The Older Person as a Former Driver: Quality of Life, Mobility Consequences and Mobility Adaptation

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CHAPTER I

Introduction

For an older person (≥ 65 years of age), the ability to maintain independence in a familiar environment is strongly influenced by efficiency of mobility. Mobility involves an integration of personal body, environmental and social resources. The older adult must be able to effectively combine these resources to meet basic and higher order human needs within their immediate and external environments (Carp, 1988). An inability to do so could lead to changes in the physical, social and psychological well-being of the elder (Wachs, 1979, p.1).

In our society, the automobile is an integral part of mobility outside of the home for all age groups, including older adults. The results of the 1990 Nationwide Personal Transportation Study (NPTS) suggested that over 80% of trips by older adults are taken in private cars, either as passengers or drivers (Rosenbloom, 1993). Waller (1991, p.499) notes that "older drivers constitute the most rapidly growing segment of the driving population in number of drivers licensed." The older driving population has more than doubled in the last twenty years; in 1991, 13% of all U.S. drivers were over the age of 65 (National Safety Council, 1992; Stock, 1995). It is estimated that 17% of the driving population will be over 65 in the year 2020 (National Safety Council, 1992).

The multiple skills needed for driving can begin to deteriorate, however, around age 55, and can decrease dramatically around the age of 75 (Transportation Research Board, 1988; National Commission for Injury Prevention, 1989; Waller, 1991). Normal aging changes and/or impairments in vision, physical dexterity, reaction time and cognitive functioning can individually or cumulatively have a negative effect on driving ability.

How has society, and the elderly themselves, responded to these changes in driving abilities? Media attention has unfortunately focused on isolated adverse events regarding older drivers, and subsequently has reinforced a negative stereotype of the group as a whole (Meier, 1992; Edmonds, 1992; Rigdon, 1993; Retchin & Anapolle, 1993 p. 283; Downs, 1994). Myriad calls for mandatory age-based relicensing procedures have been met with great resistance from advocacy groups such as the American Association of Retired Persons (AARP), who cite age discrimination and the heterogeneity of the older population in their arguments. A number of gerontological researchers are currently attempting to develop appropriate screening procedures for identifying current and/or potentially unsafe older drivers (Stock, 1995).

A second type of response to changing driving abilities is retraining or re-education of the older driver. With a goal of keeping older adults driving safely as long as possible, the AARP, the American Automobile Association (AAA), and the

National Safety Council have all developed driver re-education programs (Schmidt, 1988; McKnight, 1988). Gerontological researchers are also developing computer programs and driving simulation technology to assist older adults in self-assessment of their driving abilities, and subsequent retraining (Yee & Melichar, 1992).

Older adults may respond to their own changing abilities by modifying their driving habits. Some elderly stop driving altogether, oftentimes with great reluctance.

Considering the salience of transportation and mobility for functional independence, what happens to the older adult who must voluntarily or involuntarily stop driving? What happens to their quality of life? How do they compensate for the loss of personal transportation in meeting their basic and higher order needs? Are certain needs sacrificed?

Among gerontologists and transportation planners, an assumption exists that loss of driving privileges translates into a diminishment in quality of life (Carp, 1972; Gillins, 1990; Eisenhandler, 1992; Underwood, 1992; Yee & Melichar, 1992). Few recent studies have explored the problem empirically. A decrease in life satisfaction has been suggested in research-based studies by Carp (1971a), Cutler (1972, 1975), and Gianturco, Ramm and Erwin (1974). These seminal studies are limited in their generalizability to current cohorts, however, due to the definition of variables (e.g., lack of differentiation between former drivers and

those who never drove), sample characteristics and time lapsed since data collection. Substantial improvements in available transportation resources for older adults, for example, have occurred since the late 1960's and early 1970's when these studies were conducted.

What are the mobility consequences for an older person who stops driving? What trips do they take and how often? What types of trips, if any, are sacrificed because of lack of transportation? Few studies document this subject thoroughly. Rosenbloom (1988,1993), using data from the 1983 NPTS, suggests that non-licensed older adults take from 50 to 100% fewer trips for all purposes than do licensed older adults. Here again, "non-licensed" older adults includes both former drivers and non-drivers as one category. In addition, lack of differentiation of specific trip purpose limits understanding of what needs are and are not being met.

What adaptations do former drivers make in order to meet their mobility needs? Documentation of the use of resources for transportation by former drivers is also sparse. Rosenbloom (1988, 1993) using the same data cited above, suggests that the majority of "non-licensed" older adults take trips as passengers in cars driven by family or friends. The second most frequent mode of transportation is walking; a distant third and fourth is the use of public transit and paratransit (Dial-A-Ride type senior citizen vans) (Rosenbloom, 1988). Specific transportation resources used for

specific destinations has not been well documented.

Planning for current and future transportation needs for older persons requires a sound research base. Current gerontological research in the area of transportation and driving is focusing on maintaining safe driving abilities as one ages, and on appropriately identifying those who should no longer be driving. Few studies are exploring what happens to the older adult when they do stop driving. Available research studies focusing on the mobility and quality of life of former drivers are derived from data bases that are 20 to 25 years old. Not enough is known about the quality of life or adaptation of the current cohort of former drivers in light of changes in technology, increased availability of paratransit services, the phenomena of "aging in place" and the changes in the American family.

A responsibility of public health professionals is health promotion and disease prevention for all age groups. The goal of health promotion/prevention for the elderly, as stated in the Year 2000 National Health Objectives, is to assist them to maintain function and independence in light of the changes inherent in the aging process (U.S. Department of Health and Human Services, 1990). An important component of maintaining independence is the ability to meet travel needs. This study investigated the quality of life, mobility consequences and mobility adaptation of older adults who had become ex-drivers. This study will contribute to the understanding of the world

of the older former driver and further public health knowledge and practice by focusing on tertiary prevention needs of this population, assisting in the development of transportation policy and the planning of appropriate transportation services.

Conceptual Model

The conceptual model for this study was developed by Frances Carp (1988). She proposes that a relationship exists between well-being of older adults, their mobility and their ability to meet life needs. A diagram of the model can be seen in Figure 1. Carp theorizes that humans have two types of needs. Life maintenance needs include food, clothing, health care and banking. The ability to meet life maintenance needs is integral to the ability to live independently in the community. Higher order needs of socialization, feeling of usefulness, recreation and worship are integral to a sense of well-being. Carp suggests that overall well-being depends on the person's success in meeting their own needs in both areas, and mobility is a key element in accessing the resources necessary to meeting those needs. Feasibility (the person's ability to perform the activities involved in various types of transportation), safety and personal control are qualities of mobility that have an effect on the person's ability to meet each category of needs. These qualities are further influenced by socioeconomic status (ability to afford certain types of transportation), physical characteristics of the environment

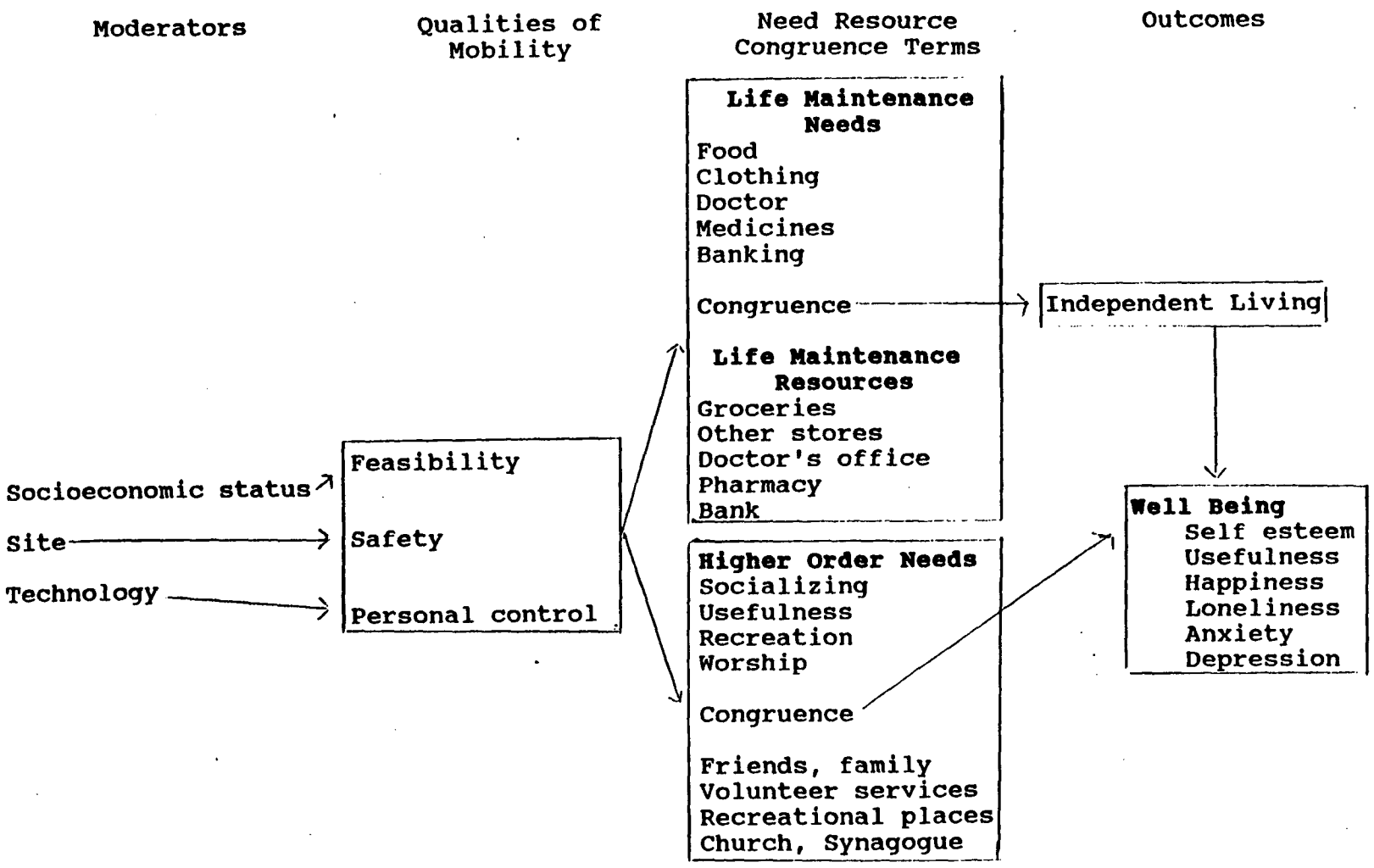

Figure 1 Carp's (1988) Conceptual model

and transportation technology. Carp does not report an empirical testing of her model, but she did utilize a review of other research studies to support her ideas. She suggests that former drivers will be less likely to meet higher order needs because of lack of transportation, and thus their well-being will suffer.

The results of this study provide only partial support for Carp's hypotheses and model. A revision of the model, based on study findings, can be seen in Figure 2.

The findings of this study suggest that actual and perceived health status have a much greater influence on mobility, meeting needs and well-being than had been hypothesized by Carp. Health status directly influences perception of well-being, or quality of life, as do other unmeasured factors. Health also influences the ability to drive (or to use other methods of transportation) as had been suggested by Carp, but also the desire or ability to travel to, and participate at, various resource destinations.

Modes of available transportation are influenced by type and location of residence, as well as income. For example, in selected situations within senior housing, older persons have access to regularly scheduled van or private automobile transportation. Certain areas of the community are served by public bus; others are not. Likewise, finances can influence a person's choice regarding driving and maintaining an automobile or hiring a private driver.

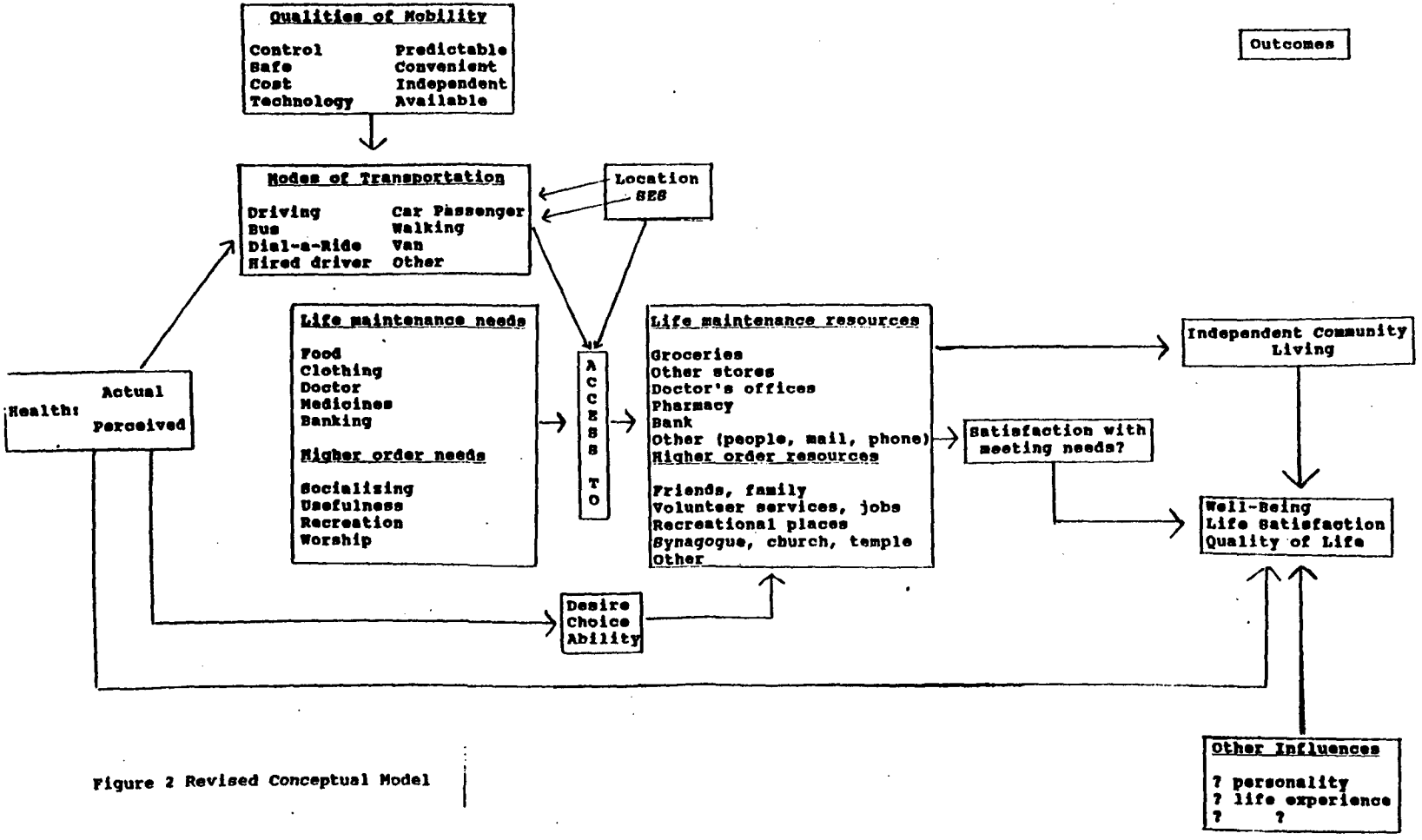

Figure 2 Revised Conceptual Model

The location of the older person's residence, availability of transportation and socioeconomic status influence the access to various resources to meet the needs identified by Carp. Here again, the older person's choice and ability to travel to the destination must be taken into consideration. Subjects within this study were using other methods (e.g. other people, the mail, the telephone) to meet various needs without travel. Carp erroneously assumed that all needs would have to be met via travel outside of the home. What is unknown is whether the older adults were satisfied with meeting needs through the use of resources other than transportation. The sense of satisfaction with such arrangements would seem to have an influence on overall well-being and is shown as such in Figure 2.

As hypothesized by Carp, participation in higher order activities was correlated with quality of life. For an unknown reason, higher order activities take on more importance for well-being for former drivers than for current older drivers. Participation in life maintenance activities did not correlate with quality of life.

In summary, in contrast to Carp's assumptions, the study findings suggest that driving and travel explain a small amount of the variance in overall life satisfaction for older adults. Quality of life (life satisfaction; well-being) is a multidimensional construct that is affected by many factors in a person's life; as with previous research, the findings of

this study suggest that self-perceived health is the principal factor influencing quality of life for older adults. In partial support of Carp's hypothesis, travel to higher order resources, and ready access to travel, were shown to be important to life satisfaction for ex-drivers. Thus, the ability to travel outside of the home may become more valuable to those who are unable to readily do so. Further explication of this finding can be found in the last chapter.

Significance

This study is significant for a number of reasons. First, it has updated the information on quality of life and driving status for older persons. Secondly, it has focused on former drivers as a distinct category, rather than grouping them with older adults who have never driven, a subgroup whose needs and resources may differ. Third, the study explored the older person's travel behavior to specific destinations with specific resources. Most previous studies have organized travel destinations into general categories, e.g. personal business. This study allows a more detailed analysis of where former drivers do and do not go, and who can be relied upon to provide transportation. Finally, the study provides an empirical basis for supporting, or refuting, some of the long-held assumptions, based on anecdotal information, regarding older ex-drivers.

CHAPTER II

Review of Literature

The first section will review the literature regarding automobile transportation and older adults. First, an overview of mobility and transportation will be given, followed by a summary of the literature on older drivers and the decrease in driving skills. Research studies regarding the cessation of driving will be addressed next, emphasizing demographics, associated health problems and quality of life. Finally, the literature on the mobility consequences and transportation adaptations of the older ex-driver will be discussed.

The second section will review the literature on quality of life, first addressing general methodological issues, then reviewing selected research on quality of life and aging.

Mobility and Transportation for Older Adults

Mobility is a critical component in the maintenance of independence and therefore the quality of life of older adults (Wachs, 1979, 1988; Carp, 1988). As noted by Yee and Melichar (1992, p.1), "any decrease in mobility limits the capacity for self maintenance, restricts participation in constructive activity and interaction with other people...and may contribute to reduced involvement and alienation from society." Mobility is dependent upon personal body abilities, characteristics of resources within the immediate environment (e.g. housing), and the characteristics of the resources in

the external community environment. A key link between the external environment and the older adult is the availability of transportation (Carp, 1988; Wachs, 1988; Yee & Melichar, 1992).

Transportation for older adults has been a major concern of the elderly and gerontology service providers and planners for over 25 years. During the 1971 White House Conference on Aging, transportation was ranked as the third most important issue for older adults, preceded only by income and health (Carp, 1988). A transportation policy for the elderly guaranteeing a basic level of mobility, cost-effective services and program flexibility, as suggested by Wachs in 1979 (p. 218) is still not a reality. The problem can only be expected to grow. As the number of elderly increases over the next 20 to 30 years, the expectation is that more adults will "age-in-place" in low density suburbs with concomitant low density of services and transportation resources (Rosenbloom, 1988).

One goal of transportation policy upon which gerontologists, older adults and planners would agree is that older adults should meet their own transportation needs for as long as possible (Waller, 1991). Currently, older adults meet their transportation needs by taking trips by car, walking or public transit.

Over 80% of trips taken by older adults are made as drivers or passengers in private cars (Transportation Research

Board, 1988; Rosenbloom, 1993). The number of older drivers is rapidly increasing. In 1940, only 5.9% of all drivers were over the age of 60. By 1991, 13% of all U.S. drivers were over the age of 65 (National Safety Council, 1992). Within the current elderly cohort, the greatest increase in licensed drivers has been seen among older women (Foley et al., 1990).

It is forecast that by 2020, approximately 17% of the driving population will be over the age of 65 (National Safety Council, 1992). The future older driver will be different than the current cohort of older drivers: they will have driven for more years, perhaps up to 50 years before retiring; they will be more dependent on the automobile (close to 100% of middle-aged adults are licensed to drive); and they will have the potential for greater longevity and a longer period of good health in old age during which driving will be possible. Meeting transportation needs of this group, especially when, and if they stop driving, is a current and future challenge (Transportation Research Board, 1988; Rosenbloom, 1993).

The 1990 NPTS reports that adults over the age of 65 continue to drive the least number of miles of any age group (Hu & Young, 1992). Rosenbloom (1988) suggests that the considerable decrease in mileage per year is due to not using the automobile for work related trips. The NPTS notes a 26% increase, however, between 1983 and 1990, in average annual person miles of travel for the cohort 65 and older (compared to a 14% increase for all ages). This mileage increase may be

due to an increase in older adults remaining in the work force after the traditional retirement age or due to other reasons yet to be determined.

The 1983 and 1990 Nationwide Personal Transportation Study (NPTS) data indicate that the second most common form of transportation for all older adults is walking. In 1983, 12% of all trips were taken by walking; in 1990, that number decreased to 8% (Transportation Research Board, 1988; Rosenbloom, 1993). Using the 1983 data, Rosenbloom (1988) estimates that 20% to 40% of trips by non-licensed older adults (never-licensed and former drivers combined) are taken by walking.

Public transit and paratransit or special transit (e.g. Dial-A-Ride) are a distant third and fourth (less than 4% of all trips each) for modes of transportation. The use of taxis is negligible (average 0.2%), most likely due to cost and lack of availability across the country (Rosenbloom, 1988). Older adults tend to evaluate public transit as inconvenient, unsafe and holding physical barriers to access. It is interesting to note that paratransit services are used so infrequently by older adults. Rosenbloom (1993) suggests that paratransit use is discouraged by the severe restrictions imposed by paratransit operators on potential riders. For example, she cites lack of evening and weekend service, advanced reservation requirements, limited hours of service and eligibility requirements as deterrents (p. 307). The 1983 NPTS

reported that users of paratransit tended to be unlicensed, living alone, with lower income and with no regular access as a vehicle passenger (Rosenbloom, 1988).

Where do older adults go on their trips outside of the home? The 1983 NPTS reported that the majority of trips are for shopping, other personal business, visits and other social trips (Rosenbloom, 1988).

Using data from the NPTS, Rosenbloom (1988) suggests that older adults without drivers' licenses take 50% to 100% fewer trips with any mode of transportation for any purpose than do older drivers. Although never-licensed and former drivers are not differentiated in this report, it does portend a significant loss in quality of life and ability to meet needs for those unable to drive. Little is known about the specific number and types of trips former drivers do take. Foley, Eberhard, Ostfeld, Wallace and deWolf (1990) did differentiate between frequencies and types of trips taken by drivers, former drivers, and non-licensed older adults in their study of driving practices among two of the Established Populations for Epidemiologic Studies of the Elderly (EPESE). The EPESE groups are representative samples of older adults who have participated in a longitudinal study (of health status, social, behavioral and environmental conditions related to morbidity and mortality) since 1982 (p. 2). During the 1989 wave, over 2,300 older adults in rural Iowa and over 1,600 subjects in New Haven, Connecticut participated in an

additional survey related to mobility. Using age-adjusted rates, Foley et al. report that, at least weekly, 56.9% (average between the two sites) of former drivers go shopping; 42.5% go visiting; 37.7% go to church; 19% participate in a social activity; 12.4% go to the bank; and 6.2% work. In the majority of categories, former drivers take at least 50% fewer trips than do drivers. An interesting finding is that, except for the "visiting" category in the New Haven cohort, never-licensed older adults take more trips in all categories than do ex-drivers. This finding may reflect a difference in health status among the two groups, or it may reflect a life-long adjustment to a non-driving status by the never-licensed elderly. Rosenbloom (1988, 1993) correctly cautions the reader regarding the interpretation of data reporting frequency and types of trips for those older adults with and without a driver's license.

> Observed travel differences may result from diverse preferences for activities outside the home, variations in the ability to pay for the activities themselves, or major differences in physical and emotional conditions...It is important to understand both the barriers that reduce the older person's desire to travel and those that reduce their ability to travel when they still wish to do so. Such a separation is not easy; the same physical problems that cause the elderly to reduce their driving could rob them of the ability to engage in

activities at their destination (p.302).

In light of Rosenbloom's comments, few studies report on the types of trips former drivers would take if transportation were not a problem. Carp (1980) questioned a group of 899 older adults (drivers and non-drivers) in San Antonio regarding their desire to go to specific destinations should transportation be available. In order of frequency, the subjects listed entertainment (37%), visits to children (30%), visits to friends (25%), visits to other kin (25%) and church (21%). Interestingly, 20% said they would go to the grocery less often if transportation was available. These findings should be interpreted with caution, however, due to the difficulty in establishing reliability and validity on hypothetical questions.

The multiple skills required for automobile driving can begin to deteriorate around age 55 and dramatically decrease around the age of 75 (Retchin, Cox, Fox & Irwin, 1988; Transportation Research Board, 1988; National Commission for Injury Prevention, 1989; Waller, 1991). The process of driving involves three phases: sensing the cues or perceiving the situation; recognizing and deciding what to do; and executing a physical maneuver (Transportation Research Board, 1988; Yee, 1990). Thus, the performance level of the driver rests heavily on the use of the five senses, cognitive and motor abilities (Hogue, 1982). Any one or all of these areas can be affected by the normal aging process or impairments common after the

age of 65. These specific changes and their effect on the older driver have been extensively reviewed elsewhere (McFarland, Tune & Welford, 1965; Transportation Research Board, 1988; Human Factors Society, 1991, 1992; Underwood, 1992).

Despite the multiple physical changes that occur in old age, older adults as a group have fewer absolute numbers of motor vehicle crashes than do all other age groups. If crashes per miles driven are taken into account, however, older adults have the highest number of crashes, except for teenagers and young adults. Older adults are more likely to be responsible for motor vehicle crashes, are more likely to be injured and 3 1/2 times more likely to die as a result of a crash, than are younger adults (McKnight, 1988).

How do older drivers respond to normal aging changes? Many restrict their own driving by decreasing nighttime driving, avoiding rush hour traffic, changing destinations to use less stressful routes, using closer resources or by stopping driving altogether.

The Older Adult as Former Driver

What is known about the characteristics, rationale and life situation of older adults who have stopped driving, either voluntarily or involuntarily? Except for the exploration of associated medical problems, the research in this area is sparse and oftentimes dated.

This section will first review the literature regarding

the prevalence and demographic characteristics of former drivers. Research on self-reported and associated reasons for stopping driving will follow. Next, the literature on the quality of life of former drivers will be considered, and the final section will review the research on mobility and transportation adaptations.

Demographic characteristics of former drivers

From the 1970's through the 1980's, few studies of older adults who did not drive differentiated between those who had stopped driving (former drivers) and those who had never driven (never-licensed). Thus, a simple frequency count of former drivers could not accurately be derived from the literature until recently.

The earliest studies specifically citing former drivers as a unique category were reported by Carp (1971a) and Gianturco, Ramm and Erwin (1974). In her sample of 780 older adults (mean age 67.5 years) in San Antonio, Carp reported 26% were former drivers. Gianturco et al. studied characteristics of drivers and former drivers as part of the sixth wave of the Duke Longitudinal Study of Aging. At that wave, 100 subjects, with a mean age of 82, remained in the study. Of that group, 44 (44%) had stopped driving.

As could be expected, more recent studies report a much lower percentage of former drivers. Foley et al., (1990); Campbell, Bush and Hale, (1993); Burkhardt, (1994); and Kington, Reuben, Rogowski and Lillard, (1994) all report

results from studies that were conducted in the late 1980's and early 1990's with larger samples. Of all the studies, Foley et al. note the highest percentage of former drivers in their report on the two EPESE groups; 18.7% in Iowa and 23.3% in New Haven. Campbell et al. provide data from a convenience sample of 1,954 older adults (ranging in age from 70 to 96) who are part of a longitudinal study in Dunedin, Florida that began in 1976. At the 8th wave, when questions regarding driving were included in the annual screening, 14% of the subjects reported they had stopped driving. Likewise, Kington et al. report 12% of their study population, of 2,429 persons over the age of 50, as being former drivers. The Kington subjects were drawn from a nationally representative panel study on income dynamics. Between 1986 and 1992, Burkhardt (1994) conducted in-depth interviews with over 2,400 randomly selected persons, over the age of 60, in Maryland. He found that 13% of his sample had stopped driving.

