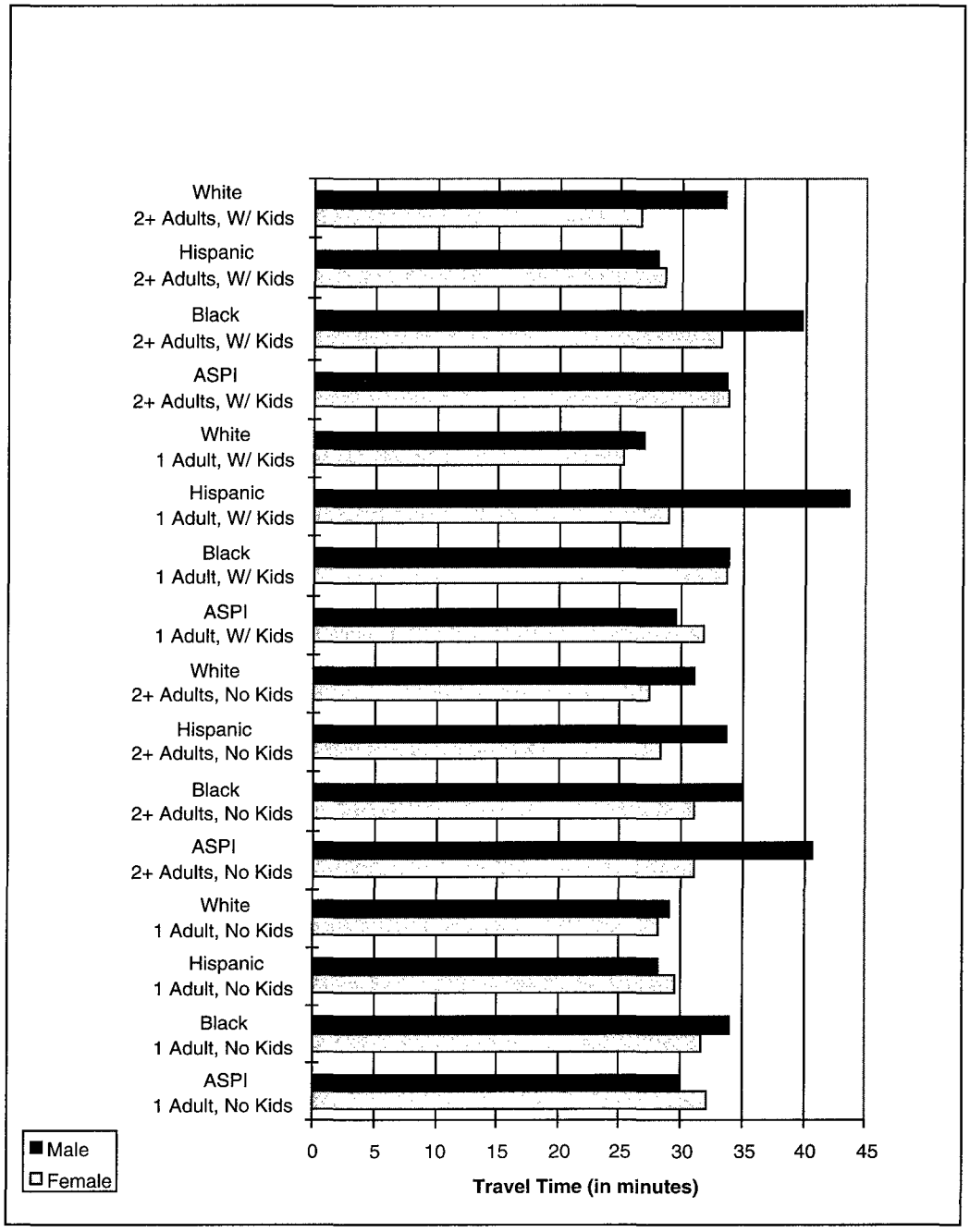
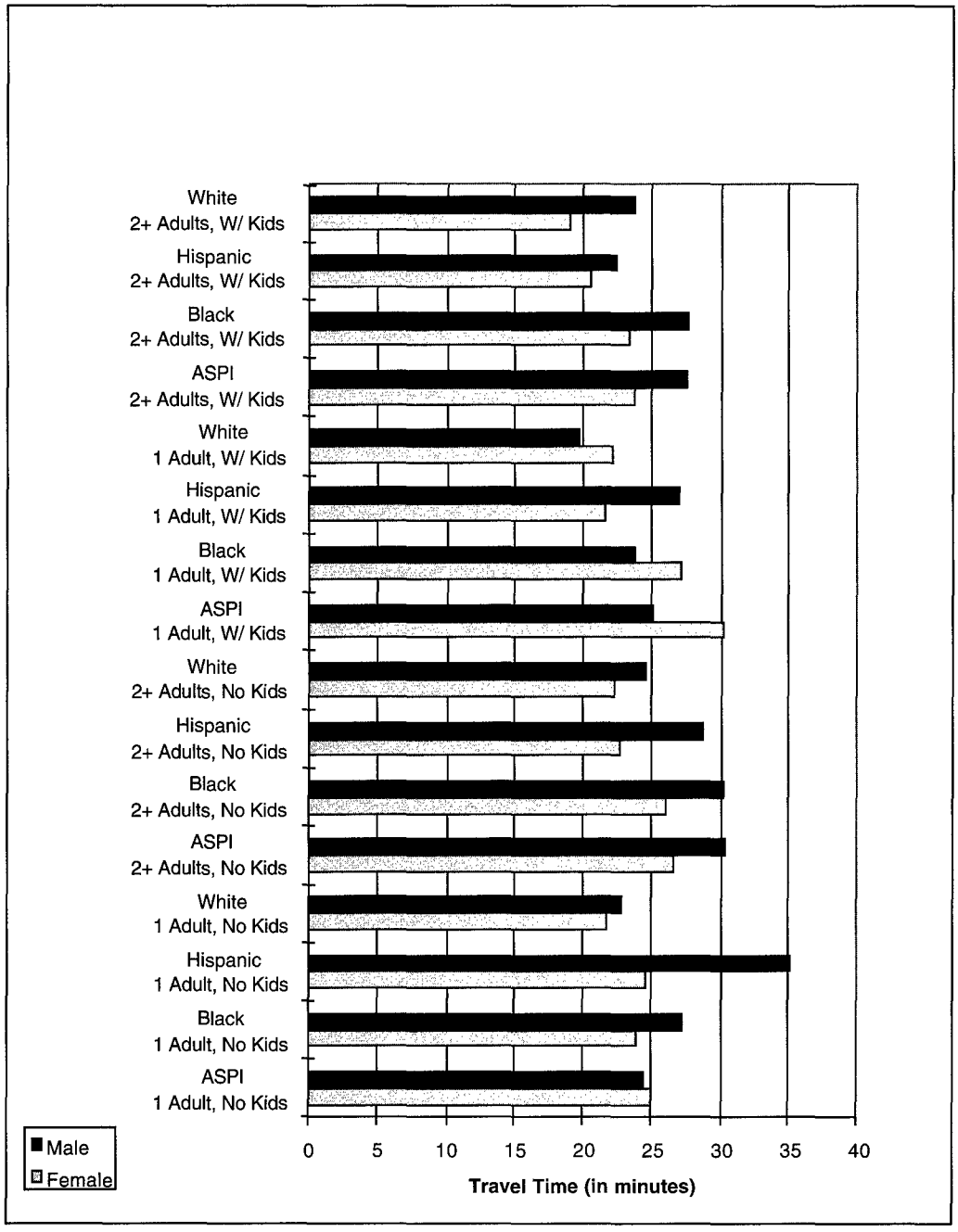


Figure 4
Travel Times For All Trip Types By Gender, Ethnicity, and Household Type



HOUSEHOLD-SERVING TRAVEL: THE EFFECT OF CHILDREN

While the gender variation in travel patterns is clear, the causes of this variation are less so. As noted earlier, a variety of explanations have been posited for why women tend to work closer to home and make shorter trips in general. And shorter commutes, in turn, have been used to explain the lower average wages of women relative to men. In the labor market, a number of studies have argued that lower average levels of human capital (education and work experience) and workplace discrimination combine to depress women's wages, while at home an unequal division of household responsibilities pushes women into lower paying jobs closer to home (Becker 1964, 1985; Mincer and Polachek 1974; Reskin and Hartmann 1986).

To examine this tension between household and workplace responsibilities, we compare the household-serving tripmaking of men and women in three separate analyses below: first with respect to overall child-serving travel; second, with child-serving travel as part of the journey-to-work; and finally with grocery shopping patterns in the household. As we would expect, in each case we find significant gender variation in household serving travel, that is, women do far more household serving travel than men on average. Though we do observe substantial variation in these patterns by household income and race/ethnicity. The gender variation in child-serving travel tends to be negatively correlated with income; women do a much higher proportion of child serving travel in the lowest income households. Further, gender variation in child serving travel tends to be lowest among Asian/Pacific Islanders and highest among Hispanics and whites. In simultaneously modeling the effects of a wide variety of factors on the propensity to make child serving stops, however, gender proves to be far more important in determining child serving travel than any other social, demographic, or economic factors. Finally, we observe higher grocery shopping trip rates for women in all household types, including in single households with no children present.

In this analysis we examine adults making child chauffeuring trips by gender, race/ethnicity of the traveler, household structure, and household income (in income quartiles). As we would expect, households without children tend to make very few trips with child serving destinations. However, even in households without children, women averaged over 1.7 times as many child serving trips as men.

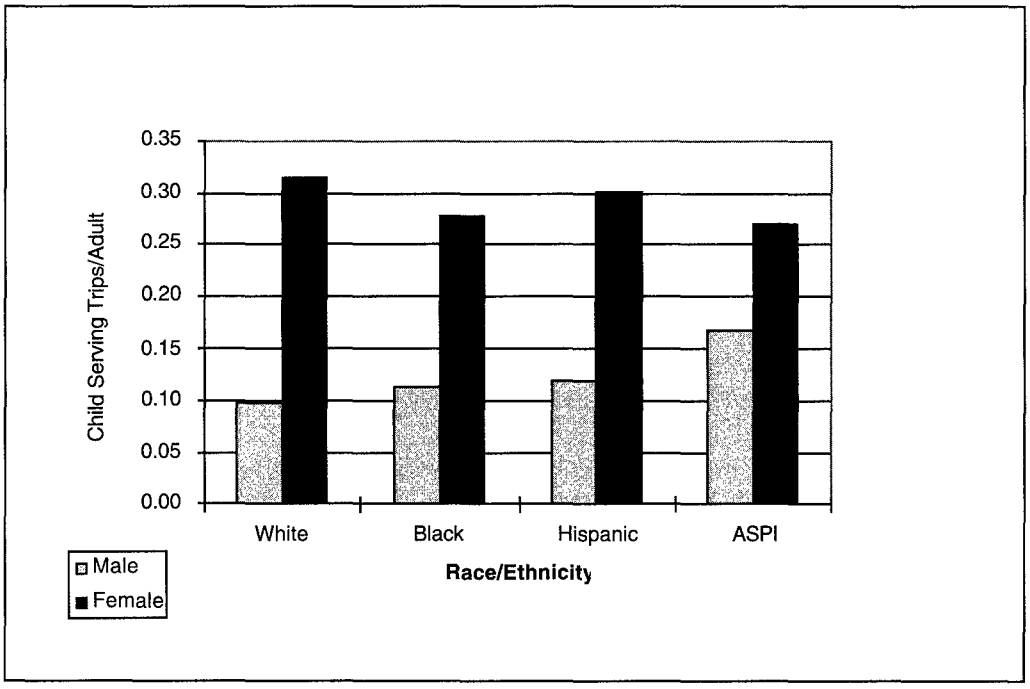
Table 7 shows who is making the child serving trips, by household structure and gender (in percent), and Figure 5 displays daily child serving trips by gender and household. While we would expect differences in child chauffeuring in dual parent households, we did not expect to find much difference between men and women in single parent households, as the single parent assumes full child chauffeuring responsibilities for their children regardless of gender.[1] Instead, we observed striking differences between male- and female-headed single parent households. Eighteen percent of all single mothers averaged two or more child chauffeuring trips per day. Only 8.2 percent of the single fathers averaged two or more child serving trips per day. Overall, single mothers made 2.33 child serving trips for every child chauffeuring trip made by single fathers. In two-or-more adult households with children (dual parent households) the differences were even greater, adult women made 2.9 child chauffeuring trips for every one made by an adult male. Overall, adult women made 2.8 times as many child chauffeuring trips as adult men. The gender difference in child-serving trips among male and female single parents may be explained in part by the higher average incomes in male-headed single-parent households; single fathers may be better able to "buy out" of many child-serving trips (with sitters, children's taxis, and the like) than single mothers.

Table 7
Adults Making Child Serving Trips By Household Type and Gender (in Percent)

Household Type	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
One+ Adults, With No Children	0.7 %	1.3 %	0.6 %	0.8 %	1.74 **
Single Adult, With Children	6.5 %	18.0 %	4.5 %	8.2 %	2.33 **
Two+ Adults, With Children	6.7 %	18.8 %	6.2 %	6.8 %	2.90 **
Total	3.4 %	8.9 %	2.9 %	3.3 %	2.82 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 5
Daily Child Serving Trips Per Adult By Race/Ethnicity



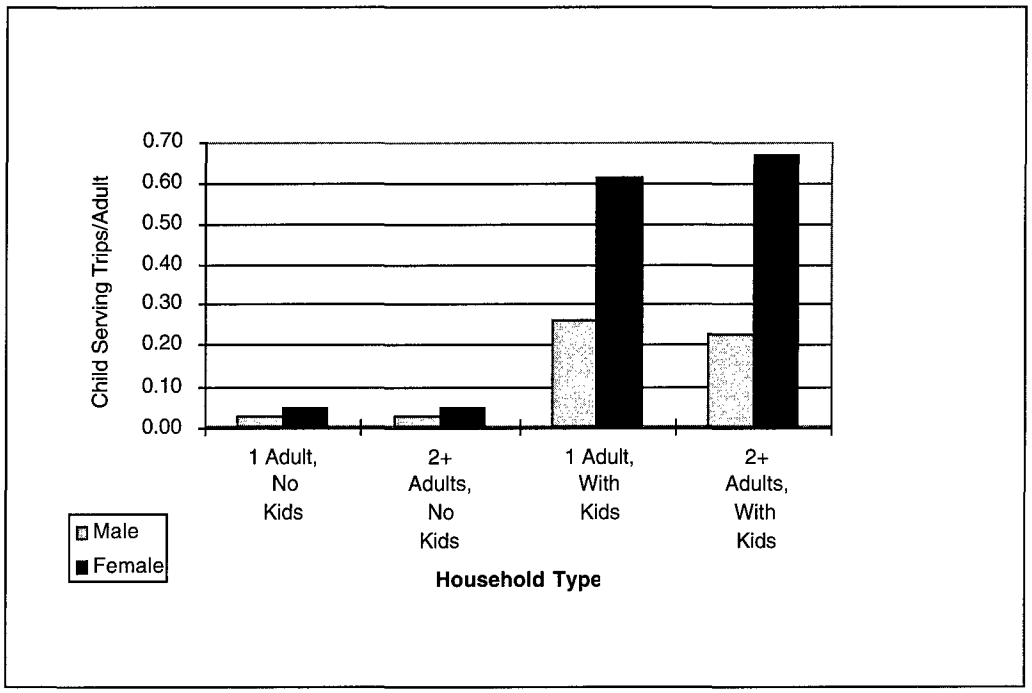
Gender difference in overall child serving travel varied significantly by race/ethnicity as well. Asian/ Pacific Islander men made the more child serving trips (0.17 trips/day) than any other group of men, both in absolute and relative terms. White men made fewer child serving trips than any other male group (0.10 trips/day). White women did more child chauffeuring than any other group (0.31 trip/ day), male or female. Table 8 lists who made child serving trips by gender and race/ethnicity, and Figure 6 displays the average number of child serving trips per day by the same categories.

Table 8
Adults Making Child Serving Trips By Race/Ethnicity and Gender (in Percent)

Race / Ethnicity	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
ASPI	2.0 %	8.4 %	3.0 %	5.5 %	1.60 **
Black	4.1 %	7.5 %	3.4 %	3.2 %	2.46 **
Hispanic	4.0 %	9.3 %	3.3 %	3.3 %	2.53 **
White	3.5 %	9.2 %	2.7 %	2.8 %	3.23 **
Total	3.4 %	8.9 %	2.9 %	3.3 %	2.82 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 6
Daily Child Serving Trips Per Adult By Household Type



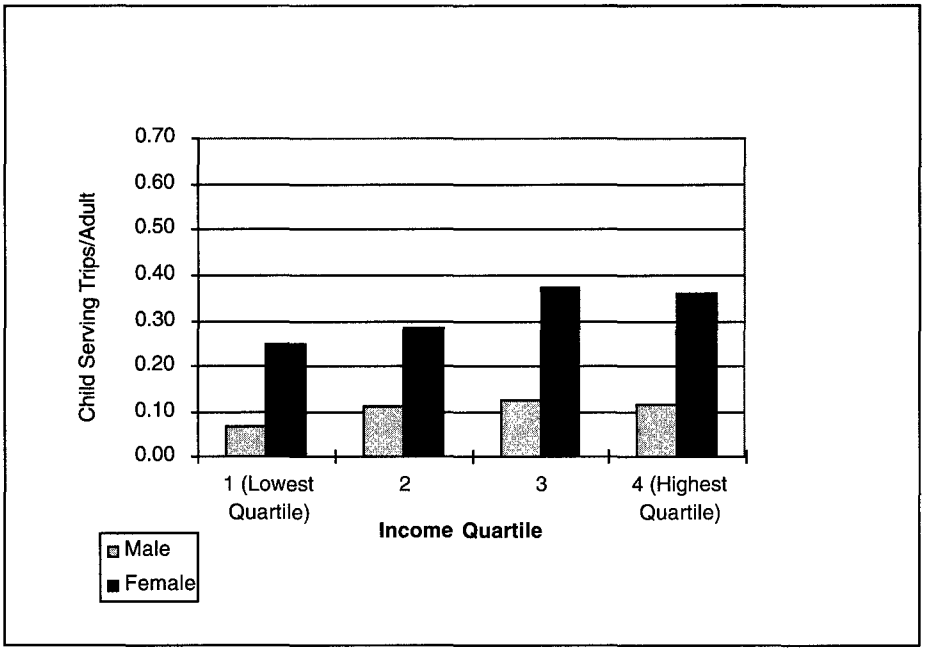
Child chauffeuring behavior varied by household income as well. The largest difference between the sexes was observed in the lowest income group, where women made 3.8 times as many child serving trips as men. In the highest income quartile, women averaged 3.2 times as many child serving trips as men. On average, women made about 2.8 times as many child chauffeuring trips as men. Table 9 lists the findings by gender and household income. Figure 7 displays the daily average child chauffeuring trip rates by gender and household income.

Table 9
Adults Making Child Serving Trips By Income Quartile and Gender (In Percent)

Income Quartile	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
1 (Lowest quartile)	2.1 %	5.7 %	1.5 %	2.2 %	3.78 **
2	3.0 %	8.7 %	2.1 %	3.6 %	2.60 **
3	3.9 %	10.7 %	3.6 %	3.8 %	2.99 **
4 (Highest Quartile)	4.4 %	10.1 %	4.1 %	2.9 %	3.20 **
Total	3.4 %	8.9 %	2.9 %	3.3 %	2.82 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 7
Daily Child Serving Trips Per Adult By Household Income



CHILD-SERVING TRAVEL AND THE JOURNEY-TO-WORK

As noted earlier, a number of scholars have asserted that women assume a larger portion of household and child serving responsibilities and that this additional household responsibility constrains women's travels (Hanson and Pratt 1990; Rosenbloom and Burns 1993). The findings from our earlier analysis of mean travel times is quite consistent with this theory. To look at the interaction between travel behavior, work location choice, and the division of labor in the home, child care stops and child serving stops made as part of the work commute were analyzed. The MTC trip diary recorded information on both child care stops and child serving stops. For our purposes, the child care stop and child serving stop data were combined, and any child care stop or child serving stop is referred to as a child serving stop. The vast majority (over 96%) of the child care/serve stops were

made by persons who were commuting via the private auto and who reported having at least one passenger in their vehicle. Table 10 shows that the automobile is used in all but 1 percent of child serving commute trips, which helps to explain why increasing numbers of commuters, especially women, arrive at work in an automobile (Rosenbloom and Burns 1994).

Table 10
Journey-to-Work Trips With Child Serving Stops, By Mode of Travel

Travel Mode	H-W Trips No CS Stop	Percent	H-W Trips CS Stops	Percent
Drive Alone	23,876	99.9 %	32	0.1 %
Shared Ride	4,386	76.3 %	1,360	23.7 %
Transit [1]	3,305	99.7 %	11	0.3 %
Bicycle/Walk	1,319	99.3 %	10	0.7 %
All Modes	32,887	95.9 %	1,413	4.1 %

1 Transit Mode includes School Bus Passengers

With respect to child serving stops made during work commutes, gender differences were consistent with previous analyses. Women made over twice as many child serving stops per work trip as men. For women, 6.0% of all work commutes included a child serving stop, compared to only 2.7% for men. The largest variation was among Hispanics. On average, 6.3% of all work commutes made by Hispanic women included at least one child serving stop, compared to only 2.0% for Hispanic men. For Asians/Pacific Islanders, the difference was not statistically significant, and the lack of significance was not due to small sample size (Table 11).

Table 11
Journey-to-Work Trips With Child Serving Stops, By Race/Ethnicity and Gender
(Percent of Total H-W & W-H Trips)

Race / Ethnicity	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
ASPI	4.0 %	3.8 %	+0.2 %	1.05
Black	6.7 %	4.2 %	+2.5 % **	1.60
Hispanic	6.3 %	2.0 %	+4.3 % **	3.15
White	6.3 %	2.5 %	+3.8 % **	2.52
Total	6.0 %	2.7 %	+3.3 % **	2.22

* Significant at the 0.05 level
** Significant at the 0.01 level

As one would expect, household structure and child serving stop propensity are highly correlated. Three household type categories were used to define family structure: (1) all households without children, (2) single adult households with children, and (3) two plus adult households with children. The results show that, regardless of family structure, women tend to make over twice as many child serving stops per trip as men. Table 12 summarizes the results of the child serving stop analysis by gender for each of the three household categories.

Table 12
Journey-to-Work Trips With Child Serving Stops, By Family Unit and Gender
(percent of Total H-W & W-H Trips)

Household Type	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
Household, With No Children	0.6 %	0.5 %	+0.1 %	1.20
Single Adult, With Children	12.0 %	5.1 %	+6.9 % **	2.35
Two+ Adults, With Children	11.4 %	5.2 %	+6.2 % **	2.19

* Significant at the 0.05 level
** Significant at the 0.01 level

Analyzing gender differences in child serving travel while controlling for income revealed differences in child serving stops were more prominent for the lowest and the highest income groups. Women in low income households made over four times as many child serving stops (on their journey-to-work) as men in the same category. In this income group, women averaged 4.9 stops per 100 trips, whereas men averaged 1.1 stops per 100 trips (Table 13).

Table 13
Journey-to-Work Trips With Child Serving Stops, By Household Income and Gender
(Percent of Total H-W & W-H Trips)

Household Income Quartile	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
1 (Lowest Quartile)	4.9 %	1.1 %	+3.8 % **	4.45
2	5.6 %	3.0 %	+2.6 % **	2.15
3	6.3 %	2.9 %	+3.4 % **	2.17
4 (Highest Quartile)	6.6 %	2.9 %	+3.7 % **	2.28

* Significant at the 0.05 level
** Significant at the 0.01 level

The trends seen in earlier tables (that women combine child chauffeuring and their work commutes more often than men) were repeated when cross-tabulating child serving stops by gender, household income, and household structure. However, new trends were revealed: higher income two-or-more adult households tend to make more child serving stops than lower income two-or-more adult households. Like tripmaking in general, the overall number of child serving trips is positively correlated with income; children in higher income households are chauffeured to day care, piano lessons, the dentist, and soccer practice more frequently than lower income children.

It was initially hypothesized that the average number of child serving stops for male headed, single parent household would be similar to those of a female headed, single parent household. Except among the highest income single parent households, this is not the case. Overall, single mothers tended to make over twice as many child serving stops as single fathers. Twelve percent of single mothers (who made a journey-to-work trip) made child serving stops on their work commute, compared to 5.1 percent for single fathers. Table 14 also shows that low income single mothers are six times more likely to make a child serving stop on the journey to work than a low income single father. Interestingly, the male/female difference in child serving trips declines as income increases;

among the highest income quartile, there is almost no gender variation in child serving travel. This contrasts with the pattern in two-adult households, where higher female child serving trip rates hold across all income categories.

Table 14
Single Parent Households: Journey-to-Work Trips Child Serving Stops,
By Household Income and Gender (Percent of Total H-W & W-H Trips)

Household Income Quartile	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
1 (Lowest Quartile)	11.0 %	1.8 %	+9.2 % **	6.11
2	14.9 %	7.0 %	+7.9 % **	2.13
3	8.7 %	3.9 %	+4.8 % **	2.23
4 (Highest Quartile)	8.8 %	8.4 %	+0.4 %	1.05
All Sngl Prnt HH's	12.0 %	5.1 %	+6.9 % **	2.35

* Significant at the 0.05 level
** Significant at the 0.01 level

Table 15
Dual Parent Households: Journey-to-Work Trips With Child Serving Stops,
By Household Income and Gender (Percent of Total H-W & W-H Trips)

Household Income Quartile	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
1 (Lowest Quartile)	8.4 %	2.1 %	+6.3 % **	4.00
2	10.7 %	5.9 %	+4.8 % **	1.81
3	11.6 %	5.0 %	+6.6 % **	1.76
4 (Highest Quartile)	13.1 %	5.5 %	+7.6 % **	2.38
All Dble Prnt HH's	11.4 %	5.2 %	+6.2 % **	2.19

* Significant at the 0.05 level
** Significant at the 0.01 level

Turning to racial/ethnic patterns in child serving travel propensity, child serving stops on the journey-to-work are summarized in Table 16 for single parent households and Table 17 for dual parent households. Here we see pronounced gender differences in child serving travel during the journey-to-work in all but single parent Hispanic households (though the observed female to male tripmaking ratio is 1.72) and dual parent Asian/Pacific Islander households (where there is no observed difference between men and women).

Table 16
Single Parent Households: Journey-to-Work Trips With Child Serving Stops, By Race/Ethnicity and Gender (Percent of Total H-W & W-H Trips)

Race / Ethnicity	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
ASPI	14.3 %	4.2 %	+10.1 % *	3.40
Black	9.8 %	2.8 %	+7.0 % *	3.50
Hispanic	8.6 %	5.0 %	+3.6 %	1.72
White	13.8 %	5.9 %	+7.9 % **	2.34
All Sngl Prnt HH's	12.0 %	5.1 %	+6.9 % **	2.35

* Significant at the 0.05 level
** Significant at the 0.01 level

Table 17
Dual Parent Households: Journey-to-Work Trips With Child Serving Stops, By Race, Ethnicity and Gender (Percent of Total H-W & W-H Trips)

Race / Ethnicity	Female CS Stops	Male CS Stops	Difference (F-M)	Ratio: F/M CS Stops
ASPI	6.6 %	6.6 %	+0.0 %	0.00
Black	14.0 %	8.9 %	+5.1 % **	1.57
Hispanic	8.6 %	2.4 %	+6.2 % **	3.58
White	13.8 %	5.2 %	+8.6 % **	2.65
All Dble Prnt HH's	11.4 %	5.2 %	+6.2 % **	2.19

* Significant at the 0.05 level
** Significant at the 0.01 level

Regardless of how the work commute trips were subdivided, gender differences in child serving stop propensity remained significant, with few exceptions. This difference persists even when controlling for race/ethnicity, household type (family structure), income, and mode of travel. To simultaneously control for all of the household demographic and socioeconomic factors in the data, a set of binary logistic regression models were constructed to determine which socioeconomic factors have the most influence on a person's likelihood to make a child serving stop on their home-work commute. Since almost all, or more accurately, since 98.5% of all child serving stops are made by persons traveling by auto mode, the modeling analysis was limited to home-work trips via auto mode to eliminate the consideration of irrelevant alternatives in the model. Table 18 lists the twenty-seven independent variables tested for inclusion in the models.

Table 18
Independent Variables Analyzed in Model Formulation

Variable	Unit	Definition
age	Person	Age of respondent
adultyn	Person	Age >= 21: (y=1, n=0)
ethnicw	Person	Ethnicity of respondent: (white? y=1, n=0)
driver2	Person	Valid drivers license: (y=1, n=0)
sex	Person	Sex: (f=1, m=0)
adult	Household	Total adults in household
fadult	Household	Female adults in household
madult	Household	Male adults in household
hhworker	Household	Workers in household
fworker	Household	Female workers in household
mworker	Household	Male workers in household
hhdriver	Household	Persons with valid drivers license in household
fdriver	Household	Females with drivers license in household
mdriver	Household	Males with drivers license in household
hhsize	Household	Persons in household
kid0_15	Household	Kids, 0 to 15 age group in household
kid16_21	Household	Kids, 16 to 21 age group in household
incvali	Household	Income per household
incvisqr	Household	Income per household squared
inc2pers	Household	Income per household member
vehicles	Household	Number of vehicles in household
veh2drvr	Household	Vehicles per household
areadens	Census Tract	Area density code
gresd	Census Tract	Gross residential density
gempd	Census Tract	Gross employment density
gpopd	Census Tract	Gross population density
hwtime	H-W Trip	H-W travel time (in minutes)

Each of the variables in Table 18 was entered into a stepwise logistic regression model of the propensity of a commuter to make a child-serving stop; ten variables were retained in the model at a 0.05 significance level (Table 19). The stepwise process was then repeated at a higher significance level for retention (0.01) and five independent variables were retained in the model (Table 20).

Table 19

Modeling Event: Child Serving Stop Modeling Occurrence: Home-Work Trips via Auto Mode Selection Method: STEPWISE Significance Level For Model Selection: 0.05

Variable	Parameter Estimate	Chi Sq.	Prob. Chi Sq.	Odds Ratio
intercept	-1.3650	18.41	0.0001	
kid0_15	1.0363	116.54	0.0001	2.819
incvali	0.000042	100.22	0.0001	1.000
inc2pers	-0.00012	76.30	0.0001	1.000
hhsize	-0.8655	63.53	0.0001	0.421
sex	0.8749	54.59	0.0001	2.399
hwtime	0.00629	20.33	0.0001	1.006
fworker	0.4374	10.78	0.0010	1.549
vehicles	-0.1836	8.11	0.0044	0.832
fdriver	-0.3935	7.54	0.0060	0.675

Association of Predicted Probabilities and Observed Responses

Concordant	= 82.7%	Somers' D	= 0.662
Discordant	= 16.5%	Gamma	= 0.667
Tied	= 0.7%	Tau-a	= 0.066
		c	= 0.831

Table 20

Modeling Event: Child Serving Stop Modeling Occurrence: Home-Work Trips via Auto Mode Selection Method: STEPWISE Significance Level For Model Selection: 0.00001

Variable	Parameter Estimate	Chi Sq.	Prob. Chi Sq.	Odds Ratio
intercept	-3.5754	440.36	0.0001 .	
kid0_15	1.0818	186.26	0.0001	2.950
sex	0.9839	87.00	0.0001	2.675
hhsize	-0.3224	25.38	0.0001	0.724
hwtime	0.00531	17.22	0.0001	1.005

Association of Predicted Probabilities and Observed Responses

Concordant	= 79.8%	Somers' D	= 0.606
Discordant	= 19.1%	Gamma	= 0.613
Tied	= 1.1%	Tau-a	= 0.061
		c	= 0.803

Table 20 shows that reducing the model to just four independent variables did little to reduce its explanatory power. The positive parameter estimate for KID0_15 indicates that the presence of children in the 0 to 15 age group residing in the household increase the likelihood of the adult worker making a child serving stop along their work commute. Furthermore, if the number of children in this age group in the household increases, then so does the likelihood of making child serving stops. The positive parameter estimate for the SEX variable (coded 0=male, 1=female) indicates that women are substantially more likely to make child serving stops on their journey-to-work than men. Thus, the model confirms that women are more likely to make child serving stops, even when simultaneously controlling for a number of other socioeconomic and demographic factors. The likelihood of making a child serving stop increases with journey-to-work travel time as indicated by the positive parameter estimate on HWTIME. The negative parameter estimate for HHSIZE indicates that as household size increases, so does the likelihood that other persons can help share the child chauffeuring responsibilities.

We also applied a second approach to modeling the propensity for child serving travel as part of the journey-to-work. This approach centered more on defining all persons in the household, except the person making the home-work trip in question. The household variables were re-coded as to not include the person making the home-to-work trip. For example, if an adult woman living alone reported making a home-work trip, then the number of adult females in the household were set to zero (and not set to one as was done in previous models) because there were zero adult females in the household in addition to the woman making the trip under study. This was done to measure the effects of any other people in the household on a given individual's probability of making a child serving stop. Using this concept of shared responsibility among cohabitors, and re-coding the number-of-person variables for the household as to not include the person making the trip in question, the models were rerun. Table 21 lists the parameter estimates and model statistics with recoded variables at the 0.05 significance level, and Table 22 lists the same for the 0.01 significance level.

Table 21

Modeling Event: Child Serving Stop Modeling Occurrence: Home-Work Trips via Auto Mode
Selection Method: STEPWISE Significance Level For Model Selection: 0.05

Variable	Parameter Estimate	Chi Sq.	Prob. Chi Sq.	Odds Ratio
intercept	-4.4951	284.75	0.0001	.
kid0_15	0.7901	345.89	0.0001	2.204
sex	0.9669	80.50	0.0001	2.630
hhadult	-0.4340	15.67	0.0001	0.648
vehicles	-0.2447	14.70	0.0001	0.783
hwtime	0.00520	11.58	0.0007	1.005
incvali	0.00023	10.20	0.0014	1.000
incvisqr	-111E-12	5.42	0.0200	1.000
gpopd	-0.0123	4.54	0.0332	0.988
hhworker	0.2254	4.46	0.0347	1.253

Association of Predicted Probabilities and Observed Responses

Concordant	= 80.7%	Somers' D	= 0.622
Discordant	= 18.4%	Gamma	= 0.628
Tied	= 0.9%	Tau-a	= 0.064
		c	= 0.811

Table 22
Modeling Event: Child Serving Stop Modeling Occurrence: Home-Work Trips via Auto Mode Selection Method: STEPWISE Significance Level For Model Selection: 0.00001

Variable	Parameter Estimate	Chi Sq.	Prob. Chi Sq.	Odds Ratio
intercept	-3.9224	914.71	0.0001 .	
kid0_15	0.7737	342.75	0.0001	2.168
sex	0.9926	87.70	0.0001	2.698
hhadult	-0.3434	19.86	0.0001	0.709
hwtime	0.00504	16.38	0.0001	1.005

Association of Predicted Probabilities and Observed Responses

Concordant	= 79.8%	Somers' D	= 0.608
Discordant	= 19.0%	Gamma	= 0.615
Tied	= 1.2%	Tau-a	= 0.062
		c	= 0.804

As was seen in the original models, KID0_15 was the most significant variable, followed by SEX. With recoded variables, HHADULT was the third most significant factor, and its' negative parameter estimate indicates that the presence of other adults in the household decreases the probability that any given adult will make child serving stops along their work commute, as these duties can be distributed or shared among a larger group of adults. Again, HWTIME's positive parameter estimate shows that the likelihood of making child serving stops is proportional to journey-to-work travel time.

Regardless of the modeling approach used, however, the model results are consistent and robust: other than the presence of children in the household, gender is by far the most important factor in determining the propensity to make child serving stops, even when controlling for a wide variety of other social, spatial, and economic factors.

GROCERY SHOPPING AND HOUSEHOLD TRAVEL

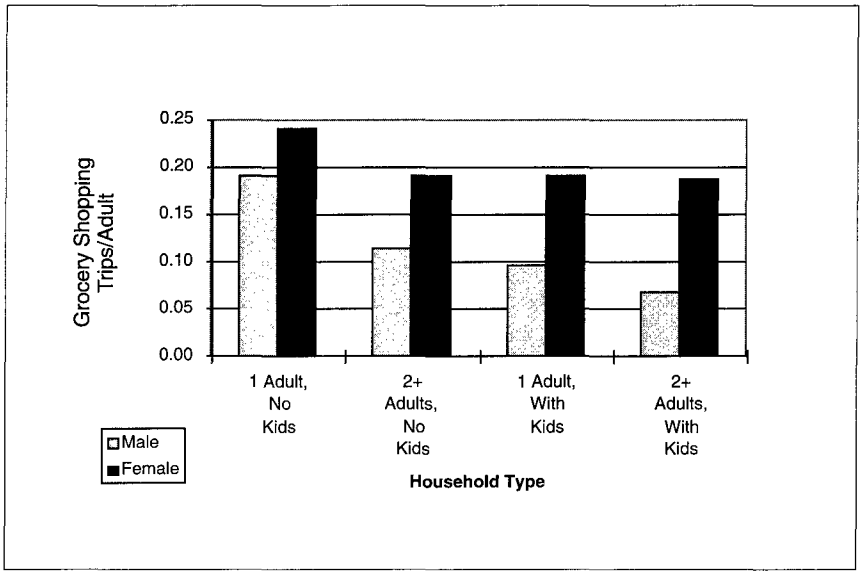
The analysis thus far clearly reveals significant gender variation in child chauffeuring, so we turn now to other forms of household serving travel. In this analysis we examine grocery shopping travel as a proxy for non-child-serving household travel. As was observed in child serving trips, gender differences in grocery shopping travel are the greatest in two-or-more adult households with children (e.g. dual parent households) and the least significant for single adult households without children (i.e. people living alone). But even though gender differences are less pronounced in single occupant households than in the other household types, adult women living alone still made 1.27 times as many grocery shopping trips as adult men living alone, revealing gendered travel patterns that cannot be accounted for entirely by the division of labor in the household (Table 23).

Table 23
Adults Making Grocery Shopping Trips By Household Type and Gender (in Percent)

Household Type	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
Single Adult, No Children	19.6 %	1.8 %	14.7 %	1.9 %	1.27 **
Two+ Adults, No Children	14.9 %	1.7 %	9.3 %	0.9 %	1.66 **
Single Adult, With Children	16.5 %	1.0 %	9.3 %	0.0 %	1.96 **
Two+ Adults, With Children	14.3%	1.6 %	6.0 %	0.4 %	2.73 **
Total	15.4 %	1.6 %	8.7 %	0.8 %	1.83 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 8
Daily Grocery Shopping Trips Per Adult By Household Type



As individuals combine to create two-or-more adult households, the overall number of grocery shopping trips increases because the household size is increasing. The total number of grocery shopping trips per person, however, decreases because there are economies of scale for grocery shopping trips with respect to household size. These lower per person rates of grocery shopping trips in two-or-more person households, however, vary significantly by gender. Women who live alone make 1.27 times as many grocery shopping trips on average as comparable men, while women in two-or-more adult households without children make 1.66 times as many grocery shopping trips as comparable men. It would appear, therefore, that women assume a disproportionate share of household-serving travel responsibilities. This trend deepens when children are part of the household.

In two-or-more adult households with children, women averaged 2.73 times as many grocery shopping trips as men. Thus, even though gender differences in household-serving travel increase as people move through the life cycle and form families, the differences between men and women in shopping trip rates in single households indicate that there exist behavioral differences in travel before families are formed.

Analyzing household serving travel while controlling for race/ethnicity and gender, reveals trends similar to those found in the child serving travel analysis. For example, white women make more grocery shopping trips than any other group (0.22 trips/day), and the difference between the sexes was the most significant for whites, and the least significant for Asians/Pacific Islanders. While these patterns are similar to the earlier analysis, the observed gender differences were less dramatic for grocery shopping. White women made 1.86 times more grocery shopping trips than white men, whereas Asian/Pacific Islander women made 1.63 times as many grocery shopping trips as ASPI men.

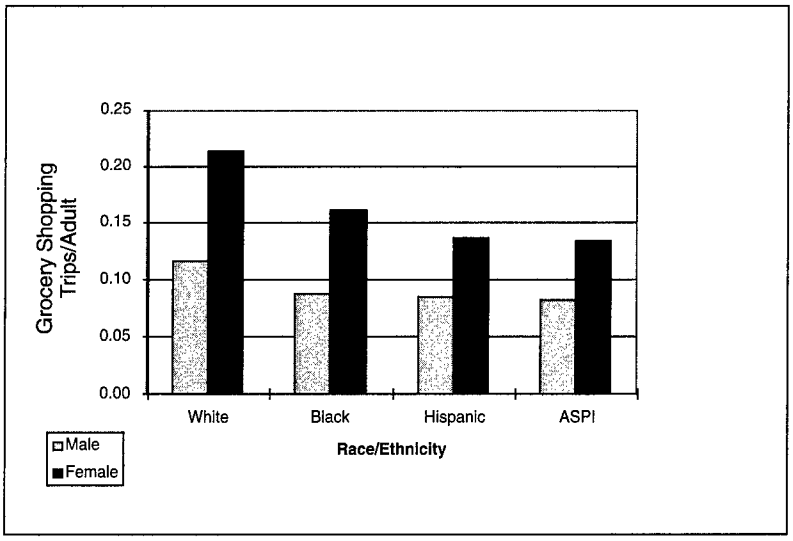
Other findings with respect to shopping are less patterned. For example, white men made fewer child serving trips than any other group, but Hispanic and black men made the least grocery shopping trips (averaging only 0.08 trips/day). Table 24 lists grocery shopping trips by gender and race/ethnicity, and Figure 9 shows the average number of daily grocery shopping trips for each of the race/ethnic groups by gender.

Table 24
Adults Making Grocery Shopping Trips By Race/Ethnicity and Gender (in Percent)

Race / Ethnicity	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
ASPI	11.3 %	1.0 %	7.7 %	0.2 %	1.63 **
Black	13.1 %	1.4 %	7.5 %	0.6 %	1.85 **
Hispanic	11.9 %	0.9 %	6.9 %	0.7 %	1.63 **
White	17.4 %	1.9 %	9.5 %	1.0 %	1.86 **
Total	15.4 %	1.6 %	8.7 %	0.8 %	1.83 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 9
Daily Grocery Shopping Trips Per Adult By Race/Ethnicity



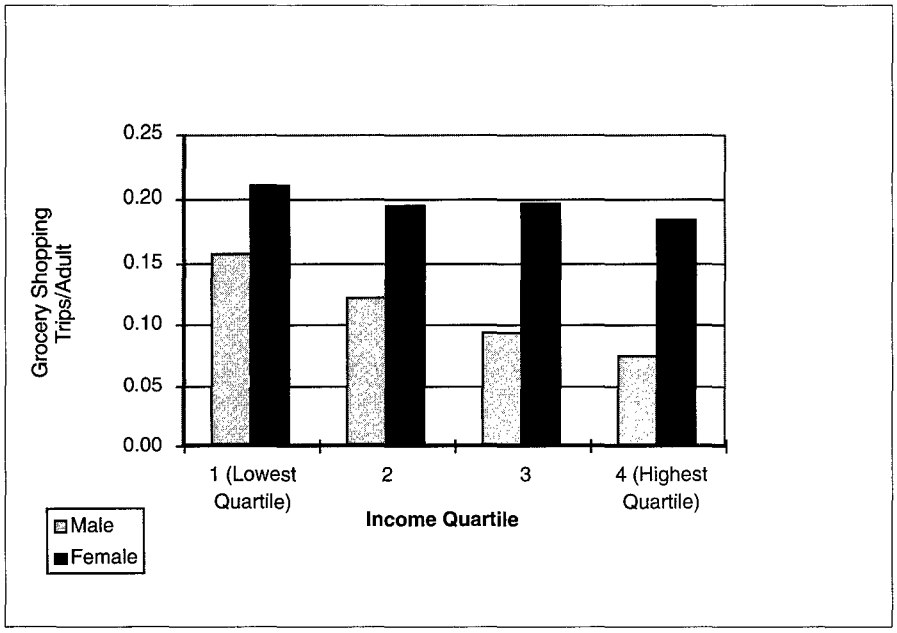
When controlling for income, gender differences increased with income for all income quartiles. In the lowest income quartile, women made 1.35 as many shopping trips as men. Women in the highest income quartile made 2.47 times as many shopping trips as men. Table 25 lists grocery shopping trips by gender and household income. Figure 10 shows average daily grocery shopping trip rates by the same categories.

Table 25
Adults Making Grocery Shopping Trips By Income Quartile and Gender (in Percent)

Income Quartile	Female 1 Trip	Female 2+Trips	Male 1 Trip	Male 2+Trips	Female/Male Trip Ratio
1 (Low Quartile)	16.6 %	1.6 %	11.3 %	1.7 %	1.35 **
2	14.9 %	1.7 %	10.0 %	0.8 %	1.60 **
3	15.3 %	1.7 %	7.7 %	0.7 %	2.13 **
4 (High Quartile)	15.0 %	1.4 %	6.5 %	0.3 %	2.47 **
Total	15.4 %	1.6 %	8.7 %	0.8 %	1.83 **

* Significant at the 0.05 level
** Significant at the 0.01 level

Figure 10
Daily Grocery Shopping Trips Per Adult By Household Income



The patterns revealed in this analysis of grocery shopping travel are important in a number of respects. First, the unequal division of household serving travel is not limited to travel related to child rearing, but appears to extend to all forms of household serving travel. Second, there appears to be less racial/ethnic variation in the gender division of grocery shopping travel than was observed for child serving travel. Third, and in contrast to the patterns observed for child serving travel, the gender division of shopping trips increases as income increases. Finally, and perhaps most interestingly, women appear to make more grocery shopping trips irrespective of household structure, though the variation between men and women appears to increase as couples move through the life cycle. Studies of occupational sex segregation have found that socialization and self-selection can contribute to persistence of lower-pay, lower-status, female-dominated occupations (Marini and Brinton 1984). The patterns of grocery shopping travel observed here suggest patterns of gender socialization may prefigure and steer subsequent decisions regarding the household division of labor.

CONCLUSION

The analysis uses detailed trip diary data from a 1990 survey of San Francisco Bay Area residents to examine the effects of race/ethnicity, income, and household structure on the differences in commuting and household-serving travel among men and women. With respect to travel behavioral differences between men and women, the findings here are largely consistent with previously published findings; namely, that women do more child chauffeuring and make more household serving trips than men. This analysis further reveals that these gender differences hold both in commuting behavior and household-serving travel and that they vary significantly by race and ethnicity in addition income and household structure. Specifically:

- Women tend to make shorter trips than men, regardless of trip purpose or travel mode;
- Almost all child serving travel (99 percent) is made via private vehicles;

- Controlling for an array of social, spatial, and economic factors, gender proved to be, by far, the most important factor in predicting the propensity to make child serving stops (other than the presence of children in the household).
- With respect to race and ethnicity:
- The difference in journey-to-work travel times is higher among whites (4.5 minutes) than non-whites, and lowest among Hispanics (1.8 minutes);
- In contrast, the gender differences in average travel time for all trips does not vary much by race or ethnicity;
- The gender variation in child serving trips was lowest among Asian/Pacific Islanders (women are 60 percent more likely to make such trips) and highest among whites (women are 223 percent more likely to make such trips);
- The gender variation in child serving trips during the journey-to-work is relatively low among Asian/Pacific Islanders (about 5 percent difference), higher among blacks (60 percent difference) and whites (152 percent difference), and highest among Hispanics (215 percent difference); and
- With respect to shopping, in contrast to child serving travel, women make about 75 percent more grocery trips than men regardless of race or ethnicity.
- With respect to household income:
- Gender variation in overall child-serving travel is greatest among the lowest (278 percent difference) and highest (220 percent difference) income quartiles, and least among the middle income quartiles (160 and 199 percent difference);
- Gender variation in child serving stops during the journey-to-work is by far the highest in the lowest income households (345 percent difference) and about the same for all other income groups (120 percent difference), and these patterns hold across household type;
- In contrast, the gender variation in grocery shopping tripmaking is least in low-income households (35 percent difference) and greatest in high-income households (147 percent difference).
- With respect to household structure:
- Journey-to-work travel times are about equal for men and women living alone, but are lower for women in households with two or more adults or when children are present;
- Regardless of household type, women make a substantially higher proportion of child serving stops, even among households with no children present;
- Women make more grocery shopping trips on average than men, even among adults living alone (27 percent more); and
- The gender variation in grocery shopping trips is greater in two plus adult households (66 percent difference) than in single households (27 percent), greater still in single parent households (96 percent), and greatest in two plus adult households with children (173 percent).

The findings here are consistent and robust suggesting that an array of social and economic factors work in concert to differentiate the travel behavior of men and women. Women living in low-income households, on average, assume a greater share of child chauffeuring responsibilities than women living in higher income households. White and Hispanic women, on average, make a higher proportion of child serving trips relative to men than blacks or, especially, Asian/Pacific Islanders. The difference in grocery shopping trips between men and women increases with the presence of other adults and/or children in the household. While women have joined the paid labor force in record numbers, travel in support of households—to chauffeur children and to shop—remains disproportionately burdened by women.

We conclude that women's household-serving travel patterns appear to be a function of both socialization and the sexual division of household responsibilities. We see evidence of socialization in the grocery shopping patterns observed in single adult households with no children, where women living alone make 1.27 grocery shopping trips for each grocery shopping trip made by a man living alone. And we find evidence of the sexual division of household labor in the increasing burden of household-serving travel at each stage in the life cycle and robustness of the gender variable in multivariate models of child-serving travel.

For journeys-to-work, the models presented here show that the probability of making child serving stop is proportional to travel time. That is, controlling for all other factors in the model, a person making a longer commute will have a higher likelihood of making a child serving stop than a person traveling a lesser distance. However, controlling for all other factors, women tend to make shorter trips than men. This includes the work commute. And yet on average, women make about twice as many child serving stops as men do. This paradox is likely explained by social and economic pressures that support women's continued, disproportionate role household maintenance. A role that translates into more trips to child care, more trips to soccer practice, more trips to the grocery store, more trip-chaining, and less separation between home and work for working women.

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NOTE

[1] While increasing in number and proportion, male-headed single-parent households remain relatively rare. The MTC travel survey oversampled single parent households and collected data on 568 male-headed single parent households and does permit a statistically valid comparison the travel behavior in female-headed single-parent households with that in (admittedly rare) male-headed single-parent households.

Is Shorter Better? An Analysis of Gender, Race, and Industrial Segmentation in San Francisco Bay Area Commuting Patterns

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IS SHORTER BETTER? AN ANALYSIS OF GENDER, RACE, AND INDUSTRIAL SEGMENTATION IN SAN FRANCISCO BAY AREA COMMUTING PATTERNS

There is a growing consensus that poor spatial access to employment opportunities is a critical factor in minority inner-city unemployment (Kain 1992; Holzer 1991; Ihlanfeldt & Sjoquist 1989, 1990; Peterson & Vroman 1992) and a major mobility disadvantage for the minority inner-city employed. Conspicuous by their absence from this "spatial mismatch" debate are the issues of female access to employment opportunities and sex-based differences in commuting patterns. Although women often have higher unemployment rates than men (England & Farkas 1986), female employment is not considered part of the mismatch problem, as women are not spatially concentrated in the way that many minority groups are. In fact, women's labor force participation is increasing, in part because the restructuring of the economy has increased the number of low-paid, dead-end secondary service sector jobs, the type of jobs which women historically have held. Furthermore, since journey-to-work travel times for women are lower than travel times for men, the spatial accessibility of employment for women is not generally considered problematic.

In this paper, we examine the possibility that the shorter travel times for women indicate not the absence of an employment problem, but the presence of individual choices and/or structural constraints. Specifically, using data from the San Francisco Bay Area, we evaluate the two dominant theories used to explain sex-based differences in commuting time: the theory that women minimize travel times due to preference and/or responsibilities in the household, and the theory that the types of industries in which women are concentrated locate in a dispersed pattern which facilitates spatial access. After establishing the theoretical context of labor markets and reviewing the literature specific to women and travel time to work, we attempt to explain the differences in journey-to-work travel time across the dimensions of race/ethnicity, residential density, household responsibility, employment in male- and female-dominated industries, and the combination of residential and industrial locations. Although travel time patterns vary considerably among the population subgroups under study, we find that sex-based differences remain within the different dimensions analyzed. The analysis suggests that neither the economic rationality argument nor the industrial location approach provides an adequate explanation of why women spend less time commuting.

THEORIES OF LABOR MARKETS

Labor economists have generally attempted to explain sex-based differences in commuting time in terms of either human capital or labor market segmentation theories. Human capital theory suggests that since women are likely to drop out of the labor force at different stages of their lives, it is neither in their interest nor in the interest of potential employers to invest in the education or training which would lead to higher-paid jobs. Since women are thus overrepresented in low-paid occupations, it would not be economically rational for them to travel as far as men do. Consistent with this idea is the notion that women, especially those with young children, would want and need to work nearer to their homes, because they have greater household responsibilities than their male partners. As a consequence, this theory suggests, women limit the radii of their job searches, and are therefore more likely to be employed in female-domi-

nated industries or occupations. Some theorists have critiqued the human capital perspective for its implication that women are employed in segmented occupations by their own preference or sex-role socialization; they suggest rather that women's perceptions of opportunity structure determine both preferences and outcomes (e.g., Pratt & Hanson 1991; Reskin & Hartmann 1986). Other empirical work has shown that the career ladders of women who take time out of the labor force are not dissimilar from those with more continuous experience: i.e., women with more continuous experience are no more apt than other women to be employed in predominantly male occupations, and women in female-dominated occupations aren't penalized less than those in male-dominated occupations for taking time out of the labor force (Wolf & Rosenfeld 1978; England 1982).

The other dominant idea, labor market segmentation theory, suggests that the labor market is divided into a primary sector with high-wage jobs, good working conditions, job stability and internal career ladders, and a secondary sector with low-wage jobs of poor quality and little job stability; within the primary sector, segmentation also occurs between independent jobs requiring a high level of skills and responsibility, and subordinate jobs of lower skills and status (Doeringer & Piore 1971). Because of employer preference (specifically, according to Edwards, Gordon & Reich (1982), the need to divide the labor force to prevent the broad-based development of class consciousness), as well as the simultaneous growth of these secondary or subordinate primary sector jobs and female labor force participation, women are slotted into many of these occupations, which become, by definition, 'female-dominated'.

Critics of this perspective (e.g. Hanson & Pratt 1995) suggest that it veils the complex socio-spatial factors, i.e. the space-time constraints on women's work, that may lead women to search for jobs close to home. Moreover, the concentration of females in these jobs may increase as industrial sectors with high proportions of traditionally female-dominated occupations, such as consumer services, tend to disperse throughout the metropolitan area, co-locating with their client populations. In contrast, sectors with fewer female-dominated occupations, such as the transportation, manufacturing, and advanced business service sectors, tend to concentrate in selected downtown or suburban areas. As a result, women are more likely to find jobs in the female-dominated occupations within female-dominated industries in closer proximity to their homes. In other words, labor market segmentation is both a cause and a consequence of women's spatial access to employment – a cause, for instance, as specific types of firms locate near "captive" female labor markets (Nelson 1986), but a consequence also, as women, especially those with young children, are expected to have shorter labor market radii and are thus more likely to be concentrated in certain occupations.

EMPIRICAL RESEARCH ON GENDER AND TRAVEL TIME

Most research on gender and travel time has emerged from the discipline of geography, exploring the possibility that patterns of occupational or industrial segmentation in space are reinforcing overall patterns of labor market segmentation. In particular, Pratt and Hanson found, in an extensive series of in-depth interviews, that suburban women with household responsibilities experience day-to-day space-time constraints which make them "heavily dependent on a relatively restricted range of local employment opportunities, to an extent that men are not" (Pratt & Hanson 1991:65). In a similar vein, Nelson (1986) suggests that the concentrations of firms near female labor pools in suburbia (e.g., back offices for financial service firms) or the inner city (e.g., government offices) affect the types of occupations such women select.

Within the spatial mismatch literature, researchers initially looked at employment outcomes as a function of residential location and distance from employment (e.g. Kain 1968). These studies typically used residential segregation and job decentralization as independent variables to measure the dependent variable of employment probability or wages. Later studies typically used travel time as an independent variable, as a more precise measure of the actual relationship between residence and workplace location (e.g., Ihlanfeldt & Sjoquist 1990; Straszheim 1980). Recently, researchers (Taylor & Ong 1993, McLafferty & Preston 1992) have used travel time as the dependent variable, hypothesizing that if commute times are higher for inner-city minority workers, the mismatch phenomenon is occurring—although, as Taylor & Ong (1993) suggest, it may be more of a mode mismatch than a spatial mismatch.

This focus on travel time as a measure of spatial access to employment is adopted by the extensive literature on women's travel patterns. This literature typically focuses on the issue of mobility, seeking to explain the general finding that women spend less time traveling to work than men do. Theorists generally agree that travel time to work is a function of mode choice, income, proximity to work, and household responsibilities, suggesting that women's work trips are shorter than men's primarily because they concentrate in work locations nearer to home because they have greater household responsibilities than men do. Research on gender and travel time has focused generally on four different aspects: comparing the worktrips of men and women; evaluating the relationship between gender and travel time using workplace/residence location; modeling household responsibility; and examining differences in travel times for different racial/ethnic sub-groups.

Research comparing women's and men's worktrips generally indicates that labor market differences are critical in explaining the shorter worktrips for women. Hanson & Johnston (1985) found that the most important factors explaining shorter travel times for women were their lower incomes, concentration in female-dominated occupations, and greater reliance on bus and auto passenger modes, and Madden (1981) suggests that if women had the same jobs, hours, and wages as their male counterparts, their work trips would be the same or longer.

Gender differences in both workplace and residential location may play an important role in determining travel time: job opportunities for women may be more uniformly distributed over the metropolitan area, reducing trip distance (Blumen & Kellerman 1990; Hanson & Johnston 1985); or located in suburban areas with a "captive" female labor force with significant household responsibilities (Nelson 1986; Rutherford & Wekerle 1988); or concentrated in CBDs, as with clerical work (Hwang & Fitzpatrick 1992). Women may also be more likely than men to rely on spatially-situated social networks in their job searches, networks which may reinforce the concentration of women in certain types of jobs (Hanson & Pratt 1995). The decentralization of jobs in the manufacturing and consumer service sectors is also an important determinant of shorter travel times, particularly for minority women (McLafferty & Preston 1992).

A number of researchers suggest that greater household responsibilities lead to shorter travel times for women (Preston, McLafferty & Hamilton 1993; Madden 1981; Johnston-Anumonwo 1992; but see Hanson & Johnston 1985). While women typically assume greater household responsibility when children are present, they also have more household obligations—and shorter worktrips—in two-worker households without children (Johnston-Anumonwo 1992). However, other research has presented contradictory evidence, suggesting that married women with or without children may have the longest commutes (White 1986, England 1993).

Still others have suggested that race or ethnicity may play a more significant role than gender in commuting time, even when controlling for income, occupation, and industry of employment (McLafferty & Preston 1991). Research has shown that African-American and Latina women commute longer than black and Latino men and all whites, and the presence of children is less likely to reduce their commuting time than it is for whites (Preston, McLafferty & Hamilton 1993). Furthermore, at least in the New York metropolitan area, spatial access to employment is poorer for African-American than Latina women, because of the greater reliance of African-American women on mass transit to get to work and the more localized labor markets of Latina women (McLafferty & Preston 1992).

This paper essentially combines elements of the four approaches. We first compare men's and women's travel times in the San Francisco Bay Area controlling for a variety of factors, including race/ethnicity and household responsibility. Typically, researchers have modeled household responsibility by using workers per household or presence of children as a proxy for responsibility; we modify this approach herein by developing a variable representing the share of household income provided by the worker. We then examine in detail the industries in which Bay Area women find themselves employed and the effect of those work decisions as reflected in travel times. Finally, we evaluate these travel time differences in terms of the two theories of economic rationality/household responsibility and industrial location. The next section details the methodology and data set used.

METHODOLOGY AND DATA

In this analysis we study differences in journey to work travel times between men and women in five counties of the San Francisco Bay Area (San Francisco, Alameda, San Mateo, Contra Costa, and Marin counties). We use data from the 1980 and 1990 Public Use Microsample (PUMS) of the U.S. Bureau of the Census. The five-county PUMS data provides detailed demographic information for a five percent sample of residents of 30 Public Use Micro Areas (PUMAs) of approximately 100,000 in population. The sub-set of this data that we use contains approximately 88,000 records and represents 1.84 million people employed in the regular civilian labor force. This dataset provides information on occupation and industry at the three-digit level, as well as variables describing travel time, place-of-work, hours worked per week, and income from wages. One important limitation however, is that place of work is reported at a much higher level of aggregation than place of residence. Place of Work PUMAs (POWPUMAs) are aggregates of as many as nine PUMAs in some cases. They follow the county lines exactly for Marin, San Mateo, San Francisco, and Santa Clara, which is not a residential PUMA that we analyze, but still a work destination for 5.9 percent of the five-county labor force. Contra Costa and Alameda are each partitioned into two POWPUMAs, which we identify as Richmond/San Pablo and Contra Costa (b) and Berkeley/Emeryville/Albany and Alameda (b) (which includes the city of Oakland). Appendix A contains a map of the PUMAs and POWPUMAs, as well as a description of the variables.

In addition to the male-female dichotomy, average journey-to-work travel times vary across four other dimensions: race, residential density, household responsibility, and a characteristic of industries which we call sex-based dominance. We look at race and Spanish origin, by creating five mutually exclusive categories from the two discrete variables: non-Hispanic white, black, Asian, Hispanic and other.[1] For ease of analysis, residential density is simply divided into urban and suburban categories, with PUMAs of more than 3,000 persons per square mile considered urban, otherwise suburban. We use 'income burden,' which is the individual's share of household income, as an inverse proxy for household maintenance and childcare responsibility. We hypothesize that this variable will be positively correlated with travel

time for three, sometimes seemingly contradictory reasons: 1) we assume that the higher opportunity cost makes it more likely that the higher breadwinner will assume a secondary role with respect to direct household maintenance activities, and thus is less restricted geographically in his/her job search; 2) the greater responsibility an individual has for his/her household's income (approaching or equal to 1), the greater importance is placed on finding a job regardless of distance or proximity to home, regardless of whether it is considered economically rational or not to travel a given distance; and 3) we assume that a higher share of household income is often a function of higher wages, in which case it may be considered economically rational to travel a longer distance for greater compensation. Our final variable, industry type, is defined by the division of industries into one of three possible groupings, 'female-dominated,' 'neutral,' or 'male-dominated,' according to the following rule: female-dominated if , male-dominated if , otherwise neutral. By basing this variable on industry rather than occupation, as well as using a location quotient approach which creates a standardized index rather than a cutoff point (i.e., female-dominated if more than 70 percent of the workers are women), we have diverged from the method most often used by other researchers in this area. The focus on segregation by industry allows us to look at sex-based differences in travel times in terms of industrial location, which we believe has a more determinant geographic pattern than occupational location. Moreover, in this PUMS dataset, the percent of women employed in female-dominated industries is comparable to the percent of women in female-dominated occupations.[2]

In the current study we use an array of difference of means tests to explore the relationships between travel time to work and race, sex, household responsibility, and residential density for Bay Area residents. We also explore the travel time implications which result from the segregation of women to certain industries and men to others; although they are likely related, we do not investigate the causal forces underlying such segregation.

LABOR FORCE PARTICIPATION

Of all women over the age of sixteen living in the Bay Area, 56.7 percent are active, employed participants in the civilian labor force, three percent are unemployed, and 38.5 percent described themselves as 'not in the labor force.' Of the 56.7 percent employed, 71.3 percent worked full-time in 1989, an increase of 1.7 percentage points over 1979. Bay Area men work at the higher rate of 69.5 percent, while four percent are unemployed and 23.6 percent are not in the labor force. Of the employed men, 85.4 percent reported working full-time in 1989, an increase of .9 percentage points from the previous census.

The Bay Area labor force is reasonably well educated. Among men, 87 percent have completed high school or higher degrees and among women 89.5 percent are so educated. Women are more likely than men to hold two- and four-year college degrees (33.3 percent versus 30.3 percent). Men are more likely (15.4 percent) than women (10.8 percent) to hold professional, Ph.D. and master's degrees.

PLACE OF RESIDENCE AND PLACE OF WORK

The residential distribution of labor force participants in the Bay Area counties and sub-counties under study is described in the following table:

Table 1
Labor Force Participation by County/Sub-County of Residence

Residence	Women	% of women	Men	% of men	Total	Total
Marin County	58,396	6.8	64,938	6.5	123,334	6.7
Richmond/San Pablo	22,896	2.7	24,186	2.4	47,802	2.6
Contra Costa County (b)	156,627	18.3	190,950	19.2	347,577	18.8
San Francisco County	172,017	20.3	198,113	20.2	370,130	20.1
Berkeley Emeryville Albany	30,290	3.7	32,830	3.5	63,120	3.4
Alameda (b)	256,671	30	292,007	29.4	548,678	29.8
San Mateo County	156,506	18.2	184,946	18.7	341,452	18.5
Total	853,403	100	987,970	99.9	1,841,373	100.0

While the proportionate rates of labor force participation for men and women residing in the same county are very similar* (statistical differences notwithstanding), the distribution of place of work shows greater variation (Table 2). Most notably, women work in greater proportions in the POWPUMAs identified as Marin, Contra Costa, San Francisco, and Alameda (b). One of the more interesting things to note is that women in the labor force are less likely than men to reside in Contra Costa County, 18.3 percent versus 19.2 percent, yet they are more likely to work there, 14.8 percent versus 12.4 percent. However, 58 percent of women and 57 percent of men in the labor force work in either San Francisco or Alameda counties, suggesting that the differences are perhaps not so pronounced. And, in fact, a cell by cell analysis of the origin and destination matrix of PUMA by POWPUMA shows that the proportional differences between men and women are statistically significantly different at a = .01 in only 17 of the 210 possible O&D pairs and significant at a = .1 in only six more.

Table 2
Labor Force Participation by County/Sub-County of Work

POWPUMA	Women	% women	Total	Men	% men	Total
Marin County	43,649	5.1	42,066	4.3	85,715	4.7
Richmond/San Pablo	16,448	1.9	20,909	2.1	37,357	2.0
Contra Costa County (b)	126,367	14.8	122,727	12.4	249,094	13.5
San Francisco County	241,642	28.3	273,110	27.6	514,752	28.0
Berkeley Emeryville Albany	37,805	4.4	45,709	4.6	83,514	4.5
Alameda (b)	216,576	25.4	245,610	24.86	462,186	25.1
San Mateo County	120,240	14.1	145,768	14.75	266,008	14.4
Santa Clara County	39,392	4.6	69,268	7.0	108,660	5.9
Other Locations	11,284	1.3	22,803	2.3	34,087	1.9
Total	853,403	100.0	987,970	99.9	1,841,373	100.0

In general, women are more likely to work and live in the same POWPUMA than are men. When considering all workers, 60.3 percent of the Bay Area's employed men reside and work in the same POWPUMA, and 68.5 percent of the Bay Area's women reside in the same POWPUMA. Among the full-time employed these percentages change to 58.2 percent and 64.3 percent respectively. Table 3 shows the likelihood of living and working in the same POWPUMA for full-time employed women and men respectively. [A complete table listing likelihood of working and living in the same POWPUMA across race and sex is given in Appendix B.]

Of the 17 O&D pairs significantly different at a=.01, 12 have higher proportions of women living in PUMAs that are bounded by their POWPUMAs. This might suggest that the difference in travel times is explained as a function of this particular travel pattern. However, the assumption is confounded by the fact that while men are more likely to leave their county of residence they are often traveling to adjacent POWPUMAs.

Table 3
Men & Women Working and Residing in Same POWPUMA

POWPUMA	**Women**	**Men**
Marin County	.594	.494
Richmond/San Pablo	.299	.269
Contra Costa County (b)	.620	.488
San Francisco County	.833	.760
Berkeley Emeryville Albany	.398	.456
Alameda (b)	.647	.613
San Mateo County	.556	.539
Total	.643	.582

INDUSTRIAL SEGMENTATION

The idea has been advanced that women's travel times are shorter because the industries that employ women locate in some fundamentally different pattern than do industries that employ men. In this section we discuss the industrial segmentation of men and women workers in the Bay Area. Based on the 1990 PUMS, 102 industries were classified as male-dominated, 87 as neutral, and 46 as female-dominated. The pattern of concentration is clearly far more intense for women than it is for men. Of the female labor force, 43.4 percent have found employment in the 46 female-dominated industries. The twelve largest female-dominated industries employ 75 percent of the women and men employed in female-dominated industries (Table 4); typical female-dominated industries include hospitals, elementary schools, banking and insurance, department stores, and private household services.

Table 4
Industries Employing 75 % of Men and Women in Male- and Female-Dominated Industries

	Male-dominated industries	Female-dominated industries
1	Construction	Hospitals
2	Air transportation	Elementary and secondary schools
3	Trucking service	Banking
4	Justice, public order, and safety	Insurance
5	Engineering, architectural, & surveying services	Department stores
6	Automotive repair and related services	Health services, n.e.c.
7	Electrical machinery, equip., and supplies, n.e.c.	Apparel and accessory stores, except shoe
8	Landscape and horticultural services	Offices and clinics of physicians
9	Wholesale trade/groceries and related products	Private households
10	Motor vehicle dealers	Apparel and other finished textiles (manuf.)
11	Radio, TV, and computer stores	Social services, n.e.c.
12	Detective and protective services	Accounting, auditing, and bookkeeping services
13	Machinery, except electrical, n.e.c.	
14	Electric and gas, and other combinations	
15	Bus service and urban transit	
16	Gasoline service stations	
17	Guided missiles, space vehicles, and parts	
18	Industrial and miscellaneous chemicals	
19	Petroleum refining	
20	Lumber and building material retailing	
21	Motor vehicles and motor vehicle equipment	
22	Water transportation	
23	Warehousing and storage	
24	Miscellaneous repair services	

Conversely, only 37.3 percent of men are concentrated in male-dominated industries, which include 102 industries. The 24 largest male-dominated industries employ 75 percent of the people employed in male-dominated industries (Table 4); typical male-dominated industries include construction, transportation, utilities, engineering services, and wholesale trade. Sixteen percent of the male labor force has found employment in female-dominated industries (and those tend to be in the highest paying occupations, as shown in Table 11), while only 12 percent of women have found employment in the 102 male-dominated industries. The histograms shown in figure 1 illustrate these differences.

Figure 1
Distribution of Workers Across Industry Groups, by Sex

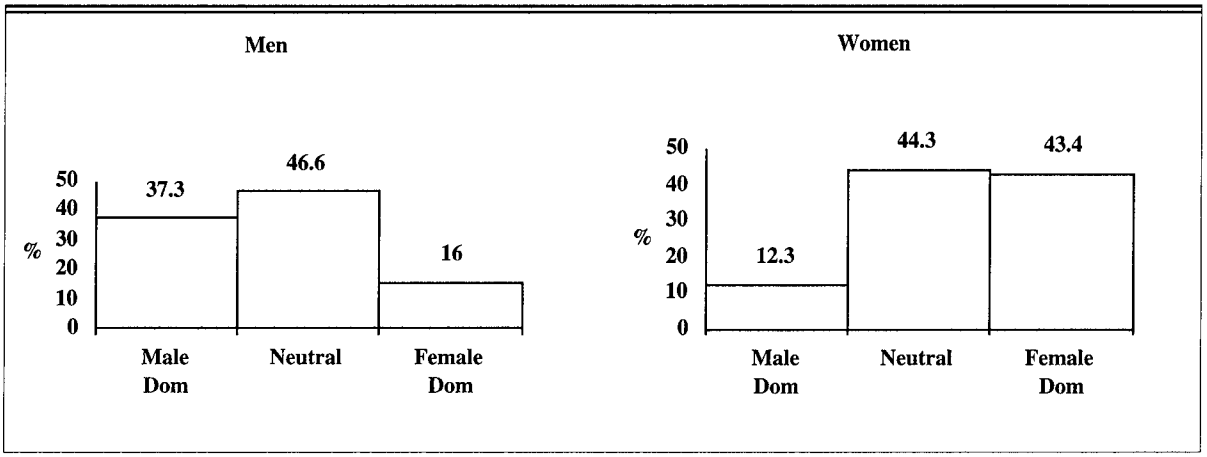
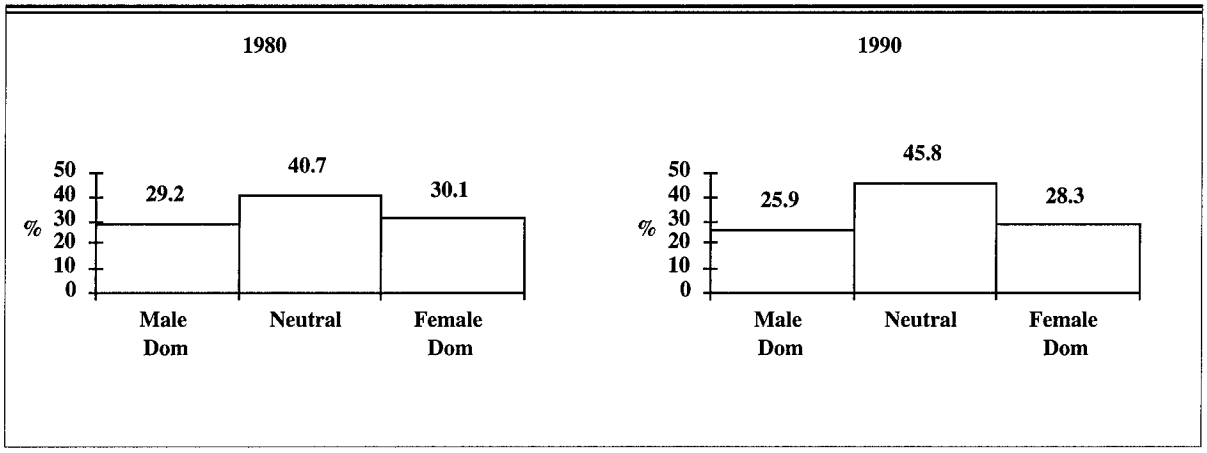


Figure 2
Distribution of Workers Across Industry Groups, 1980 and 1990



Over time, industrial segmentation has diminished from 1980 to 1990 (Figure 2). While the number of industries classified as female/male-dominated or neutral is roughly the same, the distribution of workers in those industries is converging, i.e., more people are employed in neutral industries and fewer are employed in the segregated industries.

FINDINGS

TRAVEL TIME

As expected, our findings indicate that women spend less time commuting to work than men do. For all workers in our sample in 1990, men traveled approximately 2.55 minutes longer than women (Table 5). Looking at only full-time workers, the difference narrows substantially: men working full-time spent only 1.5 more minutes than women in the journey-to-work. The difference in male and female travel times decreased slightly (less than 10 percent) from 1980 to 1990. However, for both men and women, travel times increased by over a minute from 1980 to 1990.

TRAVEL TIME BY INCOME, DENSITY, RACE/ETHNICITY, AND MODE CHOICE

When travel time differences are examined in the context of income, residential density, race/ethnicity, and mode choice, men working full-time still tend to travel longer than women (Table 6).[3] Exceptions are urban women, who travel 0.13 minutes longer than urban men, and women who use public transportation (or walk), who travel 1.64 minutes longer than men who use public transportation (or walk). The difference in male and female travel times widens beyond the average 1.5 minute difference for suburban residents, workers of white or 'other' race/ethnicity, and workers traveling to work via automobile. Income and means of transportation to work correspond closely to differences in travel time: women in the top 20 percent income category for women (with personal income from wages of more than $36,000) travel over five minutes longer than women in the lowest 20 percent income group for women (with income of less than $14,400), and women using public transportation travel over seven minutes longer than those using autos.[4]

Table 5
Mean Travel Time, 1980 and 1990

	All Workers		Women-Men	
Sex	**1980**	**1990**	**1980**	**1990**
Men	25.76	26.99		
Women	23.02	24.44	-2.74	-2.55
	Full-time Workers			
Men	26.43	27.80		
Women	24.70	26.30	-1.73	-1.50

For all differences, $p<.0001$

Certain subgroups of women are likely to have *longer* travel times than men. When traveling via public transportation, urban white and Asian women, suburban black women, and both urban and suburban Hispanic women travel longer than their male counterparts. When traveling by automobile, the pattern of shorter travel times for women is consistent across subgroups. However, the difference in travel times increases for men and women living in suburban PUMAs. Table 1 in Appendix C shows travel times for men and women by mode, race/ethnicity, and residential density.

Table 6
Travel Times for Subgroups of Men and Women

		Men		Women		Men-Women
		Mean	SD	Mean	SD	Difference
Income	Low-income quintile	25.55	17.92	24.24	18.15	1.31
	High-income quintile	30.67	19.66	29.57	19.47	1.10
Residential	Urban	25.72	17.19	25.85	17.53	-0.13
Density	Suburban	30.00	20.45	26.82	19.57	3.18
Race/	Non-Hispanic white	27.79	19.34	25.60	18.58	2.19
Ethnicity	Black	28.02	18.76	27.10	18.19	0.92
	Non-Black Hispanic	26.23	17.85	26.18	18.32	0.05
	Asian	29.06	17.95	28.69	18.36	0.37
	Other	28.80	19.96	24.54	17.78	4.26
Mode	Public transportation/walked	30.14	23.40	31.78	23.20	-1.64
	Automobile	27.26	17.73	24.51	16.29	2.75

For all differences p<.0001.

TRAVEL TIME AND HOUSEHOLD RESPONSIBILITY

We compared men's and women's average travel times across the income burden variable and found that men and women who earn less than half of their respective households' income exhibit approximately the same travel time pattern as we have observed throughout: men travel 0.8 minutes longer than women. When comparing men and women who are responsible for more than half but not all of their household's income, the difference widens to over one and a half minutes. However, travel time differences virtually disappear between men and women who are fully responsible for the income earned in their households. Since the mean income for female sole wage-earners is substantially lower than that for men ($26,300 versus $36,200)—while their commute times are comparable—it appears that the trade-off between travel time and income pays much better for men than for women, and that wage-earner responsibility has more of an effect on commute time than income level.[5]

Table 7
Travel Time by Sex and Income Burden

		Men		Women		Men-Women
		Mean	SD	Mean	SD	Difference
Burden	<.5 of household income	27.18	18.30	26.35	18.21	0.83
	.5-.99 of household income	29.39	19.28	27.79	18.70	1.60
	>.99 of household income*	26.87	18.81	26.72	18.18	0.15

*Not significant – other differences p< .0001

Historically, the presence and age of children have been used to look at household responsibility. For this analysis, however, we were only able to compare the travel times of women with children against women without children.[6] As shown in Table 8, women who work full-time and have young children (under six years of age) travel more than a minute longer than women without. In fact, the difference is even more extreme for women with children in the lowest and highest income quintiles, who travel 2.33 and 2.45 minutes more, respectively, than women without children. This again contradicts the economic rational-

ity argument, which suggests that women with the household responsibility incumbent in rearing young children are constrained in the amount of time they can spend commuting.

Table 8
Travel Times for Women With and Without Children

	Family Status	Mean	SD	Difference
All women	Without children under 6	25.81	18.10	
	With children under 6	26.99	18.27	1.18
Low-income quintile	Without children under 6	24.05	18.00	
	With children under 6	26.38	19.16	2.33
High-income quintile	Without children under 6	29.38	19.40	
	With children under 6	31.83	19.40	2.45

*Not significant - other differences p<.0001

TRAVEL TIME, INCOME, AND RACE

Table 9 shows that travel time differences between low- and high-income women (using personal income) are much greater for those using public transportation than for those driving, across all racial/ethnic groups. However, the difference between low- and high-income groups narrows for black and Hispanic women using transit. In general, white women using transit spend less time traveling to work than women in other racial/ethnic groups. For women using the auto, low- and high-income white women show the greatest disparity in travel times, followed by Hispanic women. In contrast, for black women, the travel times of low- and high-income women differ by only a minute. Thus, race seems to prevail over income in determining travel times. This is probably a reflection of both the residential and industrial segregation of black women, and suggests that structural disadvantage is constraining economic rationality in this case.

Table 9
Travel Times for Racial/Ethnic Subgroup of Women, by Income and Mode

Mode	Race/ethnicity	Income quintile	Mean	SD	Difference
Public transportation	Non-Hispanic white	Low-income	22.98	23.43	
		High-income	36.93	23.01	13.95
	Black	Low-income	31.80	25.74	
		High-income	39.88	24.47	8.08
	Non-black Hispanic	Low-income	31.07	22.97	
		High-income	39.95	22.73	8.88
	Asian	Low-income	28.39	18.07	
		High-income	42.14	22.21	13.75
Automobile	Non-Hispanic white	Low-income	21.20	14.95	
		High-income	27.47	17.70	6.27
	Black	Low-income	24.92	16.41	
		High-income	25.78	15.58	0.86
	Non-black Hispanic	Low-income	20.45	12.90	
		High-income	26.16	16.78	5.71
	Asian	Low-income	24.51	17.05	
		High-income	27.45	17.07	2.94

For all differences, $p<.0001$.

TRAVEL TIME AND INDUSTRY TYPE

Whether employed in male-dominated, neutral, or female-dominated industries, women still have shorter travel times than men (Table 10). While the difference narrows to 0.80 minutes for neutral industries, women in female-dominated industries travel 1.81 minutes less than men in female-dominated industries, and women in male-dominated industries travel 1.41 minutes less than their male counterparts. In neutral and female-dominated industries, the difference between male and female travel times has been decreasing over time (since 1980), while in male-dominated industries, the difference has increased slightly. Since women in different industry types consistently have shorter commute times than men, sex membership seems to override industry type, contradicting the hypothesis that concentration in female-dominated industries is a major factor in the shorter travel times for women.

When comparing within sex categories, it is interesting to note that women's travel times in 1990 are decreasing in the order neutral, male-dominated, female-dominated, while men's are decreasing in the order male-dominated, neutral, female-dominated. Also interesting to note is that average income for women is decreasing in the same order as their travel time but men's income follows an order in the exact reverse of their travel time: it is highest for those working in female-dominated industries and lowest for those in male-dominated industries (Table 11). In other words, men are apparently not making the same sort of trade-off between income and travel time as women are.

Table 10
Travel Time by Industry Type, 1980 and 1990

		1980				1990			
Industry Type	**Sex**	**Mean**	**SD**	**%**	**Difference**	**Mean**	**SD**	**%**	**Difference**
Male-dominated	M	26.79	18.01	100.0%		28.15	18.73	100.0%	
	F	25.79	17.00	95.5%	-1.20	26.74	18.08	95.0%	-1.41
Neutral	M	26.01	18.66	100.0%	27.65	19.17	100.0%		
	F	24.69	17.64	94.9%	-1.32	26.85	18.67	91.1%	-0.80
Female-dominated	M	26.49	18.44	100.0%		27.33	18.96	100.0%	
	F	24.36	17.40	92.0%	-2.13	25.52	18.44	93.4%	-1.81

For all differences, p<.0001.

Table 11
Income by Industry Type, 1980 and 1990

		1980				1990			
Industry Type	**Sex**	**Mean**	**SD**	**%**	**Difference**	**Mean**	**SD**	**%**	**Difference**
Male-dominated	M	$19,130	$13,001	100.0		$36,954	$25,962	100.0	
	F	$12,263	$7,516	64.1	-$6,867	$26,701	$14,329	72.3	-$10,253
Neutral	M	$18,130	$14,238	100.0		$27,859	$34,913	100.0	
	F	$11,286	$ 7,885	62.4	-$6,808	$40,407	$20,231	68.9	-$12,548
Female-dominated	M	$18,343	$15,095	100.0		$43,907	$40,173	100.0	
	F	$11,030	$ 7,212	60.1	-$3,313	$25,840	$16,898	58.9	-$18,067

For all differences,p<.0001.

Table 2 in Appendix C shows travel time differences between men and women in male-dominated, neutral, and female-dominated industries controlling for mode choice, race/ethnicity, and density. Perhaps the most striking travel time difference is between those workers traveling via public transportation versus via automobile: regardless of the industry type in which they are employed, urban women almost always travel longer than men when both travel by public transportation. Another difference which is generally consistent across racial/ethnic subgroup is between urban and suburban areas, for both auto and transit users: the gender gap in travel time is typically wider in suburban areas than in urban areas. However, whether women live in the city or suburbs, and whether they commute via auto or transit, travel times are longer for black, Asian, and Hispanic women traveling to female-dominated industries than for white women traveling to female-dominated industries, indicating that the factor of race/ethnicity may play a more important role than industry location in shaping travel time for women.

Looking only at automobile users, several other findings stand out: in male-dominated industries, suburban white, Hispanic, and Asian women spend less time traveling to work than their male counterparts, while black women travel *longer*. In the suburbs, the gender gap in travel time to female-dominated industries is generally wider for whites and Asians than for blacks and Hispanics. In urban areas, however, blacks and Hispanics generally have wider gaps in travel time to male-dominated industries than do whites and Asians.

LOCATION OF FEMALE- AND MALE-DOMINATED INDUSTRIES

Because of the variation in travel patterns for different racial/ethnic and density subgroup within the same industry type, a more detailed examination of industry location patterns for male-dominated, neutral, and female-dominated industries is warranted. Table 12 shows location quotients for jobs in the largest male- and female-dominated industries (those employing 75 percent of the workers) in each of eight counties or county subareas (the POWPUMAs). As it turns out, female- and male-dominated industries have different patterns of concentration among the POWPUMAs: female-dominated industries are relatively concentrated in San Francisco County (LQ = = 1.20), while male-dominated industries are relatively concentrated in San Mateo County (LQ=1.18) and the area outside the five counties under study (principally Santa Clara County) (LQ=1.37).

Moreover, location quotients vary considerably between men and women in the same industry type in the same POWPUMA: for instance, in San Francisco female-dominated industries, the location quotient for men () is 1.46 but for women is only 1.07, indicating that men are relatively more likely to travel to female-dominated industries in the regional downtown area. Both of these findings conflict with the premises of the industrial location hypothesis: not only are certain female-dominated industries concentrating instead of dispersing, but also within female-dominated industries O&D patterns vary.

Even within the female- and male-dominated industry categories, there is considerable variation in location quotients within different POWPUMAs (Table 3 in Appendix C). For instance, San Francisco, which contains a relative concentration of female-dominated industries (LQ=1.20), has a relative concentration of (female-dominated) apparel manufacturing, banking, and hospitals, but a relative scarcity of (female-dominated) elementary and secondary schools and health services. Likewise, male-dominated industries in general are scarce in San Francisco (LQ=0.78), but some specific male-dominated industries, such as electric and gas, and engineering, architectural, and surveying services, are relatively concentrated in the city.

Table 12
Location Quotients for Jobs in Female and Male Dominated Industries

Table 12
Location quotients for jobs in female- and male-dominated industries

Fem.-dom. industries (top 75%)*		Marin Cnty. #	LQ	Richmond area #	LQ	Contra Costa Cnty. #	LQ	SF Cnty. #
Men		5007	1.03	2012	0.75	15601	0.94	43801
Women	14417	1.06	6710	0.96	44721	1.04	85127	1.07
Total		19424	1.05	8722	0.92	60322	1.03	128928
		Berkeley area		**Alameda Cnty.**		**San Mateo Cnty.**		**Other**
		#	LQ	#	LQ	#	LQ	#
Men		3705	1.08	25175	0.87	13452	0.72	6813
Women	8127	1.01	69509	0.97	35893	0.94	12657	0.81
Total		11832	1.03	94684	0.95	49345	0.84	19470
Male-dom. industries (top 75%)*		**Marin Cnty.**		**Richmond area**		**Contra Costa Cnty.**		**SFCnty.**
		#	LQ	#	LQ	#	LQ	#
Men		11629	0.99	7143	1.10	41133	1.03	58776
Women	2941	0.79	2227	1.16	9851	0.84	16656	0.76
Total		14570	0.90	9370	1.11	50984	0.97	75432
		Berkeley area		**Alameda Cnty.**		**San Mateo Cnty.**		**Other**
		#	LQ	#	LQ	#	LQ	#
Men		7965	0.97	73166	1.05	49925	1.11	29035
Women	2170	0.98	22031	1.12	12884	1.23	7288	1.70
Total		10135	0.97	95197	1.06	62809	1.18	36323

*Includes the 12 female- and 24 male-dominated industries which employ 75 percent of all worker dominated industries.

TRAVEL TIME AND ORIGIN-DESTINATION PAIRS

One of our most startling findings is that women who work in San Francisco, as opposed to other Bay Area locations, overwhelmingly report *longer* travel times to work—and lower incomes—than their male counterparts, even controlling for mode choice. For all but 4 of the 30 PUMAs we studied, women report statistically significantly (at a= .99) longer travel times to San Francisco. In the four PUMAs for which men reported longer travel times, only one was significantly different; this is in large measure due to the limited number of observations for those four origin and destination pairs. This again contradicts the theory that women are acting out of rational choice in making trade-offs between travel time and income.

DISCUSSION

Traditionally, the two theories used to explain sex-based differences in travel time to work are that (1) because women earn less, it is not economically rational for them to spend as much time travelling to work as men do; and (2) women are occupationally segregated, and their occupations tend to concentrate in particular industries, which locate in some fundamentally different pattern than male-dominated or neutral industries. Within these theories, variations in travel time are understood as a function of mode choice, income, race/ethnicity, and household responsibilities. This empirical analysis yields contradictory evidence and provides little support for either of these theories.

This analysis found that with the exception of urban women, women using public transportation, and women destined for San Francisco, women have significantly shorter worktrips than men do. However, the difference is small, and decreasing. As this difference is generally narrower than those found by studies of other areas, our study suggests that in the Bay Area counties under study, commuters experience relative gender equality in their commutes. The following assess our findings in terms of the two theories outlined above.

ECONOMIC RATIONALITY/HOUSEHOLD RESPONSIBILITY ARGUMENT

On average, women do spend less time in travel and earn less than men. In fact, men and women both exhibit behavior consistent with the economic rationality argument: men and women in low-income quintiles both travel approximately five minutes less than those in high-income quintiles. However, five distinct findings contradict the economic rationality/household responsibility perspective:

- When comparing women who travel to San Francisco, the regional downtown area, with other women, their behavior is consistent, i.e. when they spend more time commuting they earn more. However, the theory does not hold when comparing women to men who work in San Francisco: women traveling to work in San Francisco spend *more* time traveling but earn *less* than men. Thus, their behavior is consistent with this theory of economic rationality *within* but not *across* sex categories.

- Likewise, when comparing women to men across industry types, men consistently have greater travel times and incomes than women. However, men working in female-dominated industries spend *less* time traveling but earn *more* than men in male-dominated or neutral industries. Therefore, men's behavior is considered economically rational when comparing *across* sex, but not *within* sex.

- Although high-income women have longer travel times than low-income women across both the race/ethnicity and mode choice variables, the difference narrows to less than a minute for black women who travel via automobile. That race prevails over income in this case is likely a reflection of both the residential and industrial segregation of black women. In other words, structural disadvantage places a serious constraint on "economic rationality."

- Men or women who bear sole responsibility for their household's income display no difference in travel time, despite the lower incomes for women. Moreover, the travel times for these men and women are less than those of men and women who share the responsibility for household income with others. This surprising finding suggests that full responsibility for household earnings has more effect on travel time than actual earnings.

- Women with young children spend more time traveling to work than women without young children, regardless of income. This finding is counter to the theoretical construct which hypothesizes that women with household responsibilities will spend less time commuting. This apparent phenomenon may reflect the shortcoming of the data collection, which does not allow for the possibility of complex travel patterns, e.g., women with children may be more likely to make an intervening stop.

INDUSTRIAL LOCATION ARGUMENT

The industrial location argument suggests that women have shorter travel times to work because the industries in which they are disproportionately segmented locate in a relatively dispersed pattern, thereby facilitating access from residences throughout the metropolitan area. Again, the evidence we found both provides support for and contradicts this theory. The shortest travel times—for both women *and* men—are reported for workers in female-dominated industries. However, our analysis was unable to uncover any systematic pattern of dispersion in female-dominated industries which can account for the lower travel times for women. Five distinct findings contradict the industrial location argument:

- Women have shorter travel times than men whether they work in female-dominated, neutral, or male-dominated industries.
- Women and men travel in similar proportions to the vast majority of O-D pairs.
- The factor of race/ethnicity often plays a greater role than industry location, mode, gender, or density: whether they commute by car or transit, whether they live in urban or suburban areas, black, Asian and Hispanic women have longer commute times than white women to female-dominated industries, and black women spend more time traveling than black men to male-dominated industries.
- While it was expected that male-dominated industries would be concentrated in regional centers and sub-centers, and female-dominated industries would be located throughout the region, the analysis shows a contradictory pattern. For instance, San Francisco has a relative concentration of female-dominated industries, but a dearth of male-dominated industries.
- Moreover, men and women within female-dominated industries exhibit different O-D patterns. For instance, men are relatively concentrated in female-dominated industries in San Francisco, while women tend to be concentrated in female-dominated industries in more suburban areas.

DIRECTIONS FOR FURTHER STUDY

While the two approaches under study have some explanatory power for sex-based differences in travel times, this research has pointed to several inconsistencies of these theories with travel patterns in the San Francisco Bay Area. Overall, it appears that several structural constraints may be overriding "economic rationality" or industrial location as a determinant of travel times: for instance, belonging to the racial/ethnic groups which are segregated in urban areas, being employed in San Francisco, and lacking access to private automobiles all seem to result in contradictory longer travel times for women.

There are also several deficiencies which arise in attempting to evaluate the viability of these theories, particularly by using the PUMS dataset. One major question is to what extent is an average *1.5-minute* difference in travel times evidence that women are selecting shorter commutes in an economically rational manner? Moreover, this difference is substantially smaller than either differences found in other metropolitan areas or differences found in travel surveys in the Bay Area. This raises the question of

how accurately respondents answer the census long form used for PUMS, as opposed to surveys or interview questions more specifically focused on travel behavior. Finally, the PUMS variables undoubtedly provide an inappropriate measure of household responsibility, as they cannot capture the trip-chaining and responsibility-sharing that may occur. Activity analysis and in-depth interviews would be more appropriate methods to model household responsibility and determine the role of space-time or structural constraints on women.

APPENDIX A

Table 1
Description of PUMAs and PUMS Variables

Variable Name	Notes	Variable Type	Values
Age		continuous	
Burden	defined as personal income divided by household income	continuous	0 < burden < 1
Density	population divided by area of PUMA defines urban or suburban	dichotomous	urban if Population > 3,000 p sq. mile; suburban otherwise
Education		ordinal	
Household Income		continuous	
Industry Dominance	# of women in industry divided by # of women in labor force	continuous ⇒ discrete	-1 if < .75; 1 if > 1.25; 0 otherwise
Labor Force Participation	only records representing employed members of the civilian labor force were included	continuous ⇒ dichotomous	full time if hours worked > 39; part time otherwise
Mode		dichotomous	automobile (inc. pick-up truck or van) or other
Personal Income	capped at $140,000	continuous	
Race	compiled from variables representing race and Hispanic origin	discrete	
Sex		dichotomous	
Travel Time	intended to be continuous but often reported in steps, e.g., 5, 10, 20, 45, 60 minutes.	continuous	

APPENDIX B

Table 1
Working and Living in the Same POWPUMA, by Race and Sex

	White		Black	
	Women	**Men**	**Women**	**Men**
Marin County	.582	.484	.637	.584
Richmond/San Pablo	.316	.271	.279	.291
Contra Costa County (b)	.642	.499	.463	.407
San Francisco County	.808	.770	.866	.778
Berkeley Emeryville Albany	.425	.469	.265	.293
Alameda (b)	.644	.614	.658	.617
San Mateo County	.600	.547	.416	.462
	Non-Black Hispanic		**Asian**	
	Women	**Men**	**Women**	**Men**
Marin County	.758	.653	.557	.410
Richmond/San Pablo	.340	.274	.233	.198
Contra Costa County (b)	.661	.569	.468	.335
San Francisco County	.855	.744	.861	.742
Berkeley Emeryville Albany	.475	.491	.359	.440
Alameda (b)	.714	.687	.596	.534
San Mateo County	.601	.602	.418	.436

APPENDIX C

Table C-1
Travel Times for Men and Women by Mode, Race/Ethnicity, and Density

Mode	Race/ethnicity	Density	Sex	Mean	SD	Difference
Public transportation	Non-Hispanic white	Suburban	M	34.06	27.95	
			F	31.94	28.60	-2.12
		Urban	M	25.68	20.33	
			F	28.28	20.90	2.59
	Black	Suburban	M	35.24	25.48	
			F	40.27	26.60	5.03
		Urban	M	33.91	22.07	
			F	33.30	21.70	-0.61
	Non-black Hispanic	Suburban	M	29.76	23.06	
			F	33.87	24.60	4.11
		Urban	M	29.72	21.53	
			F	32.48	22.30	2.75
	Asian	Suburban	M	42.66	24.48	
			F	39.58	22.20	-3.08
		Urban	M	30.89	20.76	
			F	33.40	20.20	2.50
	Other	Suburban	M	36.54	27.60	
			F	26.62	24.10	-9.92
		Urban*	M	29.29	22.89	
			F	29.36	21.70	0.07
Automobile	Non-Hispanic white	Suburban	M	29.70	19.56	
			F	25.28	17.60	-4.43
		Urban	M	24.64	15.61	
			F	23.63	15.40	-1.01
	Black	Suburban	M	28.81	19.33	
			F	26.26	16.70	-2.55
		Urban	M	25.14	15.94	
			F	23.50	14.40	-1.64
	Non-black Hispanic	Suburban	M	26.59	17.73	
			F	24.08	15.90	-2.51
		Urban	M	24.18	15.37	
			F	22.83	14.10	-1.35
	Asian	Suburban	M	30.22	17.81	
			F	26.81	17.00	-3.42
		Urban	M	26.47	15.41	
			F	24.38	14.80	-2.09
	Other	Suburban	M	30.55	19.09	
			F	24.43	17.30	-6.12
		Urban	M	25.43	17.51	
			F	22.51	14.60	-2.92

*Not significant. For all other differences p<.0001.

Table C-2
Travel Times for Racial/Ethnic and Density Subgroup, by Industry Type and Mode

Mode	Race/ethnicity	Density	Industry Type	sex	mean	s.d	diff
Public Transportation	Non-Hispanic white	Suburban	Male-dom*	M	33.53	27.77	
				F	33.16	28.28	-0.37
			Neutral	M	32.43	27.9	
				F	33.57	28.1	1.14
			Female-dom	M	40.09	27.6	
				F	29.47	29.2	-10.62
		Urban	Male-dom	M	27.42	21.18	
				F	28.87	18.82	1.45
			Neutral*	M	24.43	20.46	
				F	28.47	21.3	4.04
			Female-dom	M	27.19	18.87	
				F	27.84	20.85	0.65
	Black	Suburban	Male-dom	M	32.04	23.78	
				F	50.10	28.92	18.06
			Neutral	M	32.81	25.73	
				F	39.87	25.46	7.06
			Female-dom	M	47.42	23.9	
				F	37.59	26.54	-9.83
		Urban	Male-dom	M	33.46	21.64	
				F	36.66	26.88	3.2
			Neutral	M	34.05	22.33	
				F	33.77	21.91	-0.28
			Female-dom	M	34.16	22.2	
				F	32.21	20.29	1.95
	Non-black Hispanic	Suburban	Male-dom	M	25.72	22.38	
				F	39.27	28.38	13.55
			Neutral	M	34.36	22.92	
				F	36.76	21.67	2.4
			Female-dom	M	22.56	21.61	
				F	30.25	25.34	7.69
		Urban	Male-dom	M	32.11	23.47	
				F	35.63	24.81	3.52
			Neutral	M	28.62	20.26	
				F	32.49	20.15	3.87
			Female-dom	M	28.88	21.69	
				F	31.96	24.06	3.08
	Asian	Suburban	Male-dom	M	48.96	23.52	
				F	37.97	20.53	-10.99
			Neutral	M	38.17	24.61	
				F	42.38	22.86	4.21
			Female-dom	M	45.19	23.11	
				F	37.70	22.01	-7.49
		Urban	Male-dom	M	36.21	19.54	
				F	33.70	19.44	-2.51
			Neutral	M	28.38	20.99	
				F	32.17	20.78	3.79
			Female-dom	M	33.84	19.78	
				F	34.22	19.94	0.38

Table C-2 (cont)

Mode	Race/ethnicity	Density	Industry Type	sex	mean	s.d	diff
Automobile	Non-Hispanic white	Suburban	Male-dom	M	30.20	19.58	
				F	27.18	18.15	-3.02
			Neutral	M	29.95	19.76	
				F	25.49	17.64	-4.46
			Female-dom	M	27.17	???	
				F	24.21	17.26	-2.96
		Urban	Male-dom	M	24.69	15.52	
				F	23.94	14.88	-0.75
			Neutral	M	25.07	15.85	
				F	24.70	16.23	-0.37
			Female-dom	M	23.15	15.03	
				F	22.11	14.56	-1.04
	Black	Suburban	Male-dom	M	28.07	18.16	
				F	29.40	17.13	1.33
			Neutral	M	30.33	20.89	
				F	26.59	17.24	-3.74
			Female-dom	M	26.70	17.69	
				F	24.69	15.93	-2.01
		Urban	Male-dom	M	26.22	16.64	
				F	24.12	13.59	-2.1
			Neutral*	M	24.59	15.36	
				F	24.74	14.46	0.15
			Female-dom	M	23.90	15.41	
				F	22.21	14.49	-1.69
	Non-black Hispanic	Suburban	Male-dom	M	27.19	17.18	
				F	23.97	15.62	-3.22
			Neutral	M	25.63	18.19	
				F	23.82	15.68	-1.81
			Female-dom	M	26.52	18.72	
				F	24.46	16.43	-2.06
		Urban	Male-dom	M	24.88	15.72	
				F	21.95	12.95	-2.93
			Neutral	M	23.40	14.78	
				F	22.53	13.96	-0.87
			Female-dom	M	24.28	16.23	
				F	23.55	14.71	-0.73
	Asian	Suburban	Male-dom	M	30.79	18.2	
				F	25.80	15.48	-4.99
			Neutral	M	29.65	16.91	
				F	27.77	17.49	-1.88
			Female-dom	M	30.79	19.43	
				F	26.06	17.07	-4.73
		Urban	Male-dom	M	26.46	14.91	
				F	26.23	16.36	-0.23
			Neutral	M	27.00	15.91	
				F	24.54	14.16	-2.46
			Female-dom	M	24.88	14.65	
				F	23.66	15.1	-1.22

*Not significant. For all other differences p<.0001.

Table C-3
Location of Female-Dominated and Male-Dominated Industries

nty.	Richmond area		Contra Costa Cnt		SF Cnty.		Berkeley area		Alameda Cty.		San Mateo Cty.		Other	
0.76	1894	0.99	8873	0.75	26421	1.22	2800	1.21	20752	1.03	9658	0.81	5928	1.00
1.38	2236	1.22	14465	1.28	13517	0.65	3082	1.38	23644	1.23	10580	0.93	3550	0.63
0.70	627	0.51	10514	1.39	24453	1.76	522	0.35	7581	0.59	3791	0.50	1617	0.43
1.62	545	0.51	7312	1.11	15452	1.28	594	0.46	8815	0.78	6768	1.02	1550	0.47
0.81	982	1.73	4029	1.15	6041	0.94	216	0.31	6291	1.05	4165	1.18	893	0.51
1.34	595	1.17	3202	1.03	5121	0.89	1084	1.76	5533	1.04	2476	0.79	1685	1.08
0.98	616	1.37	2199	0.79	6007	1.18	305	0.56	5637	1.19	2278	0.82	717	0.52
1.81	319	0.70	2745	0.98	4839	0.94	1046	1.90	4585	0.96	2525	0.90	1140	0.81
1.32	203	0.63	1879	0.94	4291	1.18	553	1.41	2590	0.76	2460	1.23	580	0.58
0.23	91	0.24	318	0.14	11191	2.66	628	1.39	2105	0.54	588	0.25	330	0.29
0.91	506	1.33	1990	0.85	5298	1.24	645	1.40	4206	1.06	1782	0.76	600	0.51
1.21	108	0.27	2796	1.13	6297	1.39	357	0.73	2945	0.70	2274	0.91	880	0.71
1.09	**8722**	**0.92**	**60322**	**1.03**	**128928**	**1.20**	**11832**	**1.03**	**94684**	**0.95**	**49345**	**0.84**	**19470**	**0.66**
nty.	**Richmond area**		**Contra Costa Cnt**		**SF Cnty.**		**Berkeley area**		**Alameda Cty.**		**San Mateo Cty.**		**Other**	
1.16	2123	0.82	19154	1.21	26705	0.92	2867	0.91	25830	0.95	15024	0.94	9360	1.18
0.09	41	0.07	370	0.10	3816	0.54	56	0.07	3574	0.55	16327	4.23	1408	0.73
0.54	924	1.77	1862	0.58	3830	0.65	252	0.40	8859	1.62	3205	0.99	2070	1.29
1.16	535	0.92	2596	0.73	7019	1.07	818	1.16	7198	1.18	3251	0.90	1284	0.72
1.05	395	0.82	3268	1.11	7302	1.35	1260	2.16	3687	0.73	1700	0.57	1287	0.87
0.85	412	1.17	2353	1.09	2731	0.69	641	1.50	4495	1.22	2676	1.23	670	0.62
0.58	59	0.14	1084	0.42	1087	0.23	476	0.94	3872	0.89	1966	0.76	8160	6.37
2.41	292	0.94	3065	1.60	1389	0.39	381	1.01	2768	0.85	2956	1.53	622	0.65
0.59	624	1.84	1137	0.55	2661	0.70	323	0.79	5299	1.49	2676	1.28	879	0.84
1.17	364	1.23	2083	1.14	1570	0.47	327	0.91	3707	1.19	2787	1.52	732	0.80
0.96	60	0.26	891	0.63	1830	0.70	606	2.15	2249	0.92	2001	1.39	1518	2.12
0.30	187	0.94	1201	0.98	2491	1.11	215	0.89	2475	1.18	1116	0.90	447	0.73
0.81	165	0.84	901	0.75	473	0.21	523	2.20	3472	1.69	1386	1.14	882	1.46
0.28	123	0.60	1195	0.95	4432	1.92	63	0.25	1519	0.71	702	0.55	292	0.46
0.79	229	1.18	708	0.60	2379	1.09	213	0.91	2866	1.41	1061	0.88	248	0.42
1.73	479	2.89	1802	1.77	891	0.48	144	0.72	1642	0.95	1127	1.10	214	0.42
0.00	56	0.41	208	0.24	65	0.04	41	0.24	470	0.32	260	0.30	4610	10.82
0.08	515	3.71	2532	2.96	32	0.02	258	1.53	1368	0.94	602	0.70	413	0.96
0.08	1303	10.38	2579	3.34	876	0.62	0	0.00	161	0.12	31	0.04	220	0.57
2.20	115	0.89	926	1.16	800	0.55	236	1.50	1532	1.13	863	1.08	335	0.84
0.24	179	1.44	328	0.43	326	0.23	187	1.24	3694	2.84	190	0.25	167	0.44
0.32	53	0.48	307	0.45	1889	1.52	13	0.10	1711	1.49	237	0.35	259	0.77
0.47	101	0.95	181	0.28	745	0.62	177	1.38	2381	2.15	529	0.81	162	0.50
1.66	36	1.34	253	1.53	93	0.31	58	1.77	368	1.30	136	0.82	84	1.01
0.90	**9370**	**1.09**	**50984**	**0.97**	**75432**	**0.78**	**10135**	**0.97**	**95197**	**1.06**	**62809**	**1.18**	**36323**	**1.37**
1.00	**18092**	**1.00**	**111306**	**1.00**	**204360**	**1.00**	**21967**	**1.00**	**189881**	**1.00**	**112154**	**1.00**	**55793**	**1.00**

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NOTES

[1] Analyses of this kind often separate Hispanic from non-Hispanic blacks. However, since the number of Hispanic blacks in the Bay Area is very low, we have chosen to leave the Hispanic blacks in the racial, rather than ethnic, category.

[2] Specifically, in terms of occupations, 24.5 percent of women are in male-dominated, 32.7 percent in neutral, and 42.7 percent in female-dominated, while for industries, 12.3 percent of women are in male-dominated, 44.3 percent in neutral, and 43.4 percent in female-dominated.

[*] In spite of the similar values, only San Francisco and Berkeley/Emeryville are not statistically significantly different.

[3] To facilitate comparison between men and women, all analysis from this point onward will be of full-time workers only.

[4] In our sample, 76.7 percent of women commute via auto, and 23.3 percent via public transportation or walking.

[5] The income burden variable is somewhat of a proxy for household structure, since the vast majority of households (62.7 percent) with sole wage-earners are people living alone (in addition, approximately 20 percent are married-couple households with a male wage-earner, and 10 percent are female heads of household). Since single person households tend to locate in residential areas of higher density (66 percent are urban), it is perhaps not surprising that burden type is more important than income level.

[6] The PUMS variable describing presence of children came up with no children for men in the dataset; although the dataset can be manipulated to show which households have children and male parents, we did not conduct this analysis.

VI

THE TRAVEL PATTERNS OF WOMEN WITH SPECIAL NEEDS

The Mobility Consequences of the Reduction or Cessation of Driving by Older Women

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THE MOBILITY CONSEQUENCES OF THE REDUCTION OR CESSATION OF DRIVING BY OLDER WOMEN

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OVERVIEW

Driving one's own car is the option used by most persons in the United States today to obtain the mobility necessary to maintain their connections to society. However, recent medical advances have made such significant increases to life expectancy that **prospects for outliving one's personal ability to safely operate an automobile have dramatically increased for many persons**. This is because the usual consequences of the aging process include an increase in functional disabilities and a reduction in the skills and abilities needed to drive an automobile[1-3]. At the same time, prospects for obtaining mobility by any means other than driving oneself have not markedly improved.

When persons with diminished capabilities continue to drive, an increased safety risk is created for all members of society. But, when older drivers face the prospects of reducing or terminating their driving (because of declining skills or for other reasons), they often have expectations of substantially reduced mobility. Such expectations lead in turn to a reluctance among these older drivers, family members, and government agencies to terminate an older person's driving privileges. Thus, the point at which older persons voluntarily give up or are forced to relinquish their driving privileges is often seen by elders and those around them as a watershed event with large implications regarding independence, self-sufficiency, and social responsibilities.

Some researchers have suggested that there may often be serious consequences for older persons when those persons cease to drive, because their overall mobility will decline. Consequences which are mentioned in the literature include a loss of personal independence, social isolation, and a reduction or lack of access to essential services.

While some of these issues have been addressed by prior research efforts, no comprehensive overview has been produced that ties all of the related factors together in a comprehensive explanation of causes and consequences. Many questions remain: If an older person reduces or stops driving, how great is their loss of mobility? What other changes follow from the loss of mobility? Are there viable options to reduce the loss of mobility when a person stops driving? What lessons about personal mobility can we learn from those who have ceased to drive and those who never drove?

Ecosometrics, Incorporated is working on a project called "The Mobility Consequences of the Reduction or Cessation of Driving Among Older Persons." The sponsors of this project are the U. S. Department of Health and Human Services and the National Highway Traffic Safety Administration. Through a review of the literature and any research currently being conducted as well as through a series of focus groups, the goals of our project are to:

1) Identify factors that influence older persons to reduce or to stop driving, to determine how they make such decisions, and which types of persons are likely to stop driving and which are not;

2) Document the changes in mobility and travel behavior which result when driving is reduced or ceased;

3) Identify changes in the lives of older individuals and those around them resulting from reductions in or losses of personal mobility; and

4) Determine the programmatic implications of the research findings of this project.

The problem is a large one. People 65 years of age and older are projected to represent 13 percent of the population in the year 2000 and 20 percent by the year 2030 [4]. The fastest-growing demographic group in the U. S. at the moment is persons 85 years of age and older. By the year 2000, one out of every three drivers will be over the age of 55, according to the American Automobile Association [5]. Furthermore, the vast majority of Americans have grown up in a culture which strongly depends on automotive transportation for mobility, and most Americans (including the elderly) now live in communities which are not served well or frequently by public transit services.

This presentation will touch on some of these issues as they directly pertain to women. We will also discuss the state of existing research in this area. These issues are particularly relevant to women as women live longer than men do (leading some to label old age as a woman's issue).

AGE AND GENDER DIFFERENCES IN DRIVER LICENSING

According to results from the 1990 Nationwide Personal Transportation Survey (NPTS), 82 percent of women between the ages of 60-64 have driver's licenses, and they hold them until age 80, when the percentage of women holding licenses declines and reaches a level of 25 percent of all women over age 85. There were appreciable increases in the percentages of women holding driver's licenses between the 1983 and 1990 NPTS surveys, from 75 percent to 82 percent in the 60-64 age range and from 12 percent to 25 percent in the 85+ age range. Older women are less likely than older men to hold driver's licenses, and the decline in having licenses occurs earlier for women than for men, beginning in their mid-fifties. (But the onset of this difference is beginning to start later, as shown by a comparison between the 1983 and the 1990 NPTS data.) Especially among the higher age brackets, the differences between men and women in driver licensing is substantial: as mentioned, above age 85, only 25 per cent of all women still hold driver's licenses, while 55 percent of all men in this age group hold licenses. The percentages of persons holding driver's licenses for a wide range of age groups, based on NPTS data, are shown in Table 1 which indicates the gender differences as well.

Table 1 and Figures 1 and 2 focus on the differences in driver licensing among those persons 60 years of age and above, using data from the 1983 and 1990 NPTS surveys, the Survey of Assets and Health Dynamics among the Oldest Old (AHEAD, 1993 data), and surveys from five counties in the state of Maryland conducted by Ecosometrics, Incorporated from 1987 through 1989. These figures support the conclusions noted earlier:

- at the higher age levels, men more frequently hold driver's licenses than do women,
- this distinction appears to be narrowing over time, and
- the percentage of persons with licenses among both men and women is increasing overtime.

Table 1
Percentage of Licensed Drivers Among Elderly Age Groups, By Gender NPTS, AHEAD and Maryland Deeds Assessment Surveys

Men						
	60-64	**65-69**	**70-74**	**75-79**	**80-84**	**85+**
NPTS 1983	93.20%	90.50%	78.50%	78.20%	64.90%	47.50%
NPTS 1990	95.70%	93.60%	92.80%	86.70%	82.60%	55.10%
AHEAD	***	92.50%	89.50%	85.70%	80.10%	55.40%
Maryland	97.60%	95.11%	92.46%	81.82%	93.33%	71.43%
Women						
	60-64	**65-69**	**70-74**	**75-79**	**80-84**	**85+**
NPTS 1983	75.20%	61.80%	59.70%	38.10%	30.90%	11.70%
NPTS 1990	81.70%	77.60%	73.60%	61.50%	49.30%	24.60%
AHEAD	83.30%	79.50%	68.70%	60.50%	46.00%	24.50%
Maryland	88.90%	87.10%	70.10%	65.90%	44.10%	31.58%

*** There was an insufficient number of respondents available for this age group.

There are slight differences between the percent of women who hold licenses at various ages and how many continue to drive. Using data from the AHEAD and Federal Highway Administration (FHWA) surveys, we see that between the ages of 70-74, 74 percent of women are still licensed but only 70 percent continue to drive. These numbers change in the over 85 category, with 26 percent of the women still licensed but only 22 percent continuing to drive [6].

Figure 1
Percentage of Licensed Drivers by Age and Gender, 1983 and 1990 NPTS

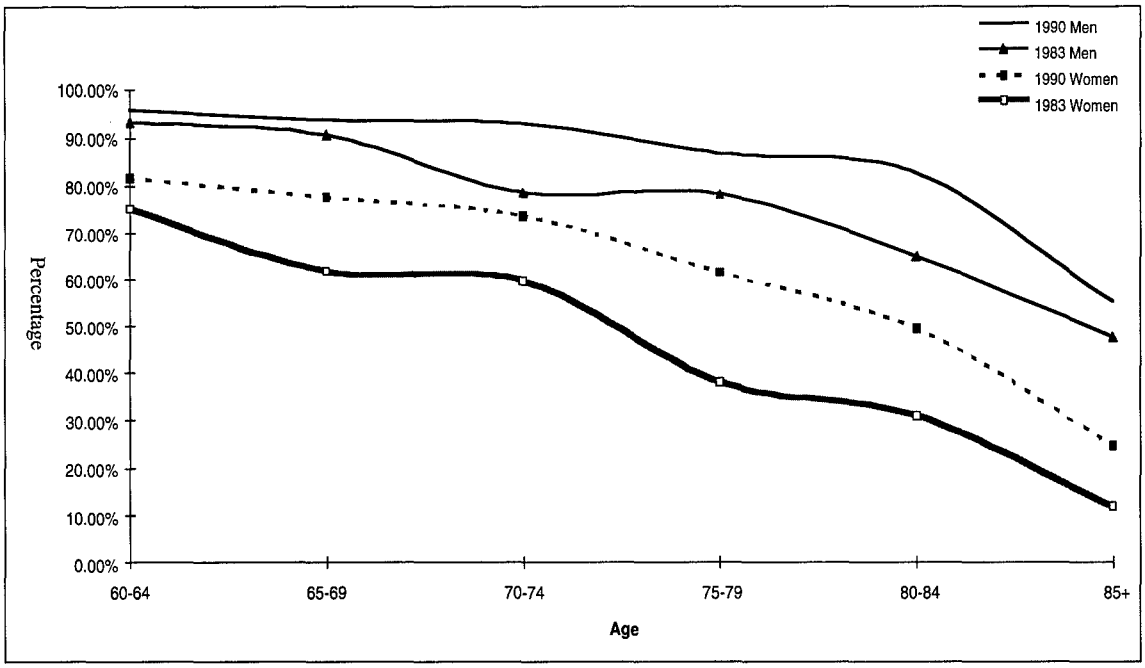
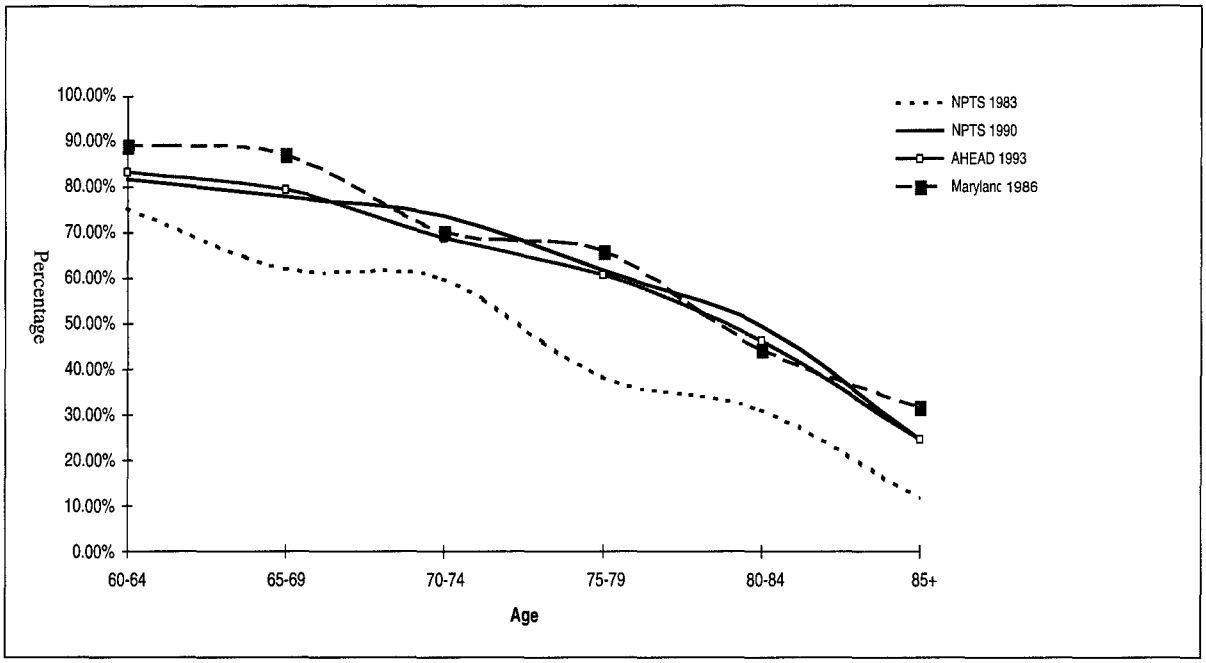


Figure 2
Percentage of Licensed Drivers by Age Group, Women Only



REDUCTION AND CESSATION OF DRIVING

Several studies have found differences between older males and female drivers in terms of decisions to limit or stop driving.

Women Who Limit Their Driving

From the literature, there are many reports that older persons limit their driving in numerous ways. These include: reducing their number of trips, reducing trip lengths, not driving at night, on superhighways, or in inclement weather, and focussing on essential rather than higher order (or social) trip purposes. We have data from the AHEAD survey which support the observations concerning reductions in overall driving and trip lengths, disaggregated by age and gender, as shown in Figures 3-5. Figure 3 illustrates that women limit their driving about 20 percent more than men do. This 20 percent difference holds for limiting trip lengths as well, with women limiting their trip lengths about 20 percent more than men do from age 65 upward. As can be expected, a comparison of Figures 4 and 5 shows that fewer women than men drive over 10,000 miles per year (15% to 43% in the 60-64 age group). Thirty-nine percent (39%) of women age 60-64 drive over 5000 miles per year compared to 67 percent for men; these percentages drop to just under 3 percent for women and just under 9 percent for men over age 85. Taken all together, these figures show that limitations increase with age and that women are more likely than men to limit their driving.

Figure 3
AHEAD Survey: Persons Limiting Driving, by Age and Gender

Winter[7], in her study of the effects of driving cessation on the older adult (using a pool of people whose licenses had been restricted or revoked by their local Department of Motor Vehicles (DMV)), also found that previous amount of driving correlated negatively with gender (in other words, women drove less than men). She also found that the amount of driving avoidance correlated with gender, whereby the women in her study avoided specific driving situations more than men. This fits in with the self restricting driving behaviors discussed previously.

Figure 4
Age Group Vs. Annual Mileage Driven, NPTS 1990, Women Only

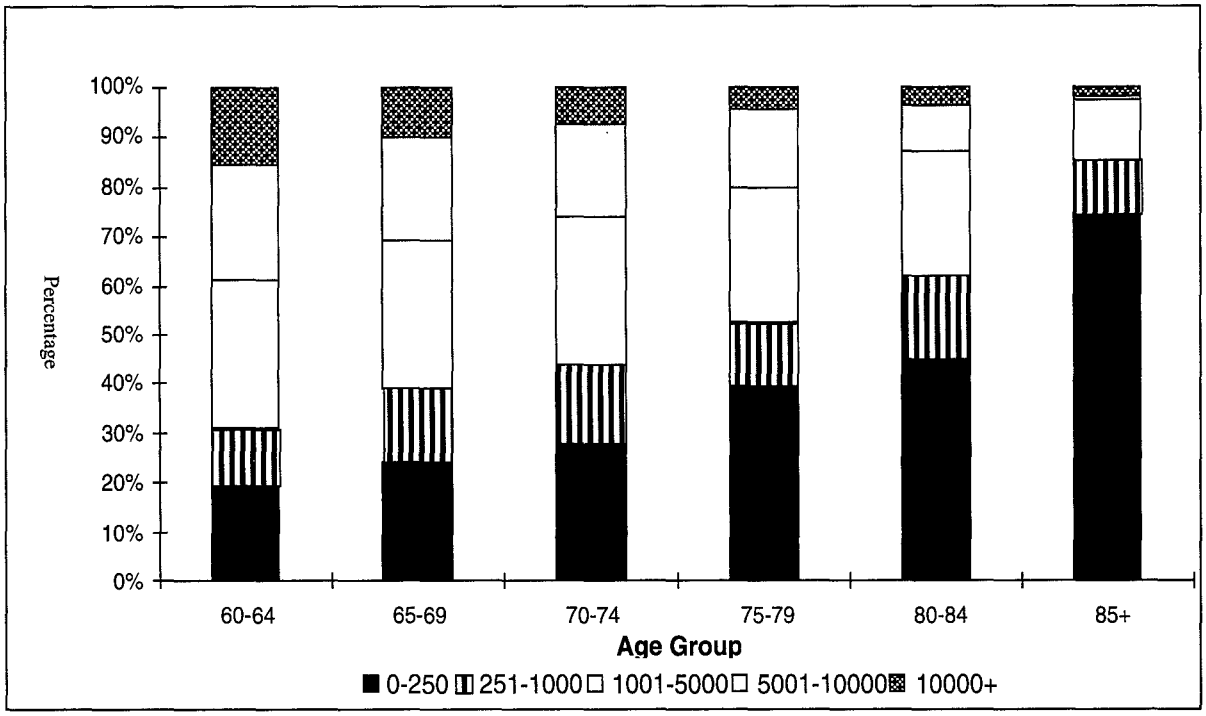
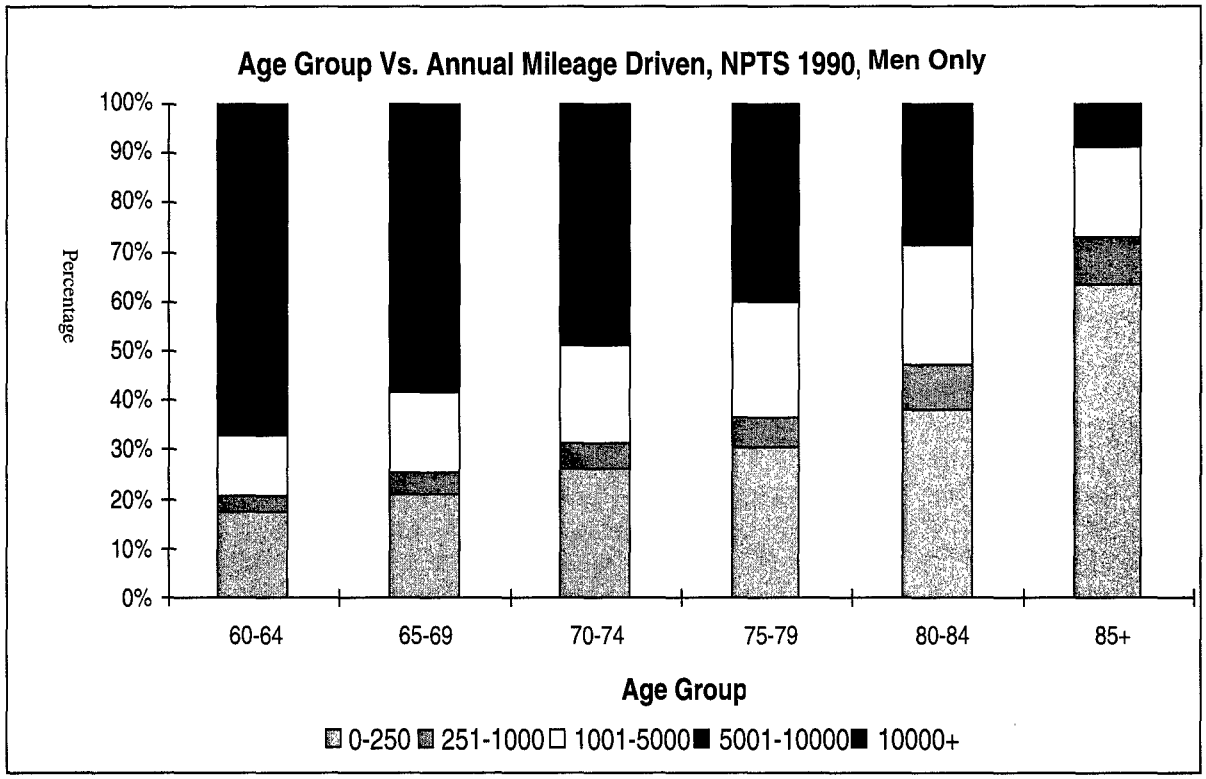


Figure 5
Age Group Vs. Annual Mileage Driven, NPTS 1990, Men Only



Women are more likely to voluntarily stop driving than men [8] or, phrased differently, men are more likely to continue driving than women[9, 10]. This can be due to the psychological implications of the role of being the driver: men see driving as part of their identity, whereas women do not. Men tend to start driving earlier and subsequently to drive more miles than women[11]; men also have, for the most part, been the main provider of transportation for their families[12, 13]. The study by Marottoli et al.[14] on driving cessation among the elderly found that women in general are less likely than men to drive; those that did drive tended to drive fewer miles than men overall and they were driving less than they had previously (based on New Haven EPESE data and the follow up). But current trends are changing the male-dominated driving roles, since many more women are driving at a younger age and are becoming much more independent and self-sufficient for their travel needs[11].

There is substantial evidence that a significant part of the "I ain't givin' up my license 'til they pry it outa my cold hands" attitude is attributable to older men. In devising strategies for dealing with such attitudes, it will be necessary to determine their roots: some may be ego issues, such as the need to feel in control of situations; others may be family role related, as in the older man who chauffeurs his wife around town; others might include a fear of the loss of mobility or also a simple denial of the decline in abilities that accompany the aging process. Eisenhandler[15] found that women without access to a car were more aware of old age as a prominent feature of their identity because their ability to get around as freely as they would wish was restricted. However, in focus groups conducted in Portland, Maine, with people who were limiting their driving, the women were no more willing than men to give up driving—even if the women were aware of and adapting to their own driving limitations. In fact, one woman said, "When you scare the living daylights out of yourself, I think it is time to stop, as far as I'm concerned."

For some persons, the reluctance to stop driving may be related to multiple factors, and these situations may prove particularly challenging when trying to convince such persons to make the transition from driver to passenger. If the issue is phrased as "give up their driving," there will naturally be a much greater resistance to change, as "giving up" and "quitting" have seriously negative connotations. If the issue comes as a directive from an outside source such as the DMV, the older driver might be more likely to resist driving cessation. Winter[7] found that older individuals who had their licenses revoked by the DMV were still likely to drive—one even the blamed the DMV by saying that the DMV "forced me to drive illegally by taking away my license." Dobbs and Dobbs[16] in their Edmonton, Alberta study of the psychological, social and economic consequences of delicensing the elder driver found a similar scenario among people with dementia who had been given a driver evaluation. Almost 10 percent of those patients whom the doctor had recommended to stop driving were still driving after the recommendation. Granted the DMV did not yet, in all cases, revoke the license in question, but that was the next step. The Dobbs' are in the process of analyzing some of their results by gender.

Loss of confidence and cost were cited as possible reasons why women stop driving[6]. Loss or lack of confidence could be a factor, particularly if efficacy theory is taken into account. Efficacy is the amount of self-confidence a person has in his/her ability to perform a specific task; a person with low perceived efficacy, or confidence, in their ability to perform a certain activity will tend to avoid that task[17]. Several studies on balance confidence[17, 18] found that women are disproportionately more likely to say they are afraid of falling than men and a greater percentage of women in the studies also reported related activity avoidance. According to Bandura's efficacy framework, perceived capability is more predictive of behavior in a given domain than actual physical ability[18]. In these instances it is used to explain activity restriction beyond what is warranted in some post-fall patients in the study. For our purposes it is an avenue to explore the reasons why women restrict, and subsequently stop, driving earlier than men do.

In the Portland focus groups, one woman stopped driving because her car died and she could not afford either to fix it or to buy a new one. Another woman stopped driving because her husband was now retired and liked to do all the driving, and that was fine with her. Accidents, medical conditions and family intervention were other reasons cited for driving cessation among our focus group participants.

Hu's study[19] found that older women were much more likely to stop driving than older men. The onset of conditions such as Activities of Daily Living (ADL) losses, Parkinson's disease, a first stroke, heart disease and cataract surgery all had statistically significant influences on women's decisions to cease driving but not on men's decisions. Men were more often influenced to cease driving by higher education, limitations on gross mobility, a second (not a first) stroke, and arthritis. Both men and women were influenced by advancing age and reduced vision. Campbell et al.[20] ran different regression models for predicting driving cessation for males vs. females. They found that in addition to increasing age, activity limitation, syncope, and macular degeneration were factors for both men and women. Stroke sequelae was also a factor for men, whereas retinal hemorrhaging and Parkinson's disease were significant factors for women.

Physical activity levels have been found to be related to driving cessation. Lawrence and Jette[21], while looking at the disablement process, found an indirect relationship between gender and activity level with women having lower levels of activity than men; these lower activity levels were associated with more lower and upper body functional limitations and Instrumental Activities of Daily Living (IADL) disabilities. The study underscores there are many potential benefits from focussing on physical activity levels as a "fruitful" intervention strategy for preventing disability, particularly among older women. Women in the non-institutionalized population had higher disability rates than men in a comparison of 1980 and 1990 census data[22]. Marottoli et al.[23] found that individuals who stopped driving experienced lower activity levels and increases in depressive symptoms over a 6-year interval.

Living arrangements influence the driving behavior of women and men differently for women and men who live alone. Hu's study[24] found that older men living alone were more likely not to drive, whereas older women living alone have an increased probability of continuing to drive. Many older adults are living alone now, due in part to the death of a spouse and in part to high separation and divorce rates. The number of older adults living alone may increase in the future as the percentages of baby boomers who live alone or marry late and have no children are higher than for any previous cohort[25].

The presence of a spouse or significant other greatly influences whether or not an older person will drive. Gerontologists have long noted the manner in which such partners assist each other to cope with the losses of old age[26]. We have all heard the stories of a non-driving spouse with good vision "assisting" the driving spouse with poor vision. This is particularly true for the many older women who have never learned to drive and for older men with significantly younger spouses. In a study of adults 50 years of age and older, Kington et al.[27] found that individuals who lived in households with other adults were less likely to drive. The study theorizes that elderly people may be more likely to choose to stop driving when there are alternatives available such as other adults to drive them around.

Our focus group in Maine found men more likely to blame external factors for their need to decrease driving than were the women; they blamed the discourtesy by others, the increased technology of cars, and driving different (new) cars for their increased difficulty in maneuvering on the roads. "The environment is unfriendly to them." The women in the focus groups tended to express more personal reasons for why they were limiting their driving—they couldn't see as well at night or did not feel comfortable driving in construction or at very high speeds. It will be interesting to see if the next sets

of focus groups that Ecosometrics conducts will yield similar information. Table 2 contains a summary of some of the comments from the focus group that was conducted with six older women (all over the age of 70) who are reducing or changing their driving behaviors.

Table 2
Summary of Focus Group in Portland, Maine with Women Who Reduced Driving:

Significant Comments

1) **Question regarding how life has changed since they reduced driving:**

"You lose your independence."
One woman said that she continues "to have ... independence with quite a few limitations."

2) **If I had to stop:**

"It would be the end of the world for me."
"I really get humble, hate to ask [for rides].'
"I would stay home, crawl into my shell, and not come out."

After not driving all winter, one woman said, "When I get it [the car] out I feel like I've sprouted wings, I feel like I can go where I want to, when I want to."

3) **The biggest problem:** "It's our pride that hurts." [Having to ask for rides.]

4) **How will you know when it's time to stop driving?:**

"When the stress level from my driving gets high enough, I'll probably throw my keys away."

"When you scare the living daylights out of yourself, that's when it's time to stop."

5) **Advice to a friend who is contemplating stopping driving:**

"Hang in there as long as you can, face it when you have to."

THE CONSEQUENCES OF REDUCING OR CEASING DRIVING

What are the mobility consequences of the reduction or cessation of driving among older women?

Items such as loss of independence, loss of a spouse's independence, increased isolation, depressive symptoms, and increased financial costs have all been named as consequences of stopping driving and also of reducing driving. When an older driver begins to restrict their driving, they impose limitations on what they can and cannot do, where they can and cannot go. Examples of this include the library book that never gets picked up, the shows that aren't seen because they take place in the evening, and the work or volunteer opportunities that are missed because the location is in a difficult to reach place. When

older adults stop driving or lose access to a vehicle, the ability to travel to and from a job each day is greatly hindered. For many, particularly older women in poverty, the ability to travel to a job interview almost disappears[28].

One outcome of the paucity of research conducted on driving cessation in general is that there is even less information on the effects on women in particular. Peter Rothe[29] conducted a study to determine the extent to which losing a license affects older adults. He surveyed 904 senior drivers, conducted focus groups with 230 elderly people and conducted open-ended interviews with 130 senior motorists who recently experienced injury-producing accidents. From this he gathered that the license to drive is synonymous with self-respect, social membership, independence and quality of life. The loss of the right to drive creates a crisis in the older adult's life; that it does create a crisis supports the proposition that quality of life and personal transportation are closely related. Other research points to the automobile and driver's license as a sign of youth, power, and masculinity, positing that the loss of a license presents more of a threat to men than to women[30]. This is in line with the theory that women are more internally motivated and men are more externally motivated.

Asking for and accepting rides from family and friends is difficult for an older person, particularly one raised in the tradition of independence and self-sufficiency. Women may have an easier time asking for rides than men do because of the more social and other-oriented ways in which women are socialized in our society. However, as a woman in one of our focus groups put it: "You really get humble, you hate to ask..." In our focus group with people over 70 who had stopped driving, we found feelings of a loss of independence and a loss of some control in life among both men and women, with few noticeable distinctions between the genders.

Older persons try to compensate for not driving by obtaining rides with family members and friends, through utilizing public transportation or specialized paratransit, by taking taxis, and by walking. There are costs, either physical, emotional or monetary, attached to each of these options. Life after reducing or stopping driving has been likened to having one's independence with quite a few limitations.

SUMMARY AND ASSESSMENT

Public pressures are increasing on State driver licensing authorities, legislators, and doctors to discourage or prevent risk-prone older drivers from continuing to drive. Comprehensive information about the impacts of driving reduction or cessation might influence future public policy toward license restrictions, steps to extend years of safe driving by older motorists, education to influence driver's self-regulation, and the provision of suitable alternatives to driving.

Seniors should be encouraged to grow into new roles. The idea of "graduating from driving" has a much more positive connotation than "giving up" your driver's license. The Central Plains Area Agency on Aging (AAA) in Wichita, Kansas developed a proactive approach to driving cessation consisting of two key elements: planning ahead for retirement from driving, and learning to drive safely longer. The premise of this approach is that the decision to stop driving should be intrinsically motivated and made by the individual for him- or herself. Once an older driver has explored all the available transportation alternatives and has a plan for the transportation options to use once he or she stops driving, the driver should be more likely to stop driving voluntarily[31]. Also, the existence of innovative alternative transportation programs that enable older persons to get around without feeling as dependent or "beholden" to others as they might otherwise feel if they had to constantly ask someone else for a ride. The Independent Transportation Network in Portland, Maine is an example of one such innovative program.

When making projections of the number of future drivers, assumptions about driver licensing and driving among females are critical. Using the assumption that females will drive at the same rate as males in the future creates a huge difference from the projected numbers of future older drivers based on a continuation of current trends, especially within the highest age groups. In the age groups of 80 and above, men drivers now outnumber the women drivers by about 2 to 1. If one assumes that an equivalency in driver licensing will be reached (that is, no gender difference in the percentages of elders holding driver's licenses), the current situation will be exactly reversed, and the number of female drivers will be almost double that of male drivers in the oldest age brackets. This would have the impact of adding one-third more oldest drivers to the roads in the year 2040. A change of that magnitude would create a very significant change from other scenarios projected for the future.

FUTURE DIRECTIONS: THE BIG UNANSWERED QUESTION

The biggest unanswered question at this time is "What difference will gender play in the reduction or cessation of driving by older adults in the future?" At present, our older adults are still from cohorts in which driving is more often performed by men, and older women are more likely to "retire" from driving than are older men. There is strong evidence that many patterns of driving behavior in younger cohorts are, increasingly, showing fewer and fewer gender-based differences. Will this make the cohorts of young females now in their 20s and 30s less likely to retire from driving in their 80s and 90s? Will they retire more frequently than males or at the same rates? The gender/cohort question remains unanswered by current research; having an answer would offer us a much clearer crystal ball regarding the driving patterns of older Americans in the next century.

SUMMARY

The women in this group were adapting to any functional and environmental circumstances that caused them to limit or change their driving behaviors. All were familiar with or had availed themselves of public transit or the Independent Transportation Network, a service unique to Portland. However, the presence of viable alternative transportation options did not appear to make the transition from driving to not driving any easier for these women. The general attitude was one of constant adaption until they have to face the actual moment of driving cessation. They did not want to plan for that moment, but would deal with it when it occurs.

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The Transportation Needs of American Women in a Cross-Cultural Context

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THE TRANSPORTATION NEEDS OF AMERICAN WOMEN IN A CROSS-CULTURAL CONTEXT

In all states with the exception of Alaska, women represent at least fifty percent of the population, with at least ten percent being over 65 years old (except for Alaska and Utah). (Upclose 1990 Census). At the same time profound social and demographic changes in America over the last twenty years are reflected in lifestyle changes of American women. Today most women live in low density urbanized communities, have salaried jobs (even those with children) and are licensed drivers, using the car for longer drives and for more trips (Rosenbloom: 1995). Women's travel patterns reflect both their work and domestic responsibilities. During this same period the use of transit and carpools have also decreased for the low income and the elderly, the majority of whom are women (Pisarski: 1992).

The traditional travel variables including household income, license-holding, and employment, while valuable for examining the travel pattern difference between groups, help to explain differences among women rather than between men and women. If the cultural factor is added as a variable by introducing the impact of race and ethnicity, will this help to explain women's travel patterns even better?

The importance of cultural factors have become observable in the changing ethnic mosaic in urbanized areas of America. Cultural preferences have begun to show up in advertisement of services such as signage in ethnic languages as well as in English. The availability of certain goods and commodities targeted towards the neighborhood ethnic population also indicate the willingness of the business world to recognize cultural preferences. If the ethnic factor which reflects cultural preferences is examined against its impact on travel patterns, there appears to be differences between Blacks, Whites, Asians and Hispanics based on lifestyle and spatial locational differences, (Miller, Morrison & Vyas: 1986).

Perhaps the same considerations may prove to be a boon for public sector service provisions such as transit. The National Personal Transportation Survey conducted in 1990 provides data for examining travel patterns. Does the data show this anticipated difference in travel patterns between the different cultural groups?

GENERAL PATTERNS

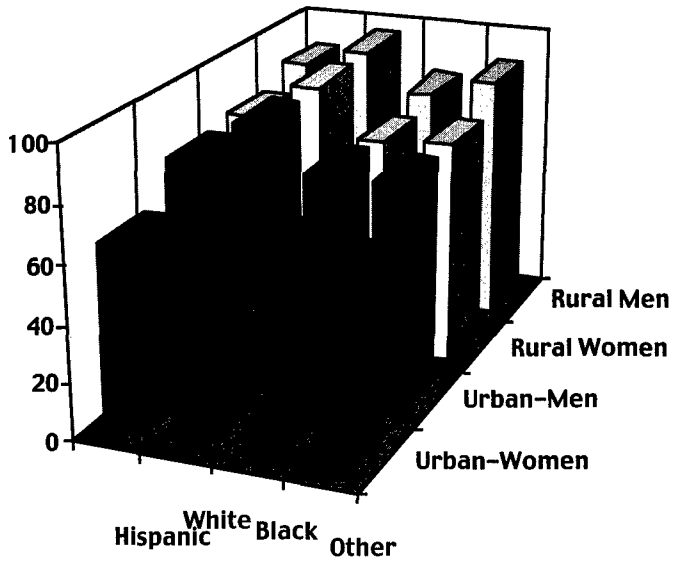
Examination of the National Personal Transportation Survey (NTPS) data for 1990 show that household income, license-holding, and employment explained the differences among different groups of women. Low income men and women in urban areas, and low income women in rural areas worked farther from home. The lowest income group of women traveled much farther than their male counterparts, (Rosenbloom: 1995).

As expected the data also shows that children have a major impact on women's travel habits. The presence of children in their lives explain the greater number of trips and distances traveled by most women 16-64 years of age. These trip patterns are further distorted based on the age of the children.

The marital status of the women also has an impact on distance traveled and the number of trips. If these travel patterns vary on the basis of income, age, and number of children in the household, the race and ethnicity factor should prove to be the remaining missing link in the equation, to explain variations in their travel patterns.

License holding is used as another indicator of travel behavior as well as mode choice. From the data, this statistic for persons 16-64 years of age if broken by sex, race and ethnicity clearly shows that for each racial category a higher percentage of men hold licenses compared to the women in that category. At the same time the differences among the comparable women groups vary.

Figure 1
License Holding People 16-64, by Sex, Race, and Ethnicity



The percentage of rural women's groups holding licenses appears to close the gap with the comparable men's group, reflecting the necessity of automobile as the only form of transportation in most areas. [Rosenbloom: 1995]. While variations between ethnic groups travel patterns exists, it is clear that cross-cultural variation in travel patterns are more likely to be evident in the major U.S. cities where larger numbers and a wider range of minority women live and work.

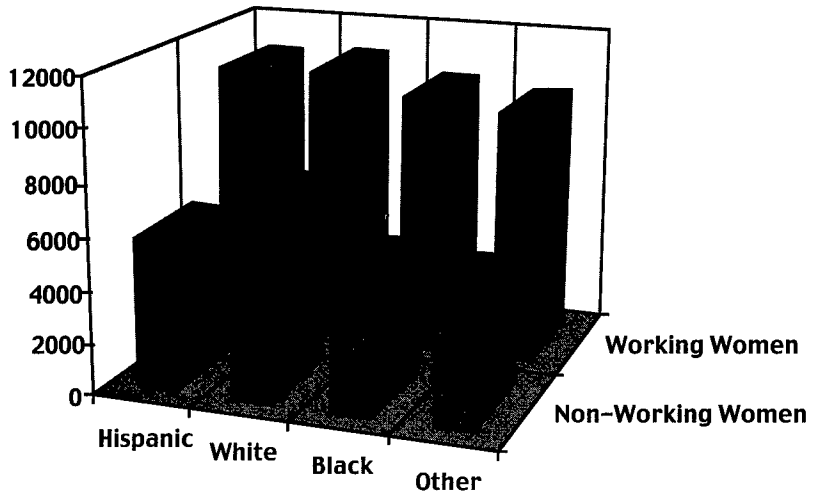
In examining other categories of NPTS data on women it is clear that within urban areas, the greatest difference among the different ethnic groups appears to be trip lengths for family/personal business with white women traveling farthest and Hispanic women the shortest distance. Here the car per household per driver may have provided an explanation for the travel patterns.

If the annual miles traveled in urban areas by women 16-64 is examined by race and ethnicity, the difference in travel patterns are least among working women regardless of race, and greatest between white working women and white non-working women **[Figure 2]**.

This would lead us to conclude that there are little differences in travel patterns among urban women from different ethnic groups. However within the major ethnic categories identified, there may be major differences which are hidden. For example, the category "Black women" include all black women. Thus any black women from the Caribbean islands, South and or Central America, or Africa have their travel patterns totally submerged by the larger black group. Likewise in the "other" women category includes Asian -American many of whom live in close knit family units, and may have the responsibility of an extended family for three generations.

This category also includes North American Indians whose travel patterns and behavior may be totally unlike the larger number of Asian-American Women in the "other" category.

Figure 2
Annual Miles Driven by Urban Women 16-64 by Work Status, Race and Ethnicity, 1990



TRANSPORTATION MODE CHOICE

The impact of culture can be gauged best from the travel mode statistics from Table 1, (Rosenbloom: 1995).

Table 1
Travel Mode for All Urban Trips by Race and Ethnicity by
Women 16-64 Years Old for 1990

Race	Private Vehicle	Transit	Walk	Bike	Taxi	Other
Hispanic	80.40%	7.40%	11.50%	0.10%	0.20%	0.40%
White	92.30%	1.50%	5.20%	0.30%	0.20%	0.50%
Black	78.70%	8.50%	11.00%	-0.60%	1.20%	
Other	80.00%	7.70%	11.10%	0.10%	0.40%	0.70%

While Table 1 clearly supports the overall findings about women using cars as the primary mode due to their multiple responsibilities (work, home, children, etc.), there are significant percentages of minority women who either walk or use transit. The percentage of walkers and transit users are similar for Black, Hispanic and other women. Walking trips are more frequent than transit trips.

The only unexpected results are the very small percentage of taxi users with "Black" women making the greatest use of this mode (0.6%), followed by "other" women. A partial explanation for these results may be due to the exclusion of older women (above 64 years old) who are more likely to use taxis.

(Black women are three times more likely to use the other mode than Hispanic women). The "other" mode may reflect the availability of jitneys, rail, subways etc. which may exist as an option in specific urban centers within specific neighborhoods or areas. The data on daily distances traveled and trips undertaken clearly reflect the pattern of license holding among women with the exception of longer daily person miles for Hispanic Women.

If the principal travel modes for selected urban trips for women by ethnic groups are examined then, excluding private vehicle trips, some interesting patterns emerge for the use of transit and walking, (Table 2), (Rosenbloom: 1995).

Table 2
Principal Travel Modes for Selected Urban Trips by Race and Ethnicity for Women 16-64, 1990, in percentage.

	Work	**Shopping**		**Family/Personal**					
	Private	**Transit**	**Walk**	**Private**	**Transit**	**Walk**	**Private**	**Transit**	**Walk**
Hispanic	80.41	13.9	5.5	78.9	4.6	23.5	85.2	3.9	10.8
White	91	4.4	3.8	94	0.5	5.3	94.9	0.5	4.2
Black	79.1	14.2	12.5	79.2	4.3	15.8	86.2	4.2	8.9
Other	75.8	16.6	7.3	80.8	5	13.5	86.9	10.8	18.9

For work trips, except automobiles, transit usage is clearly important for all women except white women. For shopping, walking appears to be very important for Hispanic women, followed by "Black" and "other" women. For trips for family or personal business "other" women use walking as the next most used mode after private vehicle, followed by transit as the next most important alternative mode. The modal choice selection is similar for Hispanic women and Black women. This usage of transit and walking may reflect in part, the different lifestyles, the difference in car ownership, license holding, as well as a different cultural preference, perhaps re-enforced by the nature of the land use patterns and availability of transit in different ethnic/cultural neighborhoods.

MARITAL STATUS & CHILDREN

In general, the presence of children for either married women, or single women as head of household has affected women's travel behavior. With an increase in the percentage of single female head of household the impact of marital status, the number of children, and age of youngest children are very critical regardless of ethnicity. If the ethnic factor is added to the impact of marital status of women on their travel behavior, some interesting patterns emerge (Rosenbloom: 1995). The largest number of trips are taken by single white mothers with children, other than those with children between the ages 6-15 years. Single Black mothers have similar patterns although they make fewer trips. Single Hispanic women with children 16-21, and single "other" women with children 16-21 make most of the trips . Clearly for both the "other" women and single Hispanic women the numbers indicate the need to make more trips for and with older children. This may be an indication of a cultural bias and a need to be protective.

In a two adult household, the daily urban trips by the female parent of white and "other" women categories are similar to the pattern of trips made by a single white female parent, although less frequently. The Black female parent appears to make fewer trips with younger children. While Hispanic women with the youngest children make most of the trips, the daily average is less than for White women.

When compared to the 1969 data, the 1990 NPTS data clearly confirms other studies conducted on women's travel behavior (the number of miles traveled by car increased by 82% between 1969 & 1990). The use of car pools dropped substantially in the same period falling 15%, while transit ridership has dropped for all categories of users including the elderly. [Pisarski: 1992]. This data does not reflect another large group of women, whose travel needs are less but who as a group are growing. It is the elderly women. What are their needs and patterns especially if the ethnic/cultural factor is introduced?

ELDERLY WOMEN

While it is clear that younger travelers' patterns do differ along racial and ethnic lines, are these differences retained as they get older? What happens to the older travelers?

An issue to be considered is the behavior of ethnic families toward their elderly female relatives that may create another form of travel assistance or travel patterns. Data on urban travel mode, for all trips by race and ethnicity for women 65 and over show that private vehicle is still the dominant mode, as shown on Table 3. (NPTS Demographic Special Report: 1995).

Table 3
Urban Travel Mode for All Trips for Women 65+ by Race and Ethnicity

Race	Private Vehicle	Transit	Taxi	Walk	All Other
Hispanic	74.20%	4.60%	1.50%	15.20%	4.50%
White	88.40%	1.70%	0.50%	8.70%	0.70%
Black	69.70%	13.50%	1.40%	15.40%	0.00%
Other	70.00%	16.30%	1.20%	12.50%	0.00%

It is clear from the data above, that transit is very important for some Black and "other" elderly, while walking is important to all minority elderly women. The unexpected low taxi usage is marginally highest for the Hispanic, followed by the Black and "other" women categories. All "other" modes (which may include jitneys) appear to be important to the Hispanic only. An interesting feature of this travel pattern is the comparison between older men and women by ethnicity and race, for daily trips, person miles, and daily vehicle trips. Older White men and women have similar patterns with women traveling somewhat less, while older Black and Other women appear to travel twenty percent less than their male counterparts. For older Hispanic women it is reduced by fifty percent when compared to their comparable men. Travel distance for the elderly does increase with household income, rising steeply up to $25,000 annual income, then the increase is slower, again rising steeply for those above $40,000 annual income level.

There are few detailed studies on travel behavior and patterns of elderly ethnic minorities outside the Black and Hispanic groups (Cruz-Lopez and Pearson: 1985). There are no detailed studies dealing with the travel patterns of elderly minority women in a cross-cultural setting. Some information on elderly women is available from the study of minority elderly population conducted in the Houston (Sen and Radhakrishna: 1990). Data collected for that study indicates that many elderly Hispanic, Asian- Indian, and Chinese women do not have driver's license, and would not drive. For the two Asian groups car ownership is tied to relatives being the main source of finance. Language barrier is also a factor preventing many minority elderly from utilizing services such as senior activities, as well as existing public transportation facilities.

In the NPTS data, cultural differences in travel patterns and behavior among women from different ethnic backgrounds show up as variations within the overall travel pattern for women. More crucial questions that cannot be answered from such statistics is the lifelong experience of many women with cross cultural backgrounds which determine their behavior, choices of activities and hence their travel needs modified by such factors as income, age, ethnicity/cultural grouping, occupation; household responsibilities, age and number of children, dependent seniors/adults if any and the number of license holders and cars in the household.

Women tend to be the primary care giver in most societies. With the lack of traditional support system of an extended family such as those in many parts of Europe, Asia, Latin America, and Africa, for many, friends or neighbors or other support systems must be used in coping with the day to day responsibilities, (Cruz-Lopez and Pearson: 1985 and Fleishmann and Shmuelli: 1984).

For many women, acquiring support in a dispersed socioeconomic landscape means using time and money for transportation. Many women from other cultures depend on male members or younger members. This is carried on throughout their lives (Sen and Radhakrishna: 1990).

Transportation needs of American Women must be perceived in terms of a number of factors; age, stage in life cycle, location, trip needs, mode choice, and life styles based on previous experiences and cultural background. The existing literature has helped to establish critical factors.
While numerous studies have already isolated the significance of stages in the life cycle, age and location of origins and destinations of trips, conventional studies of mode have dealt with preferred modes without the inclusion of life styles/cultural factors.

Yet this is critical when we consider that many women especially in urban areas are first-generation immigrants whose experience and life styles do not fit the majority. Thus a number of questions have been raised for further research and also to influence data collection efforts at all levels. They are summarized as follows:

- Do women from different cultural backgrounds bundle their trips in a different manner and in different amounts?

- Do they also choose to substitute time for money or travel time for some other activities?

- How do women with prior living experience outside the U.S. choose transport modes or conduct their lives?

- What are the average household size, and the number of non-driving adults and children in the household?

- What are the influence of country of birth / culture on preferred mode, or use of existing mode(s)?

- What are the influence of prior transportation experience on their travel behavior and patterns in the United States?

- What are the influence of their length of residence in the United States and their age at immigration.

- For those women who have acquired their licenses at some later stage in their lives, how do they use the car and how often and where and when do they travel?

If cultural minority women's groups born in the United States are added to those foreign-born or foreign-raised, there is a wide variety of transport experience which may influence their mode choices and travel behavior and patterns (Table 4).

Table 4
Cultural Background and Probable Transport Experience

Background	Mode
Africa	Walking, Bicycle, Bus, Private Auto, Horseback / Camel
Europe	Public Transit, Train, Sub-Way, Bus, Bicycle, Cart, Walking, Truck, Private Auto
Asia	Bus, Bicycle, Rickshaw, Thukthuk (Three-Wheeled Motorized Vehicle), Train, Cart, Taxi, Contract Bus, Boat, Ferry, Bicycle, Walking
South / Central America	Public Transit, Bus, Private Auto, Subway, Train, Airplane, Horseback, Taxi, Jitney
Australia / New Zealand	Public Transit, subway, airplane, Horseback, Taxi, Bus, Private Auto, Walking
United States	Walking, Jitney, Subway, Ferry, Airplane, Suburban Train, Private Auto, Bus

Table 4 indicates very similar range of modes for all continents and countries. However, the travel conditions, and the primary available mode differ and so do the lifestyle and responsibilities for the women, in all settings.

Although the differences in lifestyles may be great, there are some common elements for those now living in the United States. A Navaho woman in the reservation may walk or get a ride, or use transit if available if she does not have her own vehicle. An African woman who may have moved to the United State may walk, ride transit, or get a ride if she does not own a vehicle.

Those migrating from large population centers of the world, with some education, some knowledge of the English language, will have a different set of lifestyles, expectations, and adaptability. Hence they are likely to become automobile users (unless they are middle-aged or older immigrants). Those who have immigrated from smaller towns and rural areas and have language barriers are more likely to be dependent on public transit, walking, or getting rides. Car ownership may also be delayed due to insufficient income. If these factors are combined with marital status for the women, there may be a longer dependence on public transit, walking or getting rides, by all immigrant women.

Low income cultural minorities among women born in the United States may show similar behavior and travel patterns as the previous group of immigrant women.

A final question that should be raised is how will these women travel as they continue to age in the United States? Will their preferences and behavior shift over time just like the average American-born woman or will their behavior revert to the more dependent role as defined in their respective cultures?

These questions are important in providing the data for future transport service planning especially in areas with high concentrations of immigrants. Such data if collected over time may provide a better guide

to the future demand for para-transit, fixed-route and other types of transportation. Clearly, for many of these women, aging in the United States may lead to the introduction of different types of services and or a more restricted dependent lifestyle close to their friends, relatives, and or children.

Although women with cross-cultural experience may not be a very large group in any city, they may form a significant minority in the socioeconomic landscape (US News: October 7, 1996). Their travel needs and behavior as they age, combined with those of the all other non-driving elderly may be influential in the demand for alternative modes of transportation to the private automobile. Perhaps this increased demand for some form of public transportation may generate some innovative services. If the advent of cycle rickshaws in Oxford, England, is an indicator of transit innovations, it is not inconceivable that similar non-motorized vehicles could be considered for neighborhood services (India Abroad: September 20, 1996).

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Household and Trip-Making Characteristics of Zero Vehicle Households in Northeast Illinois

Mary Lupa

Chicago Area Transportation Study

HOUSEHOLD AND TRIP-MAKING CHARACTERISTICS OF ZERO VEHICLE HOUSEHOLDS IN NORTHEAST ILLINOIS

INTRODUCTION

The goal of this study is to look at zero vehicle households in the six county Northeastern Illinois region. Three tasks will be performed:

1) a brief comparison of zero vehicle households to all households in the region;
2) a comparison of one person households with zero vehicles by gender; and
3) an interpretation of a set of needs for occupants of zero vehicle households based on quantitative and qualitative survey data.

CHICAGO AREA TRANSPORTATION STUDY HOUSEHOLD TRAVEL SURVEY

The CATS survey is a home interview completed in 1994 which reflects the travel during an average weekday by households in the northeastern Illinois region. This database contains three linked files with 19,314 households, 40,568 persons and 162,755 trips.

The following variables will be used in the overview of zero vehicle households:

Household Data:
- total persons
- number of vehicles owned
- household income level

Person Data:
- age in years
- sex
- total trips made

Trip Data:
- mode
- trip length

COMPARISON OF ZERO VEHICLE HOUSEHOLDS TO TOTAL HOUSEHOLDS

Zero vehicle households differ from total households in several ways which will be presented in plot form. These differences are:

- geography
- household income
- number of persons in the household
- household type
- average trip length
- mode of travel

76% of the residents of zero vehicle household live in the City of Chicago while 38% of the total households reside in the City of Chicago. 37% of the zero vehicle households are in the lowest income category, less than $15,000, while 12% of the total households are in that category. One person households provide 60% of the zero vehicle households and 26% of the total households. Household relationship type differs as well. Households with one adult and one child under 14 make up 3.6% of the zero vehicle households and 1.4% of the total households. The mean trip length was lower in the set of zero vehicle households than in the set of total households. Auto driver dominated the mode used by all households while walk and bus were used most in the zero vehicle households. These six differences in the sample sets are presented in graph form in Figures 1-6 as well as in tabular form in Appendix 1.

Figure 1
Total Vs. Zero Vehicle Households by County/City

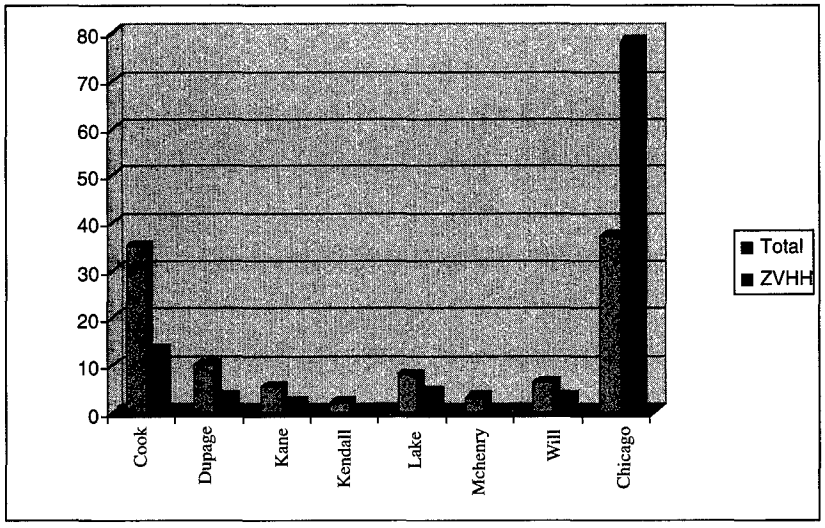


Figure 2
Total Vs. Zero Vehicle Households by Household Income

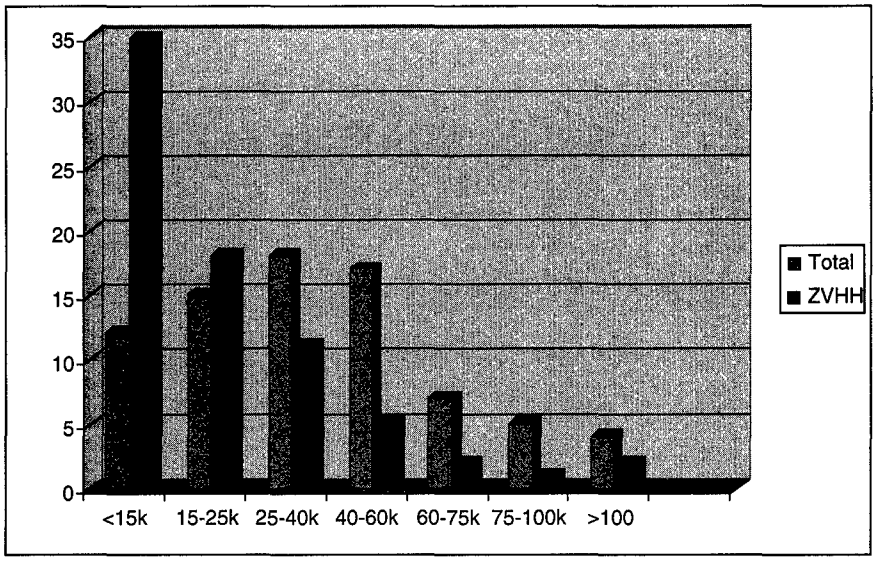


Figure 3
Total Vs. Zero Vehicle Households by Number of Persons

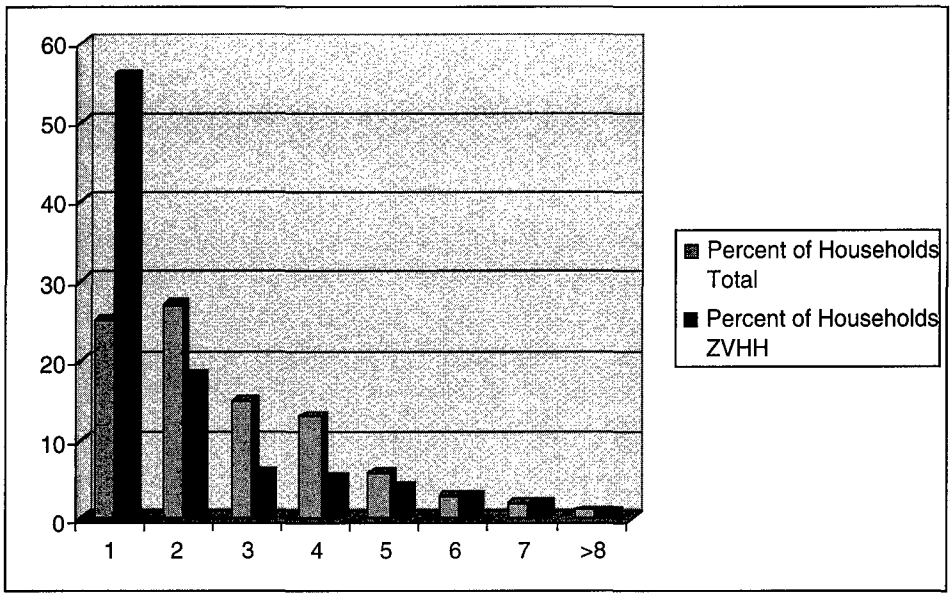


Figure 4
Total Vs. Zero Vehicle Households by Household Type
(HH type adults: children)

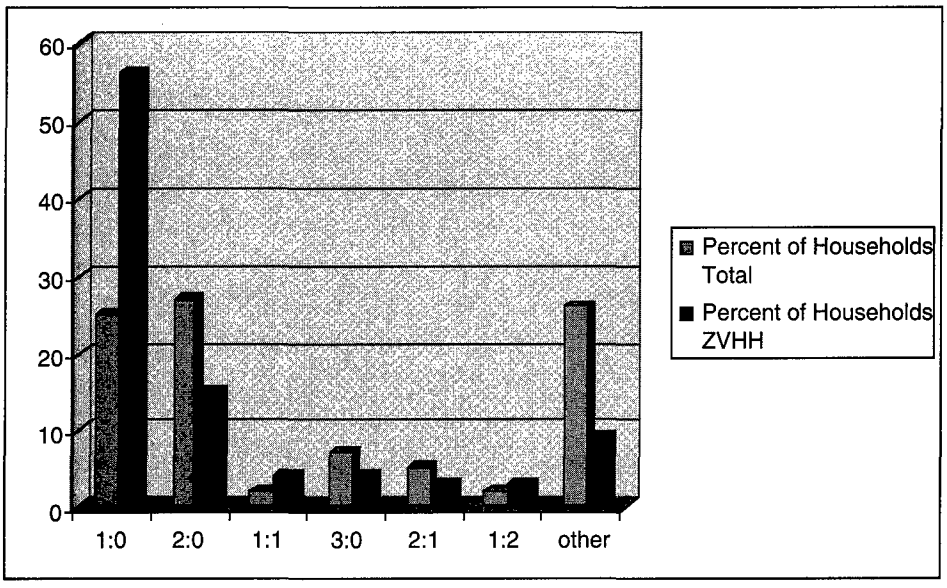


Figure 5
Total Vs. Zero Vehicle Households by Trip Length

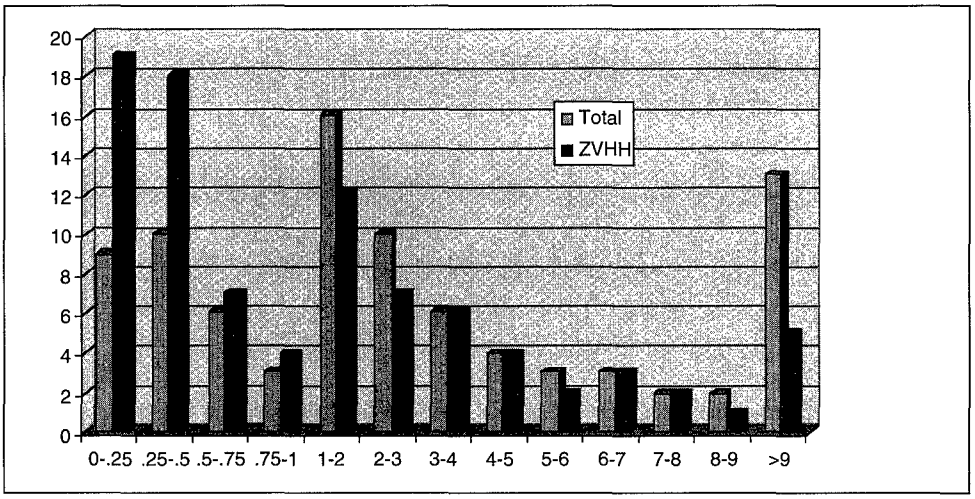
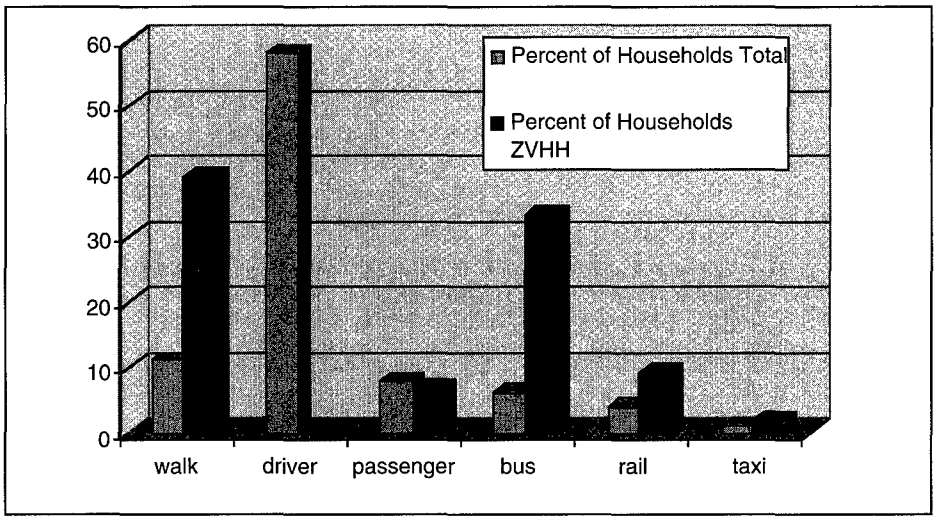


Figure 6
Total Vs Zero Vehicle Households by Mode



COMPARISON BY GENDER IN ONE PERSON ZERO VEHICLE HOUSEHOLDS

One person zero vehicle households were chosen for further analysis. This sample set had 805 unweighted households to examine. These households may be broken down as follows:

75% female and 25% male;
33% had household income less than $15,000;
54% retired;
38% working full or part time;
32% made no trips, 24% made 2 trips per day;
10% under 30 years of age, 30% 30-60 years; and 60% over 60 years;
43% of trips were by walking, 29% by bus, 9% as auto passenger and 3% by taxi.

Some of these results will be presented by gender. Of the 32% of the sample set that had income less than $15,000, 83% were female and 17% male (Figure 7). The proportion that each sex made up of each age group showed a higher proportion of females in most of the age groups and particularly in the older age groups. Although females were making 65% of the total trips, they were represented disproportionately as bus riders (72%) and auto passengers (86%).

Mode by gender may be examined more closely by controlling for household income. This examination showed roughly similar proportions of same income females and males making walking, bus and auto passenger trips. Trips by taxi made by males in the highest income category occurred at four times the rate of females in that category; trips made by males in taxis also occurred at three times the rate of females in the lowest income category. These results may be found in Appendix 4.

QUALITATIVE COMMENTS

The CATS Household Travel Survey allowed respondents to note why no trips were made on the study day. This data provides an insight into some characteristics of the low income female population who live alone without an automobile. The data suggests that this population makes up a large part of the zero vehicle database. The reasons for no trip being made may be categorized as shown in Table 1: Reasons for Making no Trip in Zero Vehicle Households.

This qualitative data along with the quantitative results shown above suggest several policy directions, particularly for the transit service providers that serve the City of Chicago. These include:

- transit fares based on distance; since households with no automobiles travel shorter distances;
- subsidy of taxi use by low income households since this mode seems to be attractive even to travelers with low household incomes;
- more demand response transit service since this mode simulates taxi service but at a lower price;
- greater attention to transit security since this concern affects the aged and infirm population to a greater extent than it affects the general population.

Table 1
Reasons for Making No Trip in Zero Vehicle Households. Health and Age

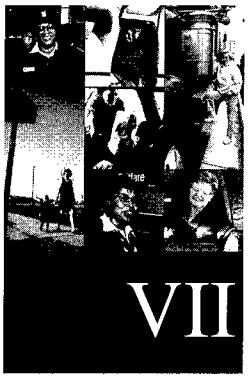
Health and Age	**Lack of Need**	**Auto Centered Traveler**
Blind	No need	Car being repaired
Disabled	None needed	Don't drive
Doesn't travel	No place to go	Car in body shop
Handicapped	No reason to leave	No car available
Half blind		Licence revoked
Had the flu	**Home as work (paid or unpaid)**	No car
Arthritis		No transportation
Too old only doctor		Walked everywhere
Does not travel	Disabled husband	Car broke down
Poor health	Spring house cleaning	
No trips too old	Baby sitter	
Ill health-age	Research paper	**Need for companion/security**
House ridden	Had company	
	Stayed with kids	No one took her
Other	Did yard work	Unable to travel alone
	Too busy	I live alone
Bad weather	Laundry	Don't use public transportation
Didn't want to	Prepare for weekend	
No sitter for child	House cleaning day	
Better things to do	Housework to do	
	Doesn't go out	
	Yard work to do	
	Worked around the house	
	Cared for an ill person	
	Just had a baby	

ACKNOWLEDGMENTS

Thanks to the Chicago Area Transportation Study for access to data and resources in the preparation of this report. The views represented in this report are the author's alone

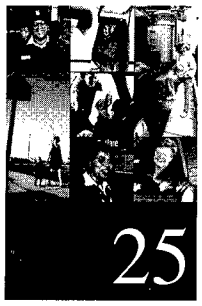
RESOURCES

Chicago Area Transportation Household Travel Survey, Information Services Division, 1994.



VII

WOMEN'S SAFETY AND SECURITY ISSUES



Women, Alcohol, and Traffic Safety

Patricia Waller

University of Michigan

WOMEN, ALCOHOL, AND TRAFFIC SAFETY

We have heard reports about women's increasing presence in motor vehicle fatalities and dangerous driving. According to data from the National Highway Traffic Safety Administration (1995), between 1975 and 1994 the number of male drivers in fatal crashes dropped from 45,084 to 39,739, a drop of almost 12 percent. During the same period, women drivers in fatal crashes increased from 9,356 to 13,430, an increase of 43.5 percent (National Highway Traffic Safety Administration, 1995). It is understandable that these numbers caused alarm.

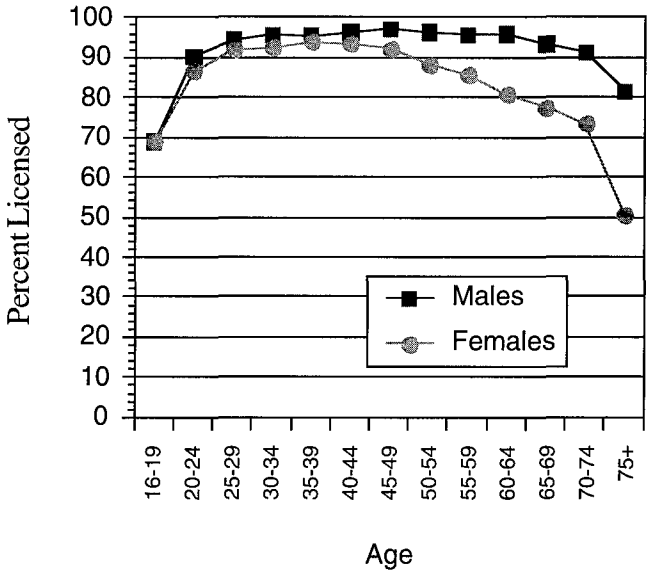
What is happening with women? The role of women in our society, and particularly their role in relation to transportation, has changed dramatically over the past two and a half decades. Changes that affect women and transportation include changes in driving behavior, changes in crash involvement, changes in alcohol use and alcohol-related crash involvement, demographic changes, and differences in alcohol's impact on women.

CHANGES IN DRIVING BEHAVIOR

LICENSURE RATE

Women are increasing their rate of driver licensure, so that they are rapidly approaching that of men (Figure 1, Massie and Campbell, 1993). Furthermore, they are now as likely as men to acquire license as early as the law allows. While the number of licensed drivers increased for both sexes between 1975 and 1994, the increase for men was 26 percent, but the increase for women was 45 percent (Massie and Campbell, 1993). It can be seen in Figure 1 that up until the mid-40s, women are holding license at about the same rate as men. The discrepancy seen in the later ages is undoubtedly a cohort effect, that is, as today's population becomes older, the higher rates of licensure for women will persist into the older years.

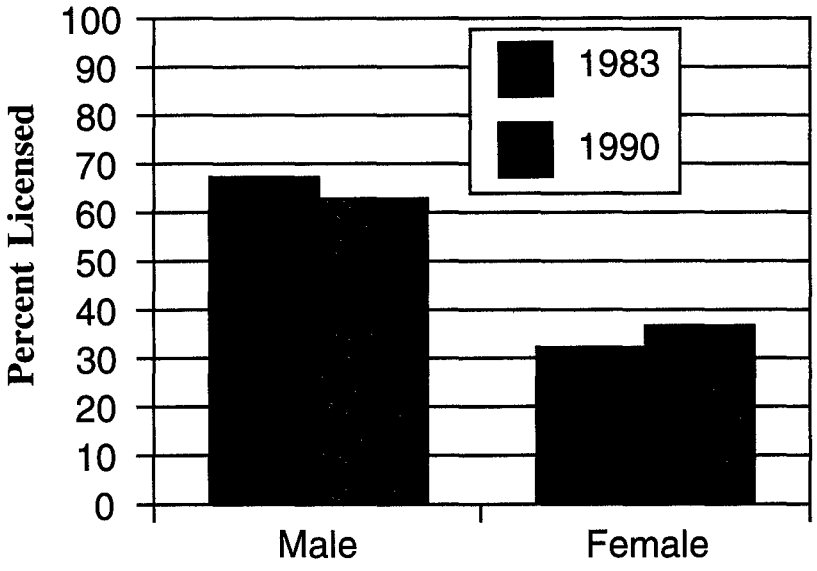
Figure 1
Percent of population holding driver license, by age and sex



MILEAGE DRIVEN

While women still do not drive as many miles as men, they are increasing their mileage, as well as their proportion of the total mileage accumulated (Figure 2, Massie and Campbell, 1993).

Figure 2
Proportion of annual mileage accumulated by gender, 1983 vs. 1990, from Nationwide Personal Transportation Surveys.



TIMES AND PLACES DRIVEN

Women are also driving at times and places previously dominated by male drivers, namely, at night, on weekends, around entertainment establishments, and on long trips. Women account for the major changes in travel behavior occurring in the U.S. today (Pisarski, 1992).

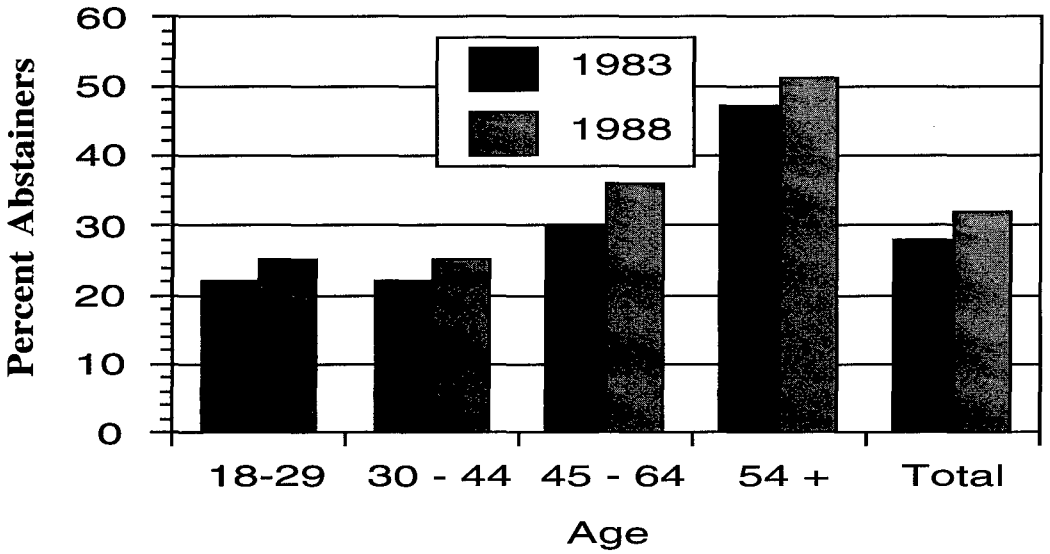
CHANGES IN CRASH INVOLVEMENT

Not surprisingly, as women increase their presence in the driving population, they have also increased their crash involvement. As mentioned earlier, the increase in crashes has been much greater for women than for men. However, the increase has not been consistent across crash types. Women are disproportionately increasing their involvement in fatal crashes. Figure 3 shows the changes in the male-to-female ratio of crashes per 100,000 licensed driver, by type of crash, between 1988 and 1994 (National Highway Traffic Safety Administration, 1995).

First, it can be seen that for all crash types, men have higher rates relative to women, based on number of licensed drivers. However, it is also evident that from 1988 to 1994 this ratio changed fairly little for property damage and injury crashes. In contrast, for fatal crashes, the ratio dropped in this time interval, indicating that women have increased their involvement in this type of crash relative to their total crash involvement. Unfortunately, valid data for injury and property damage crashes are not available prior to 1988, but for fatal crashes, data are available since 1975. Roughly

speaking, in 1975 men had about four fatal crashes for every one involving a woman driver. That ratio is now somewhat less than three fatal crashes for every one involving a woman driver.

Figure 3
Male-to-Female Ratio of Crashes Per 100,000 Licensed Driver, by Type of Crash, 1988 and 1994.



CHANGES IN ALCOHOL USE

There have been changes in alcohol use over the last decades. Figures 4 and 5 show the prevalence of abstinence in the U.S. for men and women in 1983 and 1988.

Abstainers included three groups, namely, 1) lifetime abstainers, who had consumed fewer than 12 drinks in a lifetime; 2) former drinkers, who consumed 12 or more drinks in one or more years, but no drink in the past year; and, 3) infrequent drinkers, those who drank less than 0.01 oz. daily in the past year (National Institute on Alcohol Abuse and Alcoholism, 1994).

Drinkers were classified into three groups, namely, 1) light drinkers, who consume about 1 to 13 drinks per month; 2) moderate drinkers, who consume about 4 to 13 drinks per week; and 3) heavier drinkers, who consume about 2 or more drinks per day or 14 or more drinks per week. Figures 6 and 7 show the proportion of drinkers who are classified as heavy drinkers, by age. It needs to be underscored that the percentages for heavy drinkers are based on the drinking population only (National Institute on Alcohol Abuse and Alcoholism, 1994).

First, it can be seen that for all age groups, and for both years, women have higher rates of abstinence (Figures 4 and 5). Second, it is also evident that abstinence has increased over the time frame examined. This time frame coincides with the intensified involvement of citizen action groups in addressing the problem of drunken driving. However, it should be noted that for both sexes, significant proportions still fall into the moderate and heavier drinking categories (Figures 6 and 7). In fact, women age 65 and older are the only group that does not show a decrease in the proportion of drinkers categorized as heavy.

Figure 4
Prevalence of Abstinence in U.S. Population, 1983 - 1988, Males

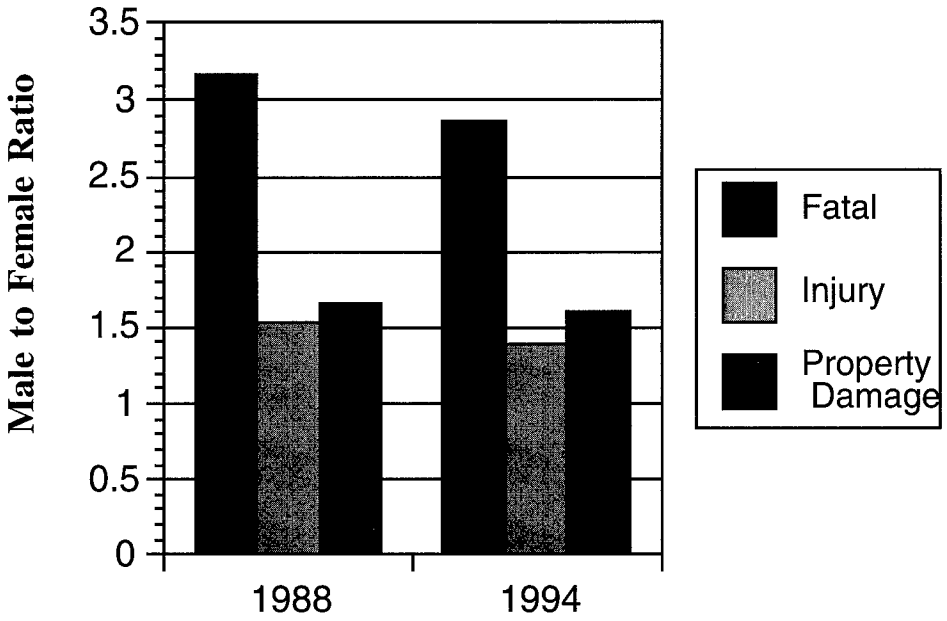
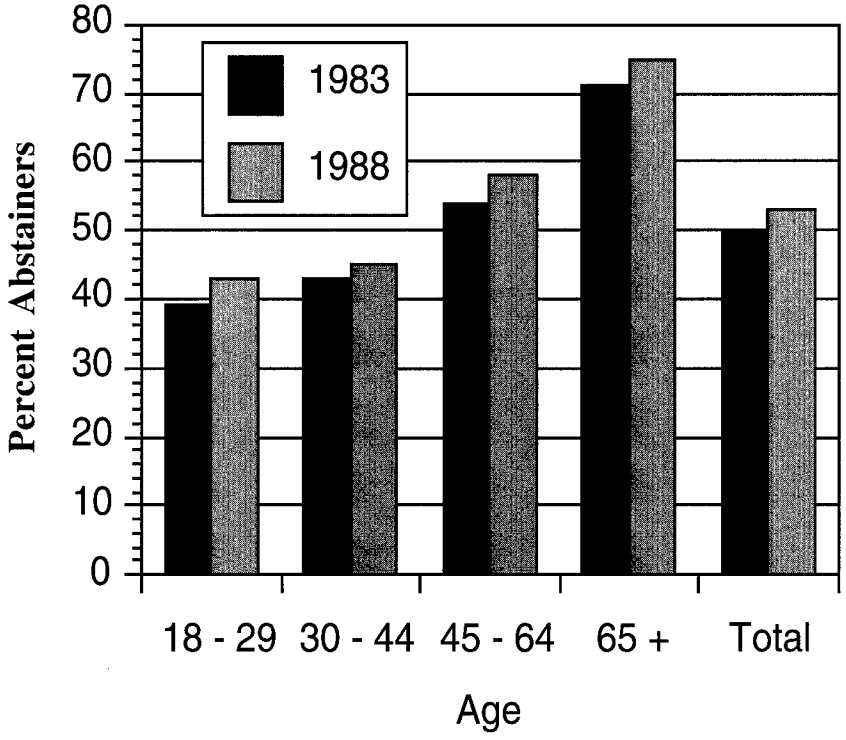


Figure 5
Prevalence of Abstinence in U.S. Population, 1983 - 1988, Females.



CHANGES IN ALCOHOL-RELATED CRASH INVOLVEMENT

In contrast to these figures showing increases in abstinence and decreases in heavy drinking, in the late 1980s there were numerous reports from around the world stating that women were a growing menace on the highway where alcohol was concerned. Indeed, the data show that, in the U.S., between 1982 and 1994, women increased from 12.9 percent of the drinking drivers (any measurable alcohol) in fatal crashes to 15.2 percent. For drivers with blood alcohol concentrations (BACs) of 0.10 percent or higher, in fatal crashes, the increase was from 12.3 percent of all drunken drivers to 14.6 percent (National Highway Traffic Safety Administration, 1995). Such changes were being reported worldwide. Increases in the rate or proportion of women drinking drivers have been reported from Canada (Beirness, 1989), Finland (Pikkarainen and Penttila, 1989), Germany (Puschel, Janssen, Schmutte, and Jansen, 1989; Freudenstein and Schmidt, 1989; Erkens, 1989), New Zealand (Bailey, 1989), Sweden (Jones, Holmgren, and Andersson, 1989), and the U.S. (Popkin, 1991; Yu, Essex, and Williford, 1992).

As in the case of total fatal crashes, men account for by far the largest proportion of alcohol-related arrests and crashes. Women, however, are an increasing proportion of the total drinking-driving problem. Figure 8 shows total alcohol-involved drivers in fatal crashes by sex, for 1982 through 1994.

Figure 6
Prevalence of Drinkers Categorized as Heavy, 1983-88, Males.

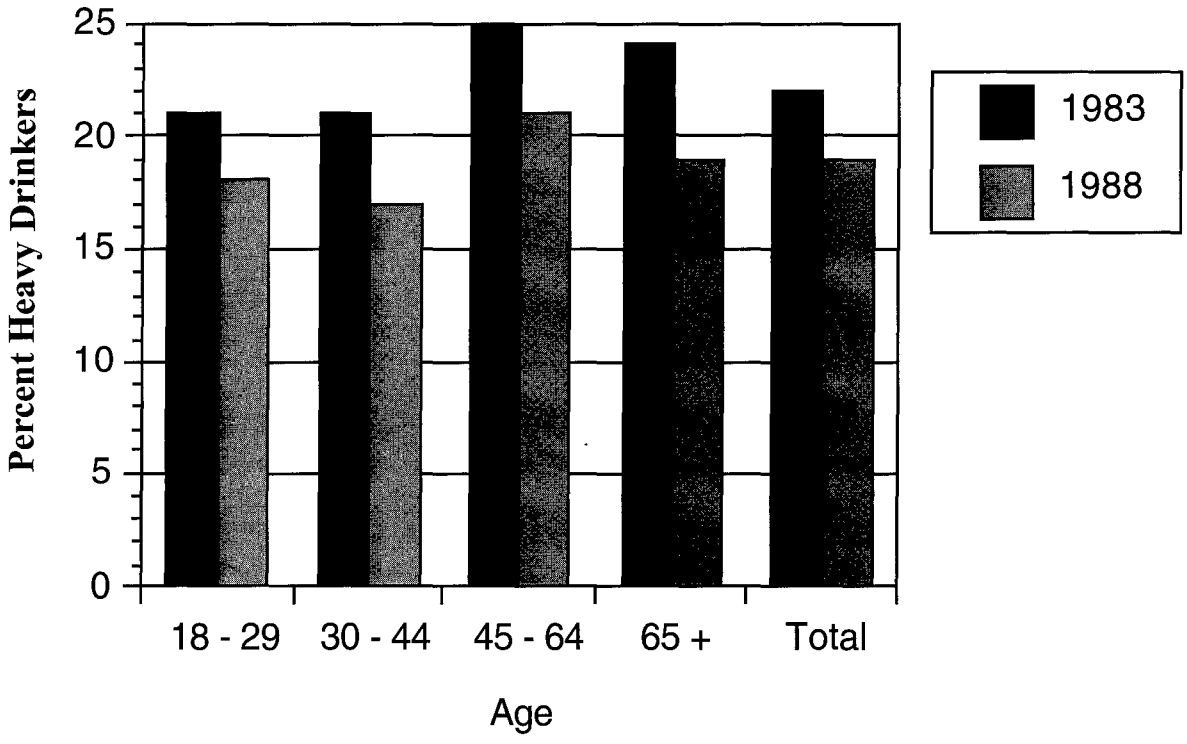
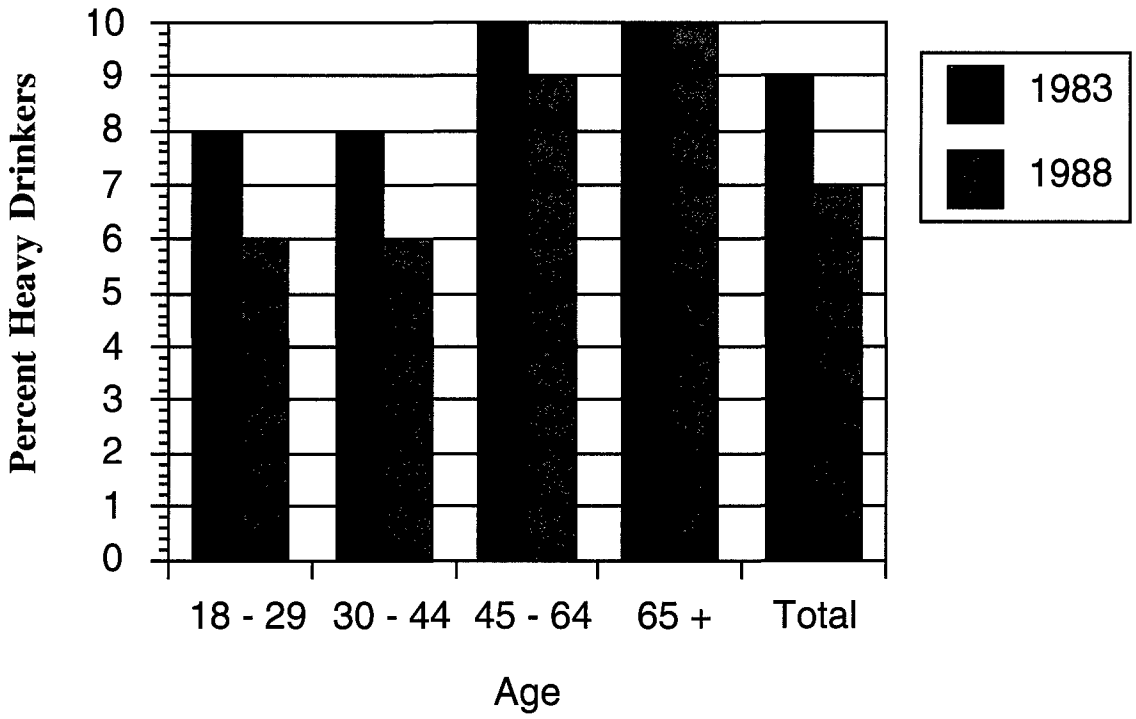


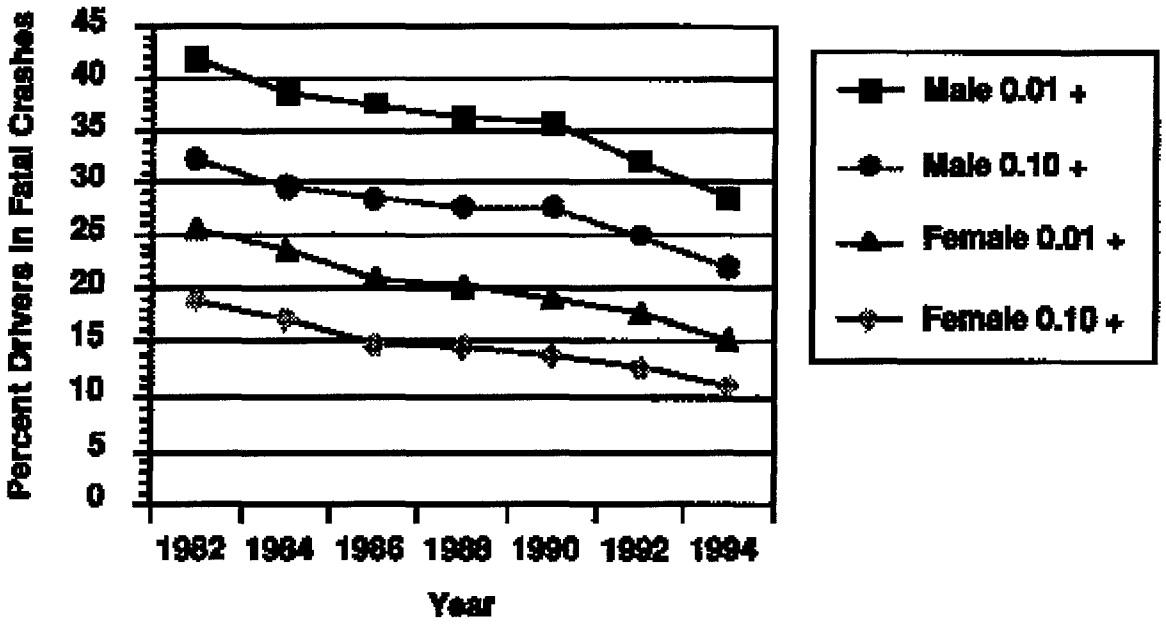
Figure 7
Prevalence of drinkers categorized as heavy, 1983 - 1988, Females.



In response to an intensified concern about drinking and driving, with numerous corresponding measures to reduce the combination, alcohol-related fatal crashes have dropped dramatically for both men and women. Several other points should be made about this figure. First, from 1982 through 1994, of those drivers who tested positive for alcohol, for both sexes, about three-fourths were at 0.10 percent BAC, the legal limit in most states, or higher. This ratio has not changed appreciably from 1982 to 1994. Thus, it appears that, of those drivers who do drive after drinking and are involved in fatal crashes, most have been drinking heavily. Nevertheless, the total numbers are lower (National Highway Traffic Safety Administration, 1995).

Somewhat less obvious from this figure is that, from 1982 to 1994, women have increased as a proportion of total drinking drivers. This increase is what has led to the growing concern about women's drinking and driving. However, these reports need to be interpreted with caution. For both men and women, alcohol-related fatal crashes have decreased, not only in number, but also in proportion of all fatal crashes. As reported earlier, women have greatly increased their numbers in total fatal crashes, while men have actually shown a marked decrease. Consequently, even though fatal crashes involving alcohol have dropped for women, and have dropped as a proportion of their total crashes, because of the changes in the number of total crashes for the two sexes, women show an increase as a proportion of all alcohol-related crashes. However, when alcohol-related crashes are examined as a proportion of total fatal crashes, women have actually shown greater relative decreases than have men (Fell, 1987; Waller and Blow, 1995).

Figure 8
Percent of Drivers in Fatal Crashes Testing Positive for Alcohol, by Sex, 1982 - 1994.



DEMOGRAPHIC CHANGES

Several demographic changes that have special relevance for women's travel behavior and their likelihood of being involved in an alcohol-related crash are discussed briefly below.

PARTICIPATION IN LABOR FORCE

Women's entrance into the labor force has increased, so that they will account for about 47 percent of the total labor force in the year 2000 (Fullerton, 1989). Married women have been a significant part of this change. Fewer than one-third of married women were in the work force in 1960, but now most women, about 60 percent by 1990, and even those with young children, are employed.

The change in job status has also provided women with greater control over resources than was previously the case. While women still receive lower pay than men, their economic independence has increased. Women now account for about half of all new vehicles sold (Belton, 1992).

DEMOGRAPHIC CHANGES

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AGE OF MARRIAGE, RATE OF DIVORCE

Another major change affecting women and transportation is the increase in age of marriage, as well as in the rate of divorce. Both these factors, in combination with higher rates of employment, have led to greater independence for women, with accompanying transportation requirements. They now account for about half of all new cars sold. Based on data from the Nationwide Personal Transportation Survey, single mothers make more vehicle trips than comparable married women (Rosenbloom, 1994). Although women drive fewer miles than men, they make more trips per day. It also appears that the travel behavior of women is more affected by variables other than their household income or whether they hold a driver license. For example, single mothers make more trips by automobile than almost any other group. If a mother is paying a dollar for every minute she is late to pick up a child at nursery school, she can hardly afford to be waiting for the bus.

The number and ages of children markedly affect the number of trips made by women, while travel patterns for the man of the house remain relatively unchanged in relation to children (Rosenbloom, 1994).

GRAYING OF AMERICA

Another demographic phenomenon that has special relevance for women is the graying of America. On the whole, women live longer than men. Thus, even if the husband has been the primary driver, women are likely to find themselves in that position. With increasing age, the ratio of women to men increases.

With increasing age, the probability of no longer qualifying for driver licensure also increases. But loss of licensure does not mean that transportation needs cease. The increasing elderly population in need of transportation services will be composed primarily of women. Furthermore, for the first time in history, more of these elderly are living in the suburbs than in the cities. These are the women who married after World War II and populated the newly built suburbs. They raised their families, and the children grew up and left home. The spouse died, so that these suburbs are populated with adults living alone in single family dwellings. This situation poses unprecedented problems for the design of adequate public transit systems. By far the largest proportion of the elderly who will confront transportation problems will be women. furthermore, for the first time in history, more of these elderly are living in the suburbs than in the cities. These are the women who married after World War II and populated the newly built suburbs. They raised their families, and the children grew up and left home. The spouse died, so that these suburbs are populated with adults living alone in single family dwellings. This situation poses unprecedented problems for the design of adequate public transit systems. By far the largest proportion of the elderly who will confront transportation problems will be women.

WOMEN AND ALCOHOL

Another major issue associated with the aging population, and the increasing proportion of women in that population, relates to alcohol. At the present time, drinking and driving is not a major problem among older drivers. As shown in Figures 4 and 5, the older population drinks less than younger cohorts. However, it is important to recognize certain generational differences. Older drivers today grew up during Prohibition and the Great Depression, times that were characterized by very low per capita consumption of alcohol. Women, particularly, were unlikely to drink, especially in certain regions of the country.

In the 1960s major social changes occurred. The Constitution was amended to lower the age of majority to 18. Most states subsequently lowered to 18 the drinking age for any alcoholic beverages. At the same time, the women's movement was growing stronger, and with increasing economic and social independence, there were marked changes in women's use of alcohol. This phenomenon has been reflected in the growing presence of women in the drinking driving population.

Longitudinal studies indicate that drinking patterns characteristic of middle age may be maintained into later years to a greater extent than previously thought. In an NIAAA Report to Congress (National Institute on Alcohol Abuse and Alcoholism, 1994), it is reported that

> drinking patterns of middle age may be maintained into older age to a greater extent than previously appreciated and...some of the changes in drinking observed among the elderly may reflect those taking place in society as a whole rather than being an age-specific effect (p. 23).

Cross-sectional studies had shown that older people drink less, and it was assumed that drinking patterns change over the life spectrum. To some extent that is true, but the longitudinal studies suggest that cohort differences may translate into subsequent differences in the drinking behaviors of the elderly.

This phenomenon has special significance for women for several reasons. First, it is well established that as BAC increases, crash risk increases at an accelerating rate (Figure 9, Borkenstein, Crowther, Shumate, Ziel, and Zylman, 1964). Second, even in the absence of alcohol, older drivers are at higher risk of crash based on miles driven (Figure 10, Peck and Romanowicz, 1993/1994). Third, it is well established that older people are more susceptible to the impairing effects of alcohol, and, fourth, women appear to be more impaired by alcohol than men.

Figure 9
Relative probability of causing a crash as a function of Blood Alcohol Concentration (BAC).

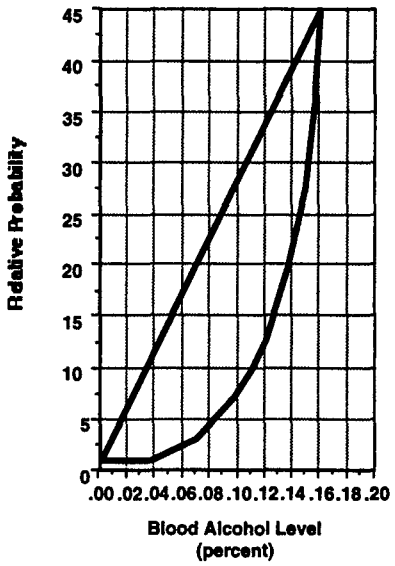
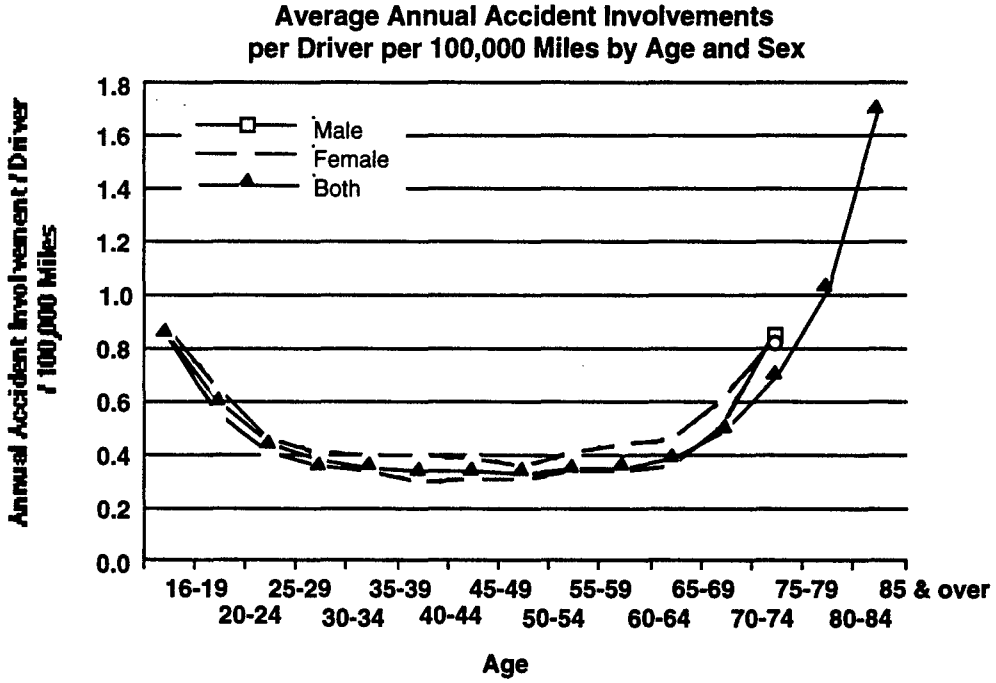


Figure 10
Annual Crash Rates based on Mileage Driven, by Age and Sex.
(Peck and Romanowicz, 1993/1994).