The demographics of the older population who have stopped driving have been more thoroughly documented. Carp (1971a), in her previously cited San Antonio study, reported no differences between drivers and ex-drivers on income, housing, education, level of previous employment, self-evaluation of health, age, ethnicity or sex.

Carp's findings differ from more recent studies, particularly on sex and age. Carr, Jackson and Alquire (1990) reported on a retrospective case control study of 182 older

adults in Michigan who had been referred to a geriatric outpatient assessment center. Forty-two subjects continued to drive; 140 had stopped. The mean age of ex-drivers was 79.8 years. Significant differences were found between the two groups on age (the drivers were younger) and sex (a greater proportion of drivers were male).

Jette and Branch (1992) examined data from a ten year longitudinal study of 1,625 randomly sampled older adults in Massachusetts. The cohort was first interviewed in 1974 and subsequently at three varying time intervals. The majority of the sample were white (98.6%) and female (65%). At each wave, it was determined as to whether the subject continued to drive, had stopped driving, or had resumed driving (after reporting stopping at the previous wave). Groups were then compared on age, sex, living situation (alone/with others), education and income. Over the ten years, continued self-reliance on driving was quite high, with probabilities of continued independence ranging from 0.73 to 0.94. Jette and Branch suggest that continued independence in driving may extend into the 8th or 9th decade of life. Maintaining self-reliance was significantly related to male gender ($p \leq 0.05$) and younger age ($p \leq 0.01$).

Campbell et al. (1993) and Kington et al. (1994), in previously described studies, also found older age and female gender to be descriptive of their former driver subjects. In addition, Kington et al. report that those older adults who

live in urban counties, and/or who live in households with more adults were more likely to have stopped driving. Subjects who were married and/or with better education were more likely to continue driving.

Conversely, Marottoli, Ostfeld, Merrill, Perlman, Foley and Cooney (1993) did not find gender (or race) to be predictive of former driver status in their further analysis of the New Haven EPESE data initially reported by Foley et al. (1990). They did, however, concur with previous studies by identifying older age and lesser education as being significantly ($p \leq 0.01$) related to not driving. In addition, former drivers were also significantly more likely to have lower income, to live in senior housing, to be married, to have available alternative transportation and/or to be unemployed.

In summary, the studies cited suggest approximately 14% of the older adult population in the United States are former drivers. Female gender and older age are the two demographic factors consistently associated with driving cessation. A few studies suggest that the presence of another person, perhaps a driver, is also associated with stopping. Demographics, however, do not provide a total picture of the circumstances that lead an older adult to relinquish their driving privilege. Other factors must be considered.

Why and how older adults stop driving

The research on how and why older adults stop driving has been more thoroughly developed than any other issue related to this special population. Most recently, a number of gerontological researchers are focusing on health and medical problems associated with the cessation of driving.

Gianturco, Ramm and Erwin (1974) questioned their Duke Longitudinal Study subjects on why they had stopped driving. Of the 44 who had stopped, 43% cited physical infirmities, primarily vision problems; 18% cited psychological reasons, such as fear of motor vehicle crashes; and 9% cited economic costs of ownership of a car. Only two subjects reported stopping because of physician advice, and one because of denial of renewal by the department of motor vehicles. Converse to expectations, a physical function rating showed no significant differences between current and former drivers, although the results were in the expected direction.

Carr, Jackson and Alquire (1990) compared drivers and ex-drivers in their previously cited study conducted in a geriatric assessment center. Significant differences were found between the two groups on the mental status exam (drivers scored higher) and functional status (drivers were more independent in all categories). Even though former drivers reported a greater absolute number of diseases and medications, there were no statistically significant differences between groups on these variables. Perhaps the

number of diseases does not reflect the severity or impact of the disease, as would the functional status measure. The study is limited by the fact that the sample was not random, and most subjects were referred to the clinic for evaluation of cognitive impairment, a major reason for older adults to stop driving.

Foley et al. (1990) questioned the two EPESE panels as to why they had given up driving. The Iowa cohort most frequently noted vision problems, loss of confidence, and slower reaction time (in that order). The New Haven group also reported vision as their number one reason; weakness and trouble with body movement, and the cost of owning and operating a car were the other most frequently mentioned reasons. Although the paper did not cite voluntary versus involuntary cessation, J. Eberhard (personal communication, September 18, 1995) reports a 2% revocation of licenses in the New Haven group and a 17% revocation in Iowa. Thus the majority of both groups stopped driving voluntarily.

Marottoli et al. (1993) went on to further analyze the longitudinal data available on the former drivers in the New Haven EPESE. Their study focused on the group who reported they had stopped driving between 1983 and 1989 (n = 139). The data used as potential risk factors in the analysis had been gathered at the beginning of the longitudinal study in 1982. The significant independent predictors in a multiple logistic regression equation were: the presence of neurological

disease; cataracts; participation in fewer physical activities; increasing disability as measured by the Rosow-Breslau scale; and the demographic characteristics of age, unemployment, and lower income (as previously mentioned) (p. S257). The researchers suggest that as the number of risk factors increased, so did the likelihood of becoming a former driver; 49% of former drivers, for example, had at least 3 or more risk factors compared to 17% who had one or two. It is interesting to note the association between what the researchers suggested as predictors from the 1982 data and what the cohort themselves reported as the reason why they quit driving when queried in 1989. The authors note a number of limitations to the generalizability of their study, particularly the "urban" nature and the "survival" status of the cohort. In addition, care must be taken when predictor data had been gathered 7 years prior to ascertainment of the outcome. It is possible that the health and socioeconomic status of the subjects could have changed in the interim, for the positive or the negative.

Jette and Branch (1992) also suggest good to excellent health and lack of mobility disability as being significantly ($p \leq 0.01$) related to maintaining self reliance in driving among their longitudinal panel in Massachusetts. The authors also suggest that self-regulation influences the elder's decision to stop driving. Although this conclusion is possible in light of their findings, the specific reasons as to why the

sampled older adults stopped driving were not reported.

Campbell, Bush and Hale (1993) provide analysis of data from a longitudinal panel of older adults (previously described) in Florida. The convenience sample presents on a yearly basis for medical screening. On the 8th visit, subjects were questioned as to their driving practices. When asked, 59% of their sample of former drivers (n=276) stated that they had stopped driving voluntarily; 32% cited health or medical problems in their decision. No one reported legal problems, yet the researchers were aware that 5 subjects had had their licenses revoked. "An age/sex adjusted logistic regression found that six conditions explained about 50 percent of the decisions to stop driving: macular degeneration, retinal hemorrhage (women only), deficit in activities of daily living, Parkinson's disease (women only), stroke-related residuals (men only) and syncope" (p. S230). The results must be viewed with caution, however, because the date of cessation of driving was not determined. Thus, the temporal relationship between the health conditions and the outcome (stopping driving) is uncertain.

Persson (1993) conducted focus groups on the issue of deciding to stop driving with a convenience sample of 58 former drivers living in retirement communities. The mean age of the sample was 81 years (range 66 to 96) and most of the participants were white widows. It was noted that "the decision to stop driving was made with great reluctance" (p.

89) but that the subjects themselves had made the decision, and felt that they should have made the decision. Rationale given for cessation of driving included advice from physicians and family, nervousness, and physical problems. Cost of vehicle upkeep was noted by 7% and only 2 respondents reported having their license revoked. Persson suggests two ways in which older adults stop driving--a less common pattern of stopping after a sudden event (e.g. a motor vehicle crash) and a very common pattern of slowly decreasing driving until a personal threshold is reached. Although Persson's study provides unique insights into the decision-making process surrounding driving, it is limited by the sociodemographic characteristics of the sample. Retirement center residents tend to be of higher income and are better educated. In addition, most centers have immediate paratransit resources upon demand, a variable that might factor into an older adult's decision to stop driving.

Kington at al. (1994) support the findings from previous quantitative studies, in their report of results from a 1990 mailed survey to a nationally representative sample of adults over the age of fifty. The 293 former drivers reported that, on average, they had stopped driving at age sixty. The most common reasons given for stopping were a health problem, (30%), a visual problem (29%), and "not comfortable driving" (27%). An average of 16% cited financial problems in maintaining a car and/or insurance premiums. Only 4% reported

that their license had been revoked. (p. 1328). Factors entered into the regression equation that were significant ($p \leq .05$) predictors of not driving were female gender and older age (as previously mentioned), poorer self-reported health, major neurological problem or visual impairment. Although Kington's findings support previous research, this study must also be viewed with caution. First, the sample includes subjects starting at the age of fifty, hardly in the category of "older adults". One third of the sample is between the ages of 50 and 59; another third is between the ages of 60 and 69. Previous research suggests that older adults continue to drive as long as possible, and significant numbers only begin to quit driving in their late 70's or early 80's. Thus, one must question that the average age reported for quitting driving in this study was sixty. Perhaps this sample has more severe health problems that led them to stop driving at an earlier age. Kington reports that 72% of the sample has one or more chronic medical conditions and that 35% of the sample report their general health as "fair" or "poor". It would have been helpful to see this sample population compared to the general U.S. population on the variables included in the survey.

The literature cited regarding the older adult's decision to stop driving suggests a desire for, and actualization of, autonomy in the decision-making process. Most elders report voluntarily relinquishing their driving privilege, usually due to medical (neurological or visual problems), psychological

(fear or discomfort with driving) or financial reasons. Estimates are that, of the older population who stop driving, 90% do so voluntarily (J. Eberhard, personal communication, October 4, 1994). The small percentage of elders who report having their licenses revoked belies the stereotype of the large numbers of older drivers who should be involuntarily removed from driving. One must be circumspect, however, in making generalizations regarding the population who have been legally or involuntarily prohibited from driving. This group is most likely underrepresented in the studies reviewed above. A large percentage of this subgroup may suffer from cognitive impairments, which would limit their participation in survey research. In addition, barring cognitive impairment, the embarrassment caused by losing a license may discourage older adults from participating in studies specifically related to driving.

Quality of life and the former driver

Numerous authors have speculated that becoming a former driver has negative effects on the quality of life or well-being of the older adult (Carp, 1971a, 1988; Cutler, 1972, 1975; Gianturco et al., 1974; Winter, 1984; Retchin et al., 1988; Smith and Hiltner, 1988; Transportation Research Board, 1988; Wachs, 1988; Gillins, 1990; Waller, 1991; Eisenhandler, 1992; Underwood, 1992; Yee and Melichar, 1992). Few reports are based on research, and even fewer have been done within the last twenty years.

Carp (1971a) did compare current and former older drivers as part of her previously cited study of transportation and aging in San Antonio. Current drivers rated the prospect of losing their license more negatively than those older adults who had actually stopped driving. Drivers were more likely to report that they would feel extremely unhappy about stopping driving, would have difficulty in getting places, would be likely to become dependent on others and would feel "old". Carp attributes the contradictory findings to defensive memory work on the part of the ex-drivers, due to ego threat.

Cutler (1972) studied quality of life and availability of personal transportation among 170 randomly selected older adults in Ohio in 1970. The median age of his sample was 74 years. Cutler dichotomized his sample into those with personal transportation and those without (defined as "not able to drive" or "not having a car"). In the latter group, no attempt to differentiate between former and never-licensed drivers was made. Quality of life was measured using the "A" form of Neugarten, Havighurst and Tobin's "Life Satisfaction Index". Again, results were dichotomized at mid-point to yield "high" and "low" satisfaction scores. Using chi square analysis, Cutler's hypothesis of higher life satisfaction among those with personal transportation was supported ($p < .02$). Cutler went on to dichotomize the sample into three other characteristics: distance from the city (more or less than 1/2 mile), health (better/poorer) and socioeconomic status

(high/low). He then controlled for these three variables. The hypothesized difference between personal transportation and life satisfaction held for those persons living greater than 1/2 mile from the city ($p < .01$); for those persons greater than 1/2 mile from the city who had lower socioeconomic status ($p < .025$); and for those persons greater than 1/2 mile from the city with poorer health ($p < .05$). No significant difference was found on life satisfaction between those with and without transportation who had better health.

Cutler (1975) continued his analysis of this same sample in 1973. He re-interviewed 104 of the original subjects to again determine the relationship between quality of life and availability of transportation. He now added a third factor: the change in quality of life as a result of acquiring, maintaining or losing personal transportation over time. Cutler controlled for health, family income, age, gender and distance of residence from city center. Again, Cutler reported a significant difference on life satisfaction scores between those with and without transportation (F net effects, $p < .05$). A declining life satisfaction was reported for 54% of those without transportation at both waves, or who had lost transportation since the first wave, compared to a 36% decline for those with transportation at both waves. Again, Cutler suggests the positive relationship between availability of personal transportation and quality of life.

Gianturco et al. (1974) compared drivers and former

drivers on life satisfaction and total activities. An instrument developed by the researchers, reflecting areas usually evaluated for quality of life, was used to measure life satisfaction. Current drivers had significantly higher numbers of activities and life satisfaction scores than did the ex-drivers ($p < .001$). Thirteen current drivers were then matched with former drivers on age, sex and physical function ratings, since the differences previously observed could be due to those variables. There was no significant difference on activities between the two groups, but life satisfaction remained significantly different ($p < .03$), again suggesting a lessened subjective quality of life when living as former driver.

Gillins (1990) proposes that former drivers suffer a loss, and therefore may proceed through a grieving process. She suggests that older adults will be more successful in working through the grieving process if they acknowledge the reasons why it is no longer safe to drive (p. 12). She further suggests that the ability to adapt depends on age, number of losses encountered within a short time, past experiences with losses, availability and use of support systems, ability to maintain a sense of control over the environment and self esteem (p. 14). The process of voluntarily giving up driving may be a means to maintain self esteem, a point that may be supported by the findings regarding decision-making reported by Gianturco et al. (1974), Yee and Melichar (1992) and

Persson (1993). Thus, Gillins indirectly introduces the concept of the multiple dimensions of life satisfaction, as well as the idea that, for the former driver, subjective evaluation of satisfaction may change over time as one works through the grieving process.

Eisenhandler (1992) used qualitative data from a stratified random sample of 50 older adults to support her theoretical arguments suggesting the driver's license as a universally agreed upon symbol of a "non-stigmatized, non-age related identity" (p. 107). The license, she posits, demonstrates that one is functionally and socially competent, independent and integrated into the heterogeneous world of others (p. 110). Driving allows easy access to various social roles. Conversely, those in her sample who did not drive (n=12, six of whom were former drivers) "were keenly aware of age and their isolation from others; reminding them that others often imputed a dependent and childlike status to them" (p. 114). Eisenhandler notes that the significance of the license is so important that older adults sometimes do not relinquish it, even when they no longer drive. This idea is supported by Persson's (1993) study, where only 37% of the ex-drivers no longer had a driver's license. Although Eisenhandler did not directly measure quality of life, her arguments regarding the status and identity involved with driving are compelling.

In summary, the few studies cited suggest a decrease in

the quality of life for older adults who stop driving. The majority of the studies are over 20 years old, however, and may not accurately reflect the current cohort of ex-drivers. In addition, the findings are limited in that only two of the studies clearly differentiate between former drivers and never-licensed older adults in the analyses.

Previously cited studies suggest a strong relationship between health and/or finances in the decision to stop driving. Both of these variables may also influence a person's evaluation of their life satisfaction. It is theoretically possible that the older adult's subjective evaluation of their quality of life may be strongly influenced by health, income or other unknown factors, regardless of driving capability. Carp notes that "the fact that decreases occur simultaneously in mobility and well-being does not guarantee that one causes the other" (1988, p. 3). Quality of life is a multidimensional construct, influenced by many different life factors. Thus, health, income and other factors warrant additional exploration regarding their influence on overall quality of life for the driver and the former driver.

Mobility consequences and the older adult's adaptation to loss of driving

The older adult who has stopped driving must adapt to the loss of independent and immediate transportation. Is there a change in the types and frequencies of trips taken by the

former driver? What transportation resources are substituted for driving? The mobility consequences and subsequent adaptation of older non-drivers to the loss and/or absence of personal transportation has been minimally documented.

Mobility consequences.

As previously noted, the 1983 NPTS reported that non-licensed older adults take 50% to 100% fewer trips for all purposes than do those older adults with drivers' licenses (Rosenbloom, 1988). Lawton (1980) and Carp (1988) have postulated that basic or life maintenance needs will continue to be met through a variety of resources, but that loss is most likely to occur in meeting higher order needs or in life enriching trips. Cutler (1972) further develops this line of thinking by suggesting that social and psychological functioning of older adults is mediated by financial and physical abilities if transportation exists and by placement of people and resources should personal transportation not exist. Thus, former drivers who live closer to needed resources (friends, family, recreation, church) should be better able to meet their higher order needs and theoretically have a better quality of life. Cutler's ideas might be questioned by Litwak (1985) who posits a task-specific theory of support for older adults by formal and informal groups. Litwak would classify each "need" by a series of characteristics of tasks (proximity required, degree of commitment required, size of group, common lifestyle,

motivation) and cross-index them by characteristics of groups. Thus, grocery shopping or a ride to the grocery would require closer proximity than the provision of emotional support, which could be given over the phone.

Few studies have tested Lawton's, Carp's or Cutler's hypotheses. Cutler (1972), using the same sample and methods previously described, reported a significant difference ($p < .01$) on life satisfaction between those with and without transportation when subjects lived greater than 1/2 mile from the city center, and thus further away from resources. The significant effect disappeared when subjects lived within 1/2 mile of the city.

Cutler (1974) also compared those with and without transportation on their number of voluntary association memberships and on their frequency of attendance. A significant difference ($p < .05$) between groups was found on both variables, with those who had transportation belonging to and participating more in voluntary organizations. The significant differences disappear, however, when controlled for health and income.

Foley et al. (1990) report on the frequency of weekly trips to various places by drivers, former drivers and never-licensed older adults in the two EPESE cohorts. In the category of life maintenance needs, an age-adjusted average (between the two cohorts) of 89.7% of current drivers compared to 56.9% of the former drivers went shopping on at least a

weekly basis. Thirty-nine percent of drivers went to the bank, while only 12.5% of former drivers did so. Higher order trips--visiting, church, social activities and work--show similar differences: 67.6% of drivers compared to 42.5% of former drivers went visiting; 64.7% of drivers and 37.7% of ex-drivers went to church; 44% of drivers and 19% of ex-drivers participated in a social activity; and 22.7% of drivers worked at a job compared to 6.2% of former drivers. No significance testing was reported. Foley et al.'s findings seem to support Lawton's (1980) and Carp's (1988) hypotheses, but care must be taken in the interpretation of the results. Although the data was age-adjusted, it was not controlled for health or income, variables previously cited as relevant in the desire and/or ability to travel outside the home for various activities. In addition, Foley et al. do not report on the use of alternative means to meet the various "needs", e.g. doing volunteer work at home or conducting banking through the mail.

Mobility adaptation.

Older adults who are non-drivers meet their transportation needs most frequently as passengers in cars, by walking and lastly by public transit and paratransit services. As with drivers, over 80% of former drivers continue to use private vehicles (but as passengers) for their primary mode of transportation; 20% to 40% of trips are taken by walking; and public bus or senior citizen van is a distant third and fourth (Rosenbloom, 1988, 1993).

Carp (1972) conducted a descriptive study of older adults as automobile passengers as part of her study of transportation and older adults in San Antonio. The sample of 709 (previously described) included 66% non-drivers. No differentiation between ex-drivers and never-licensed drivers was noted. The non-drivers reported being given rides by relatives (62%), friends (36%), neighbors (5%) and agency personnel (3%). This can be compared to Persson (1993) and Kington et al. (1994), who also queried their samples on their usual resources for rides. Persson's retirement community group of ex-drivers relied on friends (30%), relatives (26%) and the community van (22%). Persson's findings must be interpreted in light of the milieu and the type of residents who live in a retirement community. Consideration would have to be given to income, distance from family and van availability among other factors. Kington et al. reported adult children (39%), other relatives (24%), friends (23%), a spouse (21%), a taxi or other paid drivers (15%), and siblings (7%) as the usual sources for transportation. Obviously absent, among this nationally representative sample, is the use of public transit or paratransit services.

The non-driver subjects in Carp's group noted the positive aspects of receiving automobile rides: access to places, socialization, minimizing of health problems and normal aging changes, and convenience. Conversely, the negatives of being a passenger included inadequate numbers of

rides to meet needs, trip destination being decided by the driver (decreased autonomy) and feeling indebted and unable to reciprocate to the driver.

Carp (1971b) also studied walking as transportation among the San Antonio elders. She reports that ex-drivers walked more than never-licensed older adults or current drivers. This was contrary to her hypothesis that health and physical changes that lead to limiting driving would also limit pedestrian travel (p. 105). Reporting on the entire sample of 709 older adults, she notes that walking destinations included the grocery (26%), visiting friends (25%), religious services (23%) and other shopping (18%). Only 3% of the population, however, rated walking as satisfactory to meet their needs. Negative evaluations of walking cited distances to needed resources, difficulty in carrying packages, time, safety fears and health problems.

As previously noted, buses or other forms of public transit are a distant third for transportation choice by former drivers. The rationale for this is not clearly delineated in the literature. Certainly, many communities may not be served by public transit, and those that are may not offer the routes or scheduling needed by the older adult. Concerns for safety and physical abilities needed to use public transit have been noted by Carp (1988) and Rosenbloom (1988). Gillins (1990) suggests that the use of public transit may require the mastery of new knowledge, routes, schedules

etc., something the former driver may not be willing to undertake. Rosenbloom (1993) suggests that the primary reason for lack of use is that public transit is not responsive to the older adult's needs (p. 304).

Contrary to stereotype, paratransit services are used infrequently. The idea of door-to-door, barrier-free, low cost transportation provided specifically for the elderly would seem to be attractive to the former driver. Rosenbloom (1988, 1993) strongly suggests that inflexibility, stringent eligibility requirements and scheduling all factor into the low usage of paratransit services. Eisenhandler (1992) attributes low utilization of van services to an aura of neediness associated with its use. Likewise, Iutcovich and Iutcovich (1988), in a study of older adults' transportation needs in Pennsylvania, suggested that the elderly will exhaust all resources before turning to a public agency for help. Further study of this rather expensive means of transporting the elderly is certainly indicated.

Summary.

Older adults who do not drive have clearly demonstrated a preference for alternative means of transportation that provide autonomy, convenience and easy access to various locations. Former drivers note drawbacks to traveling as a car passenger, but still rely on family and friends to provide the majority of their transportation in private automobiles. What is missing in the literature is the documentation of who can

be counted on to give rides to specific destinations.

Few studies document the frequency and specific types of trips taken by former drivers. Thus, a testing of Carp's (1988) and Lawton's (1980) hypotheses is difficult at best. The ability to meet personal needs is influenced by the availability of, and access to, resources within the community. Consideration must also be given to recent technological advances that allow shopping, banking and other services to be conducted at home. With the knowledge that current and future elders do (and will) live in low density suburbs, the ability to meet basic and higher level needs without driving is unknown.

Overall, the studies cited provide some insight into the mobility adaptation of the non-driver. A key factor that continues to be missing is the separation of never-licensed older adults from former drivers. It is possible that never-licensed elders made effective adaptations for transportation over their lifespan, adaptations that continue to be utilized to the present. Thus, analyzing the two groups as one category results in an indistinct understanding of the adaptation of the former driver alone.

Quality of Life

Quality of life is a multidimensional construct that has generated volumes of research and stimulated discourse and controversy over the last 40 to 50 years. In the United States, major efforts to understand and measure quality of

life were started in the late 1940's and early 1950's, particularly under the Eisenhower administration's Commission on National Goals (Flanagan, 1982; Spitzer, 1987). An interest in health-related quality of life developed in the 1970's, primarily stimulated by concern about treatment options, and what these options could offer a patient besides cure and survival (Goodinson & Singleton, 1989; Zhan, 1992). Quality of life research specific to older adults had its genesis in the late 1940's, initially looking at adjustment to aging (Larson, 1978; Horley, 1984). Comprehensive reviews of the extensive literature on the topic are available elsewhere (Campbell, 1976; Spitzer, 1987; Goodinson & Singleton, 1989; Ferrans, 1990b; Zhan, 1992). This review will focus on methodological issues related to research on the concept of quality of life and on the literature specifically related to aging and quality of life.

Quality of Life: Definition and Methodology

Two major controversies are readily apparent in the quality of life literature: what is quality of life?, and how should it be measured?

There is no one definition of quality of life that is widely accepted. As noted by Campbell (1976), "(It)...is one of those concepts that have meaning to almost everyone but are difficult to define" (p. 119). In general, definitions provided in the literature reflect the concepts of "life satisfaction", "well-being", "life situation", and the

person's own evaluation of same. For example, Ferrans (1990a) defines quality of life as " a person's sense of well-being that stems from satisfaction or dissatisfaction within the areas of life that are important to him/her" (p. 15). Likewise, Goodinson and Singleton (1989) define it as "the degree of satisfaction with perceived life circumstances" (p. 328) and Zhan (1992) contributes "quality of life denotes how a person perceives his/her sense of well-being and life in relation to his/her situation" (p. 796). An early debate as to whether quality of life related to "happiness", "satisfaction" or both has been resolved with a preference for satisfaction. "Happiness" is seen as more of a transitory feeling, while "satisfaction" is considered a judgment against external standards (Goodinson & Singleton, 1989; Zhan, 1992).

There is agreement that quality of life is a global construct that is multifaceted. Consensus exists that at least three to four major domains affect quality of life: health and physical functioning; psychological and spiritual well-being; social interactions with family and others; and material and/or economic well-being (Flanagan, 1982; Spitzer, 1987; Goodinson & Singleton, 1989; Ferrans, 1990b; Zhan, 1992). Similar domains have been identified in discussion of quality of life for older adults (George & Bearon, 1980; Lawton, 1983, 1991). The organization of these domains in regard to a theory of quality of life is less well developed. The specific dimensions underlying each domain can vary, can reflect more

than one domain, and can be numerous. For example, Jalowiec (1990) lists almost 50 dimensions of quality of life in her review of the literature.

The multiple dimensions of quality of life and the individual nature of the definition can and does lead to difficulties in measurement. There is no standard measure (Ferrans, 1990b). Spitzer (1987) notes that there is an "epidemic of scales and measures" (p. 469). Jalowiec (1990) lists 22 different tools that have been developed to specifically measure quality of life. In addition, researchers often combine four to five other types of tools (for example, depression scales, activities of daily living measures, social network scales) to measure the various domains that are deemed relevant to the overall construct.

Besides the multitude of instruments, two major measurement issues are documented in the literature: subjective versus objective measurement; and single item versus multi-item measures. Subjective measurement refers to the respondents' own evaluation of their quality of life. Objective measurement can refer to three things: use of surrogate indicators of quality of life, such as income; the use of surrogate evaluators, such as physicians; or the use of objective scales, such as a measure of independence in activities of daily living. The early research on quality of life utilized objective social indicators, such as income, crime, education and employment, as measures of happiness. As

the social indicators improved over time, however, a concurrent improvement in population happiness did not occur; the research suggested a low correlation between the two (Campbell, 1976). Likewise, low correlations have been documented in studies that have compared physicians' evaluations of patients' quality of life with the patient's own perception of quality of life, with physicians routinely rating lower than the patient (Pearlman & Uhlmann, 1991; Fletcher, Dickinson & Philip, 1992). Thus the research supports the use of subjective measures alone, or a combination of subjective and objective measures.