AGING AND ALCOHOL CRASH RISK

For a given weight, an older person will reach a higher BAC than a younger person. Presumably this is related to the changes in the fat-to-muscle ratio that occurs with increasing age. As we age, we lose muscle, and muscle has a much higher proportion of water than does fat. Alcohol is water soluble, so when muscle is replaced with fat, there is less water in which to distribute the alcohol. The result is a higher BAC.

There is also evidence that the greater impairing effects of alcohol in the elderly is more than just this difference in alcohol absorption. It appears that at a given BAC, the older driver is at higher risk of crash than other drivers at the same BAC (National Highway Traffic Safety Administration, 1985).

WOMEN AND CRASH RISK

Like the elderly, women reach a higher BAC from a given amount of alcohol, taking body weight into account. Women also have a higher fat-to-muscle ratio and, hence, less water in which to absorb the alcohol. Women also appear to metabolize alcohol differently when the alcohol is consumed orally. Because of the metabolic differences, they absorb the alcohol more quickly and reach a higher BAC (Frezza, Di Padova, Pozzato, et al., 1990).

There is also evidence that, at a given BAC, women are at higher risk of crash than men. This phenomenon was first reported in 1964 in a classic study establishing relative risk of crash as a function of BAC (Borkenstein, Crowther, Shumate, et al., 1964). At that time, the sex differences were attributed to the relative inexperience of women in driving. However, subsequent studies have confirmed the earlier findings (Carlson, 1972; Zador, 1991). While women still drive fewer miles than men, they drive much more than they did previously, and they should be through the steepest part of the learning curve (Waller and Blow, 1995).

The sex differences in crash risk are dramatic. For teenage drivers at BACs between 0.05 percent and 0.09 percent (legal levels in most states), the relative risk of being in a fatal single vehicle crash is more than 18 for males and over 54 for females. For drivers age 21 through 24, the corresponding figures are 11.8 for males and over 35 for females. For drivers age 25 and over, the ratios are 8.6 for males and 25.5 for females. In every age group, women experience a much higher crash risk than do men (Zador, 1991). Figure 11 illustrates these relative differences. Although not quite so dramatic, similar gender differences are seen at higher BAC levels.

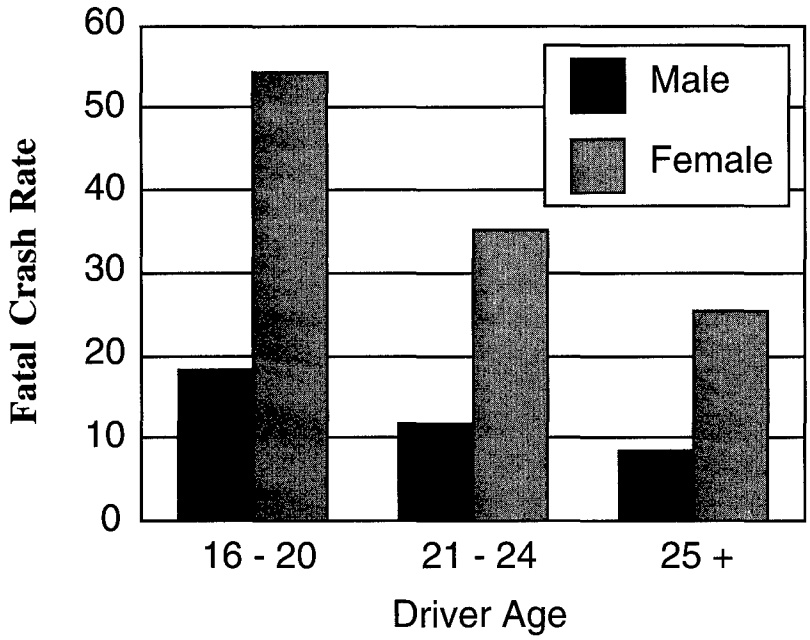
In controlled laboratory studies involving tasks unrelated to driving, there is also some evidence that women may be more impaired by a given BAC. One study using simulated traffic signs presented on slides found that alcohol affects the ability to detect the presence or absence of a sign, and that the performance of females is more impaired than that of males (Avant, 1990).

Thus, women will reach higher BACs and experience greater impairment as their drinking behaviors approach those of men.

WOMEN MORE VULNERABLE TO BIOMEDICAL DAMAGE

Even in the absence of alcohol, in a crash of specified dimensions, women have a higher probability of being seriously or fatally injured (Partyka, 1984; Evans, 1988, 1991). It is not entirely clear why this is so, especially since for most health problems, women are more robust and more likely to survive.

Figure 11
Relative risk of fatal single vehicle crash at BAC 0.05 - 0.09 percent compared to zero alcohol.



Women are also more vulnerable to the harmful effects of alcohol, in that they experience biomedical damage as a result of consuming less alcohol over a shorter period of time than is true for men (Blume, 1982). It is known that chronic use of alcohol can cause liver damage that, in turn, can interfere with the body's recovery from injury (Sherlock, 1988). It can also affect wound healing (Benveniste and Thut, 1981).

While prolonged heavy use of alcohol clearly leads to reduced bone strength, increasing the probability of fracture from a given traumatic impact (Saville, 1975; Peng, Garner, Frye, and Crenshaw, 1982), there is some controversy about the effects of moderate alcohol consumption on bone mass. A prospective study of over 84,000 women found that moderate use of alcohol was associated with an increased risk of both hip fractures and forearm fractures (Hernandez-Avila, Colditz, Stampfer, et al., 1991), and other studies have shown a relationship between alcohol consumption and reduced bone mass (Stevenson, Lees, Devenport, et al., 1989; Leino, Jarvisalo, Impivaara, and Kaitsaari, 1994; Sowers, Wallace, and Lemke, 1985). Other studies suggest that moderate alcohol consumption is associated with increased bone mass (Gavaler and Van Thiel, 1992; Felson, Zhang, Hannan, et al., 1995). One study concludes that alcohol has a harmful effect for premenopausal women but a positive effect for postmenopausal women (Laitinen, Valimaki, and Keto, 1991). Of course, the evidence on drinking patterns indicates that alcohol consumption is greater among the former group. To the extent that alcohol compromises bone strength, because women have smaller bones to start with, they will be more vulnerable to injury in a crash of specified dimensions.

ALCOHOL AND INJURY

Alcohol is related to injury in at least three ways. First, it affects judgment. Second, it impairs psychomotor performance. Third, it increases the extent of injury resulting from a given impact.

JUDGMENT

Alcohol affects judgment, but it appears to do so differentially for men and women. Men are less likely to perceive an increased crash risk as a result of alcohol (Martens, Ross, and Mundt, 1991; Mundt, Ross, and Harrington, 1992; Agostinelli and Miller, 1994). These differences may be a recognition on the part of women of the greater impairing effects of alcohol experienced by them.

PSYCHOMOTOR PERFORMANCE

While alcohol affects the psychomotor performance of both men and women, the latter appear to be more impaired by alcohol in performing psychomotor tasks (Waller and Blow, 1995). They are clearly at higher crash risk at a given BAC.

INJURY

Once a crash occurs, the drinking driver has a higher probability of serious or fatal injury than the sober driver. This potentiating effect of alcohol on injury has been demonstrated clearly in controlled laboratory studies based on animal models (Liedtke and DeMuth, 1975; Nicholas and DeMuth, 1980; Gettler and Allbritten, 1963; Flamm, Demopoulos, Seligman, et al., 1977; Brodner and Van Gilder, 1981; DeCrescito and Demopoulos, 1974; Anderson, 1986; Waller, Hansen, Stutts, and Popkin, 1986). Although human subjects cannot be used in such controlled studies, the motor vehicle crash provides a model for an injury type occurring in large numbers and for which there are independent measures, albeit rough measures, of the physical forces involved. The overall difference is about two-fold, that is, in a given crash, the drinking driver is about twice as likely to be seriously injured or killed as the sober driver, but for some crash types the difference is more than four-fold (Waller, Stewart, Hansen, Stutts, Popkin, and Rodgman, 1986).

SUMMARY

At the present time, relatively little is known about women, alcohol, and driving. The vast majority of studies on both alcohol and driving have been based on male subjects, usually young. Women pose special problems in controlled alcohol research, in that alcohol appears to have differential effects as a function of the menstrual cycle. It is not surprising that there is a paucity of good research.

Nevertheless, with the markedly changed roles of women in our society, and their growing transportation needs, women need to be given greater consideration, and to do so will require a more solid knowledge base. Several areas in particular need to be addressed.

First of all, there needs to be greater societal recognition of the many roles that women fill. For most women today, transportation is an essential component for meeting their responsibilities. While society fully expects, even demands, that women meet these responsibilities, e.g., child care, elder care, chauffeuring family members to appointments and lessons, grocery and other shopping, etc., virtually nothing is done to facilitate these functions. It is remarkable how well women have managed in the face of societal indifference.

Second, the transportation community itself needs to consider women in their planning process. Throughout most of the history of transportation, trips have been defined by tabulating vehicles and vehicle occupancy at specified locations. Conclusions are usually that most trips involve one vehicle and one occupant. However, their calculations do not register the trip linking, that is, the errands run along the way that often entail dropping off other occupants. While it may be true that the driver arrives at the workplace as the single occupant, women have often chauffeured other family members to other locations prior to the final trip segment that is observed. Solutions based on such observations are usually inappropriate.

There are other reasons women may need a car. When children are in school, a parent may get a call at any time saying a child is sick and needs to be picked up. Even though such calls may be rare, their possibility often dictates that flexible transportation be available immediately.

Third, public transit needs to become more flexible and safer. For this to occur, women engaged in real life activities and familiar with the transportation problems encountered by women need to be part of the transportation planning process. Parents are often fearful for their children to use public transport because of the situations encountered on buses and in terminals. Safety and security are essential if public transit is to succeed.

Fourth, women need to be better informed regarding the use of alcohol and how it affects them, both physiologically and behaviorally. Most women do not recognize the harm they can inflict on themselves and others through irresponsible use of alcohol, nor do they realize the greater vulnerability they experience compared to men.

Fifth, vehicle design needs to pay greater attention to women, and particularly older women. Bucket seats are comfortable, but ingress and egress are difficult for older occupants. Security is also a growing issue, especially for women and the elderly. Most car phones purchased by women and the elderly are for security purposes rather than for routine communication.

Occupant restraints pose special problems for women. Seat belts, especially in the back seat, can be major challenges for anybody, but particularly for older occupants. Occupant restraints never considered the special configurations of women. They were designed primarily to protect young healthy males in frontal collisions. There is no question but that they are remarkably effective in providing occupant protection. However, with an aging population, there are more side collisions. Furthermore, the shoulder belt that may provide protection for the young healthy male may break the ribs of the elderly occupant, which in turn may puncture the lungs.

Air bags pose special problems for women and the elderly, as well as children. No child under the age of 12 should be in the front seat of a vehicle with a passenger side air bag. The safest location is in the back seat with a belt on, even if it is just a lap belt. In this country, manufacturers are required to provide an air bag that will protect an unbelted male occupant of average size (National Transportation Safety Board, 1996; Ferguson, Braver, Greene, and Lund, 1996). When this requirement was implemented, belt usage was around 20 percent. It is now around 70 percent, but the force of the air bag is still greater than required for properly belted occupants. Smaller occupants, sitting closer to the wheel, and older occupants, frailer and more vulnerable to injury, are especially at risk.
Most of the driver fatalities caused by air bag deployments have been women, and especially older women. Vehicle modifications are needed that enable the smaller driver to reach the controls while maintaining a safe distance from the steering wheel. And of course the safety belt should always be used.

There is another aspect of occupant restraints that has received essentially no attention. With an aging population, we have more frail elderly, mostly women, who need transportation. These persons are especially vulnerable to injury, even from a sudden stop that engages the belt. Most frail elderly are cared for by families and transported in family vehicles. Yet no attention has been given to the special restraint needs of this growing population.

We need to reconsider occupant restraint systems in light of the changing population, with more women driving vehicles and more elderly occupants.

Women are a major and essential part of our expanding society. Yet their needs have scarcely been addressed in driving and transportation. They need to be better informed, and, in turn, the transportation community needs to pay more attention to them as consumers, but more importantly, as essential participants in, and contributors to, society.

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Are Women Taking More Risks While Driving? A Look at Michigan Drivers

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ARE WOMEN TAKING MORE RISKS WHILE DRIVING? A LOOK AT MICHIGAN DRIVERS

INTRODUCTION

Women's motor vehicle driving has been changing over time and is still changing. Much more driving is done by women today than in the past. More women are driving and they are driving more miles. They are also driving at older ages. Figure 1 (derived from FHWA Highway Statistics, and U.S. Census information) shows the trend in the proportion of female drivers to male drivers over the last 33 years. In 1963, there was no age group in which female drivers exceeded 75 percent of the number of male drivers. By 1975, the ratio of female drivers to male drivers exceeded 80 percent for all age groups from the youngest to 59 years of age. In 1994, the ratio of female to male drivers exceeded 90 percent for all age groups and 100 percent for the over 70 age group. The upper most curve represents the female to male population ratio in the United States in 1994. If this trend continues, the ratio of female to male drivers will more closely follow the population ratio and there will be further increases in the portion of elderly drivers that are women.

There has also been an increase in the number of miles driven by women over this time period. The U.S. Department of Transportation 1969 National Personal Transportation Survey (NTPS) reported that 73 percent of the nations vehicle miles were made by male drivers and the average male drove 11,000 miles per year while the average female drove 5,400 miles per year. The 1990 NTPS reported that 65 percent of the nations vehicle miles were driven by men and the average male drove 16,500 miles, while the average female drove 9,500 miles (Hu and Young, 1992).

Gender-related differences have also been observed in motor-vehicle crash involvement rates. Women have lower crash involvement rates than men. An analysis of 1990 NTPS data (Massie and Campbell, 1993) found that per mile driven, men had about 1.5 times the risk of women of experiencing a fatal crash. However, analyses of national crash trends show an increase in driver fatalities of women relative to men. For example, an analysis of national crash data (Cerelli, 1994) shows that female driver fatalities increased from 23.9% to 26% of all driver fatalities between 1990 and 1994.

Among the explanations offered for this increase is that women have increased their exposure, that is, women are at higher risk because there are more of them driving and they are driving more than in the past. Other explanations focus on increases in behavior that put the driver at risk, such as drinking and driving. Increases in alcohol-related crashes and alcohol-related crash rates for young female drivers have been noted and reported in the literature (e.g., Popkin, 1991; Moore, 1994). While drinking and driving is clearly risky behavior, other driving practices also put drivers at risk. Pioneering work by Evans and Wasielewski (1982; 1983) has established statistically reliable associations between crash involvement and observed risky driving practices, such as short following headways, high speed, and not using safety belts.

Research into the driving behavior of motorists has consistently found gender differences in behaviors involving risk-taking. For example, based on self-report, men drive at faster speeds, are less likely than women to use safety belts in their vehicles, and also have a higher likelihood of driving

under the influence of alcohol (e.g., Streff, Kostyniuk, Molnar, Hopp, 1995). However, if the portion of women in the driving population is increasing and driving more miles, while at the same time engaging in riskier driving practices, the level of safety on our roadways could be adversely affected.

Given that increased exposure for women is well documented, the purpose of this paper is to explore the possibility that increases in risky driving behaviors at least partially account for the increase in the share of Women's fatalities in motor vehicle crashes. The aspects of risky driving behavior selected for examination are short following headways, speeding, use of safety belts, and driving under the influence of alcohol. Because higher risk-taking is often associated with youth, examination by age is also included.

The approach of this study was to examine in a preliminary way, existing data sources for evidence of changes in the risk-taking aspects of women's driving. The Social and Behavioral Analysis (SBA) group at the University of Michigan Transportation Research Institute (UMTRI) has been conducting studies monitoring driver behavior and attitudes for over a decade and has a wealth of information on various aspects of driving behavior. Two of these multi-year studies, the Michigan Omnibus State Safety Survey of Traffic Safety Attitudes and Behaviors (Streff et. al., 1988; 1990; 1992; 1995), an ongoing study of opinions, attitudes and behaviors of adult Michigan residents, and the Michigan Direct Observation Studies of Safety Belt Use (Wagenaar et. al., 1988; Streff et. al., 1990; 1992; 1993; Eby et. al., 1994; 1995; 1996) were explored for evidence of changes in the driving behavior of women. These data, together with the Michigan State Motor Vehicle Crash records, served as the sources for our exploration of the question of change in the risk-taking in the driving behavior of women. In addition, much of the data in Evans' and Wasielewski's research into risky driving practices were collected in Michigan. Thus, their findings should be directly applicable to the population of drivers we are examining.

FOLLOWING HEADWAYS

In their investigations of whether drivers with high crash frequencies drive more dangerously than other drivers, Evans and Wasielewski (1983) looked at the length of the following headways of drivers in high flow freeway traffic and related this observed behavior to driver characteristics and driver crash records. They measured vehicular headways on a Michigan freeway on an outbound single interior traffic lane on weekday afternoons including peak commuting hours in good weather with near-capacity traffic that was generally flowing smoothly at average speeds of 65 miles per hour (mph). Short headways were considered indicative of a driver's willingness to accept risk, longer headways were indicative of more cautious driving, and very long headways were considered a consequence of non-interaction between the following and preceding vehicles.

Among the characteristics of the driver and vehicle obtained from a photograph of each vehicle were driver gender, age, safety belt use, and vehicle plate number. If the driver characteristics matched those of the registered owner of the vehicle, it was assumed that the driver was the owner of the vehicle and his/her driving record, including crashes and points on the license, was also obtained. The data consisted of 6,775 headway observations, of which 2,576 cases were matched with driving records.

The results of Evans and Wasielewski's study showed clear evidence that younger drivers tend to take more risks in everyday driving. Women were underrepresented at the shortest, risky headways but overrepresented at more cautious headways. Drivers with no crashes or points were less likely, on average, to be observed with short headways. Although these associations do not necessarily imply

causality, they do complement research based on crash frequency data that identified driver populations with high crash involvement.

Under some circumstances, vehicles following too closely cannot stop in time to avoid a collision with the leading vehicle. Such crashes are usually rear-end crashes and the following vehicle generally sustains damage on the vehicle front. We examined the crash records for the state of Michigan for 1987 and 1994 for such crashes by driver age and gender and calculated the striking vehicle crash rate per 1,000 licensed drivers. The results are shown in Table 1.

The rates in Table 1 clearly show that men more than women and younger more than older persons are driving the following vehicle in a rear-end collision. Changes in the crash rates between 1987 and 1994, shown in Table 2, indicate a very small increase in the overall driver involvement rate. The only increase of note is that for young drivers (almost three collisions per 1,000 licensed drivers) and this increase is relatively equal for both women and men.

If rear-end crashes can be assumed to be a consequence of following too closely, these findings support those of the headway study in that younger drivers more than older drivers and males more than females engage in this particular risky driving behavior. Furthermore, comparison of the rates of striking vehicle involvement between 1987 and 1994 indicates an increase in this involvement for young drivers that is not a function of gender.

Table 1
Driver of Striking Vehicle in Rear End Crash by Age and Gender
Michigan 1987 and 1994

	1987			**1994**		
	•Men	•Women	• Total	•Men	•Women	•Total
<25	26.64*	15.98	21.51	29.50	19.06	24.37
	16,480**	9,146	25,625	15,387	9,597	24,984
25-64	10.49	5.66	8.08	10.84	6.36	8.59
	23,195	12,433	35,628	24,995	14,884	39,879
65+	4.87	2.37	3.61	5.28	3.05	4.11
	1,877	933	2,810	2,355	1,480	3,835
Total	12.92	7.12	10.04	13.06	7.80	10.41
	41,552	22,512	64,064	42,737	25,961	68,698

* Rate per 1,000 licensed drivers

** Number of crashes

Table 2
Differences in Rate per 1,000 Licensed Drivers in Rear-End Crash Striking Vehicle by Age and Gender in Michigan 1987 - 1994

	Men	Women	Total
<25	2.86 *	3.08	2.86
25 - 64	0.35	0.70	0.51
65+	0.41	0.68	0.50
Total	0.14	0.68	0.37

* Difference in rate per 1,000 licensed drivers

SPEED

Traveling at excessive speeds can also be considered as a measure of drivers willingness to expose themselves to the risk of crash. In 1984, Wasielewski published an analysis of speeding as a measure of driver risk. In this study, speed of vehicles at a site in southeast Michigan with a posted speed limit of 45 mph was measured by radar. The site was a flat, straight two-laned road with 11-foot lanes, and gravel shoulders. Traffic signals were about one- half mile in either direction and there was little residential or commercial development along the roadside. The vehicle was photographed and driver and vehicle characteristics were derived from the photograph. As in the headway study described earlier, vehicle owner information was obtained from the Secretary of State and, if the owner's age and gender matched that of the observed driver, the driver was assumed to be the owner. In this way driving records were obtained for a portion of the field observations.

Wasielewski found a statistically significant decline in travel speeds with age and noted that women were less likely than men to be among the drivers at very high or very low speeds. Analysis of driving records showed that drivers with the fastest driving speeds were more likely than others to have crashes or violations on their driving records.

We examined the 1987 and 1994 Michigan Motor Vehicle Crash files for vehicle crash records where speeding was identified as the hazardous action prior to the crash. Table 3 shows the frequency of occurrence and the incidence rate per 1,000 licensed drivers of these crashes by gender and age. The table shows clearly that younger drivers were more likely than older drivers to be speeding before a collision. Overall, men were about twice as likely as women to be speeding before a collision. There does not appear to be an overall increase in the average rate of incidence between 1987 and 1994. However, there was an increase of 1.3 collisions per 1,000 licensed drivers attributed to speeding for young female drivers.

Self-reported driving speeds on Michigan's urban and rural freeways are collected as part of the Michigan Omnibus State Traffic Safety Survey. Respondents were asked, How fast do you generally drive on Michigan's urban freeways. There were 740 valid responses in the 1995 survey. Collectively, nearly 90 percent of the respondents reported exceeding the 55 mph speed limit. In general, men reported driving faster than women and reported speeds decreased with age.

Table 3
Speeding as Hazardous Action Prior to Crash by Age and Gender, Michigan 1987 and 1994

	1987			1994		
	Men	**Women**	**Total**	**Men**	**Women**	**Total**
<25	19.51*	7.90	13.93	19.58	9.18	14.47
	12,071**	4,521	16,592	10,214	4,620	14,834
25-64	4.71	2.14	3.47	4.71	2.64	3.67
	10,601	4,703	15,304	10,858	6,185	17,043
65+	1.19	0.62	0.90	1.23	0.71	0.96
	495	243	702	549	347	896
Total	7.19	2.99	5.11	6.61	3.35	4.96
	23,131	9,467	32,589	21,621	11,152	32,773

* Rate per 1,000 licensed drivers

** Number of crashes

Table 4 shows the distribution of self-reported driving speeds by age and gender. Overall, 20 percent of men and 11 percent of women reported exceeding the speed limit by at least 15 mph. Of the youngest drivers, 43 percent of males and 26 percent of females reported routinely exceeding the speed limit by at least 15 mph.

Respondents were also asked, How fast do you generally drive on Michigan's rural freeways. At the time of the survey the speed limit on all Michigan rural freeways was 65 mph. A total of 728 respondents gave valid responses to this item. Unlike the self-reported urban freeway driving speeds, less than one-half of respondents reported driving over the freeway speed limit. Table 5 shows the distribution of reported driving speeds on Michigan's rural freeways by age and gender. Ten percent of men and two percent of women reported routinely driving over 75 mph on rural freeways. The distributions of reported driving speeds of male drivers in the young and middle age groups are very similar with about 10 percent exceeding 75 mph. The older male drivers reported driving at slower speeds. The distribution of reported speeds of women drivers, while showing overall slower speeds than male drivers, does show higher speeds for young drivers. However, only four percent of the young women drivers reported routinely exceeding 75 mph on rural freeways.

Table 4
Percentage Distribution of Self-Reported Speeds on Michigan Urban Freeways (Speed Limit 55 MPH) by Gender and Age in 1995

	<25		**25-64**		**65+**	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
<55 mph	8.54	6.10	3.47	6.91	13.86	19.33
55-59 mph	20.28	18.70	17.13	33.96	33.73	42.00
60-64 mph	5.87	10.34	27.79	22.36	15.06	21.33
65-69 mph	22.42	38.59	33.55	27.53	33.73	14.67
70+ mph	42.88	26.26	18.07	9.24	3.61	2.67

Table 5
Percentage Distribution of Self-Reported Speeds on Michigan Rural Freeways (Speed Limit 65 MPH) by Gender and Age in 1995

	<25		25-64		65+	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
<65 mph	44.84	51.47	41.96	65.79	68.55	74.00
65-69 mph	20.82	24.87	24.08	23.44	20.13	23.33
70-74 mph	24.20	19.65	22.60	8.23	11.32	2.67
75+ mph	10.14	4.01	11.36	2.54	0.00	0.00

All three analyses of driving speeds show a strong gender effect on speeds, with males selecting higher speed then females. There is a clear age effect evident for both men and women, with younger drivers being more likely to travel at faster speeds than the middle-aged or older drivers. While the rate of speed-related crashes remained fairly stable for the driving population of Michigan between 1987 and 1994, there was an increase in this rate for the group of youngest female drivers. The increase was not large and may indicate an actual increase in speeding behavior. On the other hand, it could simply reflect a greater willingness of police officers to note speeding when filling out crash reports for female drivers than in the past.

SAFETY BELT USE

Safety belts are designed specifically for reducing death and injuries from traffic crashes. They are only effective, however, if they are used. A lack of safety belt use has been shown to be positively correlated with high risk driving behavior. For example, Foss, Bierness, and Sprattler (1994) have shown that drinking drivers tend to use safety belts less frequently than other drivers. Evans and Wasielewski (1983) found low safety belt use among drivers following at very short risky headways. As in other driving-related high risk behaviors, safety belt use varies as a function of gender.

The SBA group of UMTRI has measured safety belt use in statewide direct observation surveys of safety belt use since 1984. Among other things, these direct observation surveys usually examined safety belt use by gender. We have also obtained self-reported safety belt use in the Omnibus State Traffic Safety Surveys since 1987.

Figure 2 shows the overall safety belt use rates by survey year and gender across all age groups, as determined by direct-observation. Several interesting trends are evident. This figure shows clearly that safety belt use among women has been consistently higher than men in every survey year. This result is supported by the latest Omnibus survey which showed that self-reported "always wear safety belt" was 78.1 percent for females and only 59.8 percent for males. Further, the direct observation belt use rates for men and women tend to follow the same trends. Safety belt use increased markedly for both men and women during July 1985. This peak was caused by the implementation of Michigan's mandatory safety belt law. Before implementation of the mandatory safety belt law, the difference in safety belt use rates between men and women was rather small. After safety belt use was required by law, this difference became much more pronounced. This finding suggests that the risk-taking behaviors of females are more greatly influenced by traffic safety laws than are the behaviors of males. The fact that the difference between belt use rates for males and females has remained relatively constant for the last ten year does not support the hypothesis that the frequency of risk taking behaviors for women is beginning to approach that of males.

Figure 1
Gender Trends in Licensing

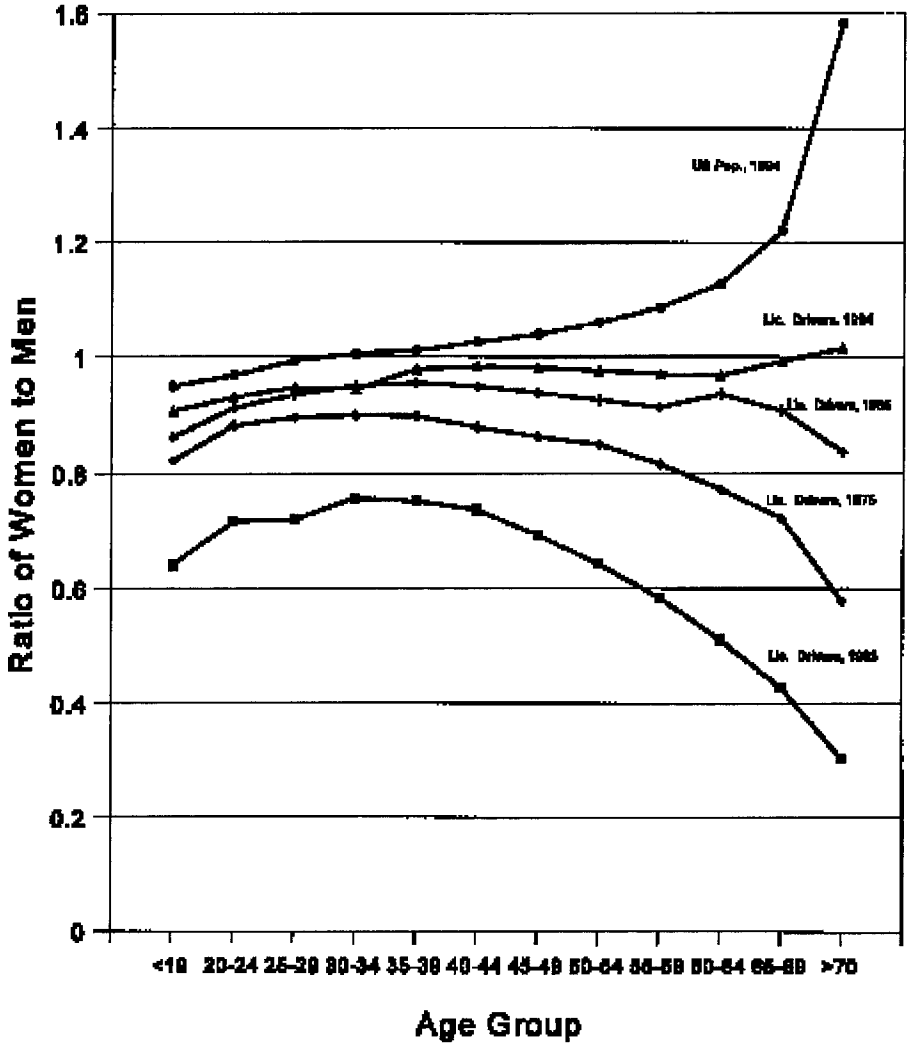
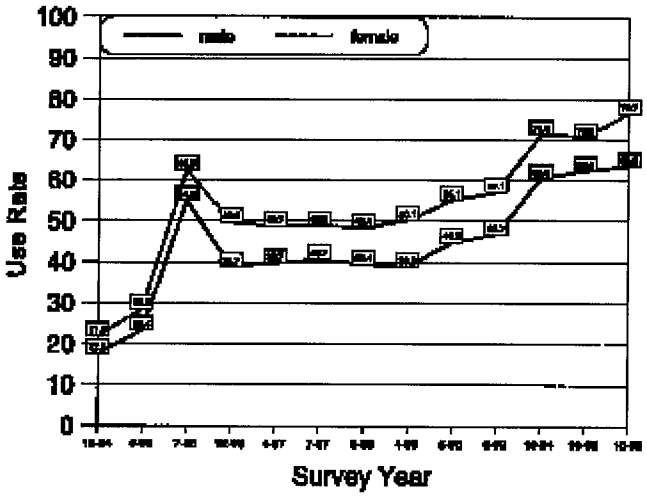


Figure 2
Safety Belt Use by Gender, Michigan, 1984-1996



In the last three direct observation surveys of safety belt use (1994, 1995, and 1996), belt use by both age and gender was collected, allowing the calculation of an estimated belt use rate as a combined function of these variables. Figure 3 shows safety belt use rates for passenger cars by age group, gender, and survey year. The results indicate that for all groups, males (solid lines) have lower use rates than females (dotted lines). Within each gender group, the 16 to 29 year old age groups shows the lowest belt use rates while the 60 years old and older age group shows the highest rates. Both trends are consistent over the survey years studied and are supported by the Omnibus age and gender results on self-reported safety belt use. Finally, the percentage point difference in belt use rates between gender groups is markedly different for the youngest age group. To more clearly illustrate this result, Figure 4, shows the percentage point difference of females to males by age group and survey year. Note that in every survey year, the 16 to 29 year old age group shows large use rate disparities between gender groups and that this gender difference is greatly reduced for the older passenger car occupants.

Collectively, these safety belt use results show that the overall use rates for both men and women are increasing at approximately equal rates, with women using safety belts more frequently than men. When the results are considered in light of the combined variables of age and gender, we find that for both gender groups, safety belt use increases with age. However, men under age 30 show the lowest use rate and the rate may be decreasing. This low use rate for young males and increasing use rate for young women resulted in a more than 21 percentage point difference in use rates between these groups. Thus, the safety belt use rate data from Michigan suggest that the risk-taking behavior of women decreases with age and, especially in the youngest age group, is much less frequent than men.

Figure 3
Safety Belt Use by Age, Gender, and Year
Passenger Cars in Michigan

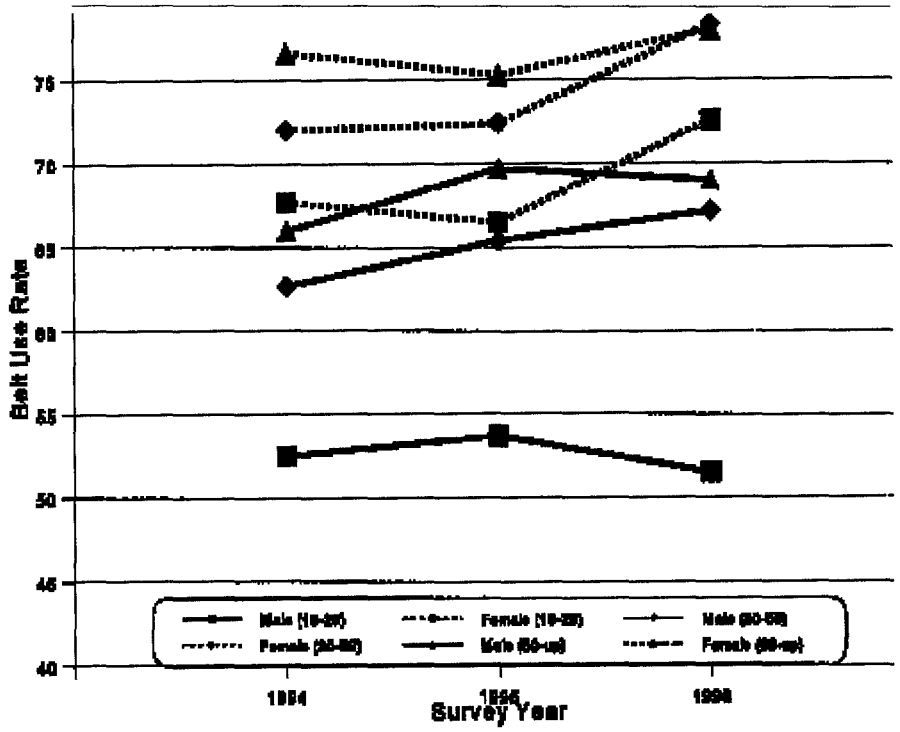
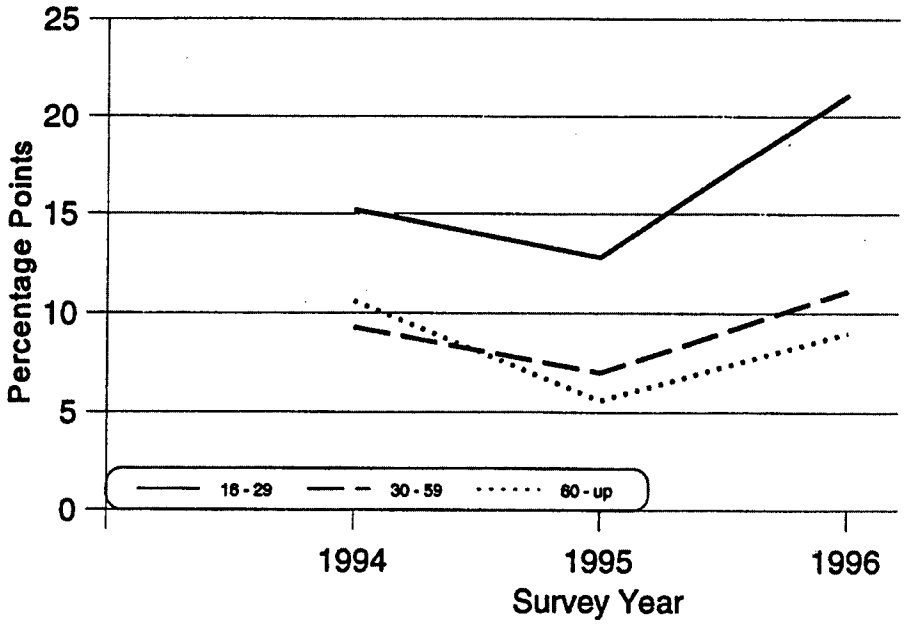


Figure 4
Gender Difference in Safety Belt Use Rates by Age and Year (percentage points)



DRINKING AND DRIVING

HAD BEEN DRINKING CRASHES

We explored drinking and driving in Michigan by examining 1987 and 1994 Michigan Motor Vehicle Crash files for vehicle crash records where a driver was reported to have been drinking (HBD) by an officer at the crash scene. Table 6 shows, by age and gender, the proportions of HBD crashes relative to all crashes, the rates of HBD crashes per 1,000 licensed drivers, and the number of HBD crashes in 1987 and 1994.

As can be seen in this table, the proportion of HBD crashes to all crashes, the HBD crash rates, and the total number of HBD crashes have declined from 1987 to 1994 for both men and women and all age groups examined. However, men continued to have higher numbers and rates of HBD crashes than women in 1994, and male HBD crashes comprised a greater proportion of all crashes involving males than the proportion of female HBD crashes. The magnitude of the declines in the proportion of HBD crashes and HBD crash rates for men and women by age group indicates that, overall, men and women experienced declines of about one third in the relative proportion of HBD crashes from 1987 to 1994. Collectively, these results show that the high-risk behavior of drinking and driving, as measured by HBD crashes, is becoming less frequent for men and women of all ages and that women are much less likely to drink and drive than men of the same age.

Table 6
Had Been Drinking Crashes by Age and Gender, Percentage of All Crashes, Rates per 1,000 Licensed Drivers, and Number of Crashes in 1987 and 1994

	1987			*1994*		
	Men	**Women**	**Total**	**Men**	**Women**	**Total**
<25	8.5%*	2.8%	6.4%	5.6%	1.6%	4.0%
	17.4**	3.7	10.8	9.4	1.9	5.7
	10,772***	2,133	12,905	4,915	940	5,855
25-64	8.5%	2.8%	6.2%	6.4%	2.2%	4.5%
	8.5	1.7	5.1	5.4	1.3	3.3
	18,721	3,793	22,514	12,508	2,978	15,486
65+	2.9%	0.6%	2.0%	2.1%	0.5%	1.4%
	1.7	.23	1.0	1.1	.17	0.6
	673	91	764	497	82	575
Total	8.2%	2.7%	6.0%	5.8%	1.9%	4.2%
	9.4	1.9	5.7	5.5	1.2	3.3
	30,166	6,017	36,183	17,920	4,000	21,920

* Proportion of all crashes

** Rate per 1,000 licensed drivers

*** Number of crashes

SINGLE VEHICLE NIGHTTIME CRASHES

Alcohol use in driving may be under-reported in HBD crash records because it is reported by police at the site of crash, often without the benefit of alcohol testing, and tends to be conservative. Single vehicle nighttime crashes are sometimes used as a proxy for alcohol involved crashes. We examined the frequency and rate of such crashes per 1,000 licensed drivers by age and gender (Table 7). The tables indicate that, although rates were higher for men than for women in every comparable age group in both 1987 and 1994, men experienced a decline between 1987 and 1994, while women experienced an increase in their single vehicle nighttime crash rate. An examination by age group shows that the single vehicle nighttime crash rate for both men and women less than 25 years of age declined between 1987 and 1994, but the decline in crash-rate was much smaller for the women. For the older age groups, the trends were opposite; that is, both men and women showed an increased involvement rate in single vehicle nighttime crashes between 1987 and 1994 and the increases were much larger for the women.

At first glance these results might suggest that older drivers of both genders were drinking and driving more frequently in 1994 than in 1987 and that the youngest drivers were drinking and driving less frequently. Such an interpretation is only supported by the previous data on HBD crashes (Table 6) for the youngest age group. An alternative explanation is that the increase in single vehicle nighttime crashes for drivers 25 years of age or older results from an increase in exposure. Without further analysis, neither explanation can be rejected, but if exposure partially accounts for the result, then the use of single vehicle nighttime crashes as a proxy for alcohol involved crashes may be inappropriate for older drivers.

Table 7
Single Vehicle Nighttime Crashes by Age and Gender Rates per 1,000 Licensed Drivers Number of Crashes in 1987 and 1994

1987				*1994*		
	Men	**Women**	**Total**	**Men**	**Women**	**Total**
	30.3*	11.8	21.4	26.9	11.6	19.4
<25	18,737**	6,739	25,476	14,032	5,849	19,881
	12.2	4.7	8.5	12.5	6.0	9.2
25-64	27,064	10,340	37,404	28,919	13,975	42,894
	2.9	.92	1.9	3.5	1.3	2.3
65+	1,118	363	1,481	1,556	634	2,190
	14.6	5.5	10.1	13.6	6.1	9.8
Total	46,919	17,442	64,361	44,507	20,458	64,965

* Rate per 1,000 licensed drivers

* * Number of crashes

CONCLUSIONS

The purpose of this paper was to explore the possibility that increases in risky driving behaviors at least partially account for the increase in the proportion of women in all fatal motor vehicle crashes. The increased exposure of women to potential crashes has been well documented— more women are driving than ever before and they are driving more miles.

We examined several data sources in order to determine whether risky driving behaviors in women has been increasing. The evidence showed that certain risky driving behaviors of women have been increasing, while others have been decreasing. In general, for all risky driver behaviors examined, men showed higher risk in driving than women. The increased womens share of fatal motor vehicle crashes results partially from an increase in women risky driving practices at least for some age groups. Older women generally do not engage in the risk-taking behaviors examined. The various analyses showed that they are the group least likely to speed, follow too closely, and drink and drive. They also have the highest rate of safety belt use. However, there are more of them driving and they are driving more miles. Therefore, their increased presence in the single vehicle nighttime crashes is most likely due to increased exposure.

Our investigation of short-following headways showed that, overall, men had higher involvement rates than women, and young drivers had higher involvement rates than all older drivers. When comparing across years, we found that the greatest increase in the rate of involvement for this type of crash was for young drivers of both genders, with young women showing the greatest increase. While two points in time is not enough to make definite conclusions about trends, the results suggest that more young women are engaging in the high risk practice of "tailgating" than were in the past.

The analysis of driving speed showed a large gender effect, with males driving faster than females, and a large age effect, with the younger drivers more likely to travel at faster speeds than the middle-aged or older drivers. While the rate of speed-related crashes has remained fairly stable for the driving population of Michigan between 1987 and 1994, there was an increase in the rate for the group of youngest female drivers. While this increase was not large it indicates, as does the following headways data, that young women in 1994 were engaging in higher risk driving in 1994 than they were in 1987.

The investigation into safety belt use showed that use has increased overall between 1984 and 1996 and continues to increase. It also showed that women of all ages are more likely to use safety belts than men and that the difference in use rates has remained fairly stable over the years. Considering only the women, we find that the lowest use rate is for the youngest women. Inasmuch as safety belt use relates to other risky driving practices, these results show that both men and women are engaging in risky driving less frequently over time.

Examination of single vehicle nighttime crashes shows an increase in the rate of involvement of middle and older drivers, with a greater increase for women than men. While these crashes have been used as a proxy for alcohol-related driving in the past, when young males were over involved in this type of crash, the proxy relationship is probably no longer true. It appears more likely that the increase in the rate of these crashes among middle and older drivers, especially women, may be due to their greater exposure to these crashes.

The evidence examined in this study suggests that the increased presence of women in fatal crashes may be partially due to the fact that younger women are engaging in risky driving behaviors more than ever before. A similar argument cannot be made for middle-aged and older women who, in the behaviors examined, are either engaging in risky driving less frequently or the same amount than in the past. However, these two age groups of women drivers are showing up more frequently in single vehicle nighttime crashes. When this result is considered alongside the fact that the percentage of women in the driving population is increasing, especially for the older age groups (Figure 1), it can be argued that they are appearing more frequently in single vehicle nighttime crashes because of increased exposure. Thus, we suggest that the increased percentage of women in fatal motor-vehicle crashes results from two factors, increased risk-taking in younger women drivers and increased exposure in older women drivers.

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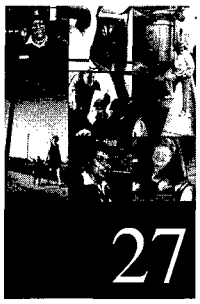

Differences Between Male and Female Involvement in Motor Vehicle Collisions in Hawaii, 1986-1993

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DIFFERENCES BETWEEN MALE AND FEMALE INVOLVEMENT IN MOTOR VEHICLE COLLISIONS IN HAWAII, 1986-1993

ABSTRACT

The purpose of this study is to examine the experiences of male and female drivers involved in two vehicle collisions in the State of Hawaii, over the period 1986-1993. Using comprehensive police crash data, characteristics of male and female drivers are compared in terms of seat belt use, human factors involved in collisions, risky behaviors (such as speeding and alcohol), and patterns in terms of collision involvement. Using odds ratios, we demonstrate that male drivers are 1.4 times more likely than female drivers to be unbelted, 3.6 times more likely to be involved in alcohol related collisions, two times more likely to be involved in speed related collisions, and 1.3 times more likely to be involved in head-on collisions. In addition to examining the general differences between male and female involvement in collisions, relationship between age, gender, and collision involvement is also examined. A logit model, explaining driver fault as a function of age, gender, and other variables is constructed. A U-shaped distribution between the odds of fault and age categories is found to exist, with young males (15-24 years old) and old females (65+) most likely to be classified at fault in collisions in Hawaii.

It has been established that changes in women's travel behavior have increased both travel by women and their exposure to the risks of collision involvement. As pointed out in the NPTS (National Personal Transportation Survey) Demographic Special Reports (U.S. Department of Transportation, 1995), "women are traveling longer and making more trips—and doing more of that in a car." Moreover, FARS (Fatal Accident Reporting System) data, collected by the U.S. Department of Transportation (1991), has shown, for example, a steady increase in the rate of female involvement in fatal crashes over the period 1975 to 1990, while the fatal crash rate among males over the same period has steadily declined (FARS, 1991). The purpose of this paper is to examine data for one state (Hawaii), over the period 1986-1993, in order to gain a deeper understanding of the relationships between gender and crash involvement. Following some background on collision research in Hawaii and discussion of data and methods used in this study, the results and implications of the analysis will be presented.

BACKGROUND

To many, Hawaii conjures images of swaying palm trees and a tropical paradise. But with a population of more than one million people, and more than six million tourists per year, there are associated problems of urbanization, traffic congestion and motor vehicle collisions. For more than a decade, the University of Hawaii, Department of Urban and Regional Planning has been doing research on traffic collisions—not just because it is a major health risk for many age groups, but also because of special circumstances in Hawaii which enhance collision research. As an island location, away from the U.S.

mainland, it is not possible for commuters or others to simply drive across the borders. Moreover, government is highly centralized in the State of Hawaii. There are only four counties each with its own police department, and one state government which together constitutes the entire state-local sector. Collision data is perhaps the most centralized, the most uniform, and the most complete of any state in the nation. In 1992, the University of Hawaii was selected as a site to develop a CODES (Crash Outcome Data Evaluation System) Cooperative Agreement, with the U.S. Department of Transportation. The CODES Project involved the development of linked database comprised of police crash reports, ambulance run reports, hospital data, and insurance claims (see Kim and Nitz, 1994, for further discussion). In addition, there were numerous analyses which were prepared including a *Report to Congress* (1996) on the effectiveness of seat belts and motorcycle helmets. An augmented CODES database was utilized in conducting the analysis for this study.

Previous research in Hawaii (Kim, et. al. 1994), utilizing loglinear modeling techniques, established a relationship between crash types and injury levels: the most serious injury producing collisions involve head-on and rollover collisions. In another paper using a two stage structural modeling technique, (Kim, et. al, 1995), females were found to be slightly more likely to be involved in head-on collisions while less likely to be involved in rollover collisions. The model showed, that while overall females were more likely than males to be injured than males, the stronger effects related to injury in the model were due to alcohol involvement or not wearing seat belts as opposed to gender.

DATA AND METHODS

The data utilized in this study come from police crash reports. Although there have been concerns expressed about the quality of police data (O'Day, 1993), there is reason to believe that crash data in Hawaii is superior to other states. Police crash reports are required for all collisions involving an injury or $1,000 property damage. Training for police crash reporting is standardized throughout the state. All crash report forms are sent to the state Department of Transportation for entry into a centralized computer system. Tapes were acquired and a comprehensive database was constructed on dedicated Sun workstation equipment housed within the Department of Urban and Regional Planning, at the University of Hawaii. Analysis was performed using the Unix version of SAS.

A database comprised of 121,315 male and 67,986 female drivers involved in two-car collisions in Hawaii over the period 1986-1993 was constructed. In addition to analysis of frequencies, the odds ratios related the police reported frequencies of crash involvement by gender for various variables such as seat belt use, human factors, crash types, and so on were calculated. Odds ratios provide a useful tool by which to compare crash involvement of males and females. Used in this context, they provide a superior measure than standard statistical testing because of the large population sizes (which would make even small differences statistically significant) and because of the ease of interpretation.

In order to examine the interactions between age, gender, and other variables and collision involvement, a logit regression model was constructed. Fault is treated as a binary response term (fault versus not at fault).[1] In this model, the relationship between "fault" and various independent variables is examined more closely. In Hawaii, the determination of fault is made by police officers at the scene of the collision and reported on the crash report. According to the police, the determination of fault is one of the most important tasks that they carry out in collision reporting. Internal validity of the fault designation has been tested by examining vehicle maneuvers and driver actions. More than 90% of those committing the dangerous action just prior to the collision were attributed with fault on the crash form.

RESULTS

Over the period, 1986-1993, there were 67,986 females and 121,315 males involved in two-car collisions in Hawaii. There were 39 females and 94 males who died as a result of injuries suffered in collisions over this period. In addition, 500 females and 756 males received incapacitating injuries and more than 11,000 persons received non-incapacitating injuries over the period. Figure 1, Age Distribution of Drivers Involved in Two Vehicle Collisions By Gender in Hawaii, 1986-1993 shows the age distribution of drivers involved in two car collisions over the eight year period. The two youngest age groups, 15-24 and 25-34 account for more than half of the total number of drivers involved in collisions. It is interesting to note that there are more females involved in collisions in both the youngest age group, 15-24, and in the two oldest age groups, 55-64 and 65+. There are likely to be different reasons explaining this U-shaped distribution in terms of collision involvement. Overall, young drivers (both males and females) have a tendency to be more involved in collisions than older age drivers (Evans, 1991). Since the life expectancy for women is longer than that for men, there are more older women involved in collisions. It is apparent the effects of youth and old age need to be studied more.

Figure 1
Age Distribution of Drivers Involved in Two Vehicle Collisions By Gender in Hawaii, 1986-93

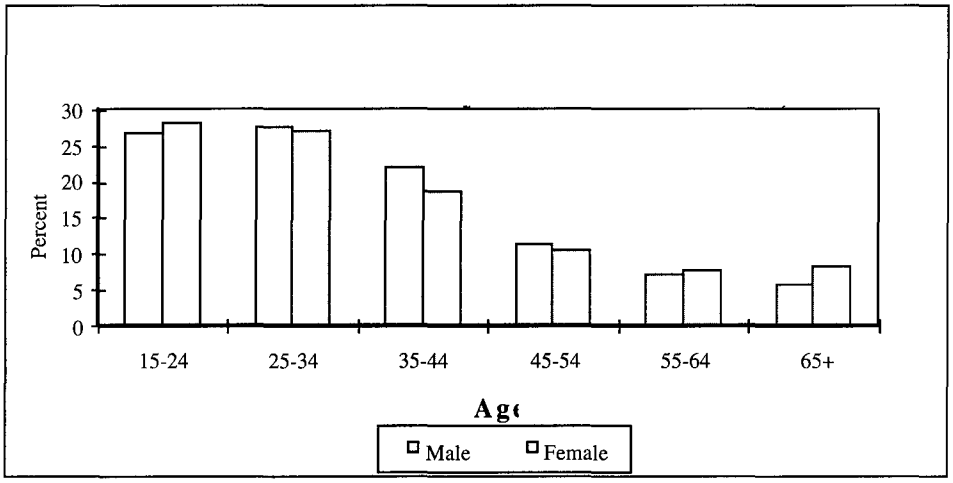


Table 1, Characteristics of Drivers Involved in Two Vehicle Collisions in Hawaii, 1986-93, contains a summary of the key differences between males and females and their pattern of collision involvement. In terms of percentage distributions, a higher proportion of females involved in collisions are: 1) more likely to use their seat belts; 2) have no human factors (e.g., inattention, misjudgment, etc.) involved in collision; 3) have no other factors (e.g., speeding, etc.); 4) more likely to drive automobiles than vans or pickup trucks, 5) more likely to have vehicle maneuvers prior to a collision; 6) less likely to be in the serious collision types (head-ons); 7) slightly more likely to be involved in urban collisions; 8) more likely to be involved in intersection collisions, and more likely to be involved in daytime collisions than their male counterparts. Moreover, while a higher proportion of males involved in collisions (0.1%) are killed compared to females (.07%); females are more likely to be reported injured, at levels of injury from possible, to non-incapacitating, to incapacitating levels. It is interesting to note that there is almost double rate of "possible" injuries among females compared to males.

Table 1
Characteristics of Drivers Involved in Two Vehicle Collisions in Hawaii, 1986-93

	Male		Female		Odds Ratio
	Frequency	Percent	Frequency	Percent	(M/F)
Seatbelt Use					
Yes	108,580	97.51	63,132	98.26	
No	2,770	2.49	1,120	1.74	1.44
Human Factors					
None	59,496	50.74	35,690	53.66	
Inattention	33,791	28.82	18,171	27.32	1.12
Misjudgment	16,888	14.40	9,825	14.77	1.03
Alcohol/Drug	2,272	1.94	383	0.58	3.56
Other Factors					
None	67,535	57.15	40,318	60.48	
Speeding	3,961	3.35	1,138	1.71	2.08
Failure to Yield	17,446	14.76	11,164	16.75	0.93
Disregard Control	3,002	2.54	1,601	2.40	1.12
Injury Severity					
None	78,956	84.42	41,460	75.62	
Possible Injury	7,439	7.95	7,730	14.10	0.51
Nonincapacitating	6,283	6.72	5,099	9.30	0.65
Incapacitating	756	0.81	500	0.91	0.79
Fatal	94	0.10	39	0.07	1.27
Vehicle Type					
Automobile	91,510	75.60	57,805	85.19	
Van	8,333	6.88	3,780	5.57	1.39
Pickup Truck	21,203	17.52	6,272	9.24	2.14
Vehicle Maneuver					
Straight Ahead	64,603	53.55	33,779	49.90	
Changing Lanes/Merging	5,016	4.16	2,553	3.77	1.03
Slowing/Stopping	8,418	6.98	4,903	7.24	0.90
Stop in Traffic	12,767	10.58	8,238	12.17	0.81
Left Turn	14,548	12.06	9,587	14.16	0.79
Crash Types					
Head-on	3,634	3.04	1,667	2.48	1.34
Rear-end	48,830	40.79	26,957	40.08	1.12
Sideswipe	38,192	31.91	20,749	30.85	1.13
Broadside	29,043	24.26	17,890	26.60	
Area					
Urban	104,147	85.85	59,120	86.96	
Rural	17,167	14.15	8,864	13.04	1.10
Location					
Intersection	57,364	47.29	33,243	48.90	0.94
Non-intersection	63,951	52.71	34,743	51.10	
Time					
Daytime	90,077	74.25	55,226	81.23	
Nighttime	31,238	25.75	12,760	18.77	1.50
Total	121,315		67,986		

The last column in Table 1 also contains the raw odds ratios of males to females of various categories. For example, to calculate the odds ratio for belt use by gender, the frequency of unbelted males to belted males over unbelted females to belted females has been tabulated. The resultant odds ratio can be interpreted that among crash involved drivers, males are 1.44 times more likely to be unbelted than their female counterparts. Odds ratios of close to one signify "neutral" gender effects, while those greater than one signify increased male effects, while those smaller than one correspond with increased odds for female effects. The results suggest that strongest gender effects include the following, that compared to females involved in collisions, males are:

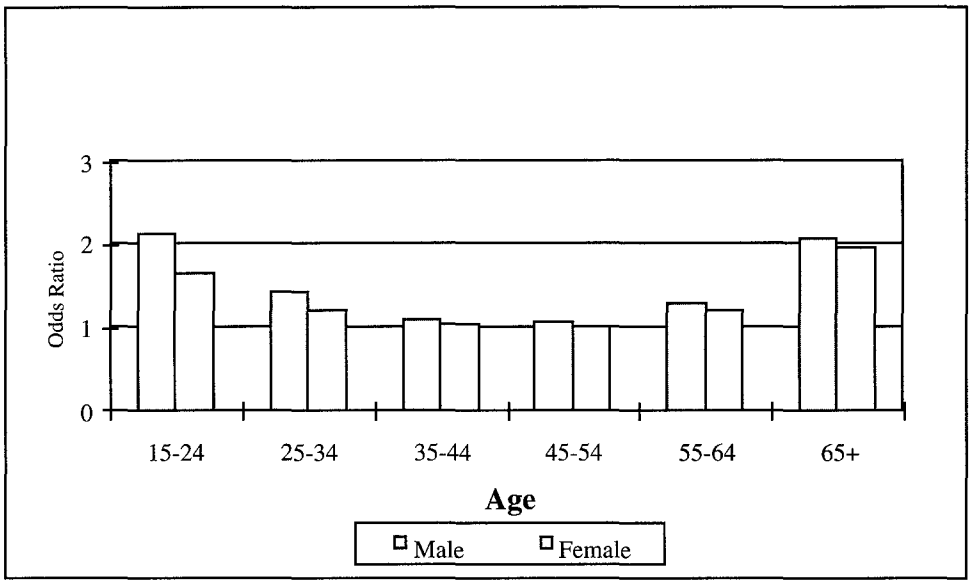
- 3.56 times more likely to be involved in alcohol or drug related crashes;
- 2.08 times more likely to be involved in speed related collisions;
- 1.44 times more likely to be unbelted;
- 1.34 times more likely to be involved in head-on collisions;
- 1.5 times more likely to be involved in night collisions;
- 2.14 times more likely to be driving pickup trucks, and
- 1.27 times more likely to be killed.

These results also show that females are slightly more likely than males to be involved in collisions which involve "failure to yield," as well as being more likely to be involved in collisions which involve left turns, being stopped in traffic, or slowing or stopping. Females are also more likely than males to be involved in collisions in urban areas and at intersections.

In order to test for the relationships between age, gender, and other variables, three different models were run and tested. The variables in addition to fault, which were included in the analysis include: age, area (urban or rural), intersection, and day time versus night time. Based on the first model, variables such as daytime, urban, and intersection, which had weak and insignificant effects, were dropped from the model. Three different forms of the model were developed and tested. The first involved explaining fault as a function of age, gender, and other variables; the second explained fault as function of age, gender, and other variables, but restricted the analysis to include only males who hit females and females who hit males. The reason for the second form, was to better isolate the gender effects. Both models produced similar in terms of the direction and magnitude of effects. The final model includes interaction terms between age and gender and was run on the unrestricted dataset. Stepwise regression and backwards elimination procedures were used to build the final model. The model results are displayed in Table 2, Logit Model Parameter Estimates for Likelihood of Fault. There were significant interactions between gender and age, particularly for the two young age groups (15-24, 25-34). Other terms were eliminated from the model because they were not significant.

The results in terms of the odds ratios of being at fault, by gender and age are summarized in Figure 2, Odds Ratios of Being at Fault By Age and Gender. Female drivers aged 45 to 64 had the lowest likelihood of being at fault and was used as the reference group for calculation of the odds ratios. In general, there is a U-shaped distribution with respect to age: young drivers and old drivers, regardless of gender are likely to be classified at-fault in collisions in Hawaii. Odds ratios of more than one indicate an increased risk of being classified at-fault. This table reveals that males (15-24) and females (65+) are most likely to be classified at-fault. Those with the lowest odds ratios include middle aged males and females (35-44 and 45-54). In fact, the group least likely to be classified at fault is 45-54 year old females. The elevated risks of being classified at fault for both young females (15-24) and older females (65+) are also apparent. But it is important to note that males in both of these groups have higher odds ratios than their female counterparts.

Figure 2
Odds Ratio of Being at Fault By Age and Gender



Logit Model Parameter Estimates for Likelihood of Fault

Variables	Parameter Estimate	Standard Error	Odds Ratio
Intercept	0.318	0.025	
Age Group			
15-24	0.492	0.032	1.635
25-34	0.171	0.031	1.187
35-44	0.0212*	0.028	1.021
45-54	0.000	0.000	1.000
55-64	0.182	0.035	1.200
65+	0.669	0.036	1.951
Gender			
Male	0.058	0.022	1.060
Female	0.000	0.000	1.000
Interaction			
15-24 and Male	0.190	0.035	1.210
25-34 and Male	0.124	0.035	1.132
Likelihood χ^2	1279.048 with 8 d.f.		
'*' not significant at .05.			

DISCUSSION

Similar findings have been found in other states. Stamatiadis (1996), in classifying drivers at fault or not at fault in the State of Kentucky over the period 1990-92, found a similar U-shaped distribution, with younger drivers and older drivers more likely to be classified at fault. However, his study seems to indicate the risk ratios for younger males and females to be quite similar, compared to the differences found in Hawaii. The findings also tend to corroborate our earlier studies (Kim, et. al., 1995), which showed that overall, the gender effects are less pronounced than the age or age-gender effects.

In reviewing the statistical results, certain methodological concerns might be raised. First, there may be concerns about data quality, because, after all, this is based on police-collected data. The data used in this analysis, however, consists of fields which are likely to be among those which are most accurately and reliably reported—gender, age, intersection, lighting, and urban and rural location. A second concern is correlated with the potential problem of bias in reporting fault. It is important to recognize that there is a potential bias—that police may be more inclined to fault one group more than another. In response to this concern, the internal validity of the police crash report was tested. Fault designations were compared to dangerous actions. In more than 90% of the cases, fault was assigned to the vehicle or driver, which committed the dangerous action—passing or overtaking another vehicle, making an illegal turn, rear-ending, sideswiping or "broadsiding" another vehicle. The internal consistency suggests validity in terms of fault classifications. A third concern relates to the selection of appropriate methods for analyzing collision risk. Ideally, a better measure of exposure would be used, such as travel times or travel distances by the various age and gender groups. Unfortunately, such data are not readily available. Moreover, collision research often uses "induced exposure," similar to this paper. It is important to note, moreover, that the data are population based—that is, they include all persons involved in police-reported collisions over the eight year period. The method of tabulating odds ratios, moreover, is often used in public health research, when exposure to various health risks are not available.

The results of this paper suggest that there is a need for more focused and targeted program of education and enforcement. Because more females than males age 15 to 24 are involved in collisions, even though a smaller proportion of females in this age group are classified at fault, there is need to conduct more research on why younger females are involved in collisions and what can be done to prevent them. Parents and the public may need to be made aware of the increased risks to younger females so that community-based programs of education and traffic safety can be developed. Much of the previous attention is focused on risky behaviors (speeding, failure to yield, alcohol, etc.). On the basis of this analysis, it is apparent that in general, males are more likely than females to be involved in crashes involving these risky behaviors. While more males than females are killed in car crashes, females, overall, have a higher rate of injury.

There would appear to be support for two different approaches for increasing traffic safety for women. First, one could target certain groups, such as young females or older females and investigate further their crash involvement patterns. Of concern is the higher rates of fault among both of these groups as well as the larger demographic trends which suggest both more younger female drivers as well as more older females on the road. Perhaps more disaggregate models might be constructed to investigate the patterns identified in this paper. There may be need to develop separate models for young male or older female drivers, which build on the findings of this study. The second line of inquiry involves recognizing the apparent temporal and spatial patterns of collision involvement. As shown earlier, when compared to men, women tend to be involved in collisions in urban areas, at intersections, during daylight hours. Efforts to improve safety through engineering, enforcement, and targeted to urban areas might

also serve to enhance safety overall and to women in particular. The fact that women are more likely than men to be involved in left-turn collisions, suggests that there may be improvements in traffic control that could lead to enhanced safety. Understanding more about the time and spatial relationships of female collision involvement could also lead to improved safety for children and others, as the vehicle occupancy rate tends to be higher for women drivers. Research conducted by Levine, Kim, and Nitz (1995) has shown that zonal characteristics can be correlated with collision risk; in particular, retail trade is strongly correlated with increased collision involvement at the block group level in Hawaii.

CONCLUSIONS

There is need for more state-level analysis of gender differences in traffic safety. The reason is that first, national databases are often confounded by problems of aggregation. The problems with national crash data include different crash thresholds, different definitions, and widely divergent geographies, climates, environmental, and roadway conditions which affect the likelihood of collisions and the subsequent reporting of crash data. State-level data holds the promise of controlling for many of these differences. Also, it is important to realize that many traffic safety programs are likely to be implemented at the state and local level. Therefore it is useful to have state level data, both for problem identification as well as for program design and evaluation. State level collision data could, conceivably, be tied into other databases to develop further insight into the relationships between demographics, licensure, traffic citations, and collisions. There is more need to integrate data at the state and local level.

At the same time, there is also need for comparative studies which look across states in order to determine if there are consistent trends and patterns which require national level attention and program development. The Hawaii data reveals that in terms of both young women drivers and older women drivers, there is need for more research, problem identification, and program design. In all likelihood, the patterns identified in this paper are likely to intensify, over time, as the population continues to age and as more women start to driver earlier and longer.

A contribution of this paper, in terms of methodology involves both its use of odds ratios and the deployment of a logit model to explain fault. At present, with all age groups, males are more likely than females to be classified at fault in collisions. This suggests that women are "better drivers" than men. If male driving was to improve over time, then the difference in the odds of being classified at fault by gender would narrow. Should this occur, then women, in time, would be no better drivers than men.

ACKNOWLEDGMENTS

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NOTES

[1] For purposes of illustration, consider a three variable model which includes fault (F), age (A), and sex (S). The loglinear approach uses an additive model that incorporates main effects and interactions between variables in the form:

$$\ln(m_{ijk}) = u + {}^{u}F(i) + {}^{u}A(j) + {}^{u}S(k) + {}^{u}FA(ij) + {}^{u}FS(ik) + {}^{u}AS(jk), \quad (1)$$

where m_{ijk} are the expected cell frequencies and the u's are the parameters to be estimated. The grand mean of the cell frequencies is u. Each of the subscripted u parameters represents a deviation from the grand mean due to that effect. For example, ${}^{u}A(j)$ are the age effects with a separate parameter estimate for each categorized age group (i.e., teenage, young, middle age, seniors). The term, ${}^{u}FA(ij)$ represents the interaction effects between fault and age.. From the loglinear model (1), using the category not at fault as the reference group, the logit model for fault over no fault is:

$$\begin{aligned}\ln(m_{ijk} / m_{Ojk}) &= [u + {}^{u}F(i) + {}^{u}A(j) + {}^{u}S(k) + {}^{u}FA(ij) + {}^{u}FS(ik) + {}^{u}AS(jk)] \\ &\quad - [u + {}^{u}F(O) + {}^{u}A(j) + {}^{u}S(k) + {}^{u}FA(Oj) + {}^{u}FS(Ok) + {}^{u}AS(jk)] \\ &= [{}^{u}F(i) - {}^{u}F(O)] + [{}^{u}FA(ij) - {}^{u}FA(Oj)] + [{}^{u}FS(ik) - {}^{u}FS(Ok)] \\ &= {}^{w}F + {}^{w}A(j) + {}^{w}S(k). \quad (2)\end{aligned}$$

where the w's are parameters to be estimated.

The Risk of Ankle/Foot Fractures Among Women Drivers

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THE RISK OF ANKLE/FOOT FRACTURES AMONG WOMEN DRIVERS

ABSTRACT

Motor vehicle crashes are a major cause of lower extremity trauma, especially foot/ankle fractures. Modification of motor vehicles to create a more crash worthy environment for the lower extremities would be one of the most effective ways to reduce the incidence and severity of these disabling and costly injuries. However, before such engineering or other interventions may be implemented, we need a better understanding of the epidemiology and biomechanics. Analysis of a linked police report/ hospital discharge database reveals a significantly higher incidence of ankle/foot fractures among drivers in frontal collisions, that seatbelts are not effective in preventing these injuries, and that women have a higher risk of ankle/foot fracture than men. Further analyses have revealed that this finding may be due to an inverse correlation between height and the risk of injury. That is, shorter drivers, most of whom are women, have a higher risk of ankle/foot fractures in frontal collisions.

INTRODUCTION

Lower extremity injuries resulting from motor vehicle crashes are a common cause of permanent disability and impairment (MacKenzie 1986; States 1986). In a 1988 study in Maryland it was noted that, due to the high prevalence of lower extremity injuries, they accounted for 40% of the one-year vehicular trauma treatment charges in the state. Furthermore, among patients admitted to trauma centers, it was noted that lower extremity injuries were the most costly of all injuries in this population. (Siegel J.H., Shafi S., Goodarzi S., and Dischinger P.C., 1994). In the past, the significance of these injuries was largely overlooked, due to the urgency of the more life-threatening injuries seen among trauma center patients. However, with increasing utilization of seatbelts and availability of air bags, it is anticipated that these injuries will become relatively more important, as survival rates for drivers in high energy collisions improve (Burgess A.R., Dischinger P.C., O'Quinn T.D., and Schmidhauser C.B., 1995).

In in-depth trauma center-based crash reconstruction studies of vehicular trauma patients, intrusion of the toepan of the vehicle was associated with distal tibia fractures and fractures to the talus, ankle joint dislocations, and foot bone fractures (Siegel, Mason-Gonzalez S., Dischinger P. et al., 1993; Siegel, Dischinger, Burgess, Cushing et al., 1994). Entrapment of the patient by the lower extremities often lead to the need for extrication by emergency medical services personnel, and further jeopardized the patients' outcomes due to the added elapsed time before administration of definitive care in the trauma center (Siegel J.H., Mason-Gonzalez S., Dischinger P.C. et al. 1993b).

More information is needed about the incidence of these injuries in different types of crashes, whether or not seatbelts and airbags are effective in their prevention, and whether or not there are variations in incidence due to driver characteristics such as gender. By integrating epidemiologic, clinical and experimental findings, it will be possible to better understand the exact mechanism of injury, thus allowing for targeted intervention measures to be implemented.

METHODS

Using police reports, all drivers injured in non-rollover crashes during the period 1991-1994 were identified. By linking police reports with hospital discharge and trauma registry databases, records were identified for all drivers (N=7188) admitted to Maryland hospitals during this period. There were 3835 men and 3353 women included in this sample.

From the police report, it is possible to determine characteristics of the crash, including the driver's age and gender, type of vehicle, use of safety equipment, and the primary point of impact. From the hospital discharge and trauma registry records, data on injury diagnoses are available. Thus, by combining these sources of information, it is possible to analyze the nature and severity of the injuries incurred by these drivers in terms of the characteristics of the crashes, such as the point of impact or seatbelt use, as well as the characteristics of the drivers, such as age and gender.

To address the question of height and the risk of ankle/foot fractures, data were obtained from the Clinical Trauma Registry of the R. Adams Cowley Shock Trauma Center (see Dunham et al., 1989) and linked with police crash reports. Comparisons between groups were made using Pearson's chi-square test of proportion. Tests for interaction were performed using the Breslau-Day test for homogeneity of the odds ratio.

RESULTS

Among the total group of 7188 patients admitted to hospitals during the study period, 16.1% had a lower extremity fracture. There was a significantly higher incidence of lower extremity fracture in frontal, as opposed to lateral and other, collisions (19.1% vs. 9.4%). Furthermore, as shown in Table 1, it may be noted that the incidence of lower extremity fracture was significantly higher in women; however, this male/female difference was only apparent for the drivers in frontal, not lateral, collisions.

Table 1
Incidence of Lower Extremity Fracture by Gender and Point of Impact (n=7188)

	Male	Female	p	Total
Frontal	16.1	22.7	<.001	19.1
Lateral	8.5	8.9	NS	8.7
Total	14.1	18.4	<.001	16.1

Subsequent tables are based on frontal collisions only, since the incidence of lower extremity fractures is highest in this type of crash. Table 2 shows the incidence of specific types of lower extremity injuries, with a comparison of male vs. female drivers. It may be noted that, while femur fractures are significantly higher among men, the incidence of ankle/foot fractures is significantly higher among women.

Table 2
Incidence of Specific Lower Extremity Fractures (Frontal Collisions, n=4961)

	Male (n=2690)	Female (n=2271)	p	Total (n=4961)
Femur	6.7	5.3	.04	6.1
Patella	2.9	3.0	NS	2.9
Tibia/Fibula	4.4	3.4	.07	3.9
Ankle	3.5	8.2	<.001	5.6
Tarsal/Metatarsal	2.3	5.9	<.001	3.9
Total Lower Extremity	16.1	22.7	<.001	

The next table (Table 3) shows a comparison of the incidence of lower extremity injuries among drivers in frontal collisions with and without seatbelts. Women are significantly more likely to be using seatbelts (67.8% vs 52.6%, p<.001). Moreover, with or without seatbelts, women in frontal collisions have a significantly higher incidence of lower extremity injury than men. Lower extremity fractures were uniformly higher among women than among men in both the belted and unbelted groups, as illustrated by a nonsignificant interaction p-value (p=.46).

Table 3
Incidence of Lower Extremity Fracture by Gender and Seatbelt Use (Frontal Crashes)

	Male	Female	p	Total
Belt	14.6	21.9	<.001	18.44
No Belt	17.4	23.6	<.001	19.70
Total	16.0	22.4	<.001	19.10

Table 4 compares the incidence of the specific lower extremity fractures for male and female drivers, with and without seatbelts. Regardless of belt use women drivers have a significantly higher incidence of ankle and metatarsal fractures.

Table 4
Incidence of Specific Lower Extremity Fractures by Gender and Belt Use

	Belt			No Belt			
	Male	Female	p	Male	Female		p
Total							
Femur	4.7	4.5	NS	8.5	6.6	NS	6.1
Patella	3.8	3.1	NS	2.2	2.6	NS	2.9
Tib/Fib	3.2	4.1	NS	3.4	4.9	NS	3.9
Ankle	3.2	8.3	<.001	3.9	8.0	<.001	5.6
Metatar	1.9	6.1	<.001	2.4	5.2	<.002	3.9
Total	14.6	21.9	<.001	17.4	23.6	<.001	19.1

Several reasons for the increased incidence of ankle/foot fractures in women were hypothesized:

differences in footwear, the fact that women drivers, as a group, are shorter than men drivers, and the possible role, if any, of osteoporosis. To directly address one of these hypotheses, data from the trauma registry of the R. Adams Cowley Shock Trauma Center were examined in order to see whether there was an association between the height of the driver and the risk of ankle/foot fracture. There were 1520 patients (959 men and 561 women) in this database, which spanned the period between July, 1987 and December, 1992.

Findings from this analysis (Dischinger P.C., Kerns T.J., and Kufera J.A., 1995) revealed that there is an inverse association between driver height and the incidence of ankle/foot fractures for both men and women (see Figures 1 and 2). Those drivers shorter than average (5'7" for this population) had a 64% increase in lower extremity fracture, mostly due to ankle/tarsal injuries. Thus, the incidence of these injuries appears to be a function of driver height, with an increase among shorter drivers, most of whom are women.

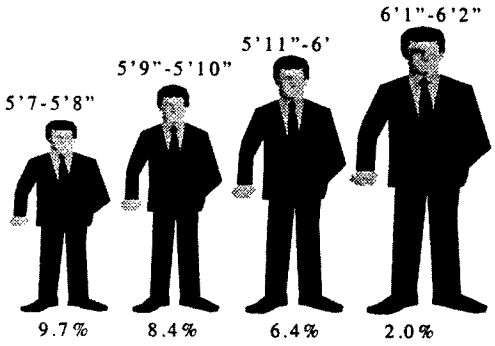

Figure 1
Incidence of Ankle/Tarsal Fractures in Men

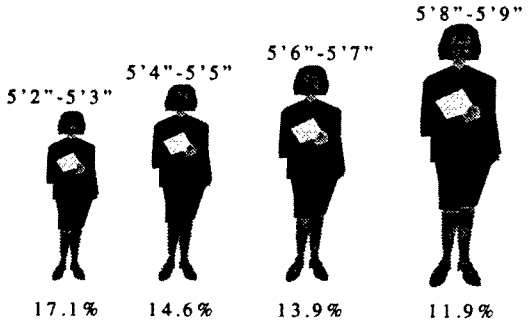

Figure 2
Incidence of Ankle/Tarsal Fractures in Women

DISCUSSION/CONCLUSIONS

It is apparent that the risk of ankle/foot fractures is a function of both crash and driver characteristics. In a previous analysis, we noted that lower extremity injuries were more frequent in frontal collisions, and that seat belts were, for the most part, not effective with regard to their prevention (Dischinger P.C., Cushing B.M., Kerns T.J., 1992). This analysis, based on a larger group of patients, confirms these findings, and focuses more on the comparisons between men and women drivers.

While we believe that the higher risk of ankle/foot injury noted for women is actually a reflection of height and not gender, the fact remains that the majority of shorter drivers are women. Further research needs to be conducted to better understand how height and gender may affect the risk of these injuries. The increased risk in women/shorter drivers may be a reflection of leg position (the angle of the femur or tibia relative to the ankle) as a function of seat placement, since women drivers are more likely than men to drive with the seat moved forward. Other factors might include drivers' foot size or the contribution of knee contacts. The possible influence of foot placement and vehicular intrusion on occupant lower limb injury has recently been described by Pilkey et al. (Pilkey W.D., Sieveka E.M., Crandall J.R., and Klopp G., 1994).

Before preventive measures such as changes in vehicle design can be implemented, further experi-

mental studies are required to explore the role of driver height, gender, and positioning of the seat and foot as related to the causation of these disabling injuries. Since, with the increasing availability of airbags, it is anticipated that there will be more survivors of serious frontal collisions with lower extremity injuries, there will probably be a relative increase of ankle/foot fractures. That is, before the advent of airbags, drivers in high energy collisions frequently suffered from multiple injuries to the head, thorax, abdomen and lower extremities; with airbags more drivers will survive due to a decreased incidence of head, chest, and abdomen injuries. Until changes in car design are implemented to prevent these injuries, the population of those disabled as a result of ankle/foot fractures should include a disproportionately high percentage of women drivers. Further research needs to be conducted to better understand how height and gender may affect the risk of these injuries. The increased risk in women/shorter drivers may be a reflection of leg position (the angle of the femur or tibia relative to the ankle) as a function of seat placement, since women drivers are more likely than men to drive with the seat moved forward. Other factors might include drivers' foot size or the contribution of knee contacts. The possible influence of foot placement and vehicular intrusion on occupant lower limb injury has recently been described by Pilkey et al. (Pilkey W.D., Sieveka E.M., Crandall J.R., and Klopp G., 1994).

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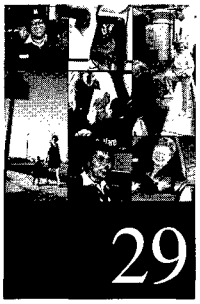

Air Bags and Children: Results of National Highway Traffic Safety Administration Special Investigation Into Actual Crashes

Flaura Koplin Winston

Children's Hospital of Philadelphia

Richard Reed

National Highway Traffic Safety Administration

AIR BAGS AND CHILDREN: RESULTS OF NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION SPECIAL INVESTIGATION INTO ACTUAL CRASHES

ABSTRACT

Air bags have been and continue to be an effective, lifesaving technology. The National Highway Traffic Safety Administration (NHTSA) has estimated that air bags have saved almost 1,500 lives, with an estimated 569 lives saved in 1995 alone. However, the increasing availability of air bags in passenger vehicles and light trucks has seen a concomitant rise in the report of injuries related to air bag deployment. While the vast majority of these injuries has been minor, the exposure of children to passenger-side air bag deployments has resulted in reports of more serious injuries. The objective of this study was to examine the interaction of air bags and children in actual crash scenarios. Investigations were conducted as part of the NHTSA's Special Crash Investigation Program. This paper will present a case series of more than twenty serious or fatal injuries in children attributed to air bag deployment. Cases of children whose lives were saved by air bags, the "success stories," were not included in the series because these cases were not reported to the NHTSA. Analysis of the investigations included determination of vehicle dynamics, occupant kinematics and injury patterns in order to define injury mechanisms.

BACKGROUND

Air bags continue to save lives[1]. Several studies of air bag effectiveness at the NHTSA have all concluded that air bags are approximately 30 percent effective in reducing fatalities in pure frontal crashes (12:00 point of impact), and about 18 percent effective in all frontal crashes (10:00 to 2:00 point of impact). Based on these evaluations, the NHTSA has estimated that air bags have saved almost 1,500 lives, with an estimated 569 lives saved in 1995 alone. Other studies at the NHTSA have shown that air bags reduce the likelihood of non-fatal injury as well. In particular, air bags minimize the risk of life-threatening injuries to an occupant's head, neck, face, chest, and abdomen. These analyses have also shown that air bags can be associated with increased risk of arm injury[2,3,4].

Air bags work optimally when deployed fully before making contact with the vehicle occupant. In the deployed state, airbags dissipate and spread the crash load and prevent occupant contact with the interior structures of the vehicle. However, if the passenger makes contact with the air bag, particularly as it is deploying, injuries may result, including abrasions, eyeglass impalement in eyes, fractures, and head injuries[5, 6, 7, 8, 9, 10].

In adults contact with the deploying air bag can be minimized by moving the vehicle seat rearward and using the seatbelt restraint system properly. In the optimal condition, the seatbelt limits forward movement of the occupant so that the air bag is inflated fully before making contact with the occupant. If the passenger is in close proximity to the air bag or is unrestrained, the air bag, which deploys at 140-200 mph, will make contact with the passenger. Close proximity to an air bag has been termed "out-of-position" and in these situations the air bag will add localized energy to the occupant thereby increasing the risk of injury.

AIR BAG CRASH INVESTIGATIONS AT THE NHTSA

In order to meet its organizational mission of improving traffic safety, NHTSA has been collecting and analyzing crash and related data on various levels. The data range in sophistication from population data and the basic data contained in routine police crash reports, to the comprehensive in-depth data contained in special reports by professional crash investigation teams. At the basic level of collection, a small number of data elements are collected on the population at large and on a large number of crashes. At the most detailed level, hundreds of data elements are collected on a select number of crashes that are designated for study. Intermediate levels involve various additional data elements, not routinely collected at the basic level, in order to study some specific aspect of highway safety on a sample of crashes. The agency utilizes three distinct data collection programs to investigate and analyze air bag-related injuries: the Fatal Accident Reporting System (FARS), the National Accident Sampling System Crashworthiness Data System (NASS CDS), and the Special Crash Investigation (SCI) program.

The Fatal Accident Reporting System (FARS) is the automotive safety community's primary data source for evaluating the "global" fatality-reduction effectiveness of automotive safety features based on analysis of Police Accident Reports. FARS is a census of approximately 40,000 fatal traffic crashes per year and encompasses data from police reports and death certificates as well as State Highway Department roadway and driver licensing data bases. While FARS has been essential in revealing global trends of air bag-associated fatality and in identifying specific cases, FARS data are qualitative descriptors and lack specifications needed by automotive designers in order to improve air bag effectiveness.

The National Accident Sampling System Crashworthiness Data System (NASS CDS) is the automotive safety community's primary data source for evaluating the "global" injury-reducing effectiveness of automotive safety features. The NASS CDS has positioned crash investigation teams throughout the United States in sites representative of the geographic and demographic characteristics of the country. For a statistically representative sample of all tow-away crashes involving cars, light trucks, and vans, investigation teams collect hundreds of data elements relevant to the environment, roadway, vehicle, occupants, injuries, and safety systems involved. Currently, 24 NASS teams with a total of 60 researchers conduct approximately 5,500 investigations per year. The NASS CDS has been an invaluable data source for the automotive safety community. However, because of the size and structure of the system, it often takes one to three years to identify crash-injury trends associated with new and emerging technologies.

In order to investigate the rapidly changing innovations in automotive technology, the NHTSA created the Special Crash Investigation (SCI) Program. Since 1972, the SCI Program has conducted clinical in-depth crash investigations involving air bag-equipped vehicles. The SCI Program has provided NHTSA with the most in-depth and detailed level of crash investigation data collected by the Agency. In contrast to the NASS CDS, which reviews, collects, records, and samples hundreds of police accident reports in a particular jurisdiction, the SCI program manager selects a much smaller number of cases for investigation, 80 to 85 per year. The SCI cases are intended to be an anecdotal data set useful for examining special crash circumstances or outcomes from an engineering perspective. The benefit of this program lies in its ability to locate unique real-world crashes anywhere in the country and perform in-depth clinical investigations in a timely manner that can be utilized by the NHTSA and the automotive safety community to improve the performance of their state-of-the-art safety systems. This report describes the results to date of Special Crash Investigations of air bag injuries in children.

METHODS

The program manager for the SCI Program receives information from an extensive and diverse network of sources. These sources include personnel from other NHTSA offices, other Federal agencies, physicians, automotive manufacturers, law enforcement agencies, consumer and legal contacts, media reports or referrals, insurance industry representatives, trauma centers, and medical examiners as well as from the general public through the automobile safety hotline.

For the current study, cases were chosen for Special Crash Investigation from crashes with passenger-side air bag deployment demonstrating unexpected severe injuries suffered by a child in a low impact collision. Once a case was identified, special crash investigation teams at Dynamic Science, Inc., Calspan, Inc., or Indiana University were dispatched to the scene to determine the pre-crash, at-crash , and post-crash vehicle dynamics and occupant kinematics. After locating the vehicles involved in the crash, the investigators photographed and measured the crash damage, identified interior locations that were struck by the occupants, obtained other scene data and photographs from the crash site, and studied evidence such as skid marks, gouges, fluid spills, and broken glass. The investigators supplemented their on-site investigations by interviewing crash victims and other involved parties, by reviewing medical records and interviewing medical personnel to determine the nature and severity of the injuries. Clinical data regarding child anthropomorphic measurements and injury patterns were provided by clinicians caring for the child and abstracted from the child's medical record.

Once all of the data were assembled, the crash was reconstructed through the use of the NHTSA's CRASH3PC and Engineering Dynamics Corporation's EDCRASH. Each investigation provided extensive information about pertinent pre-crash-, crash-, and post-crash events involving the occupants, vehicles, and rescue and environmental factors that may have contributed to the event's occurrence or resulting severity. Included in each report was an analysis and determination of the occupant kinematics and vehicle dynamics as they occurred throughout the crash. Detailed performance evaluations of the air bag and any other safety features were provided.

For a subset of the investigations, vehicles were not available for inspection (repaired, impounded, or unable to locate) or the lag time between crash date and notification was too long. For these situations, investigations were performed remote from the crash scene and were based on a review of police accident reports, medical records, and interview data rather than on detailed inspection of the scenes and vehicles.

These on-site and remote investigations formed a case series of children with air bag-induced injuries and were not a representative sample of all crashes. As such, analyses were limited to counts and descriptive summaries.

RESULTS

Tables 1 through 4 contain twenty-nine investigations of air bag-associated, critical or fatal injuries in children that were performed by the SCI Program for crashes that occurred between April 1993 and August 1996 (cases in **bold** indicate **fatal** injuries). Twenty-two of the twenty-nine crashes had occurred in the last 18 months (March 1995 through August 1996). Twenty-three of the twenty-nine investigations were performed on-site and the remainder were performed remotely. Most of the

on-site investigations were conducted within 48 to 72 hours of the crash; some, however, due to delays in notification, were initiated up to three months after the crash.

The injured children ranged in age from one week to nine years. Seven of the eleven infants and seventeen of the eighteen children older than one year suffered fatal injuries. None of these children were between the ages of nine months and three years.

Fatalities or severe injuries in air bag-equipped vehicles quite often involve unsurvivable levels of intrusion, crashes for which the air bag would not be expected to provide a life-saving benefit (i.e., rollovers, side impacts), and multiple impact crashes, where initial deployment is of limited value in subsequent collisions. However, twenty-three of the twenty-nine cases in this series involved crash severities (DV's) of 25 kilometers per hour (15 mph) or less with ten of these at less than 16 kph (10 mph). The crash severities for the remaining six cases were estimated as follows: four were less than 30 kph, one was estimated at 32 kilometers per hour, and one at 34 kilometers per hour. In almost all cases, the drivers, many of whom were unrestrained, suffered no or minor injuries. In only one case of an infant fatality, Case CA9516, did the driver sustain a moderate injury classified as a 2 on the Abbreviated Injury Scale 90[11].

Table 1

Vehicle Characteristics Associated With Air Bag-Induced Injuries in Children Older Than One Year
(Bold print indicates fatal injuries)

Case Number	Crash Date	Investigation Date	State	Vehicle	Crash Severity (Δv in kph)	Air Bag Module Mount
CA9307	**4/93**	**4/93**	**OH**	**1993 Volvo 850**	**11**	**mid**
CA9515 Remote	**3/94**	**8/95**	**TX**	**1993 Lexus LS400**	**< 20**	**mid**
CA9443 Remote	**7/94**	**12/94**	**VA**	**1994 Ford Mustang**	**<20**	**mid**
DS9420	**9/94**	**12/94**	**UT**	**1994 Dodge Grand Caravan Minivan**	**13**	**top**
IN9610 Remote	**12/94**	**4/96**	**VA**	**1994 Ford Aspire**	**<30**	**top**
IN9508	**3/95**	**5/95**	**TX**	**1995 Plymouth Voyager Minivan**	**26**	**top**
CA9523 Remote	**4/95**	**12/95**	**VT**	**1993 Dodge Intrepid**	**20**	**top**
IN9520 Remote	**5/95**	**12/95**	**MI**	**1995 Ford Contour**	**20**	**top/ledge**
ID9501 Remote	**12/94**	**12/95**	**MS**	**1995 Toyota Avalon**	**<15**	**mid**
CA9520	**10/95**	**10/95**	**UT**	**1994 Chevrolet Camaro Convertible**	**16**	**top/mid**
CA9521	**10/95**	**10/95**	**MD**	**1995 Dodge Caravan Minivan**	**20**	**top**
IN9518	10/95	10/95	PA	1995 Jaguar Convertible	<15	mid
CA9601	**1/96**	**1/96**	**MI**	**1995 Dodge Caravan Minivan**	**32**	**top**
DS9605	**4/96**	**4/96**	**MD**	**1994 Geo Metro**	**17**	**top/mid**
IN9612	**5/96**	**5/96**	**NC**	**1994 Chrysler Minivan**	**<20**	**top**
CA9607	**5/96**	**5/96**	**NY**	**1995 Ford Contour**	**17**	**top**
IN9618	**6/96**	**7/96**	**KS**	**1995 Chevrolet Lumina Sedan**	**<25**	**top**
IN9619	**8/96**	**8/96**	**MO**	**1995 Dodge Caravan Minivan**	**<30**	**top**

All but three of the cases could be grouped in one of two groups: children greater than one year old and those less than one. Fifteen of the seventeen older children who were fatally injured were unrestrained right front seat occupants and the other only wore the lap portion of a lap-shoulder seat belt. The remaining older child in the series (IN9518) was a three year old who was seated in a belt-positioning booster and restrained, to some degree, by portions of the vehicle belting. This three year old was both the only older child in the series who was belted and the only older child who survived,

Table 2
Anthropomorphic and Injury Characteristics in Children Older Than One Year
(Bold print indicates fatal injuries)

Case Number	Age	Height (cm)	Weight (kg)	Restraint Usage	Site of Most Severe Child Injuries	Site of Most Severe Driver Injuries
CA9307	**6**	**111.8**	**23.2**	**None**	**Brain**	**Minor**
CA9515 Remote	**7**	**134.6**	**35.5**	**None**	**Atlanto-occipital ligament C-spine**	**None**
CA9443 Remote	**4**	**111.8**	**24.5**	**None**	**Brain C-spine**	**None**
DS9420	**4**	**104.1**	**15.9**	**None**	**Skull**	**Minor**
IN9610 Remote	**4**	**117**	**23**	**None**	**Brain, Atlanto-occipital ligament**	**Humerus**
IN9508	**9**	**139.7**	**29.5**	**Only lap portion**	**Brain C-spine**	**Minor**
CA9523 Remote	**5**	**116.8**	**20.5**	**None**	**Brain C-spine**	**None**
IN9520 Remote	**5**	**106.7**	**20.5**	**None**	**C-spine, Neck Atlanto-occipital ligament Brain**	**Minor**
ID9501 Remote	**6**	**?**	**?**	**None**	**Brain**	**Minor**
CA9520	**5**	**104.1**	**25.0**	**None**	**C-spine**	**Minor**
CA9521	**7**	**129.5**	**25.0**	**Only lap portion**	**Brain**	**None**
IN9518	3	104.1	16.8	Belt Positioning Booster	Brain	None
CA9601	**9**	**137.2**	**41.0**	**None**	**Atlanto-occipital ligament**	**Minor**
DS9605	**3**	**96.5**	**13.2**	**None**	**C-spine**	**?**
IN9612	**4**	**109**	**20**	**None**	**Brain, Atlanto-occipital ligament**	**?**
CA9607	**7**	**123**	**22.7**	**None**	**Neck, C-Spine**	**None**
IN9618	**5**	**?**	**19**	**None**	**Brain, Atlanto-occipital ligament**	**Minor**
IN9619	**4**	**122**	**23**	**None**	**Brain**	**Minor**

Table 3
Vehicle Characteristics Associated With Air Bag-Induced Injuries
in Children Less Than One Year Old
(Bold print indicates fatal injuries)

Case Number	Crash Date	Investigation Date	State	Vehicle	Crash Severity (Δv in kph)	Air Bag Module Mount
DS9423	**11/94**	**12/94**	**CA**	**1994 Toyota Corolla**	**<20**	**mid**
CA9516	**7/95**	**7/95**	**PA**	**1995 Ford Escort**	**33**	**mid**
DS9519	**9/95**	**12/95**	**CA**	**1994 Toyota Camry**	**<15**	**mid**
CA9522	**10/95**	**11/95**	**LA**	**1995 Saturn**	**20**	**mid**
DS9522	10/95	11/95	CA	1995 Ford Escort	45	mid
DS9525	11/95	12/95	CO	1994 Ford Aspire	<15	mid
IN9521	11/95	12/95	WI	1996 Dodge Caravan Minivan	<30	mid
CA9602	**2/96**	**2/96**	**NJ**	**1995 Isuzu Trooper**	**24**	**mid**
CA9608	**4/96**	**5/96**	**FL**	**1995 Hyundai Accent**	**<25**	**mid**
LT96018	**5/96**	**5/96**	**FL**	**1994 Toyota Camry**	**<15**	**mid**
IN9617	**6/96**	**7/96**	**IL**	**1995 Ford Escort**	**<15**	**mid**

although his injuries were severe. Crash testing was conducted by the NHTSA using an exemplar vehicle and child test dummy in order to better understand the child occupant kinematics, and NHTSA and Indiana University's Special Crash Investigation Team both concluded that the belt in this case was not properly positioned at the time of the crash. A parallel investigation conducted by the National Transportation Safety Board (NTSB) concluded that the child was properly belted at the time of the crash.

The older children ranged in age from three to nine years (mean 5.4 years, median 5.0 years); height range 97 to 140 cm (mean 116.7 cm, median 114.3 cm); and weight range from 13.2 to 41 kg (mean 23.4 kg, median 23 kg). The occupant kinematics sequence typical of the older unrestrained children was as follows. Avoidance braking prior to a frontal crash brought the child in close proximity to the air bag module flap. Due to the child's forward position, he/she restricted the normal air bag deployment path allowing for pressure to mount within the air bag module. Upon forceful opening of the air bag module cover flap, the child was accelerated vertically, often hitting his/her head on the windshield, followed by a rearward acceleration that resulted in hyperextension of the neck. The children died of injuries to the cervical spine and head. One of initial cases, CA9307, had a variant injury mechanism in which the child suffered no hyperextension injury of the neck but was rather lifted vertically into the roof/dome light area which resulted in fatal brain injuries without cervical spine injury.

The other group contained the eleven infants all of whom were seated in rear-facing safety seats. The infants ranged in age from one week to nine months (mean 3.5 months, median 3.0 months); height range 51 to 69 cm (mean 59.7 cm, median 61.0 cm); and weight range from 4.5 to 10 kg (mean 7.4 kg, median 8.0 kg). Typical of this series, the baby was seated in a rear-facing child safety seat placed in the right front passenger position. The close proximity of the rear of the safety seat to the air bag module resulted in rearward displacement of the safety seat upon contact with either the air bag module flap or the air bag module cover. More than half involved contact with the cover flap and

Table 4

Anthropometric and Injury Characteristics in Children Less Than One Year
(Bold print indicates fatal injuries)

Case Number	Age	Height (cm)	Weight (kg)	Restraint Usage	Site of Most Severe Child Injuries	Site of Most Severe Driver Injuries
DS9423	**3 months**	**50.8**	**5.9**	**Rear-facing Safety Seat**	**Skull**	**Wrist**
CA9516	**3 weeks**	**61.0**	**5.0**	**Rear-facing Safety Seat**	**Skull Brain**	**Pelvis**
DS9519	**5 months**	**68.6**	**9.1**	**Rear-facing Safety Seat**	**Skull Brain**	**Minor**
CA9522	**4 months**	**61.0**	**7.7**	**Rear-facing Safety Seat**	**Skull Brain**	**None**
DS9522	6 months	61.0	10.0	Rear-facing Safety Seat	Skull	Minor
DS9525	3 months	?	?	Rear-facing Safety Seat	Skull Brain	None
IN9521	7 weeks	55.9	4.5	Rear-facing Safety Seat	Skull	Minor
CA9602	**4 months**	**61**	**9.1**	**Rear-facing Safety Seat**	**Brain**	**None**
CA9608	**3 months**	**58.4**	**8.2**	**Rear-facing Safety Seat**	**Skull Brain**	**Minor**
LT96018	**9 months**	**58.4**	**8.6**	**Rear-facing Safety Seat**	**Skull Brain**	**Minor**
IN9617	**1 week**	**?**	**?**	**Unattached Rear-facing Safety Seat**	**Skull Brain**	**None**

demonstrated cracks at the site of contact with the air bag module flap cover, which were of a midmount design. A majority of the safety seats were not installed with a locking clip. The injury mechanism was thought to involve crush and resulted in skull fractures and brain injuries. The infant in case CA9516, the most severe crash severity in the series, suffered fatal brain parenchymal fracture in addition to skull fracture.

DISCUSSION

This report presents a series of twenty-nine cases of serious or fatal injuries to children attributed to air bag deployment. The crashes were investigated as part of the NHTSA Special Crash Investigation Program. A bimodal age distribution of injury mechanism was noted. Mechanism of injury to the infants in the series resulted from rearward acceleration of rear-facing infant seats that came in contact with air bag module cover flaps and the air bags. All of the vehicles in this series were equipped with air bag module flaps located in the midmount position. The infant injuries resulted from crush and included skull fracture and brain injuries. The vast majority of the older children in the series who were unbelted were placed in close proximity to the primarily top-mounted air bag modules when the driver braked pre-impact. When the air bag deployed, the children were accelerated vertically and rearward and suffered brain injuries and hyperextension injuries of the cervical spine. In all cases, the change in velocity was at most moderate but the vast majority were less than 20 kilometers per hour; the vast majority of the drivers suffered no or minor injuries but at most moderate injuries.

The severity of these air bag-associated injuries in the children in this series are in contrast to the mostly minor injuries reported in adults. Almost all of the experience in evaluating the "global effectiveness" of air bags has been based on driver-side air bags, the majority of the current air bag fleet. The passenger-side air bag fleet has been, and continues to be, too small to conduct meaningful evaluations of their lifesaving benefits. As the dual air bag fleet continues to grow, such studies will become possible. Currently, only anecdotal information, located and developed by the NHTSA's Special Crash Investigation program, is available on passenger-side air bags[4].

The number of air bag vehicle crashes investigated by NASS CDS has grown dramatically, from less than 10 cases in 1988, to nearly 800 cases in 1994. In 1996, approximately 2,200 of these crashes will involve an air bag deployment. As a result of consumer demand and the congressional mandate requiring passenger-side air bags in all new passenger cars by model year 1998, and all light trucks and vans by model year 1999, a similar trend in case selection is expected for the passenger side air bag.

Cases from the 1988 through 1994 NASS CDS data files involving children seated in the right front seating position in crashes with passenger side air bag deployments are presented in Table 5 . The results of these six cases are quite different from those identified by the SCI program. It is important to note that this nationally representative statistical sample contains no AIS3 or greater injuries. This is particularly remarkable since "the current NASS CDS sampling design selects crashes which are more severe than the general crash population."[12]

This discrepancy of representation of serious injuries to children in the NASS CDS data base as compared to the SCI Program can be explained in two ways. This difference may reflect the inability of the NASS CDS program to investigate crashes involving new and emerging technologies outside of the designated sampling regions, or it may reflect the main limitation of the SCI Program and, therefore, of this study, a reporting bias toward severe or fatal injuries. These tragic cases tend to gain

rapid public awareness and are readily reported to the SCI Program while the success stories of lives saved by air bags go virtually unnoticed. Since the public expects the air bag to provide life-saving benefits, successes may not be reported because the air bag is performing as expected.

Table 5
Children and Passenger Side Air Bag Deployments 1988-1994 NASS CDS
(Only publicly available data are included in table; No fatal injuries in database.)

Age (yr)	Height (cm)	Weight (kg)	Vehicle	Crash Severity (Δv in kph)	Restraint	Maximum Abbreviated Injury Scale Score for Child	Maximum Abbreviated Injury Scale Score for Driver
0	64	7	1993 Mercury Sable	26	Rear-facing Safety Seat	0	1
3	?	?	1993 Bonneville	16	Forward-facing Safety Seat	1	0
4	91	13	1994 VW Golf	<30	3 point	0	2
10	155	35	1994 Chrysler Minivan	<30	3 point	1	1
11	152	54	1992 Ford Taurus	20	3 point	1	1
12	152	41	1994 Toyota Corolla	30	3 point	1	1

CONCLUSIONS

In this study, two possible air bag-associated injury-producing mechanisms have been identified that require further investigation:

1. Infants in low severity frontal collisions who were seated in rear-facing child safety seats installed in the right front passenger position in close proximity to a midmount air bag.

2. Older, unbelted or improperly belted children in low severity frontal collisions who, after pre-impact braking, were placed in close proximity to an air bag.

This case series may represent a few isolated tragic cases or the beginning of a new trend of air bag-induced injuries in children. Over 12 million vehicles in the current fleet are equipped with passenger side air bags, but it is not known how many of these air bags have deployed with a child sitting in the right front seat. Without a true measure of the exposure of children to air bags and the true incidence of air bag injuries to children, the effectiveness of passenger side air bags in injury reduction or the injury-producing potential of air bags cannot be assessed. This information is vital to policy makers and designers.

The introduction of air bag vehicles into the driving fleet has resulted in thousands of lives saved, tens of thousands of injuries mitigated, and a reduction in the societal costs incurred as a result of motor vehicle crashes. The pivotal research and developmental roles played by NHTSA's crash investigation programs during the 1970s and 1980s, continue today with the investigation of an ever-increasing number of NASS CDS and SCI special interest air bag crashes. These air bag investigations will continue to provide the automotive safety community with valuable information. The ultimate goal of these air bag investigations and other agency programs is to improve the performance of these safety technologies and further reduce the physical and economic toll of automobile crashes. The challenge now exists to maximize the effectiveness of air bags for children and adults.