It has already been noted that quality of life is a multidimensional construct. The use of a single-item global measure (e.g. "how would you evaluate your overall quality of life?") instead of a multiple item measure has been debated. Although the correlations between the single and multi-item measures can be high, .70 to .80 (Campbell, 1976; Ferrans & Powers, 1985), the majority of researchers favor a multi-item, multidimensional measure (Campbell, 1976; Horley, 1984; Spitzer, 1987; Jalowiec, 1990; Ferrans & Powers, 1992; Zhan, 1992). Jalowiec notes that "unidimensional or global approaches to assess quality of life do not provide enough information about what is going on in the patient's life...and of the impact of treatment regimens on the usual life activity and well-being in multiple domains" (p. 271). Horley (1984) suggests that quality of life evaluations should occur at

three levels: a global level; a life domain level; and a day-to-day, elemental level. He further suggests the development of measures that "allow respondents to indicate personally salient (dimensions)" (p. 126). Measures that would allow the respondent to rate quality of life in various domains and then identify which domains are most important to their quality of life would increase preciseness of the measure and could subsequently improve validity (Horley, 1984; Ferrans & Powers, 1985, 1992).

Quality of Life and Aging

As previously noted, research related to quality of life of older adults has been conducted since the late 1940's. Hundreds of studies have been reported since that time. This review will focus on research that highlights variables that are/are not related to quality of life in older age, and on longitudinal studies that focus on changes in quality of life as one ages.

Variables related to quality of life in the aged.

Larson (1978) reviewed 30 years of research literature focusing on the well-being of adults over the age of sixty. He concluded that health, socioeconomic status and social interaction (in that order) were most related to well-being; least related were sex, race and employment status. Larson suggested as age increases, well-being decreases, but he attributed this finding to other factors, rather than age alone.

Herzog and Rodgers (1986) compared eight nationwide surveys, conducted in the 1970's, to attempt to explain the "counterintuitive finding" that quality of life ratings were higher for older than for younger adults (p. 240). From a methodological standpoint, they suggested that domain-specific measures correlated more strongly with age and satisfaction than did a global measure of life satisfaction. Strong correlations were seen with housing, community, standards of living and work; the weaker correlations were seen with family life, marriage and friendships. The authors suggest a variety of reasons as to why the age group ratings are different than expected, including measurement error related to older adults' responses to survey research, and acceptance and/or adaptation of older adults to their situation in life.

Flanagan (1982) reports on a study that attempted to identify and then rate importance of factors affecting quality of life for Americans in three age groups, 30, 50 and 70 years of age. He used critical incidents techniques to identify 6,500 factors that eventually were synthesized into fifteen factors under five general categories: physical and mental well-being; relationships with other people; social communication and civic activities; personal development and fulfillment; and recreational. Specific information on the sampling method, characteristics of the sample and the psychometrics were not reported. Flanagan does report the percentage of people in each age category who rated each

factor as "important" or "very important" to quality of life. The older men reported health and personal safety, material comforts and their relationship with significant others as most important; least important were creative expression, active recreation and learning. Older women ranked health, understanding self and relationships with close friends as most important; least important were close relationships with significant other, active recreation and creative expression. Flanagan does not use statistical analysis to compare age groups, nor does he attempt an explanation of the findings.

Pearlman and Uhlmann (1991) conducted a study with 258 chronically ill elderly who were outpatients in three diverse health care settings. An equal number of men and women, with mean age of 74 years, were recruited via repeated random sampling. Quality of life was assessed in three ways: a single item global rating using Likert scoring; a forced-choice assessment of 33 attributes potentially affecting quality of life; and an open-ended interview asking what "events, changes, or situations" had increased or decreased quality of life during the preceding twelve months (p. M 32). The 33 factors were eventually collapsed into seven factors under four general categories: depression and anxiety (emotional); relationships, finance and residence (social); memory (intelligence); and health (physical). On the global rating, 69% of the respondents listed their quality of life as good; 21% listed it as fair, but good enough to manage. Only 11% of

the chronically ill sample identified their quality of life as poor. Demographic characteristics-age, gender, education and marital status-correlated weakly with global quality of life (r= -.01 ; -.03; -.08 and -. 06 in that order). Global quality of life was associated most strongly with the subjective indicators of health, emotions and finance. Multiple regression resulted in three factors-health, memory and finances-significantly contributing to explain 35% of the variance. The most frequent responses to the open-ended questions regarding events improving quality of life were housing, health behavior, interpersonal relationships, medical care and health. Common events decreasing quality of life were interpersonal relationships, functional impairments, health and pain. Interestingly, finances and memory, which were significant predictors in the regression equation, were not mentioned in the open-ended interview. The findings suggest an overall good perceived quality of life, even among chronically ill older adults. Support is provided for multidimensional measures so as to best understand the specific contributions to the overall construct. The results also suggest the importance of multiple methods (e.g. closed and open-ended questions) in assessing quality of life of older adults.

Katz and Gurland (1991) suggest that quality of life for older persons is an "irreducible combination" of the elders themselves (body, mind and spirit); their environment; and their life experiences in place and time (p. 335). The authors

concur that health is the most powerful influence on quality of life in old age; and provide support for additional influential domains identified by other gerontologists (Gurland & Katz, 1992). They provide a challenge to researchers to view quality of life in a holistic manner, and to develop assessment tools, utilizing this concept, specifically for the elderly.

Thomas and Chambers (1989) critique the use of structured survey instruments to measure life satisfaction in their report of a study of older (70 years and above) English and Indian men. They used three standard measure of quality of life: Neugarten's "Life Satisfaction Index-A", Cantril's "Self Anchoring Ladder", and a single-item "happiness" question. No significant differences were found between the two groups on any of the three measures. However, themes derived from open-ended interviews with all the subjects suggested considerable differences between the groups on the conditions and situations influencing life satisfaction. For example, the most common English theme was fear of incapacitation and of being a burden; the most common Indian theme related to the importance of family and religious beliefs. The authors suggest that the use of survey instruments can lead to inappropriate conclusions about quality of life, as well as a lack of understanding of the context within which the evaluations are made.

Quality of life and age: Longitudinal studies.

A number of longitudinal studies have explored the changes in life satisfaction as one ages, and have attempted to predict life satisfaction over time. The majority of the studies suggest that despite the expected physical and situational changes of old age, life satisfaction is stable.

Palmore and Kivett (1977) report on a longitudinal study conducted in the 1970's with a random sample of 378 adults, aged 46 to 70 years. The subjects were interviewed three times, at two year intervals, on life satisfaction (using Cantril's "Self Anchoring Ladder") and a variety of other variables. Self-rated health, organizational activities, social activity hours, productive hours and sexual enjoyment were found to be significantly correlated with life satisfaction at round one. Variables not significantly correlated included demographics (age, sex, income, education, marital status and employment), physical functioning, number of social contacts, having a confidant and intelligence. Groups were organized by five year age intervals for further analysis. Results suggest that life satisfaction was stable over time: there was no significant difference between age groups at any round, and no significant change among any age group. There was also no significant overall decline in life satisfaction as the cohorts aged. The variable with the strongest significant relationship to life satisfaction was "self-rated health" (zero order Pearson correlation .42, .30 and .25 at each successive wave). For all groups, the

strongest predictor of life satisfaction at Round 3 was evaluation of life satisfaction at Round 1 (r = .40). Self-rated health added only 1% to the variance.

Similar findings are reported by Costa, Zonderman, McCrae, Cornoni-Huntley, Locke and Barbano (1987) in their longitudinal analysis of psychological well-being as part of the National Health and Nutrition Epidemiological Study I (NHANES I) Follow Up. The researchers used a ten item version of the General Well Being Schedule at two waves, 1971-1975 and 1981-1984. A stratified nationwide probability sample of approximately 4,900 subjects, aged 25 to 74 years (at wave one) were interviewed. No significant difference in well-being was found between wave one and two for any of the age groups. The authors conclude that " life neither improves or worsens with age, or individuals adapt quickly to whatever circumstances they find themselves in" (p. 54).

Roos and Havens (1991) conducted a longitudinal study in Manitoba to attempt to predict successful aging. Two measures were obtained, in 1971 and 1983/1984. The representative sample was composed of 2,943 adults (in 1983) who were aged 65 to 84 years at wave one. Successful aging was defined by the authors as: alive; not in a nursing home; not greater than 59 days of home health care in a year; excellent to fair health rating; not dependent in activities of daily living; and acceptable Mental Status Exam. As a minor part of the study, the researchers queried the survivors on life satisfaction in

1983. Of those 182 who ranked life satisfaction as "excellent", 70% had aged successfully; 30% were alive but dependent, (they had not aged successfully according to the criteria). Similarly, "good" life satisfaction was chosen by 60% of successful agers, and 40% of "unsuccessful" agers. The authors conclude that "losing one's independence is not necessarily judged a disaster" (p. 65).

Bowling, Farquhar, Grundy and Formby (1993) support stability in life satisfaction in their sample of very elderly (85 years+) persons living in socially deprived areas of London. Their study covered a 2 1/2 year period between 1987 and 1990. The researchers used five different instruments to measure health status, social network characteristics, social support and life satisfaction (Neugarten's "Life Satisfaction Index-A" and the "Delighted/Terrible Faces Scale"). No significant difference in life satisfaction was seen over the research period. Total variance in quality of life explained by their model was 47%, with 43% explained by baseline life satisfaction (the remaining variance was explained by functional status and age). Although the findings are generalizable to only a small population, the results are compelling in light of an expected deterioration in physical and life situation in the sample population.

Summary: Quality of Life

A vast literature representing 40 years of research, reflects ongoing controversy and only occasional agreement

regarding the construct of quality of life. Consensus seems to exist on the general domains influencing life satisfaction. A multiplicity of definitions and measurement instruments, however, makes comparison of the various research studies difficult at best.

Despite methodological shortcomings and inconsistencies, the research on quality of life of older adults does suggest some commonalities. Measuring specific domains, as part of an evaluation of global quality of life, is supported. Health, socioeconomic status, social interaction and emotional functioning are domains that are frequently, but not consistently, noted as important. The findings dispute the stereotype of declining quality of life as one ages, especially in light of physical, environmental or situational changes or stressors. Although self-rated health seems influential in evaluation of quality of life, previous evaluations of life satisfaction are most predictive of future evaluations. Thus, as suggested by Costa et al. (1987), "stable personality characteristics may be more influential in evaluating quality of life rather than objective (environmental and physical) circumstances" (p. 54). The quality of life literature, and Costa's comments in particular, are intriguing in light of an exploration of the quality of life, and possible changes in quality of life, of older adults who have stopped driving.

Summary

The importance of transportation in facilitating independent community living by older adults is well accepted. Consensus exists that most older persons are able to independently meet their transportation needs, primarily as drivers of automobiles, and that older adults should continue to drive as long as safety permits (Schmidt, 1988; Transportation Research Board, 1988, p. 11).

After age 75, driving skills can drastically deteriorate, and some older adults may no longer be able to provide their own transportation. Recent research suggests that approximately 14% of community-living older adults are former drivers. The absolute number of ex-drivers is only expected to increase, however, as the older population increases in numbers over the next 20 to 30 years. The most recent research studies have focused on identifying factors that predict cessation of driving among the elderly. Health problems and finances are suggested as the primary reasons for voluntarily relinquishing driving privileges; very few older adults report being forced to quit driving against their will.

Very little is known about the life situation of the older adult <u>after</u> the decision has been made to stop driving. Very few studies document the mobility modifications by this group. It has been suggested that former drivers make fewer trips outside of the home (than do drivers), but where they

specifically go, how often and how they get there is not well documented. Even less well explored is the influence of poor health and low income (primary reasons for quitting) on the desire or ability to travel outside of the home.

Many authors have voiced opinions as to the negative impact on quality of life of losing the ability, or the right, to drive. Few recent studies have examined the problem from a research base. The studies cited in the review of literature do suggest a decrease in quality of life for the older non-driver. These studies are over 20 years old, however, and may not accurately reflect the life circumstances of the current cohort of former drivers. In addition, few of the studies clearly discriminate between former drivers and never-licensed older adults. Thus, a research-based exploration of the quality of life of the current cohort of ex-drivers is lacking in the literature.

Furthermore, the quality of life literature suggests that health and physical functioning, psychological and spiritual well-being, social interaction with family and friends, and economic well-being contribute to self-assessment of life satisfaction. Each one of these domains could either influence, or be influenced by, the ability to drive. Previous studies have focused on simply reporting a change or difference in quality of life for non-drivers, rather than exploring the multiple dimensions that influence that assessment. Therefore, the relationship of driving status to

overall quality of life for older adults is not well understood.

A study that would focus solely on former drivers , exploring not only quality of life, but modifications in mobility outside of the home, could contribute to a better understanding of this cohort, and to the development of initiatives in planning for current and future transportation needs.

RESEARCH QUESTIONS

The questions that this study sought to answer are:

1. Among a group of older former drivers, how was the decision made to stop driving?

2. a. What are the mobility consequences for older adults who quit driving?

b. Is there a difference in the numbers and types of trips taken by current drivers and former drivers?

Hypothesis: Current drivers will take significantly more trips for all purposes than will former drivers.

Hypothesis: Current drivers will take significantly more trips to meet life maintenance and higher order needs than will former drivers.

3. What resources are used by older former drivers to meet their transportation needs?

4. Among a group of older adults, is there a difference in subjective quality of life between current drivers and former drivers?

Hypothesis: Current drivers will report a significantly better subjective quality of life than will former drivers.

5. Among a group of older former drivers, does subjective quality of life differ depending on the voluntary/involuntary nature of cessation of driving; the number of higher order trips; or the recency of cessation of driving?

6. Among a group of older adults, what variables included in this study explain the variance in subjective quality of life?

OPERATIONAL DEFINITIONS

The definition of terms to be used in this study are as follows:

Older adults - persons ≥ 65 years of age, who can understand and speak English

Former drivers - older adults who report that they previously drove an automobile for a period of at least one year, but they have permanently ceased driving

Drivers - older adults who possess a valid driver's license and who report that they currently drive an automobile

Quality of life - "a person's sense of well-being that stems from satisfaction or dissatisfaction within the areas of life that are important to him/her" (Ferrans, 1990a, p. 15), as measured by the Quality of Life Index

Higher order needs- "those needs whose satisfaction is requisite to give life an acceptable and

positive quality;... includes social interaction, usefulness, recreation and religious experience;... resources for meeting higher order needs include family and friends, volunteer services, recreational places and churches or synagogues" (Carp, 1988, p. 4-5); as measured by total number of trips per year to visit family or friends, religious services, jobs, recreational activities and clubs.

Life maintenance needs- "those needs whose satisfaction is requisite to independent living; ...includes nourishment, clothing, medical care, pharmaceutical and banking; ... resources for meeting life maintenance needs include food and other stores, physicians' offices, pharmacies and banks" (Carp, 1988, p. 4); as measured by total number of trips per year to buy groceries, other shopping, health care, pharmacies and the bank.

Mobility adaptation - modifications made by former drivers in order to meet life maintenance and higher

order needs

Mobility consequences- changes in mobility, as measured by trips outside of the home, experienced by older adults who stop driving

Physical functioning - "extent to which health limits physical activities", as measured by the SF-36 (Medical Outcomes Trust, 1994, p.2)

Role-physical - "extent to which physical health interferes with work or other daily activities", as measured by the SF-36 (Medical Outcomes Trust, 1994, p. 2)

Bodily pain - "intensity of pain and effect of pain on normal work", as measured by the SF-36 (Medical Outcomes Trust, 1994, p. 2)

General health - evaluation of personal health, as measured by the SF-36 (Ware, 1993, p. 3:5)

Vitality - evaluation of energy level and fatigue, as measured by the SF-36 (Ware, 1993, p. 3:8)

Social functioning - "extent to which physical health or emotional problems interfere with normal social activities", as measured by the SF-36 (Medical Outcomes Trust, 1994, p.2)

Role-emotional - "extent to which emotional problems interfere with work or other daily activities", as measured by the SF-36 (Medical Outcomes Trust, 1994, p.2)

Mental health - personal evaluation of general mental health, as measured by the SF-36 (Ware, 1993)

CHAPTER III

Methods

This chapter will describe the methods undertaken to complete the study. First, a brief overview of the research design will be given, followed by a description of the sampling procedure. The various instruments and items used in the questionnaire will be discussed next, along with the results of the pretesting of the instrument. Lastly, data collection and data analysis procedures will be described.

Research Design

A cross-sectional, descriptive correlational design was used for this study. The purpose of the study was to explore the relationships among subjective quality of life, driving status, health, and various types of trips outside of the home among a group of adults, 65 years of age and older. A secondary purpose of the study was to describe the decision-making process, mobility consequences and mobility adaptation among a group of older ex-drivers.

Data were collected by in-person interviews with the subjects, utilizing the study questionnaire as an interview schedule. The face-to-face interview method was chosen in order to obtain the most precise and complete data possible, in light of the complexity and length of the questionnaire. Herzog, Rodgers and Kulka (1983) and Lawton and Herzog (1988) have reviewed various methods with which to conduct survey research with older adults. Although not necessarily endorsing

face-to-face interviews, the authors document the negative aspects of telephone interviews (low response rates, dependency on acuity of hearing, more stressful, and difficulty in remembering answer choices) and mailed questionnaires (low response rates, dependency on vision, and the less educated may not understand the questions and therefore don't reply). The multiple benefits of the in-person interview outweighed the efficiency that would be afforded by telephone or mail surveys in this particular study.

Sample

The subjects for this study were randomly selected from a sampling frame of all registered voters, 65 years of age or older, from six towns in central Connecticut. Within the state, the voter registration lists are considered acceptable sampling frames for studies with older adults, since many towns have 90% or more of the older adult residents registered to vote, and the lists include residents of nursing homes and people without phones (Andy Wright, Connecticut State Department on Aging, personal communication, March 3, 1994). The lists are current to the day they were printed (e.g., they are updated each time a person registers to vote in the town).

The registrars of voters in the city of Hartford and its six contiguous towns (total $n = 7$) were contacted regarding the availability of computerized lists of voters segmented by age. Three of the towns were able to provide these lists; the other four towns did not have computer capability. An

additional four towns, contiguous to the initial towns, were subsequently contacted. Three of these towns were able to provide the lists requested. A final convenience sample of six towns provided lists containing the names of 37,002 older adults. The lists were current to April 15, 1994.

In order to determine the number of subjects needed in each study group, (drivers and former drivers), a power analysis was conducted. "Power analysis represents a method for reducing the risk of Type II errors...wrongly accepting a false null hypothesis... Thus, power analysis assists in determining the sample size needed in a study to increase the likelihood of demonstrating significant results" (Polit & Hungler, 1991, p.482). In order to conduct a power analysis, three factors are necessary: 1) a significance criterion, alpha, which protects against a Type I error; 2) the population effect size, gamma, which is a measure of how strong the effect of the independent variable is on the dependent variable; and 3) power, or 1 - beta, the probability of rejecting the null hypothesis (Polit & Hungler, p.482). Alpha and beta are usually established by the investigator, using conventional standards. Gamma can be determined in a number of ways, including mathematical extrapolation from previous studies or estimation of the effect, oftentimes referred to as "small", "medium" or "large", after reviewing other similar studies (Polit & Hungler, 1991). For this study, alpha was set at .05 and the power was set at .80.

Two different power analyses were conducted, using the methods, formulas and tables recommended by Polit and Hungler (1991). First, a power analysis to determine sample size estimates for tests of difference between two means was performed. Gamma was calculated utilizing data from five different sample groups in studies using Ferrans' and Powers' "Quality of Life Index", an instrument used in this study (Ferrans & Powers 1985; Ferrans, 1990a; Ferrans & Powers, 1992; Hicks, Larson & Ferrans, 1992). Estimates of gamma from these calculations ranged from .24 to .94, with an average of .42. With a gamma of .40, an alpha of .05 and a power of .80, the approximate sample size recommended for tests of difference between two means would be 98 in each group.

A second power analysis was conducted to determine sample size estimates for bivariate correlation tests. No data were available from similar studies that would assist in the direct calculation of gamma. Thus, based on the review of literature, a "medium" effect was estimated. Polit and Hungler recommend a gamma value of .30 for a "medium" effect in this instance. Again using alpha set at .05 and power at .80, an approximate sample size of 88 was recommended.

In order to make the desired sample size more conventional, the suggested sample sizes of 88 and 98 were rounded up to 100 subjects in each group.

Further analysis was conducted in order to determine the number of elements to select from the sampling frame, so as to

attain a final sample of 100 drivers and 100 former drivers. At the time the sample was drawn, the most current and accurate data available to the investigator (regarding driving/non-driving status among older adults) was from the 1983 Nationwide Personal Transportation Study (Transportation Research Board, 1988) and the EPESE data from Foley et al. (1991). The 1983 NPTS suggested that the percentage of licensed drivers 65 years of age and older ranged from 75% for those 65-69 to a low of 22% for those 85 years of age and older. The data suggested that after age 75, approximately 50% or less of older adults would be licensed to drive (Transportation Research Board, 1988). The EPESE data reported 65.5% of the population (72 years of age and older) in the Iowa cohort and 34.4% of the New Haven cohort as being current drivers; 18.7% in Iowa and 23.3 % in New Haven reported being former drivers; and 14.8% in Iowa and 42.4% in New Haven reported never having driven (Foley et al., 1991). The wide variation in results from the EPESE study, the age of the sample and the dissimilarity between the two EPESE study locations, and the location of the current study limited the use of this more current data in the final calculations. Using the NPTS data as a rough estimate of driving status among older adults in 1994, and a conservative estimate of response rate (50%) among the population to be sampled, it was determined that 400 elements would need to be selected from the sampling frame.

The six computerized lists of registered voters were arranged alphabetically. Systematic random sampling, using a sampling interval of 93, was conducted until 400 elements had been chosen. A table of random numbers was used to select the starting point.

The initial sample of 400 did not result in an adequate number of former drivers, as suggested by the power analysis, for the statistical analysis desired. Therefore, an additional sample of 400 was selected, utilizing the same techniques described above. From this second sample, only former drivers were included in the final analysis.

Data Collection Instruments

Data were collected with a questionnaire that was used as an interview schedule. Established instruments, with acceptable psychometrics, were chosen to measure the variable of "quality of life" and "health". Single questions, adapted or used directly from other studies measured mobility adaptation and mobility consequences. Single-item questions were used to record demographics and data on driving status.

This section will describe each instrument or question used, including the scoring and the psychometrics. Support from the literature for use of the measure with the elderly population will be provided when available.

Quality of Life

The variable of quality of life was measured via one multi-item instrument, the Quality of Life Index-Generic

Version (QOLI) developed by Ferrans and Powers (1985) and one standard, single-item question.

Quality of Life Index.

The Quality of Life Index-Generic Version was chosen for this study for a number of reasons. First, it is one of the few instruments purporting to measure quality of life that allows respondents to rank not only their satisfaction with, but also the importance of, various aspects of their life. Ferrans and Powers (1985) suggest that "different people value different things" (p. 15), and therefore this component should be taken into consideration in a quality of life measure. Support for such a measure has been provided in the research literature on quality of life (Horley, 1984). A second reason for choosing this tool is that it has been used with a wide variety of populations, well to ill, and young to old (Ferrans & Powers, 1992). Modifications in the questions can be made to adapt to specific populations. For example, other forms of the QOLI include versions for patients with cancer, liver transplants, renal dialysis and nursing home residents (C. Ferrans, personal communication, May, 1993; Ferrans & Powers, 1992; Oleson, 1992). Many of the aspects of life measured by the QOLI are related, either directly or indirectly, to mobility and transportation (see Table 1), and therefore have relevance to the purposes of the current study. Finally, the instrument was chosen because it can be self-administered or used as an interview schedule, and it has consistently

Table 1

Subscales of the Quality of Life Index

Health and Functioning Subscale	Socioeconomic Subscale
Usefulness to others	Standard of living
Physical independence	Financial independence
Responsibilities	Home
Own health	Job/unemployment
Stress	Neighborhood
Leisure activities	Friends
Retirement	Emotional support
Travel	Education
Long life	
Sex life	
Health care	
Discomfort/pain	
Control over own life	
Energy (fatigue)	
Psychological/Spiritual Subscale	**Family Subscale**
Life satisfaction	Family happiness
Happiness	Children
Self	Spouse
Goals	Family health
Peace of mind	
Personal appearance	
Faith in God	

Note. From Ferrans, C. (1993, June). Subscales of the Quality of Life Index. (Available from Carol Ferrans, The University of Illinois at Chicago, Chicago, IL.)

demonstrated sound psychometrics.

Ferrans (1990a) defines quality of life as "a person's sense of well-being that stems from satisfaction or dissatisfaction within the areas of life that are important to him/her" (p. 15). In light of this definition, the QOLI is a quantitative instrument that asks subjects to first rate their satisfaction with 34 domains in their life, and then to subsequently rate the level of personal importance of each of the domains. Subjects rate the items on a Likert scale of one to six, with one corresponding to "very dissatisfied" and six corresponding to "very satisfied" in Part I and the same numbers corresponding to "very unimportant" and "very important" in Part II. The instrument consists of four subscales--health and functioning, socioeconomic, psychological/spiritual and family--as well as one overall measure of quality of life (Ferrans & Powers, 1985; Ferrans, 1990a). The aspects of life included in each subscale can be seen in Table 1. Subscales can be utilized individually for additional analysis of quality of life (Ferrans & Powers, 1992). For the purposes of this study, one item was added and one item was deleted from the health subscale. The item added queried the respondents on their satisfaction with their ability to go where they want, when they want. The item on sex was deleted as a result of respondents' comments during the pretesting phase.

Scoring of the QOLI is best described by Ferrans (1990).

> Scores are calculated by weighting each satisfaction response. Hence, scores reflect individual values as well as satisfaction, producing a more accurate reflection of quality of life. This weighting produces the highest scores for combinations of high satisfaction/high importance responses and the lowest for high dissatisfaction/high importance...Scores are calculated by: centering the scale on zero for satisfaction items, multiplying paired satisfaction and importance responses, summing the resultant weighted
> items, dividing by the number of items answered, and adding 15 to every score to eliminate the negative values (p. 17).

The score on the overall quality of life measure, as well as on each of the subscales, can range from 0 to 30. (Ferrans, 1990a).

Psychometrics on the QOLI have been reported in the literature. In this section, reliability of the instrument will be discussed first, followed by a discussion of validity.

Reliability of the QOLI has been supported by test-retest and internal consistency methodologies. Ferrans and Powers (1985) report on a test of stability reliability with a group of graduate students and a group of renal dialysis patients. Graduate students demonstrated a test-retest correlation of .87 with a two week interval and dialysis patients demonstrated a correlation of .81 for a one month interval.

Internal consistency reliability, using Cronbach's alpha, for the overall QOLI has been supported among a group of graduate students (.93), dialysis patients (.90 and .93) (Ferrans & Powers, 1985; 1992), cancer patients (.95) (Ferrans, 1990a), and nursing home residents (.94) (Oleson, 1992). All of the Cronbach's alphas reported easily surpass the .70 level suggested by Nunnally (1978) for new tools, comparison among groups and basic research.

Internal consistency reliability has also been reported on the four subscales within the measure: health (Cronbach's alphas range from .87 to .92); socioeconomic (range of .77 to .87); psychological/spiritual (range of .89 to .93); and family (range of .66 to .77) (Ferrans, 1990a; Ferrans & Powers, 1992; Hicks, Larson & Ferrans, 1992; Oleson, 1992). Three subscales easily surpass the .70 level recommended by Nunnally (1978). The subscale that is consistently low, yet usually surpassing the .70 level, is family. Oleson (1992) suggests that a lesser performance by the family subscale may be due to the low number of items (four), which influences reliability scores, or that the scale may be measuring a construct other than what was intended (p. 175).