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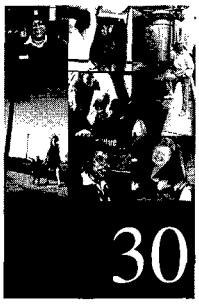

Women and Transit Security: A New Look at an Old Issue

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WOMEN AND TRANSIT SECURITY: A NEW LOOK AT AN OLD ISSUE

The research from which this paper is drawn was supported by the United States Transit Cooperative Research Program, Project F-6, "Guidelines for the Effective Use of Uniformed Transit Police and Security Personnel." The TCRP was established in 1992 to provide a continuing program of applied research on transit issues. It is sponsored by the Federal Transit Administration (FTA) and is carried out under a three-way agreement among the National Academy of Sciences (NAS), acting through its Transportation Research Board (TRB); the Transit Development Corporation, an educational arm of the American Public Transit Association (APTA); and the FTA.

There is no better way to introduce the topic of women and transit security than with the experiences of one rapid transit system in attacking head-on the issues of women's fears of using public transit. Only three years after its initial opening, this transit system was forced to organize a special police force to deal with the problem of crowding. Within eight years of its opening, the transit system was being criticized for the sexual harassment of women and girls, who, although they accounted for only about a quarter of all peak hour passengers, were forced to endure jostling and unwelcome sexual contact. The cross-class nature of these incidents was viewed as "a violation of the laws of decency."[1]

One solution the transit system rejected was cars solely for women, although years later the system would embrace the idea of cars for students travelling between school and home in the afternoon hours. The transit system, though, continued to receive criticism about the safety of women riders. A few years later, women police officers worked as decoys to contain the behavior of men who made it "their business to insult and annoy women and girls."[2] More than fifteen* new mass transit systems have opened during the last 20 years. Would anyone like to guess which system we are describing? Good guesses all, but none are correct. In fact, we are describing New York City's first subway, the Interborough Rapid Transit, which opened in 1904, and was viewed as a sensation for its underground travel, its extremely high speeds, and its unprecedented crowding.[3] It was this last attribute that led to concerns about women's safety on the system. This contrasts sharply with today's concern about women's safety, which more often revolves around dark and deserted stations and parking lots, rather than problems of too many people in too little space.

As early as 1909—only five years after the IRT opened—a prominent leader of the Women's Municipal League proposed that it reserve the last car of every rush hour train for women. At a time when women's separate spheres in most aspects of public life were taken for granted by men and women, Julia D. Longfellow advocated this male-free space to assure that women were not forced to cope with "the fearful crushes," and with sexual insults, and that they would not have to safeguard themselves from men's sexual aggression. A secondary purpose of her demand for segregated cars was less benevolent. Longfellow, representing the views of many upper-class women of her time, believed that some working-class women were willing participants in this subway rowdiness, and that creation of women's only cars would lead to more ladylike behavior by those who needed such reforming.[4]

* The fifteen new transit agencies referred to include, in the United States, Baltimore, Atlanta, St. Louis, Denver, Dallas, Metro-Rail and Tri-Rail in south Florida, San Diego, two systems in Los Angeles, Sacramento, San Jose, and, in Canada, Vancouver, Edmonton, and Calgary. There are others.

The IRT rejected the idea, but women's safety—or lack of it—whether real or perceived—remained a public concern. In 1918, when the first policewomen entered the New York City Police Department under a new, female fifth deputy commissioner, one of their first assignments was to attack the problems of white slavery and men who annoyed women on the streets, in the subways, and on the elevated trains—problems that were seen, at least in part, as related.

Those familiar with Progressive Era concerns about white slavery know that creation of such groups as the Traveller's Aid Society were directly related to demands that women be present in train stations to protect young women, often runaways or working-class immigrants, from the clutches of those perceived as ready to lure them into lives of prostitution. Early policewomen, too, spent much of their time patrolling train stations, with the expressed aim of saving women from the perils believed awaiting them there.[5] Thus concern about women and their safety in and around transit systems has a long history and plays an important role in women's demands for public positions in both the social service and criminal justice fields. Many of us here for this conference are picking up this thread of women and transit, issues that have been linked before and which continue to arouse the interests of government officials, researchers, crime prevention specialists, and women community activists.

Before we move ahead some 85 years to our present issues, it is interesting to note that although the IRT rejected the women's-only cars, the plan was adopted by the Hudson and Manhattan Railroad, which ran under the Hudson River from New York City to Jersey City, New Jersey. (Those from the New York/New Jersey area may know this rail line by its current name of PATH, or the Port Authority Trans-Hudson line).

The experiment was not a success; it lasted only from April 1 to July 1, 1909, and immediately became enmeshed in the class-based politics of the times. The ladies' cars was favored by upper-middle class women returning from shopping expeditions to New York City's popular Ladies Mile. They particularly appreciated the red-capped attendants who carried their packages to the evening rush hour trains. According to The New York Times, working women and those under 25 were noticeably absent. Other women were concerned that such "special privileges" would erode the rights they had only recently achieved. This early debate over the definitions and dilemmas of equality ended quickly, since the H & M decided that the passenger loads did not justify the special service.[6]

Despite activities in New York and other cities aimed at protecting women in stations and on rolling stock, interest in women's safety on public transit waned after the 1920s, at least in part in conjunction with the return of middle class women to their homes. The Depression made it unpopular—and in some cases illegal—for women, particularly married women, to work. Although women returned to the workplace in the 1940s, particularly during World War II, there are few reports of their being harassed on public transit or of their being victims of crimes. Possibly this had to do with the large numbers of women travelling to and from work at all hours and with the small number of young, healthy men around the cities to cause them any problems.

Although there were certainly enough men around in the 1950s, the G.I. Bill and other government programs, especially massive road building projects, led to the American fascination with suburbanization and the return of women to the home. There is, of course, a certain irony that today's concerns about women's spacial separation from many job markets and their dependence on the private car have developed at the same time we have become concerned about air pollution. Both are related to policies that originated in the 1950s but whose ultimate outcome could not have been predicted. It is

not too surprising that concerns for women's safety in the transit environment all but disappeared for the decades of 1930-1950, reappearing in the 1960s along with women's visibility in the workplace.

Concurrent with women's renewed visibility alone in public places, the 1960s saw renewed concerns about safety in public spaces; concerns that have led to parallel developments in crime prevention through environmental design and, more recently, involvement of community groups in planning for their own safety. Despite the fact that crime rates fell in many large cities in the United States in 1995 and 1996, citizens have not reported feeling substantially safer on their streets. This does not bode well for transit agencies, which have learned within the past 20 years that citizens are far more fearful of their transit systems than they are of their city streets.[7]

To combat these fears, transit agencies have embraced principles of crime prevention through environmental design while also devising their own versions of community policing, many of which focus not only on enhanced patrol techniques but also on community outreach programs.

Crime prevention through environmental design, today commonly referred to as CPTED, grew out of the concept of defensible space formulated in 1969 by Oscar Newman, an architect and urban planner, who was then an "idealistic," recent graduate of Montreal's McGill University. Simply put, his theory states that "the design of the physical environment...can create opportunity for people to come together and can remove opportunity for criminals to act freely."[8] Newman's work, which has been translated into a number of venues, including transit systems, public and private housing developments, shopping malls, and similar areas where large numbers of people gather, has been an accepted theory since the late 1960s, gaining momentum after the Washington, DC-based National Institute of Justice funded a number of projects gauging the relationship between the physical design of a facility and citizen vulnerability to crime at that location. Additional studies informed us that design features not only contributed to actual crime, but even more so, contributed to the public's perception of safety.

Another urban planner who drew attention to this issue was Jane Jacobs, who, in The Death and Life of Great American Cities (1961), stressed that people felt frightened when they were alone in dark places, particularly when they could not be observed by those they trusted and when they felt they could easily be trapped by those they did not trust.

Although transit police did not initially heed her warnings, Jacobs' descriptions of dark city streets and the fear they engender are exactly what subway riders report feeling on deserted station platforms, in deserted trains, and in large stations overrun with panhandlers, drunks, and homeless people, what bus riders report feeling in isolated shelters, and what virtually all transit riders report feeling when they walk to their cars through dimly lit, poorly fenced parking facilities.

Today we also know that women and the elderly fear such situations more than do adult males, a factor that is certainly important for transit agencies, which carry large numbers of elderly people who do not drive and a growing number of women who commute to jobs that often require them to arrive early and remain late if they are to compete with their male colleagues in the race up the corporate ladder.

Although S. Rosenbloom and E. Burns,[9] studying the impact on women of programs to reduce dependence on commuting by car, confirmed a number of international studies that found that women—particularly low income women and those who are mothers—have a disproportionate need to use a car, John J. O'Connor, chief of the Long Island Rail Road Police Department, earlier this year noted that part of his department's efforts at controlling parking lot crime were based on the realization that 40 percent of the commuters were women, who more often than men complained about the unsafe

conditions in the lots.[10] These findings are hardly contradictory; Rosenbloom and Burns' study took place in Tucson and Phoenix, where destination parking is not the same concern as it is for suburbanites travelling into midtown Manhattan. Long Island Rail Road commuters, too, while not all well-to-do, are most likely earning higher salaries than are the women in Tucson and Phoenix and may be able to depend on household help to chauffeur children and complete chores, or they may have older children who are less dependent on them for efficient transportation.

A Toronto Transit Commission study undertaken in 1976 discovered the phenomenon that O'Connor was witnessing. Responding to the concerns of the Metro Action Committee on Public Violence Against Women and Children (METRAC) and the Metro Toronto Police Force, the Transit Commission undertook a safety audit that stemmed from concerns about the vulnerability of women to sexual assaults on the system. The audit documented that despite a very low crime rate, the Toronto subway was perceived as unsafe by many women, causing them to limit "their lives very dramatically by stopping their use of the public transit system altogether or at certain times, especially at night."[11]

Despite these lifestyle limiting fears, the majority of the women had never publicly expressed their safety concerns. The interviews, focus groups, and CPTED-influenced safety audits undertaken by METRAC and the Police Force resulted in such changes as installation of passenger assistance alarms on subway cars and emergency access telephones on platforms. Today, these and similar safety steps, such as off-hours waiting areas and identification of cars in which conductors ride, are standard practice at transit systems in North America and around the world. Better lighting, emergency phone systems, more and better directional signs, and the closing off of dead-end passages in which riders could become lost, or trapped by assailants, are today built-in features of new systems and receive high priority when old systems undertake renovations. The importance of landscaping for safety is also well known.

It is highly unlikely that planners of a new transit system would neglect these issues. Newer systems are also making use of surveillance technology not only at passenger stations, but also in parking lots and employee facilities. More surprisingly, a number of bus systems have added surveillance cameras not only on their vehicles, but outside them to cut down on crime and vandalism, and along the rights of way to alert operators to suspicious activities.[12]

Automatic Vehicle Locator systems are also being placed on buses in a number of cities not only to enhance on-time performance, but as a safety measure. In Houston, where it was anticipated that drivers would see the AVL as a management inspired means of checking up on their performance, drivers warmed to the system when they viewed it as a means of police to find their buses if a departing passenger or outside observer noticed and reported that a crime was in progress. Tom Lambert, Assistant General Manager and Chief of Police for Houston's METRO, noted that the AVL was especially helpful in minimizing both driver and passenger concerns about assaults and rapes, a few of which occurred within the last decade, but none within the last few years.[13]

A large variety of crime prevention programs are also strongly influenced by situational crime prevention theories. The first of these situational crime prevention theories, known as opportunity theory, was advanced in the late 1970s by L.E. Cohen and M. Felson.[14] The theory argues that offenders will commit crimes wherever there are suitable targets and an absence of protection. D.B. Cornish and R.V. Clarke[15] extended this theory through the "rational choice" perspective, which states that offenders are rational and self-serving individuals who will weigh the pros and cons of committing crimes in any particular area. Obviously, a major "pro" is the ability to commit a criminal

act and escape unseen and unharmed. A major "con" is the opposite, having no victim that one can approach or no assurance of a safe escape route.

The applicability of these theories to transit environments has been shown in such diverse locales as BC Transit, the Vancouver Skytrain, the Newark, New Jersey, subway system, and the Los Angeles County, California, bus system[16] among others in the United States, Canada, Great Britain, European nations, and Australia.

Hence, our earlier notions about environmental design blend with these theories to remind us:

1. that crime is often concentrated in only a few areas; and,
2. that these areas are not randomly chosen.

Factors that play a large role in the selection process are:

1. availability of victims;
2. availability of hiding places from which to stalk the victims, and,
3. low possibility of capture.

Although in fact transit agencies rarely provide all three requisites, the public perceives that they do. These theories, and recent work stemming from them, go a long way toward explaining why women have higher levels of fear of victimization despite the relatively small amount of crime that takes place on public transit when compared to city streets or at home, the latter, as feminist criminologists frequently point out, being the single most dangerous place for many women. V. D. Young, discussing the apparent paradox of women's high fear of victimization and reportedly much lower actual rates of victimization, theorizes that the high level of non-stranger violence that women face contributes to generally higher fear levels in all circumstances. She also posits that the knowledge that one can so easily be victimized is a major component of fear.[17]

More recently, R. B. Felson, in a paper entitled "Big People Hit Little People," also discussed interpersonal violence, arguing that women are not unwise in their fears. Returning to rationale choice theory, he notes that physical strength may encourage violent confrontations because the aggressor knows he can win and that this is often a forgotten factor in discussing sex differences in violent behavior, as well as in the ability to deter victimization. We can see the possibilities this raises for random violence in public spaces, including transit environments, and with these possibilities, the greater fears of women. As Felson notes:

> The greater physical power of males should also deter others from attacking them. Females are probably a safer target than males because they are less likely to retaliate, and because the physical harm they produce when they do retaliate is likely to be lower. Therefore, attacks on females are likely to be more successful and less costly [for the attacker].[18]

With this discomforting noting in mind, what are some of the ways transit systems have devised to counter the greater fears of women?

Many, particularly some of the older systems which were not built with CPTED in mind, are enhancing traditional uniformed patrol presence, fare evasion enforcement, and surveillance capabilities. They are also turning to nontraditional ways to involve the community in its own safety. Most of these strategies have been developed within the last decade; with only a few predating the 1980s. Many are even more recent.

One form of partnership that has become popular with local municipalities are Transit on Patrol programs. TOPs uses bus operators and supervisors to report criminal or suspicious activities along routes to local police via bus mobile radio systems. Companion programs include: Police on Board (POB), which allows local police to ride buses in high crime areas or during school release hours as an additional crime deterrent, and Request-A-Stop, which permits bus operators to let passengers off during nighttime hours at any safe location along the route that may be closer to their homes or cars than the regular bus stop. Request-A-Stop programs are as close as any transit system we know of as come to acting on the Rosenbloom and Burns' (1993, p. 68) recommendation that to discourage individual travel by auto, "government-mandated or employer-based travel reduction programs must...provide meaningful security for those working longer days or using alternative modes at night or in unsafe areas." New Jersey Transit, under the leadership of Mary Rabadeau, its new police chief, has published a brochure entitled "Safety Tips for Riding the Newark City Subway," a system that Chief Rabadeau calls the "best kept secret" in the state.[19] While the majority of the tips are as appropriate for men as for women, both Rabadeau and NJT Executive Director Shirley DeLibero seem particularly sensitive to the safety concerns of women riders.

A vast number of bus systems—large and small—are instituting codes of conduct and working to guarantee compliance by having officers—either uniformed or in plainclothes—board buses at busy stops or ride targeted bus lines for a few stops in either direction. The codes of conduct are reinforced by school outreach programs conducted by officers, bus drivers, or public relations personnel. Printed palm cards serve as notice of the rules and reinforce to passengers that the systems take the rules seriously.

The King County, Washington, METRO's zero tolerance policy for minor violations is an example. Seattle and adjoining cities' police officers are encouraged to enforce the policies, which range from felony assault to disorderly conduct and "unlawful bus conduct"—which can be smoking, spitting, unnecessary noise, and other quality of life crimes that deter ridership—particularly among women and the elderly. METRO assigns a bus operator to follow up in court on cases originating on the buses in the belief that a high conviction rate will convince offenders that METRO buses are not the place to break the rules. This in itself is a form of rationale choice theory, assuming that a rational offender will not misbehave in a location where the conduct will be penalized.

Using a similar theory, Houston's METRO experimented with an officer riding selected buses from a transfer station that had received numerous complaints from passengers and drivers. The officer also worked closely with the school system to teach bus etiquette and to report to principals and parents students who misbehave on a regular basis. Crime on the bus line ridden by the uniformed officer dropped to zero within a very short time.

Obviously, it is not cost effective for a system to put an officer on every bus—or even every problem bus—but officers are spot-riding or boarding buses in Milwaukee, Minneapolis, San Francisco, and even New York, just to name a few. In cities where uniformed personnel ride the system to check for fare evasion, they are also being advised to enforce quality of life issues. A few systems are working with government officials to expand summonsing authority for their non-police personnel to enforce zero tolerance policies.

Zero tolerance is also found on rail systems. Washington, DC's, WMATA and the Los Angeles subway system are well-known for their well lit, wide open stations that are exceptionally clean and

graffiti-free. WMATA, since its 1976 opening, has been able to maintain a zero-tolerance police policy for even the most minor violations. The Los Angeles system, only a few years old, is at present under-utilized, which may account for its immaculate physical conditions, but certainly the high level of uniformed patrol is a contributing factor.

Even the smallest systems are learning how to keep out loiters, often rowdy teens who are most frightening to women and the elderly. Five Seasons Transportation, a bus system in Cedar Rapids, IA, has discovered that classical music piped in over the speaker system deters young people from congregating in the station. Apparently the sounds of classical music is to teens what garlic is to werewolves! Tri-Met, in Portland, OR, has one of the most truly citizen-based programs of all the transit agencies. A Rider Advocate group, consisting of a supervisor and ten people recruited from a nonprofit neighborhood coalition, randomly ride buses that have a high rate of gang-related incidents. Different than the Guardian Angels, a group that has caused controversy in many cities, especially New York, where it was first formed, Tri-Met's community riders are paid and are readily identified with Tri-Met through their jackets and patches.

The success of the program has led to its expansion as part of the Crime Bill's AmeriCorp program. The additional riders are college age community residents who receive stipends and tuition benefits in return for their participation. They, too, are identified with Tri-Met jackets and patches, although their outfits are slightly different to recognize their funding source. The Advocates are selected and work in accordance with Security Department guidelines.

The fear enhancing qualities of graffiti and other signs of disorder are well-known.[20] Many transit systems in the western United States, where gang-related graffiti continues to be a major problem, have instituted tip lines which encourage citizens to call in when they observe taggers at work. These lines are sometimes run in conjunction with local police but other times are transit-specific.

Tip lines are also helping to nip in the bud the relatively new problem of etching on windows and doors that has replaced graffiti as the vandalism of choice in many parts of the country. Etching, which requires costly replacement of the entire window, is also often gang-related and is the latest form of turf-marking to strike transit systems.

A few systems, particularly in California, are following the lead of the Santa Clara County Transit District, where a restitution program involving the parents of juvenile offenders has been instituted, which has resulted in reduced recidivism rates. Interestingly, while transit systems have stressed restitution for property crimes for a number of years, municipal police agencies are only beginning to pursue this as a way of involving parents in their children's behavior. The New York Times recently reported that, according to the National Conference of State Legislatures, about half the states have passed laws in recent years either toughening existing sanctions against parents of young offenders or adding new sanctions. In 1995 alone, at least 10 states passed these parental responsibility laws, which call for fines or, in some cases, imprisonment of parents for their children's behavior. In cases where parents are unable to pay, youngsters are assigned community service equivalent to the cost of repairing the physical damage to the system.[21]

The San Diego Trolley, in conjunction with its end of the line community of Santee, has a deputy sheriff meet each trolley that arrives hourly. Santee also built a town law enforcement office, where a Community Service Officer and a department volunteer provide crime prevention literature and take all regular police reports. On and off duty deputies and local police are encouraged to use the computer and phones at the town center, thus assuring a police presence in the area, which is slated for additional development, including a shopping center.

Parking regulations are vigorously enforced to prevent overnight parking that can lead to thefts and related crimes.

The Trolley, as well as a number of other systems on the west coast, have encouraged local charities such as Goodwill Industries to locate and staff collection boxes in their parking lots. This assures that riders will see their neighbors using the lot and provides an "eyes and ears" function that keeps troublemakers away. Commuters also find it easier to donate goods that they can take directly from the trunks of their cars to a staffed collection point. Other area residents now have a reason to stop by the station parking lot, creating additional traffic and encouraging use of station shops and facilities. The Claremont, CA, Police Department, working in conjunction with the MetroLink commuter rail line and the Los Angeles County Sheriff's Department, which polices the line, has assigned a uniformed volunteer officer to its rail parking lot, which also serves as a bus transfer point.

Parking lots, not surprisingly, continue to be trouble spots for transit agencies. The Long Island Rail Road Police Department in New York has combined traditional and community efforts to control vehicle thefts. An auto theft unit, operating in plainclothes out of vehicles loaned to them by insurance agencies, has cut the stolen car rate in half.

To further involve commuters in theft prevent, the LIRR modified a municipal program known as CAT—Combat Auto Theft. Commuters who register have decals placed in their autos which inform a railroad or local police officer that the vehicle is not normally operated Monday through Friday between the hours of 9 a.m. and 5 p.m. due to its being parked in a station parking lot. The decal gives any officer who sees the car anywhere else but in a station parking lot the right to stop the vehicle and question the driver. Normally, a police officer would not have the right to do this unless there was probable cause to believe the car had been involved in a crime.

Atlanta's MARTA has introduced another strategy to combat auto crime and enhance passenger safety in parking lots, turning to bicycle patrol at its busy Lindbergh Station, north of downtown Atlanta. Two officers on bikes were responsible for a 53.3 percent decrease in serious crimes during a three-month experimental period. The greatest impact was in the parking lot, in which approximately 1,500 cars are parked daily. Based on the success of this cost-effective crime suppression technique, MARTA plans to add six additional bike officers in 1997 and has already contemplated additional expansion of this program in 1998.

These are only a few of the varied approaches by transit agencies to providing higher levels of security at their facilities. Many agencies are using a combination of the techniques described.

This is an exciting time. Across the United States and Canada, transit police agencies are finding ways to make their facilities safer and more inviting through environmental design as well as through strategies that involve the community in the policing effort.

Transit agencies understand that only in partnership with their ever-expanding constituencies—particularly working women—will they be able to become vital links in community planning, community safety, and community development.

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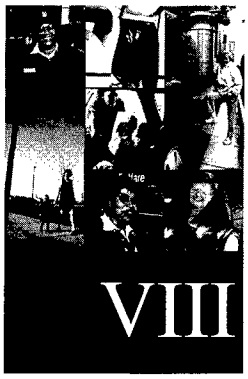

WOMEN IN THE TRANSIT INDUSTRY

Perspective on Transit Industry Response to Increased Gender Awareness

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PERSPECTIVE ON TRANSIT INDUSTRY RESPONSE TO INCREASED GENDER AWARENESS

INTRODUCTION

The nineties have been a period of tremendous change for the transportation industry. The Intermodal Surface Transportation Efficiency Act, Clean Air Act Amendments, Americans with Disabilities Act, and increasing sensitivity to gender and ethnic diversity have caused agencies to reassess their standard operating procedures. Greater knowledge has been sought by senior level transportation officials in an effort to prepare agencies for the changing policy and social environments. A variety of techniques have aided the dissemination of information including seminars and workshops, revisions to policy manuals, and strengthened procedures regarding how issues will be resolved. This research examines the level and nature of direct transportation agency response, specifically in regard to increased gender awareness in the transportation organization. That is, what departments have taken the lead in educating employees as to the types of behaviors and comments that are insensitive and subject to being misread by women? Also, how might the complaints being filed in transit agencies be classified and how much are transit authorities spending to address gender related issues?

BACKGROUND AND REVIEW OF LITERATURE

Through the 1970s and into the early 1980s, the transportation profession was dominated by males, from the ranks of bus operators to the upper echelons of senior management. As women took on greater prominence in the general working world, however, the number of female representatives in transportation increased. The change has been rapid. Carmen Turner became the first woman named as General Manager of a major U.S. transit agency when she took the helm of the Washington Metropolitan Transit Authority in 1983. Current records of the American Public Transit Association (APTA) reflect 42 female general managers in 1996.[1] While this percentage represents a notable increase over the last 13 years, the figure accounts for less than 15 percent of all U.S. transit agency general managers. This trend toward larger numbers of women in the upper ranks of the transportation arena can be expected to continue into the early part of the 21st century.

The presence of increasing numbers of women in the transportation industry, as in other domains, has encouraged a reexamination of company cultures. For instance, incorporating women into the work force raised questions regarding opportunity in many organizations. Eliminating mental barriers that allowed women to move from secretarial and clerical position to driving buses and holding senior management positions, required a shift in customs. Companies began to ask themselves whether there were legitimate reasons that women were not hired into certain positions. When rationale was found to be lacking, women accepted and excelled at many newly acquired tasks.

The nation's transit agencies represent a range of settings. Some are large, encompassing multi-modal, complex transit systems, while others are small and operate a few buses in locales that are mid-sized or sparsely populated. Thus, changes in procedures and responses to gender issues have been varied, as well. Some agencies served as industry leaders encouraging greater roles for women; others moved more slowly and may not yet offer better opportunities for female transportation professionals. Those agencies that have aggressively promoted equitable advancement opportunities recognize the impor-

tance of providing women with significant work assignments, mentors and networks that had previously only been available to their male counterparts. The agencies that are adapting to the changing workforce should reap benefits in improved recruitment and productivity.[2]

Steps toward a more totally gender integrated workforce, initially, required modification on the part of women, as well as modification of corporate cultures. For example, upwardly mobile women adjusted their dress and demeanor to mirror that of their male counterparts. Common dress included dark, conservative suits and light colored blouses. As the numbers of women entering the workforce in the 1980s increased, society, in general, broadened its traditional view of the role of women. For many males this meant changing how women are approached and spoken to, and for the first time, led to defined boundaries of acceptable male-female behavior in the workplace. For some the parameters were instinctively understood, but for others written and oral communication were needed to clarify appropriate conduct. The **New Hampshire Business Review** reports that for some individuals a shift in attitude must occur for them to understand that their actions in private may not be appropriate for work.[3]

Farsighted managers recognized that workers proficient at identifying negative circumstances would be less likely to commit infractions. So far-reaching was the need for an enlightened workforce that seminars and workshops on sexual harassment and gender sensitivities became commonplace in the late 1980s and early 1990s. Education which focuses on prevention is key to avoidance of negative circumstances. In those instances where incidents occur, the proper handling of those events is critical. Managers must not ignore or downplay situations that may arise, but respond quickly and decisively to minimize future problems. It is critical that employees understand that implicit or explicit verbal or non-verbal advances are not only unacceptable, but also unlawful. Further, managers must be cognizant that gender may not be the basis for employment decisions. As recently as 1991, Guy reports that a focus group of federal employees included one male who expressed the view that a male with a family to support was more entitled to consideration for a promotion than other individuals.[4]

Seminars and conferences on gender related issues need not only focus on potential negative circumstances surrounding women in the workplace. Research conducted by Jana Zviblman showed that many working women focus on achieving their professional goals and not on blatant discrimination.[5] The strategies used by Zviblman's interviewees included improving communication, image and self-esteem. These women not only adapted traditional male methods for advancement, but incorporated their own unique methods of operation. For instance, many women have determined that exhibiting sensitivity and concern regarding personal needs of cohorts can be responsibly handled in the workplace.

College courses that support the transportation industry experienced increasing numbers of women students entering in the late 1980s. The number rose consistently through the early 1990s. Several of the transportation degree programs at Universities in the Southwest region now report stable or slight decreases in the entering number of female students as of the Fall 1996 semester. Academic institutions in Texas and Oklahoma note up to 10% decrease in female transportation engineering students entering in 1996. Degree areas for management and policy reflect similar trends. It is yet not known whether the Fall 1996 female class represents a plateau for transportation or whether perspective female students are choosing other areas of study, signifying a diminished interest in the transportation field.

Transportation officials must recognize that the industry is now competing with a cadre of other disciplines for the best and most competent workers, including women, to conduct the tasks required for daily operation. Therefore, it is critical that the transit agency be structured to meet potential challenges, provide fair and equitable treatment in the workplace, and have avenues available to meet potential problems. The structure and operating parameters for several transit authorities are reviewed in the following sections.

RESEARCH THRUST

Research from May to September 1996 which queried transit agencies in one region of the country, Federal Region VI, regarding their experience with gender related issues. The basic question to be addressed in this research is whether transit agencies in Federal Region VI have structured their organizations to enhance the position of women in their organizations. This matter is examined through the methods and size of departments designated to resolve issues, the finances spent on gender sensitivity and the nature of gender related complaints.

METHODOLOGY

Twenty six (26) transit authorities are listed in Federal Region VI (New Mexico, Oklahoma, Louisiana, and Texas) that are members of the American Public Transit Association (APTA). There was no APTA member from the state of Arkansas. Three agencies were identified in Arkansas to participate in the research. Each agency was mailed a survey which questioned their general agency background and experience with gender specific items. A list of the agencies that were mailed a survey is attached as Appendix A. Fifteen (15) surveys were completed representing a 51.7% return rate.

FINDINGS

General Characteristics:

The agencies responding exhibited a range of sizes from small with fewer than four employees to two agencies with more than 1000 employees. Of note, however, is that there were no agencies which had 501 to 999 employees. Eighty (80) percent of respondents had workforces that are 20-49% female. This upper end of this range compares favorably with the national statistics which showed the workforce as 45.5% female in 1992.[7] One agency reported having more than 50% of its workforce as female and one had fewer than 20% female. (See Figure 1).

Most respondents (66.7%) had annual revenues of less than $5 million annually; although the other respondents had incomes ranging from $6 to over $100 million annually. The survey asked the agencies to estimate expenditures over the last five years that had been used to increase gender awareness. Seventy-five (75) percent did not respond; one agency indicated zero.

The five agencies that responded spent less than $5,000 annually (Figure 2). Those agencies that have neither encouraged employees to attend gender awareness sessions nor sponsored such sessions, would be expected to expend $0. However, the other agencies would have been expected to pay for seminar attendance or perhaps publish brochures or flyers, thus having some program expense. It is possible that these records are part of other line items and difficult to extract.

Figure 1
Gender Distribution

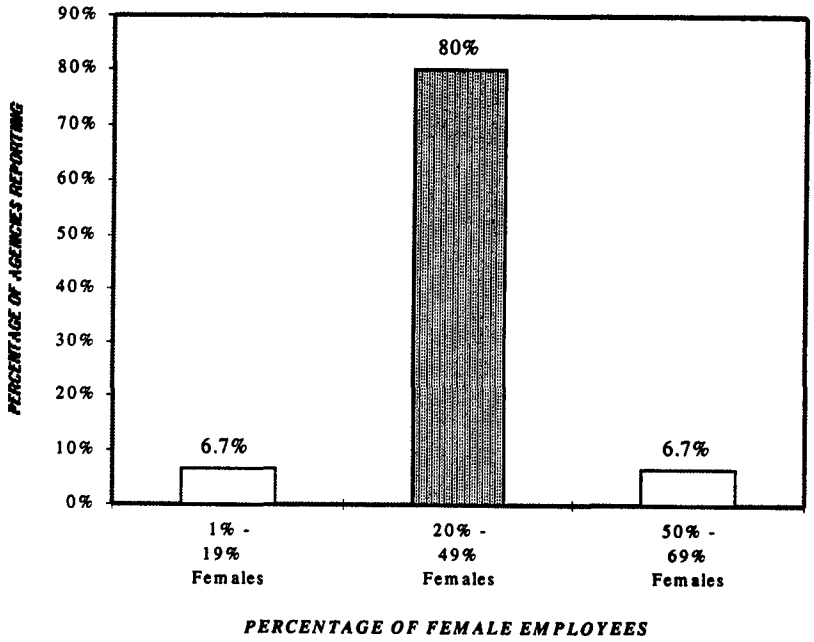
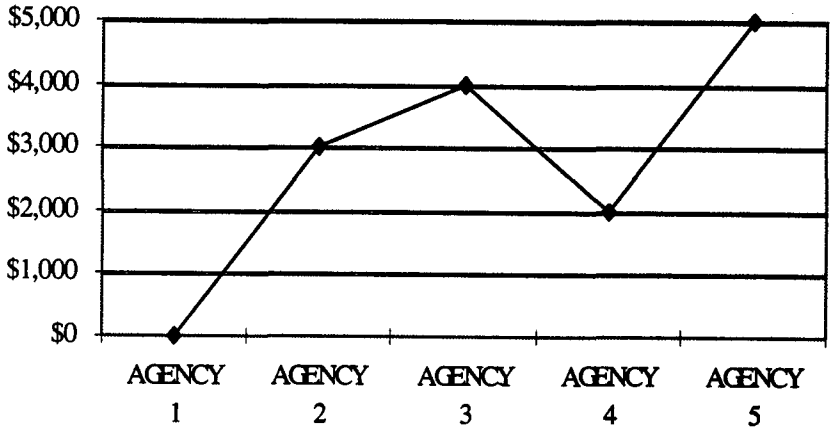


Figure 2
How Much Money Does Your Company Spend On Gender Awareness?



Slightly more than one-third of the responders sponsor seminars and workshops to educate employees to be more perceptive to gender-appropriate demeanor at work (Figure 3). It is also encouraging that 80% of respondents encourage employees to attend conferences, seminars, and workshops sponsored by others (Figure 4). Because many of the agencies are relatively small with undoubtedly strained annual budgets, the session attendance is a more cost-effective option. It should be noted, however, that a breakdown of respondents showed that 20% of the respondents (3 agencies) neither sponsor their own seminars nor encourage employees to attends sessions sponsored by other organizations. The survey responses were examined to determine whether a relationship exists between size and an agency's conduct of seminars and workshops. No trend was observed. One small agency with fewer than 15

employees sponsored a workshop; while no agency with between 16 and 99 employees sponsored such a session. The next category was 100 to 499 employees; 50% of this group sponsored seminars and 50% did not. The largest agencies with more than 1000 employees also divided evenly with one agency sponsoring sessions and one agency not doing so. (See Table 1). There was also no observed pattern between an agency's annual revenue and its sponsoring its own workshops.

Figure 3
Do You Sponsor Your Own Seminars?

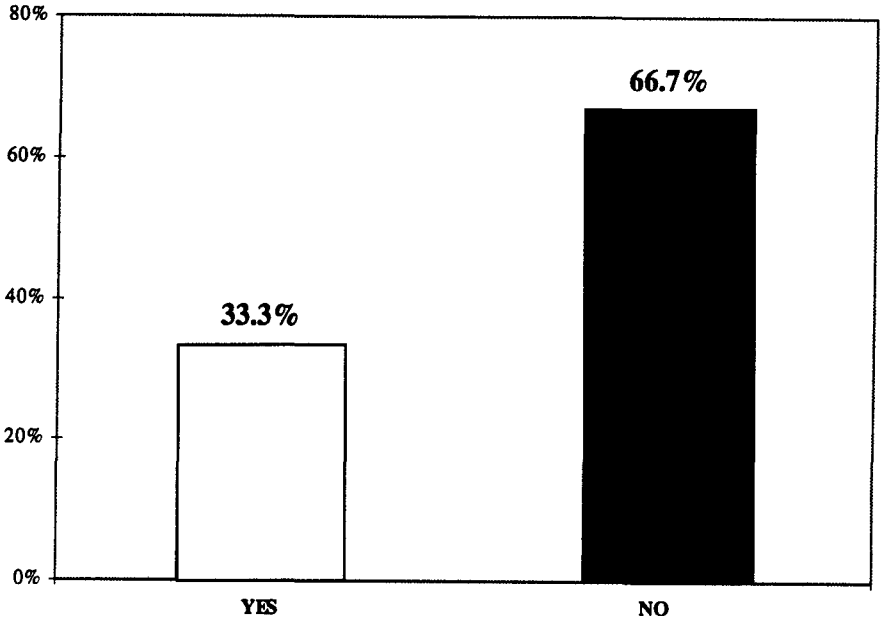


Figure 4
Do You Encourage Our Managers to Attend Conferences Sponsored By Others?

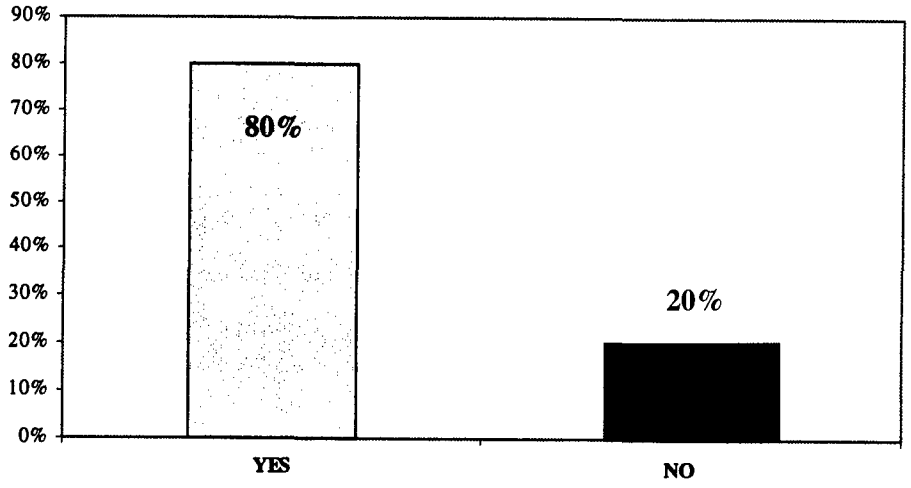
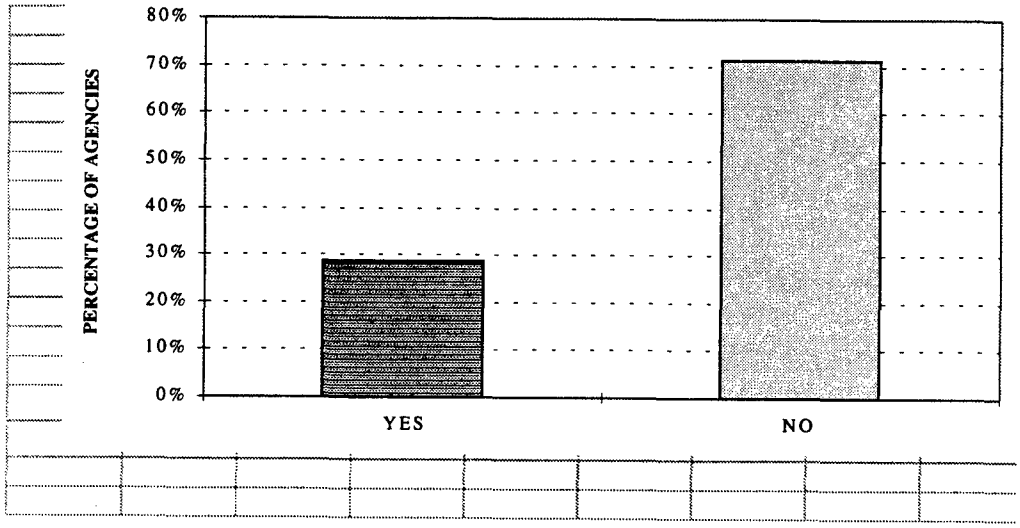


Table 1
Do You Sponsor Your Own Seminars?

Number of Employees	Yes	No	Total
1 - 4	0	1	1
5 - 15	1	1	2
16 - 99	0	4	4
100 - 499	3	3	6
1,000	1	1	2
			15

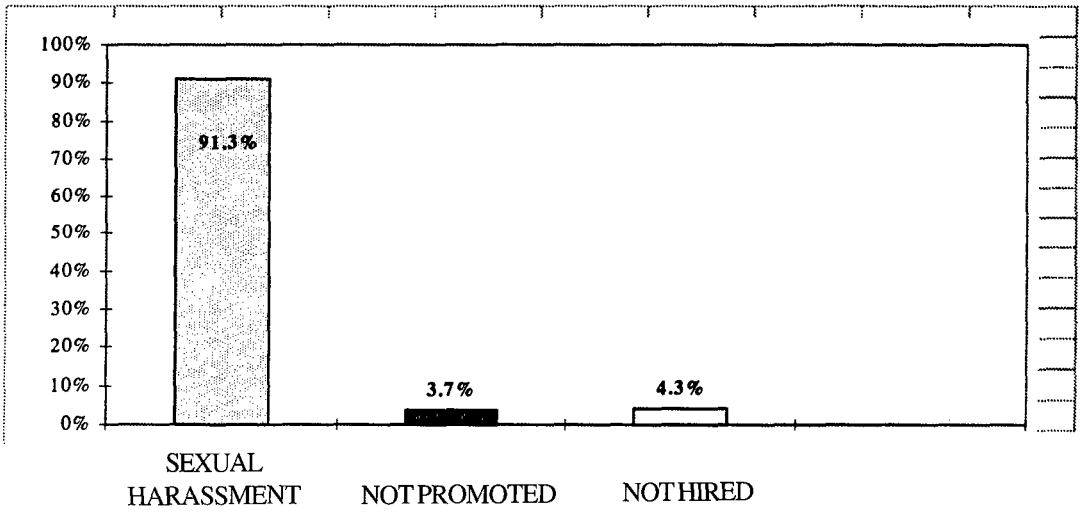
Figure 5
Issues Filed Against Your Company?



GENDER RELATED COMPLAINTS

Of the 15 agencies that answered the survey, 71.4 percent had not had any complaints or legal actions filed against their agency (Figure 5). For the remaining 28.6%, the number of charges ranged from 6 to 10 per agency. By far, the most frequent accusation was sexual harassment which represented 91.3 % of all complaints (Figure 6). The survey questioned whether complaints were handled internally (by the agency) or by an external arbitrator. Half of the responders indicated that complaints were handled internally; the others reported that complaints may be handled either internally or externally. The methods of resolution were divided among in-house counseling, treatment by the Equal Employment Opportunity Commission (EEOC) or civil action.

Figure 6
Nature of Complaint



ORGANIZATIONAL STRUCTURE

More than 80% of the agencies had not revised their organizational structure in response to increasing numbers of women in their organizations. The 13.3% that had made modifications noted an increase in personnel. Most policies advise personnel to take issues to their direct supervisor or manager first, presuming that the manager is not the problem. If so, the employee is generally advised to report to the Human Resources division. The respondents confirmed these practices in the transit agencies as problems were most often addressed by the individual manager or Human Resources/Personnel. Other departments that handle gender issues are equal employment or affirmative actions offices. Of note, is that most agencies have more than one department handling gender issues (See Table 2).

Table 2
What Department or Individual Handles Gender Issues?

	HR	MGRS.	EEOC/AA	LEGAL	OTHER
1	X	X			
2		X			
3			X		
4					X
5	X				
6	X	X			
7	X	X			
8	X				
9	X	X			
10	X	X			
11	X	X			
12	X				X
13	X	X	X		
14		X			
15				X	

HR: Human Resources Department
MGRS.: Individual Departmental Managers
EEOC/AA: Equal Employment Opportunity Comm. /Affirmative Action Personnel
LEGAL: Legal Department

CONCLUDING SUMMARY

Most individuals would agree that issues involving gender sensitivity are often gray, as opposed to clear-cut black or white. These matters may be legal, spanning areas of civil rights or may be social infractions. Agency attention to items of gender awareness is intended to increase the consciousness so that individuals are more aware of others in their surroundings. There are strong reasons for the transit manager to be increasingly cognizant of diversity related issues. Liburdi writes that the industry should take steps to ensure "the attractiveness of transportation as a career field for women". [8] Even though technology will play an increasingly important role in transit organizations, it will be the people who make a commitment to the transit industry that will assure its future viability.

The review of Federal Region VI transit agencies shows that responses of these organizations to provide a competitive, fair environment for women is varied, ranging from those who have not actively solicited gender sensitive enlightenment for their personnel to those who have taken the lead in sponsoring such activities. Admittedly, to encourage great incorporation of women into the transit industry has required some financial or time investment from existing personnel. However, the cost of not attracting talented women into the field of transit may be more costly in the long run. [9] It is important that transit agencies "institutionalize" their commitment to women through challenging assignments, mentoring, appropriate training and by providing an equitable work environment.

The intent of this research was a first step at documenting organizational response within transit agencies to proactively accommodate the gender changing work force. Where institutionalization is occurring, the experiences may benefit those agencies that have not made modifications to the same degree as the more advanced agencies. This is clearly a first step. A more complete research would expand this regional study to a national scale. The additional database would more likely lend itself to advanced statistical techniques that would more thoroughly describe and explain the structures encouraging positive gender awareness efforts in transit agencies.

ACKNOWLEDGMENTS

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DISCLAIMER

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APPENDIX

Surveys were mailed to each transit agency listed in the *Transit System Members* section of the American Public Transit Association 1995 Membership Directory for Federal Region VI.

Little Rock Transit*
Chattam Area Transit (North Little Rock)*
Pine Bluff Transit *
City of Albuquerque Transit Department
Louisiana Transit Company (Harahan, La.)
Monroe Transit System
Regional Transit Authority (New Orleans)
Shreveport Transit System
Central Oklahoma Transportation & Parking Authority
Metropolitan Tulsa Transit Authority
Brazos Transit System (Bryan, Tx.)
Capital Area Rural Transportation System (Austin)
Capital Metro Transportation Authority (Austin)
CityLink (Abilene)
City Transit Management Co. (Lubbock)
Corpus Christi Regional Transportation Authority
Dallas Area Rapid Transit
El Paso Mass Transit Department
Fort Worth Transportation
Laredo Municipal Transit System
Lower Rio Grande Valley Development Council (McAllen)
Metropolitan Transit Authority of Harris County (Houston)
Port Arthur Transit
Town of South Padre Island
South Plains Community Action Assoc. (Levelland)
Temple Transit
Tyler Transit
Via Metropolitan Transit
Waco Transit System

Survey responses were received from 15 transit agencies. Agencies were assured anonymity so respondents were not identified.

*Not an APTA member, but included as part of Federal Region VI representative from the state of Arkansas

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Zvibleman, Jana. "Womanspeak: Working Women Take on a New Attitude". *Business West.* Vol. 9. April 1993.

NOTES

[1]American Public Transit Association. 1995 Membership Directory. Washington, D.C. Data provided by Gwendolynmary Simpson, Deputy Executive Vice President, American Public Transit Association, September 1996.

[2] Guy, Mary Ellen. "*Workplace Productivity and Gender Issues*". Public Administration Review. May-June 1993. Vol. 53, No. 3.

[3]Allen, Martha. "*Sexual Harassment in the Workplace—Alive and Well in New Hampshire.*" New Hampshire Business Review. Vol. 15. February 19, 1993.

[4]Guy, Mary Ellen. "*Workplace Productivity and Gender Issues*". Public Administration Review. May-June 1993. Vol. 53, No. 3.

[5]Zvibleman, Jana. "*Womanspeak: Working Women Take on a New Attitude*". Business West. Vol. 9. April 1993.

[6]Telephone Interview with personnel associated with Transportation Engineering or Public Administration Programs at Texas A&M University at College Station, University of Texas at Austin, University of Houston, and Oklahoma State University

[7]*U.S. Bureau of Labor Statistics*, Bulletin 2307, Employment Earnings, Monthly, January Issue.

[8]Liburdi, L. C. "*Education and Training Needs of Women in Transportation* " Transportation Re search Board Special Report , p. 187, 1985.

[9]Baron, James N. and Andrew E. Newman. "*For What It's Worth: Organizations, Occupations, and the Value of Work Done by Women and Nonwhites*". American Sociological Review. Vol. 55: 155-175.

Women in Transit: Findings from African-Americans, Other Minorities, and Women in the Transit Industry

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WOMEN IN TRANSIT: FINDINGS FROM AFRICAN-AMERICANS, OTHER MINORITIES, AND WOMEN IN THE TRANSIT INDUSTRY

ABSTRACT

This research builds on the doctoral dissertation of Philip W. Jeffress, *The Negro* [sic] *in the Urban Transit Industry*. Dr. Jeffress explored the degree to which transit may be an industry in which blacks could expect favorable hiring and promotional practices. Jeffress's research took place in the late 1960s, a few years after the enactment of the Civil Rights and Federal Transit Acts. In his final chapter, he posits that the transit industry will continue to provide employment and advancement opportunities for blacks.

As a project of the National Urban Transit Institute, the Center for Urban Transportation Research revisited Jeffress's work and expanded the scope of research to include women and all minority groups recognized as protected classes in federal legislation. The research attempts to measure the degree to which minorities and women have realized favorable employment and advancement opportunities in the transit industry.

Data sources include EEO-1 and EEO-4 reports from the transit systems included in Jeffress's original study, a mail survey, and formal telephone and in-person interviews. The EEO reports were used to provide the historical experience of the systems and to measure the labor supply and demand. The mail survey, based on the American Planning Association's 1991 Planners Salary Survey, was used not only to measure salaries, but also to explore perceptions of social equity. The interviews provide additional ethnographic data. The data reveals that the women have made significant gains in the transit industry. Women were previously concentrated in clerical and secretarial positions. The data do suggest, however, that women in management positions are channeled toward human resources or "social service" line positions. The implications of these findings are twofold. First, for the women in these positions, the employment and advancement patterns carry economic and social effects that affect their lives and communities. Second, on a broader level, these employment and advancement practices may not place women in decision making positions within transit agencies. Representation at the decision making levels is important in that women and minorities have the potential to contribute to the quality of service by bringing their perspectives as members of these groups. Failure to include women and minorities in the decision making process ultimately affects the delivery of services perpetuating conditions of economic and social isolation.

This research is exploratory. Additional research is needed among all Section 9, 16 (b) (2), and 18 transit recipients. Similar investigation also could be conducted among Health and Human Service transportation providers. In this era of budget cuts, it is important that funding is expended in the most productive manner. An engendered transit decision making process is essential to this goal.

INTRODUCTION

The Negro in the Urban Transit Industry was published in 1970 as part of a research effort to learn why some industries seemed more hospitable to African-American employment, why some companies within those industries seemed to have employment policies that encouraged racial diversity, and to propose "appropriate policy."[1] It was felt that this was a significant area of study for several reasons. Transit served as a source of employment in many areas. In addition, African-Americans are generally the largest consumers of its services. During the decade of 1960 to 1970, transit employment declined. Despite this last factor, the author speculated that labor demand, industrial (and population) location and managerial, union, and government policies would converge to create ". . . a black-operated industry serving a predominant black clientele except where it brings suburban commuters back and forth to center city."[2]

In the intervening decades since Dr. Philip W. Jeffress made these speculations, these factors and others have influenced transit employment and service delivery. Examples of the changes in the transit industry:

- The transit labor demand has grown almost 100%.[3]
- During the decade of the 1980s, the federal government sought to promote increased involvement of the private sector in the provision of public transit services. In 1984, the Federal Transit Administration (FTA) issued a "Policy on Private Participation in the Federal Transit Program." The goal of this policy was to increase efficiencies and reduce cost in public transit.
- Changes in land use patterns, population, and the number of women in the job force have contributed to an unprecedented transportation demand.
- More transit use is being promoted to comply with Clean Air Act Amendments and to provide more efficient energy use.
- The Intermodal Surface Transportation Efficiency Act of 1991 was estimated to create four million jobs between 1991 and 1996. The Act also was touted to offer the opportunity for more citizen participation.

These factors may have had an adverse impact on African-Americans and other minorities with transit employment and service. For example, those changes in land use patterns categorized as suburban sprawl may have made it more difficult for transit to serve outlying areas. Suburban commuters do not just commute "back and forth to center city." Usually, the commute is from one suburban residential area to another suburban business district. This may have caused employment opportunities to become further dispersed and transit service less accessible to existing and potential users, creating declines in transit employment and use. This may be critical for women and minorities. Transit is still a vital source of employment for minorities and women and these groups represent most of transit's ridership. In addition, other issues such as the backlash against affirmative action, transit operating cuts, and technology changes may have negatively influenced employment for minorities and women in this industry.

This research reexamines the role of transit as it relates to African-Americans, other minorities, and women since the research undertaken by Dr. Philip W. Jeffress in 1970. The role of transit as employer and service provider is juxtaposed to the changes in society and the transit industry. While Jeffress's research covered African-American[4] employment in the transit industry roughly from the 1850s up to 1970, this study will review the changes since 1970 and provide some understanding of their impacts on minorities and women in transit. The research was funded and completed as part of the National Urban Transit Institute at CUTR.

The paper is presented in five sections. The first section begins with a review of Dr. Jeffress's concluding comments from the *Negro in the Urban Transit Industry*, and his expectations of the future regarding African-American employment in transit. In addition, an interview was held with Jeffress about the original research and current observations about the industry.

The second section contains information on transit service and employment in this industry, from 1970 through 1990. This includes an analysis of census data and statistics from Equal Employment Opportunity reports. An interpretation of this data in relation to employment changes for minorities and women in transit is provided were appropriate. This information is supplemented by an analysis of data from selected transit systems and a survey of minorities and women in transit.

The third section includes a discussion of the changes that have occurred in transit since Jeffress's study. Changes in the demand and supply of transit resources and use of transit are discussed. Such factors as a changing workforce and socioeconomic condition in American are examined as to their impacts on the transit industry.

Several transportation policies have been established since 1970 which may have influenced the progress of minority and women employees in the transit industry. These policies are discussed in the fourth section and include: the Federal Transit Administration's (FTA) Policy on Private Participation; Title VII of the Civil Rights Act of 1964, as amended; the Clean Air Act Amendments, and the Intermodal Surface Transportation Efficiency Act of 1991. Additionally, significant legal decisions that may have affected affirmative action efforts in transit are reviewed in this section.

Finally, conclusions from this research are presented in the last section. This section sets policy determinants for the next 25 years in the transit industry and amends *The Negro in the Urban Transit Industry* from 1970 to 1990.

REVIEW OF *THE NEGRO IN THE URBAN TRANSIT INDUSTRY,* "EXPECTATIONS OF THE FUTURE"

Perhaps a logical departure for this research is to recapture Dr. Jeffress's expectations of the future for African-Americans and the transit industry. In the final chapter of the *Negro in the Urban Transit Industry*, Dr. Jeffress gives a review of the many influences that resulted in changing policies toward African-Americans in transit.

From 1945 to 1970 African-Americans played an important role in transit, moving first into unskilled and semiskilled jobs and making progress toward an increasing share of skilled and white collar transit positions. Several factors combined to make this happen, including labor demand and industrial location, management policy, union policy, and government policy. Dr. Jeffress anticipated that transit would become evermore influenced by government policies and controlled by African-Americans. This chapter includes an interview with Jeffress about his original research and current observations about the industry.

LABOR DEMAND

The presence of African-Americans in transit started during the labor shortages of World War II. In subsequent years, the demand for transit labor declined but continued to increase for African-Americans. The author notes that this was ". . . an almost unique situation that can be understood only by examining

such factors as the image of the industry, industrial location, the availability of other jobs for whites, and government action."[5] These factors also caused whites to look elsewhere for jobs, which left a greater share of transit jobs to African-Americans. Simultaneously, a trend in the transit industry was developing. Transit companies in smaller communities were going out of business and those in larger communities (urban areas) were being purchased and operated by public bodies. These two trends increased the participation rate of African-Americans in transit and it appears that they will continue in the future.

INDUSTRIAL LOCATION

"The transit companies, almost by definition, are urban oriented and located."[6] As African-Americans migrated from the south to cities in the north during the early 1950s, they began to take over transit positions that whites left for opportunities in the suburbs. This enabled African-Americans to meet the labor demands in transit. In addition, many large transit companies in northern cities were experiencing problems of violence and disorder. Since fares were collected and carried on buses, the concern for better security was heightened. In most cities, operating a bus or train was considered "hazardous duty," which helped to decrease white interest in transit further. These problems have been lessened by innovations in revenue policy and operating practices, such as exact fare requirements and radio communication. Jeffress predicted that these concerns would continue the decline of white employment in the industry, unless severe employment declines in other sectors altered the situation.

MANAGERIAL POLICY

Jeffress was critical of the transit industry for not affecting diversity in management that should have resulted from early affirmative action programs. When considering the decline in white employment, it was anticipated that a predominantly African-American labor force would expand a similar representation in management. Since many transit properties have been taken over by public entities, management has allowed government to become more active in management decisions and management has been satisfied with meeting government mandates. "Nevertheless, managerial policy has neither been particularly forward looking nor obstructive."[7] Given the labor market and working environment, Dr. Jeffress expected a continued increase in the percentage of African-Americans in transit. Additionally, with support from the public sector, government was expected to continue to be a significant part of the transit industry.

UNION POLICY

Jeffress regarded unions as nondiscriminatory in principal, but not requiring locals to comply or failing to interfere with local policies. Resistance to including African-Americans among transit employees was prevalent in the pre-World War II period. However, the increasing number of African-American transit workers caused union leaders to change their policies, which increased union membership and influence in the transit industry. However, Jeffress described growing discontent among African-American union members regarding their status and representation in union leadership. This undoubtedly will be an issue that union officials should resolve to maintain any credibility in the transit industry.

GOVERNMENT POLICY

At the time of Jeffress' study, federal assistant programs helped transit overcome the financial problems that contributed to declining service and employment in the industry. This infusion of funds helped public entities to take over control of most transit systems. Because of government control, government had become the "key determinant of racial policy." Many large systems in metropolitan areas reversed the decline in employment, especially for African-Americans. Simultaneously, employment in small town transit systems continued to decline. Jeffress cites several factors related to government policy that will ensure a high proportion of African-Americans', other minorities', and women's employment in transit. These include civil service rules, state laws, federal grant regulations and federal laws that require affirmative action in the employment of minorities and protection against discrimination and continued federal spending, an impetus to the creation of transit jobs in metropolitan areas.

Because of government's influence in the transit industry, several obstacles to African-American advancements were abolished. In addition, government policies that made transit favorable for African-American employment resulted in several policy changes in transit. These changes include abolishing union rules barring membership by African-Americans and invalidating separate seniority lists. The latter served as a significant impediment to promotions and made African-Americans vulnerable to bumping since they were usually the newly hired, compared with other employees and would lose seniority if they transferred to another department. Besides government's influence, rapid retirement of workers with greater seniority will encourage promotion among African-Americans. Efforts also were to be directed toward upper management jobs and to political appointments to commissions, governing boards, and public authorities.[8] Black representation in unions was expected to increase along with power in the transit systems and unions. Jeffress predicted that government policies and other policy changes that affirm minority hiring in transit would help African-Americans maintain a significant role in the industry. He concluded his comments by saying that the urban transit industry would become a black-operated industry serving black riders except where it served as a link between suburban communities and the center city.

INTERVIEW WITH DR. JEFFRESS

As part of this project, staff consulted with Dr. Jeffress about his study and on other related issues. Jeffress provided anecdotal comments about his original research and his perception of the transit industry. At the outset of the interview, Jeffress said that he had done almost no transportation work since *The Negro in the Urban Transit Industry,* which was his dissertation work at the University of Kentucky.

The selection criteria for the transit agencies used in Jeffress's research:

- served a big population center;
- a large employer; and
- large ridership.

There also was a desire to have a mix of public and private providers and broad geographic representation. As a result, the sample was based more on judgement than randomness. Besides meeting the criteria, agencies had to be willing to participate and have available the necessary information. Jeffress's study was heavily dependent on agencies' data collection practices. The research also took a journalistic approach and provided descriptive statistics as opposed more in-depth analysis. (Consideration must be given to the fact that the Civil Rights and Federal Transit Acts had only been enacted in 1964. Jeffress's dissertation was published in 1970.)

Dr. Jeffress stated in the interview, overall, transit outcomes relate to land-use issues. These include the need in most areas for a regional transit system due to urban sprawl, the "urban" nature of most metropolitan areas, and the location of various employment, medical, and social centers. The developments in the telecommunications industry and the subsequent growth of home and satellite offices may exacerbate transit problems.

From an economic perspective, Jeffress said that the more transit must respond to non-market decisions, such as the American with Disabilities Act, the Older Americans' Act, and so on, the more transit must be supported by non-market funds. (Since almost its inception, public transportation has had non-market goals.)[9] According to Jeffress, transit is not a clear public good. It may only be a quasi-public good, needing private support. From the skeptic's point of view, such an arrangement may not be good for transit. The skeptic may feel that there is no longer an opportunity for affirmative action and the role that transit can play in meeting these objectives. Additionally, the skeptic is not likely live on society's fringes. The growing incidence of crime in inner cities causes additional white flight [out to the suburbs]. Although most crime in inner cities is black-on-black, the perception, in most circumstances, is inner cities and transit are not safe.

Regarding transit's role in providing accessibility to jobs within the industry, Jeffress said he was not surprised by evidence of the "glass ceiling." He intimated that the phenomenon may be a question of political backlash—minorities and women may have been expected to "stay in their places" within the industry.

Although Jeffress said that he had not kept up with current transit issues, he discussed the 1970 to 1990 demographics, especially as they related to continued urban sprawl, transit funding, and the emphasis on increased public participation. Jeffress contrasted the current political atmosphere with that of the 1960s and 1970s. He said the effect of the earlier period was that people felt comfortable in opposition. In the current climate affirmative action may be perceived as a barrier or individuals may feel that there are other solutions. He added that there also is a "done all we can do" or some anti-affirmative action sentiment coupled with the desire to try other solutions for balance.

TRANSIT SERVICE AND EMPLOYMENT FROM 1970 THROUGH 1990

This section contains information on employment in the transit industry from 1970 through 1990 and includes data on productivity and ridership. These data were collected from the American Public Transit Association (APTA), an international organization, representing more than 1,000 motor bus and rapid transit systems. Trends for these data are presented in tables and graphs.

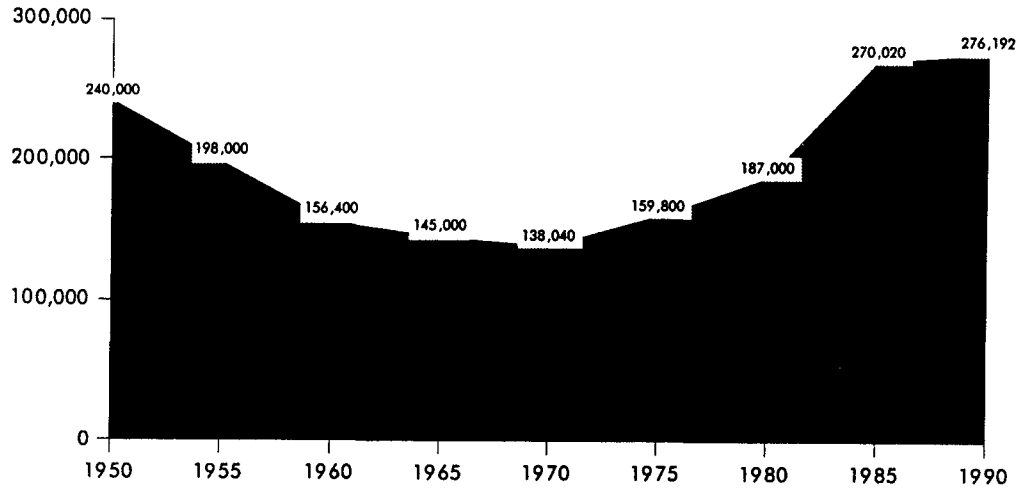
Minorities' and women's employment in transit also are examined in this section. Data from the Census and the Bureau of Labor Statistics (BLS) are used, to a limited extent, to analyze minority employment in transit. Information from Equal Employment Opportunity Commission (EEOC) for selected transit systems is reviewed to assess changes in minorities' and women's employment opportunities and provide a sample changes in the industry. In addition, a survey was conducted to gather salary and experience data and social equity perceptions of minorities and women who work in the transit industry. Information from this survey is presented.

EMPLOYMENT

As shown in Table 1 and Figure 1, during the decades of 1970, 1980, and 1990, transit employment reversed the decline experienced since 1950. The total number of employees in all forms of transit service fell from 240,000 in 1950 to 136,040 in 1970, a decline of approximately 76 percent. In 1975, transit employment grew to 159,800, an increase of approximately 16 percent over the employment figure for 1970.

Transit employment continued to increase during the decade of the 1980s. It grew from 187,000 in 1980 to 270,020 in 1985, an increase of approximately 44 percent. In 1990, transit employment was 276,192, 15 percent over the 1950 rates. Data show that employment increased slightly between 1990 and 1992. The most recent available data on transit show that in 1993 it took more than 291,000 employees to operate, maintain, and administer transit service. About 179,000 of those are employed in motor-bus service, 52,400 in heavy rail, 29,000 in demand response, 22,000 in commuter rail, and the balance in other modes. Of the total, operators and conductors on board the vehicles comprised 40 percent, maintenance personnel, 27 percent, and all other, 24 percent. In addition, there were 11,000 capital employees. Perhaps 10,000 to 20,000 other persons are employed by manufacturers of transit equipment, consultants, engineering firms, local governments, and other transit-related businesses.

Figure 1
Trend of Transit Employment



Source: American Public Transit Association (APTA) 1991 Transit Fact Book

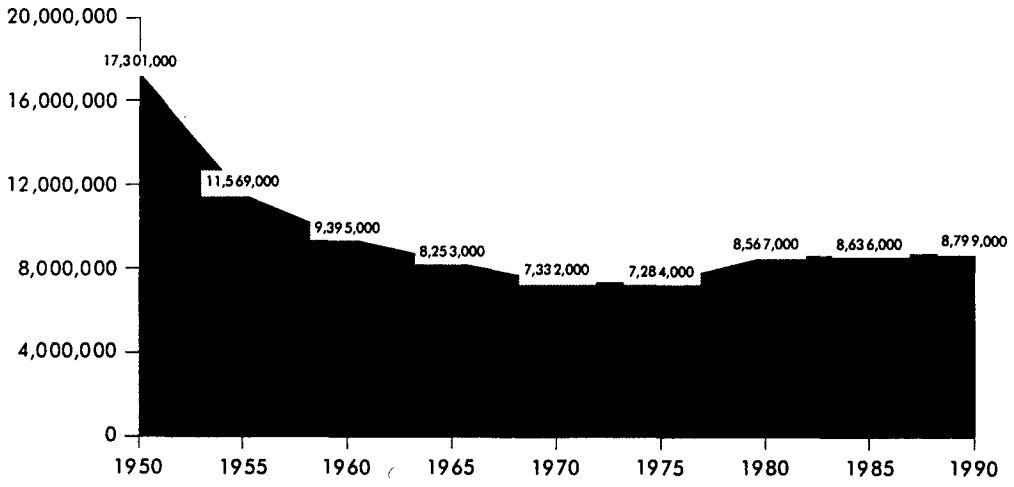
In 1970, transit carried 7.3 billion passengers, slightly less than the number of passengers carried in 1965. Transit ridership increased to approximately 8.5 billion in 1975, an increase of 14 percent. This trend continues up to 1990 when public transit systems carried approximately 8.7 billion passengers. The slight fluctuations in transit ridership are significant in this study, since employment opportunities in transit are related to market condition, ridership. Data show that transit ridership remained stable from 1990 to 1992.

Table 1
Transit Industry 1935 through 1990

Year	Total Passengers (Millions)	Total Transit Vehicles	Transit Employees	Passengers Per Employee	Passengers Per Vehicles	Employees Per Vehicle
1935	12,243	74,844	209,000	58.5	163.3	2.8
1940	13,130	75,464	203,000	64.5	173.6	2.7
1945	23,368	89,758	242,000	96.1	259.1	2.7
1950	17,301	86,310	240,000	71.9	200.0	2.8
1955	11,569	73,089	198,000	58.2	158.0	2.7
1960	9,395	65,292	156,400	60.1	143.9	2.4
1965	8,253	61,717	145,000	57.0	133.7	2.3
1970	7,332	61,298	138,040	53.1	119.6	2.2
1975	7,284	62,183	159,800	38.9	117.1	2.2
1980	8,567	75,388	187,000	45.8	113.6	2.5
1985	8,636	94,368	270,020	32.0	91.5	2.9
1990	8,799	92,961	272,839	32.3	94.7	2.9
1991	8,575	96,399	276,145	31.1	89.0	2.9
1992	8,501	102,251	278,995	30.5	83.1	2.7

Source: APTA Website: http://apta.com, 1996.

Figure 2
Trend of Transit Ridership



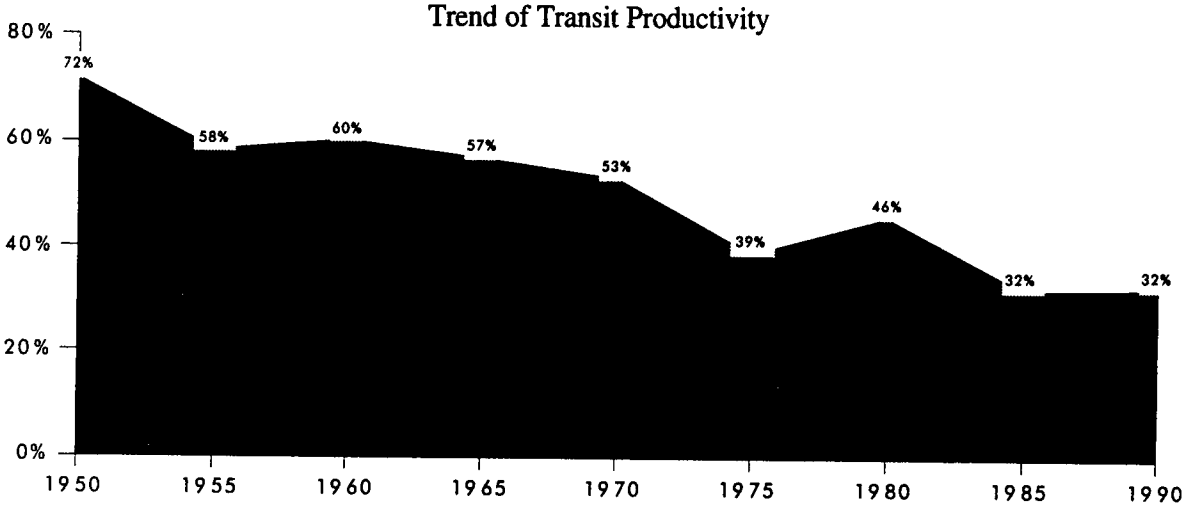
Source: American Public Transit Association (APTA) 1991 Transit Fact Book

Another review of Table 1 shows that in 1970 transit carried approximately 53.1 passengers per each employee. The number of passengers to employees may be viewed as a rough estimate of the demand-labor ratio. This ratio declined to 45.8 passengers-to-employees in 1980 and 32.3 passengers-to-employees in 1990. The ratio of passengers per each employee declined by 64 percent between 1970 and 1990. This ratio remained stable between 1990 and 1992. In addition, data in the Nationwide Personal Travel Survey (NPTS) show a trend of general decline in transit for all trips. The 1977 NPTS showed a transit share of 2.4 percent of person trips, declining to 2.2 percent in 1983, and finally to 2.0 percent in 1990.

Although the decrease is evident for the period between 1970 and 1990, the greatest part of the decline may be explained by examining the changes in ridership and travel behavior during this period. Changes in travel demand by women, minorities, and low-income populations have reduced the tendency of these groups to use transit. To understand the nature of this decline, a separate section of this paper discusses the changes in transit demand in greater detail.

Figure 3

Trend of Transit Productivity



Source: American Public Transit Association (APTA) 1991 Transit Fact Book

MINORITY EMPLOYMENT

In collecting data on minority employment in transit, information was compiled from three sources. They include 1970 and 1980 Censuses: Industry of Employed Persons; Bureau of Labor Statistics: 1990 Current Population Survey (CPS); and the Reports EEO-1 and EEO-4 for responding transit systems.

Besides providing statistical data relating to the social and economic activities and characteristics of the population of the United States, census information gives a summary of employed persons for various industries. The CPS, a monthly household survey, conducted by the Bureau of the Census for the Bureau of the Labor Statistics (BLS), provided a comprehensive body of information on the employment and unemployment experience of the nation's population, classified by age, sex, race, and a variety of other characteristics. During the early 1970s, transit systems were excluded from coverage of Title VII of the Civil Rights Act of 1964 and were not required to file racial data with the EEOC. According to the EEOC, as part

of its mandate under the amended Title VII of the Civil Rights Act of 1964, public and private employers, unions, and labor organizations are required to submit period reports showing the makeup of their workforce by sex, race, and ethnic categories as defined in the U. S. Department of Commerce, Office of Federal Statistical Policy and Standards Directive Number 15. The data collected from these reports are used by the EEOC to aid it in carrying out its enforcement responsibilities. Samples of this data are used later to show the progress of minorities and women in the transit industry from 1984 to 1993.

The Commission currently requires the filing of five types of reports; EEO-1 employer information report (annual); EEO-3 local union (biennial); EEO-4 state and local government information report (annually for 100 or more employees); EEO-5 elementary secondary staff information report (biennial); and EEO-6 higher education staff information report. Report EEO-4 is used to measure patterns of employment and identify areas of discrimination and progress. It does not measure "availability," an important factor in showing employer policies or practices that may have an "adverse impact" on the employment opportunities of any race, sex, or ethnic group. Report EEO-4 data differ from census and BLS information, which are based on individual responses to questionnaires. EEO-4 data are compiled from employer payroll data submitted to the Commission.

There are, however, limitations to the usefulness of these data.

- The census and BLS data for this study may include privately owned charter and school bus operators along with urban transit systems.
- Data comparable to 1970 and 1980 census figures do not exist for 1990. Employ ment for the transit industry is reported as "street railways and bus lines" in the 1970 census and "bus service and urban transit" in the 1980 census. A thorough search of the census revealed that transit is not reported as an industry in 1990. Thus, information from the BLS - CPS is used instead of the census to examine minorities' and women's employment in transit for 1990.
- These data also differ in that the census includes race categories for Whites, African-Americans, Hispanic, Native Americans, and Asians. CPS data do not comprise all population groups since the Hispanic, Native American, and Asian populations were too small to provide statistical estimates that are reliable. For the purposes of this paper, all minority groups have been combined.
- Although the original Federal Transit Act required all grant recipients (i.e., transit systems) to make and keep records and statistics for completion of Report EEO-4, records must only be retained for three years. The most comprehensive set of Report EEO-4 data that can be used in this analysis are available for 1984, 1985, 1989, 1991, and 1993. This information serves as a sample of minority and women employment in transit.

According to Jeffress's study, the 1960 census reported transit employment at 288,488. The data also show that employment was approximately 36 percent lower in 1970. Table 2 shows that total employment in transit increased by 106 percent between 1970 and 1980. Minorities in transit increased as a percentage of total employment during this period by 236 percent. When considered alone, the CPS data show that minorities makeup a significant share of transit's workforce in 1990, representing 28 percent of transit workers. This data appears consistent with that of the census for the preceding decades.

These data also show similar percentages for women. Not only have women maintained a significant share of the jobs in transit, but the percentage increased slightly between 1970 and 1980. Similarly, the CPS data show that women represent approximately 31 percent of transit workforce in 1990.

Table 2
Transit Industry Employment by Ethnicity/Race and Sex 1970, 1980, and 1990

Year	Total	White	Percent	Minorities	% of total	Women	% of total
1970	183,637	150,154	82	33,483	18	44,003	24
1980	378,762	266,183	70	112,579	30	101,166	27
1990	468,000	337,000	72	115,000	25	147,000	31

Source: U. S. Census Data, 1970 and 1980; Bureau of Labor Statistics, 1990.

The 1970 and 1980 censuses and the 1990 CPS illustrate an interesting trend in transit employment. A significant finding in Jeffress's study of the transit industry was that between 1945 and 1960 the number of African-American employees increased while transit employment had declined. Since 1970, employment in this industry has increased, as has employment for minorities and women. Between 1970 and 1980, the percentage of white employees in transit declined from approximately 81 percent to 70 percent, minority employees grew from 18 percent to 29 percent, and women employees increased from 24 percent to 26 percent. The CPS data for 1990 show that 72 percent of transit employees are white, 28 percent are minorities, and women represent approximately 31 percent. These data infer that the progress made by minorities during the previous decades is being reversed, that the number of white employees has increased between 1980 and 1990 and that women are increasing their share of employment in this industry.

The analysis also suggests that transit is becoming more accessible to women. The number of women in the workforce has increased significantly during the past three decades. It also may serve as an indication of the impacts of affirmative action programs and policies on employment selection procedures in transit. What is most important, however, it may corroborate the claim by many affirmative action proponents who argue that women, especially white women, benefit most from programs designed to bring diversity to the workplace.

To assess employment opportunities for minorities in transit, Report EEO-4 data were requested from 19 transit systems. These systems are presented in Table 3. The systems in the sample were selected using employment size and service area population as criteria. This criterion was used to include the greatest possible number of people potentially affected by transit policy and because major transit systems are found in the largest metropolitan areas. Additionally, using the systems with the most employees enlarges the total sample with a given number of systems. A similar survey methodology was used in Jeffress's study. Data in the 1993 Section 15 Report that provides detailed summaries of financial and operating data submitted to FTA by the nation's mass transit agencies, reported that the transit systems included in the sample comprised nearly half (45%) of transit employment in 1993.

In preparing for this analysis, Report EEO-4 data were requested for 1980 through 1994. If these reports were archived over the years, the data would provide the best sample to evaluate the progress of minorities' and women's employment in transit. As noted in the introductory paragraph of this section, a limitation of the Report EEO-4 data is that agency records must only be retained for three years. Resulting from this policy, the information received was incomplete. However, the information received is the most comprehensive data available and serves as a sample of employment in the transit industry. It includes systems in the following major metropolitan areas: Minneapolis, Baltimore, Chicago, Philadelphia, Miami, Washington, New York City, Atlanta, New Jersey, Houston, and San Francisco.[10] This information was available for 1984, 1985, 1989, 1990, 1991 and 1993.

Table 3
List of Transit Systems

New York City Transit Authority (NYCTA)
Long Island Rail Road Company (LIRR)
Chicago Transit Authority (CTA)
Los Angeles Metropolitan Transportation
Washington Metropolitan Area Transit Authority
Massachusetts Bay Transportation Authority - Boston
Southeastern Pennsylvania Transportation Authority - Philadelphia
San Francisco Municipal Railway
New Jersey Transit Corporation
Metropolitan Atlanta Rapid Transit Authority
Mass Transit Administration - Baltimore
Metropolitan Transit Authority of Harris County - Houston
Municipality of Metropolitan Seattle
San Francisco Bay Area Rapid Transit District
City of Detroit Department of Transportation
Port Authority of Allegheny County - Pittsburgh
Metro-Dade Transit Agency - Miami
Regional Transit Agency - New Orleans
Metropolitan Transit Commission - Minneapolis

Of the transit systems that could provide equal employment opportunity reports (EEO), eleven transit systems provided EEO-4 reports and one provided EEO-1 reports for the years 1984 through 1993. Table 4 displays a comparison of employees in the transit industry with the aggregated data obtained from the EEO-4 reports collected from the participating agencies.

Table 4
Sample of Transit Employees in Study

Year	Number of Transit Systems	Number of Employees in Transit Systems	Number of Employees in Transit Industry	% of Employees in the Transit Industry
1984	10	47,119	263,197	18
1985	10	47,623	270,020	18
1989	11	110,511	272,487	41
1990	11	103,018	272,839	38
1991	12	111,731	276,145	40
1993	12	112,266	302,758	37

Source: 1984 Report EEO-4.

Tables 5 through 10 illustrate the trend of employment in transit by combining data for the transit agencies included in the sample. Note, the fluctuation in sample sizes for the years is due to incomplete data.

Table 5
Transit Population Sample for 1984[11]

Occupational Group[12,13]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	2,046	72	812	27	246	9	2,858
Professionals	2,075	65	1,139	35	792	25	3,214
Technicians	513	64	294	36	150	19	807
Protective Services	505	55	408	45	137	15	913
Para-Professionals	55	56	44	43	47	48	99
Administrative Support	2,180	45	2,647	55	2,718	56	4,827
Skilled Craft	6,879	63	4,107	41	259	3	10,986
Service/Maintenance	6,527	28	16,918	69	2,877	12	23,445
Total	20,780	44	26,369	48	7,226	15	47,149

Source: 1984 EEO-4 Reports in the authors' possession.

The largest concentration of women, 2,877, among 1984 respondents is found in the Service/Maintenance occupational group. The second largest, 2,718, is found in the Administrative Support occupational group. The two groups comprise 78 percent of all women employed by respondents for that year. Women held 56 percent of the positions classified as Administrative Support and 48 percent of the positions classified as Para-Professional.

Table 6
Transit Population Sample for 1985[14]

Occupational Group[15,16]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	2,226	74	802	26	278	9	3,028
Professionals	1,793	65	982	35	763	27	2,775
Technicians	517	64	295	36	145	18	812
Protective Services	465	54	393	46	128	15	858
Para-Professionals	43	64	24	36	28	42	67
Administrative Support	2,238	46	2,644	54	2,496	51	4,865
Skilled Craft	8,390	68	4,272	34	326	1	12,390
Service/Maintenance	6,273	27	15,072	66	2,278	10	22,872
Total	21,945	46	24,484	51	6,442	14	47,667

Source: 1985 EEO-4 Reports in authors' possession.

In 1985, the largest concentration of women, 2,496, is found in the Administrative Support occupational group. The second largest, 2,278, is found in the Service/ Maintenance occupational group. Women in these occupational groups comprise 74 percent of all women employed by respondents in 1985. Women held 51 percent of the positions classified as administrative support, 42 percent of the para-professional classifications, and 27 percent of the professional classifications.

Table 7
Transit Population Sample for 1989[17]

Occupational Group[18,19]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	4,597	66	2,417	34	1,137	16	7,014
Professionals	3,776	59	2,656	41	1,511	23	6,432
Technicians	1,304	59	898	41	516	23	2,202
Protective Services	2,906	61	1,880	39	524	11	4,786
Para-Professionals	79	49	83	51	57	35	162
Administrative Support	4,110	34	8,137	66	5,947	49	12,247
Skilled Craft	17,621	50	17,657	50	900	3	35,278
Service/Maintenance	11,223	26	31,750	74	5,126	12	42,973
Total	45,616	41	65,478	59	15,718	14	111,094

Source: 1989 EEO-4 Reports in authors' possession.

Seventy percent of the women employed by the responding systems fell into the occupational categories of Administrative Support and Service/Maintenance. Women held 49 percent of the positions classified as administrative support; 35 percent of the para-professional classifications; and 23 percent each of the professional and technician classifications.

Table 8
Transit Population Sample for 1990[20]

Occupational Group[21,22]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	6,640	63	3,839	37	1,095	10	10,479
Professionals	3,574	59	2,532	41	1,444	24	6,106
Technicians	1,415	62	877	38	312	14	2,292
Protective Services	3,064	62	1,839	38	663	14	4,903
Para-Professionals	116	42	160	58	108	39	276
Administrative Support	3,706	32	8,042	68	5,883	50	11,748
Skilled Craft	19,276	54	16,590	46	1,473	4	35,866
Service/Maintenance	9,933	29	24,859	71	3,990	11	34,792
Total	47,724	45	58,738	55	14,968	14	106,462

Source: 1990 EEO-4 Reports in authors' possession.

Women comprised 50 percent, or 5,883 employees, of the occupational group, Administrative Support, among responding systems in 1990. The second largest occupational group was Service/ Maintenance, 3,990. Sixty-six percent of all women were found the Administrative Support and Service/Maintenance groups. After Administrative Support, para-professionals and professionals were the next highest groups for women.

Table 9
Transit Population Sample for 1991[23]

Occupational Group[24,25]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	7,592	64	4,323	36	1,101	9	11,915
Professionals	3,850	56	3,027	44	1,706	25	6,877
Technicians	1,214	59	851	41	275	13	2,065
Protective Services	3,118	61	2,029	39	783	15	5,147
Para-Professionals	141	38	235	63	176	47	376
Administrative Support	3,271	28	8,609	72	6,559	55	11,880
Skilled Craft	16,698	50	16,644	50	1,393	4	33,342
Service/Maintenance	10,817	27	29,138	73	4,795	12	39,955
Total	46,701	42	64,856	58	16,788	15	111,557

Source: 1991 EEO-4 Reports in authors' possession.

Sixty-eight percent of women employed by the respondents were in the occupational groups of Administrative Support and Service/Maintenance. The largest number, 4,559, was found in the Administrative Support group. Women comprised 55 percent, 47 percent, and 25 percent of the Administrative, Para-Professional, and Professional occupational groups, respectively.

Table 10
Transit Population Sample for 1993[26]

Occupational Group[27,28]	White	%Total	Minorities	%Total	Women	%Total	Total
Officials/Administrators	7,156	62	4,408	38	1,453	13	11,564
Professionals	3,895	53	3,457	47	1,856	25	7,352
Technicians	1,144	60	773	40	333	17	1,917
Protective Services	2,940	53	2,649	47	976	17	5,589
Para-Professionals	264	45	322	55	117	20	586
Administrative Support	3,324	25	9,923	75	6,712	51	13,247
Skilled Craft	15,774	51	15,431	49	1,429	5	31,205
Service/Maintenance	10,711	26	29,787	74	5,244	13	40,498
Total	45,208	40	66,750	60	18,120	16	111,958

Source: 1993 EEO-4 Reports in authors' possession.

The largest number of women, 6,712, employed by respondents was found in the Administrative Support occupation group. Combined with Service/Maintenance, these two groups comprised 66 percent of women employed by respondents. Women represented 51 percent, 25 percent, and 20 percent of the Administrative Support, Professional, and Para-Professional occupational groups, respectively.

Information in Tables 5 through 10 is aggregated for each year in the sample by white, minorities, and women. The totals are presented in Table 11. Noting that the analysis shows a significant increase in the sample size between 1985 and 1989 is important. This is due, primarily, to the increase in the number of Report EEO-4 received from various transit agencies. The sample size, however, remained stable for the years 1989, 1990, 1991, and 1993, fluctuating between 43 percent and 47 percent of transit's total

population. During these years, minorities represented over half the employment for the transit agencies in the sample. Similarly, the proportion of women in the sample had a steady growth during the years represented. The proportion of white employees in the sample declined.

There are some consistencies between the transit population sample and the previous analysis of census and BLS information on minorities' and women's employment from 1970 to 1990. These data suggest that the proportion of these population groups in transit have increased between 1970 and 1980, and has continued through the early portion of the 1990s. Both data sets show that transit employment grew during these periods. This growth is constant for women and their share of transit's workforce. However, contrary to the earlier conclusion that the progress made by minorities between 1960 and 1980 is being reversed, the transit population samples show that the number and proportion of minorities in transit had persistent growth during the early part of the 1990s. Additionally, the data showed white employment in transit fluctuated between 1989 and 1993, but declined in proportion to total transit employees. The analysis of the Census and BLS data showed an increasing trend in the number of white employees between 1980 and 1990.

Table 11
Aggregate of Transit Employees from Sample Agencies

Year	White	%Total	Minorities	%Total	Women	%Total	Total
1984	20,780	44	26,369	56	7,226	15	47,149
1985	21,945	47	24,484	53	6,442	14	46,429
1989	45,616	41	65,478	59	15,718	14	111,094
1990	47,724	45	58,738	55	14,968	14	106,462
1991	46,701	42	64,856	58	16,788	15	111,557
1993	45,208	40	66,750	60	18,120	16	111,958
Average	37,996	43	51,113	57	13,210	15	89,108

Source: Data in authors' possession.

Jeffress predicted that transit would become an industry owned and operated by African-Americans. The data for the agencies in the sample show that since Jeffress's study, not only have African-Americans increased their share of transit's workforce, but the proportion of other minorities and women in transit have also increased. In view of the data presented here, what has been the progress of minorities and women into transit management? Another review of the data in Tables 5 through 10 provides an opportunity to measure the progress of minorities and women into management positions for the transit agencies in the sample. An aggregate of the employees classified as "official/administrators and professionals" is used to assess the progress of minorities and women to these ranks.[29]

Table 12
Aggregate of Transit Employees - Management Positions

Year	White	%Total	Minorities	%Total	Women	%Total	Total
1984	4,121	68	1,951	32	1,038	17	6,072
1985	4,019	69	1,784	31	1,041	18	5,803
1989	8,373	62	5,073	38	2,648	20	13,446
1990	10,214	62	6,371	38	2,539	15	16,585
1991	11,442	61	7,350	39	2,807	15	18,792
1993	11,051	58	7,865	42	3,309	17	18,916
Average	8,203	62	5,066	38	2,230	17	13,269

Source: Data in authors' possession.

Table 12 presents information on management positions for the transit systems in the sample. The data seem consistent with the previous analysis of transit employment which showed an increase in minorities' and women's employment during the decades of 1970 and 1980, and the early 1990s. For 1989, 1990, 1991 and 1993, the years with the largest samples, the data show that minorities and women made progress into management ranks, in numbers and their shares of these positions. It also shows that the share of white employees in these positions declined. In 1993, the most recent year for data in the sample of transit agencies, minorities represented approximately 39 percent of management positions; women represented 15 percent. It is possible that the number of minorities in management is larger as the above aggregate excludes supervisors and managers for other occupational groups.

MINORITIES AND WOMEN IN TRANSIT SURVEY

The minorities and women in transit survey was conducted to gather salary, experience, and social equity perceptions of minorities and women the industry. In view of Jeffress's predictions about transit becoming an industry mostly operated and owned by African-Americans, the survey also served as an model of the progress that minorities and women have made into management positions. The survey design was taken from the American Planning Association 1991 Planners Salary Survey Form. A random sample of 500 was drawn from the membership rosters of the National Forum for Black Public Administrators (NFBPA)[30], Conference of Minority Transportation Officials (COMTO), Women's Transportation Seminar (WTS), and APTA's Minority Affairs Committee (MAC). The first mailing was made in August 1995; a second mailing took place in September 1995. A total of 297 usable surveys was returned for a response rate of 59 percent. A copy of the survey instrument is contained in Appendix A. Responses and selected comments are presented in Appendix B. The final survey question asked if respondents were interested in participating in a telephone interview. Information from the interviews is presented in Appendix C.

Response frequencies and comments regarding the perceptions of minorities and women in transit follows. The comments are limited to introducing subjects and brief interpretations of findings. Frequencies include gender, ethnicity, age, agency status, years of experience, income, education, and certification or license. Information is presented on programs that respondents have participated which are designed to enhance

diversity in public service, including mentoring and affirmative action programs. Respondents' perceptions on minority progress in transit during the last ten years are evaluated and compared with other industries. In sampling salary disparities between minorities and non-minorities and between the sexes, data is provided on respondents' perceptions about sexual, racial, and ethnic discrimination. Lastly, information was requested from respondents about their perceptions of affirmative action.

PROFILE OF RESPONDENTS AND QUALIFICATIONS

Figures 4 through 7 provide characteristics of respondents. Approximately 54 percent were women and 83 percent said they were members of a minority group. The largest group of the respondents was Black of Non-Hispanic Origin; they made up approximately 72 percent of the respondents. The median age reported by the respondents was 45 years and the median salary was $62,671. Respondents were asked to indicate the highest degree earned. Forty-two percent said a master's degree; 34 percent, a bachelor's degree. Since the respondents were asked to show the highest degree earned, it is possible that the number of respondents with a bachelor's degree is higher than reported. It is more than likely that those respondents with masters' degrees also have bachelor's degrees. This probably is true for the respondents that said they had a Ph.D. Over half the respondents (52%) do not have any certification or licensure.

Respondents were asked to indicate if they participated in any of the following programs.

- A Better Chance
- APTF Transit Hall of Fame Scholarship
- Upward Bound
- Urban League
- USDOT Summer Transportation Internship

Of the 297 respondents, less than 25 percent said they had participated in one of these programs.

Figure 4
Respondents' Race or Ethnicity

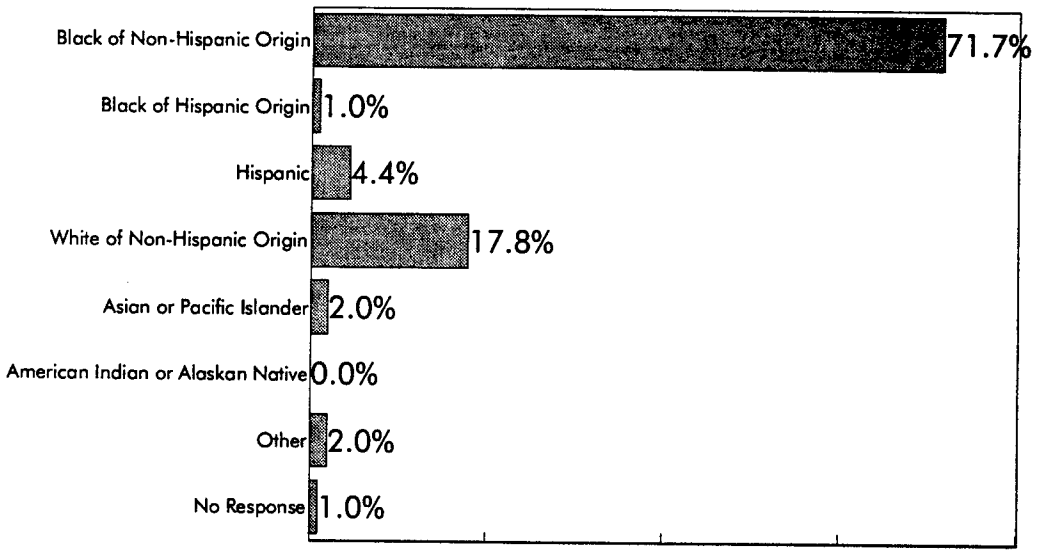


Figure 5
Respondents' Gender

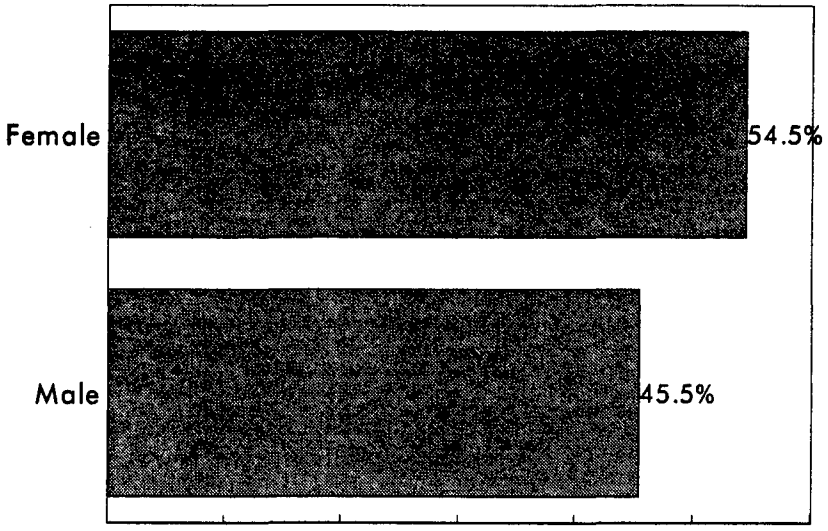


Figure 6
Respondents' Job Categories

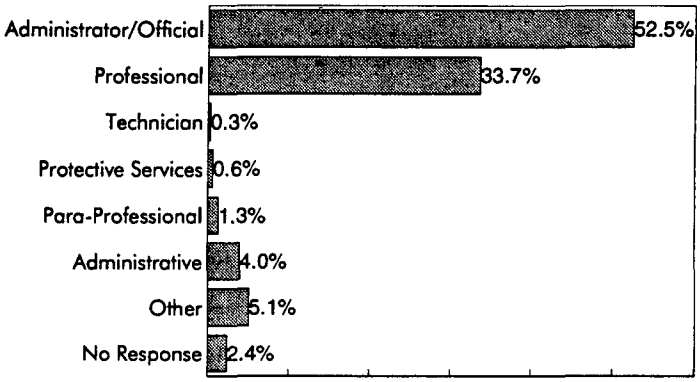
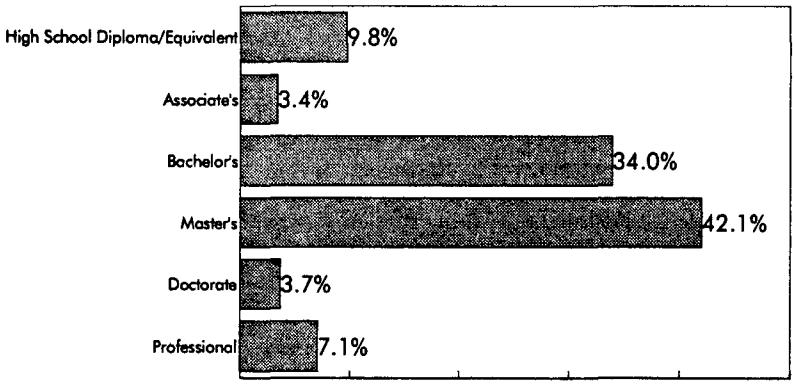


Figure 7
Highest Degree Earned by Respondents



Most of the respondents worked for public agencies. Approximately 53 percent of the respondents described their current job category as Administrator/Official. The job category with the second highest response rate was Professional, 33 percent. For this analysis, respondents that described their current job category as Technician, Para-Professional, or Protective Services, were grouped together since individually their numbers were too small to be significant. Approximately 38 percent of respondents said they had more than 15 years' experience in the transit industry; 27 percent said they had between 5 and 10 years of experience. Respondents also were asked to give the number of years they have been in their current position. Seventy percent said five years or less.

Social Equity Perceptions

The survey provided information on perceptions of discrimination in transit. Respondents to the survey were asked their opinions of the progress of minorities and women in transit during the past 10 years. Most respondents stated that minorities have made progress.

Approximately 55 percent respondents thought that the percentage of minorities and women in senior or management positions had increased and 52 percent thought that progress had occurred in their agencies. These perceptions were consistent with the findings from the sample EEO report data that suggests that the share of minorities and women in management positions has increased in recent decades. When compared with other industries, 42 percent of the respondents stated the percentage of minorities in transit is greater.

Figure 8
Do you think that the percentage of minorities and women in senior or management positions in the transit industry has...

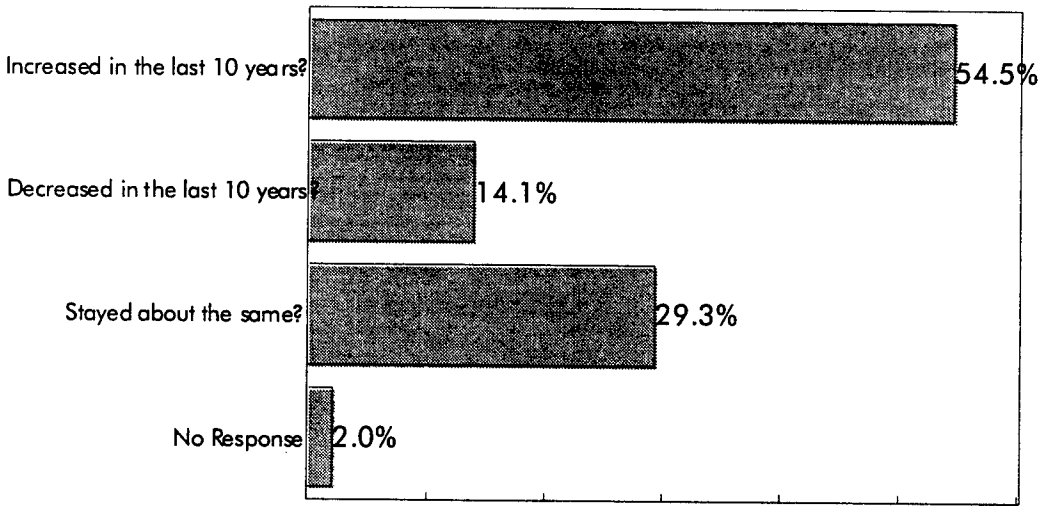


Figure 9
Do you think that the percentage of minorities and women in senior or management positions in the transit industry has...

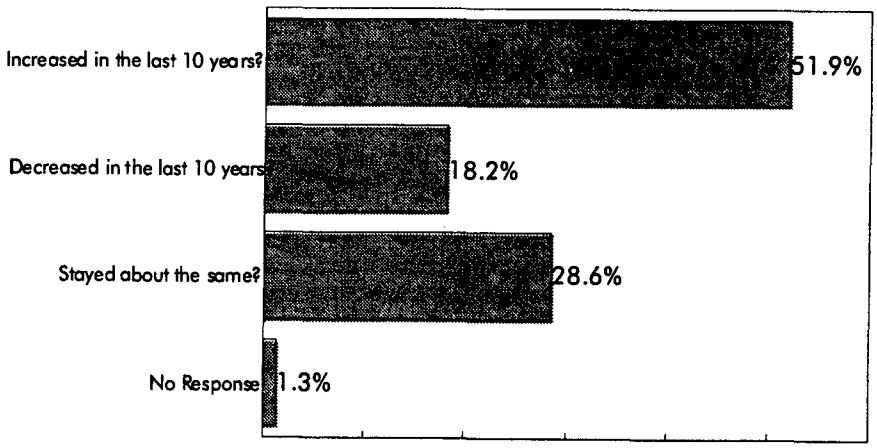
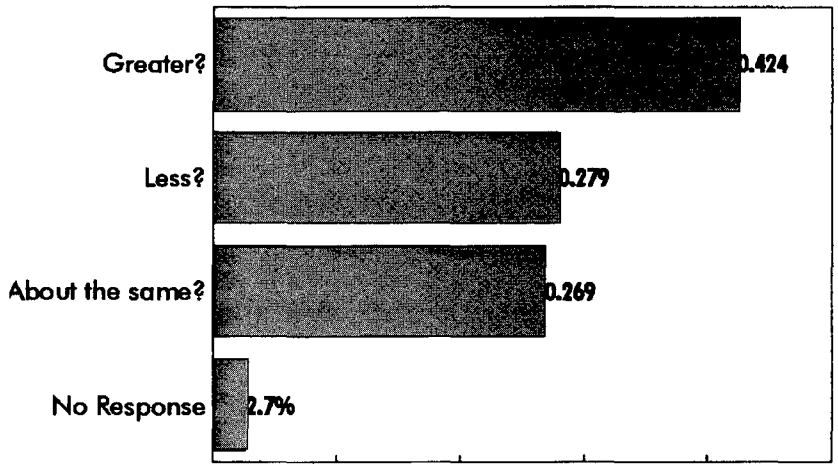


Figure 10
In comparison with other industries, do you think that the percentage of minorities and women in the transit industry is...



Respondents then were asked if they felt that they were victims of discrimination through various policies and programs at their agencies. This included areas such as the selection for assignments, promotions, mentoring, training, or being included in the flow of information. Interestingly, 70 percent of the respondents said their agencies did not provide a career guidance or mentoring program. Approximately 77 percent of the respondents said they did not receive any career guidance or mentoring from a supervisor or senior-level person in their agencies. Seventeen percent of these respondents said this was primarily due to their gender. Eighty-seven percent of all respondents said their agencies provided mechanisms to facilitate communications. However, slightly more than half the respondents, 52.9 percent, said they were not fully included in the flow of information in their agencies. Almost 19 percent of these respondents stated that gender accounted for their exclusion.

Respondents were asked, "Does your agency have a training or professional development program?" Seventy percent of the respondents said "Yes." Most respondents, 71 percent, said they had access to opportunities for training or professional development in their agencies. Of the respondents who stated, "No," almost 27 percent, 21 percent thought it was due to gender. Over half, 57 percent of respondents thought they had equitable opportunities to be involved in significant projects at their agencies. Only 40 percent of these respondents thought that they did not. Of these respondents, 24 percent believed that it was due to gender.

Figure 11
Do you receive career guidance or mentoring from a supervisor or senior-level person in your agency?

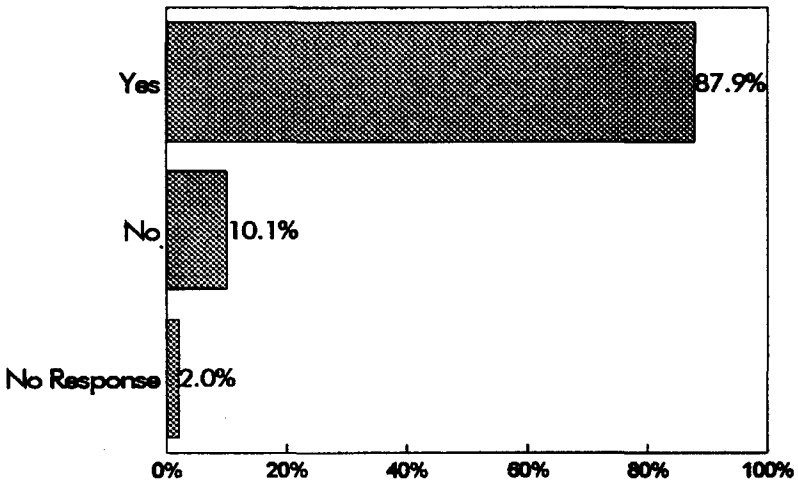


Figure 11
Does your agency provide mechanisms to facilitate communications?

Figure 12
Does your agency provide mechanisms to facilitate communications?

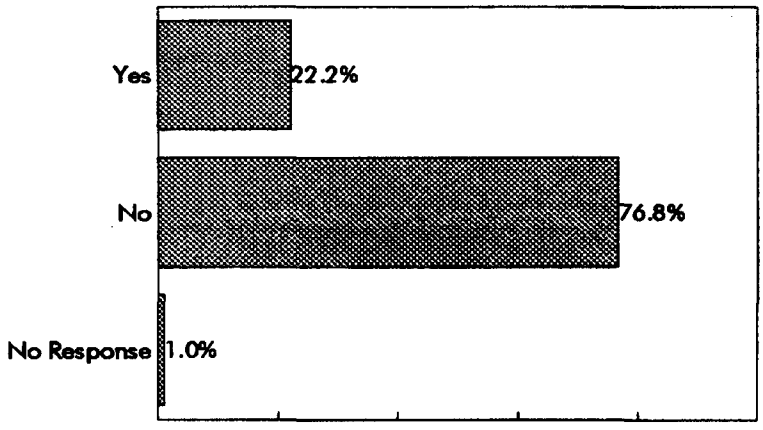
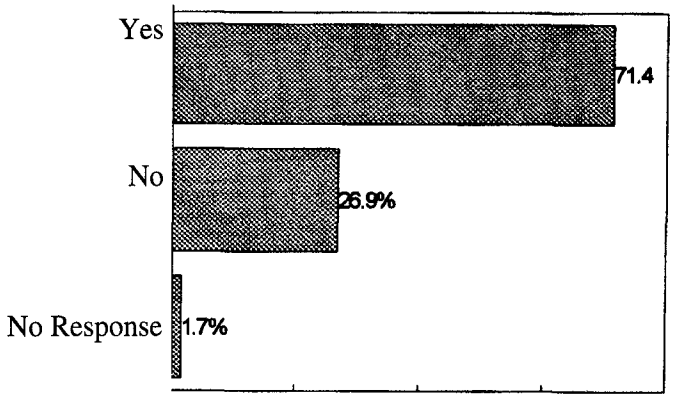


Figure 13
Do you think that you have equitable access to opportunities for training professional development in your agency?



Regarding progress for minorities in transit, most respondents, 67.3 percent, said their agencies did not have a written career path or promotion guidelines. Most of the respondents, however, did think that their agencies are fair in providing salary increases and promotions. Approximately 45 percent of respondents stated that they have been unfairly denied a salary increase or promotion in their agencies. Of these respondents, nearly 35 percent said this was primarily due to gender. Interestingly, over two-thirds of respondents, 79.5 percent thought there were salary disparities at their agencies. Of this group, 41 percent thought the disparities were due to gender.

Figure 14
Do you think that you have equitable opportunities to be involved in significant protracts in your agency?

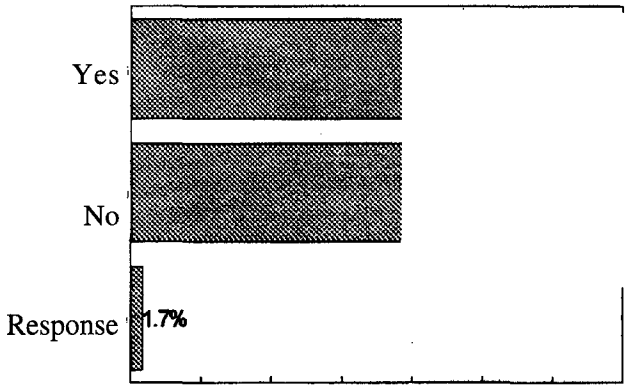


Figure 15
Do you think that you are fully included in the information of your agency?

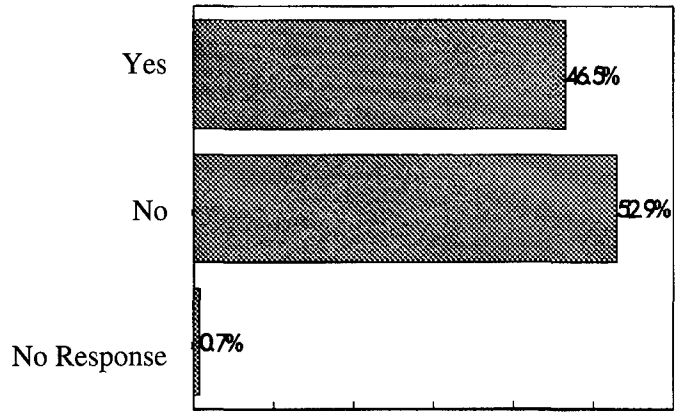
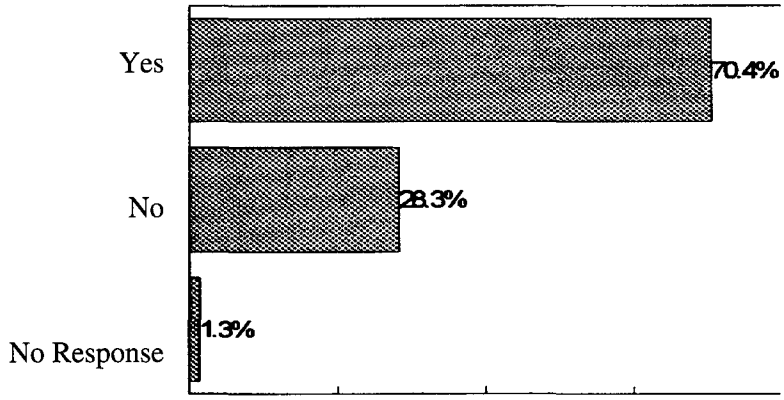


Figure 16
Does your agency have a training and professional development program?



When asked to compare their experience, credentials, and training to their positions, 68 percent of respondents said their current jobs were commensurate with their backgrounds. Twenty-nine percent said they were in dead-end or support positions that were not equal to their skills and training. Of these respondents, 36 percent said that it was due to gender. Particularly in light of the recent debate over affirmative action, respondents were asked their opinions on affirmative action policies and if they were hired or promoted due these policies. Most of the respondents, 91.6 percent, think that affirmative action policies are important in advancing the interests of minorities and women in transportation. Respondents almost were evenly divided whether their hiring or promotions were due to affirmative action.

Figure 17
Do you think that there are salary disparities within your agency?

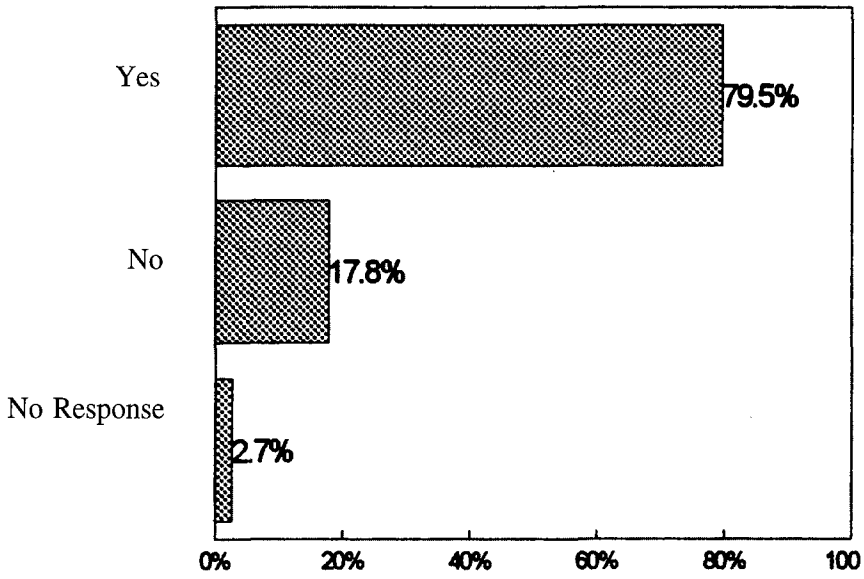


Figure 18
Do you think that you have been unfairly denied a salary increase(s) or promotion(s) in your agency?

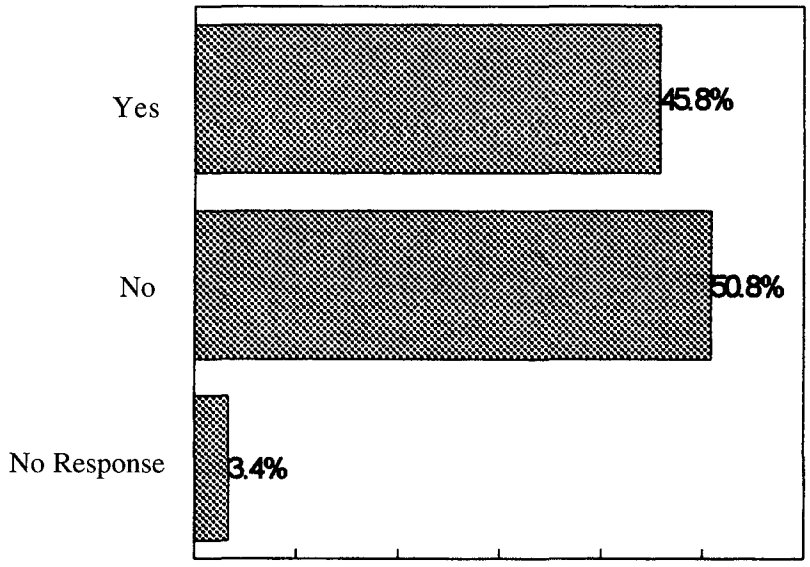


Figure 19
Does your agency have written career path or promotion guidelines?

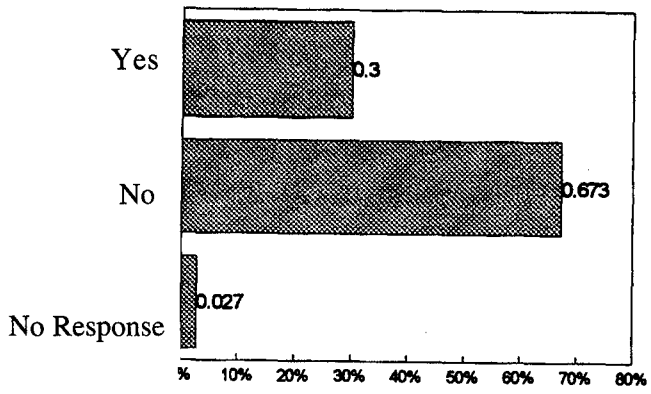


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Figure 20
Do you think that affirmative action policies are important in advancing the interests of minorities and women in transportation?

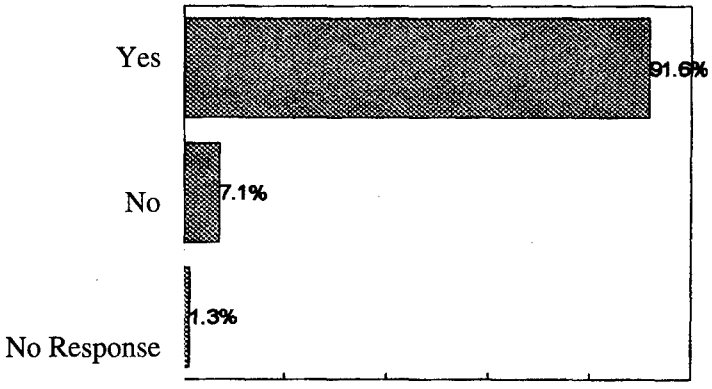


Figure 21
Do you think you have been placed in a dead-end or support position that is not commensurate with your training or experience?

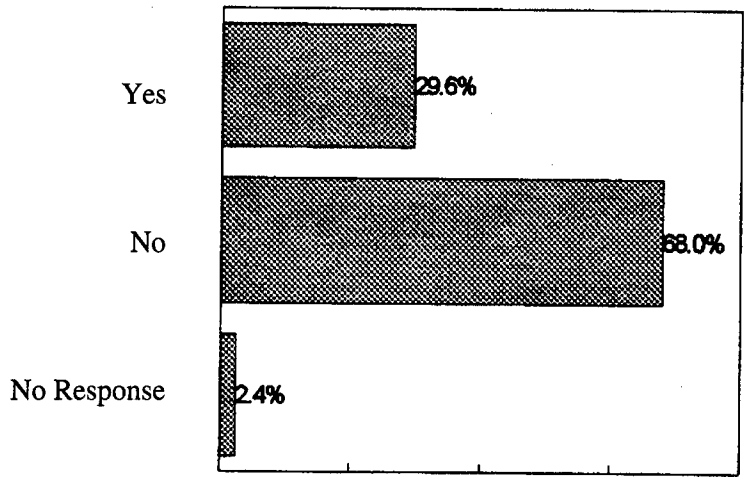
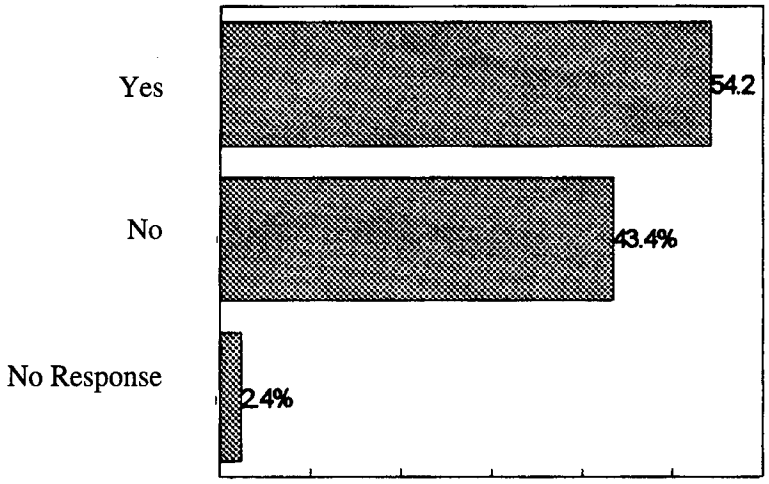
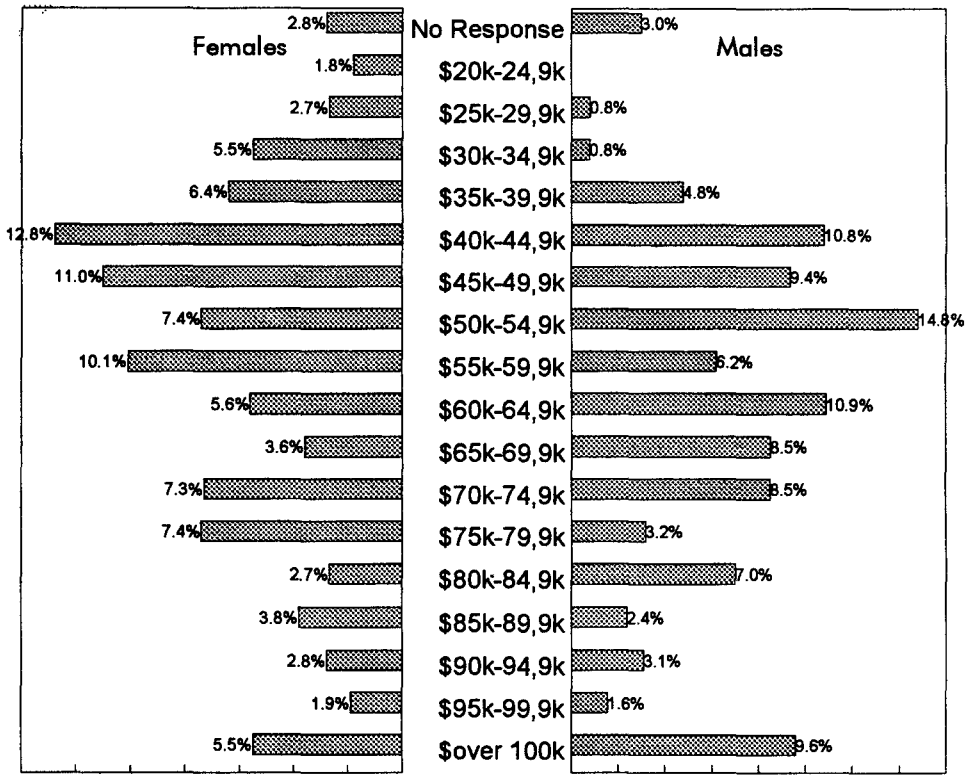


Figure 22
Do you think that you were hired or promoted, in part, due to affirmative action policies or plans in your agency?



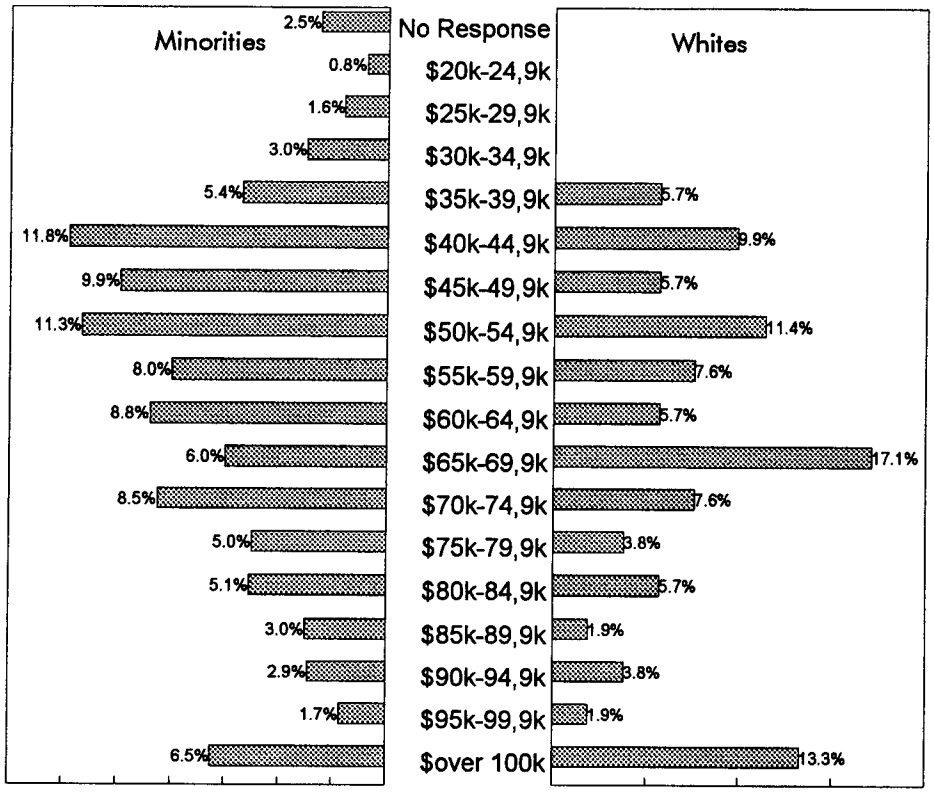
Respondents' salaries were compared by gender. The data show that most female and male respondents fell within the $40,000 to 74,999 salary range. The median salary for female respondents was $57,600; male respondents, $60,000. The largest share of female respondents, 12.8 percent, was in the $40,000 to $44,999 range. The largest share of male respondents 14.8 percent was in the $50,000 to $54,999 range. This may suggest some disparities in salary based on gender for the sample.

Figure 23
Salary Distribution by Gender



Regarding the relationship between salary and race and ethnicity, the median salaries for whites was $66,000; minorities, $58,000. The largest share of minority respondents, 12.8 percent, was in the $40,000 to $44,999 range. The largest share of white respondents 17.1 percent was in the $65,000 to $69,999 range. The difference between the median incomes of whites and minorities seem to suggest that gender and race or ethnicity are strong detriments of salary. This interpretation is consistent with the findings of the American Planning Association (1992:32).

Figure 24
Salary Distribution by Race/ Ethnicity



SUMMARY

The survey provided information on salary, experience, and social equity perceptions of minorities and women who work in the transit industry. The median age reported by respondents was 45 years, the median salary reported was $62,671, and 42 percent said they had a master's degree.

Over half the respondents believe that the percentage of minorities and women in senior or management positions in the transit industry and at their agencies, has increased during the past 10 years. In addition, various questions were asked of respondents to assess if they had experienced discrimination through policies and programs at their agencies. Many respondents said that their agencies did not provide any career guidance or a mentoring program and that they did not receive any guidance or mentoring from a supervisor or senior-level person. A significant share of respondents said that their agencies provided mechanisms to facilitate communications and have training or professional development programs. However, approximately 53 percent said they were not fully included in the flow of information in their agencies; 26 percent said they did not have an opportunity for training and development in their agencies.

Most of the respondents, 67.3 percent, said their agencies did not have a written career path or promotion guidelines. Almost half the respondents, however, thought that they had been unfairly denied a salary increase or promotion in their agencies. A significant share of respondents said there are salary disparities

at their agencies. Finally, most respondents, 91.6 percent, think affirmative action policies are important in advancing the interests of minorities and women in transportation.

CHANGES IN TRANSIT LABOR SUPPLY AND SERVICE DEMAND FROM 1970 THROUGH 1990

This section discusses some factors that have contributed to the increasing share of minorities in transit since the Jeffress study, such as the demographic changes in the workforce. It also presents interpretations of how socioeconomic changes have affected travel behavior and transportation demand. Occasionally these factors have increased the need for transit service and, in other instances, they have reduced service demand. These factors are presented to understand their effect on employment in an industry in which minorities and women have made significant progress.

Demographic Changes in Transit Workforce

Jeffress noted that African-Americans made significant gains in the transit industry during the labor shortages of World War II; this progress continued in subsequent decades in spite of falling demand for labor. Examining such factors as the image of the industry, industrial locations, the availability of other jobs for whites, and government action, may provide explanations for increased employment of minorities and women.[31] The earlier sections have shown that in addition to the employment progress made by African-Americans, other minorities and women are showing higher participation rates. The factors presented by Jeffress may not only explain the changing workforce in transit, but also may explain the overall changing workforce in the United States.

Table 13 shows the total number of the civilian non-institutionalized population age 16 and over and the approximate participation rate for the total U.S. population for 1970, 1980, and 1990. Participation rates provide an estimate of the U.S. workforce.[32] Data show that the participation rate has increased from 1970 to 1990. Thus, it appears safe to assume an increasing workforce.

Table 13
U.S. Workforce for 1970, 1980, and 1990

Year	Total Civilian Population	Participation Rate (Percent)
1970	82.0	58.2
1980	106.0	62.0
1990	125.1	65.3

Source: U.S. Census. 1980 General Social and Economic Characteristics, Table 86 Labor Force Status by Sex and Race: 1940 to 1980. 1990 General Social and Economic Characteristics, Table 44 Labor Force Characteristics by Race and Hispanic Origin: 1990.

Table 14 shows the proportionate minority and women's representation of the total workforce populace from 1970 to 1990. These data reflect important phenomena in American society, the participation rate growth of minorities and women in the workforce. During the last four decades, but especially since the 1970s, the overall labor force participation rate of women has increased substantially. In 1970, approximately 36.3 percent of all women were in the paid labor force; 1980, 42.1 percent of women were employed; and in 1990, 45.3 percent. In addition, the overall growth of minority participation in the labor force grew from 13.4 percent in 1970 to 18.0 in 1980. The share of minority participation declined in 1990 to 17.9 percent. It should be noted the 1990 census separately counted the Hispanic population which included 8.1 percent

of minority participation declined in 1990 to 17.9 percent. It should be noted the 1990 census separately Ideally, each cohort should have the same proportion of the workforce population as their respective population representations. For example, as the African-American population represented 10.7 percent of the 1990 workforce population, 10.7 percent African-American representation would be expected in the transit industry. (Data on ethnic/ race and gender cohorts for transit are presented in Tables 2.) This information is compared with data on gender and minority cohorts for the overall workforce in Figure 24. The comparison suggests that although the share of each minority cohort in the workforce has increased between 1970 and 1990, except African-Americans, each cohort have maintained a proportionate share of transit employment that is less than represented in the workforce.

The data also suggest that while demographic changes in the workforce are factors that have increased the propensity of minorities and women to enter the transit industry during the past decades, the changes have not had any dramatic impact on employee profiles in this industry; however, African-Americans have continued their progress. Additionally, census data show that America is becoming increasingly urbanized. The percentage of the population in urban areas has steadily expanded from 73.6 percent in 1970 to 73.7 percent in 1980 to 75.2 percent in 1990. Jeffress posited that transit systems are by definition, urban-oriented and located, with an available workforce that mostly consist of minorities, another factor contributing to a large minority labor pool for transit.

Table 14
Percent of Total Workforce by Race 1970 to 1990

Ethnicity/Race and Gender	1970	1980	1990
White	86.6	81.9	82.1
Minorities	13.4	18	26
Women	36.3	42.1	45.3

Source: U.S. Census. 1980 General Social and Economic Characteristics, Table 86 Labor Force Status by Sex and Race: 1940 to 1980. 1990 General Social and Economic Characteristics Table 44 Labor Force Characteristics by Race and Hispanic Origin: 1990.

These changes in the workforce are projected to continue into the next century. According to the BLS, women will make up about 48 percent of workers by the year 2005 and minorities and immigrants will hold about 28 percent of all jobs, up from 26 percent in 1990. White men are expected to account for only 33 percent of those entering workforce by 2005.[33] Additionally, "baby-boomers" who are mostly white and entered the labor force between 1970 and 1980, will start to reach 65 years of age around the year 2010; many of these workers will retire before 65. A significant share of labor will be replaced by immigrant populations. Approximately seven million people of the added population in the 1980s. were from net immigration. A disproportionate share of these new entrants was between 15 and 35 years of age, the age cohorts that make up most of the labor force. In view of the recent federal immigration legislation, which puts emphasis on skills as a criterion for entry, immigrates will have significant representation in needed skill areas. Consequently, it may be expected that minorities and immigrants may provide the flexibility for meeting future labor requirements and comprising a significant share of the workforce for the transit industry.

Socioeconomic Changes in Society

While the demographic changes in society over the past three decades have affected transit's workforce, changes in socioeconomic conditions during this period also have influenced travel behavior. These changes include modal share trends, increasing automobile use, and suburbanization. Each of these factors has

employment in transit will be affected. While these changes have increased since Jeffress completed his study, public policy and a changing workforce seemed to have helped transit to maintain a position of stable employment. However, recent funding constraints and society's demand for better accountability of public funds may increase the pressures for transit officials to be better stewards of resources that support transit.

Modal Share Trends and Automobile Use

Census data show that between 1970 and 1990 there has been a decline in nearly all alternatives to single occupant vehicle (SOV) rates (i.e., carpooling, walking to work, and transit). Collectively, the growth and dispersal of population, employment in the suburbs, coupled with increases in income and auto ownership, have created an explosion in trips made by private vehicles for all trip purposes, including the home-to-work trip, the traditional market for transit.[34] However, one category that may have possible growth in absolute terms is the working-at-home phenomenon. This upturn has long been predicted based on expectations for new computer-oriented opportunities.[35]

These trends may have negative influences on minorities' and women's employment in the transit industry. Increases in auto use may reduce the share of trips by transit, demand for service and the ability for transit to general revenue to support a growing labor force. Transit systems may have been compelled to increase fares to make up for the revenue lost from a declining market share or reduced service and labor force. Fare increases can provide limited relief to a revenue shortfall but only in the short-term. At some point fare increases are counterproductive because they may result in ridership losses so large that revenues decline, rather than increase. Additionally, reducing the labor force to operate transit service to recover any significant cost may be unsuccessful since union agreements and political forces may have prevented recovery from occurring.

Data presented in this paper suggest that minorities and women have enjoyed steady employment in the transit industry during the past three decades. Concerns about a declining market share and the possible impact on employment, implies a need to shrink the size of some transit systems, and, subsequently, employment opportunities for minorities and women.

An example of the effect that a declining market share may have on an industry is provided by the Metro-Dade Transit Agency (MDTA) in Miami, Florida. To mitigate the expenses that MDTA imposes on the budget, the county is planning to eliminate lower level jobs, many of which are in the Metro-Dade Transit Agency. More than 51 percent of the agency's 2,672 employees are black. While the costs associated with MDTA service include expenses other than the deficit caused by a declining ridership, an increase in or stable ridership may have averted the elimination of jobs.

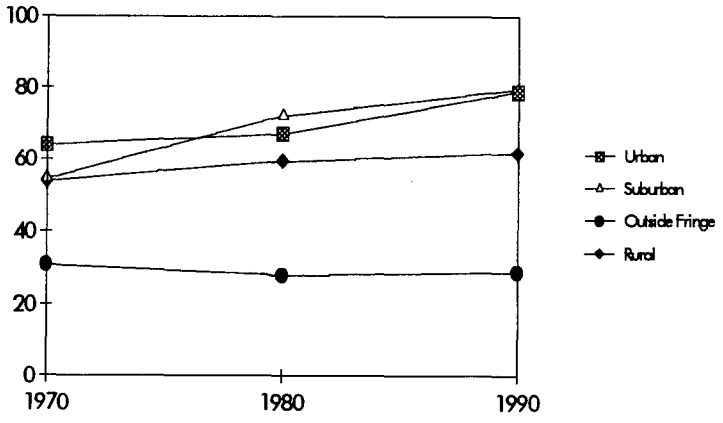
A more recent example of how ridership declines and fare increases can affect employment opportunities in transit is provided by the Hillsborough Area Regional Transit Authority (HARTline), in Tampa, Florida. Ridership for the system declined after the board of directors voted to raise fares. In response to this, the board also approved a hiring and wage freeze for the agency, thus eliminating possible job opportunities for minorities and women.

Travel is what economists call a "derived need." That is, people travel to do or consume something else. Therefore, transit's success is closely tied to the way residential, economic, and social activities are arranged on the landscape -- "land use."[36] Hence, suburbanization may be another factor affecting travel behavior and the demand for transit service. Initially, suburbs developed as bedroom communities for workers with jobs in urban centers. During the past few decades, the character of suburbs has changed dramatically. Suburbs have become multifunctional centers including residential, employment, business, and institutional activities.[37] Between 1970 and 1990, the proportion of the American population residing in suburbs grew from approximately 27 percent to 32 percent, an increase of about 31 percent. In response to the needs of suburbia, several transit systems have expanded their service area, thus, becoming regional authorities. This has allowed many transit agencies to increase financial and political support for their service. As a result, the power to affect policy decisions and assert political control has expanded from urban areas to suburban or rural communities by the appointment of additional board members. With the authority to influence decisions on employment and service, the composition of these new boards may have influenced on the opportunities for minorities and women in transit.

During the 1995 African-American Mobility Symposium, Wade Lawson, South Jersey Transportation Authority, presented the following observations about this occurrence and the effect on the progress by minorities and women in public transit to decline.[38]

- Regional transit boards may approach issues regionally as opposed to the impact on an urban community; the ability of a local mayor or community to affect policy decisions are reduced.
- There is a lack of minority control in the appointive process and a reduction of appointed positions available to elected officials that are minorities.
- Board members that represent majority communities may be insensitive to the travel demands of minority communities.
- The selection of executive level positions by new board members may exclude qualified minority and women candidates, perpetuating the "Good Old Boy" system.

Figure 25
Trends in Suburban Population



Source: U.S. Census. 1980

PUBLIC POLICY EFFECTS ON AFRICAN-AMERICANS, OTHER MINORITIES, AND WOMEN EMPLOYMENT IN TRANSIT

The Negro in the Transit Urban Transit Industry discussed the critical role that government policy has had in determining gender and racial policies in the transit industry. Civil service rules, state laws, federal grant regulations, and federal laws have had important impacts on employment decisions in transit and other public sector industries. Since the Jeffress study, several public policy initiatives have affected transit. The 1970s were especially important considering impacts of Title VII of the Civil Rights Act of 1964 were beginning to be reported and documented. Policy initiatives that also have had influences on transit include the FTA Policy on Private Participation, Clean Air Act Amendments, the Americans with Disabilities Act, and the ISTEA of 1991. A review of these regulations is presented in this section and is offered as a premise for understanding the relationship between public policy and employment opportunities for minorities and women in transit. Legal decisions that have affected affirmative action efforts to enhance minorities in transit also are presented.

TITLE VII OF THE CIVIL RIGHTS ACT 1964

The 1964 Civil Rights Act and later amendments officially prohibited racial discrimination in employment. The legislation was enacted before Jeffress's study and has had a significant role in breaking down barriers to the participation and advancement of minorities and women in the American workforce, especially white collar occupations. Further promoting equal employment opportunities for American workers, Congress passed the Equal Employment Opportunity Act of 1972. This extended Title VII coverage to state, local, and federal governments and gave the Equal Employment Opportunity Commission (EEOC) additional enforcement powers. For a time, the EEOC was rather effective in removing employment discrimination practices. Under the Reagan and Bush administrations in the 1980s. and 1990s, the number of broad, institutionally focused investigations of discrimination conducted by the agency declined sharply. Research suggests that an impetus for this decline was the appointment of conservative justices to the Supreme Court. As a result, several restrictive decisions were handed down which made it more difficult for workers to file, and subsequently, win discrimination suits.[39] Two conclusions can be drawn from this review of the Civil Rights Act of 1964 and the 1972 amendment:

1. The law provided additional help to minorities in gaining and retaining employment opportunities. This is especially true for the transit industry; and
2. While progress was made by minorities and women in transit, the restrictions placed on filing discrimination claims by the Supreme Court during the Reagan and Bush administrations may have suppressed the possible entrance of additional minorities and women into transit management positions during the 1980s.
   Without the assurance of the provisions in the Rights Act, some minorities may have been discouraged from filing discrimination claims, especially a claim involving the selection of a candidate for a management position.

The analysis of data in Tables 2 and 3 showed a decline in the proportion of minorities and women in the transit industry between 1980 and 1990, which is a significant change in the progress by minorities during the previous decades. In 1980 and 1990, the EEOC reported 121,558 job discrimination charges or claims filed the agency. Only charges based on race, sex or nation of origin were included. By 1990 the number of job discrimination charges had declined to 54,171, a reduction of approximately 55 percent. The influence of the Supreme Court's conservative views on ruling job discrimination suits is

provided in *Hill v. Metropolitan Atlanta Rapid Transit Authority (MARTA).* African-American applicants for the job of bus operator at MARTA attempted to use statistical evidence in support of their race discrimination claim. The statistics showed that at a certain stage of the hiring process, African-American applicants were discriminated against. Although direct evidence supported this inference, the lower court was unwilling to hold that discrimination at one stage meant that discrimination existed at another stage.[40] The court further ruled that statistics alone are not proof of job discrimination, but MARTA was required to offer an explanation for the disparate handling of African-Americans applicants in the hiring process for bus operators.

Further illustrating the significance of the 1991 Act, in *Wards Cove Packing Co. v. Atonio* (109 S. Ct. 2115; 490 U.S. 642, 1989), a class of nonwhite workers sued two Alaskan salmon canneries under Title VII challenging hiring and promotion practices based on a disparate impact theory. Jobs at the cannery fell into two categories, cannery positions that were unskilled and non-cannery positions that were primarily skilled. The non-cannery jobs were predominantly filled by white workers and paid more than cannery jobs. Initially, the court hearing the case on appeal held that a showing of racial stratification by job category was sufficient to support a presumption of discrimination in hiring practices. Although the plaintiff had presented a statistical analysis of disparate impact, the case was returned to the district court to determine whether the employer had satisfied its burden of proving that any disparate impact was *justified by business necessity.* Before the district court could act, the case was acted on by the U.S. Supreme Court that subsequently reversed the case, making it harder for plaintiffs to prevail in a disparate impact case by shifting the burden of proof from the employer to the employees. The Supreme Court said that the plaintiffs must show more than just statistical proof of racial stratification of the workforce. Even if the plaintiff makes the proper statistical showing, *Wards Cove* requires a showing of causation by isolating and identifying the specific employment practices that are allegedly responsible for any observed disparities and showing that the specific practice did in fact cause the observed disparity.

The Civil Rights Act of 1991 is a direct congressional response to *Wards Cove* and other Supreme Court decisions that limit the scope of civil rights legislation in employment.[41] The provisions in the Civil Rights Act of 1991 explicitly overturned the Wards Cove decision and returned to a standard for establishing a defense based on business necessity.

The *Wards Cove* Supreme Court decision implies that racial segregation in employment is still prevalent. It further depicts the attempt by a conservative court to eliminate statistical proof of racial stratification of the workforce from discrimination claims. The interpretation of the Rights Act by the Supreme Court, previously, had discouraged protected class members from filing lawsuits that may have impeded the advancement of minorities in the workforce.

The Act also established the bipartisan Glass Ceiling Commission. Its mandate was to identify the glass ceiling barriers that have blocked the advancement of minorities and women as well as the successful practices and policies that have led to the advancement of minority men and all women into management and decision-making positions.[42] The Commission's report states the exclusion of members of groups, other than non-Hispanic males, in management positions as bad for business for various reasons, including changes in the demographics of the labor force and national consumer markets.

Data presented in this study show that minorities are approximately 28 percent of transit's workforce and almost half (48.7%) of transit ridership in 1990. Additionally, the survey of the perception of transit

employees showed that equally qualified minorities and women may be denied equal access to advancement into management because of gender, race, or ethnicity. Furthermore, as noted in the Glass Ceiling Report, it would appear that it is against the best interest of transit to exclude these workers from opportunities in management. Therefore, it is likely that the Civil Rights Act will continue to have positive impacts on minority employment and opportunities in management.

FTA POLICY ON PRIVATE PARTICIPATION

The FTA Policy on Private Participation (circa 1984) called for early involvement of private providers in the development of new transit services and for their maximum feasible participation in providing those services.[43] [44] Dr. Jeffress's research concluded that public ownership aided African-Americans in getting equal opportunities for employment. While this Jeffress's conclusions may be true, mandating that private sector operators must be consulted in planning new or restructured services may have created additional employment and promotional opportunities for minorities in transit. On the other hand, the manner in which of private contracts are awarded may serve to limit opportunities for minorities and women. Congressman Alcee L. Hastings stated that 95 percent of the contracts let by Broward County (Florida) in 1995 were awarded to white males. Seventy-five percent of the remaining five percent were let to white females.[45] Although the FTA privatization initiative in transit, particularly contracting out transit service which may have limited the abilities of most transit systems to expand, it provided the potential for job creation in another aspect — specialized markets. With changing transit markets, a federal budget crisis, and transit budget deficits, FTA believed that instead of competing for existing markets, more emphasis should be placed on specialized markets, including express commute, reverse commute, paratransit, regional service, and charter bus service. Effective use of the private sector could be made in these specialized markets.

As stated earlier, conventional transit markets have changed during the past three decades and new transit markets are emerging. As a result, an increasing number of trips are oriented from the central city to the suburbs and from suburb-to-suburb. Moreover, metropolitan travel requirements may have become too diverse and diffused to be served with a single uniform type of service. A significant portion of urban travel demand has become segmented into small market niches that The implications of continued contracting out of transit service as it relates to employment for minorities and women are significant. No matter how privatization is carried out, labor is affected. Contracting out previously directly-operated services may have two impacts on employment:

1. The demand for existing system labor may decline; or
2. Private sector labor demand in transit may increase.

While stagnating public transit labor growth, privatization could broaden the overall employment base of transit, thus providing opportunities for minorities and women in management positions and as private transit operators.

CLEAN AIR ACT AMENDMENTS

The Clean Air Act Amendments of 1970 were established to reinforce the government's position to address environmental concerns that increased during the later part of the 1960s. This act created the Environmental Protection Agency (EPA) and empowered it to set ambient air quality standards.[46] Under the act, the EPA was authorized to require states to formulate and implement plans to meet ambient air quality standards. This act emphasized changes in transportation systems for attaining air quality standards, including reductions in automobile use and increased transit use.

The EPA was given broader control after the Clean Air Act Amendments of 1977 were adopted. The amendments increased the flexibility and local responsibility in the administration of the Act and required state and local governments to draft plans for meeting air quality standards in areas of non-attainment.

The 1990 Clean Air Act recast transportation planning in areas experiencing air quality problems. Such planning is to be geared toward improving air quality as well as mobility. Transportation planning also is mandated to conform with air quality planning. State and local officials are required to find ways to reduce emissions from the vehicle fleet, to develop projects and programs that will alter driving patterns to reduce the number of single-occupant vehicles and to make alternatives such as transit an increasingly important part of the transportation network.

These initiatives by the federal government to protect the environment put emphasis on reducing air pollution from mobile sources. Urban areas classified as "non-attainment areas" need to implement transportation control measures (TCMs) to reduce emission levels. The 1990 legislation also encouraged transit programs by requiring urban areas with severe ozone pollution to adopt specific TCMs to offset growth in vehicle miles traveled (VMT). The Clean Air Act Amendments of 1970, 1977, and 1990 have presented the transit industry with opportunities to expand its mode share, especially among commuters, increasing transit ridership, and expanding transit's labor force. Public policy programs of this nature are beneficial to the environment and the transit industry. An added benefit may be additional transit jobs for minorities and women.

AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act of 1990 (ADA) prohibits discrimination based on disabilities in both the public and private sectors. In 1991, the U. S. Department of Transportation (USDOT) proposed regulations to carry out the ADA. A major feature of the new regulation was the requirement that any operator of a fixed route transit system provide paratransit or other special services to persons with disabilities. The paratransit service must be comparable to the level of service provided to individuals without disabilities who use the fixed route system.[47]

The ADA is a good example of the impact that public policy has had on transit because it is well documented. The USDOT estimated the average annual cost for providing paratransit service which ranges from $28.7 million for the ten largest urban areas, $10 million for areas more than one million in population to $750,00 for areas less than 250,000 in population.[48] Regarding the impact on employment in transit, Table 15 presents data compiled by APTA on operating employees for paratransit since 1990, the year that Congress passed the ADA. These data exclude administrative employees which are included in paratransit service. The data illustrate that between 1990 and 1994 employment related to paratransit service increased approximately 61 percent. This increase in jobs suggests additional management and professional opportunities for minorities and women who tend to be overrepresented among the users of paratransit services.

Table 15
Operating Employees for Paratransit between 1990 and 1994

Year	Employees
1990	22,740
1991	24,196
1992	25,863
1993	30,021
1994	36,802(P)

P=Preliminary **Source: APTA 1996 Transit Fact Book**

INTERMODAL TRANSPORTATION EFFICIENCY ACT OF 1991

Signed into law in December 1991, the Intermodal Transportation Efficiency Act (ISTEA) provides authorization for highways, highway safety, and transit through fiscal year 1997. Total funding of more than $155 billion was proposed over the six-year period. Additionally, the Act created a surface transportation program with flexible funding that provided new opportunities to address statewide and urban transportation problems.

Given the title a "jobs bill," ISTEA has been viewed as one of the quickest vehicles to stimulate economic activity in transit as well as outside the industry. An estimated four million jobs were expected to be created during period of authorization. The legislation presents several opportunities for inclusion of minorities and women to transit's workforce. An author of this landmark transportation bill, U.S. Representative Norman Mineta, stated "that full funding of ISTEA as a component of an economic package would offer stimulus benefits. Many ISTEA projects typically have relatively quick spend-out rates, such as highway resurfacing and rehabilitation projects, bus purchasing, transit rehabilitation, and transit operating assistance."[49]

It is perhaps investments in transit that offer the greatest opportunity for continued progress by minorities and women in this industry. Federal grants to transit for capital construction and equipment, managerial training, technical studies, and demonstration projects may help to expand general employment in transit. This study has already suggested that transit has a history of concentrating service in urbanized areas where ridership is highest among minorities and women and provides most of transit's labor force. Since federal funding of transit projects will be focused on urban areas, it can be expected that minorities and women will bid for a significant share of any new jobs that may be created in transit is reasonable.

The total number of employees in transit in 1991, the year that ISTEA was signed into law, was 276,145. The most recent figures on transit employment, as reported in the 1996 APTA Transit Fact Book, show that in 1994, 311,573 workers were in the transit industry, an increase of approximately 13 percent over the number of workers in 1991. This serves as another indication of the impact that public policy may have on employment in an industry, especially when it involves federal assistance programs.

POLICY DETERMINANTS AND THE FUTURE

Minorities and women are important components of the transit industry and represent a dominant portion of the industry's workforce. Since Jeffress's study, other factors have influenced the increasing employment rates of minorities and women in transit. Jeffress noted that most minorities, mainly African-Americans, made significant gains in the transit industry during the labor shortages of World War II. This phenomenon also was true for women. Other factors, such as, the image of transit, industry location, "white [male] flight" to other jobs, and government action also were impetuses for the progress by minorities and women. As noted earlier, public policy has continued to play a significant role in attracting minorities and women to transit as well as retention among these groups. Beyond the public policy initiatives during the past few decades, this study suggests that the changing demographics in the available workforce for transit, land-use policies, and the experience and level of skills of minorities and women are the factors that have affected their employment in transit.

Jeffress noted that African-Americans first became dominate in unskilled and semiskilled jobs and progressed into skilled positions. Although not as well reported, this scenario probably was similar for other minorities and women. As the survey of the perceptions of employees in transit suggests, many minorities

and women are entering this industry in skilled positions with professional experience and advanced credentials. As a result of an expanding workforce, this trend in transit may continue in the future.

Significant changes have occurred in the transit industry Jeffress's study; additional changes are anticipated after this research. The ongoing debate over affirmative action rules and technology advances that will affect transit also will influence employment in the industry. Following are brief comments on these and other issues in transit and what the future may bring.

AFFIRMATIVE ACTION

Affirmative action has its roots in the Civil Rights Act of 1964. It was promoted as a mechanism to ensure that minorities and women were recruited by private and public sector employers and given opportunities to be hired and promoted. There have been many additions to the policy. During the Nixon administration, this policy incorporated a system of goals and timetables that provided guidelines for agencies and companies to follow. As discussed, affirmative action lost some gains during the 1980s. The Civil Rights Act of 1991 has helped to redress this matter and maintain affirmative action as a tool to level the playing field for minorities and women in the workplace.

In 1995, affirmative action programs suffered what may be another setback in the *Adarand Contractors v. Peña* ruling. Adarand Constructors, Inc., submitted the low bid to the prime contractor on a USDOT contact. The contract contained a subcontractor compensation clause, which gave the prime contractor a financial incentive to hire subcontractors certified as small businesses controlled by socially and economically disadvantaged individuals. Adarand did not meet this certification but filed suit, claiming that the race-based presumptions used in the subcontractor compensation clauses violates the equal protection component of the Fifth Amendment's Due Process Clause. The court held that federal laws and programs that use race-based preferences in minority business set-aside programs must meet a "strict scrutiny" standard to be found constitutional under the equal protection clause of the Fifth Amendment. In addition, this standard must meet a compelling government interest.

Partly because of conservative successes, like the Adarand ruling, Republican leaders are calling for a repeal of all gender and race-based federal affirmative action programs. In their view, affirmative action is nothing more than a quota or reverse discrimination system. As a first response to this, President Clinton declared his support for affirmative action programs and has initiated steps to reforming policies that create quotas, preferences, reverse discrimination, or that have achieved its purposes. Subsequently, the President has decided to suspend for at least three years federal programs that set aside contracts for minorities or women; but more specifically, that have race as a basis. Undoubtedly, any subsequent reviews of affirmative action policies will have a tremendous impact on the recruitment, hiring, and promotion of minorities and women in transit.

INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent Transportation Systems (ITS) generally refers to projects that apply advance technologies to improve the efficiency and capacity of transportation systems. The transit component of ITS is called the Advanced Public Transportation Systems (APTS) which includes technologies as smart cards and buses, advanced vehicle location systems, and interactive video. Many similar technologies have already been applied by trucking firms and delivery services, i.e., Federal Express and UPS. Passage of ISTEA, with its emphasis on ITS, focused national attention on this emerging field. ISTEA brought more than exposure to ITS, authorizing $600 million in appropriations over a six-year period.

Most of the APTS products that will find their way into full deployment will target specific groups of people. For example, smart cards cannot be effective without the support of the urban minority community. As shown in this study, minorities and women have made significant progress in transit. Changes in transit's infrastructure threaten the industry's ability to retain the workforce in light of rapidly advancing technology. The problem relates to acquiring the skills necessary to adopt the latest in technology and keep pace with subsequent modifications.[50] Just as in the construction days of the interstate system when inner city communities were physically divided by freeways, these technologies can become a major barrier in the industry workforce.[51] Studies show that most of the ITS workforce will emanate from the classical engineering and applied science areas, where minorities and women are traditionally underrepresented.[52] This suggests that management opportunities for these groups will be reduced in the future. Therefore, being prepared for the educational challenges and economic opportunities that APTS brings to the industry is important for minorities and women.

FEDERAL ASSISTANCE

As part of an overall effort to balance the federal budget, assistance to mass transit will be reduced during the balance of this decade and, perhaps, on into the future. Operating assistance will continue to be a target because the savings to the federal government are big and are typically spent quickly as opposed to capital funds that may be appropriated but are not spent for years.

In FY 1996, the federal transit appropriation was $4.6 billion, $1.6 billion for capital programs and $710 million for operating programs. Congress is proposing a reduction of between 11 and 13 percent in appropriations for transit capital and operating programs. The most significant aspect of this proposal is a 44-percent reduction in operating grants. As stated previously, this funding strategy will compel transit operators to cut service and raise fares that may adversely affect ridership. The proposed reduction in operating assistance also will have an impact on employment. For example, with state and local matches, the current reductions in transit operating levels from FY 1995 are about $600 million; this amount supports about 40,000 jobs each year.[53] Again, as this research has suggested, transit agencies employ large numbers of minorities and women. The threat of further reductions in operating assistance could lead to more layoffs at transit systems. A survey completed by APTA showed that due to recent transit budget cuts, several transit agencies have laid off workers. Additionally, the cuts in federal assistance to transit will ultimately curtail plans to expand services in high growth areas that may also limit growth in transit employment.

However, similar to the effect of ISTEA had on employment in the industry, it is anticipated that ISTEA II will affect employment opportunities for minorities and women. The challenge for the transit industry in reauthorization will be to prove that past appropriations for capital and operating projects have reduced automobile use, improved air quality, mobility for the transit dependent, and affected Americans' daily lives in a positive way. As stated earlier, capital funds that may be appropriated but are not spent for years, leaving transit agencies with large unspent funding balances. Without having produced any projects at past funding levels, justifying increased levels for capital assistance that may support continued or additional employment may be difficult.

INSTITUTIONAL BARRIERS

Besides developing affirmative action programs that will provide a true level playing field for all workers, other equal opportunity initiatives, which may be metamorphosed into public policy, will need to be established that will remove the institutional barriers to minorities' and women's progress. In spite of the legislative mandates to eradicate job discrimination, minorities and women still encounter interrelated institutional barriers that operate at the individual, group, and organizational level to limit their advancement.

At the individual level, African-Americans are faced with subtle racism and prejudice and are challenged with negative stereotypes about their suitability and competence for management responsibility. For women, the factors impeding career advancement have focused on their behavior and attitudes toward work and career commitments and human capital characteristics. This argument proposes that the competition between work and home responsibilities is justification for the lack of women in management positions. Additionally, lower educational attainment and choice of programs, such as humanities, are translated into a position with less responsibility. Factors identified as barriers to Asians and Hispanics include poor English language skills and unfamiliarity with the organizational culture. The literature is incomplete with information on the impediments to career advancements for Native Americans. On the group level, conflicts between cultures and exclusion from the formal and informal networks, create an environment that limits minorities' and women's progress. Additional constraints within the organizations that may significantly impede career developments include: less access to mentors; bias in rating of performance and promotion criteria; and shunting into positions that do not lead to senior leadership roles in organizations.

Increasingly, public and private organizations are recognizing the business case for overcoming institutional barriers, or breaking the "glass ceiling," that faces minorities and women. This is an appropriate attitude for the transit industry to have since their consumer base—transit passengers—is largely represented by these groups. While affirmative action and equal employment opportunity have been relatively effective in providing access to employment for minorities and women, policies and programs to enhance the retention and development and advancement of minorities and women in the transit industry must be a result of individual transit agency initiatives.

AGENCY RESTRUCTURING: "DOWNSIZING"

During the 1996 African-American Mobility Symposium, the keynote speaker, Congressman Alcee Hastings of Florida offered the following remark about structural change in organizations in America. "In the era of downsizing, right-sizing, outsourcing, reengineering and reinventing, what we want to know here is how minorities, in order to avoid retrogression to the point of oblivion and ignominious defeat must seek better formulae in a mathematical nonlinear regression-based allocation model to deal with intermodal bias and neglect. In other words, in order to keep from getting left out, we need more money."[54]

The effects recent recessions and the efforts of Congress and the Administration to balance the federal budget through reduced spending, especially for transit, restructuring of transit agencies provides yet another opportunity for increased productivity. Complementing this scenario is the concept of giving more authority and responsibility for financial support for transit to local governments, who already are strapped in many cases to pay for essential public safety and human services. The idea of restructuring or downsizing transit agencies becomes even more appealing.

Interestingly, some factors that are leading to corporate restructuring can be found in the transit industry. These include an increased need for flexibility to allow for quick responses to changing markets and new technology and changes in the political and economic climates. Information earlier discusses the impacts that transit's markets, such as suburban riders, reverse commuting, and technology may have on employment. Congress and state legislatures are conservative in their views on transit funding. The economic climate may affect the level of ridership if users choose between the affordability of cars and using transit.

Research findings on the effect of restructuring or "downsizing" on minorities and women in the private sector are mixed. The application of this business practice to the transit industry may render similar results. Some findings in a study entitled, *The Impact of Corporate Restructuring and Downsizing on the Managerial Careers of Minorities and Women: Lessons Learned from Nine Corporations*,[55] reveal the following:

- In more than half of the companies in the survey, white women and to somewhat lesser degrees minorities have increased their representation both in absolute numbers and in proportion to white men between 1990 and 1994. This has been the case, especially in companies that have increased their managerial force while restructuring. Among companies that downsized, examples of relatively more minorities and women were let go and examples more white men were let go (both in terms of absolute numbers and proportionately) exist. This suggests that it is not necessarily the case that whenever a company downsizes, proportionately more minority and female managers will lose their jobs.
- Companies in the survey reported losing ground in their efforts to maintain a diverse managerial force as the most likely scenario active steps were taken to maintain or increase the representation of minority and female managers.
- In absolute numbers, white male managers have absorbed the bulk of the layoffs, early retirements, and other forms of job severance during downsizing, but not necessarily in proportion to their representation in all of management. In large part, this is because there are many more white men in management than any other group. Companies simply do not have very many minority or female managers that would make a sizable impact on the magnitude of their managerial force.

This may suggest that if transit agencies considered restructuring or downsizing, white women would increase their share and number of management position. The absolute number of white men would decline, but not necessarily the proportion. However, minorities and women also may be at risk of losing management positions if the organization is not active in maintaining a diverse workforce.
While the transit industry is not becoming dominated by African-Americans, this research suggests that minorities and women, in general, are beginning to have a larger role in the transit industry at various levels. Data presented here suggest that, except Africa-Americans, minorities and women have maintained a proportion of transit employment that is less than represented in the workforce. Unfortunately, legislative mandates that were successful in advancing the role of minorities and women in transit during the past decades, may become less successful in the future. Witness the attack by on affirmative action programs. Political and industry leaders should continue their efforts to remedy the effects of past and current discrimination. These efforts could be in the form new legislation or modifications of existing affirmative action policies and programs.

For minorities, and women to maintain the progress made in transit, they will need to become active in developing structures to achieve this goal. For example, taking an active role in networking with minorities and women in the industry, educational preparedness, and reengineering of skills provide opportunities for career advancement for minorities and women. These opportunities exist for African-Americans through the many transportation programs at Historically Black Colleges and Universities. Likewise, the industry can provide support to these initiatives. The industry and individual agencies must strive to remove barriers to advancement for minorities and women and identify opportunities to include these groups in senior level management positions. Suggested of initiatives include:

- establishing mentoring programs;
- supporting diversity at the highest management levels;
- providing diversity training;
- producing better monitoring and reporting of diversity goals and programs, such as EEO reports, affirmative action plans, and so on; and
- establishing career paths and promotion guidelines.

Attempts to eradicate disparate treatment based on race or gender should be an industry-wide objective for transit. If not, the industry stands to lose ground on its efforts to maintain a diverse managerial and labor force.

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NOTES

[1]Philip W. Jeffress, *The Negro in the Urban Transit Industry*, (Industrial Research Unit, Department of Industry, Wharton School of Finance and Commerce, University of Pennsylvania, 1970), iii.
[2]Ibid. 101.
[3]American Public Transit Association, *Transit Fact Book 1992*, Table 96 Trend of Transit Employment, Compensation, and Labor Costs (APTA), 96.
[4]In the interest of cultural competence, African-American is used instead of "Negro" to describe people of African descent or people referred to as "black." "Other minorities" is used to describe people of Hispanic, Asian, Pacific Islander, Native American and Alaskan descent. Additionally, throughout this study the term "minority" is used to describe people other than white males and females.
[5]Jeffress, 96.
[6]Jeffress, 97.
[7]Ibid.
[8]Jeffress, 100.
[9]Reverse commuting and Black employment have been associated with public transit for more than 25 years. Note this reference from a 1967 *Business Week* article. "For Washington's [D.C.] big (63%) Negro population, rapid transit offers the prospect of better access to jobs in the suburbs, where warehouses and plants have been fleeing in search of cheaper land." "Getting Washington to work on time," *Business Week*, September 30, 1967, 60.
[10]New Jersey Transit operates transit service for the entire state of New Jersey. New York City includes New York City Metropolitan Transit Authority and the Long Island Railroad.
[11]Systems are in Atlanta, Baltimore, Chicago, Houston, Miami, Minneapolis, New Jersey, Philadelphia, San Francisco, and Washington. These systems represent approximately 21 percent of transit employment in 1984.
[12]Administrative Support includes those positions classified by some transit systems as Office Clerical.
[13]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.
[14]This information includes same systems as in Table 5 and represents 20 percent of transit employment in 1985.
[15]Administrative Support includes those positions classified by some transit systems as Office Clerical.
[16]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.
[17]Systems are those in Baltimore, Chicago, Houston, Miami, New Jersey, Philadelphia, Washington, San Francisco, and Long Island Railroad and New York City Transit. These systems represent approximately 46 percent of transit employment in 1989.
[18]Administrative Support includes those positions classified by some transit systems as Office Clerical.
[19]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.
[20]Systems are those in Atlanta, Baltimore, Chicago, Miami, Minneapolis, Philadelphia, Houston, San Francisco, Washington, and Long Island Railroad, and New York City Transit. These systems represent approximately 43 percent of transit employment in 1990.
[21]Administrative Support includes those positions classified by some transit systems as Office Clerical.
[22]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational

categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.

[23]Systems are those in Atlanta, Baltimore, Chicago, Houston, Miami, Minneapolis, New Jersey, Philadelphia, San Francisco, Washington, New York City Transit, and Long Island Railroad. These systems represent approximately 47 percent of transit employment in 1991.

[24]Administrative Support includes those positions classified by some transit systems as Office Clerical.

[25]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.

[26]These systems are the same as those shown in Table 6 and represent approximately 43 percent of transit employment in 1993.

[27]Administrative Support includes those positions classified by some transit systems as Office Clerical.

[28]Metropolitan Council Transit Operations, Minneapolis, MN, reported two additional occupational categories, semi-skilled operative and unskilled laborers. Semi-skilled operatives were combined with the Skilled Craft category. Unskilled Laborers were combined with Service Workers.

[29]Employees classified as officials/administrators and professionals provide the most accurate number of transit "management positions." The number of management positions under the remaining job classifications are unavailable and difficult to determine. For example, technicians may include professional engineers or data collectors. This is also the case for supervisors and managers in these classifications.

[30]Since the NFBPA members represent all areas of public service, only those members identified as transit officials were included in the selection process.

[31]Jeffress, 96.

[32]According to the Current Population Survey (CPS) definition, the workforce is comprises all noninstitutional civilians 16 years and over that: work for pay or profit or 15 hours or more during one week; and workers that are laid off for noneconomic reasons (illness, weather conditions, vacation, labor-management dispute, etc.).

[33]Bureau of Labor Statistics, http://stats.bls.gov/news.release/ecopro.toc.htm, "BLS Releases New 1994-2005 Employment Projections," December 1, 1995.

[34]Manuel Padron, "Impacts of Changing Demographics on Transit Planning," presentation circa 1992, 1.

[35]Alan E. Pisarski, *Travel Demands in the 1990s*, report prepared for Office of Highway Information Management, HPM-40, page 10.

[36]David F. Schulz, "Can Transit Be Saved?," Chicago Tribune, July 1992.

[37]Padron, 1.

[38]Wade Lawson, "The Continuing Evolution of Public Transportation Policy," in *Exploring New Frontiers: Proceedings of Symposium II on African-American Mobility Issues*, January 1996.

[39]Data on employment discrimination claims with the EEOC for the transit industry was requested, but the information was not provided.

[40]Lex K. Larson, "Employment Discrimination, Eleventh Circuit: *Hill v. MARTA*," Duke University, March 1995, 841 F.2d.

[41]Reginald V. Speegle, "The Substantive Impact of Legislation on Employment Discrimination and the Civil Rights Act of 1991," *National Black Law Journal* V.13, Spring, 1993, 198.

[42]A Fact-Finding Report of the Federal Glass Ceiling Commission, *Good For Business: Making Full Use of The Nation's Human Capital*, (U.S. Department of Labor 1992) p. 3.

[43]Edward Weiner, *Urban Transportation Planning in the United States: An Historical Overview*, (Praeger, 1987), 92.

[44]Under the Intermodal Surface Transportation Efficiency Act of 1991, the UMTA became the Federal Transit Administration.

[45]Alcee Hastings, "Keynote Address," presented at *Beyond the Horizon: Symposium III on African-American Mobility Issues*, Tampa, FL, 1996.
[46]Weiner, 40.
[47]Office of the Secretary of Transportation, "Urban Transportation Planning in the United States: An Historical Overview," revised edition, prepared by Edward Weiner, November 1992, 239.
[48]Ibid, 240.
[49]*Passenger Transport*, "Mineta Urges Full Funding of ISTEA," November 30, 1992, 2.
[50]Dr. Frank Enty, "Looking Ahead," The Cable Journal, Spring 1994, 22.
[51]Ibid.
[52]Anthony A. Saka, "Assessment of ITS Impact in the Urban Minority Community." Proceedings from the 1996 Annual ITS America Meeting. Page 1161.
[53]Federal Transit Administration, "Impact of Transit Funding Cuts," http://www.fta.dot.gov/fta/library/money/fy96cut/BFFLOTP.HTM.
[54]Alcee Hastings, "Keynote Address," presented at *Beyond the Horizon: Symposium III on African-American Mobility Issues*, Tampa, Fl., 1996.
[55]Hamlin & Associates, "The Impact of Corporate Restructuring and Downsizing on the Managerial Careers of Minorities and Women: Lessons Learned from Nine Corporations," Executive Summary, September 1994, 3.
[56]P=Professional and A=Administration

Transport Education and Training: What is Valued? What is Needed?

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TRANSPORT EDUCATION AND TRAINING: WHAT IS VALUED? WHAT IS NEEDED?

ABSTRACT

This paper considers the education and training decisions currently being made in the transport industry, especially in Urban Public Transit. It uses Australian data but the issues raised are generally applicable especially in the developed nations. Whilst an increase in formal rather than on the job training is welcomed the method of deciding what training is needed is questioned.

In particular attracting and serving customers are important in passenger transport and are frequently identified as vital to the future of Public Transit. If improvements in these area are sought education and training priorities may need adjustment. This is especially relevant for women who are often found in customer service roles in the industry.

INTRODUCTION

There is now fairly general lip service given to the view that "Education and Training" are "a good thing for" or even "essential for" the urban transit (UT) industry but for this to be translated into meaningful action we need to ask what "education and training" and "good for whom".

The time honored "sitting next to Nellie" where the new employee learned by watching an experienced worker, a form of training by osmosis, is gradually being replaced with formal training. In 1993 39.3% of employees in the Transport and Storage industry in Australia (ABS,1993) took a formal course. Much of this training took place due to the requirements of the Australian Training Guarantee Act, which required a specified amount (3%) of company turnover be spent in training, or it would be levied as a tax. Thus there was considerable incentive to spend the money on training rather than "give it to the taxation office". This trend towards should be welcomed for

- uniformity of outcome: competencies assured,
- proof of outcome: competencies accredited, and,
- broadening of outcome from training to education: competencies for the competent.

This paper sets out to examine what types of training and education are currently *valued* in the Urban Transit industry based on the assumption that organizations encourage and seek what they believe to be valuable. Ideally a complete evaluation along these lines would use micro level data about workplaces noting numbers of employees by job classification, educational qualifications held and required, in house and external training opportunities. Instead employment and training data available from the Australian Bureau of Statistics is used. Although extensive, this data is at a macro level giving information about the Australian work force in general or at an industry level the broad category employees in the Transport and Storage industries. This has been supplemented by anecdotal evidence. Thus the analysis here of what is valued is provided to encourage debate rather than provide definitive answers.

The discussion of what is *needed* considers the means of promoting urban public transit and the training requirements to assist this. Plus, in the context of this conference, we might reasonably ask how education and training might empower women in the transport industry and help their progress. The final part of the paper looks particularly at management needs for the industry, and for the nation, considering women's potential role.

This is a timely review, as the industrial relations system in Australia is in the process of extensive changes, reducing the role of unions and allowing direct employee contracts in which the terms are negotiated directly with the employer. In this situation of substantial imbalance of negotiating power there is already evidence that key conditions previously won for hours of work, family leave access are likely to be wound back. These pressures are likely to significantly effect women in general and those in the transport industries where shift work is needed in particular. It is thus important that the value of appropriate training to the organizations as well as the individual is noted so that employers will continue to support both training and working hours which allow suitable times for training.

EDUCATION AND TRAINING IN THE UT INDUSTRY

EDUCATION OR TRAINING?

A wide range of programs cater for a wide variety of skills. The program duration may range from a few hours on the job to years at a University. The ABS in a "Survey of Training and Education Experience" (ABS, 1993) categorizes these activities broadly into Management and Professional Training, Technical and Para professional Training, Trade or Crafts, Clerical or Office Skills, Computing Skills, Health and Safety, plus, categorized together, as "Other", a range of special purpose training such as induction courses and English language courses. This last group includes transport and machinery operation.

It may seem rather pedantic to distinguish education and training and indeed even politically incorrect as a product of bygone days when Universities "educated" and Technical Colleges "trained". However if one accepts that technical colleges can educate and Universities can train definitions distinguishing the two sorts of activity can be of value.

Operationally we may see training as instruction in how to perform set tasks which may range from carrying out brain surgery to cleaning the bathroom. Job Training enables the trainee to perform the job either at all or better than before. However in many situations the trainer finds the trainee will be more motivated to achieve and thus more able to be trained if they have some idea of "why" they are performing tasks and indeed seeks to "draw" out of the student a response to the matter, to educate—from the Latin root "to draw out".

Most instruction is a mix of education and training along a continuum moving from concrete instruction in "how" to total exploration of "why". Instruction programs designed for the transport industry will always have an "applied" aspect since there is little call for theoretical study of transport without some practical application.

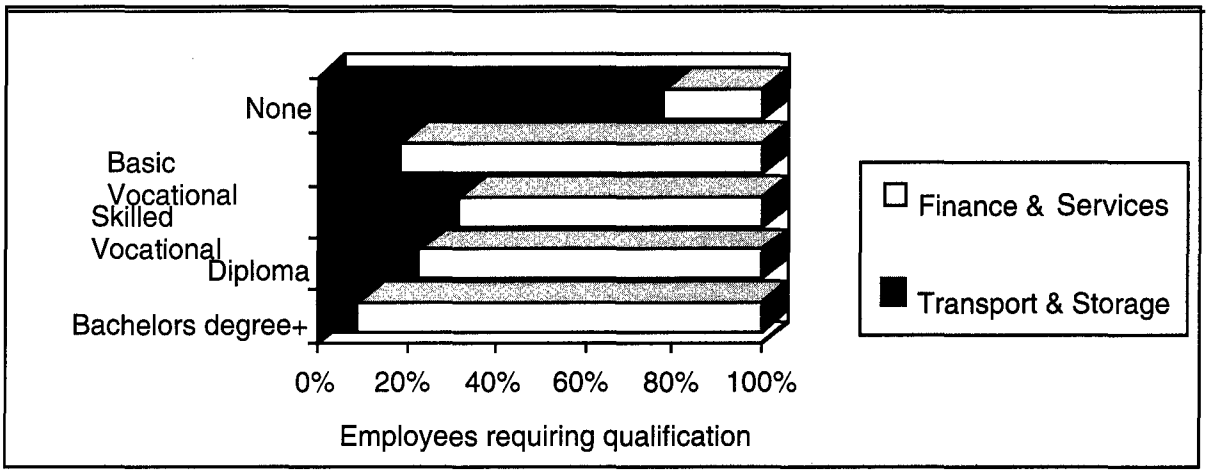
From an examination of the usual features of programs at the two ends of the instruction continuum (Table 1) it can be seen that the education program may open a different range of opportunities. These include gaining from knowledge of how people work elsewhere, making professional contacts with people outside the organization and an enhanced career path externally as well as internally.

Table 1
Common Differences Between Education & Training

Feature	Education program	Training Programs
Time frame	months/years	hours/days/weeks
Usual Site	Away from workplace	At the work site
Usual time	Evenings or instead of work	During work hours
Who usually pays	the individual the organizations	
Who attends	people from different organizations	people from within the organization
Usual qualification	externally recognized qualification	in house certification

Education programs have traditionally been more highly valued. But at the same time financial and time commitments may make education programs less accessible Moreover the lack of either a requirement for or an appreciation of formal qualification in the area they work may discourage people from seeking qualifications.

Figure 1
Percent Industry Employees Needing a Qualification for their Job



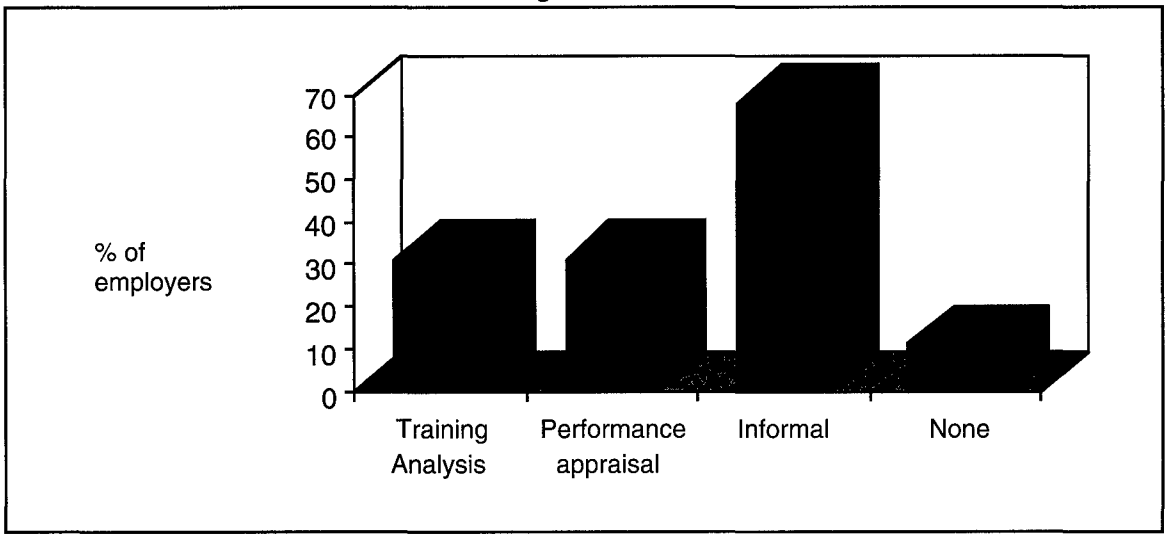
Source: ABS 1993 Training & Education Experience

Figure 1 compares qualifications required for people in the Transport and Storage industries with those in the Finance and Property Service industries. Only 8% in the former industry need a degree and an massive 64% need no formal qualification.

TRAINING PROVIDED IN PRACTICE

According to the ABS Survey of Employer Training Practices (ABS, 1994) in the 12 months to February 1994 80% of employers and 76.2% of those in the, rather broad, category Transport and Storage Industries had increased their training provision.

Figure 2
The Basis of Training Decisions in Australian Firms



Source: ABS 1994 Employer Training Practices

When questioned as to how these training needs were determined 32% of employers claimed they undertake proactive training analysis, 32% said they react to performance appraisals but 64% use informal methods to determine training needs, which, at least in some cases, may be another description for the more honest "none" at all cited by 11% (See Figure 2).

The percentages add to more than 100% since firms may use more than one method. However since "none" is a distinct category, 75% of firms determine at least some of their training needs in an ad hoc manner. Training decisions based on such methods will have a number of limitations:

Short Term Rather Than Long Term

Training decisions are more likely to be in response to short terms problems rather than in preparation for long term opportunities. Immediate skills update is provided through in-house training. The break down of training courses shown in Figure 3 shows only 4.4% of employees in the Transport and Storage industry attended an external course supported by their employers in 1993

Yet as noted above the external courses are more likely to offer general education at Technical Colleges or University compared to specific skills training in-house: 45% of external courses were part of larger programs compared to only 27% of those in-house.

Figure 3
Training Undertaken by Employees in the Transport & Storage Industry

Source: ABS 1993 Training & Education Experience

Fear of the employees leaving is often given as an excuse for not supporting external courses but as Table 2 shows the number of employees who see their course as providing an opportunity of moving organizations is not very much higher for external courses. The table also shows the faith firms have in-house courses as employees believe they are more valuable for promotion.

Table 2
Employees View of Course Providing Opportunities for Promotion or Moving

Stated advantage	**In-house**	**External**
Help move out of organization	40%	46%
Help obtain promotion	17%	12%

Source: ABS 1993 Training & Education Experience

Response to Requests - Hence Known Not Unknown

Ad hoc planning will respond to staff requests for training rather than suggest training. This will have two effects:

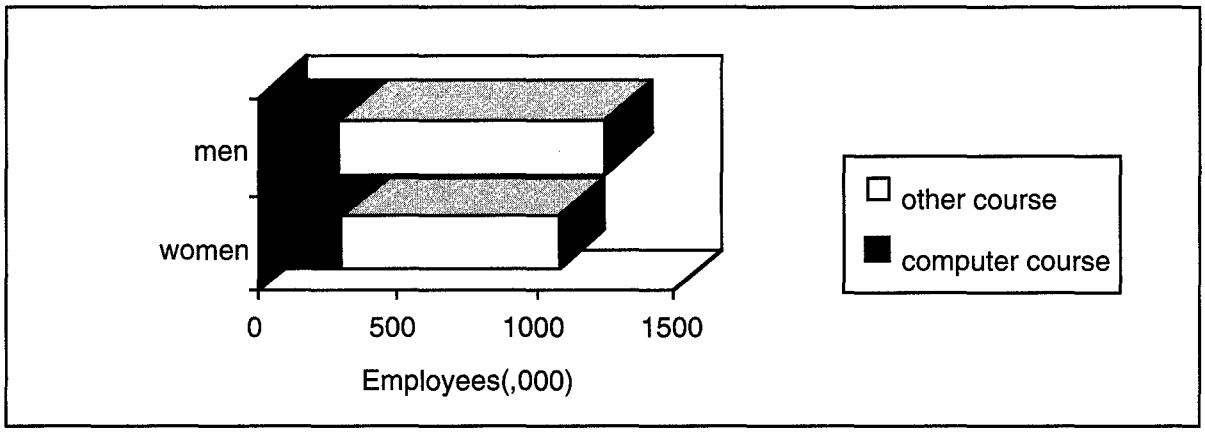
There will be a tendency to follow historical precedent and to emphasize upgrading of current skills, rather than learning new skills. People don't ask for what they are unaware exists. 75.9% of employees in transport and storage said their training needs were adequately met, but then 12.5% claimed they had no training needs.

Employees may be reluctant to suggest training needs because of general reticence especially if the culture of the origination is not supportive or because they are not sure they will be able to attend if training outside work hours is suggested. This is particular true for part-time employees especially women and the matter is explored further in section 4 of the paper.

Technical Courses Favored

Technical rather than people skills will be flavored, at least in part due to equipment suppliers offers of courses. In fact when asked why training had been increased "in response to technological change" was the most cited reason. Attending a computer course is a sufficiently common to have a category of its own in the ABS survey of Training and Educational Experience (ABS, 1993). Looking at people who are employees rather than self employed Figure 4 shows the number of men and women who took a computing courses compared to those who took other courses but not a computing course.

Figure 4
Employees taking Computer Courses, Compared with Other Courses



Source: ABS 1993 Training & Education Experience

Some 0.6 million men and women (more than 10% of the Australian workforce) learned how to talk to a computer. Since only 2.3 million took courses at all it is extremely unlikely that anywhere near that number learned how to talk to people.

WHAT SKILLS ARE NEEDED

What does the Business Produce?

In Urban Public Transit as in many other industries, there has been a culture which believes that the product is the important thing. The people, the staff who produce it or the customers who buy it are incidental. This results in conflict between those in charge of the production side: the engineers who oversee operation and the accountants who measure the cost of production and those involved in both staff relations and marketing the product.

The marketing department is often seen as unnecessary addition to the real business of producing goods or services. This attitude becomes a self fulfilling prophecy as the designated marketers fail to sell the "product". Conversely the staff relations, or human resources department is seen as a necessary evil to shield management from the staff and keep "the union wolf from the door".

All members of a firm should remember that the product has no value until it is sold. In public transit the firms produce vehicle kilometers then they sell a proportion of those as passenger kilometers. It must be the major aim of the firm to sell the product rather than to produce it. This aim is even more important in service industries such as urban transit because there is "no second chance of sale". If the furniture store sells only half their supply of garden seats they can sell the rest later at reduced price, but if only half the seats on the 10 am bus to the city are filled those extra seats can't be sold later. Service industries therefore need to stress the importance of the marketing task and the people who carry it out.

Service design is a marketing function since fitting the service to the customer is much better business than trying to entice the customer to used an inappropriate service. Getting the product right in the urban transit context means supplying the type of service which the market wants at a price it is willing to pay: a reliable and friendly service of appropriate quality. This requires market research.

Transmitting awareness of the service to the customer or potential customer is equally important. This encompasses advertising but direct response is equally important. Telephone response, timetable design, on-line computer systems for retrieval of transport information include technical issues but must be customer and staff friendly.

Indeed since transit is dependent on repeat business all customer service must be efficient and genuinely friendly. Satisfied current passengers can have a powerful on selling effect to others and they also form an important potential market for extra travel since these people are clearly willing to travel on the service. In urban transit the bulk of the staff are "on the front line" of service delivery.

EDUCATION TO SERVE THESE NEEDS

The previous section would suggest that marketing, finding and serving the customer and human resource management, managing the work force to this end, should be a top priority for any Urban Transit organization. However the educational and training qualifications for such roles do not reflect this order.

The education for many of the operational and financial roles in public transport provision is formally regulated. Accountants need appropriate accountancy qualifications, and similar requirements govern most technical aspects of the control of the production side of the business, through the computer officers with degrees in computing to the mechanics with trade qualifications. The driving the vehicle itself is governed by licensing requirements and compulsory in-house training.

In contrast the marketing and human resources roles at all levels of firms have had a less formally defined set of educational expectations and have been much more dependent on in-house training. Whereas it would be very unusual to find a financial controller without formal accountancy qualifications, and indeed lack of such qualifications might be seen a impinging on the financial probity of the business, it is less unusual to find a marketing manager without a degree in marketing. Even Human Resources managers do not necessarily hold qualifications in appropriate disciplines.

These people may be competent but they are disadvantaged as their competence must be judged by knowledge of the person themselves and they may not be esteemed as highly as other people in the organization with formal qualifications. Moreover, especially if their career track has been within the one the one organization their knowledge of alternatives to the systems in place may be limited. In the worst case scenario the ignorant may be "blissfully" unaware of their ignorance.

Experience in Britain has shown that on average good market research should guarantee resource saving of about 15% (Kilsby, 1995). Conversely surveys designed by well meaning amateurs can not only waste the time and money spent on them but cost potentially much more in lost revenue and lost opportunities.

At the customer interface training for those who provide service to travellers is not nearly so regulated as training for the mechanics who service the vehicles. It is only relatively recently that bus driver authority training encompassing service to passengers has become widespread in Australia. To all technical aspects of the job from selling tickets to driving a bus is now added customer relations encompassing: standards of politeness, personal hygiene, tidiness and appropriate dress, local area knowledge, such as where to find hospitals, rail stations and shops. As yet these types of "authority to serve customers" for drivers are not widely matched by a "counter clerk authority" or a "telephonist authority".

A different type of training is needed in dealing with advertising and incentive marketing and yet another set of skills might be required to train the trainer so that the very large number of people who make up the public face of public transport learn how to market their product. Decisions about how they should be educated and trained should be the province of a Human Resource management team, who are themselves well equipped to plan training needs. Such a plan can provide the forward thinking seldom encompassed by ad hoc training decisions.

Training Needs Analysis and Human Resource Development are being adopted in one industry after another as the critical nature of human resources becomes progressively more obvious . These trends are complemented by parallel responses to change, where managing diversity and developing and implementing a human resource management strategy become competitive tools.

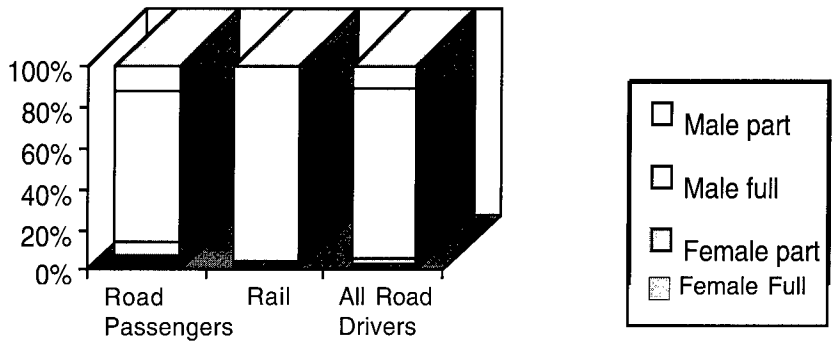
In Australia these trends have been sustained until recently by a supportive legal framework, but since a recent change in political direction at both state and national levels, this supportive structure is being substantially dismantled, and many of the developments in workplace conditions and training support have now been transferred to the judgement of employers. Statistical data for assessing the effects of such changes, if any, will not be available until 1997, so it will not be possible in the present paper to assess the degree to which training and development in the transport industries have been dependent on legal structures and requirements.

WHAT DOES THIS MEAN FOR WOMEN ?

WHERE ARE WOMEN IN THE ORGANIZATION

In Australia, the transport industry as a whole is a male oriented industry, although specialized functions within it may have significant female participation. A more appropriate way of characterizing the gender balance is through the actual jobs undertaken (Deery & Plowman, 1991). Clerical, service and professional jobs are the categories most dominated by women, while operative and managerial jobs are most dominated by men. As Australian enterprises in transport thin out their overhead, this male predominance is likely to be maintained or increased.

Figure 5
Participation in the Road & Rail Transport Industry



Source: ABS 1994 Women in Australia

In 1994 women made up 14 % of the employed persons in the Road Passenger Transport Industry and 6% in the Rail Industry (ABS, 1994). However of those in Road passenger transport half worked part-time and one sixth of the rail workers were part-time. Figure 5 contrasts male and female participation for the two industries and the specific job category "All road and rail drivers". So not only are there few women but their pattern of working hours is quite different to that of their male colleagues. For example, as can be seen from the figure, the majority of male vehicle drivers are have full time positions whereas the majority of women drivers are part-time.

Experience in larger public transit organizations tells us that women are concentrated in administrative roles and where present in management predominantly in human resource management or marketing roles. If they are at the customer interface it is in service rather than operation. The women in finance and operation control roles or involved in driving or maintaining the vehicles are a minority. There are two sets of implications:

Women desiring a position in the operational and financial side of the business will be excluded unless they are able to obtain qualifications. Lack of time, family responsibilities may make commitment to longer term training difficult but equally likely such training will not be available to part-time workers. As noted above a large proportion of training is on the job during working hours. There is often a reluctance allow a part time worker to spend there limited hours on the job in training. Firms are also reluctant to spend money on training part-time workers but these are the very people whose limited income precludes them paying education expenses. A common, and seemingly reasonable, strategy widely used in government organizations is to pay for outside courses upon proof of success but women may not be able to pay the "up front" fee.

Conversely women advancing in the marketing, human resource management areas and customer service areas may not require formal qualifications. They may even find acquisition of formal qualifications resented by senior women and men in the area either because they have no qualifications and thus do not

value them and they see time spent in study detracting from attention to work. But lack of formal qualifications may impact on overall advancement within the firm.

Women may also be more reluctant to ask for training especially if that type of training is not traditionally offered but it is a mistake to believe that women have either less interest in career advancement in general or in training to aid that advancement. A study of workers priorities in the context of union membership (Benson & Griffin, 1992) found that women and men share the same top workplace priorities although women also tend to place higher values on part-time work, health and safety, social issues and child care.

Whilst women make up a small percentage of the workforce in transport, programs tailored specifically for them are rare. This is unfortunate for whilst gender distinctions may not at first seem relevant to much operational training in practice different approaches to learning, or merely the fear of "standing out" as the one woman among a group of trainees can sometimes discourage women.

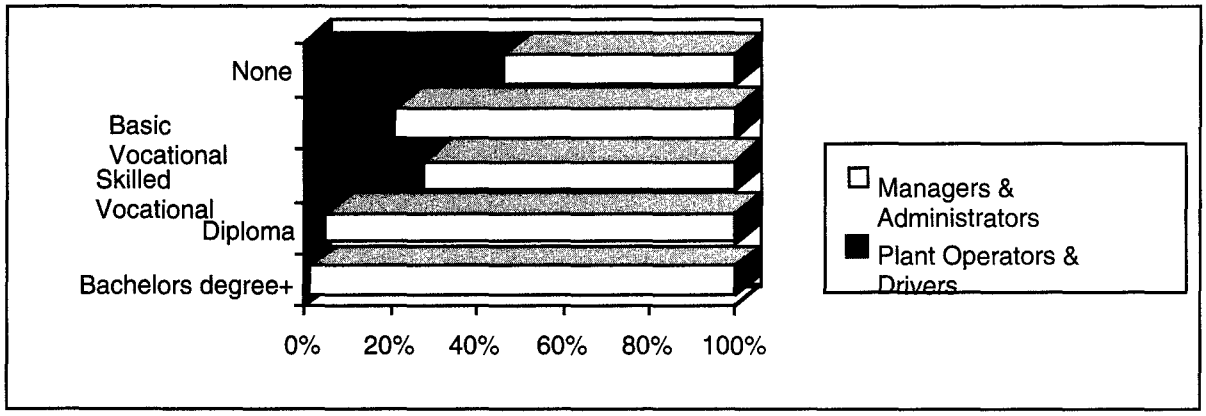
However it is not operational and technical skills that will be vital for the future success of Urban Public Transit the emphasis will need to move to "people rather than product". Some women in the management structure of Urban Public Transit are seeking to hone these skills through management education.

MANAGEMENT EDUCATION FOR WOMEN

People already in management positions or hoping to move into management positions from all areas are increasingly pursuing management education either in a general management diplomas and degrees such as the Master of Business Administration (MBA) or industry specific certificates and degrees such as those in Transport Management. These provide a theoretical basis through practical case studies Human Resource Management and Marketing as well as in Accounting, Economics, Law and Statistics.

This type of education can be particularly valuable in the Transport Industry where people moving up through the organization are less likely to have needed qualifications than those from some other areas. 64 % of people in the Transport and Storage industry need no formal qualification compared with only 10% of those in the Finance and Property Service industry (see Figure 1). Yet as Figure 6 shows while few plant operators and drivers need formal qualifications 40% of managers and administrators require a degree or diploma.

Figure 6
Employee Classifications Needing a Qualification for their Job



Source: ABS 1993 Training & Education Experience

For women, management education can provide a special opportunity for formal recognition of management skills. The Certificate of Transport Management (Bus & Coach) is a general management qualification required under the state of New South Wales legislation for managers of bus or coach companies. This legislation is based on the premise that as much of the bus transit service is provided by private operators with area wide franchisees there is considerable inconvenience to the public if a transit company fails. The intention is thus to promote industry stability by seeing that the businesses are well managed. General management training is combined with the specific requirements for complying with industry regulations and practical issues such as bus maintenance. Women from large bus companies to small country two bus services have taken the course and have performed on average better than their male colleagues.

However these women, just like the women enrolled in more mainstream management degrees, still study "in a mans world" There are easily foreseen difficulties such as being the sole "lady" addressed in "lady and gentlemen" and problems with timing of classes geared to male rather than female lifestyles—5.30 to 9.30 P.M. conflicts with children's bath time/dinner time. But more significantly management education is still carried out in a culture of management theory and practice which is deeply and powerfully masculine (Sinclair 1994).

Over the last ten years requirements for gender sensitivity replaced "he" with "they " and we "personed" rather than "manned" the barricades. However modern analysis of this trend suggests that "gender blindness" is not "gender inclusiveness". Thinking has still been shaped by a male perspective and values are predominantly majority male based. Women's experience is not registered or recognized as valid.

Some prescriptions to the teacher, drawn from Sinclair, 1995, for avoiding this sound fine in theory but provide a interesting challenge in practice. How do you make appropriate references to the achievements of women in all areas—what if all the "gurus" in the field are men? Can do you include readings by women—what if they don't write on the subject in question in transport?

In these cases history may defeat us but in other cases the opportunity exists to make history:

- Gender issues should be treated as part of the mainstream intellectual content of the discipline women are not a minority group.

- The range of teaching and learning opportunities offered and assessment methods used should cater for a diversity of learning styles making them equally accessible to male and female. This is not easy especially where some women may have adapted to male learning patterns and be just a vociferous in their defence as their male classmates.

- Women should not be allowed to be silenced but reticence should be accommodated. Especially if marks are won for contribution an opportunity to contribute must be provided.

- Women may prefer cooperative learning in group situations but must not end up within the group in a stereotypical secretarial role.

Such changes would not only improve management education for women they would ensure better overall management education. The recent Australian Industry Task Force on Leadership and Management skills (Industry Task Force, 1995) identified several key challenges to improve management performance. One of these was capitalising on diversity. The task force was more interested in "bottom line" issues than it matters of "equity". It arguments for the inclusion of women and in particular the skills they

bring to management were for the economic good of the country and equally they will be for the good of the Urban Public Transit Industry.

CONCLUSIONS

This paper has suggested that currently Australian Industry in general but the Urban Public Transport Industry in particular has planned training in an ad hoc manner. This has resulted in a focus on short term training rather than long term education, on "technical" rather than "people" skills, on response to short term problems and provision for those who ask rather than those in need. In addition the areas of the organization where formal qualifications are required are the technical areas. This is how training is *"valued"*.

However the provision of well maintained vehicles running in a cost efficient manner will not ensure a viable public transport industry. The service is of no value unless there are passengers using it. Thus marketing and customer service roles are paramount. Training and education should reflect their importance. This is where education is *"needed"*.

This has special implications for women in view of their roles in marketing, human resource management and at the customer interface. Education and training programs must be designed to accommodate their needs in an appropriate manner. Even where training programs for functions such as marketing are in place already, as in management education, their masculine viewpoint should be challenged and amended. Women should not be expected to learn to "be one of the boys".

This paper reports on the situation in Australia but the case for a review of training valued and needed is probably applicable elsewhere. Transit industry literature, especially magazine and newsletters from the USA and Europe seem to have many more articles about operational and engineering issues than about customer service. Equally the workforce in the transport industry in general and the transit industry in particular is predominantly male in most counties of the world. In those circumstances it is "natural" that training and education will be suited to male needs either by intention or default. However this does not mean this is the best solution.

Changes are vital if we are to make best uses of the resources in the industry and build the sort of public transit organizations suited to the new century.

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Where Do Women Feature in Public Transport?

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WHERE DO WOMEN FEATURE IN PUBLIC TRANSPORT?

INTRODUCTION

This paper addresses women and the public transport business environment. It considers the current position of women, changes that have occurred over time and those that are sought for the future.

Women's transport needs are distinct from those of men and they are poorly met by current transport policy and provision. The transport world has been slow to see the relevance of women, women's needs or women's issues to planning and decision-making. To a certain extent, this is because there has been a culture pervading the industry which believed the product should be its focus with people, the staff who produce it or the customers who buy it, being incidental.

But no product has value until it is sold. In public transport, we as operators produce vehicle kilometers and then sell a proportion of these as passenger kilometers. It must be our major aim to sell the product rather than to produce it. Service design, therefore, should be about tailoring the service to the customer's needs rather than trying to entice customers to use an inappropriate service. Getting the product right in the urban transit context means supplying the type of service the market wants at a price it is willing to pay.

Women are significantly in the majority as public transport users so planning and service design for women is essentially about ensuring the delivery of quality services to the real world. However, for decades transit service designers have focused on producing the product rather than selling the product with the result that they bear no resemblance to what is wanted or needed by women.

The fact that women are woefully under-represented as professionals and as service providers in the industry is also a major contributing factor. Workforce gender segregation within public transport management and operations is central to the debate of adequately catering for women's needs both as employees and customers.

In examining workforce statistics for 5 major public transit providers from various Australian States, it is hoped to provide an insight on where women do—and don't—feature in the Australian transit industry. Participating agencies are tabled below:

Public Transit Agency	Total Employees
ACTION, Canberra, Australian Capital Territory (ACT)	849
Brisbane Transport, Brisbane, Queensland (QLD)	1393
Metrobus, Perth, Western Australia (WA)	1598
Sydney Buses, Sydney, New South Wales (NSW)	4147
TransAdelaide, Adelaide, South Australia (SA)	2291

WHERE DO WOMEN CURRENTLY FEATURE?

IN SOCIETY

The number of female headed single parent families has increased by more than 50% in Australia over the last two decades and the number of older women living alone—one of the groups most reliant on public transport—has also increased considerably. (ABS 1996)

According to the Australian Bureau of Statistics, women now comprise 42% of the workforce compared to just 25% in 1961, and more women work part-time than full-time. In fact, women comprise 76% of the total part-time workforce. 60% of couples with dependent children have both parents in the workforce. 65% of working mothers have children under 12, and around half the working mothers have children of preschool age. (ABS 1992)

Clearly the ground has shifted. Work and family life are no longer separate spheres of activity. Significant changes in family composition, expectations and the roles of men and women have transformed the way people organize their work, family and community lives.

These social and demographic changes are extremely important for public transport operators. Both in terms of ensuring service provision matches customers' needs and in terms of catering for employees' needs because the cultures of many transit organizations, their structures and work patterns have changed little from the era when men were usually the only breadwinner.

IN PUBLIC TRANSIT

Any analysis of gender and the labor market quickly reveals a high degree of occupational segregation. Women and men are unevenly distributed in terms of both the type and level of work they perform. Women occupy few managerial positions and hardly any technical or trade jobs. Those areas of activity in which women have been most commonly accepted are generally extensions of the traditional roles that a woman assumed in the family such as that of teacher, nurse, or domestic help.

In the transport arena, men dominate to an even greater extent with a very marked occupational segregation by sex across all disciplines and areas of work. There are many areas, particularly in technical or engineering oriented functions, where women do not feature at all.

While more than 50% of Australia's population is female, and women are significantly in the majority as public transport users, we are woefully under-represented in transport management, operations and service delivery.

Unfortunately, statistics are difficult to obtain, extremely difficult to directly compare, and are only likely to become increasingly more difficult to come by with the fragmentation of services between private and public operators. For this reason, much of the material I cite relates specifically to my own organization, TransAdelaide.

Across the five organizations examined, women averaged 8.4% of the total number of employees with the smallest representation being 4.9% (WA) and the largest 11.2% (QLD). These participation figures are all significantly lower than that of 42% previously quoted for the total Australian workforce.

As is typical of most organizations and industries, women working within public transport tend to be concentrated in lower-qualified, lower-paid jobs. Within TransAdelaide, nearly 60% of our female employees are between the ages of 26 and 35 years, are employed at a salary level or wage rate of between $24,600 and $29,700, and have worked for the organization for less than 5 years.

When focusing on the functions of human resource management, finance and corporate services, it is found that less than 24% of the more than 1300 staff across all 5 agencies are women. These women are predominantly employed in secretarial and clerical roles but this figure of 23.9% is still woefully short of the 75% national clerical administrative workforce participation rate. Those women that are employed at the customer interface are generally in service roles as opposed to operational.

Those women who are employed in finance and operation control roles or are involved in driving or maintaining vehicles are in the minority. Again, looking across the 5 participating agencies, some 8,600 staff are employed to drive, maintain and clean the various fleets involved in direct service delivery. As an average, just 5.5% are women. NSW has the highest representation with 8.4% and ACT the lowest with 2.1%.

Granted that, over time, a greater number of females are gaining positions in middle management ranks, however, very few work in the top echelons of these organizations. When exploring where women feature in senior management, an analysis was undertaken of those employees earning greater than $50,000 per annum. A total of 174 employees earn more than this, 20 of whom (or 11.5%) were women.

In general, those women who do attain senior positions tend to be concentrated in human services and marketing roles and rarely in metropolitan strategy or transportation planning. In fact, the NSW operator was the only agency to employ a woman—and just one—within the service design function.

While certain aspects of the public transport industry's workforce composition reflects patterns of gender distribution that are evident within many industries, it does tend to differ markedly in the area of part-time employment. Nationally, 25% of males and 75% of females in the Australian workforce are employed on a part-time basis. Within TransAdelaide, almost 340 staff are employed under part-time conditions, the vast majority of whom work in the operations area. Certainly within the salaried or clerical ranks, it is predominantly women working in those few part-time roles, however, within the daily paid ranks the tables are well and truly turned, with 85% of those working under part-time conditions being men.

These statistics generally confirm what is obvious to almost everyone; women are clearly under-represented and, in essence, are still very much on the periphery rather than at the centre of public transport planning and provision.

ON PUBLIC TRANSPORT

Differences between men and women in terms of the ways in which they use public transport have been well-documented. Increasingly, the typical public transport user is not only a woman, but also a 'captive customer' being without access to a car or without a licence. In fact, two thirds of all public transport trips are made by such captive customers.

Generally speaking, women make proportionately more trips by bus, on foot and as car passengers than men do. The bus is the most used mode of transport for young and older women with two thirds of all bus users being women. Women make more local trips and undertake travel more often in the interpeak than men. Male commuters are typically employed in white-collar professional occupations while women commuters are generally employed in less well-paid clerical positions.

KEY TRANSPORT NEEDS

In essence, there are three key transport issues which are consistently raised by women or on behalf of women. These being reliability, safety and security, and physical access. Of these, the first and most important concern is safety.

SAFETY AND SECURITY

Vulnerability is a key issue for women. While it is argued that the perception of fear far outstrips the actual situation, we as service providers continue to underestimate the degree to which this misconception seriously impacts on a woman's willingness to use each and every mode of public transport and, thereby, dictates her travel patterns and those of her dependents.

Parents, generally consider the introduction or graduation to public transport an important part of their child's social development, but worry that their child may be stranded at school or at a stop in winter or after dark, or be seen regularly waiting at the same bus stop everyday, or walking the neighborhood streets. Parents are happier if their children travel in a group rather than alone which poses an interesting dilemma because this 'group' of children, seen through the eyes of a bus driver, may easily be regarded as a 'gang'.

Customers need to feel valued, to feel they are welcome and belong on public transport. In order to achieve this, operators need to provide:

- someone in uniform—to be visible at stations and on-board trains and trams
- better lighting at stations and improved siting of bus stops
- the avoidance of closed shelters and waiting areas
- ticket booths sited with a clear line of vision to platforms
- adequate signage which is well lit at night
- clearly identified safe zones providing customer information, timetables and maps as customer confidence is seriously eroded by a lack of information or communication
- passenger amenities at major stations and interchanges—baby change facilities, parent rooms and toilet facilities
- more installations of closed circuit television (CCTV)
- route maps, driver announcements, and passenger access to mobile telephones should all be available on-board vehicles; and
- enhanced linkages with complementary services such as taxis and community buses to enable a door-to-door service provision.

RELIABILITY

As already outlined, women today tend to be combining a number of roles. As a result, women have a higher value of time. That is, we have less time to achieve more activities, such as work, study and family responsibilities. Convenience becomes a key factor in balancing these activities and, with current service provision levels, it is no wonder we tend to favor the car.

Users of public transport want certainty and reliability. To roster customer service personnel only on some trains, at some times, means there is no knowing whether there will be someone there to assist you when you need it. Similarly, to have some train drivers announce station names and others not is bewildering, particularly for infrequent users of the system.

PHYSICAL ACCESS

Women's use of public transport is also affected by physical and practical considerations relating to the structural design of buses, trains and trams. The characteristics of a woman's role means that we must often travel with small children, with baby strollers, with heavy shopping, or with frail or elderly relatives. The design of many vehicles and carriages makes getting on and off under such circumstances extremely difficult.

- Practical constraints that seriously hinder women's access and ease of movement include:
- high steps which are difficult to negotiate for the elderly and the very young
- a lack of storage space for shopping, baby strollers, and other paraphernalia
- no proper provision of seating for children and no seat belts
- no organized assistance for women getting on and off who are laden with children, pushers and shopping.

Constraints often extend beyond the actual vehicles to:

- impractical siting of bus stops and train stations
- inadequate provision of seating and shelter at stops and stations
- toilets at stations and interchanges which are too small to accommodate an adult with a baby stroller
- awkward steps and crossings at railway stations.

In some instances, these 'constraints' and difficulties' can be positively dangerous. At the very least, they serve to deter women from using public transport and hamper them when they do choose to use it.

Parents cite trips on public transport with children are being more tiring than using a car and often they encounter negativity from other passengers, especially in peak periods, when travelling with a pram, bags and children. Not being able to strap a toddler into a seat on a bus, perhaps while holding an infant and balancing shopping, makes choosing public transport all too difficult.

KNOW .... BUT NO

What I have just outlined is not new. These facts and issues are now well-documented and have been discussed at length. So why has change not occurred?