Content, construct and concurrent validity have been supported in the research literature. Ferrans (1985) reports that content validity was supported by her own extensive literature review of the domains and areas of life related to quality of life, and by the reports of dialysis patients

regarding the effects of treatment on their quality of life. More recently, Oleson (1990) reported support for content validity for the use of the tool with older adults. Oleson used a quantifiable technique, involving expert external raters, to assess content validity. The raters evaluated 87% of the QOLI items as relevant to quality of life for older adults, exceeding the 80% level recommended to support content validity.

Construct validity has been supported through the use of factor analysis and contrasted (known) groups techniques. Using maximum likelihood procedures with iteration with the QOLI-dialysis version, Ferrans and Powers (1992) suggest that four dimensions (the four subscales) underlie the construct of quality of life. An additional factor analysis of the four dimensions supported one higher order factor, named "quality of life" by the authors. Contrasted groups techniques have also supported construct validity by significantly ($p \leq .002$ to .0001) differentiating quality of life ratings with cancer patients who had been dichotomized on the variables of pain, depression and stress (Ferrans, 1990a), and by differentiating dialysis patients on high and low income (socioeconomic subscale only) (Ferrans & Powers, 1992).

Concurrent validity has been consistently supported by correlating the QOLI with a one-item, global measure of life satisfaction. The one-item measure, used in numerous research studies, asks the respondent to rate their overall quality of

life, usually on a five to six item scale. Considerable overlap between the two measures has been demonstrated with cancer patients (correlation of .80) (Ferrans, 1990a); dialysis patients (r = .77) (Ferrans & Powers, 1992); liver transplant patients (r = .89) (Hicks et al., 1992); and with residents of nursing homes (r = .75) (Oleson, 1992).

The Quality of Life Index is a copyrighted instrument, and therefore does not appear as a part of the questionnaire in Appendix A. A letter granting permission to use the tool in this study can be found in Appendix B.

Single item measure of quality of life.

A single item measure of global life satisfaction (See Appendix A, page 241, item #12) was included to provide support for concurrent, criterion related validity with the QOLI. Although not usually recommended as an overall measure of quality of life, the single item measure has been frequently used in research studies, alone or combined with other measures. An acceptable correlation between the single item measure and multi-item measures has generally been reported (Campbell, 1976; Ferrans & Powers, 1985). Campbell also reports a test-retest reliability greater than .70 for his single item measure. George and Bearon (1980) report a variety of test-retest reliability results with the single item measure used with older adults, ranging from .59 at a four to six month interval,.67 at a two year interval, to .70 at a one month interval. George and Bearon caution that older

adults' responses on the global measure tend to be skewed toward the positive. The question used in this study is similar to one used by Oleson (1992) in her study of quality of life of older adults residing in a nursing home and by Yee and Melichar (1992) in their study of older drivers.

Health

Two instruments were used to measure various aspects of health in this study, the Short Form-36 (SF-36) and a single, multi-item question from the Duke Longitudinal Study.

SF-36.

The SF-36 was chosen for this study because it is a well established instrument and its reliability and validity has been documented in various populations, including the elderly. In addition, the SF-36 has been normed for various United States populations, and this data is available for older adults. The SF-36 is relatively quick to administer, either by interview or self-administration. The instrument provides multiple individual measures of physical and mental health status that can be used individually in data analysis, or combined into a physical or mental composite score (Ware, Snow, Kosinski & Gandek, 1993; Ware, Kosinski & Keller, 1994).

The goal of the developers of the SF-36 was to provide a comprehensive and precise measure of physical and mental health status, but with the minimum number of items (to decrease respondent burden) to assure reliability and validity (Ware & Sherbourne, 1992; Ware et al., 1993). The tool was to

be used as part of the Medical Outcomes Study (MOS), an "observational study of variations in physician practice styles and patient outcomes" (Steward, Hays & Ware, 1988, p. 725). The instrument has been subsequently used in hundreds of studies outside of the MOS. It has been translated into languages other than English and has been adapted for use in other cultures or ethnic groups who do speak English. SF-36 norms for the total U.S. population and various population subgroups have been calculated from a 1990 representative sample of 2,474 adults, aged 18 to ninety-four. (Ware et al., 1993). The specific history of the development of the SF-36, from the Health Insurance Experiment to the Medical Outcomes Study, has been documented in detail elsewhere (Stewart, Hays & Ware, 1988; Ware et al., 1993).

As described by Ware et al. (1993, p. 2:3), the SF-36 is a "generic measure of health in that it is relevant to everyone's functional status ... not dependent on age, disease, or treatment." The SF-36 is a multi-item measure consisting of eight scales that measure various health concepts: general health, physical functioning, bodily pain, role function/physical and emotional, mental health, vitality and social function. The specific questions and the number of items that measure each concept are listed in Table 2. The definition of each of the concepts can be found in the list of operational definitions for this study, page 61. An additional question that measures health transition is included in the

Table 2

SF- 36 Variables

Variables	Number of items	Question Numbers[a]
Physical function	10	3a to 3j
Role-physical	4	4a to 4d
Bodily pain	2	7, 8
General health	5	1; 11a to 11d
Vitality	4	9a,9e,9g,9i
Social function	2	6, 10
Role-emotional	3	5a to 5c
Mental health	5	9b to 9d; 9f, 9h
Health transition	1	2

[a]Specific questions corresponding to the question numbers can be found in Appendix A.

tool, but it is not used to score any of the multi-item scales. Ware et al. (1993) recommend its use to document change.

Scoring of the SF-36 involves a three step process. First, seven items are reversed scored. Two items are recalibrated (general health question #1 and bodily pain) so as to achieve a better linear fit. Secondly, the scores of each individual scale are summed, resulting in a "raw score". Finally, the raw score scale is transformed to a 0 to 100 scale. On all eight SF-36 scales, a higher score indicates a better health state (Medical Outcomes Trust, 1993; Ware et al., 1993). The developers recommend that missing data be imputed if at least one half of the items in the scale have been answered (Ware et al., 1993). The value that is to be substituted is the average score across the scale. In this study, scores were imputed on 12 subjects; all missing responses were on various items within question nine. Specific instructions on scoring the SF-36 can be found elsewhere (Medical Outcomes Trust, 1993).

Criticisms of the SF-36 have included the difficulty of working with eight diverse scales rather than one or two summary scales. Recently, Ware, Kosinski and Keller (1994) have suggested that the SF-36 can reliably and validly be combined into two summary scores, physical and mental. Using factor analytic techniques, the authors suggest that physical functioning, role-physical, bodily pain and general health are

more related to a physical component of health; and vitality, social functioning, role-emotional and mental health are more related to a mental component of health. They note that vitality, general health and social functioning correlate with both composite scores, but general health correlates more with "physical" and social functioning correlates more with "mental". A scoring procedure, involving standardization of the eight scales, aggregating the scores using a weighting scheme and a final standardization of the aggregate scores is described in detail elsewhere (Ware, Kosinski & Keller, 1994).

The psychometrics on the SF-36 have been repeatedly tested and reported in the literature. This section will first discuss the reliability assessment and then the validity assessments of the tool. The final section will highlight specific psychometric assessment with older populations.

The developers of the instrument suggest a minimum internal consistency reliability score between .50 and.70 for comparison of groups. Ware et al. (1993) report internal consistency scores for one to all eight of the subscales from 12 different research studies, dating from 1989. The studies cited include a variety of populations with diverse illness states. Within these studies, Cronbach's alpha ranged from .62 to .96 for individual scales, thus supporting internal consistency reliability.

A number and variety of evaluations of validity of the SF-36 have been reported in the literature. Ware et al. (1993)

provides support for content validity via a comparison of the components of the SF-36 with the components of nine other health survey instruments (for example, the Sickness Impact Profile, the Nottingham Health Profile, the Duke Health Profile, and the McMaster Health Index Questionnaire). The SF-36 is consistent in content area with the other tools.

Support for item-internal consistency is provided by McHorney et al. (1994) using data from the MOS sample. For the entire population, all items, except one (general health), loaded at or above the .40 standard within its respective scale. The standard of .40 was met for 97% of the items when segmented for the older adult population. In addition, item-discriminant validity was supported 100% for the sample as a whole.

McHorney, Ware and Raczek (1993) provide data from a Principle Components Analysis to support construct validity of the SF-36. Data for this analysis were also drawn from the MOS. The authors conclude that the SF-36 consists of two overall health constructs, physical health and mental health. The subscales of physical function, role-physical and bodily pain correlated most strongly with the physical health construct; the subscales of mental health, role-emotional and social functioning correlated most strongly with the mental health construct. The general health subscale correlated with both constructs, but more strongly with physical health. Vitality correlated almost equally with both constructs. The

researchers went on to test discriminant and convergent validity by comparing scores of four mutually exclusive groups of patients with varying levels of severity of physical and/or psychiatric illnesses. Convergent and discriminant validity were supported on the subscales of physical function, mental health and role function-physical and emotional. Convergent validity was supported for vitality and social functioning subscales, but both scales performed poorly on discriminant validity. The authors suggest that the poor performance reflects the subscales correlating with both the physical and mental health constructs.

Ware et al. (1993) summarizes the support for construct validity of the instrument, and of the two overall constructs, by citing "substantial" support for the validity of physical function, role-physical and bodily pain correlating with the physical health construct; and "substantial" support for role-emotional and mental health loading on the mental health construct. The authors suggest "moderate" support for general health and vitality loading on both constructs; and "substantial" support for social functioning loading on the mental health construct and "moderate" support for social function to load on the physical construct (p. 8:6).

Lastly, support for criterion-related validity has been provided by Ware et al. (1993) for individual subscales. Relationships are in the direction expected when physical functioning and pain are compared to a measure of ability to

work; when general health is compared to measures of the use of health services; and when mental health is compared with a number of other measures of mental function.

Psychometrics have also been evaluated when the SF-36 has been used solely with older adults. McHorney, Ware, Lu and Sherbourne (1994) report internal consistency reliability assessment for the SF-36 when used with older adults in the MOS. Cronbach's alpha scores ranged from .77 (general health subscale) to .92 (physical functioning subscale), thus again supporting reliability according to established criteria. Support for reliability was also provided by Reuben, Valle, Hays and Siu (1995) from a study evaluating various measures of physical functioning with older adults. Internal consistency coefficients ranging from .84 (general health subscale) to .90 (physical function subscale) were reported. Weinberger, Samsa, Hanlon, Schmader, Doyle, Cowper, Uttech, Cohen and Feussner (1991) provide support for criterion-related validity of the physical function and social functioning scales when compared to the Sickness Impact Profile (r= .78 and .67 respectively) among a group of elderly veterans. Andresen, Patrick, Carter and Malmgren (1995) used three subscales, physical function, general health, and role-physical, along with the Sickness Impact Profile (SIP), the Quality of Well-Being Scale (QWB) and a Chronic Disease Index (CDI) in a study of Washington state elderly. All three SF-36 subscales correlated significantly with the SIP, QWB and the

CDI, again providing support for criterion-related validity. The authors also reported a test-retest correlation of .61 on the physical function subscale at a one year interval, suggesting stability of the individual measure.

The SF-36 is a copyrighted instrument. Permission to use the instrument in this study and permission to reprint it appears in a letter in Appendix B.

OARS-Single item.

A single, multi-item question from the Older American Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire was adapted to measure the numbers and types of health problems experienced by the subjects in this study, and the subjective evaluation of how these health problems interfere with the subject's activities. (See Appendix A, pages 235-236). The question was chosen for inclusion because it precisely met the need of the information desired; the question was part of a tool that was developed and extensively tested with older adults; and the psychometrics of the instrument are sound (Ernst & Ernst, 1984). In addition, Yee & Melichar (1992) utilized a similar question in their study of older drivers.

The OARS was developed in the 1970's by the Duke University Center for the Study of Aging and Human Development to specifically measure older adults' functioning and service needs. The question chosen for this study was imbedded within a section on physical health. The questionnaire, as a whole,

was intended to be administered by an interviewer. Psychometrics reported on the physical health section suggest a test/retest reliability of .59 and support for criterion-related validity (Ernst & Ernst, 1984).

The question was adapted to meet the needs of this particular study. Six illnesses, listed on the original question, were eliminated in order to decrease respondent burden. In the judgment of the investigator, these six illnesses were unlikely to occur among the study sample. An open-ended query regarding "other" illnesses was added, in order to capture the six deleted illnesses and any others not on the original list. In addition, one health problem judged as common among the study population, "cataract", was added.

The question is scored such that it provides nominal, ordinal and ratio level data for analysis. The list of illnesses is scored "Yes" or "No", allowing for a summation of total number of illnesses or simple categorical data. The "interference" section of the question is meant to be scored one to three consecutively, with higher numbers corresponding to greater subjective burden from the illnesses (Ernst & Ernst, 1984).

Although the developers of the instrument permit adaptation, interpretation of the results of the question within this study must be made with caution. Since the question has been altered and removed from the original instrument, previous psychometric evaluations cannot be

validly applied to the current use.

The OARS is a copyrighted tool. Permission to use the single question as described was granted by the Duke Center for the Study of Aging. See Appendix B for a letter granting this permission.

Mobility, Mobility Adaptation and Mobility Consequences

In order to obtain factual data on driving status, trips outside of the home and contact with others (both in and outside the home), questions were developed by the investigator or adopted/adapted from other instruments that had been used in studies with older drivers/former drivers. These questions provide data on mobility (trips outside of the home) for the entire sample as well as information on the changes in mobility that occur when an older adult stops driving, and what adaptations they make to compensate for these changes.

Trips outside of the home, as well as contact with family and friends both in and outside of the home, was measured by Question # 7 (Appendix A, page 231-232). Question # 7 was adapted from two sources: the 1989 Yale Health and Aging Project, 5th Telephone Follow-Up Questionnaire, developed by Foley et al. (1990); and the Comprehensive Older Driver Assessment Questionnaire (MY-CODA) developed by Yee and Melichar (1992) for an AARP study regarding older driver assessment and intervention for accident prevention.

The Yale study has been described in detail elsewhere in

this report (Foley et al., 1990; Marottoli et al., 1993). The questionnaire was designed to be used as a schedule for a telephone interview.

Yee and Melichar (1992) developed MY-CODA from other instruments that had been used with older adults, as well as from their own research experiences, especially with AARP and AAA funded studies on driving. MY-CODA was one of several instruments developed to study older drivers, identify those drivers at risk and subsequently provide interventions to re-educate or retrain them. The specific goals of the instrument were: to provide basic demographics; to collect information about older drivers and their driving history; to obtain a profile of activities and a sense of degree of involvement in these activities; and to evaluate mobility and the environment (p. 13). The instrument was designed to be self-administered. Psychometric evaluations were conducted with data from 254 older adults in three U.S. states. Yee and Melichar report that "summary data was well-behaved" (p. 25), there was "reasonable validity", and reliability testing was being undertaken. Subsequent communication with Dr. Yee indicated support for test-retest reliability, content validity (from expert reviewers) and construct validity (from known groups testing) (D. Yee, personal communication, March, 1994).

Letters granting permission to use items from the Yale study and from MY-CODA are in Appendix B.

The goal of Question #7 was to obtain as specific

information as possible on older adults' trips outside of the home. Foley et al.'s (1990) question provided seven categories for types of trips: shopping, banking, visiting friends and family, social/recreation, work-related, church and health care; and five categories for frequency of trips, ranging from "at least three times per week" to "less than once a month" and "never". Yee and Melichar (1992) offered 17 categories under their question on activities, but not all categories related to trips outside of the home (for example, gardening). They did provide greater specificity in destinations, such as senior centers, clubs, movies and eating out. They offered five frequency categories, ranging from "three times a week or more" to "one to two times per year" and "never".

Neither individual question seemed adequate in light of the goals of this study. Changes were made to the question as a result of the review of literature, personal experience of the investigator, consideration of Carp's (1988) conceptual model and the pre-testing phase of the instrument. Thus, some categories were collapsed (e.g. clubs, meetings, senior centers); other categories were expanded (e.g. differentiating between "grocery shopping" and "other shopping"); and new items were added (e.g., beauty/barber shop) to result in 14 items measuring various destinations outside of the home.

As suggested by Yee and Melichar (1992), contacts with family and friends do not necessarily have to happen via trips outside the home, or even in person (Litwak, 1985). Therefore,

four items measuring frequency of social contact in the home and by telephone were added. Even though these questions do not relate to "trips" as such, they were included in this section to decrease respondent burden, since the answer choices were the same as for the "trip" questions.

Neither the MY-CODA nor the Yale instrument's choices for frequency of trips were considered specific enough in light of the goals of this study. The frequency categories were changed to reflect eight mutually exclusive answer choices, ranging from "every day" to "never". If a respondent answered "never", they were queried as to a reason for not taking that particular kind of trip.

Scoring for Question #7 was adopted from Yee and Melichar (1992). Categorical answers for each item were transformed to correspond to an estimate of the number of trips taken per year: e.g. "every day" was recorded as 365; "2 to 3 times per week" was recorded as 104; "Once a week" as 52, etc. Thus, a ratio-level number of trips for individual categories could be determined, as well as a total number of trips across all categories. Contacts with family and friends is scored accordingly.

Question # 8 (Appendix A, page 233) was developed by the investigator because no similar question seemed to exist in other instruments. The goal of this question was to provide specific information about transportation resources used by the sample for <u>specific</u> destinations. The categories as shown

were developed using general knowledge, knowledge of resources available to subjects in the sampling areas, choices given by the Department of Transportation in the NPTS (1991), and choices used by Yee and Melichar (1992) and Foley et al. (1990). In addition, if a respondent gave "car passenger" as an answer, they were queried as to who would usually be driving the car. This question provides categorical data.

Questions 9 and 10 (Appendix A, page 234) measure the respondent's subjective evaluation of their mobility and transportation resources. Question #9 was adopted verbatim from Foley et al. (1990) and is meant to be scored one to three, providing ordinal level data. Question #10 is adapted from Kivett (1979), and is scored in a similar fashion. Extreme caution must be exercised in the interpretation of the results of both of these questions. Single-item questions cannot be evaluated for internal consistency, and it is difficult to separate true change from measurement error in a stability assessment. Validity testing is difficult because the single-item questions only have face validity (Oleson, 1992). Thus, clarity on the construct/concept actually being measured by these two questions is difficult to assess.

Carp (1988) has suggested that success in meeting life's needs is influenced by access to the resources required to satisfy those needs. Likewise, Cutler (1972, 1974) has suggested that older nondrivers who have ready access to resources have a better quality of life. Question #11

(Appendix A, page 234) was adopted from the MY-CODA in order to have the subjects evaluate their community and community resources (Yee & Melichar, 1992). Two items, i. and j., were added, since both reflect alternate means of transportation that might be influential in mobility. Yee and Melichar suggest that the items be scored 1 to 5 consecutively, and then summed. A low score would indicate that the person was pleased with their immediate community.

Driving status

Factual data on driving status and driving history were obtained by Questions #1 and #2 on the "Driver's Questionnaire" and by Questions #1 through #6 on the "Former Driver's Questionnaire" (See Appendix A, pages 2229-230). Question # 3 (Former Drivers) which inquires about the decision-making process related to cessation of driving, was open-ended, rather than forced choice, to allow the respondent to describe the experience from their own perspective.

Demographics

Demographic data, reflecting standards used in such questions, were gathered via Questions #1 through #6 (Appendix A, page 242).

Gender and town of residence were recorded by the investigator.

Pretest

The questionnaire was pretested with a group of ten older adults who fit the sampling criteria for inclusion in the

study. Drivers and former drivers were represented. At the conclusion of the interview, the pretest subjects were asked about the content, comprehensiveness and clarity of the questions; the legibility of the large print answer cards; and the length of time needed to complete the interview. No problems were identified in the procedural aspects of the interview. Subjects did identify that some older adults may not be able to answer all of the Family subscale questions, because the questions may not apply to their particular situation (e.g. a deceased spouse). In addition, pretest subjects overwhelmingly suggested removal of the QOLI question on "sex". Subjects identified that the question increased their anxiety regarding other types of "intimate" questions that might be forthcoming, and thus made it difficult for them to concentrate on what was being asked. This question was subsequently removed from the interview schedule.

Subjects confirmed that the selection of trip destinations and transportation resources (Questions #7 and #8) were complete, thus supporting face validity for this population. A recommendation was made to include trips to the beauty salon/barber shop, and thus this item was added to the final study instrument.

Internal consistency reliability testing was conducted on the two multi-item instruments, SF-36 and the QOLI. Cronbach's alpha on the eight subscales of the SF-36 ranged from .73 to .95, thus exceeding the .70 standard recommended by Nunnally

(1978). Cronbach's alpha on the overall QOLI was .91. Two of the subscales of the QOLI, did not achieve the recommended .70 standard, Family (.485) and Socioeconomic (.66). Reliability of a scale is influenced by the number of items measuring the concept (particularly in Cronbach's alpha assessment) and by the heterogeneity of the sample (Polit & Hungler, 1991). Fewer items measuring a concept potentially decrease reliability, and the more homogeneity among the population being sampled, the lower the reliability coefficient will be (p. 374). Low internal consistency on the family subscale was attributed to fewer items (n=4), small sample size for testing, and missing data on various scale items due to lack of applicability to certain subjects (thus even further decreasing the number of items in the calculation). A borderline coefficient on the Socioeconomic subscale was attributed to small sample size. It was anticipated that a larger, more heterogeneous sample would improve reliability among the two subscales. Thus, the QOLI was included in the study questionnaire.

Test-retest reliability of Questions # 7 and # 8 (frequency of trips and contacts; and resources for transportation) was assessed on a subgroup (n=8) of the pretest sample one month after the initial interview session. A correlation exceeding .98 was achieved on the two items, thus supporting stability of the questions.

Data Collection Procedures

Systematic random sampling of subjects was conducted by the procedure previously described. Each selected subject was mailed a one-page letter (Appendix C) briefly explaining the purpose of the study, the potential utility of the findings and the commitment involved in participation. The letter was printed on letterhead paper from a local college. An offer of a $20 stipend was made for completion of the interview process. Each person also received a self-addressed, stamped postcard that they were asked to return, indicating their interest in participating or not participating. (Cards were returned to the investigator's work address at a local college). Subjects were informed that if cards were not returned within a two week period, they would be contacted by phone to assess interest in study participation. At least three attempts were made to contact non-respondents.

Upon receipt of the return postcard, interested subjects were contacted by phone to arrange a time and place for the interview, and to clarify any questions regarding the study.

All interviews were conducted in person by the investigator, using the questionnaire previously described. Prior to the start of the formal interview, subjects were asked to read, or were read, the informed consent (Appendix C). In addition to the information on the informed consent, subjects were instructed that they need not answer questions with which they were uncomfortable. The interview order was as follows: Part I - driving history and trips; Part II- health

and SF-36; Part III - QOLI; and Part IV - demographics. Transitional statements were made between each section, and specific instructions given prior to the beginning of each part. Because older adults may not be familiar with Likert-type answers, practice questions were used with the QOLI. In order to facilitate answering multiple-choice questions in the SF-36, answer choices, printed on 8 1/2 by 11 inch white paper, in bold #15 new courier print were handed to the respondent. Likewise, answer choices for the QOLI were printed on 8 1/2 by 5 1/2 inch yellow, laminated cards in bold #15 new courier print. The enlarged print was chosen so as to compensate for any visual deficits with the subjects. If subjects were unable to see the enlarged print, answer choices were read to them. On average, interviews lasted one hour.

At the conclusion of the interview, subjects were given the opportunity to question the investigator regarding the purpose and meaning of specific areas of questioning.

Statistical Analysis

Data were analyzed using SPSS/PC for Windows, Version 6.1. All data were entered, checked for error and cleaned by the investigator. Missing data were coded as "missing" except for the SF-36 instrument, where values were imputed using procedures previously described.

Frequency distributions and measures of central tendency were used to summarize data and to check for entry errors. All continuous interval and ratio level data were evaluated for

normal distribution using the Normal P-P Plots option of SPSS/PC. Data that were not normally distributed were converted to base log, then re-evaluated for normality. Variables that deviated considerably from a normal distribution were not entered into analyses requiring this assumption.

Correlations were analyzed using Pearson-product moment coefficients except if data were ordinal or interval level, when Kendall's Tau-b or Spearman Rank correlations were used. Point-biserial correlations were used when one variable was dichotomous and one variable was continuous.

Differences between groups were analyzed using T-tests for independent group means for continuous data, and chi-square analysis for categorical variables. Evaluation of equality of variances for the T-tests was conducted. When assumptions for the T-test were seriously violated, the Mann-Whitney U test was utilized. When multiple comparisons of related data were conducted, the alpha level was adjusted (.05/the number of independent comparisons) to decrease the probability of a Type I error. Analysis of covariance was used to evaluate differences between groups while controlling for other variables.

When multiple regression was used to answer research questions, the enter procedure was used to add variables in groups according to hypothesized relationships. Categorical variables were dummy coded to be entered into the equation.

The data were examined to assure that all assumptions for a straight-line model were met: existence; independence; linearity; homoscedasticity; and normal distribution (Kleinbaum, Kupper, & Muller, 1988). Regression diagnostics suggested by Kleinbaum, Kupper and Muller (1988) were conducted, including residual analysis using studentized residuals. Collinearity was evaluated using a correlation matrix of all variables entered into the equation (no two variables exceeded a correlation of .50) and an evaluation of variance inflation factors (VIF), all of which centered around 1.

Quasi-statistics were used to summarize data obtained from open-ended questions.

Psychometric assessment

Psychometric evaluations were conducted for the use of the instruments with this particular population. Internal consistency reliability, using Cronbach's alpha, was assessed for the two multi-item instruments, the SF-36 and the QOLI. Item internal consistency was assessed for Question # 34 ("How satisfied are you with your ability to go where you want, when you want?") in the QOLI. This item had been written by the investigator for specific use with this population. In addition to item internal consistency, responses to Question #34 were evaluated for diversity as well as normal distribution. Concurrent, criterion-related validity was evaluated for the QOLI using the single-item life satisfaction

question as comparison; for the OARS medical conditions questions, using subscales of the SF-36 for comparison; and for the single-item Question # 9 (Often go), using various measures within the instrument to attempt to establish the exact construct being measured by the item.

CHAPTER IV

Results

This chapter will describe research findings and the results of data analysis. First, characteristics of the towns and the subjects included in the study will be described. Descriptive data on those persons who refused to participate will be noted. Psychometric characteristics of the research instruments will be reviewed, as well as changes in the instruments. Finally, each research question will be addressed with relevant data.

Descriptive Findings

Towns

Six towns in central Connecticut were able to provide computer generated lists of persons aged 65 and older who were registered to vote. This purposive sample was the basis for the sampling frame. The towns included in the study represent a broad range of population diversity, geography, income and concentration of older adults. Table 3 summarizes the general characteristics of each of the towns. Table 4 summarizes general information about older adults in each town, including the percentage registered to vote. All towns were served by public transit and by paratransit services.

Characteristics of the Study Sample

Of the 400 persons chosen in the first random selection, 177 were eligible and agreed to be interviewed, for an initial response rate of 44%. A second dedicated sample selection of

Table 3

Selected Characteristics of Towns Included in Study

Town	Geographic character % urban % rural	Minority Population %	Median family income	Median non-family income
A	81% u 19% r	50%	$56,500	$24,800
B	100% u	72%	$24,700	$17,100
C	100% r	2.5%	$63,900	$30,500
D	96% u 4% r	8.6%	$46,000	$25,000
E	37% u 63% r	4.1%	$73,000	$34,000
F	100% u	9%	$60,500	$28,000

Note. From Connecticut Summary of Socioeconomic Characteristics, 1992, Hartford, CT. : Connecticut State Data Center , and 1990 Census of Population: Connecticut, 1992, Washington, D.C.: United States Department of Commerce.