The first Women and Transport Issues Conference, was held in 1978 in Washington D.C. and was followed during the next decade by a flourish of attention to gender in policy through "women and ....." literature—women and housing, women and transportation, women and economic development, women and media.

Since that time, a number of studies have pointed to the difficulties that many women face in their day-to-day negotiation of transport systems but little attempt has been made to act upon the issues raised by women about transport and, to date, they remain largely unaddressed. (Hamilton, 1989; Beuret, 1991; Little, 1994; Morris, 1995)

The reality is public transport provision remains an industry which is male dominated and little influenced by any awareness of the importance of gender. The integration of the more recent research on women and public transport into the operations of the public transport policy makers and service providers is still to materialize.

Australia as a country actually has a significant history of expanding services for women and their dependents and passing antidiscrimination and equal pay legislation, however, all of these strategies have relied on:

- a significant role of Government as a service provider and legislator; and
- a politics of economic difference, whereby the differences between women and men in terms of income, wealth, leisure, labor market position, and responsibility for unpaid work are argued as a basis for targeted and special needs policies for women.

Both of these points have their weaknesses when considered in the context of the current public transport environment.

Firstly, competitive tendering within public transport is being driven, primarily, by a need to reduce the cost of the provision of services. Unfortunately, the link between more women employees and the capacity to better deliver the services required by the industry's major user group—women—will become increasingly difficult to make where responsibility and accountability is taken away from government agencies and contracted to multinational companies whose managers are principally accountable to overseas shareholders.

Secondly, the success of a 'politics of economic difference' in changing public policies to better reflect women's needs has always been to some degree problematic. Economic policy analysis still rarely disaggregates by gender. In fact, the Women's Budget analyses at Federal and State levels of Australian government bear testament to the fact that many government departments have great difficulty in thinking about the gender of their clients. (Sharp, 1995)

Certainly, a lack of specific initiatives targeting women customers has often been excused by public transport operators by quoting improvements introduced to enhance the quality of service delivery to that unisex individual, 'the passenger'.

Another difficulty faced by service providers, is that so many of us working in the industry would have been fortunate enough to have been sheltered from the grimmer realities of limited access to goods and services, real economic hardship and isolation. If for no other reason, as transport operators we must question *how* we listen to women, *what* we hear and *why* the same old stories of frustration, cynicism and disappointment in *our* planning efforts keep circulating. This needs to be done while involving the community—setting agendas with women, not for them—and we need to make a concerted effort to be much more accepting of how and why women say what they do. (Stratford, 1995) I believe that this is an important area in which women employed within the industry can make a valuable contribution to the reshaping of service provision.

WHY SHOULD WE INVOLVE MORE WOMEN?

WHAT DO THEY HAVE TO OFFER?

As previously mentioned, the Australian public transport environment is compelling industries to become more flexible, more responsive to customers and market opportunities, and more collaborative. There is also pressure to seek closer ties to customers, staff and suppliers and to improve the quality of our products. Employers are seeking to create a committed and skilled workforce where managers and employees share a common purpose and a sense of commitment to the business. Whilst employees are seeking policies and work practices that will enable them to balance family and work roles.

In keeping with this trend, public transport is in the throes of great change which provides an opportunity to harness the goodwill, talents and energy within our people to place the industry on a new plane of operation—redefining our business, and building a new culture and new working relationships. Why is it essential that women play a key role in this change process? Why should we have equal representation in the workplace and equal input to decision-making? Whether we call it social justice or human rights, women make up half the population and more than one-third of the workforce so our right to equality of opportunity and treatment in employment must be clearly expressed by participation in all levels of activity. It is also essential for the acceleration and effectiveness of organizational development, as women are capable of providing an ability and creativity which has so far remained largely untapped.

Admittedly, the debate continues on the qualities women contribute in the workplace. In researching this paper, I found much of the literature refers to the "inherent and distinctly feminine" characteristics that women have to offer. Unfortunately, many fail to elaborate on just what they consider these characteristics to be and, of the few that do, I feel qualities such as "task orientation" and "attention to detail" can be equally attributed to men. So, I will attempt to portray what I believe women have to offer the astute employer. Many women are socialized to have an intuitive respect for other people's ideas, thus, women are very comfortable with consultation, cooperation and reconciliation. Delegation and team-building are often the most natural ways for women to approach work. Women also tend to be very concerned about social and ecological issues and how these fit with forward looking policies. One of the most interesting areas of women's involvement to date, has been government sponsored and led community consultation within the context of strategic planning. Many of us can relate to the significant changes women have made through grass roots community action.

Women tend to speak with a "different voice" which as a rule lays stress on the social ethos of development, that is to say education, health, children, and the environment. Conversely, men tend to concentrate on the economic aspects such as production, profitability, finance, and technology. Women are generally more people-oriented, while men are more object-oriented; women tend to be better with words and language, men with visualization; women at give and take, men with spatial orientation and conceptual skills. But all this really means is that, together, men and women can achieve more. An incredible synergy is created.

The new competitive environment provides women with greater opportunity than they have enjoyed in the past. I believe the emerging environment to be more conducive to women's skills, and the shift in corporate culture to be more conducive to women's aspirations. While the potential opportunities in this environment are substantial, women must seek to involve themselves to ensure they gain access to these emerging opportunities. Without a doubt, women can contribute importantly to the exploration of the human dimension of service development, to the negotiation of new work practices and to the creation of more innovative forms of employment.

The recognition of women's needs in planning and service design and a commitment to addressing those needs is influenced, to a considerable extent, by the participation of women in decision-making processes. So, what might we expect from a greater representation of women in the industry and a commitment on the part of service providers to consult with and seek the opinions of their key customers?

Clearly there are costs associated with NOT involving women. If we reflect on the profile of the typical public transport user, for example, one can quickly draw the conclusion that planning and service design for women is essentially be about ensuring the delivery of quality services to the real world. Given that the concerns about safety, travelling with children and/or shopping, making local journeys etc. are well known to male transport planners but, to date, have gone unaddressed, it is to be hoped that involving women in service design would ensure a choice availability that matches the demand and conforms with the performance levels women expect from today's lifestyles. Competitive edge is based on innovation and improvement and smart employers will recognize that women add-value to their organizations and will incorporate women's particular knowledge of problems and solutions.

STRATEGIES FOR THE FUTURE

The search by all employees for a balance between work and family life is impacting on organizations as never before. It makes good business sense, therefore, when reviewing organizational cultures and work practices in an effort to become more competitive, to include the integration of women-friendly and family-responsive practices in order that the full potential of the workforce might be realized.

Attitudes and behavior are shaped by strong organizational cultures and, while they are not easily changed, now is the time to ensure the introduction of quality workplace programs to increase women's opportunities and maximize their potential. To do otherwise in an era when women have never before received the levels of education they now do, is a waste of skill, ability and goodwill.

In fact, some very compelling figures come from the field of education. The cost of educating a girl to Year 12 (the completion of high school in Australia) is nearly $50,000. An additional three years of higher education sees this figure rise to $75,000. The community cannot tolerate wasted potential represented by the under-utilization of women's skills and ability, nor can the industry ignore this issue if it is to be competitive.

Through my reading on this topic and in discussions with people both in and affiliated with public transport, I have identified a number of initiatives that could be put in motion to progress women within the industry. They are presented in no particular order, however, I am aware that some could be more easily achieved than others. Nonetheless, I believe it is up to each of us to continue to push for change no matter how large or small our individual contributions may be. Suggestions for the acceleration of change include:

- Participation and representation by women at all levels and in all relevant areas is fundamental. Each of us has an obligation to take every opportunity to put our views forward and to express our opinions to make sure the public transport system becomes better and more work able for everyone.

- The development of a list of women of high potential through the establishment of a database of suitable women in each State and across Australia.

- Recruitment needs to be targeted more effectively, and greater encouragement for women to apply for positions needs to occur.

- Comprehensive employment profiles need to be developed and maintained to allow for detailed analysis of workforce participation.

A review of existing and/or the development of new complementary policies and practices should be undertaken. These might include:

- maternity or paternity leave supported by a benefits policy accommodating extended leave. A number of organizations have introduced career break or extended leave of absence schemes (varying from 3 to 7 years), and dependent care leave.

- greater flexibility of working time arrangements with more opportunity for part-time employment, job sharing, compressed working weeks, split shifts, nine-day fortnights, school year work contracts.

- an assessment of the impact of business travel demands.
- a rethink of how training is offered where extended time before and after work hours, or on weekends is required, in particular, residential training programs; and
- the assessment of pro-rata remuneration and education benefits for flexible working time employees.

- To change entrenched attitudes, such policies must be clearly linked to other strategic organizational issues such as those dealing with quality, diversity, gender equity and retention, and career development.

- The introduction of corporate/education partnerships possibly through executive shadowing for secondary students—high profile women are simply "shadowed" for a week to expose the student to an example of what their life could be like if they pursued further education and professional careers—or participation in corporate visits to school or university 'careers days'.

These initiatives do not create a threat to people who are in the workplace currently and incur very little cost to an organization.

- TransAdelaide's Customer Panels provide an avenue for users of public transport to actively contribute to the development of a quality transit system by drawing on members' experience and expertise who, in turn, represent the interests of their community. An extension of the customer panel concept to specifically address women's needs within local operations should be encouraged.

- Lunch time or meal break seminars on topics such as managing dual careers, or evaluating child care and elder care facilities could be offered.

- Incorporation of affirmative action principles into corporate policies and the application of an affirmative action framework are integral to enabling workers to balance family and work roles with minimum conflict.

- And lastly, women empower other women through encouragement. Whenever the opportunity arises, endeavour to say something positive about another woman.

IN CONCLUSION

Women's issues are really business issues. Even more so when you operate a public transport system. Smart employers are becoming aware of the fact that they need the skills and perceptions women can bring to their businesses. In order to achieve both economic growth and social equity, businesses need men and women sharing in decision-making. As already stated, I believe this industry holds great potential for women. Yes, it is an industry that is male dominated, but opportunities exist simply because we are under-represented.

Public transport service providers operating in today's competitive environment can no longer afford to ignore women under-utilized skills as employees. By incorporating more women in all areas of transport provision, it will become easier to communicate the fundamental issues involved and operators will achieve the competitive edge they seek over business rivals.

Similarly, it is important that a transport system provides for the whole community but operators can no longer afford to ignore the particular needs of their primary customers. It is appropriate that women's needs are identified and considered within the overall framework of service delivery. I can't stress sufficiently the importance of women—both as employees and customers of public transport—taking every opportunity to put their views forward, to express their opinions and to make sure they get what they want and need to make public transport better and more workable for everyone. I hope this paper has served to demonstrate that there are a number of areas within public transport in which change is possible to effect which will influence women's use of services.

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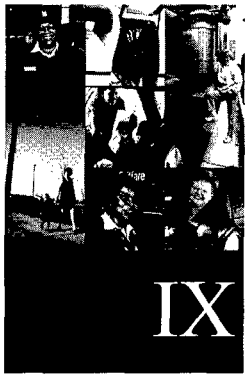

TRANSPORTATION: POLICY ISSUES WITH SPECIAL IMPLICATIONS FOR WOMEN

From Wooing Soccer Moms to Demonizing Welfare Mothers: A Legislative and Policy Context for Women's Travel

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FROM WOOING SOCCER MOMS TO DEMONIZING WELFARE MOTHERS: A LEGISLATIVE AND POLICY CONTEXT FOR WOMEN'S TRAVEL

INTRODUCTION

One of the truly amazing stories of the last otherwise low key Presidential election season was the discovery and exploitation of a "new" demographic group—the so-called "soccer mom." Pollsters, spinsters, pundits and columnists have all rushed to chronicle the existence of these middle to upper income women, who spend their suburban days and suburban nights shuttling in their Volvos or minivans between school, shopping trip and soccer game, often with a job sandwiched in between. The selection of New Jersey Governor Christine Todd Whitman as the keynote speaker at the Republican Convention was widely seen as candidate Bob Dole's attempt to reach out to this new target group, in a clear vindication of the findings of the first conference on Women's Travel Issues nearly twenty years ago.

Of course the rush to reach out to the "soccer moms" by candidates of both political parties has not included serious discussion of the transportation and land use trends that have created their daily plight, or of the strategies available to government to deal with their problems. Instead the candidates focus on issues like education, abortion and values, and spin their messages to appeal to the supposed bent of this group. At the same time other political issues which could have significant impacts on women's travel and quality life are discussed without reference to their implications for women, including welfare reform, school choice and affirmative action. The one legislative initiative which has provided real tools to respond to women's travel needs—the Intermodal Surface Transportation Efficiency Act, up for reauthorization next year—is seen as a construction bill or jobs bill.

What are recent key legislative initiatives and how have they affected women's travel? What legislative issues are on the horizon and how will they be reflected in the demand for travel and in the satisfaction of that demand? And, finally, how can research and policy analysis help to better define these issues so that legislation and spending can be targeted to dealing with the real problems of the so-called "soccer moms" and "welfare mothers", along with everybody for whom a category has not yet been invented?

CURRENT LEGISLATIVE CONTEXT FOR WOMEN'S TRAVEL

Arguably, women's travel patterns have been partly shaped by past transportation and land use policy, with the construction of the Interstate highways, beltways and bypasses contributing to the suburbanization of jobs and housing as women have entered the work force while continuing to perform child care and household manager roles. The resulting travel patterns have been well documented throughout this conference. With the completion of the overwhelming majority of the Interstate highway system in the late eighties, federal attention shifted to system management and dealing with problems like suburban congestion. The transportation legislation passed in 1991, called the Intermodal Surface Transportation Efficiency Act or ISTEA, refocused attention and funding to metropolitan areas, revitalized the consideration of social, economic and environmental considerations through a planning and programming process, expanded the eligible uses of federal transportation funding and called for increased public and local government involvement.

ISTEA has been hailed as a much needed sea change and decried as the most anti-highway highway bill ever. ISTEA clearly provided many opportunities for improved consideration of women's travel issues in the transportation planning process, as well as for the development of innovative projects to eliminate barriers to transit use or ridesharing. In addition, the bill created something of a boom in transportation planning and research, by doubling planning funding and by creating a variety of new funding programs for transportation and travel behavior research.

While the ISTEA bill is clearly the major piece of legislation affecting women's travel in the past five or six years, other legislation can have impacts as well. The 1990 Amendments to the Clean Air Act, for example, more closely linked transportation spending and air quality attainment. In so doing the Amendments focused attention and research on travel demand modeling. Indeed, the transportation air quality conformity process has forced many metropolitan areas to undertake travel surveys and update and improve their models for the first time since the sixties. In addition, the Clean Air Act initially mandated the development of Employee Commute Option programs, intended to reduce single occupant driving to work. These employer oriented rideshare programs prompted research that identified child care responsibilities and the prospect of family emergencies during the work day as being significant barriers to ridesharing by women. In some companies, the result has been the institution of guaranteed ride home programs and child care facilities in the work place. While the air quality benefits of these programs has been hotly debated, the quality of life improvement for women who participate has been undeniable.

President Clinton's issuance of the Executive Order on Environmental Justice, coupled with heightened enforcement of Title VI of the Civil Rights Act, has raised awareness of the differential impacts of transportation decisions on communities of color. Some environmental justice advocates have begun to identify the need for involvement in planning by women of color, perhaps the single most underrepresented group in transportation decision making.

ISTEA'S IMPACT ON WOMEN'S TRAVEL

The Intermodal Surface Transportation Efficiency Act promised change in the transportation arena in a number of areas. Two that bear attention are the impact of more flexible funding on women's travel choices and the impact of ISTEA's changes in the planning process. With respect to flexibility and expanded eligibility, ISTEA allowed almost 50% of former highway only funds to be used for a wide variety of purposes at state and local discretion. Some of the programs with a particular interest to researchers interested in women's travel issues are projects to provide day care at transit station in Cleveland, Southern California and the San Francisco Bay Area, programs to provide a guaranteed ride home being offered by transit agencies including the Virginia Railway Express, and a wide variety of ride sharing and commute option programs. In addition, programs to make transit more reliable and to provide traveler information have been promoted through Intelligent Transportation Systems funding. These and other innovative uses of transportation funding, including transit oriented development efforts nationwide and traffic calming projects intended to reduce the need for travel, need to be studied with respect to their impact on women's travel choices.

The changes to ISTEA's planning process have the potential of promoting greater understanding of the issue. Greater public involvement, improved models and expanded consideration of social issues all promise to break down the one-size-fits-all approach to transportation planning in favor of planning which acknowledges the diverse needs of different parts of the population, including women. Some five years after ISTEA's passage, all fifty states now have some form of long range plan completed with some level

of public involvement and hundreds of metropolitan areas have completed transportation plans. By and large, these plans, though greatly improved, still do not adequately address the transportation needs of women for four reasons.

CAPITAL PROJECT EMPHASIS

First, transportation plans and models are still focused upon projecting the need and identifying the funding for new capital facilities, such as highways and transit lines. The planning process has not yet adapted to managing the transportation system to promote accessibility for different population groups. For example, programs to locate and quickly and safely remove stranded vehicles from the side of freeways can have a big impact on congestion and on women's fear of traveling, yet these kind of programs are not well analyzed by existing transportation models.

OVEREMPHASIS ON RUSH HOUR WORK TRIPS

Secondly, most transportation planning and modeling is based upon assessing the capacity of the system to handle rush hour loads and home-based-work trips, not off-peak, non home-based trips. This single-minded attention overemphasizes capacity considerations on major facilities and de-emphasizes the difficulties faced by women forced to trip chain, make suburb to suburb or inner city to suburb trips and generally lavishes funding and attention on the part of the travel market dominated by men. New research in activity patterns, non-work travel, barriers to transit use by women and off-peak suburban congestion promises to shed light on these problems, but most of this work is going on outside the context of the metropolitan planning process.

PUBLIC INPUT

Third, despite tremendous increases in public involvement programs in the preparation of metropolitan plans, involvement by women in the planning process still appears to be low. Transportation planners are still predominantly male and attendees at public involvement sessions appears to be predominantly male as well. One of the most ambitious and successful public involvement programs in the country was undertaken in Albany, New York as part of its "New Visions" effort. As part of an extensive documentation of their effort, the Albany planners logged respondents at each session. Only about thirty of 160 participants were female. Few public sessions feature child care, and fewer still offer transportation to and from the sessions. Most meetings are held during business hours in downtown locations, although this appears to be changing. More and more planners are learning to hold meeting in the community as part of existing neighborhood sessions.

LIP SERVICE TO SOCIAL ISSUES

Finally, despite ISTEA provisions calling for consideration of social impacts, STPP's scan of metropolitan plans indicates that many consider social issues through a "check-off" process, where issues mandated by ISTEA are listed in a matrix in an appendix to the plan and a check mark indicates that the issues were considered.

ISTEA was indeed a major change for planners all over the country and the foregoing discussion is not meant to imply that it has not sparked an improvement in transportation planning. Women's issues in transportation are, however, not adequately being considered in transportation plans. Perhaps the most encouraging long term trend is the great interest in transportation and livable communities, with projects aimed at transit and pedestrian oriented mixed use development and traffic calming underway all over the country.

ISTEA's reauthorization debate is already underway, with the bill scheduled to expire on September 30, 1997. Various proposals have been advanced by different interest groups, ranging from the "Highway Only Transportation Efficiency Act" (HOT-TEA) proposed by the highway lobby to the various proposals for state level block grants being advance by state agencies. Local government, transit and environmental groups appear to be coalescing around incremental improvement of ISTEA.

A PREVIEW OF COMING ATTRACTIONS — LEGISLATIVE ISSUES WHICH MAY AFFECT WOMEN'S TRAVEL PATTERNS

As important as it is, Federal transportation policy and investment is only one source of change in the way Americans will travel in coming years. Travel by women is no exception to this rule. This election and the 105th Congress will consider a number of issues which may have substantial impact on travel by women and families over the next few years. Each of these areas requires research and analysis; this listing is meant only to identify possible areas for further study.

WELFARE REFORM

The other image of women that has been exploited by politicians, their handlers and the media is the image of the "welfare mother", and indeed most welfare recipients are female. The impact of the welfare reform bill passed by the Congress and signed by the President this summer is just beginning to be felt. Surprisingly, many newspaper accounts are focusing on the spatial mismatch between the location of job seekers in center cities and rural areas and the location of jobs in the suburbs and the exurbs. The Washington Post reported last week that state welfare agencies are advising rural job seekers to move to cities to find jobs. Inner city residents are finding that transit connections to suburban jobs are unreliable and that employers are reluctant to hire transit dependent person. Clearly welfare to work programs will have a disproportionate impact on women, especially women with children. Issues of job creation in cities and transit connections to existing jobs are likely both to heat up in the next session of Congress and to have a real impact on women's need for transportation services.

SCHOOL CHOICE AND CHARTER SCHOOLS

The state and local trend toward programs which allow parents to choose which public school their children will attend as well as the trend toward charter schools and school voucher systems is likely to have some impact as children are enrolled in schools increasingly dispersed across the metropolitan area. Couple this trend with the collapse of pupil transportation programs around the country and the trip to school begins to become a major component in family travel, with the major responsibility still being placed on women.

The ongoing efforts to eliminate affirmative action programs may affect women's opportunities for employment, particularly with respect to women of color. Also of potential importance are efforts at control of legal immigration.

INFORMING FUTURE LEGISLATION — SUGGESTIONS FOR RESEARCH

It often seems as though the political process is little influenced by research and analysis, but examples abound where relevant research and analysis has informed and advanced a political debate. Future research on women's travel can serve such a function, if the research agenda is developed in a way that recognizes the legislative context. ISTEA's reauthorization offers the opportunity for research to impact legislation, and it offers the opportunity to develop a research agenda that can help to eliminate some of the barriers to resolving women's transportation problems. The following is a list of research topics which could serve to aid in the legislative arena as well as in transportation planning and investment.

IMPACTS OF DEMAND MANAGEMENT ON WOMEN

Most analyses of demand management strategies such as ridesharing, guaranteed ride home, and day care at transit has focused on the trip reduction and air quality impact of these programs. A compelling case can be made that the real impact of these programs is a quality of life impact for working women. Have women found these programs useful, do they provide a lifeline option, and what impact do they have on the employability of women with children?

ACTIVITY ORIENTED TRAVEL RESEARCH

Continued study of the reasons people travel—for work, shopping, education, recreation—and the factors that influence their choices can help to develop new methods of analyzing the adequacy of the transportation system in satisfying women's travel needs.

UNDERSTANDING SUBURBAN TRAVEL

Off-peak suburban congestion is becoming a perceived problem, especially by women. How real is this problem and how amenable is it to traffic management, neighborhood land use strategies and traffic calming programs? Most evaluations of these strategies deal with rush hour work trips, not with off peak travel.

TRAVEL NEEDS IN THE TRANSITION FROM WELFARE TO WORK

The spatial mismatch between those who need jobs and job locations has been well documented. Not so well documented are the travel patterns of welfare recipients, particularly female heads of household, and the way their household's travel needs affect their ability to seek and get to work. These issues may mitigate against reverse commute programs and toward place based strategies. Transit's adequacy in serving this market also needs to be assessed in more than an anecdotal way.

TRAVEL NEEDS OF FEMALE IMMIGRANTS

In some metropolitan areas, legal immigration constitutes a major shift in the population, and, potentially, a major change in travel patterns. What are the travel needs of recent female immigrants and immigrant households? How do they change over time. Researchers speculate on their early transit dependence and transitions to automobility. Is this true?

TRENDS IN PUPIL TRANSPORTATION

Women continue to be predominantly responsible for getting kids to school. What is the extent of the pull out in school bus service, and how has the loss of the neighborhood school impacted mode choice and travel patterns for the family. Do cities with school choice or voucher programs exhibit difference from cities which do not have such programs?

IMPROVING PUBLIC INVOLVEMENT BY WOMEN IN TRANSPORTATION PLANNING

What are current levels of involvement by women in ISTEA planning processes? Can involvement be improved by holding evening meetings, providing child care, or providing shuttle service? Would increased involvement result in the raising of different issues?

CONCLUSION

It took almost twenty years for women's travel issues to move from a national conference to the notice of the political soothsayers and media mavens. Hopefully, the lag time between lip service and serious consideration of the policy issues in a legislative context will be much shorter.

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Linking Social Context with Transportation Planning and Funding

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LINKING SOCIAL CONTEXT WITH TRANSPORTATION PLANNING AND FUNDING

INTRODUCTION

Recent changes in federal transportation policy have raised expectations that future infrastructure funding priorities will now be more closely linked to the demands of transportation consumers. In the few years since passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), transportation agencies have indeed begun to place greater emphasis on public involvement, environmental impacts and alternative strategies for alleviating congestion. Yet, there remains a definite tendency to utilize "traditional" highway criteria and standards for evaluating and selecting transportation infrastructure, at all levels of analysis.

The purpose of this paper is to explore the criteria currently used to evaluate and select transportation infrastructure projects and the major social and demographic patterns in which the projects occur. The paper begins with a brief overview of the social context in which transportation projects are being selected. This overview is not meant to be all encompassing, but rather to provide the necessary background in which to interpret the actualization of ISTEA's policies. The overview on social context is followed by a detailed discussion of the goals and objectives noted in ISTEA and a review of the criteria typically used to evaluate and select new transportation projects for funding. The paper then turns to a discussion of the interactions between social context and the criteria used to prioritize projects for funding. Finally, the paper concludes with a summary of recommendations for future research which identifies many of the links that must be forged between transportation users and project prioritization.

THE CONTEXT

HOUSEHOLD STRUCTURE

Increases in teen pregnancies, divorce, male mortality and economic hardship have all contributed to important changes in household structure, particularly minority household structure (Worobey and Angel 1990). There has been a dramatic increase in the number of female-headed households in all population groups (Speare and Rendall 1990). For example, in 1986, 13% of white households, 44% of African American households and 23% of Hispanic households were headed by women (Rosenbloom 1995). Roughly one-half of all poor households is female-headed and one-half of these are headed by a woman who divorced or separated (Maudlin 1991).

When women do divorce or separate, the majority experience a reduction in living standard (Maudlin 1990) and those women making the most pre-divorce money experience the biggest decrease in post-divorce living standards (Weitzman 1985; Weiss 1984). Women with children under six years of age are also far worse-off economically after divorce or separation than women with children over age six at the time of separation or divorce (Maudlin 1990). Households headed by women tend to be substantially poorer than households headed by men (Lugaila 1992); this is especially true for women, blacks and the oldest old (Meyer 1990, Wilson 1987). For example, in 1988 the median income for married elderly women was 43% of that for married elderly men.

Changes in the living arrangements of older women, especially older minority women, have also been dramatic (Bianchi and Spain 1986; Mutchler and Frisbie 1990). Several researchers have noted the increase in the numbers of both black and white elderly women living alone. In just two decades, the percentage of black and white women living alone has increased by 67% and by 60% , respectively (Pampel 1983; Mutchler and Frisbie 1990). Mutchler and Frisbie also found that elderly white women were significantly more likely to live alone than elderly black women. Additionally, elderly Black women tended to experience poorer health, with little adjustment in living style, than white women. Worobey and Angel (1990) found that elderly non-Hispanic women in poor health have more living arrangement options than Black and Hispanic older women in poor health.

ORGANIZATION OF HOUSEHOLD ACTIVITIES

The results of both time-budget and travel activity pattern studies are consistent. Time budget studies show that women do the greatest share of household and family support activities (e.g., cooking, cleaning, yard work, child care, shopping and chauffeuring) (Blau and Ferber 1992, p. 52; Hersch and Stratton 1994; Hochschild 1989; Shelton and John 1993), even in two-earner households in which the woman is employed full-time (Hersch and Stratton 1994; Robinson 1988). Travel activity pattern studies tend to confirm time budget analyses: women tend to make more family and household support trips and spend more time in household and family support activities than men (Hanson and Hanson 1980; Hanson and Johnston 1985; Niemeier and Morita 1995; Rosenbloom 1987; Rosenbloom 1995a,b).

EMPLOYMENT

Part-time employment continues to grow (Tilly 1992). Roughly 40% of all new part-time jobs created in the 1980s were involuntary part-time as a result of slack work, plant down time, or the inability to find a job (Yang and Lester 1988). Furthermore, almost two-thirds of those employed part-time work in low skilled clerical or service occupations. Women are also 2.5 times more likely to work part-time than men (Yang and Lester 1988). The increasing numbers of employed women has also helped to generate new ways to increase job flexibility; 23% of full-time and 60% of part-time working women do not work traditional hours and greater numbers of women now work-share or voluntarily reduce work hours (Rosenbloom 1994a,b; Rosenbloom 1995; Axel 1988).

The effect of household family and support activities on women's employment is striking. Most research tends to confirm that affordability and availability of child care dramatically increases the probability of employment (Cleveland et al 1996). Women are also more likely to participate in the labor market when the family has only one child under age six; women are much less likely to be employed if they have more than one child under six or if they also have children between 6 and 10 (Cleveland et al 1996).

WOMEN'S TRAVEL TRENDS

In most research, gender continues to be identified as an important predictor of travel patterns (e.g., Turner and Niemeier 1997). Employed women tend to have shorter commute-to-work distances and times than employed men (Blumen, 1994; Hanson and Johnston, 1985; Hanson and Pratt, 1990; Madden, 1981; McLafferty and Preston, 1991); women tend to make more household and family support trips (Hanson and Hanson, 1980; Hanson and Johnston; Niemeier and Morita, 1995; Rosenbloom, 1987); women make fewer recreational trips (Hanson and Johnston) and, finally, in contrast to earlier research (Hanson and Hanson 1980; Hanson and Johnston), women's licensing rates and use of private vehicles is now comparable to men (Hanson and Pratt 1990; Rosenbloom 1993a,b).

The presence of children has been associated with shorter commute times for Black, Hispanic and White women (Preston et al 1993) although the effect of children on women's commute times may somewhat depend upon their occupational status. Fagnani (1987) found that unskilled employed women displayed commute times which inversely varied with the number of children in the household: the greater the number of children, the closer the proximity of workplace to home. In female-headed households, the number of children generally reduces the woman's commute distance (Madden 1981).

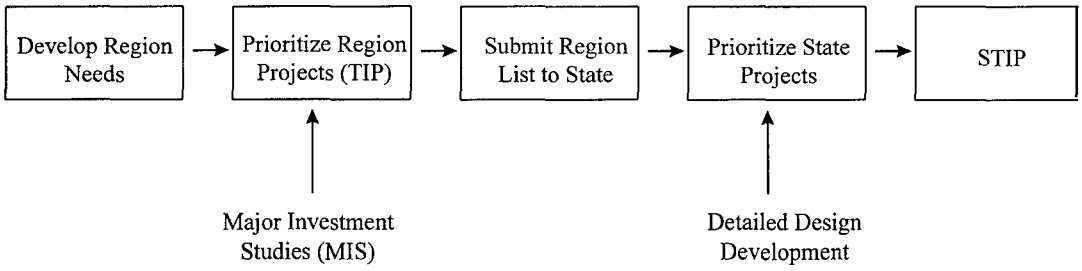
TRANSPORTATION PROJECT SELECTION AND PRIORITIZATION

The ISTEA created new opportunities for funding, which has historically been invested in highways, to be transferred and invested in other modes (e.g. additional transit service or new bike routes). Under ISTEA, each state initiates a statewide transportation planning process that includes all modes of travel and embraces a multi-modal approach to urban transportation planning by:

> "... creating methodologies to continue to meet the nation's needs for safe, efficient, and environmentally sound movement of people and goods through more proficient use of the existing transportation infrastructure, while minimizing transportation-related fuel consumption and air pollution..." [ISTEA, 1991, p. 1955].

In accordance with ISTEA, state and regional transportation agencies cooperatively establish a regional Transportation Improvement Plan (TIP) and a State Transportation Improvement Plan (STIP). The STIP is a "spending plan" to allocate funds for transportation projects. By law, the STIP is constrained by the predicted funding levels, thus the number of transportation "needs" may actually be much greater than represented on the STIP. Each STIP and associated funding constraints are reviewed every two to three years depending on the state's funding cycle. The generic process of evaluating, prioritizing and selecting STIP projects is illustrated in Figure 1.

Figure 1.
Typical Planning Process



Most regional and state transportation agencies begin by developing an areawide "needs" list. This list can include literally thousands of projects for urban areas such as Seattle, WA or Portland, OR. Each regional agency then prioritizes the projects on their particular region's needs list. The criteria used in the regional prioritization may be developed entirely by the region or in concert with a state transportation agency, but should be directly associated with regional transportation goals and objectives. Conceptual alternatives are also generally developed at this time for the high priority problems identified on the needs lists; the preferred solutions form the basis for the regional TIP. The region may then submit, to the state transportation agency, those projects of statewide significance for inclusion on the STIP. Most state agencies also conduct detailed analysis of the design alternatives for high priority projects of statewide significance on the TIP.

By law, the final STIP must be fiscally constrained and thus clearly cannot accommodate all the projects generally prioritized and submitted by the regions. For example, in Alaska over 1000 multi-modal projects might be submitted by the regions for the STIP and only about 50 can be funded each year. Consequently, some project prioritization must again occur at the state level during the preparation of the STIP. The prioritization criteria used to develop the STIP is, ideally, directly associated with the state transportation goals and objectives. Based on Figure 1, it can be seen that, in general, transportation improvement projects must be evaluated and prioritized first, at the regional level (which results in a TIP) and then again at the state level (which results in a fiscally constrained STIP).

The types of measures used to evaluate and prioritize projects often differ among regions within a state, between regions and the state and among the states themselves. However, the measures must reflect the 15 factors for metropolitan transportation planning (20 for statewide planning) that the ISTEA has established to help direct the development of future multimodal transportation systems. The 15 regional factors are shown in Table 1. For design alternative evaluations, the criteria evaluation is guided by the principles elaborated in the Major Investment Study (MIS) policies.

Table 1.
Summary of Regional Transportation Planning ISTEA Factors

1. Preservation of existing transportation facilities
2. Consistency between federal, state and local energy conservation programs
3. Relieve and prevent congestion from occurring
4. Transportation-land use interactions consistent
5. Programming of enhancement activities
6. All projects included in assessing the effects of improvements
7. International borders and access to airports, ports etc. considered
8. Improve connectivity
9. Identify needs through the management systems
10. Preserve right-of-way
11. Enhance freight movement
12. Use of life-cycle costs in design
13. Consider the overall social, economic, energy, and environmental effects
14. Enhance and expand transit services
15. Include capital investment to increase transit security

Table 2.
Transportation System Performance Measures

System Performance	No. Trips by Mode Vehicle Miles Travel Congestion Peak Hour Congestion Transit Boardings Highway Level of Service
Mobility	Mobility Options Improved Movement of People
Accessibility	% within 30 minutes Transit/Highway Speeds
System Dev, Coordination	Terminal Loadings System Development Regional Importance
Land Use	Compatibility with Land Use Plans Growth Inducements
Freight	Reduced Goods Movement Costs
Socio-Economic	Homes/Businesses Displaced Max. Economic Benefits Historical Impacts Construction Employment
Environmental	Air Quality Sensitive Areas Natural Env.
Energy	Consumption required for Construction/Operation
Safety	Annual Accidents by Mode Safety Ratings
Equity	Equity of Burden-Benefit
Costs	Capital Costs Operating Costs
Cost Effectiveness	Annualized Costs per Trip or Mile FTA Index
Financial Arrangements	Funds Required Funding Feasibility - Build/Operate Private/Public Sources
Institutional Factors	Ease of Staging and Expansion Non-implementing Agency Support

Source: Rutherford, G.S. (1994). *Multimodal Evaluation in Passenger Transportation Transportations, A Synthesis of Highway Practice*, Table 23, NCHRP Synthesis 201, Trans. Res. Board, Nat. Res. Council, Washington, D.C.

With the passage of ISTEA, the elaboration of new evaluation measures and prioritization methodologies has been an on-going process for both metropolitan and state transportation planning agencies. In 1991, a National Cooperative Highway Research Program (NCHRP) case study survey was conducted of the MIS, regional and state evaluation criteria used by transportation agencies. The purpose of this study was to assemble common measures and identify the areas in which additional research was needed. The results suggested that the state of multi-modal evaluation, and thus project selection, under ISTEA was still in the process of development (Rutherford, 1994). Table 2 presents the classification of evaluation criteria reviewed in the NCHRP case study.

The types of criteria reviewed in the NCHRP study ranged from very traditional measures such as vehicle miles traveled and highway level of service to relatively new additions such as air quality. However, as Rutherford notes, most of the 17 case studies reviewed relied on a very small subset of the measures noted in Table 2. Further, regional studies tended to emphasize integration and coordination more than individual project planning or evaluation studies; equity considerations were extremely rare and criteria associated with mobility, system coordination and integration, land use, freight, energy, safety, cost-effectiveness, equity, financial arrangements and institutional factors were left out more than they were included.

A second recently completed case study on Major Investment Studies (MIS) reveals much the same result as the earlier NCHRP report (Stokes and Niemeier 1996). The primary purpose of an MIS is to act as a project evaluation tool or process for major transportation investment strategies. Generally, the new MIS planning mission requires metropolitan planning organizations to use the following objectives, as a minimum, for developing and evaluating multi-modal transportation strategies:

- [Design] transportation system management and investment strategies to make the most efficient use of existing transportation facilities [ISTEA, 1991, p. 1963].

- [Make] transportation planning consistent with energy conservation programs, goals, and objectives [ISTEA, 1991, p. 1957].

- [Relieve] congestion and prevent congestion from occurring where it does not yet occur [ISTEA, 1991, p. 1957]; including accomplishing trip reductions trough Travel Demand Management (TDM) programs [Comsis, 1993], "particularly single-occupant motor vehicle travel" [ISTEA, 1991, p. 1963].

- [Consider] the likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with short-range and long-range land use and development plans [ISTEA, 1991. p. 1957].

- [Identify] transportation needs resulting from the management systems (pavement, bridge, safety, congestion, public transportation, and intermodal transportation) [ISTEA, 1991, p. 1958].

- "[Develop] strategies for incorporating bicycle transportation facilities and pedestrian walkways in projects where appropriate throughout the State" [ISTEA, 1991, p. 1963].

- "[Consider] the overall social, economic, energy, and environmental effects of transportation decisions" [ISTEA, 1991, p. 1958].

- [Take into account] the feasibility to unify and connect existing transportation systems within the metropolitan area to reduce energy consumption and air pollution while promoting economic evolution [ISTEA, 1991, p. 1915].

- Specifically for Clean Air Act Amendments of 1990 (CAAA), transportation improvement programs must provide for attainment of the National Ambient Air Quality Standards (NAAQS) which is covered under a required State Implementation Plan (SIP is a plan to meet CAAA & NAAQS standards to achieve and maintain clean air status) [23 CFR 450.320, 1995, p.113].

- "[Define] methods to expand and enhance transit services and to increase the use of such services" [ISTEA, 1991, p. 1958].

- "[Bring] methods for integrating new technology and alternative modes, demand management / reduction, and other recent innovations in transportation planning into today's existing infrastructure" [ISTEA, 1991, p. 1914].

The specific representation of each MIS objective, in terms of an actual evaluation measure, is generally left to the discretion of the individual transportation agencies. The results of the MIS case study suggest that most agencies conducting transportation investment analyses continue to rely on pre-ISTEA evaluation criteria. Consistent with Rutherford's earlier NCHRP assessment, the Stokes and Niemeier MIS case study finds a plethora of evaluation criteria associated with system perfor- mance, financial costs and revenues, cost effectiveness, environment and financial arrangements while use of criteria reflecting accessibility/mobility, system development or coordination, land use, and freight or energy appears to pose a somewhat greater challenge.

A brief review of three states evaluation criteria helps to establish the basic structure of the state-level system evaluation and programming process. Referring to Figure 1, most states prioritize construction projects each biennium. To accomplish this prioritization under ISTEA, each state must develop a new set of state-level evaluation criteria sensitive to the factors noted in Table 2 and then, using the criteria, select a subset of projects identified on the STIP to fund. Three states have recently completed updates of the evaluation criteria used for selection of projects: Washington, Oregon and Ohio. Table 3 presents and contrasts the criteria used in each state for each funding cycle to set the fiscally constrained STIP.

Washington and Ohio also weight criteria to parallel the emphasis of the state transportation goals and objectives: Washington places well over 50% of the criteria weight on cost-efficiency while transportation efficiency can carry up to 55% of the total weight for Ohio. Washington's cost efficiency criterion is essentially a representation of travel time benefits (which typically comprise 80% of transportation improvement benefits) weighted by project cost. The value of travel time savings is based on a statewide average. Ohio's transportation efficiency measures are traditional highway related performance measures and are typically difficult to interpret in a multi-modal setting.

INTERACTIONS BETWEEN SOCIAL CONTEXT AND PRIORITIZATION

The performance of any transportation system should ideally be linked directly to the needs of the transportation consumers. As it stands, most transportation evaluators continue to use transportation performance criteria that do not reflect travel needs relative to contemporary ethnic, racial or gender social contexts; this clearly continues to promote historical infrastructure trends. In short, the needs of the consumers should be reflected in the criteria chosen to measure—or evaluate—the performance of transportation infrastructure.

For example, *accessibility*—in those state and regional programming frameworks where it is evaluated at all—is often defined in terms of employment (i.e., the number of workers within *x* travel time of work). The emphasis of this criterion is based on the concept of decreasing the distance between work and home. For women and poor minorities, *accessibility* to household and family support activities such as affordable child care and community support structures is at least as important as accessibility to jobs. Moreover, for female-headed households, accessibility to job training centers and post-secondary education facilities is also critical if we wish to increase the probability of this cohort's long-term economic success. Ignoring these aspects of accessibility creates an inherent, mostly gender, bias in the use of the measure and identifies a gap between the use of *accessibility* by transportation planners and its importance to the certain segments of consumers.

Further , Table 2 suggests that there may be trade-off's to be considered in terms of representative evaluation criteria. Recent legal tangles in New York and Los Angeles suggests that the transit performance criteria requires modification—or perhaps elaboration. For example, using the peak period number of trips per mode and transit boardings as measures of transit efficiency (See Table 2) is misleading unless the actual user is identified. It has been demonstrated numerous times that minority travel patterns differ markedly from non-minority travel patterns; transit travel tends to be conducted more in the off-peak period and be of shorter length for minorities (Taylor et al 1995; James and Niemeier 1996).

Linking the infrastructure evaluation and selection criteria to context requires a deeper understanding of the complete system in which these communities of women and minorities function. By far, the easiest parameter to re-examine is the traditional conceptualization of "work." The economic "work" benefits accrued as a result of improved transportation system performance are usually represented through savings in travel time. The idea of valuing travel time savings has traditionally been discussed in terms of added time for engaging in market production or leisure (Hensher, 1995). In other words, the opportunity costs of travel time is lost wages. Stating this in a more relevant context for women requires inquiring about the use—and value—of travel time savings for conducting additional household and family support activities (which is unpaid labor in the economic sense), or in the case of African-American women, Latina's and other women of color, unpaid or low paid community-based employment (Naples, 1992). For women, the opportunity costs of travel may actually be the value placed on household and family activities (which might exceed lost wages).

The criteria missing, or minimally considered, in Table 2 are almost as important as the criteria represented. It is insightful to note that both equity and energy measures are missing from Table 2. The energy component is important because it raises issues of measurement; how do we adjust for poorer single auto households, which tend to make fewer overall trips but drive less efficient autos. Further, how are benefits for less energy consumption to be assigned to those households having zero autos? If women make more trips than men, because of household and family support activities, should they be assigned poorer energy consumption values?

Equity drives many of the trade-off's in these types of analyses and yet the criterion is infrequently, if at all, represented. The current implicit reliance on the "fairness principal" (i.e., tax burdens equal

benefits), forces the transportation system to, by definition, provide more services for the rich than the poor and more services for men than for women. It is unclear that this equity measure, appearing in many transportation alternative analyses, is actually contextually useful (Niemeier and James, 1996). For those few circumstances in which equity is defined in terms of economic principles (i.e., income transfers), there is little follow-up to ensure that transfers, as a result of transportation infrastructure improvements, actually occur between high and low income groups.

Although ISTEA is clearly motivating changes in the planning process itself (Meyer 1992), the criteria used throughout the process has actually changed very little. Perhaps an alternative way to think about evaluation criteria is examine social context. Table 4 presents one possible organizational framework for linking the major demographic and activity patterns in a relevant context. The purpose of this table is not to define a strict typology but rather to elucidate the social constructs which may, in turn, guide the development of future transportation efficiency evaluation criteria.

CONCLUSION

The criteria currently used to select and evaluate transportation infrastructure may work well for an average traditional nuclear family; the incompatibility lies in the fact that these families are fewer in number than ever before. The dramatic changes occurring in demographic and travel patterns are a reflection of greater numbers of female-headed households, more migration of ethnic groups and greater access to automobiles. Current transportation project evaluation and selection criteria simply do not account for these "new" populations. In short, most of the transportation evaluation and selection criteria do not reflect the types of performance standards necessary for those individuals on the "travel margin"—predominantly women and minorities.

If our project evaluation and selection criteria do not adequately reflect the needs of the major consumers, then perhaps not only refinement of existing criteria is needed but also greater elaboration of regional and state transportation goals and objectives. For example, Rosenbloom's research provides clear evidence that current TSM/TDM federal objectives conflict with womens most basic travel requirements (1993a). Other conflicts may include unreasonable expectations of transit service to low density areas and too much emphasis on reducing congestion without linking it to social context.

New research is needed to interpret how social context is affected by, and affects, current transportation infrastructure evaluation and selection criteria. Does vehicles miles of travel represent an improvement in mobility or a reduction when specific cohorts are taken into account? How can the conflicts between criteria be minimized? Research is also needed to develop new transportation selection and evaluation criteria that adequately reflects contemporary context, especially for women and minorities.

Table 3.
STIP Prioritization Criteria: Washington, Oregon and Ohio

Evaluation Category / *Actual Criteria*	*Factor Values*[1] WA	OH	OR
Transportation Efficiency			
Average Daily Traffic		0-20	
Volume to Capacity Ratio		0-20	
Highway Level of Importance		0-5	
Corridor Completion		0-10	
Safety			
Accident Rate	*Incl* Cost-Eff.	0-15	*Incl* Cost-Eff.
Economic Development			
No. of Non-Retail Jobs Created		0-10	
Evidence of Job Retention		0-5	
Economic Distress - Severity of Unemployment		0-5	State Rank
Ratio of Jobs Created:Project Cost		0-5	
Level of Private Sector Capital Attracted		0-5	
Financial Arrangements			
Private/Local Participation	*Incl* Cost-Eff.	0-20[2]	*Incl* Cost-Eff.
Multi-Modal Connections			
Multi-modal or Regional Feature	0-10	0-5[2]	
No. Multi-Modal Connections			CM[4]
Cost-Efficiency			
Benefit-Cost Analysis	B/C[3]		NPV/C[3]
System Integration			
Connectivity	0-10		
Community Support			
Community Project Rank			CM[4]
Environment			
Most Natural Resources	CM[4]		CM[4]
Most Cultural Resources	CM[4]		CM[4]
Accessibility			
Minimum tolerable levels of service (MLOS)			0-1[5]
Land Use			
Compatibility	0-19		-6 to 6

1. Point ranges are given for qualitative factors; actual values are used for quantitative factors.
2. Used in assignment of bonus points.
3. Present Value Benefit to Cost Ratio (B/C), Net Present Value to Cost Ratio (NPV/C). For both states, cost categories include preliminary engineering, right-of-way, operations and maintenance and construction and are reduced for private contributions; benefit categories include travel time and accident reductions savings.
4. One or more Quantitative Composite Measures
5. Based on whether a project helps bring a facility to the published MLOS.

Table 4.
One Possible Context-Activity Typology

Traditional Nuclear Family	***Demographic***
	High rates of separation and divorce, especially among minority women
	Women are more likely to be employed in part-time labor
	Men are increasingly likely to participate in involuntary part-time labor
	The majority of married women with children under 6 in workforce
	More likely to live in the suburbs
	Women's licensing rates are comparable to men's
	Model family for most retirement age programs
	Activities
	Women conduct most of the household and family support activities
	Men spend more time than women engaged in work travel
	Women with children tend to spend less time in the work commute
Female-Headed Households	***Demographic***
	More likely to be poor, elderly and/or African-American, Hispanic
	More likely to live in the urban area
	Employment linked to affordability and availability of childcare
	Postsecondary training increases likelihood of employment for low income women
	Job training increases per capita income after divorce
	Those remaining in poverty are more likely to experience health problems
	Most women experience a lack of economic security without a spouse
	Increasing proportion of elderly women-headed households
	Activities
	Women conduct most of the household and family support activities
	African-American women also tend to engage heavily in community-work activities
	The number of children and travel time are inversely related
Poor Households	***Demographic***
	More likely to be female, elderly and/or African-American, Hispanic
	More likely to live in the urban area
	Activities
	Lowest access to automobiles
	Fewer trips overall

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The Influence of Gender and Occupation on Individual Perceptions of Telecommuting

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THE INFLUENCE OF GENDER AND OCCUPATION ON INDIVIDUAL PERCEPTIONS OF TELECOMMUTING

ABSTRACT

Accurate forecasts of the adoption and impacts of telecommuting depend on an understanding of what motivates individuals to adopt telecommuting, since those motivations will offer insight into who is likely to telecommute under what circumstances. Motivations for telecommuting are likely to differ by various segments of society. In this study, we analyze gender and occupation differences in the perceptions of telecommuting for 583 employees of the City of San Diego. Numerous differences are identified. Most broadly, women on average rated the advantages of telecommuting more highly than men—both overall and within each occupation group. Women were more likely than men to cite family, personal benefits, and stress reduction as advantages of telecommuting, and more likely to see the lack of visibility to management as a disadvantage. Clerical workers were more likely than managers or professionals to see the family, personal, and office stress-reduction benefits of telecommuting as important, whereas managers and professionals were more likely to cite getting more work done as the most important advantage of telecommuting. Reduced social interaction appeared to be of about equal concern to both clerical and professional/technical workers, and reduced professional interaction was of greatest concern to managers and professionals. Professionals were more likely than the other two job types to see the lack of visibility to management and the need for discipline as disadvantages.

INTRODUCTION

Telecommuting has recently gained recognition as a potentially effective transportation demand management strategy. Reasonable estimates of the travel impacts of telecommuting depend on accurate forecasts of telecommuting adoption by individuals. Accurate forecasts, in turn, depend on an understanding of what motivates individuals to adopt telecommuting, since those motivations will offer insight into who is likely to telecommute under what circumstances. Motivations for telecommuting are likely to differ by various segments of society. Understanding these differences is important for those trying to market telecommuting as a work option or transportation demand management strategy, as well as for those trying to accurately predict future adoption and impacts of telecommuting.

For example, conventional wisdom has suggested that telecommuting would be more attractive to women than men. Since working women still undertake a disproportionate share of domestic responsibilities (Tingey *et al.*, 1996), the hypothesis is that the promise of telecommuting to save time and to offer greater flexibility would appeal even more strongly to women than to men. A previous study of telecommuting adoption (Mokhtarian and Salomon, 1996a) found that indeed, females were significantly more likely to want to telecommute from home than males ($p = 0.00077$). However, preference within both groups was quite high (92% for women in the sample; 83% for men), raising the question of whether women and men wanted to telecommute for the same reasons or not.

In the same study, preference for home-based telecommuting did not vary significantly across major occupation groups: 88% of respondents in each of the manager, professional/technical, and clerical groups wanted to telecommute. Although the proportions of respondents wanting to telecommute are relatively uniform across these groups, the question again may be asked as to whether there are significant differences among them in their reasons for wanting to telecommute—or, for that matter, not want-

ing to telecommute. For example, concerns that telecommuting would hinder professional development due to a reduction in workplace interaction may be more of a detriment to managers and professionals than to clerical workers (Olson and Primps, 1984).

Identifying differences such as these is the aim of this study. Specifically, we examine whether the perceived advantages and disadvantages of telecommuting differ significantly by gender and occupation. We study six gendered groups: managers, professionals, and clerical workers separated by gender. The remainder of the paper is divided into three sections. The next section describes the data analyzed in the study and the variables created from them, while also presenting some key socioeconomic characteristics of the sample. Section 3 begins by specifying a number of hypothesized gender and/or occupation differences in the perceived advantages and disadvantages of telecommuting. Then, statistical tests of these and other differences are reported. The final section summarizes and discusses the results.

THE RESEARCH CONTEXT

THE STUDY, THE SAMPLE, AND THE SURVEY

This study is part of an ongoing research project involving modeling telecommuting preference and choice (see Mokhtarian and Salomon, 1994; 1996a, b, c; Mannering and Mokhtarian, 1995; Bagley, 1995). Although previously-reported models have found attitudinal variables to be important to both preference and choice (Mokhtarian and Salomon, 1996b, c), a systematic examination of how perceptions of telecommuting differ by gender and occupation has not been undertaken by the project before now.

The sample consists of 583 usable responses to a fourteen-page self-administered questionnaire distributed to 1428 employees of the City of San Diego in December 1992. The survey contained questions on previous awareness of and experience with telecommuting, job characteristics, ability to telecommute, advantages and disadvantages of telecommuting, information on other possible choices to satisfy hypothesized lifestyle drives, attitudes toward telecommuting and issues related to lifestyle drives, and sociodemographic characteristics. Mokhtarian and Salomon (1996a) discuss selection bias in the sample and its possible implications for the generalizability of reported findings. For the current study, selection bias means that the proportion of the sample in each study group is not necessarily representative of that group's presence in the population as a whole, but it can be expected that the sample reasonably represents each group's perceptions of telecommuting. That is, female clerical workers, say, may be underrepresented in the sample, but the female clerical workers that are in the sample are likely to be fairly representative of how the population of female clerical workers views telecommuting.

This study focuses on the survey questions relating to the advantages and disadvantages of telecommuting. Respondents were asked to rate on a four point scale (not at all important, slightly important, moderately important, and extremely important) 17 advantages and 11 disadvantages. These characteristics of telecommuting were developed from the literature (e.g. DeSanctis, 1984; Katz, 1987) and from researcher judgment. "Other" advantages and disadvantages could also be specified by the respondent; these were recoded to listed attributes where possible, and otherwise not further analyzed here. After rating the characteristics on each list, respondents were asked to rank the top three advantages and disadvantages, respectively. Respondents were rating each attribute with respect to their perceptions of telecommuting for themselves. Hence, managers' views in particular should be understood to relate to telecommuting for their own situation and not for their staff.

The 28 intercorrelated attributes were factor analyzed together to reduce them down to nine (oblique) factors (Mokhtarian and Salomon, 1996c). The 17 advantages loaded on five of these factors, which may be viewed as measuring drives or motivations to telecommute, whereas the 11 disadvantages loaded on the other four factors which constitute constraints on the desire and/or ability to telecommute. Tables 1 and 2 display the exact wording of the advantages and disadvantages listed in the survey, and indicate the factor(s) on which each statement loaded most heavily.

Table 1
Advantages of Telecommuting

Advantage Statement	Factor
To have more time for myself.	Personal Benefits
To reduce the stress of commuting.	Stress
To get more work done.	Stress
To reduce the stress I experience in the main office.	Stress, Personal Benefits
To make it easier to handle dependent (child or adult) care.	Family
To have more independence.	Personal Benefits
To spend more time with my family.	Family
To save money.	Personal Benefits
To make it easier to pursue educational or personal interests.	Personal Benefits
To help the environment by driving less.	Stress
To have more control over my physical working environment.	Stress, Personal Benefits
To increase flexibility.	Personal Benefits
To be able to work while temporarily disabled.	Disability/Parental Leave
To be able to work while permanently disabled.	Disability/Parental Leave
To be able to work instead of taking parental leave.	Family
To keep working at this job after changing my residence.	Relocation
To keep working at this job after my main workplace moved to another location.	Relocation

Table 2
Disadvantages of Telecommuting

Disadvantage Statement	Factor
In general, I prefer the social interaction found at the conventional workplace.	Workplace Interaction
I prefer the professional interaction found at the conventional workplace.	Workplace Interaction
I would be concerned about my opportunities for visibility and career advancement.	Management Visibility
There is a risk that I would be viewed negatively by management.	Management Visibility
The main office is nicer / better equipped.	Office Discipline
It s harder to get motivated to work, away from the main office.	Office Discipline
It s too much trouble to remember what to take back and forth between work locations.	Office Discipline
My commute trip is a useful transition between home and work.	Commute Benefit
I use my commute time productively.	Commute Benefit
My commute trip allows me to do errands on the way to or from work.	Commute Benefit
Working at home may increase family conflicts.	Commute Benefit

DEFINING OCCUPATION CATEGORIES

Before examining differences by gender and occupation, a brief description of how the occupation categories were defined may be in order, as a reminder of the uncertainties inherent in variable measurement. More than 95% of the original sample of 628 people had jobs that could be categorized as managerial (14.5%), professional (55.5%), or clerical (25.1%). This result, plus the fact that many other telecommuting research projects have focused on the above three job categories (see e.g., Pratt, 1984; Hartman *et al.*, 1991), were motivations to limit the analysis to these occupations. Unfortunately, occupational categories are not precisely defined in the public mind, and thus, people doing nearly identical jobs may label them very differently. Some people may be more likely to identify with the type of work they do rather than with their work status (i.e., title or rank), and vice versa. It was expected that this would especially be a problem with the manager occupation group. Consequently, we used two questions to classify respondents with respect to manager status. The question, "Whom do you supervise?" had as responses "no one", "one or more staff", and "one or more supervisors"; the question, "Which of the following best describes your occupation?" included responses of "manager/ administration", "professional/ technical", and "clerical/administrative support" among others.

When the responses to these two questions were cross-tabulated, two types of discrepancies arose. Fifteen people classified themselves as manager/administration based on the second question, but responded to the first question that they supervised no one. Conversely, 156 people classified themselves as either professional/technical or clerical, but indicated that they supervised people. The first group of people may have included some with non-supervisory administrative responsibilities and some whose job title may have contained the word "manager" as a courtesy. In neither case would it be desirable to combine that first group with "true" managers, and since there was no way to reclassify them into one of the other two categories they were discarded from the analysis.

Regarding the second type of discrepancy, it is recognized that the terms "manager" and "supervisor" are not universally considered synonymous (Feuer, 1988), and therefore that people may be supervisors without considering themselves to be (or having the title of) managers. Therefore, those people in this group who reported only that they supervised "staff" were not moved, whereas the 28 professional/ technical and three clerical workers who reported supervising "supervisors" were reclassified as managers. This increased the size of the manager group from 58 to a more statistically robust 89. The results of exploratory analyses using the original self-reported occupational designations did not differ materially from the results reported here.

Table 3 presents the final crosstabulation (after reclassification) of occupation by supervisory status of the 583 respondents retained for this study.

Table 3
Supervisor Status by Occupation

Table 3: Supervisor Status by Occupation

Supervises:	Occupation			
	Manager	Professional	Clerical	Row Totals
None	0[1]	236	133	369
Staff	21	104	21	146
Supervisors	68	0[2]	0[3]	68
Column Totals	89	340	154	**583**

1 Fifteen respondents who reported being a manager but not supervising anyone were discarded.

2 Twenty-eight professional/technical workers who reported supervising supervisors were reclassified as managers.

3 Three clerical workers who reported supervising supervisors were reclassified as managers.

CHARACTERISTICS OF THE SAMPLE

A comparison of the six study groups on basic demographic characteristics is important for describing the sample and may offer some basis for interpreting the perceptual differences identified in Section 3. Table 4 summarizes several socio-economic characteristics by gender-job type category. For the continuous variables household size, one-way commute length, vehicles per driver, and years in present occupation, analyses of variance were conducted to simultaneously identify any gender and occupation main and interaction effects. For the remaining (categorical) variables, Pearson chi-square tests were conducted for differences by gender and occupation separately. The p-values of these tests are reported in the final two columns of the table.

Four variables significantly distinguished between both gender and job type: age, education, household income, and years of experience. On average, males were older than females in each occupation category. Similarly, for each job type, men had higher education levels and household incomes than women, with one exception: female clerical workers reported household incomes slightly higher than those of (the small sample of) male clerical workers. Finally, men had (on average, about four) more years of experience in their present occupation than women, with the same exception.

The remaining variables differed significantly on at most one of the two dimensions of gender and job type. Male respondents generally had larger household sizes, more often had children under the age of 6, and, as discussed in the introduction, less often wanted to telecommute. Occupation differences were observed for presence of children ages 6-16 (with managers having them most often and professionals least often), presence of someone needing special care (occurring most often for the clerical workers), vehicles per driver (with clerical workers having the least at 0.9) and actual telecommuting (with clerical workers least likely to do it and managers most likely to do it). It is perhaps surprising that proportionally

Table 4
Demographic and Other Characteristics by Gender and Occupation

Variable	Indicator	Female1			Male1			Significance2	
		Mngr N=24	ProfN=143	ClerN=142	MngrN=65	ProfN=197	ClerN=12	G	O
Age	mean3	39	37	39	43	40	43	0.004	0.001
Household Size	mean size	2.4	2.4	2.6	3	2.8	3.1	0.004	N
Presence of Children Under 6	percent	13%	20%	16%	23%	24%	25%	0.06	N
Presence of Children 6-15	having	29%	20%	26%	29%	19%	17%	N	0.07
Needing Special Care	having	4%	0%	8%	0%	5%	0%	N	0.01
Education4	category	4.8	4.5	3.1	5.1	4.6	4.2	0	0
Household Income	mean3	$53K	$55K	$41K	$66K	$57K	$40K	0	0
Years in Present Occupation	mean	7.3	6.1	7.3	13.3	9.9	6.9	0	0.006
One-way Commute Length	miles	10.3	13.7	12.4	14.1	13.1	6.7	N	N
Vehicles per Driver	mean	1	1.1	0.9	1.1	1.1	0.9	N	0
Preference for (Home-based)	percent	96%	94%	89%	83%	84%	83%	0.001	0.83
Choice of (Home-based)	percent	33%	18%	5%	20%	10%	8%	0.657	0

more managers (24%) telecommute than professional workers (13%), but managers presumably have more autonomy than their staff, and may already themselves have been managed remotely to some degree before beginning to telecommute. In any case, it is clear from these data that whatever face-to-face interaction is required of managers can often be scheduled in such a way as to make telecommuting possible.

PERCEPTION DIFFERENCES BY GENDER AND OCCUPATION

HYPOTHESES

Based on the literature and on the judgement of the authors, a number of gender- and occupation-related differences in the perception of telecommuting are hypothesized. For example, several studies (e.g. Tingey, *et al.*, 1996; Bielby and Bielby, 1988) have indicated that working women still bear a disproportionate share of household responsibilities, and that this dual role is a source of considerable stress. This suggests that women are more likely than men to view telecommuting as a (partial, at least) solution to those types of pressures. Among occupation groups, we hypothesize that clerical workers (who, in our sample as derived from Table 4, have the lowest education levels, the lowest average household incomes, and the highest rate of incidence of dependents needing special care) are more likely to see telecommuting as a solution to stress. (Whether or not telecommuting succeeds as such a solution, is of course another question; several researchers have noted that telecommuting may in fact increase role-conflict and stress, especially for women with child-care responsibilities, or at least not reduce it materially [Olson and Primps, 1984; DuBrin, 1991; Christensen, 1988; Shamir and Salomon, 1985]). Managers in our sample have the largest households, the highest incidence of older children and the second-highest incidence of young children among the three job types, but they also have the highest levels of education and household income. It is expected that the more affluent managers are more likely to balance work and family through hiring domestic help, and hence are less likely to value telecommuting as a solution for these types of pressures.

In view of the multiple roles undertaken by women, we expect them to value the utility of the commute trip (in terms of serving as a boundary or transition between home and work, the ability to use the commute productively to run errands, and so on [Salomon and Salomon, 1984]) more highly than men. Hence, we hypothesize that women are more likely than men to see the various benefits from commuting as disadvantages of telecommuting.

Olson and Primps (1984) found that males tended to telecommute for work-related reasons such as reducing distractions and improving the work environment, but in their study, gender was apparently heavily confounded with occupation (with professional workers tending to be male and clerical workers almost exclusively female). Since other studies have found that "when job status is controlled, work attitudes and career commitment are not gender-linked" (Pazy *et al.*, 1996, p. 270; Bielby and Bielby, 1989; Lefkowitz, 1994), we hypothesize that the desire to telecommute to get more work done is strictly a function of occupation, and not of gender.

Olson and Primps also found that male professionals cited reduced stress as an advantage of telecommuting, due to "lack of interruptions", "avoidance of office politics", and "elimination of the stress of commuting". We expect at least the first two of those aspects not to be gender-specific (Duxbury, *et al.*, 1987; Newman, 1989). As for occupation effects, we expect that both professionals and clerical workers may experience office stress. We hypothesize that managers are less likely to be concerned about office stress as they have more control over their office environments.

Lack of visibility to management and fears of the impact that might have on career advancement within the organization have been repeatedly identified as perceived drawbacks of telecommuting (e.g. Duxbury, *et al.*, 1987), although the empirical evidence (e.g., Riley and McCloskey, 1996) indicates that the reality is quite benign—at least for professional workers. We hypothesize, in keeping with Olson and Primps' (1984) results, that lack of visibility is more likely to be perceived as a disadvantage by professional/technical workers than by clerical workers. And although managers may be equally (or more) concerned with career advancement as professionals, it may be expected that they themselves are already managed remotely to some extent, and therefore that telecommuting is less of a noticeable departure from the status quo for them. We further hypothesize, in view of the considerable attention paid to the "mommy track" and the "glass ceiling" for women (e.g. Schwartz, 1989; Hall, 1989) that women are more likely to be concerned about lack of visibility than men (this was found empirically by Pratt, 1984).

Another frequently-cited disadvantage of telecommuting is the social and professional isolation associated with it (although it should be noted that such isolation is primarily an issue for high-frequency telecommuting—often associated with clerical workers doing routine data entry work at home—rather than for the 1-or-2-day-a-week levels associated with much telecommuting by professional workers). Salomon and Salomon (1984, p. 20), citing an earlier study (Herzberg, *et al.*, 1957), indicate that "[t]he social interaction aspect [of the job] was found to be more important among workers of routine duties and those holding jobs that provided little satisfaction from the work itself", whereas "[t]he social role of the workplace is of less importance in managerial and professional jobs. Workers of this type ranked achievement, advancement, and the work itself as factors that contribute most to job satisfaction". Thus, it can be hypothesized that clerical workers are more likely to be concerned about a loss of social interaction with telecommuting, whereas the other two groups may be more likely to be concerned about professional interaction. However, Shamir and Salomon (1985) suggest that workers of all types may value the social relationships of the workplace, which may negate the first part of the hypothesis (also see Duxbury, *et al.*, 1987).

The specific hypotheses implied by the above discussion are stated below. Further, as this study is essentially exploratory, we systematically examine all potential effects of gender and occupation on telecommuting perceptions, even when no prior hypothesis (or multiple competing hypotheses) may be apparent. All significant results (and some nonsignificant ones) are presented and discussed in the following subsection.

Gender-based Hypotheses

G1: Women are more likely than men to cite family reasons as advantages of telecommuting.
G2: Women are more likely than men to cite personal reasons as advantages of telecommuting.
G3: Women are more likely than men to perceive stress reduction as an advantage of telecommuting.
G4: Women are more likely than men to see lack of management visibility as a disadvantage of telecommuting.
G5: Women are more likely than men to see the benefits of commuting as a disadvantage of telecommuting.

Occupation-based Hypotheses

O1: Managers and professional workers (independent of gender) are more likely to cite work-related reasons as advantages of telecommuting.
O2: Clerical workers are more likely to perceive family reasons as advantages of telecommuting.
O3: Clerical workers are more likely to cite personal reasons as advantages of telecommuting.
O4: Managers are less likely to perceive reduced stress as an advantage of telecommuting.
O5: Managers and professional workers are more likely to see reduced professional interaction as a disadvantage of telecommuting.
O6: Clerical workers are more likely to see reduced social interaction as a disadvantage of telecommuting.
O7: Professionals are more likely to view lack of visibility to management as a disadvantage.

RESULTS

Gender and occupation differences in perceived advantages and disadvantages of telecommuting are analyzed in two ways here: through examining the individual advantages and disadvantages cited as most important, and through analyzing the factor scores for the five advantage and four disadvantage factors. Importance ratings for the individual attributes were also examined, but the factor scores constitute composite ratings that carry essentially the same information in a more compact form. The most important advantage and disadvantage variables are binary (equal to one if the respondent chose it as most important, zero otherwise), and hence Pearson chi-square tests were performed to determine if there were significant differences in the distribution of responses by gender and occupation separately, and (where appropriate) by occupation within each gender category and/or by gender within each occupation type. T-tests were conducted to check for significant differences in the mean response values within and across groups. On the other hand, the factor scores are continuous variables, and thus analysis of variance methods were used to analyze them.

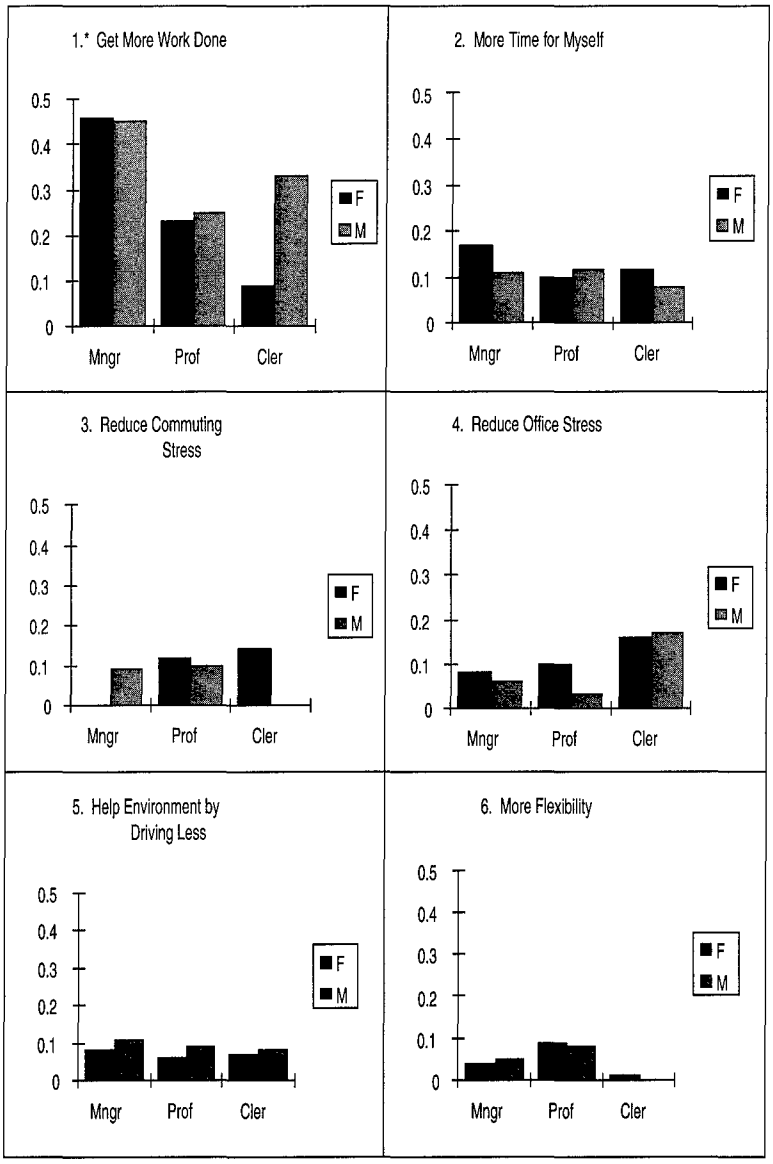
These two approaches are complementary. The most important advantage and disadvantage reported by an individual may likely be the strongest single indicators of his/her motivation to telecommute or not. On the other hand, the "most important" variables represent a forced choice: some respondents may have dutifully recorded a most important advantage even when they did not consider that advantage (or any other) particularly important in absolute terms. Further, several variables may relate to a single underlying dimension, and the choice among them of the most important variable may be somewhat arbitrary. Factor scores, on the other

hand, capture the intensity of perception: individuals who did not consider a certain group of related advantages very important would have a low score on the factor derived from those advantages. It is just as important to understand how gender-occupation groups vary in the *degree* to which they value various potential characteristics of telecommuting as it is to know how they differ on what they consider the most important characteristics.

Most Important Advantages

For simplicity of exposition, we focus on the top six attributes in each of the two categories. Figure 1 portrays, for the top six advantages, the fraction of respondents in each group citing that attribute as most important. At the outset, it is important to note that the size of the male clerical worker sample is very small (N = 12), and thus, the fraction of respondents in this group choosing a particular attribute may not be reliable.

Figure 1
Fraction of Respondents in Each Group Choosing Telecommuting Advantage as Most Important



The six variables shown in Figure 1 were cited by 69% of the overall sample as being most important: get more work done (most important to 23.8% overall), more time for myself (11.7%), reduce commuting stress (10.8%), reduce office stress (8.7%), help the environment by driving less (7.9%), and more flexibility (6.0%). None of the remaining 11 advantages were most important to more than 5.2% of the sample. Collectively, these variables indicate that stress, personal benefits, and travel/environmental issues are likely to be important drives in an individual's telecommuting preference formation.

Chi-square tests on the variable "get more work done" found a significant gender difference ($p = 0.001$), with 30% of men but only 18% of women citing it as most important. However, as shown in the figure, the percentages of men and women within each occupation group choosing it as most important were very similar. In fact, within the two job types having a significant number of male workers, chi-squared tests show no significant gender differences (manager p-value = 0.92; professional p-value = 0.70). This result is consistent with previous studies cited in Section 3.1.

Although there are no significant differences between gender *within* occupation, there are significant differences *across* occupations without regard to gender ($p = 0.000$). Nearly half of all managers cited getting more work done as the most important advantage of telecommuting. Presumably managers are subject to many interruptions that can be more readily controlled in a telecommuting environment. Nearly a quarter of the professional/technical workers group cited this attribute as most important. Overall, the responses for this variable support hypothesis O1.

The second-most cited variable, "more time for myself", can be categorized as a personal benefit of telecommuting. As such, it could be hypothesized (see G2) that women would more often than men select this advantage as most important. However, chi-squared tests did not show any distinctions within gender ($p = 0.992$) or occupation ($p = 0.973$). "Reducing the stress of commuting" is another advantage of telecommuting that could potentially be more attractive to women (see G3). Here too, however, there were no significant differences within gender ($p = 0.335$) or occupation ($p = 0.319$) in selecting this advantage.

The next variable, "reducing office stress", was significantly more important to women than men (13% of the women chose it versus only 4% of the men; $p = 0.000$), in support of hypothesis G3. Further, female clerical workers were more likely to choose it than females in the other two job types, indicating that this is the primary group perceiving reduced office stress to be a key advantage of telecommuting (pair-wise t-tests across occupations showed significantly different means between clerical workers and the other two groups, p-values < 0.02). Of the three job types, clerical workers may have the least control over their working conditions, and consequently, may feel more office stress. Stress was also differentially important to female professionals however; as Figure 1 shows, they were more than four times as likely as their male counterparts to cite this advantage ($p = 0.002$ for chi-squared test of gender difference within the professional workers group).

For the variable "help the environment by driving less", no chi-squared or t-test showed a significant difference among occupations or gender for 0.05, suggesting that this particular advantage is approximately equally important across the six study groups. The last variable, "more flexibility", showed significant occupation differences ($p = 0.006$), with professionals (8.5% of that group) most likely to cite it, managers next most likely (4.5%), and clerical workers least likely (1.3%).

It is interesting to note that the family-related advantages of telecommuting were separately not among the top six. Two such advantages combined, however, were most important for more than 10% of the overall sample (which would have placed family issues fourth in the ranking): "spend more time with my family" (5.1%) and "easier to handle dependent care" (5.0%). There were no significant gender or occupation differences for the variable "spend more time with family". The dependent care variable, on the other hand, showed significant differences for both gender ($p = 0.001$) and occupation ($p = 0.00001$).

Clerical workers (12.3%) were five and ten times as likely as professional (2.6%) and managerial (1.1%) workers to cite this advantage as most important, in support of O2 and consistent with the evidence in Table 4 that this group most often had dependents needing special care. Women (7.8%) were four times as likely as men (1.8%) to cite dependent care as an advantage, in support of hypothesis G1. This is especially telling since, as can be derived from Table 4, one-third more men (24%) in the sample had children under age 6 than did women (18%), and similar proportions of men (21%) and women (23%) had older children living at home. Interestingly, however, within occupation groups there were no significant gender differences, although cell sizes were generally too small to warrant emphasizing this outcome.

The difference in response patterns between the two family-related advantages of telecommuting is suggestive. It may well be the case that men and women are equally likely to see their family role in terms of spending time together, whereas women are more likely than men to see their family role in terms of caring for dependents. This finding illustrates the need to carefully define a "family" variable in this type of context.

A composite variable was created to combine the two family variables, and gender/occupation differences were tested for in the tendency to cite *either* variable as the most important advantage. The results for this composite variable roughly parallel those for the dependent care variable: there were moderately significant gender ($p = 0.06$) and very significant occupation ($p = 0.0006$) differences, in the same directions as before but with smaller contrasts between groups. Within occupation, there were no significant gender differences, although some cell sizes remained rather small.

Taken together, these results can be considered to offer only mixed or partial support for the hypothesis (G1) that women are more likely than men to cite family reasons as advantages of telecommuting.

Most Important Disadvantages

Turning to the most important disadvantage variables, the top six disadvantage variables shown in Figure 2 were collectively cited as most important by 84% of the overall sample: professional interaction (22.1%), career advancement (20.1%), social interaction (16.3%), negative management view (9.9%), better main office (9.1%), and motivation (6.2%). None of the remaining five disadvantages were most important for more than 4% of the sample. Taken together, these results suggest that workplace interaction, management visibility, and office discipline are important constraints in an individual's telecommuting preference formation.

Males (28%) were significantly more likely than females (17%) to report "reduced professional interaction" as the most important disadvantage of telecommuting ($p = 0.001$). However, it is clear that some women also feel this disadvantage is powerful, as the highest selection percentage (42%) of any one group came from the women managers. In terms of occupations, managers were much more likely to choose this disadvantage as most important ($p = 0.000$), partially confirming hypothesis O5. Fully 39% of the manager group cited this variable (by far the most-frequently-selected disadvantage for that group),

compared to 23% of professionals and 10% of clerical workers. Similarly, a related disadvantage of telecommuting, "reduced social interaction", also varied significantly across occupations (pooled chi-square p-value = 0.06), although not across genders. Interestingly, clerical (19%) and professional (17%) workers were about equally likely to cite this variable (t-test p = 0.692), and both groups were significantly more likely than managers to do so (t-test p-values of 0.011 and 0.008 respectively). Thus, as seen from the data, both females and males, and both professional and clerical workers, rated social interaction equally highly, which is broadly consistent with the literature cited in Section 3.1. This supports and modifies hypothesis O6.

"Career advancement" and "negative management view" were related disadvantages collectively chosen as most important by nearly a third of the sample. Both were notably more important to women (p-values < 0.03). Women (38%) were almost twice as likely as men (21%) to cite one of these two variables as the most important disadvantage, corroborating hypothesis G4. Lefkowitz (1994) found that "the importance of advancement" was one of only two job-related variables that women rated higher than men. The large difference between men and women in this area seems to point to a current corporate culture that is perceived by women to be biased towards male success.

A "better main office" and "motivation", two disadvantages dealing with office discipline, were selected as most important by 15.3% of the sample. This result suggests that office discipline issues represent an important area that individuals consider in their telecommuting preference formation. However, as responses were not significantly different among groups, office discipline disadvantages are apparently valued similarly across genders and occupations.

It is interesting to note that the three variables associated with benefits of commuting (see disadvantage statements 8-10, Table 1) did not have significantly different distributions across gender-occupation groups, and in fact, collectively only accounted for 5.0% of the choices for most important disadvantage. Thus, there is no support for hypothesis G5 among the most important rankings of this sample.

Advantage and Disadvantage Factor Scores

For the gender-occupation groups in this study, a two-factor analysis of variance (ANOVA) model was used to identify, for each factor score, significant gender main effects, occupation main effects, and interaction effects. (Note the two different, but equally conventional in separate contexts, uses of the word "factor"). Testing for a gender main effect compares males and females on each factor score to determine if the mean scores differ significantly by gender. Similarly, testing for an occupation effect examines whether the mean factor scores differ across the three job types. Testing for an interaction effect shows whether any change across gender type varies by occupation type (or conversely).

Plots of the mean factor scores for telecommuting advantages and disadvantages by gender and occupation are displayed in Figures 3 and 4. Note that factor scores are standardized, so negative values simply indicate a score that is less than the overall sample mean score for that factor. All nine factors are discussed below, eight of which have at least one significant main effect at 0.05. Although visually there may appear to be some interaction effects due to scale exaggeration, none were statistically significant.

Figure 2
Fraction of Respondents in Each Group Choosing Telecommuting Disadvantage as Most Important

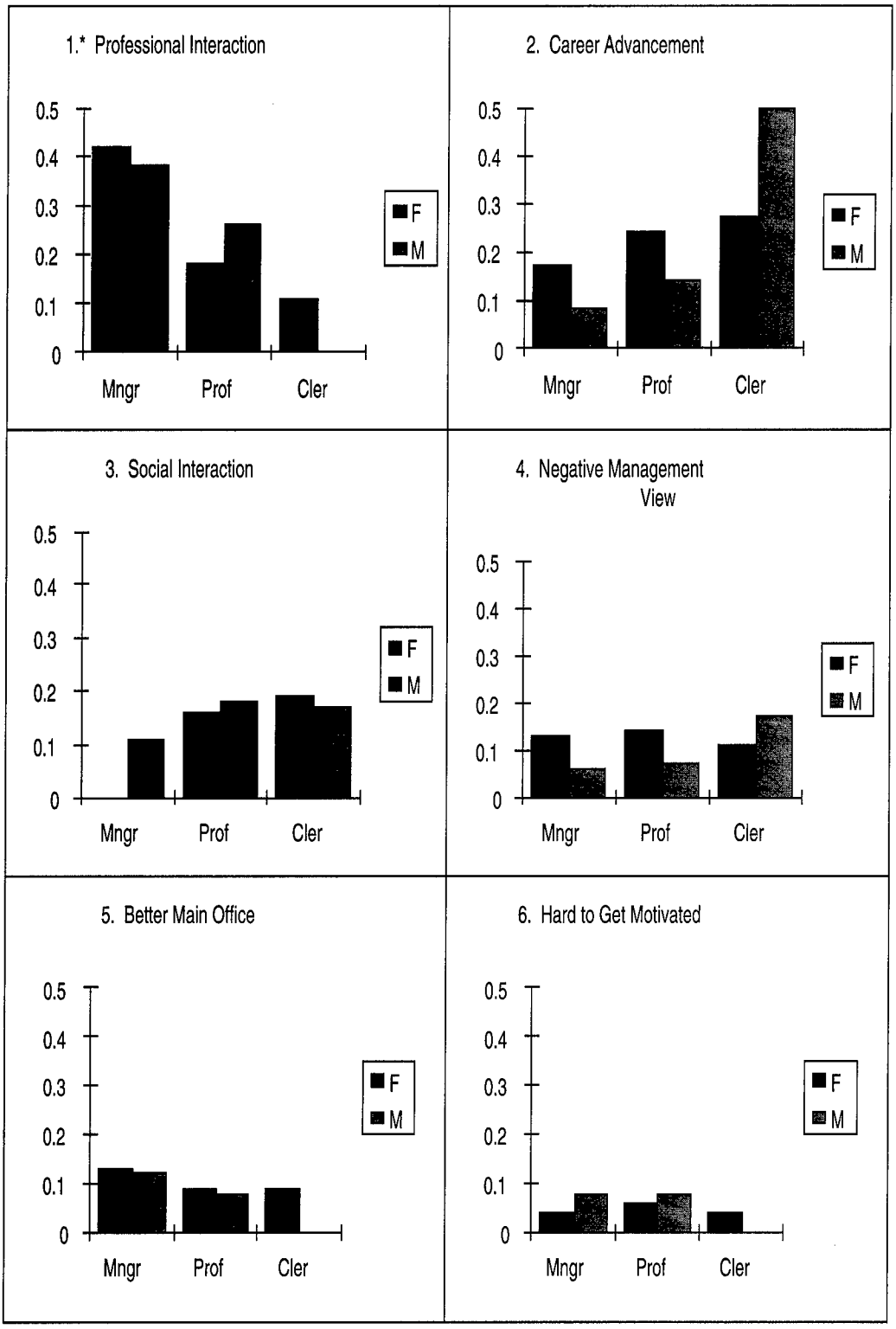
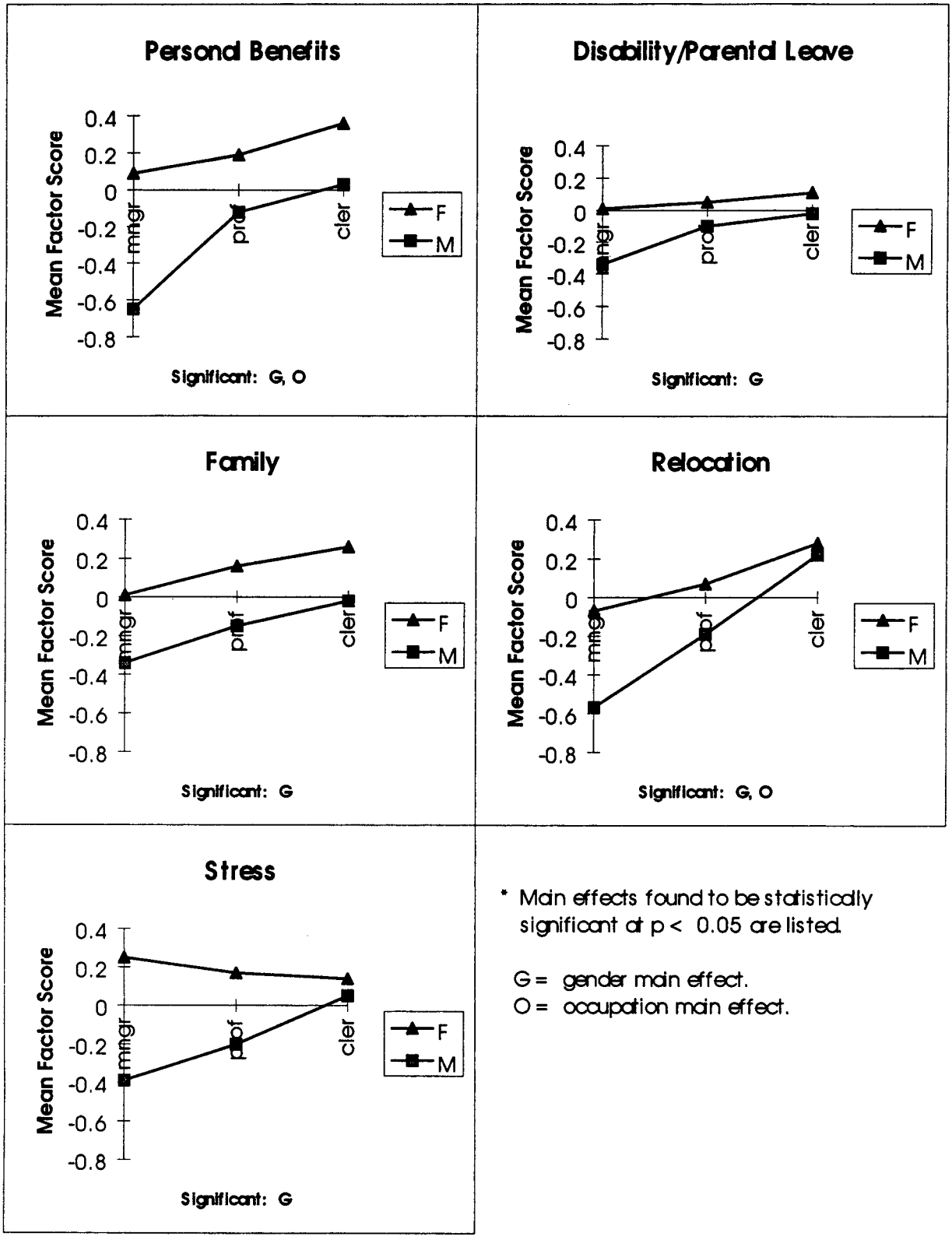


Figure 3
Plots of Mean Factor Scores for Telecommuting Advantages by Gender and Occupation



* Main effects found to be statistically significant at $p < 0.05$ are listed.

G = gender main effect.
O = occupation main effect.

Starting with the advantages, a couple of interesting observations emerge from looking at the five factors together. First, gender effects are significant in every case: specifically, for every factor and within every occupation group, mean scores for women exceed those of men. Evidently, the potential advantages of telecommuting are on average more salient to women than to men, which helps explain why women are significantly more likely to want to telecommute and which also generally corroborates hypotheses G1-G3. Second, in general for both women and men (but more strongly for men), managers have the lowest, professional/technical workers the next highest, and clerical workers the highest mean factor scores. These occupation effects are significant for only two of the five factors, but again they are consistent with the hypothesis that telecommuting will appeal the most to those who have a great deal of stress and the least amount of control over various aspects of their lives (see O2-O4).

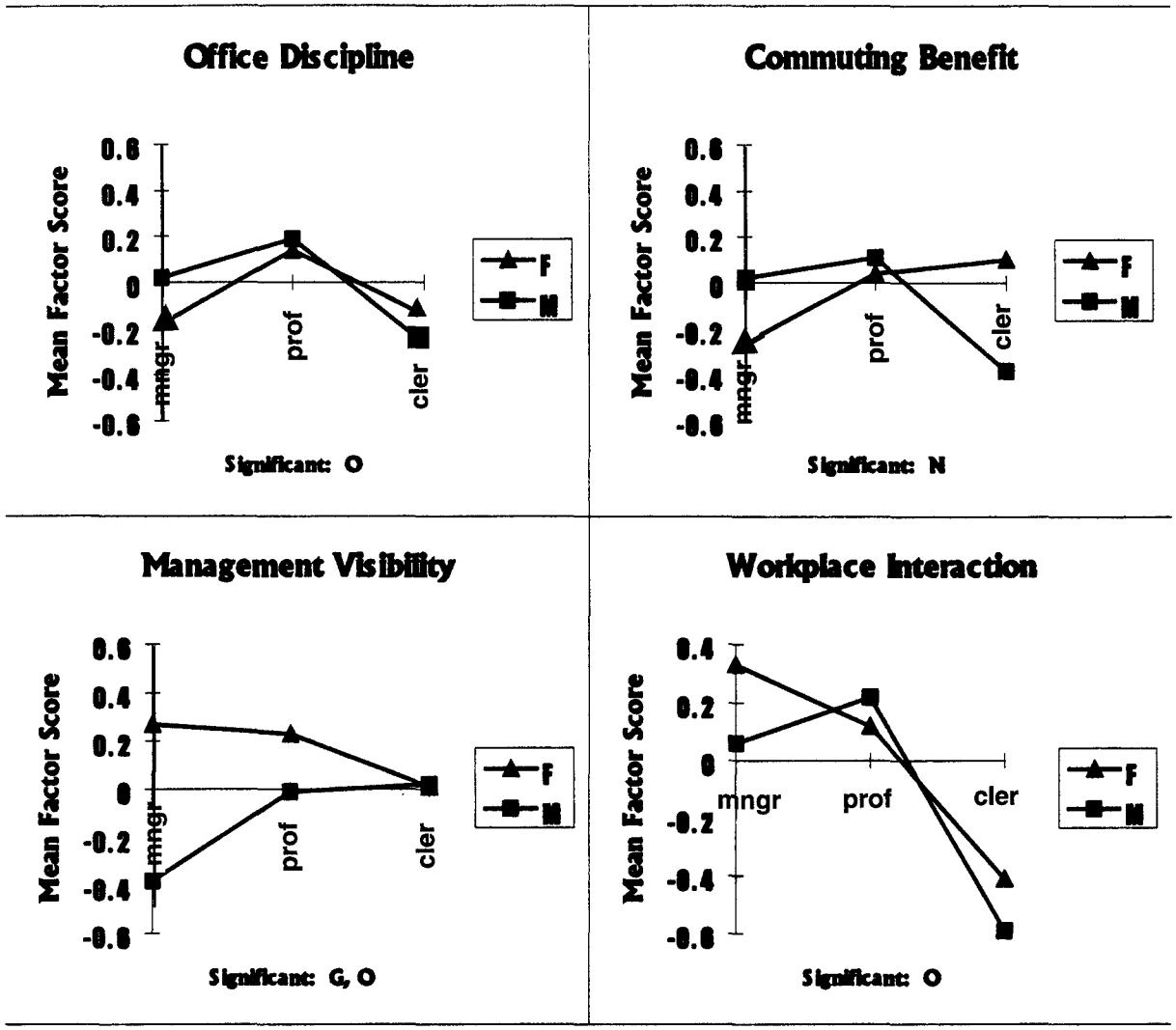
Turning to the personal benefits factor specifically (which, as shown in Table 1, is based on attributes such as having more time for self, and increasing independence, control, and flexibility), the ANOVA results show that both gender and occupation main effects are significant. Women rated that characteristic of telecommuting much more highly than men, and clerical workers found it much more important than the other occupations. This finding supports hypotheses G2 and O3.

Only the gender effect was significant for the two family-related factors, disability/parental leave and family. As noted, women on average rated these factors more highly than men, indicating that they perceive the ability to balance work and family as a valuable advantage of telecommuting (unambiguously supporting hypothesis G1, in contrast to the case for the most important advantage analysis). For the relocation factor, both gender and occupation effects were significant, with clerical workers placing the highest importance on the ability of telecommuting to allow them to continue to work in case of job or residential relocation. This is a natural result, since a clerical worker's job may well be most vulnerable to either type of relocation.

The last advantage factor, stress, had only a significant gender effect. Although an interaction effect is not significant, it is striking that males show a clear progression of increasing mean scores from managers (for whom reducing stress is not perceived to be an important advantage of telecommuting) to professional/technical workers, to clerical workers (in weak support of hypothesis O4). For females, on the other hand, the average scores across all three job types were quite similar. Either male managers do not experience as much stress as their female counterparts, or they do not see telecommuting as an answer to the stress they do experience. The former explanation seems more plausible.
Turning to the disadvantage factor scores, it is first observed that the systematic overall patterns noted for the advantage factors do not appear here. Gender effects are significant for only one out of the four factors, whereas occupation is significant for three. In general, the disadvantages of telecommuting appear to be somewhat more salient to professionals than to the other two job types.

The office discipline factor comprises attributes relating to problems associated with working away from the main office, such as having the right equipment, materials, and motivation. Self-motivation and self-discipline are often identified as characteristics of successful telecommuters (e.g., Katz, 1987). This factor displays a significant occupation effect, with professionals scoring more highly on this disadvantage of telecommuting than the other two groups. Professional/technical workers may have a greater need for access to sophisticated and expensive work tools (such as technical manuals and lab equipment), and their jobs may in some ways be the least routine (and therefore perhaps demanding more motivation to undertake outside the traditional office environment).

Figure 4
Plots of Mean Factor Scores for Telecommuting Disadvantages by Gender and Occupation



Main effects found to be statistically significant at $p < 0.05$ are listed.

G = gender main effect.
O = occupation main effect.
N = no significant main effect.

Management visibility, having both gender and occupation significant effects, is the only disadvantage factor that has a significant gender effect. The mean factor scores for women were higher than those for men, showing once again that women feel more strongly that telecommuting could negatively impact their careers (hypothesis G4). As expected, the male managers had the lowest mean factor score, indicating that they are more confident that telecommuting would not hinder their job advancement opportunities. The female clerical workers had the lowest mean factor score of the female occupation groups. It may be the case that female managers and professionals are more career-oriented than female clerical workers, and thus more concerned about being viewed positively for promotions.

Workplace interaction had a significant occupation effect. Clerical workers perceived the loss of interaction at the workplace to be less important than did professionals and managers. (The fact that the factor combines both social and professional interaction makes the relationship of this result to hypotheses O5 and O6 somewhat problematic). Rather, it is the female managers who score most highly on this factor. Overall, it appears that workplace interaction is important to both professionals and managers, which is consistent with the literature (Shamir and Salomon, 1985).

The only factor without a significant effect was the telecommuting disadvantage commuting benefit. Thus, there is no support for hypothesis G5 in this sample. As we have seen here and elsewhere (Mokhtarian and Salomon, 1996c) that women have higher scores on both general stress (analyzed here and containing some aspects of commute stress) and a specific commute stress factor (derived from attitudinal statements in another section of the survey), it may be the case that the negative aspects of the commute tend to outweigh the positive aspects in women's minds.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study has identified numerous gender- and occupation-related differences in the way telecommuting is perceived. Most broadly, women on average rated the advantages of telecommuting more highly than men—both overall and within each occupation group. Telecommuting appears to appeal more strongly to women as a solution to problems they face, although it is worth pointing out again that telecommuting was highly desirable to the men in this sample as well (preferred by 83% of men, compared to 92% of women).

Table 5 summarizes the key findings of this study. Nearly all of the specific hypotheses formulated from the literature and from judgement were corroborated to some degree by the empirical evidence. Women were more likely than men to cite family, personal benefits, and stress reduction as advantages of telecommuting, and more likely to see the lack of visibility to management as a disadvantage. Clerical workers were more likely than managers or professionals to see the family, personal, and office stress-reduction benefits of telecommuting as important, whereas managers and professionals were more likely to cite getting more work done as the most important advantage of telecommuting. Reduced social interaction appeared to be of about equal concern to both clerical and professional/technical workers, and reduced professional interaction was of greatest concern to managers and professionals. Professionals were more likely than the other two job types to see the lack of visibility to management and the need for discipline as disadvantages. The only hypothesis not corroborated at all by the data was that women would be more likely than men to see the benefits from commuting as a disadvantage of telecommuting.

Table 5
Summary of Results

GENDER-BASED RESULTS	OUTCOME/BASIS*
Prior Hypotheses	
G1: Women more likely to cite family reasons as benefits	yes: MI (partial), FS
G2: Women more likely to cite personal reasons as benefits	yes: FS
G3: Women more likely to perceive stress reduction as a benefit	yes: MI (office), FS (general)
G4: Women more likely to see lack of management visibility as a cost	yes: MI, FS
G5: Women more likely to see benefits of commuting as a cost	no
Other Gender Results	
Women more likely to see keeping same job after relocation as a benefit	yes: FS
Men more likely to see lack of professional interaction as a cost	yes: MI
OCCUPATION-BASED RESULTS	OUTCOME/BASIS
Prior Hypotheses	
O1: Managers and professionals more likely to cite work-related reasons as benefits	yes: MI (mgrs highest, profs next)
O2: Clerical workers more likely to cite family reasons as benefits	yes: MI, FS (weak but NS)
O3: Clerical workers more likely to cite personal reasons as benefits	yes: FS
O4: Managers less likely to perceive reduced stress as a benefit	somewhat: FS (weak but NS support for male mgrs)
O5: Managers and professional workers more likely to see reduced professional interaction as a cost	yes: MI (mgrs), FS (both prof and soc interaction)
O6: Clerical workers more likely to see reduced social interaction as a cost	yes, with profs: MI
O7: Professionals more likely to view lack of visibility to management as a cost	yes: FS
Other Occupation Results	
Clerical workers more likely to see reduced office stress as a benefit	yes: MI
Professionals more likely to see increased flexibility as most important benefit	yes: MI
Clerical workers more likely to see keeping same job after relocation as a benefit	yes: FS
Professionals about as likely as clerical workers to see reduced social interaction as a cost	yes: MI

* MI = most important advantage or disadvantage analysis; FS = factor score analysis; NS = not statistically significant.

Two immediate extensions of this research would be useful. The first is to incorporate the effects of having children at home into the analysis. It may be that some of the gender effects seen here are actually interaction effects of gender with children. Conversely, it may be the case that some effects which do not differ significantly across gender alone may differ depending on the presence or absence of children, or on a gender-children interaction. There may be children-occupation interaction effects as well.

The second useful extension of this research is to explore gender and occupation differences in the constraints on telecommuting. Table 4 shows that while women are more likely than men to prefer telecommuting, they are equally likely actually to be telecommuting. This suggests that constraints on the ability to telecommute are operating more strongly for women than for men. Conversely, there were no occupation differences in the preference to telecommute, but significant variations in the choice of telecommuting. Thus, constraints are operating differentially for occupations as well.

Mokhtarian and Salomon (1994) and others have identified a number of external and internal constraints on the ability/desire to telecommute. External constraints can be classified as relating to awareness, the organization, and the job, whereas internal constraints are psychosocial factors. Most of the latter (e.g. personal interaction needs, lack of discipline, benefit of commuting) have already been examined here in the study of perceived disadvantages of telecommuting. Data on the external constraints have been collected in the same survey used for this paper (see, e.g., Mokhtarian and Salomon, 1996a), and it would be relatively straightforward to examine these data for occupation and gender differences.

Telecommuting has been labeled a "complex solution"—that is, "a single intervention which is intended to solve many problems" (Salomon, forthcoming). In this study we see clear evidence that telecommuting appeals to people for a variety of reasons, and further that different reasons are important to different types of people. We also see evidence, as Salomon suggests, that the perceived costs of telecommuting are different for different people. What this study alone cannot answer is how closely the perceived benefits and costs match the reality once telecommuting is tried. Such knowledge will be important to assess whether telecommuting lives up to its promise, and whether its costs are fair and equitably distributed. The answers to those questions in turn will affect forecasts of future telecommuting adoption and the development of public policy on telecommuting. Hence, the study of gender and occupation differences in a multi-employer sample containing large numbers of (1) telecommuters, (2) those who want to telecommute but are not doing so, and (3) those who do not want to telecommute, would be extremely valuable.

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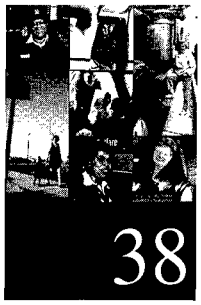

Behavioral Response to Congestion: Identifying Patterns and Socioeconomic Differences in Adoption

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BEHAVIORAL RESPONSE TO CONGESTION: IDENTIFYING PATTERNS AND SOCIOECONOMIC DIFFERENCES IN ADOPTION

ABSTRACT

An understanding of how individuals perceive congestion and the range of coping strategies they adopt is crucial for the development of relevant, effective policies. This study empirically tested two hypotheses: (1) that responses to unsatisfactory conditions, such as a congested commute, are a function of previously adopted adjustments, and (2) that responses to congestion are distributed differently across various socioeconomic segments. Coping strategies were classified into tiers according to their similarity in implementation cost and effort: lower-effort strategies which increase the comfort in maintaining existing travel patterns; moderate-effort strategies which tend to reduce travel; and major lifestyle/location change strategies such as job or residence changes. Findings confirm that lower-effort strategies tend to be adopted first, with higher-effort strategies adopted if dissatisfaction persists. The adoption of most types of strategies, especially the more costly ones, appears to fall disproportionately to women. Additionally differences were identified by family status, income level, employment status, and household type. These results illustrate the need for further study into patterns of behavioral response to congestion, with the goals of improving forecasts of the effects of congestion mitigation policies and identifying distributional inequities in those effects.

INTRODUCTION

Congestion is a well-known problem for modern city dwellers, and a major issue on the public, and consequently the political, agenda. It is not just a personal cost but a major social cost. The value of time lost due to congestion in the United States is estimated at $48 billion per year (Arnott and Small, 1994). All else equal, congested traffic produces more air pollutants than smooth traffic flow and consumes more energy.

Much of the attention of transportation policy makers and planners is focused on means to alleviate congestion. Congestion is commonly seen as a result of the gap between the direct costs to the individual and externalities imposed by the individual on others. As individual costs do not account for the full social costs, drivers are inclined to behave in a manner which is socially undesirable. This discrepancy between individual and social costs as the underlying cause of congestion must be borne in mind when policy measures to curb congestion are devised. Such policies often assume that an individual will respond in a manner congruent with the social objective. Very likely however, individuals will respond in a manner which best suits them. For example, while congestion is increasingly recognized as a major urban problem, it may not necessarily result in deteriorating travel times for individuals (Gordon et al., 1991; Levinson and Kumar, 1994). It is true that as cities and automobile dependence grow, congested traffic conditions persist for longer periods of time and on a growing geographical scale. However, individual commuters may adjust their behavior in a manner that does not result in increasing travel costs to them.

In a previous article, Salomon and Mokhtarian (1996) have addressed the gap between policy-makers' expectations and travellers' responses. It seems that in the face of increasing congestion, travellers adjust their behavior in ways which differ much from the responses expected by planners and policy-makers. Some eighteen responses identified as plausible personal adjustments, provide a useful perspective to assess policies designed to reduce congestion. The possible responses vary in their (generalized) cost of adoption and in their expected relief of the dissatisfaction associated with congestion.

Not only is the range of alternative adjustment strategies much wider than that commonly acknowledged by policy-makers, but it is also characterized by dynamics which result in diverse impacts on levels of dissatisfaction. The actual sequence of adjustments adopted by an individual is likely to be dependent on her or his previous experience.

Behavioral adjustments also differ in the distribution of costs and benefits, among the individual, household members, and society. Some adjustments entail only personal costs whereas others impose some costs on other household members. Consequently, understanding the distribution of costs and benefits seems to be of significant importance to the study of congestion mitigation policies.

Assuming that adjustment processes in fact involve the transfer of travel costs into other facets of life, we hypothesize that different market segments are likely to incur different shares of such reallocated costs. An obvious example is the withdrawal of women from the labor force if travel costs are too high, as they cannot always reallocate domestic responsibilities to others. Viewing the behavioral adjustments as a transfer of costs, either between different facets of one's lifestyle or between individuals within an household, implies that responses to policy measures are likely to have distributional effects. Some groups may be more likely than others to carry the burden of adjustments.

Thus, the objectives of this study were to test two hypotheses: (1) that responses to congestion are a function of previously adopted adjustments and (2) that the adoption of congestion-reduction policies is distributed differently across various socio-economic segments of the population. This paper presents the empirical evidence used to test these two hypotheses. Further work is in progress to estimate models describing behavioral responses to congestion as a function of previously adopted strategies and other explanatory variables.

The remainder of this paper is divided into four sections: Section 2 provides background information on coping strategies and describes the data set used in the study, Section 3 discusses the methodology and results of testing the first hypothesis through the identification of response patterns, Section 4 provides similar elaboration on testing the second hypothesis through an examination of the distributional effects of responses, and Section 5 presents a final discussion and conclusions.

While congestion is experienced on many urban trips, both work-bound and others, the current paper focuses only on work trips. We assume that the range of behavioral responses is dependent on the trip purpose, and thus dealing with non-work trips calls for a separate analysis.

THE DATA

BACKGROUND AND DESCRIPTION OF SAMPLE

An earlier paper (Mokhtarian and Salomon, 1994) presented a conceptual model of a decision-making process that is initiated when an individual is dissatisfied with one or more elements of her/his lifestyle. Key components in the decision-making process include (1) constraints or facilitators that, respectively, hinder a change or make it easier for one to occur and (2) drives that act as motivators for an individual to consider or adopt a change to the current situation. Although constraints and facilitators aid the process of making a lifestyle change, it is the presence of drives that results in an active search for alternatives. For example, in the context of facing a congested commute, eliminating a constraint such as lowering the cost will not alone cause an alternative to be chosen. A drive, such as the desire to have more leisure or family time, is also necessary to generate a change.

As part of this conceptual model, a choice set of potential responses to one or more of five lifestyle-related drives (work, family, leisure, environmental ideology, and travel) was identified. A questionnaire was developed for the purpose (among others) of obtaining data on the adoption and consideration of these alternative responses. The data used in this study were collected via administration of the questionnaire in December 1992 to employees of the City of San Diego, California. The final data set contained 621 usable responses, including detailed information on previous and potential adjustments to satisfy lifestyle drives; attitudes toward work, family, and commuting; and demographic data. A more detailed discussion of the survey, sampling frame, and previous results can be found in Mokhtarian and Salomon (1996).

Of particular interest to the present study were five variables drawn from the survey that described the family status, annual household income, employment status, household type, and gender for each respondent. Table 1 summarizes the distribution of respondents on each of these variables.

Table 1
Sample Distribution of Key Characteristics (N=621)

Category	No.	Percent	Category	No.	Percent
Family Status			**Employment Status**		
Single	121	19%	Sole employed worker	218	35%
2+ adults, no children	276	45%	F/T with other HH workers	377	61%
1 adult, with children	20	3%	P/T with other HH workers	26	4%
2+ adults, with children	204	33%			
Income			**Household Type**		
			One-adult	141	23%
Less than $15,000	5	0.8%	Two-adult (or more)	480	77%
$15,000 - $34,999	111	18%			
$35,000 - $54,999	193	31%	**Gender**		
$55,000 - $74,999	141	23%	Female	328	53%
$75,000 - $94,999	92	15%	Male	292	47%
$95,000 or more	70	11%	Missing	1	0.2%
Missing	9	1%			

The family status variable contained four categories that described household composition in terms of the number of adults and children present. A plurality of respondents (45%) lived in two-adult households with no children. A third lived in two-adult households with children. About a fifth (19%) lived alone, and 3% were single adults living with children. Since the latter category was too small to subdivide by gender (there were only two single fathers in the sample), it was combined with the category containing two or more adults with children after experimentation determined that results did not differ materially between combining it or eliminating it entirely.

The highest percentage (31%) of respondents had annual household incomes between $35,000 and $54,999 per year. The five respondents having annual incomes less than $15,000 were combined with the next higher category in the analysis that follows. Employment status was divided into three categories, in which (1) the respondent was the sole employed household member (35%), (2) the respondent was employed full-time with other employed household members (61%), or (3) the respondent was employed part-time with other employed household members (4%). Household type, while similar to family status, segmented the sample by the number of adults in a household rather than by the presence of children. Single-adult households accounted for 23% of the respondents and two- (or more) adult households accounted for 77%. Lastly, the sample was fairly evenly split between females (53%) and males (47%).

BEHAVIORAL RESPONSES TO CONGESTION

In one section of the survey, respondents were asked to indicate which of 23 responses or adjustments to lifestyle drives they (1) "have already done," (2) "have been considering," or (3) "have not seriously considered." Eighteen of those alternatives could be considered responses to a travel drive, specifically the drive to reduce the personal impacts of congestion. It is these responses or coping strategies that constitute the focus of the present study. A commuter may adopt any number or combination of such strategies in response to an unsatisfactory condition. Table 2 provides a listing of these coping strategies, lettered and worded as they appeared in the survey, but ordered differently as explained in Section 3.

It is necessary to point out that there might be some inherent limitations in the use of these data (which were collected primarily for a study of telecommuting) for the present purpose. First, although some of the strategies in Table 2 (e.g. e, q, s) were worded to relate specifically to congestion, most of them can also be adopted in response to drives other than congestion, as noted in Mokhtarian and Salomon (1994). In the next stage of analysis, models of considering various strategies as a function of commute characteristics (including perceptions of congestion) will be formulated. These models will clarify the nature and strength of the relationship between congestion and the consideration of these strategies. Second, some of the questions did provide a time frame for the adoption of the action, but some did not, and even for those which did, the exact timing was not well-defined. For example, respondents were asked, "Within the last two years, have you moved your residence closer to your job?". There is little difference, from this research perspective, if it were two or three years ago, but there is a difference if it were last month or 23 months ago. This is because, with increasing congestion, the benefit delivered by a change will attenuate over time, so that the time since a change was made becomes an important explanatory variable of the likelihood of considering another change (Salomon and Mokhtarian, 1996). Such a resolution is lacking here. Nevertheless, it is believed that in the aggregate, the behavior observed in this sample has something meaningful to say about the collective response to congestion.

Table 2
Survey Questions on Lifestyle-Driven Responses

Statement: For each of the items listed below, please indicate whether you have (1) already made that choice, (2) been considering that choice, or (3) not seriously considered that choice.

		Rank Based on Adoption *(Increasing freq. of category 1 responses)*	Rank Based on Lack of Consideration *(Decreasing freq. of category 3 responses)*	Combined Final Ranking *(Based on sum of previous 2 ranks)*
a.	Buy a car stereo system	2	1	1
e.	Within the past year: Change work trip departure time to avoid congestion	1	2	1
j.	Adopt flextime	3	3	3
I.	Hire someone to do house or yard work to save time	4	5	4
c.	Buy/lease a better car	7	4	5
d.	Buy/lease a more fuel efficient car	6	6	6
l.	Within the past year: Change means of travel to work (such as from driving alone to carpooling)	5	8	7
m.	Buy a home computer to be used for work	8	7	8
o.	Telecommute from home (part or full time)	10	9	9
n.	Buy other equipment/services to help me work from home	9	11	10
t.	Within the past 2 years: Work part-time instead of full-time	11	14	11
k.	Adopt compressed work week (such as a "4/40" or "9/80" schedule)	15	10	11
v.	Within the past 2 years: Start a home-based business (or put more effort into an existing one)	13	13	13
b.	Acquire a cellular phone	14	12	13
s.	Move my home closer to the job I have now	12	17	15
q.	Change to a new job closer to my current residence	16	15	16
w.	Retire or stop working by choice	17	16	17
p.	Telecommute from a local work center (part or full time)	18	18	18
f.	Within the past year: Change work trip departure time for personal reasons	N/A[1]	N/A	N/A
g.	During the past 6 months: Work unpaid overtime	N/A	N/A	N/A
h.	During the past 6 months: Take work home	N/A	N/A	N/A
r.	Within the past 2 years: Change to a new job at the same location as before	N/A	N/A	N/A
u.	Within the past 2 years: Work full-time instead of part-time	N/A	N/A	N/A

[1]The last five strategies are considered to be responses to lifestyle drives other than travel, and are not analyzed here.

When analyzing the data used in this study, seven cases out of an original 628 were identified as missing 17 or more of the travel-related responses and were discarded. Of the remaining 621 cases only 46 were missing any data in the section on responses to lifestyle drives. The majority of these (36 or 78%) were missing only one out of the 18 travel-related responses; the remaining ten were missing between two and four responses. All of these missing data were recoded to the most common response for that survey question, and 621 cases were retained in the final working database.

IDENTIFYING PATTERNS OF RESPONSE

The coping strategies shown in Table 2 can be grouped according to several different characteristics. First, they differ temporally, with some that may be adopted in the short term, others that may be adopted at a longer range, and still others that may be adopted in a very long time range. Secondly, the responses differ in their cost of adoption (monetary and non-monetary). In general, those with a shorter adoption time correspond to a lower total cost and those involving the longest time to adopt are the most costly.

Although the strategies were designed to reflect different levels of implementation cost or effort, it is unrealistic to expect each and every strategy to be tried in turn because (1) some strategies effectively preclude others, (2) several responses may accomplish roughly the same purpose, and (3) unknown constraints may prevent the adoption of some strategies. Thus, we want to identify groups or tiers of strategies having similar costs and/or that accomplish similar objectives. Once the strategies are classified into tiers, we can test the hypothesis that responses to congestion are a function of previously adopted adjustments. If this is true, we should see patterns of responses where lower-cost strategies or options are adopted first, followed by the adoption of successively higher-cost strategies. That is, when higher-cost strategies are adopted, it should most often be the case that lower-cost strategies have already been adopted. To test this hypothesis the data were first grouped into tiers, responses for each tier were then studied, and the resulting patterns were identified.

CATEGORIZING RESPONSES INTO TIERS

Two different methods were used as a basis for developing a hierarchical structure of coping strategies. The first method used the actual responses to the survey questions to rank and group strategies. In the second method, a factor analysis of the responses was performed to identify tier groupings. In both cases, the methods were used to generate an initial structure which was then slightly modified judgmentally to achieve greater conceptual clarity.

Rank Ordering

Rank ordering partitions the coping strategies into tiers based on the empirical frequency of their adoption and consideration. The assumption is that this frequency reflects the respondents' collective perceptions of the implementation cost or effort required for each group of strategies. Those strategies that "have already been done" by the most people are those with relatively lower costs. Similarly, the strategies that were "not seriously considered" by the fewest number of people should be those with relatively low implementation cost. Combining the rank orderings of those strategies that have been adopted the most often with those that have not been considered the least often provided a robust basis for constructing three tiers that reflect low, medium, and high implementation cost. Table 2 lists both the individual and final (combined) ranking scores for each survey question. The final rankings were then used to create a three-tier structuring of the coping strategies.

Table 3
Rank Order and Factor Analysis Tier Structures

Tier Description Strategies	Cost	Term
Rank-Based Tiers		
1. Travel maintaining		
Buy a car stereo system		
Change work trip departure time to avoid congestion		
Adopt flextime		
Hire someone to do house or yard work to save time		
Buy/lease a better car		
Buy/lease a more fuel efficient car		
Acquire a cellular phone	Low	Short
2. Travel reducing		
Change means of travel to work		
Buy a home computer to be used for work		
Telecommute from home		
Buy other equipment/services to help me work from home		
Adopt compressed work week		
Telecommute from a local work center	Moderate	Medium
3. Major location/		
lifestyle change		
Work part-time instead of full-time		
Start/enhance a home-based business		
Move my home closer to the job I have now		
Change to a new job closer to my current residence		
Retire or stop working by choice	High	Long
Factor-Based Tiers		
1. Auto improvement		
Buy a car stereo system		
Acquire a cellular phone		
Buy/lease a better car	Low	Short
2. Departure time		
Change work trip departure time to avoid congestion	Low-Moderate	Short
3. Work schedule change		
Adopt flextime		
Adopt compressed work week	Moderate	Short
4. Remote work Buy a home computer to be used for work		
Buy other equipment/services to help me work from home		
Telecommute from home		
Telecommute from a local work center	Moderate-High	Medium
5. Relocation		
Change to a new job closer to my current residence		
Move my home closer to the job I have now	High	Long
6. Work/lifestyle change		
Work part-time instead of full-time		
Start/enhance a home-based business		
Retire or stop working by choice	High	Long

As shown in Table 3, each of the three tiers reflects a difference in implementation difficulty and cost, with Tier 1 composed of strategies that were adopted or considered the most frequently and Tier 3 containing strategies that were adopted or considered least often. Tier 1 strategies are short-term, low-cost, strategies referred to as *travel-maintaining*. The purpose of Tier 1 strategies is to *reduce the cost of traveling* (e.g. to make it more comfortable) *rather than to reduce the amount of travel itself.* By contrast, Tier 2 contains *travel-reducing* strategies that are medium-term and require a moderate implementation cost. Tier 3 strategies are *major location/lifestyle changes* that are implemented in the long-term and have the greatest expense.

In grouping strategies into the tiers, a few strategies were judgmentally moved into a tier different from that indicated by their empirical rank in order to create a better fit with tier characteristics. Option "p", "telecommute from a local work center, part- or full-time," received the lowest rank of all responses. Telecommuting from a local work center was not common when the data were collected in 1992. It could not have been chosen by many and is unlikely to have been considered or well-understood by survey respondents. However, availability aside, in terms of time frame and cost of implementation it resembles Tier 2 strategies more closely than Tier 3 strategies. For this reason, it was moved to the medium-term travel-reducing strategies of Tier 2, to reflect an expected outcome as working from a telecenter becomes more common.

Additionally, in summing the ranking scores there were three sets of ties, most importantly between the scores for strategies "t" and "k" and between the following pair "v" and "b". Based on the characteristics of other responses in each tier, options "t" ("work part-time instead of full-time") and "v" ("start a home-based business or put more effort into an existing one") were assigned to Tier 3 whereas option "k" ("adopt compressed work week") was assigned to Tier 2. Option "b" ("acquire a cellular phone") was assigned to Tier 1. The empirical ranking of option "b" was again assumed to be a consequence of the relative unavailability of cellular phones in 1992. As expense falls and coverage rises, it is more appropriately considered a Tier 1 strategy.

It should also be noted that strategy "i", "hire someone to do house or yard work to save time," is somewhat different in nature from the other options in Tier 1. However, because it allows time to be spent on existing travel, by having others take on house or yard work, rather than reducing travel time so that respondents could spend that time on domestic work themselves, it was retained with the other travel-maintaining options.

Factor Analysis

A factor analysis of the survey data was also conducted to group those responses with common patterns of variation across the sample. The scree plot from an unrotated factor solution matrix was examined to suggest the number of factors needed, and four-, five-, and six-factor solutions were created using principal axis factoring and varimax rotation methods. The five-factor solution provided the most interpretable results and was used as a basis for the six-tier structure presented in Table 3. The results, shown in Table 3, also separated the strategies, fairly distinctly, by type: (1) auto improvement, (2) departure time, (3) work schedule change, (4) remote work, (5) relocation, and (6) work/lifestyle change.

The Tier 1 elements of the six-tier factor-based structure are short-term, low-cost, auto improvement strategies. Tier 2 contains the low-to-moderate-cost, short-term strategy "e", "change work trip departure time to avoid congestion." Although this strategy ranked number one in adoption, collectively strategies "a", "b", and "c" of Tier 1 had a greater percentage of adoption (58.9%) than strategy "e" alone (51.2%). This suggests that Tier 2 represents at least a slightly higher-cost strategy than Tier 1, which is plausible in

view of the fact that, unlike Tier 1 strategies, adoption of Tier 2 may necessitate the reallocation of household assignments. The purpose of both Tier 1 and Tier 2 strategies is to reduce the *cost* of traveling (e.g. to make it more comfortable or less stressful).

The more costly work schedule strategies of Tier 3, "adopt flextime" or "adopt compressed work week", differ from Tier 2's "change work trip departure time" in their perceived commitment level and availability at the work place (as well as in their potential impact on the household). Both flextime and compressed work week schedules are formalized arrangements that may require managerial approval or company existence of these programs, whereas changing work trip departure time can be adopted on an *ad hoc* basis. Nevertheless, assuming the existence of these programs in the organization, they can be adopted by the individual quite quickly. The remote work elements of Tier 4 also require formal programs or managerial approval, and are likely to be less readily available or easy to implement than work schedule changes. The impacts on the household may be stronger as well. Hence Tier 4 is arguably somewhat farther along the scales of both implementation cost and term than Tier 3. Nevertheless, both Tiers 3 and 4 contain strategies that have the potential to reduce the *amount* of travel (with the exception of strategy "j", "adopt flextime"). The strategies of Tiers 5 and 6 combined recreate the most costly tier of the three-tier rank-based structure. They involve relocation and work/lifestyle changes that are both very high in cost and require long-term implementation, and were judged to be of equal difficulty in adoption.
Similarly to the creation of the rank-based tier structure, several strategies were eliminated from the tier indicated by their factor loadings or moved to another factor, to create a better fit with tier characteristics. Because option "i", "hire someone to do house or yard work to save time", loaded oddly on Tier 5 (work/ lifestyle changes), and it, along with option "d", "buy/lease a more fuel efficient car", had weak connections as direct responses to a congested commute, they were eliminated. Option "l", "change means of travel to work (such as from driving alone to carpooling)", was ambiguous in its responses as to the direction in which the mode change occurred, and so it too was eliminated here. All three strategies will be examined in the modeling phase of the project to assess the extent to which congestion contributes to their consideration by a respondent.

Two options were moved to different factors: option "p" (telecommute from a local work center) loaded with the relocation strategies but was moved to the remote work factor, and option "v" (start/enhance a home-based business) loaded weakly on the relocation factor but was moved to the work/lifestyle factor. Finally, option "e" (change work trip departure time), which loaded with options "j" and "k" (adopt flextime and compressed work week), was placed in a separate tier for the reasons discussed above (i.e. differences in implementation cost).

Comments

Both the ranking and factor analysis methods resulted in similar tier structures with the most costly tiers identified by both methods being identical after minor adjustments (containing options q, s, t, v, and w). As with the three-tier rank-based structure, each of the six factor-based tiers represents a difference in implementation difficulty and cost. Both sets of tier structures are useful. From a policy analysis perspective, categorizing on the basis of travel impacts (maintaining travel, reducing travel, altering home-work locations), as the three-tier structure explicitly does, makes sense. However, the six-tier structure, based on conceptual similarities among strategies, may more closely reflect the bundles of strategies as they are perceived by individuals. Strategies within a given bundle represent, for the most part, alternative ways of accomplishing the same objective, and an individual is likely to select just one of them at a time. The six-tier structure also offers a more finely-grained assessment of implementation cost and term. For example, Tier 1 of the three-tier structure groups auto improvement strategies together with some of the

schedule change strategies, creating an overall low-cost, short-term tier. The six-tier structure, however, separates these strategies and recognizes the higher total cost of changing work trip departure time or adopting flextime compared to making auto improvements. For both of these reasons, the six-tier structure may constitute a stronger basis for evaluating distributional impacts.

Because the main focus of this study is on understanding the patterns and distributional impacts of adoption, we adopted the factor-based six-tier structure for the distributional analyses of Section 4 after preliminary exploration suggested that substantively similar results would be obtained with both methods. With the tier structure in place, the next step is to examine whether patterns of response are consistent with the hypothesized ordering of lower-cost strategies being adopted first, followed by successively higher-cost strategies.

TESTING THE HYPOTHESIS OF ORDERED RESPONSE PATTERNS

It is hypothesized that when faced with an unsatisfactory condition such as a congested commute, and motivated to make a change, individuals will adopt strategies in an ordered pattern. It is hypothesized that they will adopt the lower-cost, shorter-term, travel-maintaining strategies first, and then if the unsatisfactory condition persists, adopt successively higher-cost and longer-term strategies that not only reduce travel, but may eventually result in a major location/lifestyle change. This section develops a method for identifying patterns of response and then tests the level of compliance of respondents in the sample data with the hypothesized ordering.

Patterns of Response

To test whether adoption of responses followed a sequential ordering (lower to higher cost), a binary variable was created for each of the six factor-based tiers. The idea is to set the variable corresponding to each tier equal to "1" if that tier can be considered to have been adopted; the question is what criterion for adoption to use. As mentioned earlier, selection of one strategy may effectively preclude others (especially others within the same tier) from being chosen, and several strategies within a given tier may be approximately interchangeable. For example, in Tier 5 option "q" ("change to a new job closer to my current residence") and option "s" ("move my home closer to the job I have now") are similar strategies that accomplish roughly the same thing. It would not be reasonable to require both strategies to have been adopted in order to consider that tier implemented by a respondent. This is especially true of the more costly strategies of the last three tiers.

Because of these considerations, the variable corresponding to each tier was assigned a "1" if the respondent had "already done" at least one of the strategies within that tier. If no strategy within that tier had been adopted, the variable was set equal to "0". Further, for this part of the analysis, Tiers 3 and 4 and Tiers 5 and 6 were combined. The basis for doing so was that each member of the pair was of approximately equal implementation cost and somewhat interchangeable with the other member (adopting a strategy in one tier of the pair made it rather unlikely that a strategy in the other tier would also be adopted in the same time frame). Even though Tier 4 was argued to be farther along the implementation cost and term scales than Tier 3, there is some evidence that schedule change and telecommuting options are seen as somewhat interchangeable ways of reducing the number of weekly commute trips. In fact some organizations explicitly prohibit an employee from engaging in both telecommuting and compressed work week schedules at the same time (Pratt, 1991).

Hence, the variables for all six tiers were combined into a sequence of four ones and zeros for each case that indicated the order and pattern of responses. For example, respondents who had adopted a Tier 1 and either a Tier 3 or 4 strategy, but not a Tier 2, 5, or 6 strategy, would have a "1010" response pattern. There were 2^4 or sixteen possible patterns of "1"s and "0"s.

Level of Compliance

Some patterns of adoption (e.g. "1111", indicating the adoption of a strategy in each tier) unambiguously comply with the hypothesis. For those patterns that do not, degrees of compliance can be distinguished. A measure of the lack of compliance of response patterns to the hypothesis was developed as follows. Taking the approach that a violation in a higher tier is a more serious breach of the hypothesis than a lower-tier violation, each pattern was assigned a penalty of "I" points for an "incorrect" zero in the *ith* position, where "incorrect" means skipping a lower-cost tier to adopt a higher-tier strategy. For example, a pattern of "0001" for the six tiers would receive six penalty points for having "incorrect" zeros in the first (one point), second (two points), and third (three points) positions. A pattern of "1100" would receive no penalty points because it follows the hypothesized order of adopting lower-tier strategies before higher-tier ones.

Figure 1 shows the observed and expected responses for each level of compliance score for the six-tier solution. The expected number of responses corresponding to each level of compliance is obtained (under the null hypothesis of independence) by multiplying the marginal probabilities of adoption or non-adoption of each tier and the total sample size. For example, the expected number of people exhibiting the pattern "1100" is 0.589 x 0.512 x 0.451 x 0.781 x 621 = 66, where the four proportions in the product are the estimated marginal probabilities of adopting Tiers 1 and 2 and not adopting Tiers 3, 4, 5, or 6, respectively (see Table 4 which tabulates the percentage of respondents adopting, as well as considering, each tier).

Table 4
Adoption and Consideration of Tiers

	Percent Adopting	Percent Considering
Rank-Based Tiers		
1	88.4	62.8
2	52.8	58.8
3	21.9	38.0
Factor-Based Tiers		
1	58.9	43.8
2	51.2	7.6
3	39.0	38.6
4	31.6	42.7
5	9.2	16.7
6	13.7	30.3
3 and/or 4	54.9	59.4
5 and/or 6	21.9	38.0

As seen, 54% of the respondents (334 out of 621) are observed to follow the hypothesized ordering exactly, whereas only 44% (276) are expected to do so under the null hypothesis of independence. An additional 17% violated the hypothesis only in skipping the lowest-cost tier, and 11% skipped just the second tier. (The procedure was also repeated for the rank-based three-tier structure, which had eight possible patterns, with similar results as shown in Figure 2. Compliance scores of "0" and "1" represented 92% of the cases). It should be noted that the more detailed six-tier structure will naturally have a lower percentage of compliance than the three-tier structure as it would be easier to skip tiers with a smaller number of strategies. Further, with smaller tiers it is more likely that all the strategies of some tiers (e.g. both flextime and compressed work week) would not be available to the respondent.

A chi-squared test can be conducted to test the null hypothesis that tiers are adopted independently of each other. Since we are testing for the independence of each dimension of a 2x2x2x2 contingency table (two levels for each of the four tiers or tier combinations), the degrees of freedom for the test are calculated as the number of parameters in the saturated log-linear model (16) minus the number in the independence model (5), i.e., 11 (Christensen, 1990).

The test statistic for the six-tier structure is computed to be 46.31, which results in rejecting the null hypothesis at $p = 0.000$. Thus, we statistically reject the hypothesis that tiers are adopted independently. For the three-tier structure the degrees of freedom are 4 and the calculated chi-squared test statistic is 11.86, which also results in rejecting the hypothesis that the tiers are adopted independently at $p=0.018$.

It is possible to estimate log-linear models to identify more precisely the relationship among the various tiers. However, the main point is that, in keeping with the hypothesis of this study, adoption of each tier is not independent of the others. From Figures 1 and 2 we observe qualitatively that the dependence takes the expected form: specifically, respondents are more likely to adopt tiers in the order of lowest to highest cost than would be expected under the independence hypothesis.

DISTRIBUTIONAL EFFECTS OF RESPONSES

METHODOLOGY

The second hypothesis of this study is that the adoption (and consideration) of congestion-reduction strategies is distributed differently across various socio-economic segments of the population. To test this hypothesis, the binary tier adoption variables described in Section 3.2 were used (for the six-tier structure), and similar binary variables were created for having considered each tier. That is, the consideration variable for a given tier was set equal to one if the respondent had seriously considered at least one strategy in the tier. Table 4 presents the percentage of respondents who adopted and considered each tier.

Each tier variable was cross-tabulated with the demographic variables presented in Table 1: family status, income level, employment status, household type, and gender. Chi-squared tests of independence were performed to identify whether differences existed in the adoption or consideration of coping strategies between the subgroups of each demographic variable. Table 5 summarizes the results and describes the significant differences between subgroups for the adoption of strategies. Because there were relatively few significant results for the consideration variables they are not presented in table form here. They are mentioned, where appropriate, in the text. Table 5 presents the tier number and socio-economic variable for which the difference occurred, the p-value associated with each difference, and an interpretation of the results. In particular, the interpretation of results provides the percentage of respondents in the base category who chose the tier, and the probability ratio of adoption for that base category against each other

subgroup within the variable. The significance of the difference is indicated by the number of asterisks on the probability ratio, as described in the table footnote. For example, 45% of the females in the sample adopted a Tier 3 strategy; females were 1.4 times as likely as males to do so, and the difference is significant at a p-value < 0.01.

Further comparisons were made through subdividing each demographic subgroup by gender. Where the previous tests identified differences across the subgroups within each variable, these chi-squared tests identified whether there were significant differences between males and females within each subgroup. Table 6 summarizes the results for the adoption of a strategy. The table lists the main demographic factor, each subgroup within that factor, sample sizes for females and males respectively, and for each significant difference that occurred between male and female respondents, the percentage of females choosing a strategy within a tier and the probability ratio of females to males is provided. For example, 57% of the 69 females within the "single" category of the family status factor chose Tier 2. Females in this group were 2.3 times as likely as males within the same group to adopt a Tier 2 strategy, with a p-value less than 0.01.

RESULTS

The results indicate that there are significant differences in adoption of coping strategies – primarily by gender, and secondarily by family status, income, employment status, and household type. The main results from Table 5, describing the differences between socio-economic subgroups for the adoption of strategies, are discussed below:

Gender:

Whenever there were significant gender differences – i.e. for four out of the six tiers – females were more likely than males to have adopted a strategy within the tier. In particular, they were 1.3 - 1.4 times as likely as males to change their work trip departure time or change their work schedule. They were also 1.5 and 1.9 times as likely as males to have adopted the costliest strategies of Tiers 5 and 6, respectively. There were no significant differences between males and females in the adoption of Tier 1 (auto improvement) or Tier 4 (remote work) strategies. (Females were, however, 1.2 times as likely as males to *consider* a remote work strategy of Tier 4.)

Family Status:

Respondents living in 2- or more-adult households without children were 1.1 - 1.3 times as likely as others (singles or households with children) to change their work trip departure time. This is not unexpected as households without children have fewer constraints than households with children. However, it is unclear why this tendency was not also exhibited by single-person households. It may be a reporting bias, as such a change would be less disruptive and hence less easily recalled for a single person.

Additionally, single-person households were less likely to adopt a remote work strategy, but they were 1.9 - 2.3 times as likely to relocate either their households or their jobs. Both of these results are expected as single adults are likely to value the social interaction at the work place more highly (Pratt, 1984; Shamir and Salomon, 1985) and also have fewer constraints when moving or changing jobs.

Table 5

Socio-Economic Differences in the Adoption of Coping Strategies

Demographic Variables	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
(Sample Size)	(a, b, c)	(e)	(j, k)	(m, n, o, p)	(q, s)	(t, v, w)
	Percent of base category choosing					
	Probability ratio of base category to others					
Gender						
Female (328)						
Male (292)		58% of females	45% of females		11% of females	18% of females
		1.3 x males	1.4 x males		1.5 x males	1.9 x males
		***	*		***	***
Family Status						
Single (121)		55% of group 2		23% of group 1	16% of group 1	
2+ adults, no						
children (276)		1.3 x group 1		0.69 x group 2	1.9 x group 2	
1+ adult(s), with children (224)		1.1 x group 3		0.69 x group 3	2.3 x group 3	
		*		*	**	
Income						
$0 - $34,999 (116)	73% of group 5	45% of group 2		40% of group 5	5% of grups 3, 4, 5 combined	22% of group 1
$35,000 - $54,999 (193)	1.7 x group 1	0.82 x group 1		2.0 x group 1	0.36 x group 1	1.8 x group 2
$55,000 - $74,999 (141)	1.2 x group 2	0.75 x group 3		1.3 x group 2	0.33 x group 2	2.3 x group 3
$75,000 - $94,999 (92)	1.2 x group 3	0.96 x group 4		1.2 x group 3		1.4 x group 4
$95,000 or more (70)	1.2 x group 4			1.1 x group 4		1.5 x group 5
	***	*		**	***	*
Employment Status						
Sole employed			54% of group 3			77% of group 3
worker (218)						
F/T with other HH			1.6 x group 1			5.1 x group 1
workers (377)			1.3 x group 2			9.0 x group 2
P/T with other HH workers (26)			*			
Household Type						
1 adult (141)				34% of group 2	15% of group 1	
2+ adult (480)				1.4 x group 1	2.0 x group 2	
				**	***	

* indicates a p-value< 0.1
** indicates a p-value< 0.5
*** indicates a p-value< 0.1

Income

There were significant differences among income groups in the adoption of strategies in five out of the six tiers. Most interesting, the highest-income respondents were 1.2 and 1.7 times as likely as other income levels to adopt the lowest-cost strategies of Tier 1 and were 1.1 to 2.0 times as likely to adopt the remote work strategies of Tier 4, perhaps because they both involve higher out-of-pocket costs than, say, the time-changing strategies of Tiers 2 and 3. Conversely, the lowest-income respondents were 1.4 and 2.3 times as likely as other income levels to adopt the costlier strategies of Tier 6. The lowest two income levels were also more likely, at a 0.0006 level of significance, to adopt the relocation strategies of Tier 5. It seems that the higher-income respondents are more invested in specific locations, probably (in part) by having already internalized the effects of congestion in their location choice and other compensatory mechanisms (quality of car, residence, and so on).

Employment Status

Part-time workers in multi-worker households were 1.3 to 1.6 times as likely as either sole employed workers or full-time workers in multi-worker households to adopt the flextime or compressed work week strategies of Tier 3. This result is interesting in that it suggests that part-time workers may have already explored other work schedule changes before going to part-time work. (It is intriguing that part-time workers were 1.3 - 1.5 times as likely as other workers to *consider* the remote work strategies of Tier 4, suggesting that they are still seeking a work style solution.) However, it may also represent a circularity, in that part-time workers may consider their part-time schedule itself to be a flextime or compressed work week situation, loosely defined. Such a circularity is clearly evident in the result that part-time workers were more likely to adopt Tier 6 strategies, one of which includes "work part-time instead of full-time." Aside from these two relatively spurious results, there were no significant differences in adoption across employment status categories.

Household Type

Consistent with the earlier observation for the family status variable, one-adult households were less likely to adopt remote work strategies, and more (twice as) likely to adopt relocation strategies, than households with two or more adults.

The results from Table 6 describe the gender differences within each of the socio-economic subgroups. Again, in all cases exhibiting significant differences, females were more likely than males to adopt a strategy within a tier. Some of the relevant results from Table 6 are as follows:

Tiers 1 and 4

Table 5 showed that there were no overall gender differences in the adoption of Tiers 1 (auto improvement) and 4 (remote work). Table 6 shows quite clearly that this parity between gender for those two tiers holds at each level of each demographic variable examined.

Tier 2

For the Tier 2 strategy of changing work trip departure time, hypotheses in either direction are plausible. In traditional households we would expect men to leave for work earlier and women later in order for the latter to cater to household chores and get children ready for school. However, the strategy is to *change* departure time without specifying whether earlier or later. The results show that where there is a gender

difference, women are more likely to be the ones making the change. Specifically, females of the following socio-economic groups were between 1.3 and 2.3 times as likely as males to change their work trip departure time: single-person and 1+ adult with children households, the second ($35,000 - $54,999) and fourth ($75,000 - $94,999) income categories, sole-employed household workers, and both one-adult and two-or-more adult households (with or without children).

Tier 3

Tier 3 (flextime and compressed work week) had the most gender differences. Females in the following groups were 1.3 to 2.3 times as likely as males in the same groups to adopt: 2+ adults no children and 1+ adult with children households; income levels 2, 3, and 5; sole employed workers and full-time workers in multi-worker households; and two- or more-adult households. This implies that females from a fairly broad spectrum are more likely to adopt work schedule changes in response to a congested commute and other lifestyle drives.

Tier 5

Tier 5, relocation, had only two gender differences: for full-time workers in multi-worker households and for two- or more-adult households. Females were 1.7 - 1.8 times as likely as males in these same groups to move either their homes or jobs. Analyzing this latter result clarifies the significant Tier 5 gender and household type results from Table 5, with the following story emerging: from Table 5, one-adult households were overall twice as likely to relocate as two- or more-adult households, which is reasonable (as mentioned) since it is easier for them. Importantly, within one-adult households, no gender differences appear. Within two- or more-adult households, however, women were 1.7 times as likely to *report* a relocation. It seems that this could be either because women in two-adult households are genuinely more likely to be the ones making the adjustment (a true distributional effect) or because women are more likely than men to identify with and hence to report a partner's or a household move (a survey response bias) – or both. However, this result is partially at variance with the lack of gender differences within the family status variable in Table 6. Our confidence in the present finding would be higher if we had seen gender differences in the two-adult households without children and the 1+adult households with children (91% of which had two or more adults) family status categories. As it is, since the gender difference for the two-adult household type is only significant at $p = 0.09$ and is not corroborated by the family status results, we must view this outcome with some caution.

Tier 6

For Tier 6, containing the work part-time instead of full-time, start/expand a home-based business, and retire or stop working strategies, females in 1+ adult households with children, those in two-or-more adult households with or without children, and those in the highest three income levels were quite significantly more likely (between 2.1 and 2.6 times) than males in the same groups to adopt. Women in 1+ adult households with children were also 1.4 times as likely as males in the same group to *consider* these costly strategies.

Table 6

Differences between Females and Males in the Adoption of Coping Strategies

Demographic Variables	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
(Sample Size)	(a, b, c)	(e)	(j, k)	(m, n, o, p)	(q, s)	(t, v, w)
	Percent of females choosing					
	Female-male probability ratio					
Family Status						
Single (69, 52)		57%				
		2.3***				
2+ adults, no children (146, 129)			43%			
			1.4**			
1+ adult(s), with children (113,111)						
1+ adult(s), with children (113,111)		58%	50%			23%
		1.3**	1.6***			2.6***
Income						
$0 - $34,999						
(96, 20)						
$35,000 - $54,999 (88, 105)		53%	47%			
		1.4**	1.4*			
$55,000 - $74,999 (70, 70)			56%			59%
			1.6**			
$75,000 - $94,999 (36, 56)		58%				
		1.5*				
2.4***						
$95,000 or more (30, 40)			57%			
			2.3***			
Employment Status						
Sole employed						
worker (118, 100)		59%	39%			
		2.0***	1.4*			
F/T with other HH workers (189, 187)			47%		11%	
			1.3**		1.8*	
P/T with other HH workers (21, 5)						
Household Type						
1 adult (87, 54)		59%				
	2.3***					
2+ adult (241, 238)		58%	47%		10%	

* indicates a p-value< 0.1
** indicates a p-value< 0.5
*** indicates a p-value< 0.1

DISCUSSION AND CONCLUSIONS

Transportation policies geared to reducing congestion are often based on simple behavioral assumptions and consequently fail to attain their objectives.

The analysis of the data in this paper supports the hypothesis that individuals perceive the set of alternative coping strategies as consisting of strategies ordered on the basis of costs. Thus, individuals are likely to adopt low-cost strategies before they adopt higher-cost strategies. Second, the wide range of coping strategies can be bundled into a number of tiers, again reflecting an increasing cost, but also offering different types of solutions to the problem of growing congestion. Some strategies cluster together as those which allow maintaining a given level of travel, while still reducing congestion costs, others reduce congestion costs by reducing travel and the third bundle involves a reduction of congestion costs by adopting location or life style changes.

We take as a departure point the hypothesis that individuals who face increasing congestion view the choice of alternative coping strategies in a manner which is, among other things, dependent upon their socio-economic and demographic characteristics.

The implications of this hypothesis are twofold. First, for purposes of policy analysis, it is necessary to forecast the impacts of policy measures. If different segments of the population exhibit differential responses to policy measures, it is useful to identify such variations so as to properly assess the potential effectiveness of planned policies. Second, if in fact there are such variations, it implies that equity issues should be explored so that policy measures do not adversely affect groups which may already be at some disadvantage.

The detailed analysis demonstrates that gender, family status, income, and household type are all related to the response pattern. However, most striking is the fact that women are remarkably more likely than men to adopt (or consider) behavioral adjustments to congestion. The available data can suggest but not definitively confirm some reasons behind this fact. It may be indicative of a real difference in coping mechanisms in which women are more willingly open to changes than men. However, an alternative explanation to this openness may depend on the perception of roles. It is plausible that in the case under study, gender differences reflect a difference in the perception of gender roles. If men perceive their work, and consequently their work trip, as being of greater importance or centrality in the household, they may see it as a pivot around which the household members and their activities should revolve. This argument implies that women are either overtly obliged to change their behavior more often than men, or have internalized this obligation in a way that manifests itself as being more open to changes. The strongest support for this explanation lies in the relatively large number of gender differences in Table 6 for households containing two adults compared to single-adult households.

Of course, the observed differences can also be a reflection of differences in reporting patterns. It is possible that women are in general more open to reporting behavioral changes or considerations thereof, but it may also be the case that women in multi-adult households are more inclined to report a change in the household as if they have personally adopted it.

The data upon which the current study is based were collected for a study of telecommuting behavior and the items analyzed here were not the main focus of that study. At present, it is clear that given the distributional effects of response strategies and the complex dynamics of the process, a survey instrument which is designed specifically for this purpose is likely to reveal even more significant insights into the behavioral response patterns.

Figure 1
Observed and Expected Responses for Each Level of Compliance: Six-Tier Solution

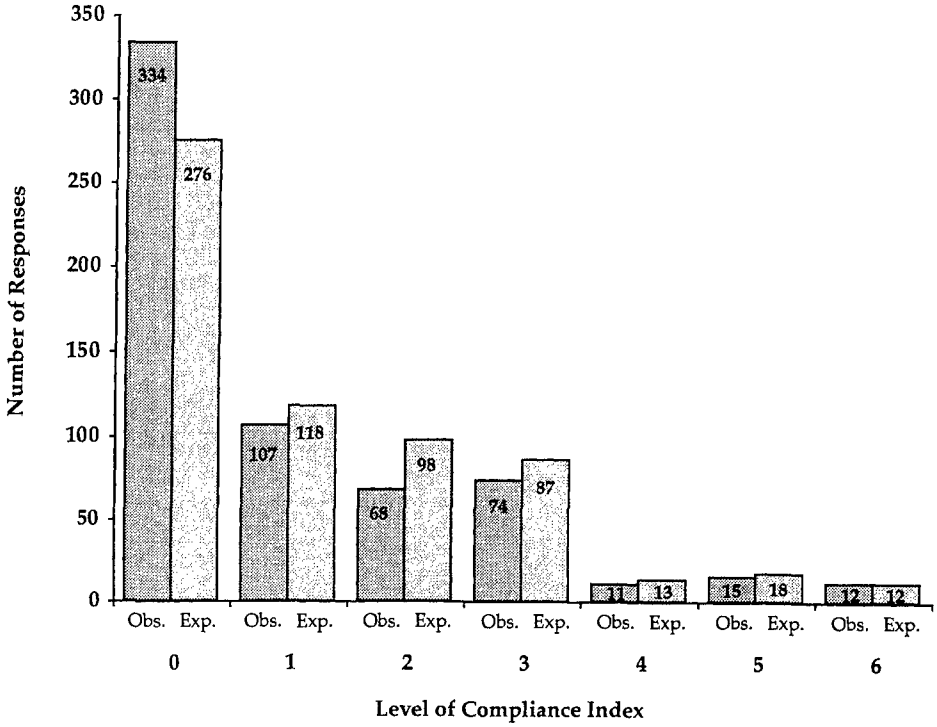
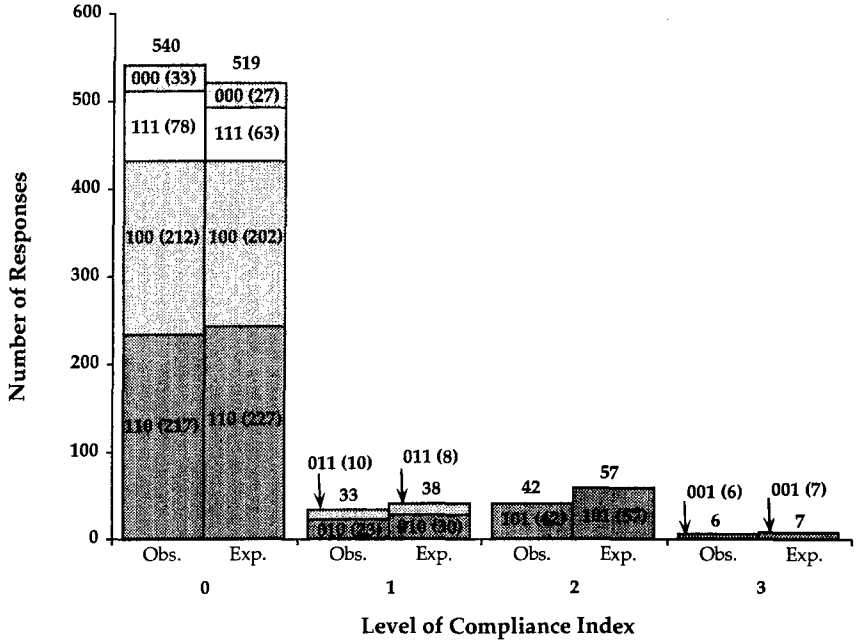


Figure 2
Observed and Expected Responses for each Level of Compliance: Three-Tier Solution



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Automobile Insurance Pricing: Operating Cost versus Ownership Cost; the Implications for Women

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AUTOMOBILE INSURANCE PRICING: OPERATING COST VERSUS OWNERSHIP COST; THE IMPLICATIONS FOR WOMEN

ABSTRACT

This paper assesses the ability of automobile insurance prices to distinguish the 2:1 ratio of men's to women's annual mileage—which is linked to a similar ratio of accident involvement per year. Review of current price classes by driver sex and age, by future mileage, and by past driver record reveals severe limitations to their capacity to assess women's lower mileage exposure to risk of accidents. Accidents are modeled as a process of random sampling of vehicle miles traveled (VMT) by cars in an insurance class. This analogy underscores 1) the impossibility of pricing by individual accident record and 2) the paramount importance of odometer-measured vehicle miles of on-the-road exposure for assessing individual accident risk in money terms.

The need for risk classification as the essential complement to exposure measurement is shown by considering how a single insurance surcharge on gasoline ("pay at the pump" insurance) as an exposure measure would perversely affect incentives for risk control. Current risk classification is profoundly compromised because individual exposure is not measured. An efficient per-mile premium system combining exposure measurement and risk classification is described. Current flat premiums are compared to premiums that would increase in direct proportion to miles of driving exposure. This comparison shows how individuals, and also women and men as groups, would be affected by changing insurance from a fixed cost of car ownership to a per-mile operating cost of car use.

As a fixed cost of car ownership, automobile insurance currently competes for financial resources with car payments, registration fees, and property taxes. If we were to make insurance a per-mile cost of driving, however, operating costs, which now are dominated by gasoline, would approximately double. Why make such a change? Two reasons are obvious: to enhance affordability and to reduce externalization of accident costs[1]. A third and less obvious reason is suggested by the fact that this change would reduce annual ownership cost by several hundred to several thousand dollars for all drivers and cause operating cost to increase by a similar range in amount. We will see, however, that the insurance increase in operating cost for most drivers would either be greater or less but not the same as the insurance decrease in their ownership cost. An important political question is which groups would spend more for insurance and which would spend less than they do now.

A more fundamental question, however, is which system—fixed cost or operating cost—can more accurately measure and charge for the risk of driving an automobile. Economists generally agree that insurance cost pressure should provide individuals with incentives to control accident risk[1,2,3]. We will consider how well the current system provides this risk control function and whether a change to per-mile charges could do a better job.

Insurance would be changed to an operating cost if mandated by a one-sentence amendment to insurance rate regulation law, introduced but not enacted several years ago in Pennsylvania[4] and proposed in other states. The amendment would require companies to convert their price unit—and thus their cost unit—from dollars per vehicle year to cents per vehicle mile. But what would this change mean for women?

This question is especially relevant since the system now in use has been defended for several decades as a benefit to women and used to justify resistance to any civil rights measure to prohibit pricing by driver sex[5,6,7]. As a lower mileage group, women might spend less for auto insurance, but insurers argue that price classes are already tied to the annual mileage of cars and also to women's lower accident involvement and better driving records. Therefore, we will start with an examination of the current class system and its capabilities.

INSURANCE CLASSES

The car, not the driver, is the unit of insurance. To analyze costs and set prices, insurers categorize cars according to six kinds of classes: territory, type of car, future use of car (such as driving to work), type of driver, future mileage, and past driver record[1,5,8]. In practice, they assign a base price by coverage (liability, collision, etc.) to each territory class according to past costs. The other five kinds of classes supply additions to and subtractions from a base 1.00 multiplier of the territory price. If converted to the vehicle mile unit, territory base prices could be adjusted by weight and other vehicle characteristics—classifications not now used—to serve important risk evaluation functions. Before discussing these functions, however, we will look more closely at the classes involving drivers and mileage that are represented as beneficial to women.

DRIVER SEX AND AGE CLASSES

Classification of cars by type of driver uses sex and age to define three kinds of subclasses: young men, young women, and unisex adult. According to annual police reports, men's accident involvement per 100 licensed drivers is about twice women's in each age group. Strikingly inconsistent with this pattern, however, is the insurance switch from sex-specific to unisex pricing for almost all cars with drivers more than 25 or 30 years old[5].

Table 1
Insurance Prices and Costs by Driver Sex and Age, and Car Miles per Year

Type of Driver	Net Class Multiplier by Future Mileage Class*			Vehicle-Year Price ($) for High Future		Vehicle-Mile Cost (Cents) to Owner by Miles Driven in Year
Class	Low	High	Mileage**	5,000	10,000	20,000
Men 17-24	2.35	2.80	1400	23.5	14.0	7.0
Women 17-24	1.50	1.70	850	15.0	8.5	4.3
Unisex 30+	0.95	1.10	550	9.5	5.5	2.8

* State Farm California manual effective 1-15-91.

** Territory base price assumed to be $500.

Table 1 shows typical prices for cars assigned by driver age to unisex and sex specific classes. Insurance for cars driven by young men is about 1.6 times the price for cars driven by young women, and both are higher than the unisex prices. Since these prices approximate the ratio of men's to women's annual mileage, however, young men and women on average—but not individually—spend about the same amount per mile for insurance. In Table 1, young women who drove 5,000 miles in a year paid 15 cents per mile while young men who drove 10,000 miles paid 14 cents per mile. Although all cars are classified by driver age, fewer than one in four cars are classified by driver sex.

If costs for cars with adult drivers were kept separately for men and women, as they are for young drivers, non-insurance mileage and accident statistics indicate that the price for adult men would be about 40% above the current unisex price and the price for adult women would be about 30% below it [5].This is not an argument for expanding discrimination between men and women to include all cars instead of a small minority of them. Nevertheless, since a large majority of cars are classified as unisex, one can reasonably ask how the real difference between men's and women's average mileages for these cars is expressed in insurance prices? Why is the cost difference ostentatiously responded to in youth cars and ignored in the far larger group of adult cars? Even if all cars were classified by the sex of a driver, however, many men drive fewer miles in a year than women's average and some women drive more miles in a year than men's average. Therefore, driver sex does not serve at any age as an acceptable proxy for the miles individual cars travel.

FUTURE MILEAGE CLASSES

Insurers profess to take individual vehicle miles traveled (VMT) into account by offering price classes that are defined in terms of annual mileage, which they call "mileage rating." By requesting odometer readings on application and renewal forms, they encourage the driving public to assume that mileage driven has a significant effect on premium amount[5]. However, company rate and rule manuals define a car's annual mileage by how far it will be driven in the coming year—that is, *future mileage*—as stated by the insured (or filled in by the agent). At the end of the policy year, there is no premium adjustment regardless of how many or few miles a car actually was driven. Predictably, the resulting price differences between low and high future mileage classes conform to nominal discount or surcharge amounts of 15 to 20 percent. Some companies have even discontinued low future mileage discounts entirely because of the inherent impossibility of keeping a large majority of drivers from getting them[5, page 390].

Since neither driver sex nor future mileage is capable of pricing the difference between the accident involvement and annual mileage of men and women, we turn to driver record as the third and last kind of class pricing that insurers say helps to distinguish these differences.

DRIVER RECORD CLASSES

The familiar advertisements that offer "good rates for good drivers" promote the mistaken idea that individual risk can be measured by a driver's accident record[8]. Although the idea is quietly disparaged by some company actuaries, the public only hears the marketing department messages. Probability modeling by industry actuaries that treats traffic accidents as a random process, however, shows that this popular idea is erroneous[8, 9, 10]. A simple thought experiment explains why. Imagine a jar containing 100 black balls representing individual cars. Draw out one ball at random to represent an accident involvement, and then replace it in the jar and stir before the next drawing. To keep track of the accident record of individual

balls, change the color of a drawn ball before replacing it from black to white (first accident), then from white to green if drawn a second time, then from green to red for a third draw of the same ball. Since 100 insured cars typically produce 5 claims a year and since insurers use the records of the past three years to determine surcharges, draw and replace 15 balls. Then count the balls by color. Poisson probability predicts that about 86 of the balls will still be black (accident free), 13 white (1 accident), 1 green (2 accidents), and 0.05 red. If the experiment were scaled up to 10,000 balls—approximately the number of cars actuaries require for a credible risk class—five of them would be red, indicating 3 accidents apiece in a period of three years. Is this proof that some balls are more likely to be drawn than others? Not at all. By design, all of the balls had an equal chance of being picked in each draw.

In defense of classifying cars by accident record, insurance companies point to the well-established fact that the subclass of drivers who had accidents in a three-year period subsequently averages more accidents in the following year than accident-free drivers in the same class. This result, however, can be modeled by specifying that not all of the balls spend the same amount of time in the jar and thus have different chances of being drawn[8, 10]. Rather than appealing to compound Poisson models of balls with different exposures, we can instead think of an accident-record subclass as a random sample of a class of cars on the road.

A three-year's sample of cars picked at random by accident involvement from a class of cars would include cars driven many miles and also cars driven few miles. The cars driven more than the class-average, however, would be over-represented in the accident sample because they were more exposed to risk of accident, while the cars driven less than average would be under-represented in this sample. In the coming year, therefore, the subclass of cars whose drivers have had accidents in the last three years would average a higher mileage and more accidents than the large class of cars with accident-free drivers. An example emphasizes important consequences.

Typically a subclass of cars defined by having had accidents in the past three years, taken from a class with 5 claims a year per 100 cars, subsequently averages about 7.5 claims a year per 100 cars, which is a fifty percent increase. This apparently large increase in accident rate would simply mean that there has been a similar increase in annual mileage, say from a class average of 10,000 miles to an accident subclass average of 15,000 miles. Finally, it is important to realize that despite this large difference in accidents per year between the main accident-free class and the recent-accident subclass, a very large majority of the cars in each would have identical accident-free records in this fourth year: about 93% in the recent-accident subclass compared with slightly more than 95% in the rest of the class.

In discussing a paper of mine that made the analogy between accident record classes and random samples biased to higher average mileages, the chief actuary of the Automobile Insurers Bureau in Boston noted that the effect of differences in miles of exposure to risk on the road "is one that I expect many practicing actuaries frequently forget." He then described an equivalent problem: "If one surveys riders [on the subway] at random and asks how many days per month they ride the subway, the average answer will be too high an estimate of the population mean because the survey-taker more likely will encounter persons who are frequently on the subway,"[11].

As with surveying subway riders for riding frequency, if one were to randomly survey cars on the road for annual mileage, the resulting average would be too high an estimate of the population mean for any class of cars. Similarly, an accident sample of cars on the road will not be representative of average mileage of a population of insured cars, but will be biased to cars which are more frequently on the road. In fact, the

population that accidents sample at random is not a class of insured cars but rather the total VMT in a year (or other time period) by the cars in the class.

It follows that the protection cost an individual car imposes on the insurance system is not proportional to the amount of time that the insurance is in effect—as insurance is currently costed and priced—but is proportional to the number of miles the car is exposed to risk, which is recorded by its odometer. The car owner exerts absolute control on risk: without exposure there is no chance of accident involvement and no cost to the insurance system. Moreover, VMT of on the road exposure to risk can only be measured individually and not by averages for classes defined by driver sex or by unverifiable representations of future mileage. Measuring exposure, however, is only one of two parts to the task of evaluating individual task.

Complementary to measuring individual exposure is the need to determine the risk rate per vehicle mile of exposure for different classes of driving risk. For cars with young drivers the accident sampling rate per VMT is two to four times the rate for cars with adult drivers. The model of balls picked randomly from a jar, however, emphasizes that the sampling rate per VMT is a class property that cannot be measured for individuals.

We will compare current class prices presumed to reflect risk with the risk per VMT that could be derived from direct measurement of exposure by the odometers of all cars in each class. To underscore the importance of classification to measure different risk rates per mile, however, we will first examine an alternative proposal that would proportion premiums to gallons of gasoline.

MEASURING VEHICLE RISK

MEASURING VEHICLE MILES OF EXPOSURE

Adding an insurance charge to the price of gasoline is a proposal that has received considerable support from consumer and environmental advocates and some academics[12]. Full coverage would probably require nearly $1 per gallon, although proponents are proposing only minimum coverage that would require a lower surcharge. A substantial addition to the price of gasoline would increase the operating cost incentive to reduce risk by driving less. A "pay-at-the-pump" insurance system, however, would not only eliminate price variation for different car values and optional coverages but, even more seriously, would produce strong incentives for increased risk. For example, an insurance increase in the cost of gasoline would give a perverse incentive to increase risk by driving lighter vehicles that provide less occupant protection than heavier vehicles[13].

Another problem for a gasoline surcharge system is the need for territorial classes to assess the difference in risk per VMT between urban and rural areas. If the insurance price per gallon could not be sufficiently varied by locale, which is likely because purchasing patterns would frustrate any but minimal differences, it would charge too little for the risk of driving done mainly in urban areas and too much for predominantly rural driving. As a consequence, there would be more urban driving than justified by accident costs, which would be subsidized by overcharging for the risk of rural driving. These difficulties in appropriate risk classification, largely ignored by proponents, are sufficiently serious that it is not necessary to examine important practical concerns. Therefore, we will consider alternatively how a system of per-mile insurance charges would probably operate, and how well it would perform the combined functions of exposure measurement and risk classification in comparison with the current system.

If required to change from the year to the vehicle mile exposure unit, auto insurance companies would probably follow standard commercial procedures[4]. This would include adopting the policy provisions on odometer fraud they have established in providing mechanical breakdown insurance for new and used cars. Premium payment in advance would be required to keep insurance protection in force. The premium at vehicle-mile prices for driving coverages would be prepaid in mileage amounts and at times chosen by the car owner. At a price of 5 cents per mile, for example, an owner might decide to spend $250 to get 5,000 miles of coverage for the car, expecting that amount of protection to last about six months. Administrative expense and premium for non-driving coverages at vehicle year prices would be prepaid at policy-year renewal time. The car's proof-of-insurance identification card—required by law in most states—would display the odometer-mile and date limits at which protection would lapse pending further premium prepayment.

Policy renewal would be conditional on taking the car to a garage designated by the company for the annual physical audit of its odometer. The odometer would be inspected and read, and tamper-evident seals would be applied at the initial audit. Under this procedure, theft of insurance protection would be controlled because tampering with the odometer—already a federal crime—would automatically void the policy. Driving with the odometer cable unhooked would not steal insurance protection, because it usually would be detected after an accident and the tampering would have voided the protection. Self-interest and competition on service should assure development of company systems that are efficient, convenient, and credible for consumers, and that effectively control premium fraud.

Although insurers have asserted in defense of current flat premiums that the costs of measuring mileage would be enormous, examination of their statements shows that the "mileage" to which they are referring is an expansion of future "mileage rating" classes under the current vehicle year system. They are not referring to a system that would use an audited vehicle-mile exposure unit resulting in proportional premiums. Under cross examination at a rate discrimination trial, actuaries testifying as expert witnesses for defendant auto insurance companies admitted that, in their opinion, the cost of odometer auditing would be less than $25. This amount, which is large in comparison with what private garages charge for safety and emissions inspections, is adopted for the sake of discussion in this paper. A study of how a per-mile system probably would be operated found the potential for reducing the number of insurer transactions with customers from the current number ranging up to twelve per year for installment and suspension of coverage arrangements, and to reducing enforcement costs to states with mandatory coverage[4]. Since an odometer method capable of measuring exposure appears to be feasible, we can now consider the characteristics of current risk classes and how they could be converted to equivalent classes in a vehicle-mile system.

CLASSIFICATION FOR MEASURING RISK PER VMT

Of the five kinds of price classes cited, territory makes the greatest difference in what insurance now costs. A car's territory class is determined by the owner's residence and presumably assesses the risk where a preponderance of driving is likely to be done. This function can be evaluated by comparing two California territories where there is a large difference in prices, Table 2.

Table 2
Insurance Costs by Territory Class for Vehicle Miles Driven

Territory	Vehicle-Year Price ($) by Future Mileage Class*		Vehicle-Mile Cost (Cents) by Miles Car Was Driven in Year			
Class	Low	High	3,000	8,000	12,000	20,000
Rural N. Calif.	229	265	7.6	3.3	2.2	1.3
Urban Los Angeles	1,012	1,172	33.7	14.7	9.8	5.9

* State Farm California manual effective 1-15-91. "Low" is future mileage stated as less than 7500 miles and "High" is 7500 miles and more.

State Farm's price for urban Los Angeles is 4.4 times the price it charges in thirteen rural Northern California counties for identical coverage, $1172 versus $265. Both prices reflect the future mileage class adjustments. For comparison to these annual prices, the costs to owners in cents-per-mile terms are calculated at four mileages from three to 20 thousand miles, each of which represents the amount many cars are driven in a year. (In 1990, about 15% of household vehicles were driven less than 3,000 miles, and 18% were driven more than 20,000 miles[14].)

The justification for territorial classes is geographic variation in congestion and other hazards that affect per-mile accident rates. Using the analogy of accident involvement to random sampling, there is a higher sampling rate per million VMT by urban class cars than the sampling rate per million VMT by rural class cars. The per-mile insurance costs that individuals now pay, however, call this rationale into question.

Under the existing system, the cost per mile decreases as the number of miles driven during the policy year increases. In Table 2 the cost per mile is least for the cars driven 20,000 miles in one year. If the same 20,000 miles were driven in two years instead of one, however, the per-mile cost of insurance protection would double, from 1.3 cents to 2.6 cents in rural California, Table 2. Or if the 20,000 miles were driven in a year but two cars were used instead of one, the cost per mile, with the effect of a fifteen percent multi-car discount included, would nearly double to 2.3 cents. This large variation in insurance cost per mile in a single territory class contradicts the rationale that territory classification assesses geographic differences in average driving risk.

The driving risk rationale for territory classes is also challenged by comparing cents-per-mile insurance cost between Los Angeles and rural Northern California, where difference in driving risk presumably is very large. Paradoxically, however, insurance costs more per mile for rural California cars driven low mileages than it does for Los Angeles cars driven high mileages, 7.6 cents per mile for rural cars driven 3,000 miles in a year versus 5.9 cents per mile for urban cars driven 20,000 miles, Table 2. These kinds of anomalies in per-mile cost completely discredit the rationale of appropriate insurance pressure on the driving risk in different territories. Conversion of these two territorial classes to per-mile prices, however, shows how territorial classification could effectively assess difference in risk rates.

Conversion of auto insurance from the vehicle year to the vehicle mile price unit requires determining the average mileage of each class. Cost per vehicle-year divided by miles per vehicle-year equals cost per vehicle-mile. Insurance companies now routinely determine cost per vehicle-year for each territory. They could closely estimate class-average mileages initially for conversion by sampling, but would subsequently get the average from the sum of the individual mileages of each class population. It is very unlikely, however, that the average annual mileage per vehicle in Los Angeles classes is the same as the average mileage in the comparable rural Northern California classes.

Because parking, taxes, and especially insurance make the unit cost of car ownership higher in cities, individual cars tend to be used by more drivers and the average annual miles per insured car should be more than in non-urban areas. Consequently, it is assumed that the urban Los Angeles class averages 12,000 miles per car year, which translates to a 9.8 cents per mile class-average cost, Table 2. While rural drivers themselves probably average more miles than urban drivers, their driving is commonly spread over several vehicles. It is therefore assumed that the rural California class average is 8,000 miles per vehicle, which results in a 3.3 cents per mile class cost. By means of these per-mile averages, the effect on annual insurance expenditure through conversion from per-year prices can be considered.

Figure 1
Flat and proportional premiums by vehicle miles traveled per year for urban and rural territories.

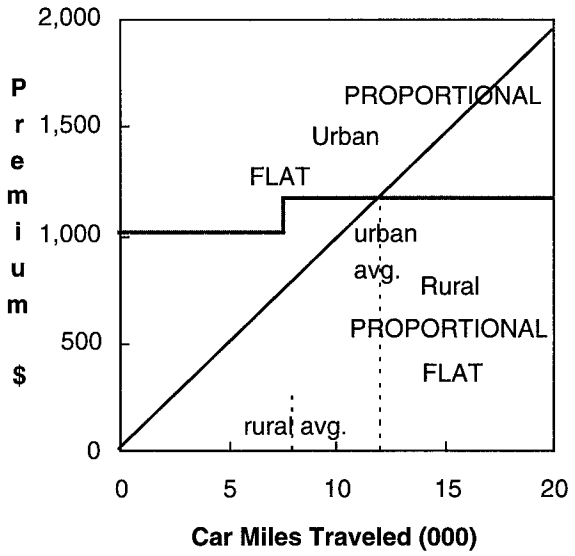


Figure 1 shows the effect on premium charges of the miles a vehicle travels during a policy year. Stepped horizontal lines represent the premium cost at the current dollars per year prices for the two territories. Steps at 7,500 miles show the effect of the two future mileage classes, as if they represented the miles subsequently driven during the policy year. The two "proportional" lines extending from the origin represent the premium versus vehicle miles traveled at per-mile prices. The slopes are defined by the current premium divided by the average mileages assumed for each class (Table 2). These mileages are marked by vertical lines, which connect to the equal premium intersections of the Flat and Proportional lines. Owing to the different average mileages assumed for the classes, the slope of the Urban line is only about three times as steep as the Rural line, which probably represents a more realistic difference in risk per mile than the 4.4 to one ratio of the flat premiums. Comparing flat and proportional premium lines also allows us to consider some implications of a change to the vehicle mile exposure unit.

IMPLICATIONS OF EXPOSURE UNIT CHANGE

INCENTIVE TO CONTROL RISK

The existing insurance pressure on ownership cost perversely provides incentives for increased risk. The only way consumers have to cut insurance expense—other than by selling one car and using another more intensively or by keeping a young household member from getting a license—is to cut back on coverage. But reducing coverage increases the risk to family savings, and shifts costs to employer paid health insurance and to social insurance funded by taxpayers.

It is axiomatic that, with every mile a car is driven, risk is both assumed by the car's owner and passengers and is also imposed on other road users. With reference to the flat premium lines of Figure 1, the effect of insurance cost on the amount of driving is limited to the extent that income to pay the cost of gasoline is reduced by the insurance charge. Nevertheless, once the lump sum insurance cost of admission to car licensing is paid—whether $1,000 in Los Angeles or one-quarter of that in rural California—insurance puts no cost pressure on decisions about whether or not to take a trip. The relatively small step up for the high future mileage class merely serves as an incentive to avoid the step by entering a low future mileage number on the application or renewal form. As price competition has dictated for car rentals, auto insurance provides "unlimited free mileage."

In contrast to the current lack of risk control incentives, proportional premiums would impose cost pressure on every mile driven. After paying a nominal fee for odometer auditing, the incremental (marginal) cost that per-mile insurance would provide is like the resistance to walking up an incline, up the proportional premium line. The steepness of proportional premium lines in Figures 1 signals the degree of driving risk with per-mile prices. Higher risk classes would put more cost pressure on the amount of driving. Young drivers cannot increase their age, nor should people be expected to move to lower risk rate territories, but proportional premiums would allow drivers to control their insurance cost, the same way they can control their accident risk, by the amount of driving they do.

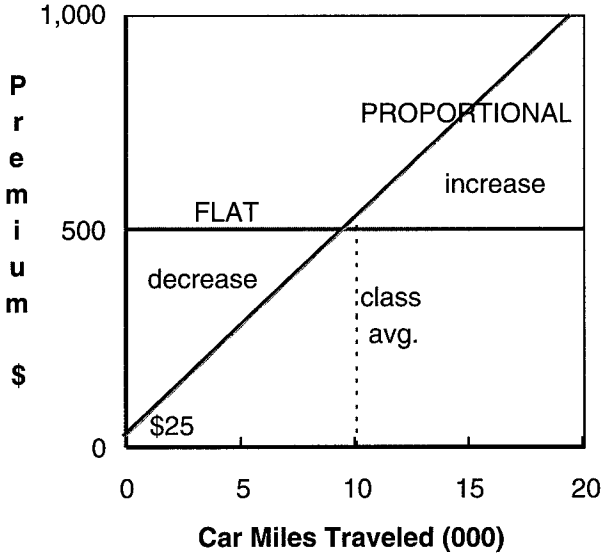
Risk is strongly affected by vehicle weight[13] and, to a lesser extent, by safety devices like air bags and anti-lock brakes. Existing premiums, however, do not vary at all by car weight. Furthermore, the discounts insurance companies provide for safety devices on late model cars are not only not backed by claim cost experience, but also may be associated with more collision claims per car year than identical cars without the optional devices[13, 15]. Although "offsetting behavior" and "adverse selection" (drivers with higher risk per-mile somehow know this and preferentially buy safety equipment) are offered as explanations[15], it is also true that demand for optional safety devices correlates directly with income which also positively relates to demand for vehicle miles of travel, that is, exposure to risk. More miles of travel on average by those choosing anti-lock brakes would tend to offset any reduction in risk rate per mile.

Drivers can reduce their risk rate through choice of a heavier car at a cost of decreased fuel efficiency and increased risk per mile imposed on other traffic. The current flat premium system, however, provides no accurate financial risk-reducing incentive or even any information on what car weight is most risk-efficient in terms of the combined effect of assumed and imposed risk.

INDIVIDUAL AND GROUP EFFECTS

Which individuals and groups would spend less and which would spend more on insurance with a change from flat to proportional premiums? This issue can be framed with reference to Figure 2—a simplified version of Figure 1. It shows premium paid as a function of miles traveled during the policy year. The $500 premium line has no steps for future mileage classes, in view of their inherent unenforceability. A class average 10,000 miles per year is assumed, which makes the slope of the proportional premium line 5 cents per mile. An odometer audit fee—assumed generously at $25 for the sake of discussion—raises the proportional line by that amount and puts the equal premium intersection of the two lines at 9,500 miles (the $25 fee is equivalent to 500 miles at 5 cents per mile).

Figure 2
Flat and proportional premiums by vehicle miles traveled per year with $25 assumed odometer fee.



The vertical separation between the flat and proportional lines at the number of miles actually driven represents the change in insurance expense with change in exposure unit. This helps to answer the question I posed initially in observing that ownership cost would decrease for all drivers—by a net of $475 in Figure 2—but that the simultaneous insurance increase in operating cost would be greater or less than the ownership cost reduction. The answer for individuals would depend on whether they drive more or less after the change than what the average mileage for their class was before the change. We can draw some conclusions about groups by considering conditions that now cause changes in driving levels.

For Figure 1 we assumed a difference in average mileage between rural and urban territories in California. In estimating the number of future claims, insurers take into consideration expected economic conditions and gasoline prices. During recessions, or when the price of gasoline increases significantly, many drivers reduce the number of trips they take with the result that overall accidents and claims drop sharply[5]. At a hearing by the Pennsylvania House insurance committee when the 1990-91 recession was ending, the President of the Insurance Federation of Pennsylvania testified that auto claims had declined not because of a recent reform law to control medical expense, but because of decreased driving. To dramatize the drop in auto insurance claims, he quoted State Farm's Pennsylvania vice president as speculating that "a lot of cars are up on blocks" [16].

When the economy improves or gasoline gets cheaper, auto insurers apply for regulatory approval of higher prices because "people are driving more"[5, page 272-73 for statements made to regulators]. The fact that insurers find it necessary to raise prices when driving increases is strong evidence that current automobile premiums do not respond to the individual changes that add up to changes in average mileage.

Although insurers usually retain the windfall decreases in costs from unexpected decreases in driving as a hedge against having to raise prices sharply when driving returns to normal, occasionally they refund part of the surplus premium. For example, refunds by State Farm Mutual Auto Insurance that followed the 1990-1991 recession illustrate the cost-shifting effects of the current price system. At the end of policy periods covering that time interval, in several states the company returned 20 percent of the premium that each policy holder initially paid[17].

Figure 3
Effect of twenty percent decrease in average mileage on flat versus proportional premiums

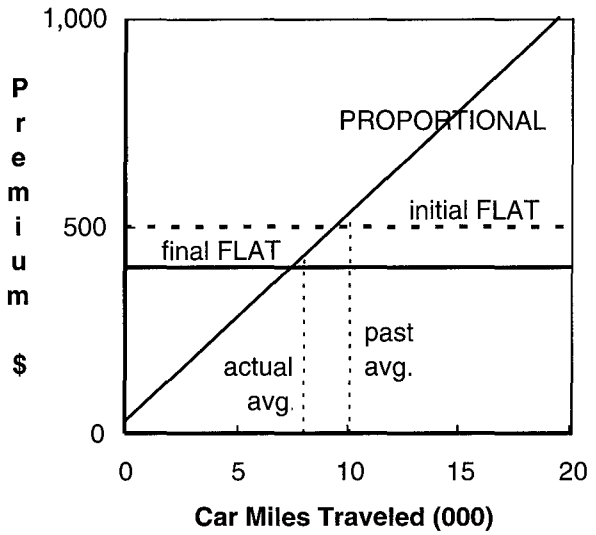


Figure 3 reproduces Figure 2, but with the effect of a 20 decrease in insurer cost represented by a premium refund. It also shows an assumed proportional decrease in average mileage from 10,000 to 8,000 miles. (This is a simplification. Fatal accidents drop more than a decrease in mileage because the marginal trips foregone tend to be after-dark driving for entertainment with higher than average risk rates per mile.[18]) If 20 percent is the average decrease in driving, and if it is assumed that there are drivers not affected by recessions or gasoline prices, then some of those who were affected must have decreased driving more than 20 percent. Drivers who cut mileage thirty percent got a twenty percent refund along with all other car owners. The other ten percent savings would thus pay for the refund to owners who cut driving less than 20 percent, or may even have increased their driving.

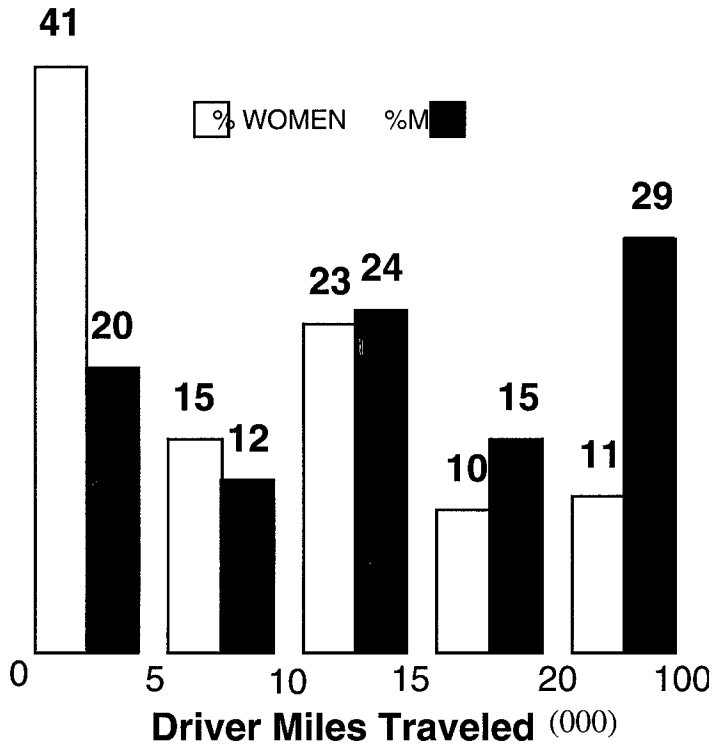
Thus with current pricing based on class-average cost, any windfall cost reduction from a decrease in average mileage actually goes not only to people who drive less, but to all policyholders regardless of their individual mileage. Those who are responsible for cost savings share them with others unaffected by recessions and higher gasoline prices. Since demand for vehicle miles correlates to income[19], dollars in effect are transferred from lower to higher income motorists via auto insurance premiums. Car owners whose mileage is perennially below average are forced to subsidize the insurance protection for owners of cars in their class driven above average mileage. Low income individuals who buy car insurance they can scarcely afford in fact provide subsidies for those who generally do not need them.

WOMEN AND MEN

Economic conditions and the price of gasoline must also differentially affect the driving of women and men as two demographic groups with a large difference in income distributions. According to the 1990 NPTS data, 41 percent of women drivers drove less than 5,000 miles, while about half as many men drivers were in this low mileage category[20, page 3-20.] Conversely, in the high mileage category, nearly 30% of men drove more than 20,000 miles while only 11% of women drove that much, Figure 4. The difference between the mileage distributions of women and men leaves little doubt that a greater proportion of women than men would gain a deserved and risk-based net saving from a change from per year to per mile insurance. Nevertheless, it is important to keep in mind that it is individuals, not groups, who drive cars and that individuals respond to changes in the cost of driving and also to changes in economic conditions.

Figure 4

1990 NPTS distribution of women and men drivers by annual mileage.



Current flat pricing is buttressed by strong insurer marketing mythologies—such as the selective reality of women's greater "safety" as drivers and the statistically absurd idea that risk can be individually assessed by use of driver-record and claim-free pricing. Recent research on women drivers has sought to problematize the increase in women's accident involvement, rather than to explain it as an inevitable consequence of an increase in women's average miles of exposure to accident risk. Press releases announcing research findings generate invidious newspaper headlines like "Road hazard? Women are more accident-prone, U-M study finds" [21].

In a 1968 economics study, one of this year's Nobel prize winners, William Vickrey, attempted to call attention to "the frequently overlooked fact that the manner in which premiums are computed and paid fails miserably to bring home to the automobile user the costs he imposes in a manner that will appropriately influence his decisions"[1]. Subsequent scholarly indifference to this strong condemnation can only be explained in terms of protecting a subsidy for higher-mileage drivers as a politically and economically powerful group. University researchers, however, have a responsibility to set aside class and sex politics in order to contribute constructively to an emerging and long overdue critique of charging automobile insurance as an ownership cost [7].

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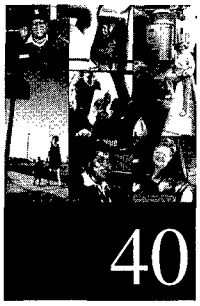

Trip Reduction Incentives: Gender Differences and Policy Implications

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TRIP REDUCTION INCENTIVES: GENDER DIFFERENCES AND POLICY IMPLICATIONS[1]

ABSTRACT

The social science literature in transportation identifies a number of gender differences in the commuting behaviors of men and women. Women tend to make more trips related to family needs, and they also travel more than do men overall, particularly between the ages of 24 and 54—the prime child rearing and family development years. This suggests that men and women may respond to and be affected differently by incentive programs used by employers to reduce the number of trips made and vehicle miles traveled by workers. Knowledge of these differences, and identification of programs that have been particularly responsive to women's needs, would be useful to community transportation planners, transit authorities, and companies attempting to meet requirements for trip reduction.

The environmental literature provides a number of recommendations for the design of programs aimed at changing behaviors that adversely affect the environment. In general, this literature has not been integrated with the transportation management literature. This paper provides some lessons learned from the environmental literature and examines their applicability to the Washington State Commute Trip Reduction Program. It describes the incentives and sanctions used by employers in Washington State to encourage their staff to reduce trips to work and the evaluation activities undertaken to assess the success of the program and the impacts on male and female employees of the trip reduction program. It presents results of discussions with employers and transit authorities about the availability and need for information about the differential effectiveness of various incentives and the policy implications of these findings. The paper provides an assessment framework derived from recent developments in environmental management and assessment and utilizes data collected from employees in Washington State as part of the Washington State Trip Reduction Program, along with data from a ten-year series of telephone surveys of representative samples of frequent, infrequent, and nonriders of public transportation in the Seattle metropolitan area. The analysis discusses gender differences in the use/nonuse of trip reduction incentives and in the relative attractiveness of various alternatives to single-person, daily car commuting to work. The paper also presents preliminary information about the degree of awareness and response to gender and other social group differences in the effectiveness/desirability of trip reduction incentives by employers' transportation coordinators in the Puget Sound area.

> "Commuting, like all passenger travel, is a social phenomenon, an economic phenomenon and a technological phenomenon." (Pisarski 1996: 1)

> "In 1977 Harvey Brooks...pointed out that long-term environmental problems pose a special challenge to humanity. Even if the *causes* of environmental problems such as the greenhouse effect could be easily understood, their cure would be difficult when—as is often the case—we have become committed in ways both deep and complex to the activities that cause these problems....The obstacles to a sustainable society are hard and heavy, and the levers short and frail. Learning how to move those obstacles is the first step." (Lee 1993:5, xii.)

"Unfortunately travel reduction and environmental programs are constructed to attempt to reduce societal costs without any meaningful attempt to offset personal benefits lost." (Rosenbloom and Burns 1993).

"To the greatest extent practicable and permitted by law...each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations...." (Executive Order 12898 on Environmental Justice, February 11, 1994).

INTRODUCTION

This paper focuses on the Commute Trip Reduction (CTR) program in Washington State, with particular attention to King County, one of the eight counties subject to the Washington State CTR regulations. It discusses the design, implementation, and consequences of this program from the perspective of emerging standards of practice and lessons learned from environmental assessment and natural resource management, with the goal of providing a bridge between the transportation management and environmental management literature. By looking at the structure and processes of the program and at available data documenting its implementation in King County, it assesses the potential for the CTR program to cause disproportionate impacts on women. To avoid redundancy it takes as a starting point, rather than a focus of investigation, the well-documented findings in literature that a wide variety of social and demographic attributes, including gender, affect commuting behavior and transportation choices. These attributes can affect choices and opportunities in ways that can result in disproportionate allocation of benefits and costs and unintended adverse impacts on families and communities when policies such as travel demand management are implemented (Meyerhoff et al. 1993; McLafferty and Preston 1991).

Inequities and unintended consequences between genders or between employees with young children and those without often occur because program planners do not understand or take into account socially established patterns of responsibilities, constraints and resource limitations that shape individual behaviors or do not provide opportunities for potentially affected groups to participate in the design of the program. Of particular salience to this discussion is the well-documented finding that child- and elder-care and household maintenance responsibilities, predominantly still fulfilled by women, make it more difficult and costly to switch from single occupant vehicles to other modes of transport (Rosenbloom and Burns 1993; Rosenbloom and Burns 1994; Wachs 1988; McLafferty and Preston 1991). In addition, other attributes such as single parenting and low-wage jobs that make any monetary or time costs imposed by such policies more impactful also tend to be disproportionately associated with women and minorities (Guiliano 1979; McLafferty and Preston 1991; Pas 1984; Meyerhoff et al. 1993; Rosenbloom and Burns 1993).

The increased attention to environmental impacts and intensified efforts to regulate activities that affect the environment reflect an emerging realization that science and technology, combined with a growing human population, have the potential to transform the world. A growing body of environmental management and impact assessment literature joins the policy analysis literature in emphasizing the difficulty of predicting the outcomes of environmental policy or management initiatives and stressing the importance of monitoring, evaluation, and modification as a way of compensating for this difficulty (Holling 1978; Lee 1993; Ostrom 1990; Renn et al. 1995). This literature also highlights the importance of addressing organizational issues and incentive/ disincentive structures when designing programs or implementing policies to address environmental problems or achieve environ-

mental goals. It increasingly emphasizes that effective program design must give careful consideration to equity, acceptability, administrative feasibility and unintended social consequences (Branch et al. 1984; Kasperson and Dow 1991; Sachs 1995; Lach et al. 1994; Bradbury et al. 1994). Environmental literature highlights the importance of public involvement and participation in the design of programs and selection among alternatives in order to identify and avoid adverse social and environmental consequences and enhance acceptability and implementability (Holling et al. 1978; Lee 1993; Carley and Christie 1993; Nugent 1996; Bradbury et al. 1994; Hildebrand and Cannon 1993; Renn et al. 1995).

The emergence of the grassroots environmental justice movement in the mid-1990s has drawn particular attention to the need to consider the distributional consequences of environmental policies and practices by challenging the fairness or equity of how environmental hazards, burdens, and benefits are distributed across various populations (Bullard 1990; Capek 1992; Davis and Bailey 1996; Lach et al. 1994). The environmental justice movement focuses primarily on the disproportionate imposition of impacts from environmental hazards to minority and low-income populations and has raised awareness of a significant social problem. However, social impact assessment, a component of environmental impact assessment, has long identified the need to consider how environmental policies and decisions may differentially affect any social or stakeholder groups (Branch et al. 1984; Hildebrand and Cannon 1993).

The objectives of the Washington CTR program are to reduce the number of trip miles and single occupant vehicles to and from work, reduce congestion, and reduce peak hour travel. The principal impetus for the CTR program is environmental; important supporting considerations are economic and public satisfaction/quality of life. Differences in program characteristics and employee attributes affecting transportation choices create the potential for CTR program benefits, costs, and consequences to be differentially distributed among social groups in ways that are socially significant at both the individual and societal level (Rosenbloom and Burns 1993; Stewart 1994).

As described in greater detail below, those designing and involved in the early implementation of the Washington CTR program gave a great deal of attention to gaining the support and acceptance of the affected employers. To its credit, the Washington CTR program includes an extensive program evaluation and monitoring component, and specific arrangements for knowledgeable technical assistance and support. However, in a review of program documents and exploratory interviews with a limited number of program participants, we found little evidence that employers' trip reduction programs had been designed or were being evaluated with specific attention to the needs and issues of different social groups. There was little indication that issues of equity in the distribution of costs and benefits across employees or employee groups, such as women, or adverse unintended social and community consequences of trip reduction and transportation demand management policies and programs, had been a focus of attention by policymakers, the governmental agencies providing technical assistance, or employers and their employer transportation coordinators. More attention had been paid to the potential for differential impacts on employers (Dodds nd; Egan nd; Johnson nd).

The goal of programs such as the Washington CTR is to encourage changes in commuting behavior in ways that prevent harmful environmental degradation by eliciting sufficient change efficiently and with minimum social cost. To be successful the behavioral changes must occur without intrusive regulations that restrict individual freedom of choice and inequitable distribution of costs. The laudable goal of protecting the environment has no simple solution. Efforts must be made and responsibility shared between individuals, businesses, and government agencies alike. It is important to capture information from programs such as the Washington CTR so that subsequent programs can benefit from this experience.

This paper describes some of the innovative and positive efforts being undertaken in Washington State and particularly King County to implement an effective and flexible program that achieves trip reduction goals while supporting workers in meeting their community and family responsibilities and preventing an increase in social inequities. It presents the results of interim evaluation studies of the King County program and identifies aspects of the program that deserve greater attention and study. The paper is organized as follows: Section 2 describes the approach and methods used in this paper, and presents a brief review of the environmental management, assessment literature and some lessons from this literature that seem pertinent for our examination of the Washington CTR program. Section 3 describes the Washington State approach to CTR, with specific attention to the King County Program and some of the innovative programs developed by collaboration between the County and individual work sites. Section 4 describes the monitoring and evaluation components of the state program and presents data on the use of CTR options at affected King County work sites. Section 5 summarizes our conclusions and offers some recommendations for the program. Section 6 suggests some areas for additional research.

APPROACH AND METHODS

ENVIRONMENTAL ASSESSMENT AND MANAGEMENT: A FRAMEWORK FOR EXAMINING THE WASHINGTON CTR PROGRAM

A growing body of literature is devoted to the methods and results of efforts to develop and implement effective strategies for managing nonmarket, shared resources such as clean air or clean water, maintaining or promoting environmentally responsible behaviors, and assessing the complex consequences of environmental and resource management strategies and policies (Edwards 1987; Ostrom 1990; Hardin 1968; Hildebrand and Cannon 1993). Tremendous effort has been exerted to design programs that reduce or eliminate environmentally destructive behaviors broadly and quickly enough to protect the environment. There is widespread agreement that it is highly preferable to achieve these goals through voluntary actions, since this preserves freedom of choice, an important component of social well-being, and enhances flexibility, a key requirement for successfully addressing complex problems.

However, there are questions about whether voluntary programs, driven by regulatory requirements rather than market forces, can achieve the behavioral changes needed to protect the environment. A widespread goal is to avoid the situation in which quality of life is doubly reduced—by both environmental degradation and the imposition of draconian measures that limit individual freedom and choice. The difficulty of achieving these goals of protecting shared, nonmarket resources has received a great deal of attention in environmental literature (Edwards 1987; Holling 1978; Ostrom 1990; Kolluru 1944).

Review of environmental management and impact assessment literature identified five approaches that offer guidance applicable to the design and evaluation of programs such as the Washington Commute trip Reduction (CTR) initiative: Adaptive management; strategic environmental management; environmental impact assessment; research on conservation behavior and environmental values; and environmental equity. Each of these is discussed briefly below, and contributes to a set of lessons that appear pertinent to examination of the Washington State CTR program.

Adaptive Management

Adaptive management emphasizes the need to employ an experimental approach in designing environmental policies and management initiatives. It acknowledges the complexity of the natural and social systems and advocates designing interventions and monitoring/data gathering efforts specifically to

gain knowledge and understanding that can be used to improve management approaches and policies. An important principle of adaptive management is flexibility—setting outcome goals, but providing flexibility in the means for achieving those goals. Among the key advocates of adaptive management are Holling et al. (1978) and Lee (1993), who have written extensively about the requirements and difficulties of adaptive management.

Strategic Environmental Management

Strategic environmental management is an approach emerging in private industry and government agencies that emphasizes the benefits of addressing environmental issues proactively, rather than as a matter of compliance with environmental regulations, and systematically incorporating consideration of environmental consequences into key decisions at all levels of an organization. It stresses integration, analysis, priority setting, and attention to issues of implementation, evaluation, and learning (Kolluru 1994; Wever 1966). Strategic environmental management focuses on developing an integrated set of analytic techniques that agencies or companies can employ to ensure the effectiveness and efficiency of environmental management practices. Strategic environmental management also emphasizes the importance of attending to issues of organizational effectiveness, such as the location of environmental authority and initiative within the agency or company, and the value of incorporating findings from organizational and management research in the design and implementation of environmental policies. Evaluations of environmental management initiatives often identify organizational and management characteristics as among the most critical in determining program success or failure (Kolluru 1994).

Environmental Impact Assessment

Environmental impact assessment, including social impact assessment, was codified into the U.S. system with the passage of the National Environmental Policy Act in 1970. Social impact assessment, though applied unevenly, attempts to identify and evaluate the distributional and system effects of environmental policies and proposed projects on individuals, social groups, and communities. It stresses the importance of providing opportunities for those potentially affected by the policy or program to be informed and involved in the design, evaluation, and decision-making process, and emphasizes the importance of understanding the social processes that distribute impacts to different groups. It also emphasizes the power of perception, values and process, and the consequences of gaining acceptance and support rather than opposition and resistance to the outcomes of policies and programs. Social impact assessment also attempts to address the impacts of environmental policies and development projects on "quality of life," though the effectiveness of these efforts has been questioned (Branch et al. 1984; Burdge 1994; Hildebrand and Cannon 1993; Andrews 1986; EPA 1973). To date, social and environmental impact assessment have generally not focused on the environmental consequences of changing human demographics and behaviors that occur as secondary effects of environmental policies or programs.

Behavioral Research

Despite considerable research on methods to promote and reinforce environmentally responsible behaviors, programs that aim to influence and, ultimately, change human behaviors produce mixed results. In part, the lack of consistency is due to the absence of a conceptual model that links values, beliefs, motivations, information, and behavior. For instance, studies trying to link environmental values to concrete behaviors typically find that even persons who are the most pro-environmental do not consistently behave in ways that have positive benefits to the environment.

Recent theoretical and empirical work view pro-environmental behaviors as part of a system connecting values (personal and environmental) with motivation, information, and social context. Especially critical is the notion of "conservation competence" (DeYoung 1989; Corral-Verdugo 1996; Vining and Ebreo 1990). Conservation competence focuses on provision of relevant information and support services, within a particular context, that make it easier for a behavior to be carried out. For instance, recycling behaviors are much more likely to be undertaken and to become habitual when people are provided with recycling containers and when they live in single-family neighborhoods where their friends and neighbors also recycle (and presumably where their behaviors are "on view"). Monetary incentives, on the other hand, have proven to be less successful in making long-term changes in behavior: once the incentive is removed, the behavior often is not maintained.

Behavior change is also more likely to take place among people who already have positive environmental values and who are intrinsically motivated to behave in a pro-environmental manner. As an example, studies have found that people increasingly view recycling as "biospheric altruism" (Thogersen 1996) and that they thus view recycling behaviors as falling within the realm of ethics and morality. These behaviors then become powerful motivators of other pro-environmental behaviors. In implementing a pro-environmental program, this research emphasizes that attention needs to be paid to both the introduction phase and the maintenance phase of the behavioral change. Information and support services may be particularly important for initial changes in behavior, whereas the social context and environmental values may be especially critical in maintaining the behavioral change over time. Highlighting the environmental value of the sought-after behaviors can help reinforce participation in programs such as trip reduction and recycling.

Environmental Equity and Justice

In addition to adverse impacts on the natural environment, there is growing evidence and concern about human health impacts and their distribution across different populations. As synthesized by Lach et al. (1994), environmental equity refers to the distribution of environmental hazards, burdens and benefits across populations, and is frequently discussed in terms of social equity (the distribution of environmental impacts across social groups defined by such attributes as income, social class, ethnic status, gender, age and family characteristics); geographic equity (the spatial distribution of benefits, risks and impacts); and inter-generational equity (the distribution of potential impacts across present and future generations). In addition to the distribution of impacts or outcomes, environmental equity is also concerned with the level of procedural equity in the decision-making processes that lead to these differential allocations. Environmental justice is the goal of a grassroots social movement that is concerned with both environmentalism and social justice.

As articulated by Lach et al. (1994), the issue of fairness in the allocation of resources and the processes for distributing resources is the central focus of discussions about environmental equity and social justice. The environmental equity and justice literature identifies three principal bases for achieving fairness in the allocation of resources: (a) an equitable distribution that allocates resources based on relative input; (b) an equal distribution that allocates resources equally among all involved regardless of input; and (c) a needs-based distribution that apportions resources to those who have the greatest requirements for survival. Although the characteristics of a fair process or procedure are less well established, the following components are often suggested:

- All affected participants are identified and represented in discussions about the distribution;
- Participants perceive that everyone is acting in 'good faith' and willing to work together;
- Participants have access to all available information;

- Procedures are used consistently; and
- Procedures, rules, and guidelines are flexible and adaptable to the circumstances.

As with strategic environmental management and social impact assessment, the environmental equity discussion emphasizes the importance of the organizational location of decision-making and control and the openness of the design and decision-making process. Access to information and the ability to influence decisions that affect them through a process of public information, participation and involvement in the planning and decision-making processes has been identified as a requirement of both formal environmental regulations and environmental management approaches. Monitoring and evaluation are seen as important tools to provide evidence of the achievement of fair processes and outcomes.

Pertinent Lessons from the Environmental Management Literature

Based on review of this literature associated with these five environmental approaches, we suggest the following as lessons learned from consideration of the design and implementation of environmental management programs that are pertinent for examining the Washington CTR program:

- Recognize the complexity of social and natural systems and design interventions as experiments. Incorporate monitoring and evaluation as key components of the program and be prepared to modify the program in response to what is learned from this information. Lee (1993) emphasizes the importance of capitalizing on every opportunity to gain greater understanding and data that can be used to improve environmental management efforts. This requires an emphasis on monitoring and evaluation, and of effective sharing and use of monitoring and evaluation information.

- Set outcome goals but avoid prescribing how they are to be achieved. Design flexibility into the program. This allows for flexibility to accommodate local and changing circumstances and for taking advantage of learning and innovation and is a central tenant of adaptive management.

- Analyze system characteristics and relationships. Identify key relationships that influence program design.

- All five approaches emphasize the importance of identifying the significant connections between and within parts of the system under examination. Rosenbloom and Burns (1993), for example, point out that one of the reasons that CTR programs have had limited success is that they do not address key factors driving the use of single occupancy vehicles by working women: child-care and household maintenance responsibilities.

- Inform and involve stakeholders and the public. Take a collaborative approach. Effective interaction with stakeholders and provision of information and opportunities for involvement to the general public are emphasized as critical for success in all five approaches, both because such involvement increases acceptability and support for the initiative and because it provides critical information to program implementors.

- Where possible, provide for voluntariness, which increases acceptability and reduces perceptions of risk. Provide multiple options to increase opportunities for choice.

There is substantial literature that clearly demonstrates the positive effect of voluntariness on acceptability and perceptions of safety and risk. For these reasons, it is generally considered preferable, where possible, to achieve environmental goals through voluntary compliance rather than the imposition of prescriptive regulations.

- Address distributional and equity issues.

  Both the environmental literature and social policy literature emphasize the importance of assessing the distributional and equity consequences of programs and policies, although the environmental justice movement demonstrates that this is often not done effectively. Failure to address these issues can jeopardize the credibility and acceptability of the program or policy and can lead to serious adverse social (and political) costs.

- Recognize that organizational aspects influence outcomes.

  Although the importance of organizational and management effectiveness is widely known and accepted, circumstances often lead to inattention to these aspects of program design and implementation. Program proponents and supporters are often not in a position to evaluate or address organizational and management problems.

- Provide accountability and feedback.

  Achieving behavioral change is difficult and requires information, feedback, and accountability, facts noted in all five environmental management approaches. This requires establishment of appropriate data collection and accounting procedures, as well as appropriate organizational and institutional relationships.

- Recognize and address the fundamentals of behavioral change.
  This includes the relationship between values and behavior, the benefits of encouraging incremental change, and the need to provide reinforcement of desired behaviors.

METHODS AND DATA

To help frame the question and determine what information was already available and well-established concerning gender issues in commute trip reduction, the authors conducted a literature search and review. Given the extent of research and strength of evidence in the literature about women's travel patterns and their continuing disproportionate responsibility for caregiving and household maintenance, and the limited information available about the design and impacts of commute trip reduction programs, we focused our attention on developing a set of lessons learned from the environmental management literature, describing the characteristics of the Washington State and King County Commute trip Reduction Programs, analyzing data from the first two rounds of surveys of employers and employees in King County, and gathering information about the organizational dynamics of program design and implementation. Information about the Washington State and King County programs was assembled from available sources, employee surveys and interviews with a limited number of program administrators, transportation consultants, and employee transportation coordinators at programs identified as successful in meeting the CTR target goals.

To gather more descriptive, process, and evaluative data and to help us validate the pertinence of the lessons derived from the environmental management literature, the authors interviewed key King

County transportation planners, transportation consultants active in King County, and a dozen CTR representatives of local companies that were succeeding in meeting their program goals. These interviews focused on identifying successful programs and learning about the internal workings of the CTR program. We asked how the programs had been initiated, what key objectives they had set out to accomplish, and whether they thought their strategies had been or were going to be successful. To determine whether the special needs of women had been specifically taken into consideration in the design of the program at the state, county, or company level, we asked the respondents about their familiarity with data on women's travel patterns and whether the needs of different employee groups had been specifically taken into consideration in the design of the program, with a special query about the needs of those with primary responsibility for children and elders. We asked who participated in the development of the CTR program, and whether they had any data indicating whether certain incentives were more or less appealing to certain groups of employees. Given the small and opportunistic nature of the sample of interviewees, the information we gained from this process is considered suggestive and exploratory, providing context for interpretation of the employee survey data and consideration of the applicability of the lessons learned from the environmental management literature. It also supports our conclusions about research needs.

A particularly pertinent finding with implications for research and the availability of data in this area was the reluctance of employers to: (1) specifically plan programs to meet the needs of particular employee groups; (2) identify programs as beneficial to a particular group of employees; or (3) collect data that would imply or encourage analysis along these lines. Neither the state nor the county asks for gender information in its annual surveys. None of those interviewed indicated that they had designed or designated components of their program to be beneficial to or particularly considerate of women (or any other particular group). Those who acknowledged awareness of these issues indicated that their programs were intentionally kept "gender neutral." That is, no emphasis was placed on alternatives that might be more appealing to women employees with primary domestic responsibilities. One rationale for this position was that the work force increasingly includes men who also assume domestic responsibilities. Another rationale is concern about possible claims of discrimination. Some CTR representatives were concerned (or had been so advised by legal counsel in some instances) that their companies might subject themselves to claims of discrimination if their programs offered primary caretakers options not available to others in the company. Title VII civil rights laws, as interpreted, require that any such policies be gender-neutral on their face.[2] As a result of these considerations, the ability to analyze the distribution of costs and benefits of the CTR programs across social groups, including gender, is severely limited.

THE WASHINGTON STATE APPROACH TO COMMUTE TRIP REDUCTION

This section describes the legislation and program characteristics and the roles and responsibilities of the key components and participants in the state program. It also provides a brief description of the King County program, including a brief sketch of two innovative trip reduction programs: the Preston Vanpool program and the U-Pass program at the University of Washington.

LEGISLATION AND PROGRAM CHARACTERISTICS

The Washington State Legislature adopted the Commute Trip Reduction (CTR) law and incorporated it into the State's Clear Air Act in 1991. The legislature found that automotive traffic in Washington metropolitan areas was the major source of emissions of air contaminants, which cause significant harm to public health and degrade the quality of the environment, and took steps to correct the problem (RCW 70.94.521). The premise of the law is that congestion and air pollution can be

reduced when people reduce their numbers of single-occupant-vehicle commutes (SOVs) as well as vehicle miles traveled (VMTs). This is important in Washington State, where, according to the King County Department of Transportation, " [t]raffic congestion and the resulting air pollution cost nearly $1 billion annually in related health problems and lost productivity in the State of Washington." (Municipality of Metropolitan Seattle 1993:A3).

The CTR program receives funds from the State Air Pollution Account, a dedicated user-fee account. These funds are specifically designated for use to support statewide implementation and assistance to counties, cities, and towns implementing CTR plans and ordinances.[3] Although not required by federal law when passed, the CTR program represented an effort by the State of Washington to improve air quality, reduce traffic congestion, and decrease transportation-related fuel consumption before federal laws were imposed. This was particularly important in the Puget Sound region, which, according to a regional transportation report, had the 20th largest population base in the United States and the sixth worst highway traffic congestion. The State had concluded that the costs of fully accommodating traffic on roads and highways were prohibitive and that decreasing the demand for vehicle trips through an employer-based program represented a significantly less costly and at least as effective method for reducing traffic congestion. The CTR law was passed during a time when policymakers and citizens were engaged in a number of public discussions about how the region could manage continued growth while maintaining the regions valued quality of life.