Table 4

Selected Characteristics of Population 65 Years of Age and Older in Towns Included in Study

Town	Population ≥ age 65 n	% of total town population ≥ age 65	% of population ≥ age 65 registered to vote
A	3,815	17%	89%
B	13,809	9.8%	80%
C	778	8%	90%
D	8,124	15.7%	90%
E	2,234	10%	90%
F	13,266	22%	88%

Note. From Connecticut Summary of Socioeconomic Characteristics, 1992, Hartford, CT.: Connecticut State Data Center, and 1990 Census of Population: Connecticut, 1992, Washington, D.C.: United States Department of Commerce.

400 resulted in an addition of 39 former drivers; the response rate to the second sampling procedure was 41%. A total study sample of 216 persons resulted from the two selection processes. Of the 216, six interviews (3%) were unable to be completed because the subjects were unable to focus on the interview questions within a reasonable time frame. Of those six subjects, two were drivers and four were former drivers; ages ranged from 84 to 89; three were male, three were female. Final data analysis was completed on 210 subjects, 129 drivers and 81 former drivers.

For the total sample, the majority of the subjects were female (63.8%) and Caucasian (95.7%). Ages ranged from 65 to 96 years, with a mean of 76.5 years (SD 7.78). The greater majority of the sample were either currently married (47%) or widows or widowers (41.5%). Most of the subjects had a high school education or better (91.4%), and 65.9% reported an income greater than $30,000 per year. Fifty-one percent of the sample lived in private homes; the second most frequent type of residency was senior citizen apartments (20%). Table 5 summarizes the specific demographic data for the sample as a whole.

The study population was compared to the older (≥ age 65) population in the 1990 census data for the Standard Metropolitan Statistical Area (SMSA) that includes the sampled towns. As can be seen in Table 6, the study sample is similar to the population from which it was drawn on sex, race,

Table 5

Selected Sociodemographic Characteristics of Study Population (N = 210) and Study Subgroups, Drivers (n = 129) and Former Drivers (n = 81)

Characteristic	Total Sample f (%)	Drivers f (%)	Former Drivers f (%)
Age			
65 - 69	43 (20.5)	41 (31.7)	2 (2.5)
70 - 74	58 (27.6)	47 (36.4)	11 (13.6)
75 - 79	31 (14.8)	21 (16.3)	10 (12.3)
80 - 84	34 (16)	12 (9.3)	22 (27)
85 - 90	30 (14.3)	7 (5.4)	23 (28.4)
90 - 94	11 (5.2)	1 (0.7)	10 (12.3)
95 +	1 (0.4)	0	1 (1.2)
Age range	65 - 96	65 - 91	67 - 96
Mean age ± SD	76.5 ± 7.78	72.9 ± 6	82.2 ± 6.7
Median age	75	71	83
Sex			
Female	134 (63.8)	68 (52)	66 (81.5)
Male	76 (36.2)	61 (47)	15 (18.5)
Race			
Caucasian	201 (95.7)	122 (94.6)	79 (97.5)
Other	9 (4.4)	7 (5.5)	2 (2.5)
Years of formal education			
Range	4 - 20	8 - 20	4 - 20
Mean ± SD	14.5 ± 3	15 ± 2.6	14 ± 3.3
Median	14	15	13
Mode	12	16	12

Characteristic	Total Sample f (%)	Drivers f (%)	Former Drivers f (%)
Residence			
Private home	106 (50.5)	90 (70)	16 (19.8)
Condominium	24 (11.4)	22 (17.2)	2 (2)
Apartment	17 (8.1)	10 (7.8)	7 (8.6)
Senior housing: apartment	41 (19.5)	4 (3.1)	37 (45.7)
Life care	14 (6.7)	2 (1.6)	12 (14.8)
Assisted living	5 (2.4)	0	5 (6.2)
Other	2 (1.0)	1 (0.8)	1 (1.2)
Missing	1	0	1
Marital Status			
Married	97 (46.9)[a]	82 (64.1)[a]	15 (19.2)[a]
Widow / Widower	86 (41.5)	32 (24.8)	54 (69.2)
Divorced	10 (4.8)	8 (6.3)	2 (2.6)
Separated	1 (0.5)	1 (0.8)	0
Never married	11 (5.3)	4 (3.1)	7 (9)
Other	2 (1.0)	2 (1.6)	0
Missing	3		3
Income			
$5 - $9999	9 (4.4)[a]	1 (0.8)[a]	8 (10.3)[a]
$10 - $19999	24 (11.7)	3 (2.4)	21 (26.9)
$20 - $29999	37 (18)	17 (13.5)	20 (24.7)
$30 - $39999	61 (29.8)	50 (39.7)	11 (13.6)
$40000 +	74 (36.1)	56 (44.1)	18 (22.2)
Missing	5	2	3

Table 6

Comparison of Study Sample (N = 210) to 1990 Standard Metropolitan Statistical Area (SMSA) Census

Characteristic	Study Sample %	SMSA %
Age		
65 - 69	20.5	32
70 - 74	27.6	26
75 - 79	14.8	19
80 - 84	16	12
85 +	19.9	10
Sex		
Female	63.8	60
Male	36.2	39.7
Race		
Caucasian	95.7	94
Other	4.4	6
Years of education		
< high school	8.6	44.2
high school graduate	22.4	33
> high school	69	23.2
Housing[a]		
Owner occupied	68.6	69.3
Renter	27.6	30.7

(table continues)

Characteristic	Study Sample %	SMSA %
Marital Status		
Now married	46.9	52.6
Widow/widower	41.5	33.6
Divorced	4.8	5.1
Separated	0.5	0.9
Never married	5.3	7.8
Income		
$5 - $9999	4.4	4.7
$10 - $19999	11.7	18.9
$20 - $29999	18	21.3
$30 - $39999	29.8	18.6
$40000 +	36.1	36.6

Note. From Special Tabulation on Aging: 1990 Census, 1994, Washington, D.C.: United States Department of Commerce, Bureau of Census.
[a]Does not include "assisted living" or "other" category.

housing and marital status. The study population does have slightly fewer currently married subjects and slightly more widows/widowers than does the SMSA. More study subjects were in the higher income brackets, although the $40,000+ category is equivalent. The study population were more educated than the SMSA population, with 91.4% reporting a minimum of high school education compared to 56% in the SMSA. The study population tended to have larger percentages of persons in the older age categories, and fewer in the younger age categories.

Non-respondents/Refusals.

After random selection, two groups of non-participants emerged: a non-respondent group, who could not successfully be contacted regarding participation; and a refusal group, who provided rationale for lack of participation. Data regarding both groups were hard to analyze as a whole, due to the large sampling frame used, and the variation in provision of demographic data on the voter registration lists. Two towns that did provide more complete data were used to analyze a cross-section of the non-participants, and for comparison purposes against the total study population.

"Non-respondents" (n = 51 for two towns) were potential subjects who did not return the postcard and could not be contacted by phone because they lacked a listed phone number (35%) or they had an answering machine that answered all calls (63%) Non-respondents were more likely to be female (73.5%) and not currently married (64%). The age range of non-

respondents was 66 to 93 years, with a mean of 76.5 years. The age range is comparable to the final study sample. No estimates of driver/former driver status was possible.

"Refusals" (n = 84 for two towns) were potential subjects who returned their postcard and/or provided a reason for not participating. (Of this total group, 70% were willing to provide a reason). The refusal group were more likely than the final subject group to be female (71% compared to 64%) and married (50% compared to 46.9%). The mean age for the refusal population was 76.2 years (range 65 to 90), similar to the final study population.

Reasons given for not participating were (in descending order): not interested/"don't want to be bothered" (24%); too ill (18.6%); fear of participating/bad experience with participating in previous research (18.6%); never drove (12%); "too busy" (12%); spousal illness (5%); and the subject had moved to a nursing home and was too ill to participate or had a language barrier (3.3% each). Six percent (n = 5) of the refusal group within the two towns identified themselves as a former driver.

Subgroup comparisons:Demographics.

Within the final sample of 210 subjects, 129 persons (61.4%) were drivers and 81 persons (38.6%) were former drivers. Demographic comparisons between the two subgroups can be seen in Table 5. Except for race, a number of differences are readily apparent. Former drivers were significantly more

likely than current drivers to be female, $\underline{x}^2(1, \underline{N} = 210) = 17.83$, $\underline{p} = .000$, and older, $\underline{t}(208, \underline{n} = 210) = -10.43$, $\underline{p} = .000$. Former drivers were also more likely to be widows or widowers (69.2% compared to 24.8%), and drivers were more likely to be currently married (64.1% compared to 19.2%). Likewise, former drivers were significantly more likely to be in the lower income categories, $\underline{x}^2(4, \underline{N} = 205) = 55.06$, $\underline{p} = .000$. Seventy percent of drivers lived in private homes, compared to only 20% of the former drivers; 68% of the former drivers were living in some form of senior adult housing. Although the central tendencies for education were similar for the two groups, current drivers were more likely to be college graduates.

Driving demographics.

Questions # 1 through 5, and 9 and 10 on the questionnaire obtained frequency data regarding driving status, driving history, and evaluation of transportation resources.

For the sample as a whole, subjects had been driving an average of 50.6 years (range 8 to 77 years; SD 13.3). Former drivers had driven significantly fewer years than had current drivers, $\underline{t}$ (111.11, $\underline{N} = 210$) = 2.33, unequal variances, $\underline{p} = .02$; former drivers had driven an average of 47 years (range 8 to 77; SD 17.3) and current drivers, an average of 52.3 years (range 18 to 75; SD 9.6).

Former drivers reported that they had stopped driving a mean of five years prior to the interview (range 1 month to 32 years; Mdn = 3 years; mode = 2 years). The group had stopped driving, on average, at age 77 (SD = 9.99; range 41 to 91 years; Mdn = 80; mode = 83).

All current drivers (100%) carried a valid driver's license; 40% (n = 32) of the former drivers also maintained a currently valid license.

Subjects were queried as to their routine use of alternative methods of transportation: current use by drivers, and use prior to cessation of driving for former drivers. Table 7 summarizes the results. Former drivers were more likely to report use of buses, dial-a-ride services and walking as routine means of transportation while they still drove, compared to the current drivers. Both groups reported high frequencies of traveling as a car passenger (79% for drivers; 77% for former drivers).

Two questions (#9 and #10) asked respondents to evaluate mobility and transportation. As can be seen in Table 8, former drivers reported significantly less ability to go places when they wanted to. Despite this response, no significant difference was found between drivers and former drivers on being "troubled" by transportation (Table 9).

Health status.

The total number and types of physical health problems experienced by the subjects were recorded from the OARS

Table 7

Use of Alternative Transportation Resources: %[a] Reporting Routine Use

Transportation Resource	Drivers (n = 129) %	Former Drivers[b] (n = 81) %
Bus	13	30
Car passenger	79	77
Dial-A-Ride	9	24
Taxi	4.7	4
Walking	30.2	51

[a]Column % can total > 100% because subjects can use more than one transportation resource. [b]% of former drivers who reported using the resource prior to cessation of driving.

Table 8

Drivers' (*n* = 129) *and Former Drivers'* (*n* = 81) *Report of How Often They Can Go to Desired Places*

Response	Drivers[a] f (%)	Former Drivers f (%)
"As often as I like"	99 (76.7)	16 (19.8)
"Fairly often"	15 (11.6)	29 (35.8)
"Not nearly as often as I'd like"	14 (10.9)	36 (44.4)

Note. χ^2 (2, *N* = 209) = 66.85, *p* = .000

[a]Missing cases = 1.

Table 9

Drivers' (*n* = 129) *and Former Drivers'* (*n* = 81) *Report of Frequency of Feeling Troubled by Transportation*

Response	Drivers f (%)	Former drivers[a] f (%)
"Often"	8 (6.3)	9 (11.1)
"Sometimes"	37 (28.9)	23 (28.4)
"Never"	84 (65)	48 (59.3)

Note. χ^2 (2, *N* = 209) = 1.75, *p* = .41
[a]Missing cases = 1.

question. In addition, subjects were asked to evaluate to what extent each health problem interfered with their activities.

For the entire sample, an average of four health problems were reported per subject (range 0 to 11). There was a significant difference between the average number of health problems reported by drivers (M = 3.5) and former drivers (M = 4.9), t (208, N = 210) = - 4.98, p = .000.

Table 10 summarizes the most frequently reported health problems for the entire sample and for the two subgroups. Three medical conditions that were not items on the original question were added by the subjects during the interviews: other orthopedic problems (not arthritis); other visual problems (generally macular degeneration); and hearing deficits. The top five health problems are the same for the two subgroups, except for a change in rank order for cataracts and hypertension for drivers, and arthritis and cataracts for former drivers. Rank order also differs for the subgroups in the lesser five health problems. "Other visual problems" is the 7th most common problem noted by former drivers. For drivers, "cancer" (not on the table) is actually the 6th ranked health problem (n = 22, 17.2%) and "hearing problems" is actually ranked 10th (n = 18, 14.1%). Chi square analysis (2 X 2) on each health problem indicated a significant difference between the two groups on arthritis, cataracts, glaucoma, gastrointestinal, and other visual problems, with former drivers reporting a higher frequency of each of these

Table 10

Health Problems Reported by Total Study Sample (N = 210) and By Subgroups, Drivers (n = 129) and Former Drivers (n = 81)

Health Problem	Total Sample f (%)	Drivers f (%)	Former Drivers f (%)
Arthritis	133 (63)	74 (57)	59 (73)**
Cataracts	116 (55)	54 (42)	62 (77)****
Hypertension	94 (45)	57 (44.5)	37 (46)
Cardiac	76 (36)	46 (36)	30 (37)
Orthopedic	53 (25)	27 (21)	26 (32)
Circulatory	52 (25)	27 (21)	25 (31)
Glaucoma	42 (20)	19 (14.8)	23 (28.4)***
Gastro-intestinal	37 (17.6)	17 (13.3)	20 (25)*
Genito-urinary	37 (17.6)	18 (14.1)	19 (23.5)
Other vision	33 (15.7)	8 (6.3)	25 (30.9)****

*p = .03. **p = .023. ***p = .015. ****p = .000

diseases than would be expected. No significant differences were found between the two groups on any of the other 13 health problems.

If subjects indicated that they currently experienced a particular medical condition, they were then asked to rate, on a three point scale, their evaluation of how much that problem interfered with their activities. Table 11 summarizes the results for each of the two subgroups. For drivers, orthopedic (63%), circulatory (40%), hearing (38.8%), other visual problems (37.8%), and arthritis (29.7%) are the major causes of activity limitation; only orthopedic problems, however, are reported as limiting for more than 50% of the individuals experiencing the condition. Severe limitations are caused most frequently by the same set of medical conditions. Former drivers report the most interference from other visual problems (80%), orthopedic problems (69.2%), arthritis (67.7%), hearing (61.5%) and genitourinary conditions (57.8%); each one of these medical problems are reported as limiting by at least 50% of the individuals experiencing them. The same set of medical conditions cause severe limitations with the former drivers, with the addition of glaucoma (21.7%).

Chi-square analyses were conducted on status (driver, former driver) and "interference" (dichotomized to "any interference" or "no interference") for each medical condition. The answer choice for "interference" was dichotomized because calculating the chi-square with three

Table 11

Percentage of Drivers (n = 129) and Former Drivers (n = 81) Reporting Interference with Activities as a Result of Health Problems[a]

	Drivers		Former Drivers	
Health Problem	% Reporting Any Interference[b]	% Reporting a Great Deal of Interference	% Reporting Any Interference[b]	% Reporting a Great Deal of Interference
Arthritis	29.7%	5%	67.7%****	20%
Cataracts	18.5%	1.8%	33.8%****	6.4%
Hypertension	3.5%	-	8%	-
Cardiac	19.5%	4.3%	33%	-
Orthopedic	63%	11%	69.2%	27%
Circulatory	40%	7.4%	52%	12%
Glaucoma	15.7%	5%	39%**	21.7%
Gastrointestinal	17.6%	-	40%*	-
Genitourinary	16%	-	57.8%***	15.7%
Other vision	37.8%	12.5%	80%	68%
Hearing	38.8%	5.5%	61.5%	18.7%

[a]% reporting interference among those who have the health problem. [b]% reporting "a little" or "a great deal" of interference.

*p = .042. **p = .019. ***p = .005. ****p = .000.

answer choices (none, a little, a great deal) resulted in excessive expected cell frequencies of less than five subjects. As shown in Table 11, significant differences were noted between drivers and former drivers on the impact of arthritis, cataracts, glaucoma, genitourinary, and gastrointestinal problems, with former drivers more frequently reporting activity limitation from all of these medical conditions. Chi-square analyses on all other medical conditions showed no difference between groups, or were not able to be calculated due to small expected cell frequencies.

Study Instruments

Quality of Life Index

Findings related to the measures of central tendency for the Quality of Life Index (QOLI) and its subscales can be seen in Table 12. Pretest and study sample internal consistency scores for the instrument as a whole, and its subscales, can be seen in Table 13. Except for the Socioeconomic and Family subscales, all internal consistency coefficients exceeded the .70 recommended by Nunnally (1978) for group comparisons.

The QOLI was compared to the single-item life satisfaction question. A significant correlation (r = .61, p = .000) suggested overlap between the two, and supported concurrent criterion-related validity.

Question # 34 on the QOLI was evaluated for inclusion in the instrument, and thus in the analysis, because the question had been written by the investigator. Question # 34 queried

Table 12

Measures of Central Tendency for QOLI and SF-36

Scale	Possible Range	Sample Range	Mean	Median	Mode	SD	SE
QOLI[a]	0-30	12.4 to 29.8	23.78	24.5	22.7	3.7	.256
FQOL[b]	0-30	0-30	23.42	26	30	7.6	.562
SEQOL[c]	0-30	12.56 to 30	24.65	25.2	23.5	3.49	.241
HQOL[d]	0-30	6.67 to 30	22.58	23.48	25.5	4.9	.34
PQOL[e]	0-30	4.62 to 30	24.85	25.8	30	4.5	.311
SF-36							
GH[f]	0-100	10-77	70.99	77	72	20.78	1.43
PF[g]	0-100	0-100	67.69	75	90	27.03	1.86
RP[h]	0-100	0-100	72.02	100	100	36.27	2.5
RE[i]	0-100	0-100	93.96	100	100	20.76	1.43
MH[j]	0-100	20 - 100	77.5	84	92	18.75	1.29
SF[k]	0-100	0-100	88.45	100	100	23.3	1.6
BP[l]	0-100	10-100	76.8	84	100	24.66	1.7
VT[m]	0-100	0-100	57.64	60	80	24.29	1.67

[a]Quality of Life Index. [b]Family Quality of Life subscale. [c]Socioeconomic Quality of Life subscale. [d]Health Quality of Life subscale. [e]Psychological Quality of Life subscale.

(table continues)

[f]General Health. [g]Physical Function. [h]Role-Physical. [i]Role-Emotional. [j]Mental Health. [k]Social Functioning. [l]Bodily Pain. [m]Vitality.

Table 13

Reliabilities of Multi-Item Scales and Subscales

Scale	Pretest n = 10 Alpha	Study Sample N = 210 Alpha
QOLI	.92	.90
Health Subscale	.88	.86
Socioeconomic Subscale	.66	.66
Psychological Subscale	.76	.77
Family Subscale	.49	.65
SF-36		
General Health	.74	.76
Physical Function	.92	.90
Role-Physical	.75	.83
Bodily Pain	.96	.84
Vitality	.88	.89
Social Function	.91	.91
Role-Emotional	.74	.84
Mental Health	.87	.83

subjects on their satisfaction with being able to go where they wanted, when they wanted. A full range of scores, from -15 to +15 were recorded (M = +5;SD = 10.3; Mdn = 9). Item internal consistency was evaluated in order to see with which subscale the item would best correlate. A correlation of .40 was established as a minimum cut point for inclusion on any of the subscales. Question #34 loaded significantly (p = .000) on the Health, Psychological, and Socioeconomic subscales, but not on the Family subscale (p = .09). The correlations with the Psychological subscale (r = .32) and the Socioeconomic subscale (r = .31) did not achieve the .40 standard. The correlation with the Health Subscale (r = .646) did exceed the standard, and therefore it was considered appropriate to include the question in the QOLI Health subscale.

Question 34 was also evaluated for construct validity via known groups analysis. It was hypothesized that current drivers and former drivers would differ on their scores on this question, with drivers scoring higher. A t-test analysis of the question provided support for this hypothesis, with drivers (M = 9.30, SD = 7.57) scoring significantly higher than former drivers (M = -1.36, SD = 10.70) on the single item, t(130.1, N =210) = 7.82, unequal variances p = .000. Thus, construct validity was supported.

The psychometric evaluations on Question # 34 provided support for the item's inclusion in the QOLI.

SF-36

Findings related to the measures of central tendency for the eight SF-36 subscales can be seen in Table 12. The means for the study sample are equivalent to the national norms for men and women aged 65 and older, (Ware et al.,1994) for the subscales Physical function (Norm M = 63.82), Mental health (Norm M = 76.04), and Vitality (Norm M =56.63) . Sample means for the subscales of General health (Norm M = 60.13), Role-physical (Norm M = 57.91), Social function (Norm M = 78.33), and Bodily pain (Norm M = 66.1) are slightly higher than the national norms, although well within one standard deviation. Only Role-emotional exceeded the national norm, with the study sample averaging 93.96, and the national norm for older males being 76.94 and for older females, 73.38.

Internal consistency coefficients for the pretest and for the study sample can be seen in Table 13. All SF-36 subscales exceed the .70 standard for group comparisons (Nunnally, 1978).

OARS

The OARS question regarding health problems and interference with activities was assessed for concurrent criterion-related validity with the composite scores and appropriate subscales of the SF-36. A summated score of total health problems taken from the OARS correlated significantly with the Physical Composite Score of the SF-36 (r = -.497, p = .000) but not with the Mental Composite Score (r= .-125, p

= .069). A summated interference score also correlated significantly with the Physical Composite Score (r = -.544, p = .000) but not with the Mental Composite Score (r = -.06, p = .32). Both summated scores also correlated significantly with the General Health subscale (total health problems r = -.40, p = .000; interference score r = -.375, p = .000) and with the Physical Function subscale (total health problems r = -.50, p = .000; interference score r = -.586, p = .000). Concurrent, criterion-related validity was supported since the OARS question is purporting to measure physical health problems (rather than mental problems) and particularly physical function related to those problems (interference).

Single item: Often go

An attempt to establish concurrent, criterion-related validity on Question # 9 was undertaken. Question 9 asks subjects to evaluate how often they are able to go to the places they would like to go. Because a variety of factors might influence the subject's response, correlations with a variety of variables were conducted. "Often go" correlated moderately, but significantly, with five variables: Number of trips outside the home (r_s = .389, p = .000); General health (r_s = .26, p =.000); Physical function (r_s = .355, p = .000); Total health problems (r_s = -.31, p = .000); and Income (r_s = .37, p = .000). The correlations for all five variables are similar; no one variable is correlated more strongly with the item than the others. Thus, the construct of "often go" is

influenced by a number of factors, and interpretation of the results from this question must be done with caution.

Community environment evaluation

Question # 11 (Appendix A, page 234) asked subjects to evaluate their community and its resources. (The question had been taken from Yee and Melichar [1992]). Respondents had difficulty in answering all of the questions. A considerable amount of missing data was generated, primarily due to subjects' lack of experience with the particular resource, for example, public transit or dial-a-ride. Subjects also had difficulty with the interpretation of the words "near" and "convenient". None of the problems encountered with the study sample had surfaced during the piloting phase. Due to the difficulties encountered in obtaining answers to the items, and the volume of missing data, the question was not included in the final analysis.

Research Questions

Research Question One

The first research question was, "Among a group of older former drivers, how was the decision made to stop driving?" An open-ended question regarding the specific decision-making process was used. Subjects were encouraged to describe the reasons for quitting as well as the process for deciding to do so. The reasons given were categorized by the investigator, and quasi-statistics were used for the analysis. Twenty-five different categories emerged from the data. Over half of the

subjects (n= 81) gave more than one reason for cessation of driving, for example, a motor vehicle crash and then lack of money to purchase another car. Table 14 summarizes the most frequent reasons cited by the former drivers. A visual deficit (not macular degeneration) was the most frequent reason for stopping, noted by 22% of the subjects (n= 18). Financial reasons (17%) and a motor vehicle crash (16%) ranked second and third. A "concern about own ability" and "macular degeneration" tied for fourth place, each mentioned by 14.8% (n = 12) of the subgroup. "Concern about own ability" reflected the subjects' worry about declining competence for the driving process, and the possibility of being involved in a motor vehicle crash or hitting someone, especially a child. "Fear of driving", the fifth most common reason (12%, n = 10) reflected subjects' apprehension regarding traffic and other individuals' driving, rather than their own abilities. Six subjects (7%) noted that someone was available to provide transportation for them, and therefore it was easy to stop driving. Other reasons, cited by one or two persons, included: specific medical or psychiatric problems; moving to a new community, and lacking familiarity with the roads; concerns with memory; and concerns expressed by family or physician. One subject reported having his car insurance canceled due to frequent motor vehicle crashes.

Sixty-eight of the former drivers (83.9%) reported that they made the decision to stop driving on their own; these

Table 14

Most Common Reasons Given for Cessation of Driving by a Group of Older Former Drivers (n = 81)

Reason	Frequency[a]	% of Subgroup
1. Visual deficit - not macular degeneration	18	22%
2. Financial	14	17%
3. Motor vehicle crash	13	16%
4. Concern about own ability	12	14.8%
4. Macular degeneration	12	14.8%
5. "Fear" of driving	10	12%
6. Someone available to provide transportation	6	7%

[a]Each subject may give more than one reason.

subjects reported no pressure from family, friends, health care professionals or legal authorities. Sixteen percent of the former drivers (n = 13) were categorized as stopping "involuntarily" because they had no intention of stopping when they did, or were not planning to stop driving in the near future. The most frequent reason given for involuntarily stopping was physician insistence (n = 7), especially related to visual problems (n = 4). Of these four subjects, two had been reported, by their physician, to the Department of Motor Vehicles in another state, and were then required to relinquish their driver's license. Other reasons cited included family action (n = 3); a motor vehicle crash (n = 3); an acute medical problem (n = 3) (e.g. a fracture, paralysis of legs, a diagnosis of epilepsy); and automobile insurance cancellation (n =1).

Research Question Two

The second research question was: "What are the mobility consequences for older adults who quit driving?"

All subjects were asked to report how often they took each of fourteen different trips outside of their home. Data were recoded to calculate the number of trips per year to each destination for each subject. The range of responses was from 0 (never goes to the destination) to 365 (goes everyday to the destination). Table 15 summarizes the average number of trips per year for each destination and by driving status (current driver/former driver). Because the data were not normally

Table 15

Number of Trips Per Year Taken by Older Drivers (n = 129) and Former Drivers (n = 81) to Various Destinations: Unadjusted and Adjusted for Age

Destination	Drivers		Former Drivers		Net Difference (p)[a]	Adjusted Net Difference (p)[b]
	Unadjusted M (SD)	Adjusted M	Unadjusted M (SD)	Adjusted M		
Bank	59 (51)	53	27 (29)	33	32 (.000)	20 (.001)
Religious Services	35 (46)	32	34 (64)	38	1 (.813)	-6 (.396)
Clubs	63 (87)	65	37 (68)	34	26 (.016)	31 (.087)
Pharmacy	16 (18)	12	26 (60)	29	-10 (.334)	-17 (.171)
Restaurants	87 (90)	82	45 (48)	50	42 (.000)	32 (.035)
Grocery	92 (68)	89	70 (54)	74	22 (.063)	15 (.240)
Hair Salon	15 (19)	17	19 (19)	17	-4 (.113)	0
Job	82 (116)	65	65 (119)	81	17 (.226)	-16 (.466)

(table continues)

Destination	Drivers			Former Drivers			Net Difference (p)[a]	Adjusted Net Difference (p)[b]
	Unadjusted M	(SD)	Adjusted M	Unadjusted M	(SD)	Adjusted M		
Health care	7	(13)	6	6	(9)	7	1 (.987)	-1 (.547)
Recreation	102	(111)	103	41	(61)	40	61 (.000)	63 (.000)
Shopping	37	(39)	35	12	(17)	13	25 (.000)	22 (.002)
Vacation	4	(12)	3	1	(2)	1	3 (.005)	2 (.037)
Visit Family	49	(72)	41	29	(72)	36	20 (.000)	5 (.020)
Visit Friends	70	(93)	71	62	(114)	61	8 (.025)	10 (.069)

Note. p levels must be ≤ .003 to achieve significance due to multiple comparisons. Numbers reported do not include subjects who reported a non-transportation reason for never going to a selected destination.
[a] t-tests for independent samples after log transformation [b]Analysis of covariance after log transformation.

distributed, log transformations were performed then T-tests for independent samples were conducted to determine if any differences existed between the two subgroups on any of the individual destinations. Significant differences were found between current drivers and former drivers on trips to the bank, recreation, eating out, other types of shopping, and to visit family, with former drivers taking fewer trips to all of these destinations.