The state law applies to employers with 100 or more full-time employees at a single worksite who begin their scheduled work day between 6 a.m. and 9 a.m. (with exemptions for some higher education employees, seasonal employees, and most construction worksites) in the eight Washington counties with populations over 150,000: Clark, King, Kitsap, Pierce, Snohomish, and Spokane. Figure 1 shows the eight affected counties [map from Merchant 1995—1995 report to the Washington State Legislature: 1]. The law established a goal of reducing single occupant vehicle rates and vehicle miles traveled per person at affected worksites by 15 percent by 1995, 25 percent by 1997 and 35 percent by 1999, compared to the 1992 baseline rate for the zone[4] in which the worksite is located. (Johnson nd.)

As noted in the *1995 Report to the Washington State Legislature*, "[u]nlike mandatory trip reduction programs established in other states through federal air pollution regulations, Washington's program relies on a collaborative partnership between the public and private sectors to make positive progress toward these goals." The program calls upon affected employers to make good faith efforts to achieve the CTR goals, and requires them to measure progress by surveying their employees in 1995, 1997, and 1999, if not more frequently. The structure of the program and the focus of the support activities emphasize flexibility and voluntariness, both with regard to the relationship between the program and the employers and between the employers and their employees. Support materials and technical assistance are provided to encourage employers to develop programs that provide a wide selection of options among which employees may choose.

PROGRAM ROLES AND RESPONSIBILITIES

Employer CTR Responsibilities

Reflecting this framework of flexibility and voluntariness, the law requires affected employers to: (a) appoint and identify an Employee Transportation Coordinator (ETC); (b) develop and implement measures to reduce single occupant commuting; (c) distribute information on alternative commute modes to affected employees; (d) conduct biennial employee commute surveys; and (d) report

progress annually. The law also requires affected employers to conduct an employee survey and establish base year single-occupant vehicle (SOV) and vehicle miles traveled (VMT) rates. Two of the program's most important short-term goals were to gain complete program participation by employers, local jurisdictions, and state agencies and to make progress toward implementing successful worksite programs. According to the evaluation provided by the Task Force, by 1995, every affected jurisdiction had passed a CTR ordinance and 100 percent of the 825 worksites affected by the law, representing over 335,000 employees, were participating in the program. In addition, another 30 smaller employers were participating in the program voluntarily. Most worksites offered their program to all employees, with the result that the Washington CTR program is estimated to have covered over 465,000 employees in 1995. (Johnson nd.)

According to the Washington State Energy Office Evaluation, some employers see the CTR program as providing benefits to their company, while others see it as an unnecessary burden (Burrell et al 1995:11). An active Employee Transportation Coordinator (ETC) is seen as critical for the success of the program.

Task Force Responsibilities: Participation, Representation and Evaluation

At its outset, the CTR program faced a challenge of acceptability and effectiveness. Success of the program is dependent upon gaining and maintaining the cooperation and participation of the affected jurisdictions and employers. To address this challenge, the CTR law established a 23-member Task Force composed of citizens and representatives of employers, local jurisdictions, transit agencies, and state agencies to provide oversight and guidance and a Technical Assistance Team to promote program consistency statewide, enhance collaboration, and assist jurisdictions and employers in developing effective CTR programs (Merchant 1995:2; Lagerberg nd). The Task Force is mandated to oversee implementation and evaluation of the law, including assessing progress toward implementation, evaluating benefits and costs of the program, assessing program impacts, and providing recommendations about whether the law should be continued, modified, or terminated (Johnson nd). To gather information about the progress of the program, the Task Force sponsored a series of five open forums for employers affected by the CTR law, whose purpose was to communicate directly with employers and local jurisdiction representatives.

Governmental Agency Responsibilities: Leadership, Support, Participation and Evaluation

The law requires state government to take a leadership role in the program (Merchant 1995:2). The Washington State Department of Transportation (WSDOT) is the lead agency, responsible for implementation and evaluation of the program. (Johnson 1996; Johnson nd; Egan nd). The Department of General Administration coordinates the state plan and assists state agencies with transportation policy development. The 1995 State Transportation Policy Plan provides cost-efficient alternatives, such as public buses and vanpools, to single-occupant commuting and helps increase public awareness of the need to decrease vehicle trips. In 1995, the state budget for CTR was $3.1 million per year. Of this, $2.4 million passed through to local jurisdictions to cover administrative and oversight costs, technical assistance to employers, and special projects.

Responsibility for implementing the CTR law is delegated to local governments in the eight affected counties. Counties affected by the law and jurisdictions within them that have affected worksites must adopt a CTR ordinance and develop a CTR program for their employees and establish goals for reducing the single-occupant vehicle rate (SOV) and vehicle miles traveled per employee (VMT) at affected worksites. Cities adopted their own ordinances, allowing each jurisdiction to consider the needs and resources available to employers and commuters within their region. Local jurisdictions are

using the CTR program as a strategy in their transportation and growth management planning, and use information from the program to help identify projects that support the transportation needs of major employers.

A number of local jurisdictions provide support and technical assistance to the CTR program and participating employers. King County Metro has been particularly active in this effort. (Merchant 1995: 1-2.). According to an evaluation conducted by the Washington State Energy Office, local jurisdictions attribute much of the success of the program to the "cooperative nature of the relationship between local jurisdictions and employers" (Burrell et al 1995:1). Maintaining this cooperative relationship is expected to be challenging, given the responsibility local jurisdictions have to enforce the law by requiring program modifications when employers do not meet goals.

THE KING COUNTY PROGRAM

King County's Transit Division and its predecessor, Metro, have been advising local employers about alternative modes of transportation for nearly 15 years. Formerly known as the Municipality of Metropolitan Seattle (Metro) before its 1994 merger with King County, the King County Department of Transportation's Transit Division prepares and makes available useful CTR program materials to employers within King County. Those materials clearly describe the employers' responsibilities under state law and applicable local ordinances. They also provide thorough checklists to help employers' CTR representatives plan and carry out successful programs at their work sites[5]. A recurring theme from employer representatives surveyed is that using the regional CTR program experience of KC Transit staff has saved the employers start-up and implementation costs and contributes to their successful CTR programs.

As the agent for 15 local jurisdictions within King County, KC Transit advises employers on planning and promoting a tailor-made CTR program for their affected work sites. KC Transit representatives provide an array of services. These services include information on how to analyze employee needs, survey employees, garner corporate resources, "train the trainer," set goals for individual work sites, set up pass sales or fare subsidy programs, plan incentive programs and promote the CTR program. CTR program staff also tracks employer progress and collects regional performance data (Metro Transit 1996a).

Commuting options available in the Puget Sound region include bus (provided by three separate systems), ferry, carpooling, vanpooling, bicycling, walking, telecommuting, flextime and alternative or compressed work schedules.[6] The travel demand management (TDM) options which comprise the incentives and penalties provided by CTR programs are grouped into six categories:

- parking management—items such as discounted parking costs or priority parking spaces for carpools and vanpools;
- subsidies—including subsidies and incentives for use of non-drive-alone modes;
- special programs—telecommuting, internal ridematch services, shuttle services or Guaranteed Ride Home program;
- schedules—policies allowing a work schedule that eliminates a commute trip during the morning peak such as flextime or compressed work week schedules;
- fleet vehicles—providing company vehicles for work-related trips, carpooling or vanpooling; and
- site amenities—items such as bike racks and showers.

The King County CTR program provides information to employers about those alternative modes, costs of planning, and effective ways to encourage employees to consider alternatives to solo driving. One KC Transit staff member explained, "There is no substitute to energetic, nay mildly aggressive, on-site promotion of this program. Getting people to 'think green' is probably more successful in the Puget Sound area than appealing to people's pocket books." The publication *How to Implement and Promote Your CTR Program* offers local employers a variety of cartoon clip art and copy designed to encourage employees to explore alternative ways to get to work. The themes include strategies to approach people inclined to ask "what's in it for me?" (reduce stress and save money), invoke a little fear and guilt ("can you live with dirty air?") or encourage people to be part of something better ("Clean Air? It's your choice").[7]

TWO EXAMPLE PROGRAMS

In addition to providing the public transit facilities and system, technical assistance, and research and evaluation services, KC Transit also works to identify collaborative initiatives that can provide service to residents and workers in King County and contribute to trip reduction efforts. Two examples of such innovative programs undertaken in support of the CTR legislation are the Preston vanpool and the U-Pass programs. Both programs are examples of programs that combine subsidies with special program elements to meet the needs of special populations and employers.

Preston Vanpool Project

Preston is a rural city about 25 miles outside Seattle. Preston was a logging town but during the past decades has lost its main industry and much of its population base. Not far from Interstate 90, Preston has recently become the location of a new industrial park. Because the work force in the area was insufficient to support the needs of the new manufacturing businesses, new employers looked elsewhere for the employment pool and transportation to its work site. Representatives from the industrial park met with the Greater Seattle Chamber of Commerce and local government representatives. The Seattle/Preston Workforce Connection was formed to provide training for citizens living in the central district of Seattle and link them with jobs available in the Preston Industrial Park. The Central Seattle district, like many other inner-cities, suffers from a diminishing number of entry-level employment opportunities. (Urban Enterprise 1996) The Workforce Connection group recognized that to get trained people from the inner-city to the industrial park required the cooperation of many groups including KC Transit. During a two-year period, a coalition of creative individuals from government, businesses and social agencies designed a blueprint to provide training to workers—and transportation to get them to jobs in Preston. [8]

The Department of Social and Health Services and Employment Security agreed to make available to a Preston employer, a pool of job-ready applicants who would be prescreened and ready to work. This reduced recruitment, hiring and training costs for the employer. Dependable workers were needed by the employer who, in turn, was willing to diversify its work force and provide jobs to a targeted community. The employees would be trained, coached, and counseled by persons dedicated to the success of the program.

Transportation to the industrial park is provided by KC Transit vans and subsidized in part by the Department of Transportation and the affected employer. Initially, 17 new employees were trained and hired; the employees are picked up in their neighborhood by the vans and transported directly to the work site.

Still in its infancy, the Seattle/Preston work force project is not without critics. Some argue that transporting entry-level workers outside their neighborhoods to minimum-wage level, or even $6-$7 per hour jobs is not sustainable. Others, however, contend that this public/private partnership is a realistic alternative to unemployment and provides workers with experience and an opportunity to "integrate into a new and different work environment to positively affect their future, both individually and as an overall community." (Seattle/Preston Workforce Connection 1996:2) These workers get more than a pay check. Discussions about child care and YMCA camps in Preston are underway. In addition, a low-cost Basic Health Plan will be available to the employee which will be transferable if the employee moves on.

The U-Pass Project

The University of Washington (UW) is an educational institution with 50,000 students, faculty, and staff on campus each day. Roughly 15 percent of the students live in on-campus student housing; the rest commute to campus by other means. To alleviate traffic congestion, the UW has had notable success with its flexible U-Pass program, which has been recognized internationally as a leader in commute trip reduction efforts. (University of Washington 1996)

The U-Pass program began as a three-year pilot project in 1991 and has had overwhelming success. Offered to every student, faculty, and staff member, the U-Pass provides many benefits including unlimited rides, seven days per week, on King County's Metro buses and Community Transit (CT), the transportation service in Snohomish County north of King County. The benefit is substantial, as the cost for this pass is only $27 per quarter for students and $37.50 per quarter for faculty and staff.[9] The U-Pass is funded by user fees, general parking fees, and other UW general fees.

To offer more frequent and convenient bus service to the UW campus, the university negotiated with KC Transit and CT for additional bus routes and annual service hours. The buses are also equipped with bike racks, a popular feature among students who bike one direction and ride the bus the other. Bus ridership has increased on the University campus from 21 to 34 percent since the U-Pass program began.[10]

The University, which has 12,000 parking spaces, 50,000 students, faculty, staff and thousands of guests and visitors weekly, collaborated with KC Transit's predecessor, Metro, to develop two innovative reciprocal programs that link subsidies for transit use (U-Pass) with parking management options specifically to respond to employee/student needs for flexibility. In one program, the faculty or staff member who has purchased a U-Pass but no quarterly or annual parking permit is allowed to purchase a book of individual commuter parking tickets during an academic quarter, at a rate roughly half that charged to faculty/staff who have not purchased a U-Pass. The individual tickets can be used in specific parking lots or zones an average of twice a week, thereby allowing the employee to take alternative transportation the other three days. In the other program, employees who need to drive their cars to campus most days, and some residence hall students, may obtain monthly parking for $42.00. These people are given a complimentary U-Pass, to encourage them to use alternative transportation when driving their car to campus is not necessary. (University of Washington 1996:3)

MONITORING AND EVALUATION: RESULTS

STATEWIDE INTERNAL ASSESSMENT ACTIVITIES

Data from a variety of sources were collected to help evaluate the effects and effectiveness of the CTR program. At this stage in the program, attention has not been directed toward analysis of the

differential impacts of the program or individual incentives on different types of organizations or different groups of individuals, although this need was identified in the Phase 1 assessment documents.

Data compiled for program assessment in Phase 1 included:

- Biennial employee questionnaires (approximately 220,000 biennially, 1993 and 1995).
- Annual reports and program descriptions (900 per year).
- CTR cost survey (290 biennially).
- ETC, jurisdiction, and county focus groups (17 conducted in 1995).
- Employer forums (6 completed in 1994/1995).
- Employee interviews (380 conducted in 19951996). (Lagerfeld nd.)

The CTR Task Force is attempting to answer the following questions about the CTR program:

- Did employers develop and implement worksite programs?
- Did employers achieve the SOV and VMT reduction goals?
- Did the programs result in reduction in air pollution, congestion and energy consumption?
- Were program benefits greater than program costs?

In addition, in 1992 the Washington State Department of Transportation funded an intensive study of a selected sample of organizations subject to the CTR regulations in King, Pierce, and Snohomish counties. This study surveyed employees (2,495 responses out of 3,211 questionnaires distributed; 57 percent of respondents were women) and employers (45 persons at 14 worksites) in organizations considered to have "model" TDM programs. The report by Poulenez-Donovan and Ulberg (1995), indicates that transit riders, carpoolers, and others who received some benefits from the employers' TDM programs believed that the organizations, along with society, generally were "picking up the costs for TDM efforts" (p. 34). All groups "felt that society was the greatest beneficiary of the programs," although program users were more likely than SOV-users to see themselves as the primary beneficiaries. This study also found that most employees were already using their preferred mode for commuting, indicating that those carpooling, riding transit, or using other means to get to work did not prefer to drive alone to work. The TDM programs may be enabling employees to successfully utilize their preferred mode rather than causing people to change their mode preferences (p. 38)[11]. They did not examine gender issues in detail, although they did have the data to do this analysis.

In 1995, the Washington State Energy Office conducted a series of 17 focus group meetings in the affected counties, involving 124 people (Burrell et al 1995:5). No analysis of these focus groups had been published at the time of this paper.

Johnson (nd) assessed the benefits that could be attributed to the CTR program, attempting to characterize:

- Benefits to commuters arising from mode switches, such as reduced expenditures for gasoline, reduced vehicle operation and maintenance costs, and the amenities of using non-SOV modes.
- Benefits to worksites, such as the value of vacated parking spaces and increased employee satisfaction and corporate profitability.
- Benefits to society, such as reduced costs for new highway capacity or the value of increased capacity on existing highways, increased visibility and reduced materials damage and other pollution impacts, and strengthened national security associated with reduced reliance on foreign oil.

The WSDOT emphasizes both the importance and difficulty of accurately measuring the monetary and nonmonetary costs and benefits of programs such as the CTR, but emphasizes that "[q]uantifying the benefits of employer-based TDM programs such as CTR is essential if these programs are to successfully compete for resources and institutional support against traditional approaches to resolving air quality, congestion, and energy consumption problems, and if they are to be taken seriously by the public and policymakers. The TDM research community should devote significant effort to refining existing techniques and developing additional methods for quantifying the benefits of TDM programs" (Johnson nd.).

The Washington State Energy Office also collected information about first-year administrative, capital and facilities, incentives, and materials and supplies costs of first-year program implementation. This preliminary survey found that the two largest categories of administrative costs were ETCs' time and the costs of administering the biennial employee surveys. These two items accounted for about 97 percent of the reported administrative costs, and averaged $4,175 per worksite across the eight counties (Johnson nd.). The survey found that the distribution of worksite incentive and subsidy costs were highly skewed. Many sites reported incurring no costs for incentive payments or commuting subsidies (Johnson nd.).[12] The WSDOT plans to conduct ongoing analyses over the next several years to "refine the cost estimates and to understand why costs vary between different types of employers, different size employers, and employers in different geographic areas, and what particular program elements appear to be most effective at different worksites" (Johnson nd.). Current data provide only a limited ability to assess employee commuting decisions or to correlate worker characteristics with use of incentives and program impacts, in part because only limited demographic information about employees is collected and individual employees are not tracked from survey to survey. (Dodds nd.)

Data from 1993 and 1994 worksite surveys indicate that the Washington CTR program had systematic consequences for commuting patterns. Key findings were that:

- General information and promotion appeared to have limited impact, but specific information on a single mode did.
- Less and more expensive parking increased use of all non-drive alone modes.
- Incentives to use a particular mode increased use of that mode. [However, non-drive alone modes are substitutes, and actions that increase use of one mode will tend to reduce use of other modes (Dodds nd).]

Poulenez-Donovan and Ulberg (1995) conducted a study of the CTR program for the Washington State Transportation Center that included eight organizations (14 sites) participating in the Washington State CTR program. Although they collected information about employee characteristics, including gender, their analysis did not break out the results on this basis. They provided a number of recommendations for program implementation which include:

1. Identify and make policies that relate to targeted behaviors.
2. Use information sessions in work group settings as a primary means of communicating TDM program efforts to workers.
3. Provide extensive specific "how-to" information about alternate commute modes.
4. Make behavioral change goals graduated and public.
5. Include public monitoring and specific feedback regarding goal attainment.
6. Encourage or require supervisors and managers to model and reinforce alternate mode use.

KING COUNTY PERFORMANCE DATA

This section describes the King County program, focusing on data gathered from employee surveys and analyses conducted by Georgiadou and Major of KC Transit (1996), but including information from secondary sources and interviews with transportation managers and employee transportation coordinators at CTR-affected sites. The discussion focuses on the patterns of travel demand management options used at worksites and a comparison of sites according to their success in achieving trip reduction goals. Descriptive information obtained from interviews with transportation planners, managers, and employee transportation coordinators at CTR-affected work sites is included for illustration and to provide context.

Patterns of Goal Achievement in 1993 and 1995

During 1993, the first year that the CTR law was implemented, participating employers in King County were asked, on an optional basis, to conduct baseline employee surveys to validate the baseline zone values for SOV and VMT in King County. These values had been previously established by the Puget Sound Regional Council based on census data. Out of the 495 work sites in King County identified as CTR-affected in 1993, 293 conducted baseline CTR employee surveys. In 1995, the CTR-affected work sites were required to conduct another employee survey to track progress. The following data present patterns of CTR options included in the programs of the 255 work sites that conducted surveys in both 1993 and 1995.

Figure 1 shows the pattern of goal achievement at these 255 sites. Although CTR-affected work sites in King County had their official CTR programs in place for only a brief period at the time of the 1995 survey (from six to fifteen months), goal performance in 1995 compared with 1993 reveals movement in the right direction—a reduction of the proportion of drive-alone commuters and the number of vehicle miles traveled. The percentage of sites with an SOV rate worse than their zone's baseline decreased from 25 percent in 1993 to 15 percent in 1995. The percentage that achieved the levels set for 1995 increased from 41 percent in 1993 to 46 percent in 1995.

Figure 1
1995 and 1993 SOV Goal Achievement Among Sites That Surveyed Both Years

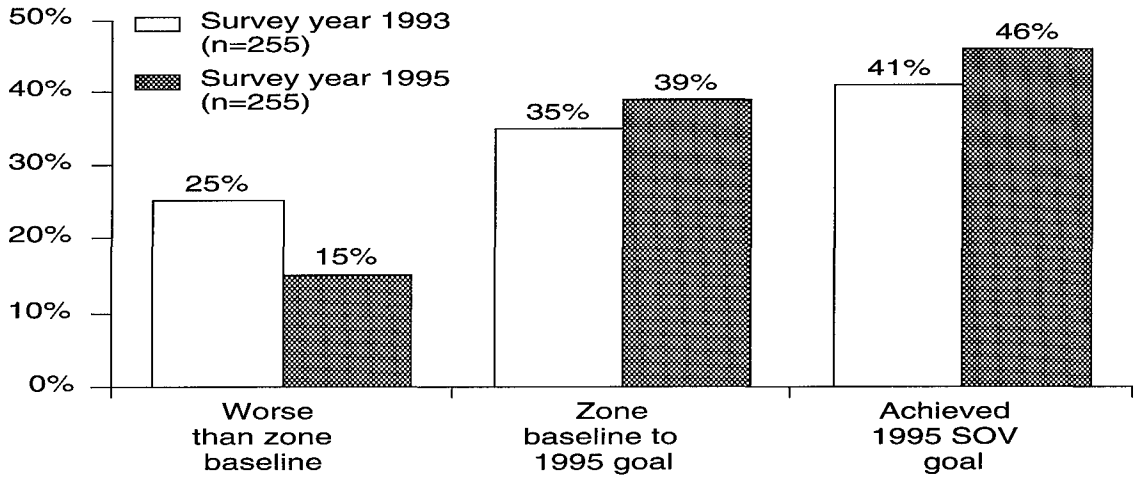
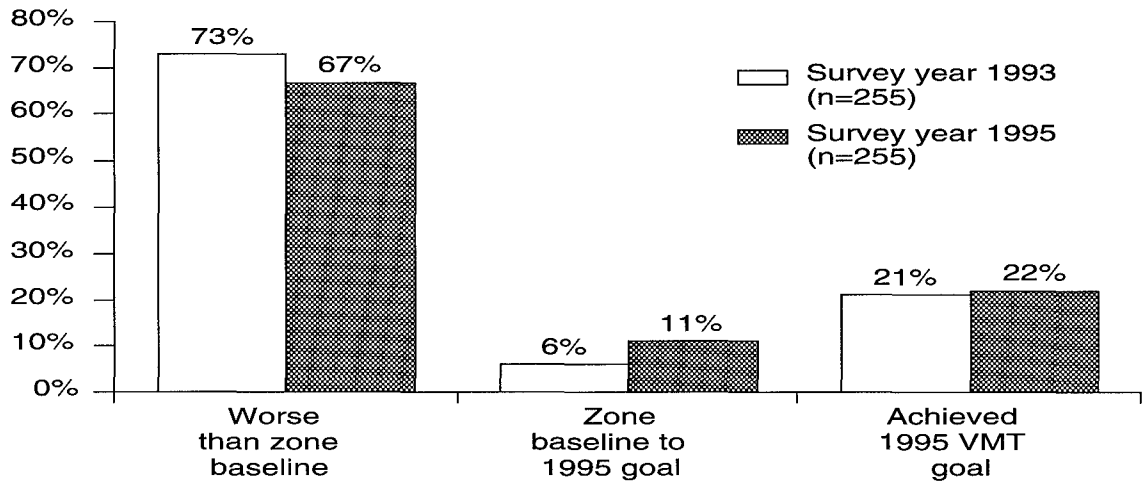


Figure 2 shows similar information for the vehicle miles traveled (VMT) data. As seen in this figure, the percentage of sites with a VMT rate worse than their zone's baseline decreased from 73 percent in 1993 to 67 percent in 1995. The proportion that achieved the level set for 1995 stayed about the same—21 percent in 1993 and 22 percent in 1995. (Georgiadou, F. and Major, M. 1996:12)

Figure 2
1995 and 1993 VMT Goal Achievement Among Sites That Surveyed Both Years



Patterns of Travel Demand Management Options Offered by King County CTR-Affected Work Sites

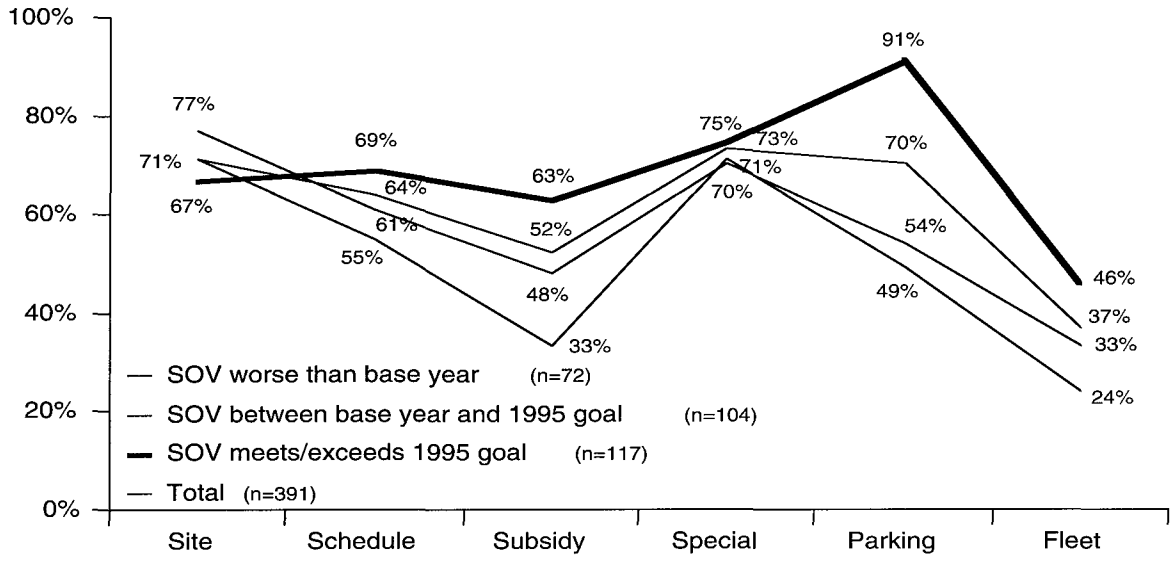
An affected work site's CTR program includes a set of transportation demand management (TDM) options, also known as the work site's CTR program elements. Work sites report information about their TDM options in their annual *CTR Employer Program Report.* The following section describes the TDM options reported in use by affected work sites when they conducted the 1995 CTR employee survey, the basis for their SOV and VMT goal measurement. Data for the entire sample are presented, along with information illustrating patterns of TDM option offerings by sites grouped according to their degree of success in meeting 1995 target SOV goals. Following this, patterns observed for elements within the TDM options are discussed.

The results presented here are preliminary and associated only with SOV goal achievement. No conclusions should be drawn as to the success or failure of different program elements based on these data, as it is important to evaluate programs in their entirety. In future analyses, the differential impacts of the individual incentives on different types of employers or different groups of employees will be examined, although the absence of gender information in the employee survey limits the ability to detail patterns of use by male and female workers.

Figure 3 shows the proportion of programs that included options in each of the six TDM categories, grouped by level of SOV goal achievement, as shown by the 1995 CTR Employee Questionnaire data. The pattern for the entire sample is also shown to provide a point of reference. Overall, more than 70

percent of the work sites reported offering special programs, site amenities, and parking options, while only 52 percent reported offering subsidies and 31 percent reported offering fleet options. Compared with sites that had not met their 1995 SOV goal, a greater proportion of sites that met their 1995 SOV goal included subsidy elements, parking management strategies, and fleet elements in their CTR programs. In particular, they were more likely to have charges for parking, discounts for carpool parking, subsidies for transit and ferry fares, and fleet vehicles for work-related trips. Sites that met their goal were also more likely to include work schedule flexibility than were those sites with an SOV rate worse than their zone's baseline value. High and low achievers did not differ significantly in the extent to which they included special programs and site amenities options (both of which were included by over two-thirds of the sites in each achievement group). (Georgiadou, F. and Major, M. 1996:25)

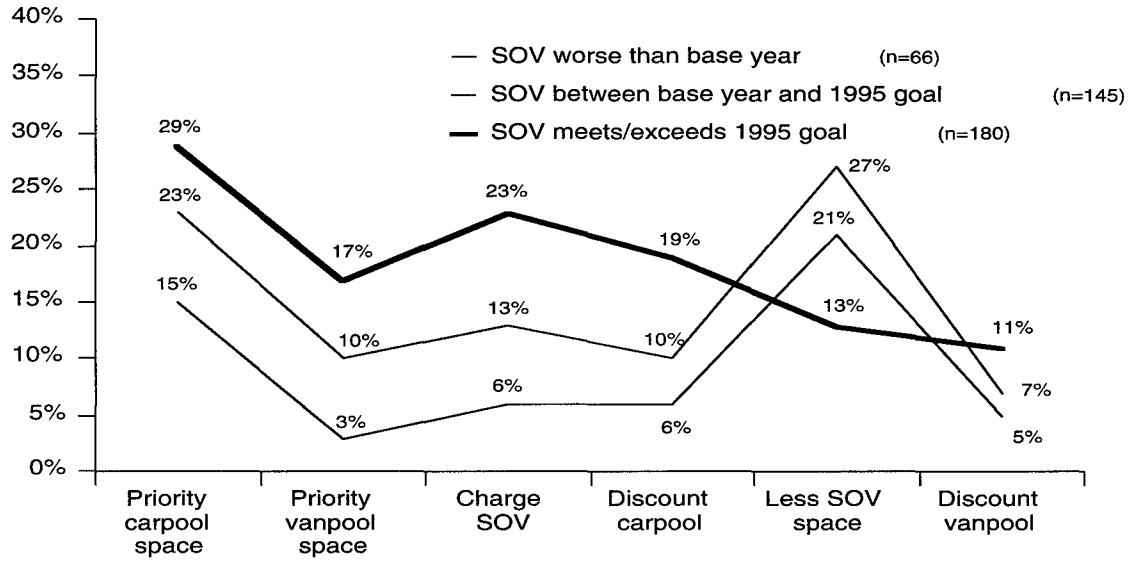
Figure 3
Types of Reported TDM Elements by SOV Goal Achievement



TDM Option 1: Parking Management.

Sites that met their 1995 SOV goal were more likely than other sites to have parking charges for drive-alone commuters and more likely to discount the parking costs for carpools. As shown in Figure 4, they are more likely than those sites with SOV rates worse than their zone's base-year values to provide priority parking spaces for carpools or vanpools. They are less likely than sites that were between their zone's base-year value and the 1995 goal to have reduced the number of parking spaces for drive-alone commuters. (Georgiadou, F. and Major, M. 1996:30)

Figure 4
Reported Parking Management Strategies by SOV Goal Achievement



Priority parking

Parking management options include preferential or priority parking at the work site and discounted parking fees for carpools and vanpools. Under the priority parking approach, spaces for carpools are reserved close to employee entrances and elevators. That feature addresses the employees' desires for parking convenience and the oft-repeated concern about safety[13]. As an example of combining methods, an employee transportation coordinator (ETC) at one site took the additional step of including a "Good for You! Thanks for Carpooling" message on the carpool-reserved signs to provide "a little peer support and pressure."

Priority parking was thought by those we interviewed to be especially effective where parking was limited, a relatively common occurrence in King County. One ETC, for example, noted that at one of their work sites, which has been grandfathered into an area that has been renewed and is now primarily residential and with very limited free parking, the provision of reserved priority spaces in the single lot next to the work site for carpoolers/vanpoolers had created a lot of employee interest and participation in carpools and vanpools.

Subsidized parking

Discounted or free parking for carpools and vanpools can be of real benefit to employees when employers do not offer free or subsidized parking on site. Transportation managers pointed out, for example, that in downtown Seattle, all-day parking rates at private lots and garages range from $6-18 per day. Most commuters expect to pay rates of $135-$200 a month in a private garage. As part of

its CTR program, the City of Seattle offers carpool parking at selected locations around the city, with the stated goals of reducing traffic congestion and pollution in downtown Seattle. The rates are $150 per **quarter** for two-person carpools and $75 per **quarter** for three-person carpools. To get a permit, carpoolers must confirm they will drive together into downtown Seattle at least four days a week. Although city workers have priority, space is available for other non-city employees on a space-available basis. There is a significant waiting list for some parking areas.[14]

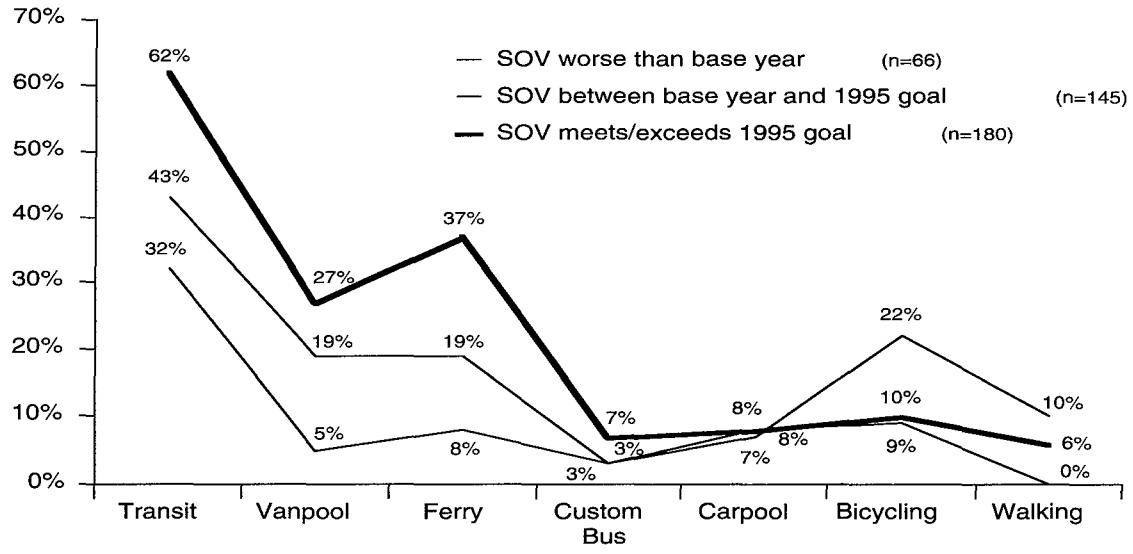
Parking passes

A parking pass allows registered carpoolers/vanpoolers, bus riders, bicyclists, and walkers to park free or at a discounted rate a number of times per week or month. This option is especially useful for employees with primary care responsibilities, because it allows them to participate in the CTR program and gives them an incentive to find an alternative to driving alone the majority of the time, while giving them flexibility to bring their cars to the work site on designated days or as needed. This offers alternatives for many workers, such as to establish carpools for their children, leave their cars at park-and-ride lots after dropping off their children, or take advantage of other commute options.

TDM Option 2: Subsidies for Alternative Transit Modes

Affected work sites that met their 1995 SOV goal are more likely than other sites to include subsidies for transit and ferry fares. They are more likely than the sites with SOV rates worse than their zone's base-year value to include subsidies for vanpool fares and incentives for walking to work. As shown in Figure 5, work sites with SOV rates between their zone's base year and their 1995 goal are more likely than all other sites to provide an incentive for bicycling to work. They are more likely to provide a subsidy for ferry fares than sites with SOV rates that are worse than their zone's base-year value. Work sites with SOV rates worse than their zone's base-year value had not provided any incentive for walking to work and thus were less likely than the other sites to have that element. (Georgiadou, F. and Major, M. 1996:28)

Figure 5
Reported Parking Management Strategies by SOV Goal Achievement



Bus subsidies

In King County (and throughout the region), KC Transit will provide bus passes to participating employers on consignment. The employer can then sell the passes to employees at a discount. Bus subsidies have been particularly effective at the University of Washington (UW) as part of the U-Pass program described above. Although most employers require employees to use the bus a high proportion of the time in order to receive a subsidy, some interest has been expressed in *individual commuter tickets*. A number of employees with child care responsibilities interviewed for the purpose of this paper said they could and would organize their after-work errands two days a week, if they could have their cars at their worksites for those times. There is growing recognition among the employee transportation coordinators interviewed that this type of flexibility might encourage an additional contingent of workers to participate in the CTR program, and that if every employee would commit to ride the bus, ride their bikes or carpool, even one day per week, a 20 percent reduction in SOV and VMT to the affected work site would be realized. In addition, data from the Rider/Nonrider Survey conducted by KC Transit has shown that a high proportion of King County residents have never ridden the bus. Encouraging experimentation by supporting a "try it" approach is seen as a way to introduce new users to alternative transportation modes, thus establishing a basis for additional behavior change and value commitment.

FlexPass

FlexPass offers employees daily access to many commute options. KC Transit and the employer work together to offer specific transportation services to employees through the FlexPass program. The FlexPass program typically includes full access to KC Transit services, ridematch service, Home Free Guarantee, vanpool fare subsidies and free or reduced rate carpool or vanpool parking. The package may also include park-free days, merchant discount programs, voucher programs or other strategies tailored to the work site. Having access to many transit benefits increases employees' flexibility when they choose their daily commute mode. It also increases the likelihood of a successful FlexPass program.

Vanpools

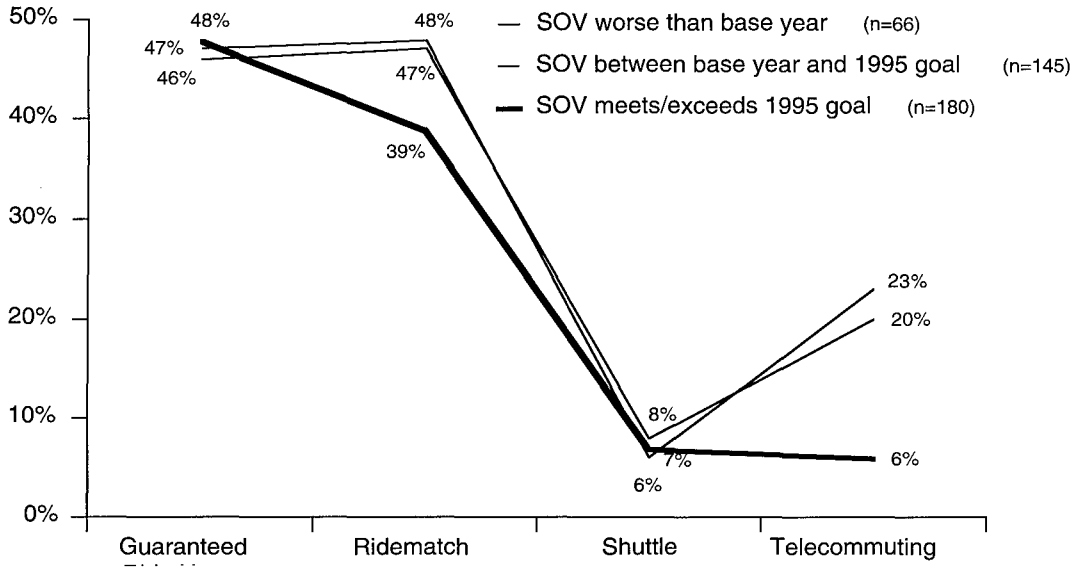
In the Puget Sound region, KC Transit has a well-organized vanpool program with more than 700 vans available to local employers. Vans accommodate 5-15 passengers. Fares are charged on a self-sustaining basis, and fares vary depending on the distance traveled and the van size. The benefit of the vanpool to the employees is that the annualized cost of vanpool fares per passenger is substantially lower than the cost of driving cars alone. The routes are also more flexible and generally faster than the bus. In addition, the vanpool driver gets to keep the van at his or her home and is allowed to use it for personal use at a reduced rate per month. Through the initiative of both employers and KC Transit, some creative vanpool programs have been initiated in King County, both before and after the CTR legislation was passed.

Responses to our targeted September survey confirmed that CTR representatives consider employee subsidies that can be used flexibly on buses, vanpools, and carpools to be one of the most important incentives of their successful CTR program. Further, King County Transit's 1994 Rider/Nonrider Survey confirmed that in response to a question posed to the general population, 31.5 percent of people surveyed said a single pass covering fares for vanpools, buses, and ferries throughout the Puget Sound region would very likely increase the use of alternative transportation.

TDM Option 3: Special Programs

Special programs were less frequently included than some of the other TDM options, even though they were popular with employees. As shown in Figure 6, sites that had already met their 1995 SOV goal were less likely than other sites to have a telecommuting program for their employees. In providing Guaranteed Ride Home, Ridematch, or shuttles, the sites do not differ statistically. (Georgiadou, F. and Major, M. 1996:29)

Figure 6
Reported Special Programs by SOV Goal Achievement



Shuttle service

Although shuttle services are offered at only a minority of the CTR-affected work sites that completed both surveys, employer-provided daytime shuttle services that take employees between buildings during the day—or are available to employees during lunch hours for errands to local shopping centers and restaurants—have proven to be an effective part of the regional CTR program, especially for large employers and employers whose workers live in concentrated neighborhoods. For example, health-care providers on Seattle's Capitol Hill operate a regular shuttle between hospitals and medical centers, as well as to the UW School of Medicine and Medical Center.

The University of Washington contracts with a private vendor to provide shuttle services from the campus directly to the rider's home after dark. One of the first of its kind on college campuses, Night Ride operates from dusk to 12:30 a.m. during the school year, in three service areas where the majority of students live. Vans circulate throughout the campus on a fixed route—picking up faculty, students, and staff with U-Passes at five locations—and deliver riders directly to their doors within the established service areas. The program has proven to be responsive to after-dark safety concerns for women students in particular. It also effectively reduces campus traffic congestion by providing direct service to and beyond campus housing. Microsoft provides shuttle services for its employees, who often work irregular hours and tend to live in areas with less dense bus service.

Guaranteed rides home

The guaranteed ride home program is a benefit offered by employers to provide employees with a ride home in an emergency. It is also available if an employee is required to work past normal hours and has taken the bus, carpool, vanpool, bicycled or walked to work that day. The purpose of the program is to give employees assurance that they can get home quickly if necessary. Studies conducted by KC Transit's predecessor, Metro, showed that "employees rate guaranteed ride home (GRH) programs as very important but rarely use them. At a relatively low cost, GRH gives employers a powerful way to lessen employee anxiety about not having emergency transportation available—and to remove strong psychological barriers that prevent individuals from trying commute alternatives." (Municipality of Metropolitan Seattle 1994:3/75)

GRH programs are clearly an important benefit to primary caregivers, because it gives employees with these additional responsibilities flexibility to get home quickly when necessary. In the region served by KC Transit, the program is called the "Home Free Guarantee" and is partially grant-funded. Under this program, KC Transit contracts with local taxis and supplies vouchers for taxi service to participating employers. After the service is used, the taxi returns the voucher to KC Transit and is repaid for the service provided under the program.

There are other successful guaranteed ride home programs in this region. Some companies choose to make their company vehicles available to employees for emergencies. Other employers contract directly with taxi companies. One pioneer of this latter approach was, again, the University of Washington. The UW's Reimbursed Ride Home program is another element of the U-Pass, and is available to all faculty and staff. Employees faced with an emergency can call one of two taxi service providers under contract with the university. The employee pays the fare at the time of the ride and submits the receipt to the university's Transportation Office for a 90 percent reimbursement. The university repays an employee at this rate up to 50 miles per quarter.

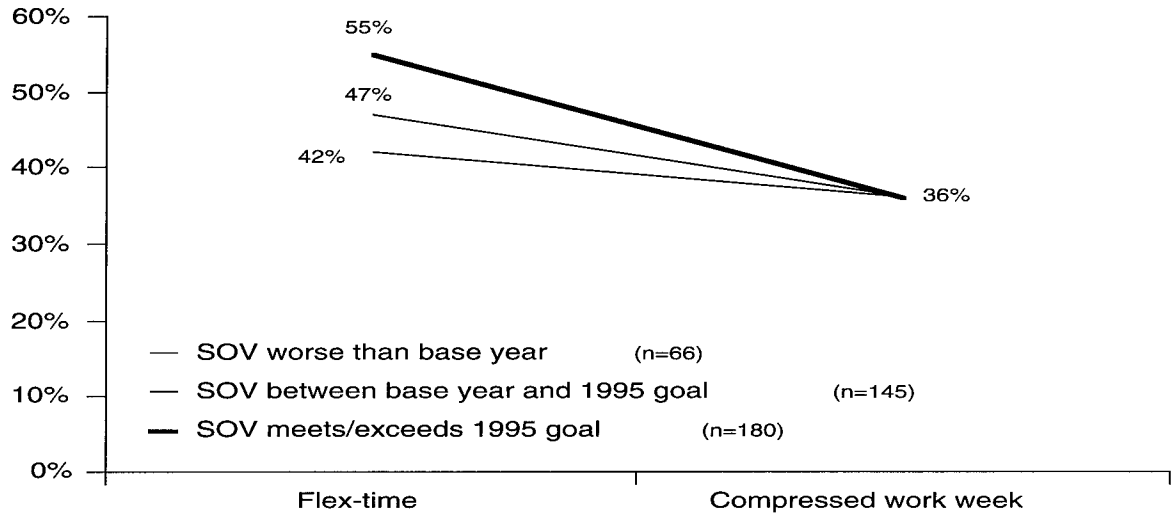
Ridematch assistance

Employer ridematch systems can greatly help ridesharing arrangements for two-person carpools, enough employees to fill a vanpool, or even custom bus service. Employer representatives surveyed acknowledged they are aware of and have used the Regional Ridematch System provided by KC Transit and annually or semiannually offer "travel fairs" to encourage new people to try alternatives. Company CTR representatives noted that most carpools coming to their work sites were, not surprisingly, created within their organizations among colleagues and friends.

TDM Option 4: Work Schedule Options

Approximately half of the affected work sites included flextime and about 40 percent allowed employees to work compressed weeks. As shown in Figure 7, the survey revealed little difference in the availability of these options among employers who achieved or failed to achieve their 1995 SOV goals. (Georgiadou, F. and Major, M. 1996:27)

Figure 7
Reported Work Schedule Options by SOV Goal Achievement



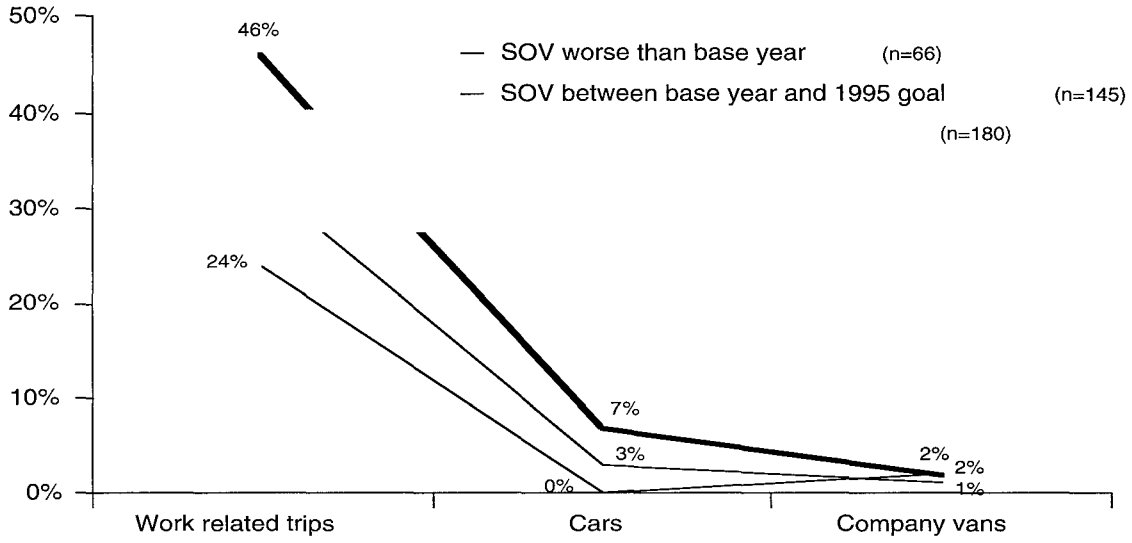
Flextime

Flextime and telecommuting options are favored increasingly by employees with family responsibilities who can effectively work alternative schedules. There is considerable literature on the use, benefits, and costs of flextime from both the employee's and the employer's point of view. The benefits for employees are clear. One cautionary note is that in unionized workplaces flextime, like other CTR benefits, has recently become an issue that must be bargained if it changes the employees' working conditions. If a policy changes the working conditions, and a union agreement is in place, the personnel, labor, and legal departments should be consulted before carrying out new policies. As noted by one personnel lawyer recently, it remains to be seen how labor unions will balance the needs of their members with family responsibilities against the tradition of granting such benefits as flextime and limited parking based on seniority.[15]

TDM Option 5: Fleet Vehicles

Figure 8 shows the distribution of work sites that include fleet vehicle options in their CTR program. Sites that met their 1995 SOV goal were more likely than other sites to provide vehicles for work-related trips. They were also more likely than sites with SOV rates worse than their zone's base-year rate to provide company cars. (Georgiadou, F. and Major, M. 1996:31)

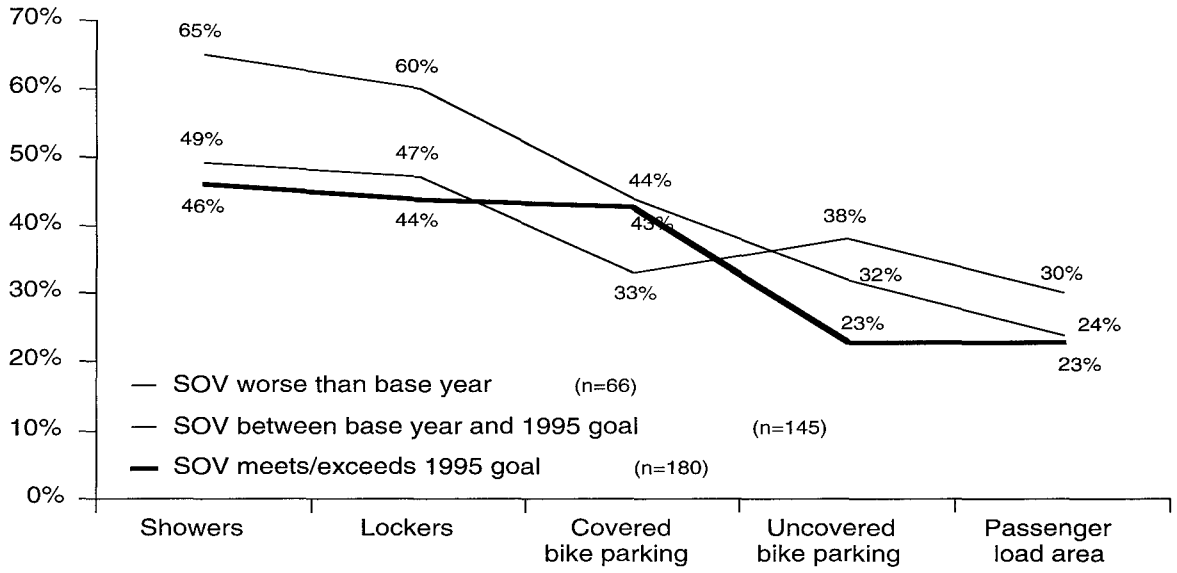
Figure 8
Reported Company Fleet Vehicle Elements by SOV Goal Achievement



TDM Option 6: Site Amenities

Worksites with SOV rates between their zone's base year value and the 1995 goal were more likely than other worksites to have showers on their premises. They were also more likely than sites that had already achieved their 1995 SOV goal to have showers and clothes lockers at the time of surveys. Sites that had already met their 1995 SOV goal were less likely to have uncovered bicycle parking than sites with SOV rates worse than their zone's base year values.

Figure 9
Reported Site Amenities by SOV Goal Achievement



CONCLUSIONS AND RECOMMENDATIONS

In this section, we summarize some observations about the Washington State and King County CTR programs in light of the framework presented in Section 2. The environmental literature provides useful input and perspectives for the design and evaluation of programs such as the Washington State and King County CTR programs. As one of only a few in the country, the Washington program provides an opportunity to inform efforts elsewhere on ways to reduce commuter traffic. Ongoing evaluation will continue to provide more detailed and quantitatively precise information about program attributes and performance.

As Rosenbloom and Burns (1993) have found elsewhere, equity considerations and the potential for disproportionate impacts on specific social groups such as women have not received much specific attention in the design and evaluation of the Washington State CTR program. However, several key aspects of the approach taken to the design and implementation of the program in this state appear to have lessened the potential for adverse impacts on women or other groups whose transportation choices are constrained by child care and household maintenance responsibilities or resource and time pressures. It is evident, by contrast, that considerable effort has been expended to design a program that achieves trip reduction goals by meeting organizations' and commuters' needs generally.

The Washington CTR program reflects, at least in part, a number of program design and implementation lessons derived from the environmental management literature, as discussed below.

- **Recognize the complexity of social and natural systems and design interventions as experiments. Incorporate monitoring and evaluation as key components of the program.** The Washington State and King County programs both included a number of mechanisms to ensure monitoring and evaluation of program effectiveness. There is widespread recognition among the key designers of the program and those providing technical assistance that transportation systems and decisions are complex and interrelated. The program involved many transportation professionals who are knowledgeable of the literature on transportation decision making and the environmental and social costs of both traffic congestion alternative transportation modes.

- **Set outcome goals but avoid prescribing how they are to be achieved. Design flexibility into the program.** The Washington State program is designed to maximize flexibility. It sets outcome goals, but provides only minimal specifications about what employers must do to meet those goals. Extensive technical assistance has been made available to employers that enables them to capitalize on the expertise available in the system and also promotes flexibility.

- **Analyze system characteristics and relationships. Identify key relationships that influence program design.** It is clear that those formulating the program and providing technical assistance have studied transportation systems and understand many of the key relationships. Specific attention has not been given to clarifying factors affecting the commuter choices of different social groups, or that this perspective was conveyed to those responsible for program design and implementation at the affected employers. The absence of demographic information in the employee survey limits the specificity of analysis.

- **Inform and involve stakeholders and the public. Take a collaborative approach.** The Washington CTR program has taken a very collaborative and participatory approach with employers, certainly one of the key stakeholders in this effort. Overall, the program emphasizes the development and provision of information to employers, to employees, and to the public. However, discussions with employee transportation coordinators indicate that the overall program had not emphasized involvement of employees in the design of employer programs. Since this is one of the most effective ways to ensure that options provided serve everyone's interests and that the programs are not designed in a way that results in significant adverse impacts on any stakeholder groups, it would be useful to have more information about issues or concerns associated with providing greater involvement of employees.

- **Where possible, provide for voluntariness, which increases acceptability and reduces perceptions of risk. Provide multiple options to increase opportunities for choice.** The Washington CTR program is based on voluntariness and emphasizes the provision of incentives to change from SOV transit during peak commute hours rather than the imposition of penalties. Less than a third of the affected worksites impose charges on SOV parking or reduce SOV parking spaces. As discussed earlier, most employers provide multiple options among which employees can choose. This lessens the potential for adverse impacts or significant inequities, though sufficient information is unavailable on the demographic characteristics of option users or the constraints/limitations imposed upon option availability to determine exactly how free workers actually are to choose among nominally available options.

- **Address distributional and equity issues.** Aside from the self-correcting mechanisms of voluntariness and choice, little attention has been given to employee distributional and equity issues. More attention has been given to the potential for inequities across employers. Evaluation information, employee surveys for example, do not include demographic information, and most employer records do not appear to facilitate analysis of distributional effects within employers. However, there apparently are some organizations that track employee benefits, including those associated with the CTR program. Our interviews and review of available data found no evidence that distributional or equity issues had become a significant issue for any employer or the program overall.

- **Recognize that organizational aspects influence outcomes.** Thus far, there has been no analysis of the organizational characteristics of the employer programs. At this time, it is not possible to characterize the organizational location, job title, scope of authority or demographic characteristics of the employee transportation coordinators, or to analyze relationships between these characteristics and program success. It is not known, for example, what proportion of employer transportation coordinators are located in environmental management, human relations or facilities, or whether that organizational location is related to program design and success.

- **Provide accountability and feedback.** As a consequence of the program's emphasis on monitoring and evaluation and collaboration with employers, there is a considerable sense of accountability and provision of feedback to employers in the Washington CTR program. Although the employee surveys provide the basis for feedback to employees, it does not appear that a high priority is placed on reporting back to workers what has worked well and what has failed to meet expectations. In addition, because of the lack of penalties and strong emphasis on voluntariness, there is some question about how seriously the employers view the program.

- **Recognize and address the fundamentals of behavioral change.** The technical support provided to the employer transportation coordinators seems to reflect research on behavioral change. However, it is not clear that program implementors have been successful in translating information about behavioral change requirements into effective behavioral change support. Several people commented about the desirability or promoting incremental behavioral change (carpooling once a week, for example) and lamented their lack of success in conveying this concept and practices to the employees.

RECOMMENDATIONS FOR ADDITIONAL RESEARCH

Although the Washington CTR program provides for a considerable degree of monitoring and evaluation, some areas could benefit from additional data or research.

- **Information about the perceptions and viewpoints of the employees concerning the program and its need and effectiveness:** In order to enhance employer evaluation, feedback and behavioral change reinforcement, a program to gather information about employee perceptions and viewpoints would be valuable. The process of gathering the information would itself provide reinforcement, and employers as well as planners could benefit from understanding the program from the perspective of the participants.

- **Demographics data on employees and their choice/use of CTR options:** Currently, the employee survey includes minimal information about the social characteristics of the respondent. This limits analysis of equity consequences. Attempts to expand the survey would need to overcome resistance on the part of employers, and reluctance to make the self-administered employee survey longer and more complicated. Another alternative is to conduct a supplementary survey that would be designed to provide data for use analyses that would be administered to a sample of employees.

- **The organizational location and demographic attributes of the Employee Transportation Coordinators (ETC):** Aside from a 1992 study by Wachs and Guiliano, there is little in the published literature about ETC's, although the organizational literature emphasizes the importance of these factors on program design, implementation and priority. In addition, as more companies undertake environmental management programs, it will be interesting to see how (or whether) CTR programs are integrated into overall corporate environmental planning and monitoring.

- **The dollar value of incentives provided and penalties imposed by the program and its distribution among different employee groups:** Although there are no indications that the Washington CTR program is imposing significant monetary costs or benefits upon workers, a more detailed and rigorous analysis would be valuable. Obtaining the data needed for such a study would require a concerted effort, however, and cooperation from the employers.

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NOTES

[1] This paper was supported in part by the following FTA grants: Evaluation of CTR Programs, WA90-X140 and CTR Tools, WA90-2159

[2] Awareness about potential adverse legal consequences has led to some unusual results. To appear unbiased and above reproach from either men's or women's groups, one large organization selected a small group of individuals who were skilled at program development but who had no children among them. That group evaluated, made decisions about and set up on-site day-care options several years ago. This employer felt its objectivity toward the subject would be confirmed. It is possible to argue for a policy giving employees with day-care or family obligations some priority, such as for flextime opportunities or priority parking slots. Such a policy could have such an important purpose for the company and workers as to be a sufficient defense against a disparate treatment claim. Clearly, this is an issue for the 1990s and one that deserves careful legal evaluation.

[3] The Washington State Department of Transportation estimated that the total 1995 annual cost to implement the CTR program in Washington State was $7.5 million. (Johnson nd.)

[4] Zones were constructed based on predominant land use, population density and other characteristics. (Merchant 1995: 1).

[5] See, for example, *How to Develop your CTR Program* (1993) and *How to Implement and Promote your CTR Program* (1994), first published and disseminated by the Municipality of Metropolitan Seattle.

[6] Trains or light rail are not yet part of the infrastructure in the Puget Sound region.

[7] The KCDOT CTR program willingly shares its materials to other jurisdictions upon request. The general number for CTR Services is (206) 684-4444.

[8] King County's Department of Transportation, King County's Executive's Office, the State of Washington's Department of Transportation, the Greater Seattle Chamber of Commerce, the State of Washington's Department of Social and Health Services, the State's Department of Employment Security, the Private Industry Council, Tarah & Associates, the Urban Enterprise Center, Bernard Development Center, and the employer provided representatives and suggestions to build this program.

[9] Compare these rates to KC Transit's monthly pass rate for peak travel hours of $39.50 for one zone or $57.50 for two zones.

[10] U-Pass: *The University of Washington's Transportation Management Program.*

[11] This casts the issue of equity consequences in a somewhat different light, and reveals the complexity of the analyses of distributional impacts.

[12] The average worksite annual incentive costs ranged from $0 in Yakima County to $2,642 in King County, with a statewide average of $1,779. The statewide average 1995 total annual cost per worksite was estimated at $7,404, or $9.03 per employee and $0.095 per peak period vehicle mile trip reduced (Johnson nd.).

[13] According to the 1994 Comprehensive Rider/Nonrider survey (Metro Transit 1995) safety issues, particularly for workers who work late hours and leave their work site alone and after dark, are of increasing concern among women.. "The risks and fears of physical attack, harassment and other anti-social behavior have become a significant influence on the travel habits of many urban dwellers. Although apprehension about personal security affects many people, certain groups are particularly vulnerable. Obvious examples are women, the elderly, ethnic minorities, people with disabilities, lesbians and gay men." (Lynch and Atkins 1988:257)

[14] More information about the City of Seattle's carpool program is available through Seattle's Carpool Parking Office 206-684-0816.

[15] Special thanks to S. Pailca for this observation, September 10, 1996.

Poster Session Abstracts

Patricia Bethea
Access to Public Transportation and Patterns of Career Development Among African-American Women

Tricia Brennan
An Analysis of Trip Behaviour Patterns of Women in Developing Countries: A Case Study of Puebla, Mexico

Joseph Hacker, IV
Measuring Women's Non-Work Transportation Needs in Urban Areas

Amie Lindeberg
Swedish National Travel Surveys

Joel Rey and Michael Baltes
Temporal Changes in Gender-Based Travel on Florida's Commuter Rail System

Anthony Saka
Comparative Analysis of Travel Characteristics of Women and Men in the Baltimore Area

Katherine Shriver, Linnaea Tillett, and Glynis Berry
An Intercept Survey of Walking Along New Lots Avenue Prior to a Street Lighting Improvement

ACCESS TO PUBLIC TRANSPORTATION AND PATTERNS OF CAREER DEVELOPMENT AMONG AFRICAN-AMERICAN WOMEN

Patricia Bethea

ABSTRACT

Current research indicates that African American women are more likely to be rearing children alone, to be poor, and to be dependent on public transportation than their counterparts in other ethnic groups. Specifically, the National Personal Transportation Survey (NPTS, 1990-91) found that minority women account for the majority of transit users. This dependency on public transportation is aggravated by the limitations of public transportation in small urban areas. These limitations affect children who are handicapped by mothers unable to model career development and planning and employers heavily dependent on the female work force of 2010 and beyond.

This study examined access to public transportation among African American women and the relationship between public transportation and career development using a definition of career which included work and leisure (C = W + L). The sample was taken from an urban area in the southeast where a three year old municipally operated transit system was functional. In the first phase of data collection, 415 women who were either dependent on fixed-route public transportation or who had access to private transportation participated in a fixed-route survey or focus group process. Participants were asked how they travel within the city to work and leisure activities, and to describe their work histories and career development in the context of transportation.

Sixty percent of fixed-route transportation dependent respondents identified the bus as a good way to get to desired jobs compared to only 13% of transportation independent women in the focus groups. Among transportation dependent respondents, 47% reported having refused or quit a job because of lack of transportation and 67% stated that in the past, they had taken a job just because they could get there by bus. Women who experienced fewer work interruptions due to transportation expressed greater satisfaction with bus service whereas having to refuse or quit a job due to lack of transportation influenced the attitude that the bus is not a good way to get to work. Importantly, most transportation dependent women described their work experience as a lot of different jobs as opposed to a career while almost all of their transportation independent counterparts in the focus group process identified their work experience as a career. There were also important difference in the patterns of career development between women in the two groups. Fixed-route respondents indicated more fragmented and unstable work histories.

AN ANALYSIS OF TRIP BEHAVIOUR PATTERNS OF WOMEN IN DEVELOPING COUNTRIES: A CASE STUDY OF PUEBLA, MEXICO

Tricia L. Brennan

ABSTRACT

Women by virtue of their distinct and clearly defined roles in Latin American society have different transportation needs than men. Women are responsible for caring for the household, earning income and acting in the community to improve basic urban services. Understanding how these roles play a significant part in women's use and access to transportation resources is critical, especially in the developing world context which is characterized by rapid population growth, expanding urban areas, significant income disparities, high rates of inflation, poor infrastructure conditions and decreased government spending on urban services. These events have a significant effect on low-income communities and in particular low-income women who must negotiate time, costs and access to transportation while meeting their daily duties.

The purpose of this project is to interpret and assess the particular trip patterns of women in developing countries utilizing both literary sources and primary data, and to determine appropriate transportation policy responses to their defined needs. The first part of this study provides a general discussion of transportation and gender planning issues in developing countries, and of women's experiences with transportation in Mexico and Latin America. Puebla, Mexico serves as the case study area in the second part of the study. This case study utilizes information from a door-to-door transportation survey conducted in 1993-1994 by the Inter-University Group of Montréal, in association with the State Government of Puebla, the Autonomous University of Puebla, and the World Bank.

The first stage of this case study focuses on the key areas in which women's use of transportation differs from men's. Findings from the first stage support the existing literature and previous studies regarding women's experiences with transportation in Mexico and Latin America and indicate that age, work status, driver licence status and location are significant factors in women's trip patterns. It was found that when women in Puebla make trips, they make trips more often; for more reasons, and; depend on public transportation more than men. Contrary to the literature, women in Puebla spend less time travelling per day than men.

The second stage assesses how daily activities and associated trips patterns vary between women from three sample areas differentiated by location and socio-economic factors. The findings indicate that low-income women rarely demonstrate similarities with suburban women in their trip behaviour patterns. This stage raises key issues that have significant implications for future trip behaviour survey procedures and transportation planning in Puebla, Mexico. Emphasis needs to be placed on women's accessibility to transportation and the incorporation of women voices into planning processes, as well as a commitment to gaining more information on women's experience with transportation. In particular, transportation behaviour surveys need to incorporate questions recognizing gender roles and reflecting the reality of the employment market in developing countries.

MEASURING WOMEN'S NON-WORK TRANSPORTATION NEEDS IN URBAN AREAS

Joseph F. Hacker, IV

ABSTRACT

Transportation planning for low income women—unemployed, burdened with children, and without access to automobiles—requires innovative measures of mobility to non-work destinations. Physical accessibility to prenatal care, a uniquely female trip linked to positive birth outcomes, is used to explore appropriate non-work measures. This paper examines alternative measures of transportation needs identification and systemic access boundaries affecting women's health care accessibility in west/southwest Philadelphia.

The needs identification method locates transportation disadvantaged census tracts using social indicators exceeding twice the median urban values. Access boundaries reflect the reach of the public transit system *from* the participant health care providers *outward* to the clients. Disaggregate data from the Healthy Start prenatal program is used to examine the distribution of clients in relation to need areas and transit service boundaries.

The author found validation for the needs identification method. Access boundaries, however, differed from medical or automobile aggregations. 41% of Healthy Start trips duplicated mass transit service, and only 4% of contracted trips originated from medical need areas. The author illustrated how different measures can misrepresent need or service provision. Overall the author argues that women's non-work trips require different measures for appropriate service. These measures suggest broad changes required by public transit to respond to the changing urban environment.

SWEDISH NATIONAL TRAVEL SURVEYS

Amie Lindeberg

ABSTRACT

The present national travel survey in Sweden, Riks-RVU, runs for (at least) five years, 1994-1998. It contains the following main variables, describing:

the trip —	mode, number of kilometres, purpose, starting and ending point, time
the person —	age, sex, occupation, driving license, income
the surroundings —	household, housing, number of cars, bicycles, mopeds, motorcycles

The results are stored in a database that is updated each quarter of the year.

A specially developed menu system enables the user to make tables in a very easy and quick way.

The system allows the user to choose between:

- trips, journeys, segments, or kilometers
- totals or means
- year or day estimates
- persons or households with different characteristics

Two earlier surveys were carried out by SCB in 1978 and 1984. The results are almost totally comparable.

The diagrams show the major differences in the travel patterns of women and men. They also give comparisons between women and men, and comparisons between different groups of women.

TEMPORAL CHANGES IN GENDER-BASED TRAVEL ON FLORIDA'S COMMUTER RAIL SYSTEM

Joel R. Rey and Michael R. Baltes

ABSTRACT

INTRODUCTION

The poster presentation addressed gender-based travel issues and other issues such as trip purpose, mode choice, frequency of use, and the interrelatedness of these many issues using data from three comprehensive on-board surveys conducted in 1991, 1993, and 1994 by the Center for Urban Transportation Research (CUTR) for the Tri-County Commuter Rail Authority (Tri-Rail). The issue at hand was to investigate the temporal changes in women's travel through the use of traditional travel variables such as trip distance, modes of access and egress, and trip purpose, among others. For example, the literature points out that, even though women have entered the workforce in substantial numbers during the past decade or so, women still make work trips which, on average, are shorter in distance than that of men due to a variety of reasons such as lower wages, the suburbanization of service and retail sector employment being more evenly distributed across geographic regions, and women retaining their traditional family roles as nurturers, shoppers, homemakers, and family crisis managers.

METHOD

Descriptive statistics as well as a host of crosstabulations were used as the methods for analyzing the on-board survey data. From the three on-board surveys, approximately 8,500 records and myriad variables were analyzed, including like data for travel during the week (Monday-Friday) as well as during the weekend. Specifically, comparisons between the weekly and weekend travel for women were explored. The findings from the analyzes are contained in the next section.

DISCUSSION OF FINDINGS

The findings show that, based on the variables that were analyzed, the demographics and travel behavior of female travelers on Tri-Rail has changed over time. The major findings, as outlined in the poster presentation, are as follows:

Gender

Since 1991, female ridership, as a percent of total ridership, has increased;

Age

Overall, female ridership in the 23 to 34 age category has shown the greatest decline as a percent of total ridership since 1991;

Ethnicity

Overall, Hispanic females showed the greatest increase in use of Tri-Rail for their trip making since 1991;

Annual Household Income

Since 1991, a greater percent of female riders are coming from households with lower annual incomes;

Education Level

No significant changes have occurred in the level of education of female riders since 1991;

Travel Frequency

The largest decline in usage is among the female riders who use the system 4 or more days per week;

Trip Purpose

The work trip purpose exhibited the largest decline among female riders since 1991;

Reason for Riding

Since 1991, fewer female riders indicated that the economy of riding the train was the reason for their use; and

Alternative Travel Mode

Driving as an alternative travel mode to Tri-Rail has shown the greatest decline among female riders since 1991.

SUMMARY

As more and more women enter the workforce and declines in federal, state, and local funding and ridership continue to occur, policy-makers, decision-makers, and transit providers such as Tri-Rail need to take a hard look at public transit's most captive rider, women, to address their specific mobility needs. The findings from the three on-board surveys as well as further market analysis should provide a basis for improving the mobility of women on all transit modes.

COMPARATIVE ANALYSIS OF TRAVEL CHARACTERISTICS OF WOMEN AND MEN IN THE BALTIMORE AREA

Anthony A. Saka

ABSTRACT

This paper discusses the trip making characteristics of women and men in the Baltimore metropolitan area. A survey was undertaken on white collar office workers. The purpose of the survey is to document and compare some trip making characteristics, including number of trips made, amount of time spent on the road, latent effect of random violence on trip making, and the travel issues perceived to be the most critical, for women and men.

Analysis of 51 participants (37 women and 14 men) suggests that, contrary to previous studies on gender related travel, women in white collar jobs make more daily trips and hence spend more time on the road than their male counterparts; equal proportion of the women and men perceived random violence to be the most critical travel issues; and the women postponed a higher percentage of their trips owing to perceived personal safety. The survey also shows that the married women make fewer trips than the single women; the women with kids make more trips than the women without kids; and the married women with kids make fewer trips than the single women with kids. In addition, the analysis of traffic accident data for the Baltimore metropolitan area from 1993 to 1995 reveals that the accident rate for men is approximately twice the rate for women.

The fatality rate ratio is even higher. The conclusion of the study is that contrary to the popular notion, for men and women with similar socioeconomic attributes, there is no evidence that men make more trips and travel longer than women. Indeed, there are indications that the women make more trips and spend more time on the road than their male counterparts.

AN INTERCEPT SURVEY OF WALKING ALONG NEW LOTS AVENUE PRIOR TO A STREET LIGHTING IMPROVEMENT

Katherine Shriver, Linnaea Tillett, and Glynis Berry

ABSTRACT

In 1995, the NYC Department of Transportation sponsored research to determine whether lighting tailored to support considerations to which pedestrians are sensitive has the potential to influence pedestrian activity and attitudes during evening walks and perhaps increase use of city streets after sundown. East New York in Brooklyn was selected because the local population has a strong custom of street use and while safety is a local problem, the area is experiencing a revitalization. Three poorly lit yet often used sites were selected for low-cost, supplemental street lighting improvements. Would better lighting increase a sense of security and comfort and affect changes in pedestrian perception, attitude and activity? An intercept survey was developed to monitor longitudinal changes in these relationships with a controlled comparison six months before and after the lighting installation.

The intercept area encompassed the intervention sites that are located: 1) upon the front of a community center, neighborhood library and an historic church; 2) along the main street to link these civic uses with the IRT terminal and surrounding retail; and, 3) at two intersections under the elevated IRT to enhance access between residences and the main street. Baseline data were collected on three July evenings between 6 and 9 pm. This was conducted by interviewing the trip maker en route, which involved having walkers who were passing by respond to survey questions about aspects of their walk trip characteristics and activities as well as affective and person-related characteristics. Three hundred twenty-four usable surveys were collected, equivalent to 0.05% of the total population within 0.6 miles of the IRT terminal.

With the exception of children under 12, the number of male and female participants was nearly even, with about 2% more males agreeing to answer questions of the survey team. Almost a third of the participants did have a car available for their personal use and a third of this subgroup were women. Of the 11% who live alone, half as many were women, who also tend to live with children or an elder.

Women participants walk slightly less frequently, less far and less long. It appears that more than half who arrive at the site by public transportation and depart on foot are women. Women in particular indicated that they arrive by the IRT and will walk home if a transfer bus does not arrive and if the conditions are right for walking. Men are more likely to arrive and depart from the area on foot or by car or arrive on foot and depart by public transportation. Of the top three trip purposes, commuting (31%), shopping (19%), and hanging out or visiting with friends (13%) the distribution among women and men was equal. On the other hand, of the 12% who were conducting personal business, 15% more were men. Twice as many women were engaged in a civic activity; while a third more of the 9% who were strolling or playing in the street were men. Most participants, 49%, engaged in no other activities aside from the primary purpose of their walk; of the 48% who did one or two additional activities, 4% more were women many of whom were commuters. Although a small number of the total participants, men were almost twice as likely to conduct three or more secondary activities.

Women and men ranked five benefits of walking in the same descending order: exercise, cost savings, seeing a friend or acquaintance, being around others in public, and conserving the environment. Of five possible changes that would encourage participants to walk more in the evening: 23% of women and 21% of men stated that being able to see who is on the street after dark is the single most important factor. Beyond this factor female and male participants did not agree. Twelve percent of the women stated that shops open later in the evening would be the most compelling reason to walk more after dark, while 17% of men wanted more recreational and entertainment opportunities. Although the total remaining 15% of participants indicated that safe intersections and a good street appearance would be more important in encouraging evening walks, safer intersections ranked higher among women (7.74%), while 5.29% of the men were more concerned with better overall street appearance.

About 17% of both male and female participants are not comfortable walking alone after dark. Yet there appears to be a predictable link between gender and sense of comfort after dark. While 39% of all participants were comfortable walking alone, half as many were female. Of the 42% who prefer to walk with others, 15% more were female. More women indicate they never walk after dark. Tests for the equality of means show a t-value of 3.67. If a woman must go out after dark and would prefer to not walk, 15% indicated they would take a cab, 13% use public transportation and 11% will drive a car. Interestingly, almost twice as many men indicated they do not go out after dark if they must walk; however this tendency to not go out after dark significantly correlated with living alone, which is the choice of more men than women.

This study is an attempt to understand, or at least acknowledge, the role of multiple factors in affecting various changes in a small spatial area. Women and men appear to use and perceive this neighborhood activity center in different ways. The final analysis will help identify what changes in activity and attitudes occur in response to this specific street lighting design approach, and will provide an opportunity to explore whether changes in pedestrian travel behavior will be different among the men and women who use this neighborhood center.

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RESEARCH AGENDA

RESEARCH AGENDA

BACKGROUND

The Conference was designed to identify:

➡ the additional research required to better understand the travel patterns of various women and their families,

➡ the information needed to formulate equitable and effective transport polices which take women's constraints and needs into account, and,

➡ the methods and approaches most likely to develop or elicit the required data on the travel behavior of women and their children and their parents.

On the last day of the Conference the Steering Committee invited all interested participants to attend a half day work session structured to develop a series of research statements, projects, and approaches addressing the wide range of substantive areas discussed at the Conference. Participants who could not be present were asked to submit written research or project statements.

In all, 32 separate research issues and topics were identified. For the sake of convenience these topics have been grouped into ten complementary categories:

- Women's Travel Constraints, Preferences, and Patterns
- Understanding the Travel Patterns of Women of Color
- Understanding the Travel Patterns of Aging Women
- Women's Safety and Security Issues
- Women and Technology
- Land Use Patterns and Community Interaction
- Travel Patterns of Children
- Developing Appropriate Research Design and Methods
- Policy Research and Issues
- Women in the Transportation Industries

These categories, while convenient, are artificial even if defensible. Most of the important research questions in each of these categories overlap or are raised in several other categories. We cannot examine the accident rates of women, for example, without looking at the growing dependence on the private car by so many women. We cannot analyze the impact of land use on women's travel patterns without evaluating the travel patterns of suburban or urban women.

Rather than viewing an important topic from only one perspective, we have elected to include a variety of perspectives on the same topic. In the category focused on older women, for example, we question the impact of suburbanization and of personal fears about safety and security on older women's travel—even those such topics are raised in the Land Use and Safety/Security discussions as well.

WOMEN'S TRAVEL CONSTRAINTS, PREFERENCES, AND PATTERNS

1) **We must better understand how women make the trade-offs between and among transportation, housing, and employment choices.**

Current research shows that women often have shorter commutes than men; these patterns are often explained in terms of income or by differences in labor markets. But existing transportation and labor market models rarely account for the multiple spatial or geographic constraints under which many women operate. While occupational segregation may limit the actual location of jobs which some women can take, residential development patterns may constrain the effective employment opportunities of other women—even in the absence of discrimination in either housing or employment markets. And we know that some women do face discrimination in both markets.

We must understand to what extent the travel patterns of women overall, or subgroups of women characterized by residential geography or occupational status or household income or race and ethnicity or immigration status, etc., are affected by housing and employment locations overall and in individual communities. For example, research shows that rural and urban women may have different responses to such constraints; at the same time, other research shows that comparable women in different metropolitan areas may demonstrate great variability in their work trip commutes. We must have a better understand of the underlying dynamics of these patterns and choices.

We also need very community-specific research with a disaggregate focus; that is studies of women's travel patterns from specific neighborhoods or to specific employment locations (i.e., downtown or suburban malls, etc.) or to certain types of firms.

2) **We must better understand how household roles and domestic responsibilities constrain or structure the travel patterns of women first alone and then in conjunction with employment and residential patterns and constraints.**

A growing body of research shows that women have different travel patterns than comparable men; many researchers have argued these differences arise because women retain a disproportionate share of domestic responsibilities when they join the labor force. We need more detailed studies of the short and long term impacts of these constraints and whether they have the same force and direction for different sub-groups of women.

For example, some researchers have argued that women have shorter commutes because they wish to be closer to home to more easily carry out their obligations to young children, However, research presented at this Conference suggests that Black women have much longer commutes than comparable white women. We must understand if household constraints are less confining to these women or if other forces take precedence.

Moreover, most research which focuses on spatial and geographic barriers to women's travel rarely considers these issues of household role—and vice versa. We need research which simultaneously, but comprehensively, examines the overlapping or conflicting impacts of household role and employment and housing patterns on women's travel patterns, for women overall and then for various subgroups of women—again characterized by residential geography or occupational status or household income or race and ethnicity or immigration status, etc.,

3) **We must understand the full implications of trip-linking behavior on women's total travel patterns.**

Substantial research indicates that salaried women are much more likely to link multiple trips together than comparable men; women are more likely to drop children at daycare or to go grocery shopping on their way to or from work. But many studies either do not collect or do not fully analyze data on trip-linking thus failing to understand the magnitude and complexity of this phenomenon.

We need research which examines the behavioral underpinnings of trip-linking in order to understand how important a determinant it is of schedule, mode, and route choice. Can such behavior be changed and under which circumstances? For example, will providing childcare facilities at transit stations make any difference in the travel patterns of working mothers with young children?

4) **What are the implications for policymakers of differences in the attitudes, preferences, and values of women travelers today?**

Research presented as early as the first national conference on Women's Travel Issues found that women had different perceptions of a variety of transportation related variables, from safety and security to environmental pollution. We must understand if these differences between men and women have continued and, if so, what they imply for those trying to predict or change travel choices.

For example, many studies show that women report themselves more concerned about environmental degradation than men. Can or do such attitudes lead to changes in travel behavior—less driving alone, more use of transit and shared-ride options, for example? And under what circumstances?

At the same time, employed women with children may be more concerned with time and they may have greater fears for their personal safety. Even if many women are genuinely more concerned about the environment, will that lead to desired differences in their travel patterns? And if we wished to address safety and security issues, what would we have to do to convince women that certain choices were safe (from parking in lots at night to using transit in low density communities.

UNDERSTANDING THE TRAVEL PATTERNS OF WOMEN OF COLOR

5) **We must have a comprehensive understanding of differences in the travel patterns of women by race, ethnicity, country of origin, and years in the US, as well as by patterns of residential segregation along racial or ethnic lines (etc.), whether voluntary or not.**

Research presented at this Conference, and elsewhere, clearly shows that there are sometimes major differences in the travel patterns of comparable women of different races and ethnic backgrounds. Hispanic women are far less likely, for example, to be licensed or to drive but Black women are more likely to take transit. Most of this research, however, has a) not isolated the behavioral underpinnings of such differences, nor, b) evaluated these patterns in light of disaggregate differences in residential location within metropolitan areas.

Research has shown, for example, that among women living in the same size and density metropolitan area, black women are substantially more likely to use transit, even controlling for income, than comparable White, Hispanic, or Asian women. However, within those metropolitan areas black women may be living in very different areas, traveling to very different locations for work. In short, these variations in travel may simply reflect other, more fundamental, differences affecting commute patterns and choices.

6) **We must understand which differences in travel patterns among groups of women <u>are</u> linked to cultural norms about trip-making or to different experiences in the country of origin among immigrants; moreover we must determine which of these patterns are likely to persist.**

There is a growing body of research which suggests that people from different ethnic and racial backgrounds have different lifestyles—that is differences in the way they use their time and interact with friends and families. Not surprisingly, these lifestyle choices affect their travel patterns. If such decisions explain some or all of the differences seen among women from diverse backgrounds, we must understand if these patterns are likely to persist. If immigrant women are much more likely to use transit than comparable native born women—will they lower their transit use as they become acculturated?

Overall, we need a better understanding of why people of color and immigrants display such variations in their travel choices and what those variations should and could mean to policymakers and researchers in both the short and long run.

7) **What are the real travel patterns and needs of women on public assistance; what transportation barriers and problems do they face as they attempt to enter the labor force?**

The role of transportation, or lack thereof, in explaining high inner city unemployment—especially among minority women—has been hotly debated for decades. Can better transit provide the welfare-to-job link which policymakers seek or is the car the only feasible answer?

Much will depend not only on the location of jobs open to women with low skills levels, but also on the hours of employment, the regularity of the work schedule, the location and availability of childcare, and regulations about car ownership. For example, car use may be limited among low income women seeking jobs by public policies which refuse to allow a welfare recipient to own or operate a car.

To properly assess these issues in each community, we must know where affected women actually live, where it is realistic to expect they can find jobs appropriate for their skill levels, and which potential transportation resources are available to them. To be relevant in policymaking, this kind of work must be done in individual metropolitan areas, often at a relatively disaggregate level.

UNDERSTANDING THE TRAVEL PATTERNS OF OLDER WOMEN

8) **It is crucial to develop longitudinal data on the travel patterns of older women, so that we can see the impact of increasing income, automobility, suburbanization, etc. on their transportation choices.**

Substantial research shows that older women and men have different travel patterns—from one another and from younger travelers. Older women are much less active than comparable men, curtailing their driving at early ages. But we do not know if newer generations of older women will behave in the same way, since their life experiences will be so different. Moreover retirement will likely be later among both men and women in the coming decades.

It is crucial to follow the travel patterns of women as they age, not just upon reaching retirement but in each 2-5 year period after retirement or reaching 65 or 70. The role of the auto in their lives, as well as travel implications of the presence and assistance of children and family, should be studied.

9) **We must also understand the travel patterns of older women who have fewer resources as they age, including poor women, those living alone, and those of color.**

Being poor and/or living in certain areas of a metropolitan area may pose barriers or just create differences in the travel patterns of sub-groups of older women. We must identify the travel patterns of groups of older women characterized by where they live or their marital status or household income or race and ethnicity or immigration status, etc.

10) **We must develop longitudinal data on the accident rates and profiles of older women**

Most women reaching 65 in the next three decades will have been licensed drivers for most of their lives. However, while older women are less likely to have accidents than comparable men on a per capita basis they may be more likely to have accidents on an exposure basis (that is, per trip or mile driven). They are also more likely to be seriously injured when involved in an accident.
We must fully understand the conditions under which older women are more likely to have an accident or be injured, as well as changes in those patterns over time. It may be, for example, that "new" generations of older women may be more competent or more experienced drivers than those currently driving.

11) **All aspects of the traffic safety hazards facing older women must be studied—from the design of cars, roads, and signage to differences in the physical skills necessary to safely operate a car.**

We must understand which of the differences in accident rates and severity among older drivers are due to inherent differences in the way the sexes perceive, react, and respond to vehicle, road, and traffic conditions. Older women are, on average, smaller than comparable men so some of the problems they face in accidents, for example, may be the result of stature. Or older women may react to visual stimuli and traffic safety messages in different ways than older men—and than younger drivers of either sex.

These research findings may have important policy implications given the preponderance of older women among older people. Changes may be needed in the way cars and safety devices (air bags, for example) are designed or roads are signed or safety messages are conveyed.

UNDERSTANDING WOMEN'S SAFETY AND SECURITY ISSUES

12) **We must develop better and more comprehensive data on pedestrian, transit, and auto crime affecting women.**

Crime statistics are rarely kept in a way that allows policymakers to understand how women travelers are constrained or disadvantaged by actual crime or by the threat of crime. We must develop statistics which link incidents to travel choices by mode and time of day and severity of crime.

13) **What impact on travel mode or route or schedule does the fear of crime have on various groups of women travelers? What is the relationship between attitudes and behavior?**

Women generally report themselves more concerned about their personal security than comparable men—but we have little idea of how these concerns actually affect their travel patterns in the short and long run. Women may respond by abandoning transit and refusing to walk, or they may "simply" wait for a bus at more crowded stop or travel a stop further in order to get off with other people. We need to understand exactly how fear for personal security affects different women; for example, older women may be more responsive and younger women less (or not).

This research is crucial not only in helping to develop ways to make the widest possible set of travel options open to most women, but also in marketing and promoting security changes to affected women. We would like to know, for example, if surveillance systems (for example, at highway rest stops or transit transfer points) make women feel safer, and if they do, what changes are seen in their travel behavior.

14) **We must develop comprehensive traffic accident data on women in general, and on specific sub-groups of women.**

Men and women have different patterns of accidents—rates, times, severity—but women's accidents seem to be worsening. Women are facing, for example, increasing involvement in fatal crashes as they drive more miles more often. Given almost universal licensing among women under 40, we need mechanisms to obtain extensive information on the type of accidents in which women drivers are overrepresented—by time of day, road conditions, road type, vehicle design, the number of occupants, etc.

Data collection and analysis must be longitudinal as more women become workers and drivers.

15) **How important is the growing problem of alcohol and drug abuse among women drivers—and what role does drinking and drug abuse play in women's crashes?**

Are women becoming more reckless and less concerned about drinking and driving? Unfortunately some research presented at this Conference suggests that younger women may be becoming more like younger men in using and abusing substances which impair driving performance and which are demonstrably related to accident rates and severity. We must understand what is happening and why. Is it possible or desirable, for instance, to target anti-drinking/driving campaigns to young women?

16) **We understand the role of vehicle and restraint design on women's crash involvement and injury.**

Motor vehicles and the safety devices they contain—especially airbags and seat belts—are designed, built, and installed to benefit the 50th percentile male—and not smaller or more frail women, children, or men. As a result we continue to unnecessarily harm anyone who is not midsize male with ill fitting restraint devices and inappropriately designed vehicles.

We must define the real world performance characteristics of interior design dimensions, vehicle controls, and restraints (belts and airbags) and their role in causing or preventing harm to women in a crash. We must also understand the role of seat and passenger position, crash avoidance and protection systems, and vision enhancements in facilitating the driving task, and increasing or reducing accidents and harm to various sub-groups of women drivers. Older people, for example, may have more difficulty with night vision while children face important seat positioning issues.

WOMEN AND TECHNOLOGY

17) **Are there gender differences in perceptions and use of in-vehicle navigation systems? What changes are observed in traveler behavior?**

In-vehicle navigation systems are being widely installed in rental vehicles and in selected luxury cars, often marketed as a way for travelers to feel more secure and to avoid congestion, accidents, etc. by suggesting alternative routes. Such systems typically route users along the path which will take the shortest time to complete, generally along interstates and major arterials. But there may be gender differences in response to such systems; for example, do women want or use shortest-path information if it takes them away from their childcare center or into neighborhoods they do not know?

We must investigate whether men and women seek the same kind of information from such systems, if they value that information in the same way, and if it leads to the same changes in travel behavior. For example, will women deviate off their route to avoid an accident or are they more willing to tolerate the resulting congestion? Since we rarely want **all** drivers to deviate to alternative roads/streets, this may be useful information for system designers.

We must also understand if women want different kinds of cues or displays of information or if they perceive them differently than comparable men.

18) **How will improvements in telecommunications affect women overall, and sub-groups of women in particular?**

Are there differences in how men and women will react to and use various telecommunications options? If so, what are the causes of those differences and what are their ultimate implications for occupational segregation, the location of firms and industries, and the way people organize their households?

For example, the applicability of telecommuting, etc., may be industry and even job specific; to what extent are women represented in the kind of jobs likely to use or involve such technology? And if large groups of women are not able to use such technology, will that increase the wage gap between men and women and/or increase the relative amount of resources certain women are forced to spend on travel?

And if some or many women do make use of such options, what will the impact be on their total travel patterns and choices in the short and long run? Will women move farther from work if they do not have to travel there as frequently? Will they give up the car without the need to commute daily or will they be more likely to drive since they do so less frequently?

19) **What role will improvements in highway and transit surveillance play in women's travel patterns; will women be more or less willing to give up privacy for security?**

While women often report the importance of personal security concerns, privacy issues have forced the removal of surveillance cameras on highways and other locations. In which transportation situations are surveillance devices likely to increase both actual and perceived security sufficiently to overcome privacy objections? For example, are these devices more warranted/ accepted in transit situations than along highways?

It would also be important to learn if men and women have different perceptions of the trade-offs between these two societal objectives. Are women more likely to be willing to give up one to gain the other than comparable men? Do different groups of women have different views of this issue; for example, are elderly women more likely to favor surveillance-based security systems?

Moreover we need to know if these devices actually make a difference in the travel choices of various groups of women. Do women use one mode or route because they feel confident that they will be seen if their car breaks down or if they are accosted? Or are these systems seen as a last ditch option, help probably arriving too late to matter or not at all?

LAND USE PATTERNS AND COMMUNITY INTERACTION

20) **There is a need to expand our understanding of the spatial mismatch between the homes and potential employment locations of various groups of women, at the neighborhood and community level, as well as at the metropolitan or aggregate level.**

The term spatial mismatch is generally used to describe the plight of low skilled inner city, largely female, workers who are increasingly distanced from appropriate jobs in the suburbs. While a vigorous debate still rages over whether the distance between home and growing suburban employment concentrations really explains unemployment, it is clear that some groups of women are substantially more disadvantaged than others by these distances, and/or the lack of appropriate transportation options.

It is also clear that these disparities are very community-specific. Some workers living in the inner city might have an easy and rapid transit connection to suburban jobs while other inner city workers may have to transfer twice or three times to reach a job not five miles from their homes. It is important to understand these discontinuities within individual metropolitan areas at the neighborhood and even large employer/firm level and among women with different educational, occupational, income, and racial and ethnic backgrounds.

21) **How has the suburbanization of homes affected the travel patterns of various sub-groups of women?**

Suburban women had different travel patterns than other women—they travel longer distances, more often in the car. But we do not understand the extent to which certain kinds of travelers have self-selected the kinds of residential communities which facilitate more travel or offer a greater number of possible destinations. For some, suburbanization may equal greater, not lesser, mobility.

We also do not know the extent to which women have willingly traded greater distances and dependance on the car for other suburban attributes—from larger homes to better schools to backyard gardens. At the same time, women at different life stages may have different perceptions of what they are losing and gaining in suburban areas; older women in suburban areas may feel less mobile as they lose agility or the ability to drive.

22) **Can we untangle the behavioral underpinnings of sometimes major differences in the travel patterns of rural, suburban, and urban women?**

Research presented at this Conference showed that rural and urban women have different work commute patterns; however, we do not have a clear idea of the extent to which these patterns represent constraints rather than choices. And while we have strong theoretical models we have little empirical data to indicate exactly which variables play the strongest role in shaping urban and rural travel—household roles, employment locations, transportation resources, etc.

CHILDREN'S TRAVEL PATTERNS

23) **How has the growing magnet school and school choice movement (whether formal or informal) affected the travel patterns of mothers?**

Many communities have attempted to voluntarily desegregate their K-12 system by designating various schools as math or science or art magnets, allowing parents to chose where in a community their children attend school. Other parents have opted for private schools for which they pay or they have taken advantage of voucher programs offered by local school districts. All of these trends have sharply reduced the importance of the neighborhood school—a place where many children could walk or bike or use transit.

Most parents gain an additional transportation chore by choosing schooling options outside their own neighborhood. Mothers seem particularly constrained by such decisions. But we have very little idea of the overall impact on their travel patterns and choices now, and conceivably in the future. At the same time, there is tremendous pressure on families in these situations to allow teenagers to drive at the earliest possible moment in order to relieve those burdens; we do not know the full implications of these patterns either.

24) **What has been the impact on children's and ultimately parents' travel patterns of the growing inability of school districts to provide school bus service?**

Some transit systems have seen dramatic increases in bus ridership as school districts phase out bus service in response to spiraling costs. Are children become transit users in greater proportions? And if they are, are there long term implications; do children used to buses ride transit more as they grow up? And what are the impacts on more traditional riders? For example, many systems have found that young children on-board transit vehicles often frighten older travelers, even if the children are not behaving in a menacing way.

On the other hand, transit services are not always available for all students who lose school bus service. To what extent are parents forced to change their travel patterns—from dropping out of carpools to buying second cars—in order to respond to these new but long term needs of their offspring? Are mothers, as commonly thought, the parent most affected by their children's school trip needs?

25) **We need a better understanding of how the imposition of stronger safety and auto restraint requirements affects the travel patterns of various groups of mothers.**

It is well accepted among safety experts that children should be placed in the back seat, belted and in appropriate child safety devices. Most of these requirements effectively reduce the child-carrying capacity of each individual car as well as reducing the number of adults who can ride. Do mothers drop out of carpools or drive alone where they once packed several children into a car?

Conversely, do mothers fail to comply because to do so would create substantial transportation problems (for example, a mother with three children under 5) What is the level of compliance among mothers in different groups; do otherwise comparable men and women have different rates of compliance? And exactly why do more parents not comply with regulations or accepted safety practices?

26) **Does carrying children interfere with women's driving? Do data indicate greater accident rates among women chauffeuring children?**

Data show that women are more likely to be accompanied by children when they travel than comparable men. We know, however, very little about how the presence of even properly belted and restrained children affects the driving behavior of mothers and fathers. Are women more distracted because they have such passengers? And if they are, does that translate into greater accident or citation rates?

DEVELOPING APPROPRIATE RESEARCH DESIGN AND METHODS

27) **We must have a better way to bridge the gap between research and practice, between scholars addressing these issues and policymakers establishing programs and projects.**

Many scholars present at this Conference have been documenting and analyzing important travel differences between comparable men and women, and among groups of women, for almost two decades. Yet little of that work is represented in commonly used planning tools and approaches. It is crucial to develop a way to incorporate a range of important societal variables into planning models and evaluation tools.

For too long concerns about the transportation needs of women in general, or under-served or underrepresented women in particular, have been relegated to a few paragraphs in a final report or transportation plan which results from a massive process which never once considered those needs in any systematic way.

28) **We must change and reorganize the way in which travel data are collected, synthesized, and evaluated so that they better capture both the profound and subtle attributes of women's travel.**

It is crucial to provide policymakers and planners with timely and accurate information on the travel patterns of women in a variety of circumstances. We know that women's patterns are often more complex than men's but research studies and planning projects often fail to collect or use that information. For example, women often link many trips together with their home-to-work commute; many studies collapse all those links into the category "home to work." This may explain why several studies show that women take longer to make a work trip of comparable length even controlling for mode—the data treat a women's trip home from work via the childcare center and the grocery store the same as a man's trip directly home. (And if men do link trips, those links are equally ignored).

We also know that women are more constrained by their children's travel needs than comparable men. To understand the travel patterns of many women we understand their children's schedules and constraints. Yet these kind of data are rarely collected in a useful way.

We must develop and implement data collection methods which respect and measure the intricacies of women's travel. If data collection and processing are done correctly initially, this kind of approach may be no more expensive than current methods.

29) **What evaluation measures and performance criteria can be developed to measure the impacts on women of various transportation projects and polices?**

If women have different needs, perceptions, and preferences, it is unlikely that all policies and programs affect them equally. While research presented at this Conference has suggested that women may be differentially impacted by various programs and projects, etc., the magnitude and even the direction of the implications are not clear.

For example, some analysts have asserted that increased gas or road prices will be doubly unfair to working women with modest incomes; yet research presented at this conference has suggested that some women would rather pay the higher prices and get home faster perhaps because the time spent in traffic, etc. has a very high value to them. We must explore these implications and develop a way to recognize and measure how a variety of governmental and private actions actually impact various sub-groups of women.

In addition, women may value some potential outcomes more than others—they may value safety more than congestion relief, or time more than money, or money more than time. Performance measures and evaluation criteria must be structured to recognize that different groups of people place different value on different results.

30) **We must structure ways in which qualitative and quantitative research approaches can be blended to provide better information on women's travel.**

Much of the detailed data needed on women's travel patterns, particularly at the disaggregate or small group level, may be difficult to collect, organize, and synthesize. Yet more qualitative data are often not collected in a way which allows their incorporation in planning models or tools. We must find a way to use various approaches to understanding women's travel to complement and strengthen one another.

POLICY RESEARCH AND ANALYSIS

31) **To what extent are women involved in the variety of neighborhood, city-wide, local, regional, and state-wide transportation planning processes and projects which affect their lives? How can we expand their participation in projects of importance to them, to their children, and to their aging parents?**

Many transportation and other planning processes which receive Federal aid require active citizen participation at various stages. But we do not know the extent to which various groups of women participate, or whether the concerns of many different kinds of women are voiced in these forums.

We must understand exactly who is and is not "at the table" in a variety of important policy discussions and attempt to gauge the impact on the ultimate decisions taken.

32) **What are the comprehensive transportation implications for women of welfare reform efforts?**

We must understand not only how different groups of women may be affected by various policy options but also what transportation alternatives might respond to their needs. Do current transportation options structure or restrict the jobs available to the women most likely to be affected? What traditional and nontraditional transit options might allow different groups of women to seek, find, and maintain jobs? What role could jitneys, community buses, restructured transit services, vanpools play?

We also need to understand the role of access to private cars in welfare reform efforts. Given the long commutes and poor transit options to suburban jobs, women seeking employment may only get to a job interview let alone to the job by using private vehicles. Yet many state welfare programs will not allow recipients to own a car—making it difficult for them to work their way out poverty. There are some demonstration projects in which women on public assistance are helped to buy or share cars; these efforts should be closely monitored.

33) **What are the transportation and other implications of the housing and employment choices open to women receiving public assistance**?

The transportation needs of different groups of welfare recipients are as much a product of where they live and the location of jobs open to them as they are to the availability of cars or public transit. We must comprehensively examine the network of choices and constraints facing these women as we attempt to stake out a role for transportation efforts in moving people from welfare to work.

34) **To what extent are the lives of women affected—either positively or negatively—by Federal transportation and environmental mandates which require metropolitan areas to plan congestion mitigation and environmental controls?**

We know that not all travelers are equally impacted by policies and programs which restrict the car, or mandate work schedule changes, or which increase the cost of driving, directly or indirectly. Some analysts feel that women may face a double burden in responding to the kinds of measures which might be adopted in areas struggling with air quality or congestion problems, largely because even very poor women depend so heavily on the private car to balance their lives. At the same time, recent research suggests that women might be more willing to use more expensive options—like toll roads, for example—because it saves them so much time, the thing they lack more than money.

While very restrictive options (like banning free parking) have been made voluntary in most Federal and State programs, most areas not in conformity with clean air and other standards will still be spending considerable effort trying to find ways to encourage people to not drive, or not drive during congested periods. But the incentives they offer—while perhaps less harmful than sanctions—may not be appropriate for the real needs of working women and their families.

We must understand how various incentives and programs actually impact the lives of working women, what programs and policies would best allow them to balance their many obligations without driving, and if these options differentially impact different groups of women.

35) **How can we better link equity issues, particularly those focused on the needs of various groups of women, to actual performance measures?**

There is a great deal of lip service given to the needs of disadvantaged groups and to those with disproportionate obligations, like working women; communities are often required to develop special plans or planning processes for such travelers. But it rare for existing or planned systems to be evaluated in terms of how well they ***actually*** provide services to women and others. Most performance measures assume that system attributes a) equally affect all travelers and b) are equally valued by all travelers—for example, that men and women want the same level of safety and security or are equally well served by a given level of crime prevention or surveillance.

Perhaps women value time savings more than men with comparable incomes; perhaps they desire transit services—like being delivered to their door at night—more than men.

If system performance is not explicitly measured in terms of its impact on various groups of women, it is extremely unlikely that highway or transit or other services will be built, financed, or operated in a way responsive to their needs. In addition, unless these needs are made explicit, it is equally likely that well-intentioned public policies may have serious unintended but very negative consequences for women. We must, therefore, **both** develop ways to calculate and measure the attributes desired by various groups of women in different transport systems, and, to structure the evaluation process to include those measures.

There are a host of new transit and highway services being implemented in the US from transit route restructuring to HOV lanes. We need to do before-and-after studies which focus explicitly on how women are impacted by these services; services which *on-average* are successful or well-liked may not, in fact, be very useful for women travelers, or those with children, or those who are elderly, etc. Certainly not all services need be geared to all needs, but aggregating averages should not be allowed to obscure differential impacts on women.

WOMEN IN THE TRANSPORTATION INDUSTRIES

36) **Have women been as successful as comparable men in a) being accepted in various aspects of transport, and b) rising to managerial positions?**

What opportunities and what constraints to the employment and advancement of women, particularly those from traditionally disadvantaged groups, are found in various transportation industries? Are women and disadvantaged minorities more likely to do well in public enterprises or those with a non-engineering focus? We should develop databases which allow us to keep track of women's careers over time, to identify areas of greatest opportunities, and to attempt to overcome barriers in the areas with the least evidence of advancement.