Because trip frequency might be influenced by age, an analysis of covariance was conducted on each destination. The adjusted means are summarized in Table 15. Controlling for age, the bank, recreational and other shopping trips remained significantly different between drivers and former drivers.

In two categories, beauty shop/barber and pharmacy, former drivers took an absolute greater number of trips per year than did current drivers, but there was no significant difference. In addition, no significant difference between groups was noted for trips to religious services, physicians or health care, visiting friends, jobs, clubs, the grocery and vacation, although current drivers took an absolute greater number of trips in all of these categories.

Since contact with family and friends does not have to only occur outside of the residence (thus requiring transportation), analysis of the subgroups' contacts with these persons, either in the subject's home or via telephone, was conducted. There were no significant differences between

drivers and former drivers on the mean number of contacts with family (t = -1.02, df = 203, p = .30) or friends (t = -.38, df = 199, p = .70). Former drivers did have a slightly higher absolute number of contacts in the home with family, (M = 238.5 for ex-drivers, M = 211.5 for drivers) and with friends,(M = 231.3 for ex-drivers, M = 220.8 for drivers) but as noted, they were not significantly different.

Hypotheses.

The first hypothesis associated with this research question was: "Current drivers will take significantly more trips for all purposes than will former drivers."

The number of trips in each category were summed for each subject to establish a total number of trips taken per year. For the entire sample, an average of 588 trips per person per year (SD 346.5; range 4 - 2,252) was calculated. The results of a t-test comparing the two subgroups can be seen in Table 16. A significant difference (p = .000) exists between drivers and former drivers on the average number of trips taken per year for all purposes, with drivers taking more trips (M = 697) compared to former drivers (M = 415). Since health and age can influence the number of trips, an analysis of covariance was conducted. As shown in Table 16, the significant difference between drivers and former drivers on total number of trips per year persisted, even when controlled for health and age. Thus, the hypothesis is supported.

The second hypothesis associated with this question was:

Table 16

Results of t-test Analysis and Analysis of Covariance[a] for Composite Categories of Trips: Drivers (n = 129) and Former Drivers (n = 81)

	Drivers		Former Drivers			
Composite Category	Unadjusted M (SD)	Adjusted M	Unadjusted M (SD)	Adjusted M	Net Difference (p)	Adjusted Net Difference (p)
Total trips per year	697 (353)	638	415 (254)	474	282 (.000)	164 (.003)
Higher order trips per year[b]	397 (278)	355	251 (222)	292	146 (.000)	63 (.167)
Life maintenance trips/year[c]	198 (111)	182	100 (89)	116	98 (.000)	66 (.000)

Note. p levels must be ≤ .016 to achieve significance due to multiple comparisons. [a]Analysis of Covariance controls for age and health. [b]Higher order destinations include trips to clubs, religious services, jobs, recreation, and visits to family and friends. [c]Life maintenance destinations include trips to the grocery, other shopping, the bank, health care and the pharmacy.

"Current drivers will take significantly more trips to meet life maintenance needs and higher order needs than will former drivers."

Trips were categorized into "higher order needs" and "life maintenance" needs according to criteria established by Carp (1988). Six types of trips were included in the higher order category: recreation, clubs, religious services, visits to family, visits to friends, and jobs. Five types of trips were included in the life maintenance category: grocery, other shopping, physician/health care, bank, and pharmacy. Three types of trips, vacation, eating out, and beauty shop/barber, were not included in the analysis since they were not included in Carp's original framework, and it was not clear as to how to validly categorize them. For the entire sample, the mean number of higher order trips was 341.6 (SD = 267.45, range 0 - 1,329). The mean number of life maintenance trips for the sample was 160.2 (SD = 113.27, range 1 - 580). Table 16 summarizes the data comparing drivers and former drivers on both categories of trips. A significant difference exists between the two groups on both of Carp's categories, with drivers taking a greater average number of trips for both life maintenance and higher order needs. The difference persists for life maintenance trips, even when controlled for age and health. The difference narrows and is not significant, however, for higher order trips when controlled for age and health. The second hypothesis is therefore only partially

supported.

Regression analysis.

Rationale for taking or not taking trips can vary; one cannot assume that presence or absence of transportation resources is the primary factor influencing an older adult's mobility outside of their home. Therefore, to analyze what variables might explain the variance for total number of trips per year, a multiple regression procedure was conducted. Table 25 in Appendix D summarizes the Pearson correlation coefficients for selected study variables and total trips per year. Table 17 summarizes the results of the multiple regression. Demographic variables were entered first, followed by health variables. Twenty-six percent of the variance was explained by four independent variables: status (driver/former driver); general health; physical function and income. The independent variable that did not significantly contribute to total trips was age. In previous regression analyses (not shown), variables that were not significant predictors included gender, marital status, mental health, total health problems and vitality.

For former drivers, general health (r = .26, p = .016) and physical functioning (r = .26, p = .019) were the sole variables significantly correlated with total trips per year. A regression analysis on total trips was not significant (F = 1.4, p =.19). Variables tested in the regression included age, driver hierarchy, income, residence (senior housing/other),

Table 17

Statistical Summary of Multiple Regression Analysis for Total Trips Per Year (N = 210)

Variables	B	SE B	p
Total trips per year: Final model			
Status	.260	.130	.04
Income	.109	.044	.01
Age	-.008	.007	.26
General health	.006	.002	.01
Physical function	.005	.002	.01

Note. Adjusted R^2 = .26, F (5, 199) = 15.4, p = .000

general health, physical function, and interference from eye problems (present/absent).

Qualitative data.

Former drivers were queried in an open-ended format regarding the changes in their mobility since cessation of driving. Ten percent (n = 8) of the subgroup reported they missed driving "a great deal"; 15% (n = 12) reported they missed it "some"; and another 10% said they "didn't miss it at all". Two subjects stated that they always "hated" driving, and so were relieved to finally stop. Twenty percent (n = 16) voluntarily cited a decrease in "independence" and 7% (n = 6) noted a loss of "convenience". When asked where they would go if they still drove, 25 different destinations were noted. Table 18 summarizes these responses.

The heterogeneity in mobility consequences can perhaps best be explained through the following three case examples.

Mr. X , had voluntarily stopped driving four years prior to the interview due to macular degeneration. He was 80 years old, currently married, and living in a private home in a suburban town. He worked on a daily basis at a family business, conducted out of his home. Vacations were very important to he and his wife; they had recently returned from an extended visit to Antarctica. Approximately once a month he would travel outside of his home to church, meetings, restaurants or to visit his children. He said,

I miss driving some. As long as I can do my job at home,

Table 18

Trip Destinations Cited as Desirable by Former Drivers (n = 81)

"Little places" (n=4)
Library (n=3)
Vacation (n=3)
Visit family (n=3)
Beach (n=2)
Bookstores (n=2)
Church (n=2)
Distant places (n=2)
Exhibits (n=2)
Restaurants (n=2)

All of the following destinations were each cited by one person.

Camping	Movies
Cemetery	Play bridge
Concerts	Recreational driving
Dates	Reservoir
Dry Cleaners	Sales
Fishing	Shoe Store
Golfing	Sporting events
Mall	

I'm satisfied. I have what I need. I can go where I want to go. The rest are not important.

Mr. Y had involuntarily stopped driving two months prior to the interview due to multiple motor vehicle crashes in a short period of time. He was 87 years old, married, living in a private home in a more rural area of a suburban town. His wife was a resident in a nursing home, approximately 10 miles from his residence. He had no family in the vicinity.

I like to visit my wife everyday, but it is very difficult to get there. Dial A Ride will only take me three times a week; but if they take me to the grocery, that counts as one trip. Then they won't take me to see her. I have to make a choice.

Besides visiting his wife, Mr. Y went to the grocery and the bank on a weekly basis, and to the doctor and pharmacy about once a month. He was unable to travel to any of the other destinations.

Miss Z was a 75 year old woman who had voluntarily stopped driving about 3 months prior to the interview. She reported that she had been on the verge of quitting because of vision problems, when she had a motor vehicle crash. Prior to the crash, she was driving "very little anyway". She lived in a Continuing Care Retirement Community; she had no family in the local area. She only went to two places with any

frequency, the bank and the grocery.

> I have no urge to go out. With my health, it's just too difficult. I've 'been' to all those places you ask about; I don't need to go there now. My life is here in my apartment; I enjoy my reading and visiting with my neighbors. My needs are met.

Research Question Three

The third research question asked what resources are used by former drivers to meet their transportation needs.

Table 19 summarizes the most frequent types of resources used by former drivers to go to specific destinations. For the majority of types of trips (n = 10 out of 13), most former drivers travel as car passengers in private automobiles. For three destinations, the beauty shop/barber, the pharmacy and jobs, former drivers are more likely to walk than to go as a car passenger. Overall, walking is the second most frequent mode of transportation, followed by dial-a-ride and public transit. Private automobiles, walking and dial-a-ride are used for a wide range of trip destinations. Public transit and on-site vans are only used for a small number of selected destinations.

Those former drivers who reported regularly traveling as a car passenger to a destination were asked to identify who would usually be the driver of the automobile. Table 20 summarizes the frequency of various driver resources utilized

Table 19

Transportation Resources Used by Former Drivers (n = 81) For Specific Trip Destinations

Trip Destination	Car Passenger	Walk	DAR[a]	Bus	On Site Van
Clubs	58.8%	21.5%	17.6%	-	-
Church	65.3%	30.6%	-	4%	-
Bank	38%	34.5%	16.3%	3.6%	-
Hair salon	29%	52.7%	12.7%	3.6%	-
Visiting friends	61.7%	29.7%	4.2%	4.2%	-
Visiting Family	89%	-	-	4.6%	-
MD	52.5%	-	23.7%	7.5%	8.7%
Pharmacy	34.2%	37%	17%	-	-
Recreation	41.9%	20.9%	19.3%	-	14.5%
Restaurant	73.3%	18.6%	4%	-	-
Grocery	32.7%	19.6%	24.5%	-	23%
Shopping	55.3%	10.7%	7.1%	10.7%	12.5%
Job	23.8%	61.9%	11.9%	-	-

Note. % are for those subjects who report that they go to the destination at least once a year.
[a]Dial-A-Ride

Table 20

Resources Used by Former Drivers (n = 81) for Automobile Rides to Selected Destinations

Trip	Spouse %	Children %	Other family %	Friends %	HSP[a] %	Neighbor %	Hired driver %
Clubs	5.7	5.7	-	57.0	14.2	14.2	2.8
Church	14.2	14.2	25.7	31.4	-	11.4	-
Bank	15.3	23.0	7.6	23.0	-	3.8	26.9
Hair salon	20.0	30.0	10.0	25.0	-	-	15.0
Visit friends	15.0	6.0	15.0	63.6	3.0	-	-
Visit family	11.4	50.8	29.5	1.6	1.6	1.6	3.2
Health care	15.0	15.0	17.0	5.6	33.9	1.8	11.0

(table continues)

Trip	Spouse %	Children %	Other family %	Friends %	HSP %	Neighbor %	Hired driver %
Pharmacy	6.0	18.7	12.5	25.0	-	12.5	25
Recre-ation	9.0	24.0	21.2	36.0	-	6.0	3
Restau-rant	14.0	20.3	21.8	35.0	1.5	6.0	-
Grocery	13.7	24.1	6.8	24.7	-	-	31
Shopping	12.5	35.0	20.0	20.0	2.5	-	10
Job	16.6	8.3	8.3	41.6	16.6	8.3	-

Note. % are for those subjects who report ever going to the destination AND who report ever going as a car passenger.
[a]HSP is Human Service Provider.

for specific destinations. When taken as a whole, family (spouse, children, other family) provide rides for former drivers to the majority of the destinations. The second most frequently cited resource was friends. In particular, friends provide the most rides to clubs, jobs, and to visit friends. If family is viewed as three distinct resources, friends provide the greatest number of rides to most of the destinations. Human service providers give the highest percentage of rides to the physician or health care (33.9%) and hired drivers provide the majority of rides to the bank (26.9%) and to the grocery (31%).

As previously mentioned, in some trip categories, former drivers reported "never" going to a particular destination because the need was met in another way. For the bank, 28% (n = 23) of former drivers reported that another person did the banking for them, or all banking was done by mail. Likewise, over half of former drivers (55%, n = 45) reported never going to a pharmacy because either the pharmacy delivered or the subjects were participants in a mail prescription program. Nineteen (23.4%) of the former drivers reported that another person always does their grocery shopping, and fourteen (17%) stated that they never went shopping, relying instead on catalogs and mail order to purchase what they wanted.

Qualitative results.

The three subjects who served as case examples in the previous section, also provide insight into mobility

adaptation.

Mr. X depended upon his wife to provide all transportation. She also did all the shopping, banking, and pharmacy trips, thus relieving him of these responsibilities.

Mr. Y, conversely, had to totally rely on human service programs or providers. As previously noted, he used Dial A Ride to visit his wife and/or to go to the grocery. He was paying a social worker at his wife's nursing home to drive him to other destinations, or to and from the nursing home. His area of residence was not served by the public transit bus. He reported that he was trying to hire a live-in housekeeper, who could then also provide his transportation. If that was not successful, he planned on trying to get re-licensed, so as to resume driving.

Miss Z used a variety of options to provide her limited transportation needs. She never used the retirement center's van. Instead, friends provided the trips to the grocery and the bank. If she wanted to go other places, her home health aide would drive (as part of her assigned work). Her physician and pharmacy were on-site.

Research Question Four

The fourth research question asked: "Among a group of older adults, is there a difference in subjective quality of life between current drivers and former drivers?" An associated hypothesis proposed that current drivers would report a significantly better subjective quality of life.

Quality of life was measured using the QOLI. Table 21 summarizes the results of the t-test and analysis of covariance between the QOLI scores of the two groups. For the t-test , a significant difference ($p = .004$) exists between drivers and former drivers on subjective quality of life, with drivers scoring higher. However, when controlled for general health (ANCOVA results), the difference narrows considerably, and is not significant. Additional analyses (not shown), using other individual health variables as covariates (physical function, total health, health interference score) also resulted in nonsignificant QOLI scores between drivers and former drivers. The hypothesis is not supported.

Research Question Five

Research question five explored the possibility that various subgroups of former drivers would have differing subjective quality of life, depending on their control of the process of cessation of driving, their participation in higher order activities, or the recency within which they had stopped driving.

A multiple regression analysis was performed on quality of life, with three variables entered simultaneously: number of higher order trips per year; time passed since cessation of driving; and a dichotomous variable recording voluntary or involuntary nature of the cessation of driving. Table 22 summarizes the results of the analysis. Fourteen percent of the variance of quality of life was explained, with only

Table 21

Results of t-test Analysis and ANCOVA[a] for Quality of Life Index Scores: Drivers (n = 129) and Former Drivers (n = 81)

	Unadjusted M (SD)	Adjusted M
Quality of Life		
Drivers	24.36 (3.47)	23.9
Former Drivers	22.87 (3.89)	23.2
	t=2.87, df=208**	F (2, 207)=2.74*

[a]Controlled for health.
* p = .100. ** p = .004.

Table 22

Statistical Summary of Multiple Regression Analysis: Selected Variables For Quality of Life for Former Drivers (n = 81)

Variables	B	SE B	p
Quality of life			
High level trips[a]	.007	.00	.000
Stop driving[b]	.014	.06	.830
Voluntary cessation[c]	.879	1.0	.410

Note. Adjusted R^2 = .14, F (3, 77) = 5.55, p = .000
[a]"High level trips" include the following destinations: clubs, religious services, recreation, jobs, and visits to family and friends. [b]"Stop driving" is the amount of time since driving cessation. [c]"Voluntary cessation" is a dichotomous variable indicating voluntary or involuntary cessation of driving.

higher order trips contributing significantly to the equation.

Research Question Six

Research question six asked: "Among a group of older adults, what variables included in this study explain the variance in subjective quality of life?"

Variables that initially demonstrated a significant correlation with the QOLI scores were evaluated for entry into a multiple regression analysis. The Pearson correlation coefficients for the QOLI and selected study variables can be seen in Table 26, Appendix D. Table 23 summarizes the results of the regression: step one enters variables related to subjective health; step two enters driving status; and step three enters variables related to socialization. Thirty-two percent of the variance of quality of life was explained; two variables- general health, and contacts with family and friends--were significant predictors.

A second regression analysis on QOLI was performed for former drivers only. Table 27 in Appendix D summarizes the Pearson correlation coefficients for QOLI and selected study variables for this subgroup. Variables were evaluated for eventual entry into the regression analysis. The best model, using the enter regression procedure, had three variables explaining 40% of the variance of quality of life; general health, higher order trips and available driver hierarchy. Table 24 summarizes this regression analysis.

Table 23

Summary of Multiple Regression Analysis: Quality of Life

(N = 210)

Variables	B	SE B	p
Quality of life: Final model			
General health	.09	.01	.000
Driving status[a]	.705	.43	.11
Family/friend contacts[b]	.001	5.92E-04	.001

Note. Adjusted R^2 = .32, F (3, 206) = 34.4, p = .000
[a]"Driving status" is a dichotomous variable indicating current driver or former driver. [b]"Family/friend contacts" is the number of contacts per year with family and friends both in and outside of the subject's home.

Table 24

Summary of Multiple Regression Analysis: Quality of Life for Former Drivers (n = 81)

Variables	B	SE B	p
Quality of life/former drivers: Final model			
General health	.082	.015	.000
Driver[a]	-.55	.155	.002
High level trips[b]	.005	.001	.002

Note. Adjusted R^2= .40, F (3, 77) = 18.83, p = .000
[a]"Driver" is a hierarchical variable indicating usual transportation resource; lower numbers indicate family and friends, higher numbers indicate public resources; [b]"High level trips" include the following destinations: clubs, religious services, recreation, jobs, and visits to family and friends.

CHAPTER V

Discussion

This chapter will discuss the results of the data analysis reported in the previous chapter. Characteristics of the sample will be considered first, followed by a discussion of each of the research questions and hypotheses. Next, Carp's conceptual model will be critiqued in light of the research findings. An evaluation of the various research instruments used in the study will follow. The chapter will conclude with consideration of the limitations of the study, recommendations for further research, and implications for practice.

Sample and Sample Characteristics

The study sample, as a whole, compared favorably with the SMSA population on distributions of sex, race, marital status and housing. The sample had greater percentages of subjects in the older age categories (≥ 80 years), but this reflects the concentration of former drivers in the study, who tend to be older. Differences were also seen in levels of education and income, with the study population being more educated and more apt to be in higher income brackets than the general SMSA population. Older adults who are more educated and who have higher incomes are more likely to participate in survey research, and this may partially explain the differences (Carter, Elward, Malmgren, Martin & Larson, 1991). In addition, persons with higher levels of education are more apt to be registered to vote (Schick & Schick, 1994), and

therefore more likely to be chosen from a voter registration list. Although income and education were not significantly correlated with quality of life, it is possible that these two variables could influence a number of findings in the study.

Compared to the overall older (≥ 65 years of age) population of the United States, the study sample had similar distributions on sex and marital status. As with the Connecticut SMSA, age distribution differed, with 9% of the U.S. older adult population being over the age of 85, compared to 20% in the sample. Racial distributions also differed, with approximately 90% of U.S. older adults being "white", compared to 96% in the sample. The sample's level of education (U.S. Mdn = 12.1 years; sample Mdn = 14 years) and income were also higher than the general U.S. population (Schick & Schick, 1994). Because of the differences between the target and sample populations, generalization of the findings beyond the Connecticut SMSA must be done with extreme caution.

Except for racial identity, drivers and former drivers differed on all demographic characteristics. The majority of the differences between the two groups can be attributed to the overall older age (M = 82.2 years) of the former drivers. Within the former driver subgroup, the majority of the subjects were female, widows or widowers, with a high school education. Over a third (37%) of the former drivers had incomes less than $20,000 per year (compared to 3% of the drivers). Within the general U.S. population, the majority of

older adults are females (60% of the population ≥ age 65), but this percentage increases as age increases (68% of the population ≥ age 80; 72% of the population ≥ age 85) (Schick & Schick, 1994). Likewise, persons over the age of 75 are more likely to be widows or widowers (especially women); have less education; and have less annual income that those older adults between the ages of 65 and 74 (Schick & Schick, 1994).

Older drivers were more likely to live in private homes (70%); former drivers were more likely to live in some type of senior adult housing, either rental apartments, continuing care retirement communities (CCRC's) or assisted living units. The concentration of former drivers in senior housing may be explained by the environment of senior housing and its many associated resources. If one has to stop driving, it is theoretically easier to do so within a situation that readily facilitates links with transportation, and that offers basic and higher order need resources on site. Older adults who already live in senior adult housing may find it easier to stop driving, and older adults who have quit may find senior housing to be an attractive housing option, should they desire to move. Within the former driver subgroup, 25 subjects (30.9%) reported moving since they stopped driving (data not reported in previous chapter). Of this group, 64% (n = 16) moved into one of the senior housing options.

An accurate, generalizable percentage of former drivers was difficult to extrapolate from the sample data, primarily

due to the low response rate from this segment of the population. Within the initial sampling, 25% of the respondents were former drivers. This was higher than the 14% average calculated from previous research studies (Carp, 1971a; Gianturco et al., 1974; Foley et al., 1990; Campbell et al., 1993; Kington et al., 1994; Burkhardt, 1994), but consistent with the 23.3% figure identified by Foley et al. (1990) in the New Haven, Connecticut EPESE. The demographic characteristics of the typical former driver in this study (older age and female) concurred with studies of former drivers by Jette and Branch (1992), Campbell et al. (1993), Marottoli et al. (1993), and Kington et al. (1994). In addition, income, education and housing characteristics of the former drivers in the sample agreed with characteristics found by Marottoli et al. among the former drivers in the New Haven EPESE.

Transportation/driving characteristics

All subjects were asked a number of questions regarding their driving history, use of alternative transportation resources, and their evaluation of their transportation and travel.

Current drivers reported having driven a greater number of years than had former drivers, despite the age differences in the two subgroups that would logically imply that former drivers would have driven longer. The cohort effect is most likely being seen here. The young-old current driver, both men

and women, most likely started driving at a younger age than did the current cohort of the old-old. In particular, many women in the old-old age category did not start driving until well into their adult life, rather than at the attainment of legal driving age (14 years to 18 years of age) (Transportation Research Board, 1988).

Forty percent of the former drivers still held a valid driver's license, findings similar to those in studies by Eisenhandler (1992) and Persson (1993). Eisenhandler suggests that ex-drivers keep their license for symbolic reasons, while Persson suggests that it is maintained for identification purposes. Through anecdotal comments, subjects in this study concurred with the utility of the license as a form of identification. A few subjects expressed a desire to start driving again in the future, and therefore kept their license current. Others still carried a valid license because they had only recently quit driving, and their license had yet to expire; they had chosen not to destroy it. The symbolic nature of the license, as suggested by Eisenhandler, was not mentioned by the subjects and was not explored.

The regular use of alternative transportation by the sample (both current drivers and the former drivers, when they still drove) was investigated. It has been suggested that older adults might be more willing to stop driving (when necessary) if they have used, or are familiar with, the alternative transportation modalities that are available to

them (H. Heeren, personal communication, October 4, 1994; Heeren, 1995). Except for traveling as a car passenger, very few current drivers used any alternative transportation on a regular basis. Former drivers were more likely than the drivers to have regularly used walking (51%), the bus (30%) and Dial-a-Ride (24%) while they still drove. The findings must be interpreted with caution, however, because of the possibility of recall bias for the former drivers. In addition, causal relationships cannot be inferred due to the cross-sectional methodology. However, the results suggest support for Hereen's ideas, and suggest programmatic implications for older drivers.

Subjects were asked to evaluate how often they were able to go places they wanted to go. The intent was to assess if former drivers were prohibited from going to desired locations due to the lack of transportation, particularly driving. As expected, former drivers were significantly less likely to report that they could go places as often as they wanted. Over 20% of drivers, however, also indicated that they were unable to travel to places as often as they would have liked; this suggested that other factors, besides transportation, were at work. Psychometric evaluation of the question revealed moderate correlations between the "often go" variable and total number of trips, physical functioning, general health, total health problems, income, age, and driving status. The findings suggest that former drivers are not going places as

often as they would like, but many factors are influencing their ability to do so. Driving status, alone, cannot be considered more or less influential than other factors.

Despite not being able to travel as often as they would like, former drivers were no more likely than drivers to report being troubled by transportation. This may imply that former drivers have a certain level of comfort in knowing what transportation is available and when. The transportation may not be "ideal" (e.g. independent, autonomous, private), but it is stable and dependable. Once again, caution must be exercised in interpreting the responses to this question. In anecdotal comments, former drivers noted worrying most about the scheduling and reliability of Dial-a-Ride services. Drivers reported concerns about traffic and feeling unsafe in certain driving situations. Thus, although the answers denote both groups being "troubled by transportation", former drivers were most worried about the process of getting a ride, and current drivers were most worried about the process of driving. Despite the differing interpretations, the findings belie the stereotype that ex-drivers are in a constant state of stress about their transportation. Conversely, it is a concern that 35% of current older drivers in the study find themselves "often" or "sometimes" stressed by the act of driving.

Health characteristics

The most frequently reported health problems are similar

for drivers and former drivers, and are consistent with the most frequent health problems reported by persons ≥ 65 years of age in the National Health Interview Survey (NHIS) (Verbrugge & Patrick, 1995). Likewise, the chronic conditions (arthritis, vision, hearing, and orthopedic) that contribute to the most activity interference among the sample are consistent with conditions causing major or secondary limitations for older adults in the NHIS (Verbrugge & Patrick). Compared to the national data, the chronic condition that is under-represented in the sample population is diabetes mellitus. The reasons for this are unknown.

Although the health problems reported were similar across the subgroups, the data suggest a poorer health status for former drivers, with that group reporting a greater number of health problems per person and greater restrictions from the health problems they have. Compared to the drivers, the former drivers have a higher percentage of persons reporting that they have each one of the most frequently cited medical conditions. In addition, former drivers scored significantly lower than drivers on the SF-36 subscales of general health, mental health, vitality, physical functioning and role-physical (data not reported in previous chapter).

Four of the medical conditions causing "a great deal of interference in activities" for ex-drivers--arthritis, orthopedic, vision and hearing--are health problems that can affect a person's ability to be mobile within their immediate

and external environments. These problems, especially vision and hearing, can also interfere with a person's ability to effectively and comfortably interact with other people. These health conditions and the impact they have on an older adult's "ability and desire to travel outside of the home" have to be considered in any evaluation of mobility consequences for former drivers (Rosenbloom, 1988, p. 31). Fewer trips outside of the home may be due to lack of ready transportation, but also may be due to inability to effectively and safely participate in a chosen activity at the destination.

Research Questions

Research Question One

The first research question asked former drivers how and why the decision was made to stop driving. Consistent with other research studies, and contrary to popular stereotype, most former drivers in this sample stopped driving through self regulation rather than legal revocation of the license (Foley et al., 1990; Campbell et al., 1993; Persson, 1993; Kington et al., 1994). Only two (2%) of the former drivers reported any type of revocation procedure, which is compatible with the 2% revocation rate reported in the New Haven, Connecticut EPESE study (J. Eberhard, personal communication, September 17, 1995). The majority of the former drivers denied that pressure from other people--family, friends, health or human service providers--was instrumental in their decision. The decision had been made independently, upon their own

initiative. A number of former drivers commented that family and friends had been surprised at their decision, and had actually encouraged them to continue driving.

One would hope that the decision to stop driving was made in a timely manner, but that is not evident when 16% (n = 13) of the former driver sample reported that a motor vehicle crash was the primary reason for cessation of driving. One can speculate that these subjects may have needed to stop sooner, but were reluctant or resistant to do so.

The majority of the former drivers had stopped driving in their late 70's or early 80's. These findings concur with other studies that show a slow decrease in the driving population as adults age, with a particularly noticeable decline between ages 80 and 85 (Transportation Research Board, 1988; Campbell et al., 1993; Marottoli et al., 1993; Burkhardt, 1994; Kington et al., 1994).

Rationale given as to why most subjects quit driving--visual problems, finances, and fear/concern regarding driving--correspond with reasons given by former drivers in previous research studies (Gianturco et al., 1974; Foley et al., 1990; Campbell et al., 1993; Marottoli et al., 1993; Persson, 1993; Kington et al., 1994). In contrast to other studies, motor vehicle crashes were listed as the third most frequent reason for quitting among this sample. Only Campbell et al. mention motor vehicle crashes in their report, and only to suggest that former drivers with no reported crashes were more likely

to quit driving. It is unclear as to why motor vehicle crashes are a major cause of driving cessation in this particular sample. Other studies have primarily focused on identifying medical problems associated with driving cessation, and therefore the researchers may not have specifically asked about crashes. The open-ended question used within this study, as well as the personal nature of the interview, may have encouraged subjects to reveal this possibly embarrassing reason.

The costs of maintaining an automobile were mentioned by 17% of the former drivers. The price of gasoline, repairs and car insurance had become prohibitive for a number of older adults who were on fixed, or declining, incomes. A number of subjects noted that they held on to older cars as long as possible; when a new car was needed, the combined costs of the car and the accompanying increase in car insurance were outside of their budget. Therefore, they had to stop driving. Thus, a few former drivers within the study were still physically and mentally capable of driving, but prohibited from doing so due to financial reasons.

Research Question Two

The second research question examined the differences in numbers and types of trips taken by the drivers and former drivers, with the goal of further exploring the mobility consequences of cessation of driving. Despite drivers taking a greater absolute number of trips per year to most of the

destinations, the data suggest that the situation for former drivers is not as bleak as has been predicted by other researchers. Within this sample, former drivers were not "marooned" (Carp, 1972); resource deprived (Lawton, 1980); isolated (Underwood, 1992); or totally confined (Yee & Melichar, 1992). Rather, for the majority of individual destinations, former drivers were travelling at rates that were not significantly different from that of the current drivers.

The findings regarding trip frequency and purpose are similar to those reported from the Nationwide Personal Transportation Studies (NPTS). The average number of trips per year taken by the total sample, 588, was slightly lower than the national average for persons over 65 years of age and older ($\underline{M}$ = 713.5) (Hu & Young, 1992). The lower average most likely reflects the over-representation of former drivers in the sample. Consistent with the NPTS, older adults in the sample population were taking most trips for shopping, personal business, visits, and social reasons (Rosenbloom, 1988; Rosenbloom, 1993). Travelling to a job, either volunteer or paid, was one of the five most frequent trip destinations for both drivers and former drivers. As anticipated, work-related trips are showing an increase in frequency for elderly cohorts, and will have to be seriously considered in future research studies related to transportation needs.

As previously mentioned, current drivers took an absolute

greater number of trips per year than did the former drivers (drivers' M = 697; former drivers' M = 414.7). Rosenbloom (1988) has suggested that non-licensed older adults take from 50 to 100% fewer trips for all purposes than do current older drivers. The findings of this study contradict the NPTS data used by Rosenbloom. The sample former drivers took approximately 40% fewer trips per year (for all purposes) than did the drivers (not controlled for age). Percentage differences varied by specific trip destination, but no one trip category approached the 100% difference noted by Rosenbloom. The largest percentage difference was for the category of "recreation", where drivers took 77% more trips than did the ex-drivers.

Despite the reduction in the percentage differences, the absolute difference between drivers and former drivers on the overall total number of trips per year was significant, even when controlled for age and health status. The regression equation on "total trips" suggested that four variables--driving status, health, physical function and income--explained 26% of the variance. Thus, the findings suggest that the ability to drive does allow greater access to all types of destinations for older adults, but that health and physical function also influence travel. The small amount of variance explained by the regression equation, however, suggests that other factors, not measured in this study, are influential in the number of trips taken by older adults. Future research

should further investigate these factors, with particular emphasis on choice or desire to travel to selected destinations.

Selected types of trips were grouped into two categories (life maintenance resources and higher order resources) in order to evaluate Carp's hypotheses regarding her conceptual model (Carp, 1988). Carp has suggested that former drivers will be least likely to meet both life maintenance and higher order needs, but that higher order needs will suffer most. Differences were seen between drivers and former drivers on both categories, with drivers taking significantly more trips. When controlled for age and health, however, the difference on higher order trips narrowed, and was not significant (although the absolute numbers were in the direction expected). The statistically significant difference on life maintenance trips remained. Thus, the findings only provide partial support for Carp's ideas. Caution is advised in interpreting these findings, however, because the satisfaction of the "need" was not determined; only the frequency of trips to the resource to meet the need was measured. Further analysis of this restriction will be discussed in the section on Limitations.

Individual trip destinations were also analyzed for differences. For three destinations--religious services, the physician, and beauty shop/barber--drivers and former drivers were travelling at almost equal frequencies. For one destination, the pharmacy, former drivers were travelling more

often than drivers, probably reflecting their overall poorer health status. For the remaining ten destinations, drivers travelled more frequently than ex-drivers; significant differences were seen for trips to the bank, eating out in restaurants, recreation, other shopping and visits to family. Adjusting for age does influence trip frequency in some categories, but drivers continue to travel to most individual destinations more often. Once controlled for age, however, only recreational, other shopping and bank trips remain significantly different.

"Other shopping" trips would be categorized as a life maintenance need by Carp. Anecdotal comments from the former drivers, as well as comments regarding desired destinations, suggest that shopping trips may not be overly important for the group. Subjects reported that they did not like to "shop" primarily because they didn't need anything: "At my age, I don't need clothes, I don't need furniture, I don't need things for my house."

The major reason for shopping seemed to be the purchase of gifts for holidays or special occasions. Only five subjects noted a shopping destination when queried regarding places they would like to go if transportation were available. Thus, the differences seen between drivers and former drivers on trips for shopping may actually be reflecting a preference not to shop.

Conversely, former drivers provided an extensive list of

desired destinations that would be categorized as "recreation" and higher order resources (Carp, 1988). Their anecdotal comments thus support the statistical finding of a major gap between current drivers and ex-drivers on this type of trip. In addition, trips for recreational purposes were positively, and significantly, correlated with quality of life for former drivers (r = .27, p = .01). These three pieces of information converge to suggest a major consequence of the cessation of driving: the loss of life enrichment that is afforded by recreational activities. The lack of consensus on specific recreational trip destinations, however, highlights the heterogeneity of the older population. Meeting individual needs for transportation to such varied activities, through mass transit programs, would be difficult.

The findings suggest that regular contact with family and friends is not being jeopardized by lack of independent transportation. After adjusting for age, there were no statistically significant differences between drivers and former drivers on the numbers of contacts with family and friends, both in and outside of the home. As suggested by other researchers (Litwak, 1985, 1987), alternative means to meeting needs can be used; in this case, the telephone. Seventy-nine percent of the former drivers reported that they receive a phone call from a family member at least weekly; 39% reported daily contact by phone. Here again, caution is advised because the quality of the interactions with family

and friends cannot be inferred from the number of interactions. However, the frequency of interactions does not seem to depend on the presence or absence of driving.

Qualitative findings relating to mobility consequences emphasize the loss of independence and convenience in meeting mobility needs. The confirmation of the loss of independence provides support for the hypotheses of previous gerontological researchers (Retchin, Cox & Irwin, 1988; Smith & Hiltner, 1988; Gillins 1990, Eisenhandler 1992; Underwood 1992; Persson, 1993). Former drivers find that they must rely on the discretion of another person and/or resource for meeting needs that require transportation; former drivers must travel at the convenience of the other person (or by the schedule of the bus or DAR) rather than when they necessarily want to go. Gonda (1982) has suggested that the morale of older persons is improved when events in their lives are predictable and controllable; she extends this hypothesis to the idea of transportation. Within this sample of former drivers, a significant difference ($F = 6.82$, $p = .002$) was seen on quality of life scores (QOLI) between subjects who reported being "troubled by transportation" often ($m = 19.1$), sometimes ($m = 22.2$) or never ($m = 23.8$). Thus it is possible that a sense of loss of independence and control over travel may have a greater influence on overall quality of life rather than an objective loss of travel to various destinations.

The objective data suggest that former drivers travel

less often (than drivers) to most destinations, even when age and/or health are taken into consideratio; except for a few destinations, however, the numbers of trips taken by former drivers are not significantly different from current drivers. The greatest objective loss is in the area of recreational trips; a finding validated by the qualitative data. The actual loss, with major implications for quality of life, may not be in terms of numbers of trips, but instead in the ability to control and determine when and how those trips will occur. Further research is recommended into the predictability and control of various forms of transportation used by former drivers.

Again, caution must be exercised in the interpretation of this data; generalizations about "mobility" without the person's evaluation of that mobility may be erroneous. In addition, it is not known if former drivers would travel more or less to selected destinations IF they still drove. Specific concerns will be discussed in the Limitations section.

Research Question Three

The third research question explored the mobility adaptation of former drivers: what resources were being used to meet travel needs, and how ex-drivers were creatively meeting their needs without regular access to autonomous automobile transportation.

For almost every destination, the primary mode of transportation for former drivers was traveling as a car

passenger in a private automobile. This finding concurs with previous research, including data from the NPTS (Rosenbloom, 1988; Kington et al., 1994). Walking was the second most frequent mode of traveling, followed in descending order by Dial-A-Ride, public transit bus, and on-site van.

Despite health limitations, walking continues to be the second most frequent mode of transportation for former drivers (Rosenbloom, 1988). For three destinations, the beauty/barber shop, jobs and the pharmacy, walking was the most frequent method of traveling. For many subjects, the regular use of walking reflects the placement of resources in or near their residence, particularly senior housing complexes.

Despite a number of anecdotal complaints about Dial-A-Ride services, former drivers <u>are</u> using it. Dial-A-Ride (DAR) was used more frequently as a primary mode of transportation by the study sample (41.9% overall) than by the 1983 NPTS group (<16% overall) (Transportation Research Board, 1988). Almost 25% of the study group reported that DAR was their primary mode of transportation to the grocery or the physician. The change in usage since 1983 may indicate an increase in availability of paratransit services, an increase in acceptance of such services, or the absence of any other choice for getting to the desired destination. DAR is used most often to go to those destinations to which they tend to limit their services: grocery shopping, physicians, recreational activities at senior centers or clubs, and the

pharmacy.

The very low usage of public transit bus reflects the limited bus system that is available in the study area. The bus system serves a commuter population, and therefore routes and scheduling are adjusted accordingly. Evening service is negligible and weekend service is non-existent in many areas. What is not known is if ex-drivers would use the bus more frequently if service was re-oriented to meeting their transportation needs.

On-site vans are paratransit-type services that are limited to residents of individual senior adult housing complexes. The subjects' use of the on-site van for physicians, recreation, grocery and other shopping demonstrate their pre-designated purposes. Regularly scheduled trips, guaranteed rides, and reliability make on-site vans an attractive paratransit option for older adults.

Overall, however, former drivers continue to show a preference for the many advantages of traveling as a car passenger. Within the study population, the people who are providing the automobile rides to former drivers are family and friends. These findings are consistent with those reported by other studies (Carp, 1972; Rosenbloom, 1988; Persson, 1993; Kington et al., 1994).

When considered as one group, "family" provides the greatest percentage of rides to the majority of the destinations. However, when family is divided into individual

resource categories (spouse, children, other relatives), friends provide the greatest percentage of rides to most of the destinations. Because "friends" are almost always another older adult, concern has to be noted regarding the ripple effect of one person stopping driving; they are not only leaving a void in transportation for themselves, but also for an unknown number of older adults who have depended upon them for rides (Carp, 1972; Kathy Freund, personal communication, March, 1994).

It was unexpected that so many former drivers would rely on friends for automobile rides. Within the driver subgroup, 28% (n = 36) reported that they never gave a ride to another older adult. Less than half of the drivers (42.6%) reported giving rides to other older adults on any frequent basis (once a month or more often). Drivers expressed concern about insurance and liability as well as being reluctant to become obligated to another person. Likewise, former drivers expressed discomfort in asking for rides from fellow older adults, and in riding with persons that they considered to be unsafe drivers. It is unknown as to whether the rides being given by older friends were offered, asked for, or part of a routine. In addition, it is unknown whether former drivers in this study were satisfied with riding with their friends, or if they had a preference as to who they would like to have drive them. The conflicting results suggest a need for further research in regard to the "friends" who are providing rides.

A new category for driver resources emerged from this data: the hired driver with a private car (not a taxi). Subjects were engaging a driver for one to two hour periods and paying an hourly fee. They were able to go where they wanted, when they wanted, without feeling obligated to another person. The advantages of traveling as a passenger with a hired driver are very similar to the advantages of traveling as a driver in a private automobile: convenience, flexibility, autonomy, choice, privacy. Even though "finances" was given as the second most frequent reason for cessation of driving, former drivers are demonstrating that the benefits of hiring a driver is money well spent. It should be noted that the use of hired drivers was seen across all income groups, not just those in the higher income brackets. The ongoing public policy concerns about the expense of Dial-A-Ride services, and the obvious willingness of some older adults to pay for private transportation, warrants further development of hired driver services or programs.

A number of former drivers used methods, other than transportation, to meet various needs, particularly life maintenance needs. Fifty-five percent of the former drivers reported never going to the pharmacy, relying instead on home delivery or mail programs to obtain their medications. Likewise, 28% reported never going to the bank; 23% never go to the grocery; and 17% never go shopping, relying instead on other persons, the mail, or home delivery options. There was

no significant difference on overall quality of life between former drivers who went and former drivers who never went to each of these destinations (data not reported in previous section), but specific evaluation of these alternative arrangements was not included. The question remains however if transportation is the missing link in meeting these needs independently? Or do other factors, particularly health status, make these types of trips inherently difficult?

The multiplicity of resources available within senior adult housing complexes also decreases the need for transportation. The various senior housing visited for the study provided some, or all, of the following services on site: volunteer or paid jobs, small groceries, recreational activities, meals, health care, hair salons, banking, and regularly scheduled religious services. There was no significant difference on overall quality of life between former drivers who lived in senior housing and those who did not (data not reported). However, the potential for a former driver to meet life maintenance and higher order needs without driving is theoretically greater within senior housing complexes.

The findings suggest that former drivers continue to meet their various transportation needs primarily by traveling as a car passenger in an automobile driven by family or friends. For some ex-drivers, life maintenance needs are being met through the use of means other than transportation: other

people, the mail, the phone, or on-site resources. Fifty-nine percent of the former drivers reported that they never worry about transportation, implying a certain level of stability and satisfaction with their arrangements for travel. The ready availability of a family or friend to provide transportation, compared to routine use of public resources, was a significant predictor of the variance in overall quality of life for former drivers. Still, further evaluation of their level of satisfaction with their specific transportation resources is recommended.

Research Question Four

The fourth research question analyzed the differences in perceived quality of life between drivers and former drivers. Based on previous research studies, the hypothesis predicted that current drivers would report a better quality of life than former drivers (Carp, 1971; Cutler, 1972, 1974; Gianturco et al., 1974). The hypothesis was not supported. The initial analysis of the scores demonstrated a significant difference. When the scores were controlled for health, however, the difference narrows and it is no longer statistically significant. This finding is in contrast to previous studies of drivers and former drivers that suggested that differences in quality of life/life satisfaction persisted even when controlled for health (Cutler, 1972, 1974; Gianturco et al., 1974). The findings of this study suggest that caution must be exercised in assuming that driving status, alone, influences

quality of life. Further discussion of the concept of quality of life will follow in Research Question Six.

Research Question Five

Research question five explored the idea that there would be differing levels of perceived quality of life among different subgroups of former drivers, depending on their control of the decision regarding cessation (voluntary vs involuntary), the length of time since quitting, or the number of Carp's higher order trips they would be able to take. A regression on quality of life (restricted to former drivers) suggested that higher order trips was the sole significant variable among the three investigator-selected variables.

An unstated hypothesis inferred that older adults who quit driving voluntarily would have a better perceived quality of life. Gillins (1990) has suggested that having control over the decision-making process might influence, and help to maintain, self-esteem, and subsequently quality of life. The results do not support these ideas. The findings may suggest that the "involuntary" subjects had adjusted to the compulsory decision, or that they had acknowledged that it truly was no longer safe for them to drive (Gillins, 1990). A larger sample of former drivers whose licenses had been legally revoked may have revealed greater differences in perceived quality of life. In addition, the investigator's interpretation and classification of "involuntary cessation" may not have been congruent with the interpretation of the decision-making

process by the former drivers.

A second unstated hypothesis suggested that former drivers who were new to their status would have a lesser perceived quality of life. As suggested by Gillins (1990), these older adults would have still been working through a grieving process, and adapting and adjusting to the loss of driving. Once again, these ideas were not supported by the regression analysis; time since cessation of driving was not a significant predictor of quality of life. The findings suggest a heterogeneity among the former driver population, with varying levels of adaptation to the change in status. As with any grieving process, the adjustment is individual, depending on many intrapersonal and extra-personal factors. The findings suggest that generalizations about former drivers should be made with caution.

The final unstated hypothesis suggested that a better quality of life would be reported by former drivers who take a greater number of higher order trips. This analysis was suggested by Carp's model, and her proposition that higher order activities are important to a sense of well-being and quality of life (Carp, 1988). Higher order trips was a significant predictor of life satisfaction, explaining 14% of the variance. (Higher order trips also explained a significant amount of the variance in the final quality of life model to be discussed under question six). Preliminary support is provided for Carp's idea, particularly as it relates to former

drivers. The findings suggest the importance of higher order activities for former drivers, and support the availability of transportation services to these activities.

Research Question Six

The final research question explored what factors influence the perceived quality of life of older adults. An enter regression procedure was used to ascertain which variables within the study would explain the variance of subjective quality of life for the sample as a whole. Approximately 32% of the variance for quality of life was explained by two variables: general health and contacts with others (family and friends). No variable directly related to driving, or driving status, entered the equation. "Contacts with others" is indirectly related to transportation because it does include contacts made via travel outside the home.

A variable from the SF-36, general health, explained the majority of the variance (28%). "General health" assesses perception of personal health, including a comparison of personal health to peers' health and a projection of future health (Ware et al., 1993).

"Contacts with others" was a variable that measured the total number of contacts with family and friends within a period of one year. "Contacts" could be visits within the subject's home, visits in the family or friends' homes, or telephone conversations. Despite explaining such a small amount of variance (approximately 4%), the importance of

social interaction and social support for older adults' quality of life are affirmed by the inclusion of this variable.

The findings are consistent with other studies that suggested that self-rated health and interpersonal relationships are the primary predictors of quality of life among older adults (Larson, 1978; Flanagan, 1982; Pearlman & Uhlmann, 1991; Oleson, 1992). In partial support of the findings from this study, Palmore and Kivett (1977) and Herzog and Rodgers (1986) suggested that perceived health was the primary predictor of quality of life among older adults, but that social contacts or relationships with family and friends were only weakly, or not at all, correlated with well-being.

A second regression procedure limited to the former driver subgroup suggested a slightly different explanation of life satisfaction. Forty percent of the variance of quality of life was explained by three variables; general health, available driver, and frequency of Carp's higher order trips. Subjective health was consistent in explaining the majority of the variance (22%). Two variables directly related to transportation, however, explained the remainder of the variance.

"Available driver" is a variable constructed by the investigator to reflect a hierarchy of the people or resources that are usually available to the former driver to provide transportation (self, spouse, family, friend, neighbor, hired

driver, bus, dial-a-ride/van). The variable was constructed using criteria suggested by Litwak (1985) in his discussion of formal and informal networks' assistance to older persons: proximity, commitment, lifestyle, motivation, and size. The results of the regression analysis suggest a better perceived of quality of life among former drivers who have ready access to transportation from family and friends. Those former drivers having to rely on public resources are less satisfied. These findings may provide indirect support for Gonda's suggestion regarding the influence of predictability and control (of transportation) on the morale of older persons (1982). Former drivers may perceive a greater amount of predictability and control over their transportation when it is provided by family or friends; these perceptions may decrease as the older person must increasingly rely on formal organizations who decide when travel will occur and where trips will go.

Caution is urged in the interpretation of the findings related to the "driver" variable because it was constructed by the investigator without validation from the subjects. Further discussion regarding this variable can be found in the section on Instruments.

The frequency of trips to higher order resources also explained a significant amount of the variance of quality of life for the former drivers. The objective number of trips may be a surrogate measure of a phenomena that occurs at a higher

order resource that contributes to improved well-being. Support is partially provided (for this subgroup) for Carp's hypothesis that the meeting of higher order needs is important for overall life satisfaction (1988). The question remains unanswered, however, as to why the higher order trips are NOT a predictor of quality of life for the current drivers.

A number of researchers have suggested that quality of life is a subjective experience, and therefore objective conditions of life will only weakly correlate (if at all) with well-being (Campbell, 1976; Costa et al., 1987; Pearlman & Uhlmann, 1991). The results of the regression procedures provide partial support for these ideas. The major predictor, general health, is a subjective, self-evaluation of health. When two objective health indicators, physical functioning and total health problems, were substituted in the equation, they predicted 13% of the variance of quality of life (data not shown). The two objective variables provide support for "health" as a major predictor of quality of life, but they explain less variance than the more subjective variable. The total number of contacts with family and friends, as well as higher order trips, <u>are</u> objective, but are most likely a surrogate measure of what the older person gains from the experiences. Objective variables that did not enter the equation for the total sample include driving status, demographics and various composite scores for numbers of trips.

Concern must be expressed that former drivers demonstrated an objective loss in total number of trips, yet self-evaluated their quality of life at a level comparable to that of the current drivers. It is possible that the former driver group had adapted to the objective loss by lowering their expectations (e.g. "it doesn't get any better than this, so I might as well adjust"); using a process of social comparison (e.g. " he/she is worse off than I am; I shouldn't complain"); or by shifting priorities (e.g. travel, over which there is little control gets shifted to a lower priority; other areas of life, over which there is some control, receive higher priority) (Pearlin & Skaff, 1996; Baltes, 1991). Such psychological adaptations could tend to inflate the reporting of subjective quality of life (and increase measurement error).

Previous longitudinal studies of older adults have suggested a stability in evaluation of quality of life over time; despite the inherent life changes as one ages, the older adults' evaluation of quality of life remained constant (Palmore & Kivett, 1977; Costa et al., 1987; Bowling et al., 1993). Such studies introduce the possibility of stable personality predispositions or characteristics that influence the evaluation of quality of life (Campbell, 1976; Costa et al., 1987, p. 54; Oleson, 1992). Krause (1991) has suggested the idea of a "Top Down" theory related to life satisfaction and stressful life events for older adults. He proposes that

an ongoing, overall sense of satisfaction leads to a predisposition to assess stressful events in a congruent way (p.584). Lifelong personality traits may be more influential in a person's evaluation of quality of life, rather than discrete positive or negative life events.

A personality factor, or global attitude, may be influential in the findings of this study. A range of scores on the Quality of Life Index was seen for both drivers and former drivers. Despite similarities in life stressors and health status, former drivers did not evaluate their quality of life in a uniform way. During the interviews, an overall sense of the "glass half empty or half full" concept emerged, especially among the former drivers. For example, some ex-drivers had dealt with the fact that they were no longer able to drive, had made adjustments and adaptations, and went on with life. Their quality of life scores were high, sometimes higher than those of the current drivers. It is possible that their response was characteristic of their coping strategies throughout their life. Stable personality traits may be strongly influencing a person's evaluation of their quality of life, and deserve further study.

A different type of global attitude, depression, must also be considered. In preliminary statistical analyses, the Mental Health variable from the SF-36, explained the majority of the variance of quality of life within the study population. The variable was later removed from the regression

equation because of the threat of tautology. Perceived emotional health has also been strongly correlated with quality of life in other studies of older adults (Pearlman & Uhlmann, 1991). Depression, or a depressed affect, could certainly influence a person's evaluation of their overall quality of life, and this would cross all segments of the older population, not just former drivers.

The findings suggest that subjective health and social contacts are important factors in an older adult's quality of life. Driving, travel, and other objective variables were not influential among the total study population, but were more important for those who had stopped driving. Caution is advised in making assumptions about life satisfaction, based solely on subjective measures. Rather, the findings suggest the importance of examining both subjective and objective measures of quality of life, particularly when the results can influence public policy. The findings on quality of life within the study population are a reminder of the variability among the elderly, and of the fallacies that can result from making generalizations about any "group" of older adults.

Carp's Conceptual Model

The framework for this study was drawn from a conceptual model developed by Frances Carp (Carp, 1988). She proposes that well-being for older adults is dependent upon their ability to independently meet two types of needs: life maintenance and higher order. Meeting life maintenance needs

allows for independent living in the community, and thus influences well-being. Carp proposes, however, that meeting higher order needs are more important for well-being. Mobility is the key element in meeting all needs and thus is "a major determinant of well-being" (p. 2). Carp suggests that former drivers will be least able to meet their needs, and therefore have diminished well-being; car owners will have greater mobility and therefore greater life satisfaction.

The findings of this study are equivocal, and perhaps lean toward not supporting Carp's model.

Caution must first be noted in regard to the methods used for measuring the variables. (Carp did not provide details on testing the model directly). This study utilized a count of how often older adults came in contact with the various resources to meet the life maintenance and higher order needs. Comparisons were made between drivers and former drivers on their number of contacts with the resources; no direct measures of the subjects' satisfaction with meeting individual needs were conducted. The "contact" with a resource, particularly with a higher order resource, does not necessarily translate into satisfaction with meeting the need. Rather, it is an abstract phenomena that transpires at the resource site that leads to feelings of "self-esteem", "usefulness", and "happiness", and ultimately, "satisfaction". Indirectly, satisfaction with all the higher order needs was measured by the QOLI. Specific questions on the instrument ask

subjects to evaluate their satisfaction with family, friends, control, independence, usefulness, jobs, leisure activities, relationship with God, self esteem, and happiness. The QOLI provides a composite evaluation of satisfaction in meeting Carp's higher order needs, and thus provides a basis from which to evaluate her model.

The study findings support Carp's ideas in a number of areas. First, current drivers did go more often to all of the resource sites, even when controlled for health and age. Secondly, Carp notes the importance of social interaction in overall well-being, and this factor is supported by the findings; "contacts" with family and friends entered the regression equation (for the total sample) to explain a small, but significant, amount of variance of quality of life. Thirdly, a better subjective quality of life was reported by former drivers who had more frequent higher order trips; this difference persisted even when controlled for health, age and income. This effect was not seen, however, among the current drivers (data not reported). This finding may suggest that higher order activities take on a more important role for quality of life among older adults who have stopped driving; current drivers may be deriving some satisfaction from higher order activities, but other unknown factors may be contributing more to their quality of life.

Carp cites two qualities of mobility, feasibility and personal control, that "facilitate the meeting of needs, and

thereby support well-being" (1988, p. 3). Indirect support for Carp's ideas are provided by study findings. Carp defines personal control as "the degree to which it (the form of transportation) enables individuals to meet their needs independently" (p. 3). The variable "driver", which was a significant predictor of quality of life for former drivers, may be denoting a sense of control over mobility. Feasibility is defined by Carp as "the person's ability to perform the activities involved" (p. 3) related to driving, walking, getting on and off a bus, etc. Carp suggests a number of physical health factors that would influence the ability to undertake these activities. Within this study, physical function is positively and significantly correlated with the frequency of both life maintenance and higher order trips. Physical function is also significantly correlated ($r = -.40$, $p = .000$) with driving status (poorer physical function is associated with ex-driving status). Other modes of transportation were not tested against physical function. "Feasibility", defined as physical function within this study, does seem to have an effect on travel outside of the home. The question remains as to how feasibility influences travel. Does feasibility, as Carp suggests, have an impact on ability to safely maneuver in various forms of transportation, and thus indirectly increase or decrease travel outside of the home? Or does feasibility influence the ability to participate in activities at the resource site, and thus directly increase

or decrease desire to travel?

A number of study findings did not support the model. First, Carp's proposal that higher order needs (satisfied by contact with higher order resources) directly influence well-being was not supported for the total sample; higher order trips did not enter the regression equation on quality of life, although it was minimally and significantly correlated with the QOLI (r = .28, p = .000). Secondly, Carp suggested that drivers would have greater life satisfaction because of their ease of access to all of the resources; this hypothesis was also not supported. Thirdly, Carp proposed that drivers, being more mobile, would be able to travel to places more often than ex-drivers. For the majority of individual destinations in this study, drivers and former drivers were travelling at statistically comparable rates, especially when controlled for age. The significant differences in travel were divided among life maintenance trips (the bank and other shopping) and higher order trips (recreation). This finding is in contrast to Carp's expectation that higher order trips would suffer the most from lack of driving.

Critique

Carp's model derived from her own previous research on transportation, mobility and older adults, as well as research by other gerontologists (1988). The findings from this study support Carp's suggestion that the model was "first generation" and needed further refinement (p. 16).

A number of Carp's initial assumptions about mobility, meetings needs, and well-being are faulty. Carp states that both well-being and mobility decrease with age (p.2). Although mobility can decrease with age, previous research has suggested a stability in regard to quality of life as one ages (Palmore & Kivett, 1977; Costa et al., 1987; Bowling et al., 1993). Carp suggests that well-being is dependent on meeting needs independently, and the "major determinant of well-being" is mobility (p. 2). Quality of life is very likely influenced by ability to meet needs, but that is not the sole influencing factor; well-being is a much more complex construct. A major void in the model is the absence of the direct influence of "health" on well-being, a factor that had been suggested as a primary determinant of quality of life in previous studies with older adults (Campbell, 1976; Palmore & Kivett, 1977; Larson, 1978; Flanagan, 1982; Herzog & Rodgers, 1986) and was supported by findings of this study. Carp did give minor attention to "health" in regard to "feasibility as a quality of mobility", but only as it related to ability to perform activities involved with various forms of transportation. She also did not give consideration to the influence of health on the desire or ability to go to the various resource sites (Rosenbloom, 1988).

Consideration was not given to meeting the various needs in ways other than traveling to the site. Carp states that meeting almost every need requires going out into the

community (p. 3). Findings from this study suggest that some former drivers (and current drivers as well) were meeting their needs through other resources. For example, subjects utilized the mail, the phone and/or other persons to do banking, grocery shopping, or purchasing of medications. Family and friends visit in the homes of drivers and former drivers. Many subjects had jobs based in their homes or residential complex. What is not known is if Carp would consider the use of another resource to meet the need as "independent". A second unknown is if older adults perceive the use of other resources as being "independent" or "dependent", and how this would influence their perceived quality of life. Once again, the ability and desire of older adults to go to various resource sites has not been considered in the model (Rosenbloom, 1988). Older adults who use alternative resources may be very satisfied with these arrangements because they cannot or do not want to go to these places. The utilization of alternative resources may be the key to allowing them to remain living in the community, an outcome deemed desirable by Carp.

Carp's concepts of "personal control" and "meeting needs independently" needs to be more fully explicated. Driving would certainly seem to have a great deal of personal control, as defined by Carp. She also cites "walking" as a form of transportation that is high on control. What is not known is the perception of control and independence in meeting needs by

the use of other transportation resources such as family and friends, Dial-A-Ride, or public transit buses. For example, an older person may feel that he/she is meeting various needs independently through the use of a Dial-A-Ride service, but at the same time feel that they have little control over the Dial-A-Ride schedule. On the contrary, that same person may prefer an automobile ride from a family or friend because it is predictable and reliable, but they may feel more "dependent" upon that person.

Carp does note that the older population is heterogeneous, and generalizations from the model do not imply homogeneity. She also suggests that the concurrent decline in mobility and well-being as one ages does not imply causality (p.3). Carp suggests that "mobility" should be considered when evaluating quality of life of older adults. This is correct. However, the findings of this study suggest that it is erroneous to assume that mobility is the major determining factor in life satisfaction.

Carp stated that her model needed "more explication and refinement" (p. 16). The findings of this study support that need. Health, desire to go places and satisfaction with meeting needs should be given consideration in future testing and development of the framework.

Methods and Instruments

Sample Selection

The sample for this study was drawn from voter

registration lists segmented by age. The lists were readily available, accessible and inexpensive. A majority of older adults in each town were listed, but no list contained 100% of the persons aged 65 or over. Consideration must be given, therefore, to the characteristics of the people missed in the sampling. Registered voter lists tend to have an over-representation of more educated persons and under-representation of minorities (Schick & Schick, 1994). A third group who is under-represented are new residents, those who have recently moved into the town and have yet to register to vote. The final sample as a whole compared favorably to the minority distribution in the SMSA, but the more highly educated were certainly over-represented. Consideration must also be given to the possibility that educated persons are more likely to participate in a research study. Forty-three subjects in this sample had master's or doctoral degrees. The educational background of these subjects, and their appreciation of the value of research, may have influenced their decision to participate.

The difficulty in securing an adequate number of former drivers in the initial sampling was unexpected. More recent statistics (obtained after the sampling was completed) indicated that the 50% driver/former driver cutpoint would be found between the ages of 80 to 85 years, rather than the 75 year cutpoint used in the calculation of sample size. The low response from former drivers could also be explained by Herzog

and Rodgers (1988) who suggest that the response rate decreases on a linear basis as age increases. As previously stated, former drivers tend to be in the older age categories, and thus are in general less likely to respond to research requests. Future studies focusing on former drivers would need to oversample in the older ($\geq$ 80 years) age groups in order to obtain an adequate sample size.

The initial response rate of 44% was disappointing, but acceptable considering the nature of the research study. Other geriatric researchers have reported similar response rates to survey research with large, national samples being drawn for sophisticated studies: 49% to 69% (Herzog & Rodgers, 1988); 46% to 53% (Cartmel & Moon, 1992).

An unexpected barrier to access to subjects was the answering machine. In this age of technology (and telemarketing), a large number of older adults seem to be relying on an answering machine as a call screener. Few researchers have yet to analyze this obstacle to survey research, but the increasing numbers of answering machines across all population strata suggests the need for further study of this phenomena and its effect on sampling.

The offer of a $20 stipend did not seem to overtly influence subjects' decision to participate in the study. Most people initially refused the money, and would only accept it after intense persuasion.

Suggestions to increase the response rate in future

studies would include improving the incentives to participate; the use of peers to make initial contacts; or to obtain and advertise the endorsement of the study by key informants in the community.

Methods

An in-person interview was chosen as the survey methodology in order to obtain the most complete and best quality data possible. Although extremely time consuming, this decision was supported by the results. A minimum amount of missing data was recorded on the questionnaire. Immediate clarification was possible when subjects seemed puzzled by the Likert scale on the Quality of Life Index.

A number of subjects also noted appreciation for the socialization provided by the in-person contact.

Instruments

With few exceptions, the instruments and individual questions performed well and exhibited acceptable psychometrics for basic research. This section will first review individual questions and then go on to discuss the established instruments.

Trips.

The questions regarding frequency of trips outside the home gave a sense of the objective current mobility of the sample. Although the frequencies reported were within the expected boundaries, former drivers reported a greater frequency of trips than had been reported in previous national

studies. Rodgers and Herzog (1987) express concern regarding a tendency of older adults to over-report factual data in survey research. The reliability of this question on the pretest was excellent, suggesting stability. Care must be taken, however, in deciding whether this sample of former drivers is more mobile than previous national groups, or if the difference is a result of measurement error. Future studies should consider limiting the time frame of the question to a smaller range, e.g. one month or one week, rather than one year, or using alternative methodologies such as diaries or longitudinal studies to improve reliability of the data.

Driver hierarchy.

As previously mentioned, the variable "driver" was constructed by the investigator using theoretical criteria related to helping networks (Litwak, 1985). The variable attempted to capture a preferable hierarchy of available transportation resources. No validation of the construct with the sample was possible; face validity provides limited support. The variable was significantly correlated ($r = -.51$, $p = .000$) with a question from the QOLI that asked "How satisfied are you with your ability to go where you want when you want?" It is possible, however, that the variable is measuring a construct other than the one intended, particularly related to social support. Caution is therefore advised in the interpretation of this variable. Further

refinement and validation of this variable is suggested for future research studies.

Often go.

An attempt was made to elicit subjects' satisfaction with their mobility, specifically related to the availability of transportation. The responses to the "often go" question demonstrated a distribution of answers in the expected direction. However, the psychometric evaluation of the question elicited parallel correlations with a number of different variables. Thus, "often go" was measuring a person's satisfaction with their ability to go, but that satisfaction was influenced by multiple factors, not just driving or transportation. Further development of a question, or questions, to reliably and validly measure mobility satisfaction, specifically related to transportation, is recommended.

Environment.

It was disappointing to see the great difficulty caused by the questions evaluating the subjects' environments. Access to, and placement of, various resources is extremely important in an evaluation of mobility for older adults and in evaluating Carp's (1988) model. As previously noted, subjects had difficulty in interpretation of the words "near" and "convenient". For example, one former driver subject noted that a grocery was "near" geographically, but she could not walk to it and it was not served by a public bus. Future study

of the community environment needs to ascertain availability of resources and also access to those resources via various forms of transportation.

OARS.

The OARS question regarding physical health problems was easy and quick to administer. None of the medical conditions that had been removed from the original list were extemporaneously reported by the subjects, providing support for the investigator's judgment that these conditions were rare and need not be asked. Three health conditions were added by the subjects: orthopedic problems (not arthritis); visual problems (not cataracts or glaucoma); and hearing deficits. Because of their prevalence among the study population, inclusion of these three conditions would be suggested in future uses of this question.

Quality of Life Index.

Although time consuming to administer with older adults, the Quality of Life Index (QOLI) was an appropriate instrument for this study.

The psychometrics on the QOLI as a whole, and on two of the subscales (health and psychological) were acceptable for basic research. Two subscales, family and socioeconomic, approached, but did not attain the .70 minimum alpha score recommended by Nunnally (1978). Internal consistency evaluation depends on the consistency of responses across the items, and the number of items in the scale. Fewer items lead

to lower internal consistency scores. The Cronbach's alpha on the family subscale can be attributed to the low number of items ($\underline{n}$ = 4) in the original scale, and an even lesser number of items answered by the subjects. No answer was recorded for over 67% of the sample on the item related to "spouse and significant other". Missing data was also noted on all other items, but not to the extent of the "spouse" question. Any number of subjects had absolutely no family on which to base the response (9 subjects had total family subscale scores of 0); no spouse or significant other; or no children. Additional items may need to be developed to capture the unique situation with "family" as a person ages.

The socioeconomic subscale provides a different challenge. The number of items, nine, do not seem to be the problem; rather the inter-item correlation may likely be the cause of the difficulty. Particular concern was noted on the items relating to satisfaction with education, job and the importance of having a job. In addition, it is possible that two distinctive constructs are being measured, social and economic. Ferrans and Powers (1992) have suggested that social may need to be considered separately, or combined with the family subscale into one subscale of "social support". The difficulties encountered with both the family and socioeconomic subscale in this study, would lend support for the latter.

SF-36.

The SF-36 was simple to administer by interview, and had internal consistency scores for all subscales that were acceptable for basic research. For seven of the eight subscales, the sample's scores were consistent with national norms for persons ≥ age 65 (Ware et al., 1993). A ceiling effect was seen for the subscales on social functioning, role-emotional and role-physical, which may indicate a tendency to give socially desirable responses in these areas. The ceiling effects within the sample were consistent with ceiling effects reported by McHorney et al. (1994) for subjects over the age of 65.

The SF-36 measures health within the most recent four week time period. Generalizations about the subjects' health outside of that time frame must be made with caution, since the four week time period may not accurately reflect the health status for a 6 or 12 month period. Further analysis of the stability of the results of the SF-36 over extended time periods is recommended.

The SF-36 and the Quality of Life Index.

During data analysis, the possibility of a tautology between selected SF-36 variables and the QOLI arose. All eight SF-36 variables were significantly correlated with the QOLI, but three had substantial magnitude: Mental Health (r = .60); Vitality (r = .52); and General Health (r = .53). The QOLI consists of four subscales, two of which are entitled "Health

and Functioning" and "Psychological/Spiritual". The correlations between these two subscales and the SF-36 subscales in question were significant (all at $p = .000$) and across a range of magnitudes (from $r = .32$ between Vitality and Psychological Quality of Life to $r = .61$ between General Health and Health Quality of Life). Because the various subscales and instruments can only attain a correlation that is the product of the two reliabilities, substantial overlap between the instruments was noted. Regression analyses, using different procedures, resulted in Mental Health and Vitality explaining 39% to 49% of the variance of quality of life; General Health explained approximately 10% of the total variance, once controlled for Mental Health. The question remained: were these two instruments measuring the same concept in a different way?; or, are Mental Health, Vitality and General Health truly major significant predictors of quality of life?

Individual questions on both instruments were reviewed for redundancy. Five items in the QOLI questioned satisfaction with aspects of life that were similar in wording or content to the SF-36: (QOLI vs SF-36 variable) 1.) "health" vs "general health"; 2.) energy; 3.) "amount of stress or worry" vs "feeling nervous", "calm and peaceful";4.) "peace of mind" vs "calm and peaceful"; and 5.) "happiness in general" vs "a happy person". Twenty-nine other items on the QOLI were not closely related in terminology or content to the SF-36

variables of interest.

Although similar in terminology, the wording of the questions being asked by the two instruments is different. For example, the QOLI asks, "How satisfied are you with the amount of energy you have for everyday activities?" and "How important to you is having enough energy for everyday activities?" The SF-36 Vitality question asks, "How much of the time during the past four weeks did you have a lot of energy?" The SF-36 is focusing on a quantitative evaluation of how often a person felt a certain way. The QOLI is focusing on how satisfied a person is with feeling that way. No where in the SF-36 is the subject asked to evaluate personal satisfaction with any of the measured concepts.

Further review of the literature related to the SF-36 suggests that, at times, the instrument is referred to as a measure of "health-related quality of life" (Ware et al., 1993; Weinberger et al., 1994; Berlowitz, Du, Kazis & Lewis, 1995). Ware et al. (1993) define health-related quality of life as "personal health status; usually refers to aspects of our lives that are dominated or significantly influenced by our mental or physical well-being" (p. G:3). Well-being is defined as "subjective bodily and emotional states; how an individual feels; a state of mind distinct from function that pertains to behaviors and activities" (p. G:7). No definition of life satisfaction is given. The authors suggest that the phenomena of well-being is best captured by the SF-36

variables of Bodily Pain and Vitality (for physical well-being) and by Mental Health and Vitality (for mental well-being).

Ware et al. (1993) report on a comparison of the Mental Health scale with a one item (dichotomized) measure of dissatisfaction with life. The Mental Health scale scores were in the direction expected, with 70% of the sample who reported being dissatisfied also scoring "0" on the 5 item Mental Health scale. A similar comparison with a one item life satisfaction question ("How happy, satisfied or pleased have you been with your personal life during the last month?") found significant positive correlations with Mental Health (r = .60), Vitality (r = .45), and General Health (r = .35). Ware et al. provide limited support for the SF-36 scales as surrogate measures of "health-related quality of life". The strongest support derives from well-being related to the Mental Health and Vitality subscales. The authors admit that "a sound basis for interpreting the SF-36 scales as a measure of health and health-related quality of life...is being debated" (p. 9:23). A major difficulty with this analysis is, as with most other quality of life research, the definition and precision of terms across instruments relating to well-being, satisfaction, happiness, and quality of life.

Ferrans strongly defends the differences between the QOLI and the SF-36 (C. Ferrans, personal communication, February 1, 1996). She suggests that the QOLI is measuring life

satisfaction and the SF-36 is measuring physical and mental functioning from the perspective of the patient/subject. "Life satisfaction suggests an evaluation based on comparisons of desired and actual conditions of life" (Ferrans,. 1990a, p. 15). Ferrans perceives the QOLI as evaluating the actual conditions of life that are reported in the SF-36. She challenges the use of the SF-36 as a measure of quality of life.

Because of the potential tautology, Mental Health and Vitality were not included in the regression analysis on quality of life as measured by the QOLI. Removal of the two variables was justified by the theoretical similarities in the construct of "well-being" used in both instruments. General Health was included in the regression analysis, based on support from previous research studies on quality of life, and after further review of the theoretical background of the SF-36 variables.

The question of tautology between the two tools remains unanswered by this study, but warrants further research. Are the SF-36 variables of Mental Health and Vitality providing concurrent criterion related validity for the QOLI? or, are they truly major significant predictors of life satisfaction? A third possibility is that the Mental Health variable is tapping into a personality characteristic ("general positive affect" MOS, [1994], p. 2) that was noted under the discussion of Research Question Six. A general positive affect

could certainly influence a person's overall evaluation of life satisfaction.

Further methodological analysis is recommended, with clarity of definitions regarding the major theoretical constructs under consideration.

Limitations

This section will review the limitations to the study in regard to internal and external validity.

Internal validity refers to "the degree to which it can be inferred that the independent variable(s), rather than uncontrolled, extraneous factors are responsible for the observed effects" (Polit & Hungler, 1991, p.647). Many controls were introduced into this study to decrease threats to internal validity. Also the range of responses to the majority of the questions and instruments suggest a lack of systematic bias in any one direction. However, possible threats to internal validity must still be explored.

Subjects were randomly chosen for inclusion in this study. This procedure helps to decrease selection bias, and controls for all possible sources of extraneous variation (Polit & Hungler, 1991, p. 228). The subjects were selected, however, from voter registration lists which did not include 100% of the persons eligible for the study. Thus, under-representation of certain segments of the population might introduce systematic bias into the variables of interest.

Because the former driver subgroup was significantly

older than the current driver subgroup, the possibility of a cohort effect must be considered. It has been suggested that the old-old are more heterogeneous than the young-old, which could potentially correct for this threat. However, the influences of a cohort's life experiences on the variables of interest cannot be ruled out.

The characteristics of the population who agreed to participate is a cause for concern. Although the sample population compared favorably with the SMSA population from which it had been drawn, there was over-representation of persons who were more educated and had higher incomes. Any number of study variables could have been effected by these demographic differences. Herzog and Rodgers (1988) suggest that older adults tend not to participate in research studies primarily because of poor health. The older adult population who do participate, therefore, may be overly representative of healthier groups. A range of health problems and health status was reported by this study sample. But, the low response rate introduces the possibility that a large segment of the more unhealthy older population was missed. Consideration must be given to the possible changes in the findings if more of the participants had poorer health. Lastly, former drivers subjects who agreed to participate may have done so because they had adapted well to their change in driving status, and were willing to talk about it. Lack of participants who were angry, embarrassed and did not want to talk about the issue

could change the findings.

The research situation in itself, as well as the instruments, may influence the results. Control of the research situation was introduced by the investigator doing every interview in the same order and format in a private location. Despite standardization of the interview situation, it is possible that the investigator inadvertently communicated preconceived expectations to the subjects that would influence their responses to the questions. Socially desirable/acceptable response bias has been particularly noted among older adult research subjects (Herzog & Rodgers, 1986). Response bias would tend to inflate scores on the QOLI and the SF-36, and could seriously jeopardize the results of the study.

Interpretation of the variables used to measure the concepts of interest is probably the most serious threat to internal validity in this study. An absolute count of the number of trips to various destinations was used as a measure of "mobility". Comparisons between current drivers and former drivers on number of trips was used to evaluate "mobility consequences" for former drivers. (The assumption being that if former drivers are traveling to selected destinations at least as often as current drivers, mobility consequences are lessened). No data was collected on how often former drivers traveled to the destinations prior to cessation of driving. Therefore, it is unknown whether former drivers had previously

traveled more, equally, or less often than the current driver group. A more accurate portrayal of mobility consequences would be to measure travel characteristics while still driving, and then after stopping. The cross sectional nature of this study, as well as potential problems with recall bias, limited the use of such a measure. Wachs (1988) has suggested "a person's mobility should be judged by the extent to which his/her need to travel is being met, and not by how much he/she travels in comparison to others" (p. 170). No reliable or valid conclusions regarding former drivers' satisfaction with their level of current mobility, as it specifically relates to transportation, can be made from the variables measured in this study.

External validity is "the degree to which the results of a study can be generalized to settings or samples other than the ones studied" (Polit & Hungler, 1991, p. 644.). Generalizations of these findings, beyond the SMSA population, should be done with great caution, and only to those older adult populations with demographic characteristics similar to the SMSA. Connecticut tends to have a more highly educated, wealthier population which does not mirror the demographic situation of the United States. The generalization of the findings should also be limited to areas with senior adult transportation resources similar to that within the study area.

Research

A number of potential research studies are stimulated by the experiences and findings from this study. Only a few of these will be discussed.

Replication of the study is suggested, particularly with better representation of lower income older adults. A study focusing solely on former drivers who were legally required to stop driving is also recommended. Although still a small percentage of older former drivers, this group has undergone a very different experience than most of the subjects in this study. A better understanding of their lived experience is needed.

Thirty-two percent of the variance of quality of life was explained by variables within this study. Approximately two-thirds of the variance was not explained. Further study of the construct of quality of life is recommended, with particular attention to the influence of personality predispositions.

In order to obtain a more precise understanding of mobility consequences and mobility adaptations, longitudinal studies with groups of older drivers are encouraged. Following a cohort would allow for more accurate comparisons of pre and post-driving travel (mobility consequences) and a better understanding of mobility adaptations over time. For example, do transportation resources (for former drivers) remain constant or change as time progresses? At what point do former drivers start using Dial-A-Ride services?

Family and friends are providing the majority of transportation for former drivers. Little is known about the perceptions of these groups in regard to this supporting role. Is providing automobile rides a burden? Or, is it an accepted part of the family/friend relationship? Further study of this aspect of instrumental support is suggested.

Further development and testing of Carp's conceptual model is recommended. As previously mentioned, variables relating to health and satisfaction with mobility would need to be integrated.

Finally, further development of reliable and valid questions or instruments related to the construct of "mobility" is recommended. Subjects' satisfaction with their current frequency of travel, current mobility and current resources for transportation were not adequately elicited by this study. A question or questionnaire needs to be developed that will capture satisfaction with mobility that specifically relates to the presence or absence of transportation. Additional information is also needed on where former drivers <u>want</u> to go, how often, and where they want to go but cannot due to lack of transportation. It is unknown if former drivers have lowered their expectations and accepted it, tolerating unmet needs, or whether they want to travel more (Wilkin, 1987). The speculative nature of this type of information provides a challenge for the development of reliable and valid questions on the topic.

Implications

Burkhardt (1994) has suggested that generalizations about transportation solutions for the older population are useless due to the heterogeneity of the population (p. 15). Findings from this study provide partial support for Burkhardt's intimation. Individual health status, income and choice factor into an older person's need to travel to selected destinations. A number of findings from this study, however, allow limited generalizations of interest to policymakers.

In support of previous national studies, former drivers (when compared to current drivers) have a loss in total mobility, even when health and age are taken into consideration. The loss is seen across the majority of destination categories, but is most severe in the area of recreation. Higher order activities, (church, contact with family and friends, jobs, and recreation), have been shown to be important in the overall quality of life of former drivers. Public transportation programs for the elderly are inconsistent in providing rides to these destinations, generally assigning them low priority. Qualitative findings from this study support the desire of former drivers to travel to destinations that would be considered "higher order", particularly recreation. The diversity of destinations cited, however, would be difficult to realize with a mass transportation program. The challenge to transportation planners is to consider creative solutions to provide travel

to destinations other than those considered life maintenance.

Former drivers in this study demonstrated a preference for traveling as a car passenger, generally with family and friends. They also showed a propensity to use hired drivers to provide transportation to various resources. Despite economic limitations, people were willing to spend money to avail themselves of the many positive qualities of this type of transportation. Some areas of the country are beginning to develop creative programs to meet this consumer demand (Freund, 1995). Freund has suggested that if attractive, alternative, independent transportation is available, older adults may be less reluctant to stop driving (personal communication, March, 1994). Further development of such programs, dedicated to meeting the needs of older adults, is recommended.

Former drivers reported use of paratransit and transit services prior to the cessation of driving. Current drivers had limited experience with these alternative resources. As has been previously suggested, former drivers may have been more willing to stop driving because of their familiarity with alternative transportation resources. Here again, some areas of the country have begun to develop programs to familiarize and to encourage older adults, including current drivers, to use transportation other than driving (Hereen, 1995). Replication of such programs is recommended.

A great deal of attention is now being paid to retirement

planning, especially in the area of finances. Many companies or organizations offer retirement planning programs for persons nearing, or at, retirement age. Information about "driver life expectancy" should be integrated into these programs, and adults should be encouraged to seriously plan for a possible "career" as a former driver. Particular emphasis should be given to the evaluation of the positive and negative effects on mobility that can occur with various housing options.

Transportation planning for the aging of the "baby boomers" will depend a great deal on the forecasting of the health status for this cohort. Will the group live longer with better health and a lessened period of dependency? Or conversely, will they live longer, but with a concomitant longer period of dependency? The findings of this study would suggest that the former would result in greater numbers of older adults independently providing their own transportation through driving. The latter, however, would indicate poorer health, increasing numbers of former drivers and an accompanying need for extensive development of alternative transportation resources, in order to meet mobility needs of an evergrowing older population.

Carp (1988) has noted the importance of including "mobility" in planning studies involving older adults. Questions regarding driving and transportation should be included for older adults in the National Health Interview

Survey. In addition, "driving" should be considered for inclusion as one of the Instrumental Activities of Daily Living (IADL's).

This study does not purport to provide answers to the major public policy question as to when it is appropriate to remove older persons from the driving population. What the findings of this study do suggest are that older adults are generally making reasonable decisions regarding their own driving abilities. In addition, the mobility consequences of relinquishing the driving privilege are not as dismal as had been previously thought. If an older person does stop driving, they should be able to maintain a reasonable amount of mobility through the use of personal and public transportation resources.

Finally, transportation planners, gerontologists and others should take extreme care in making generalizations about the impact of cessation of driving on older adults, particularly related to "quality of life". Changes do occur in an older adult's life as a result of not driving, but the changes may not be as dismal as previously assumed. Unfortunately, a stereotype has proliferated that does not take into consideration the heterogeneity or adaptability of older adults. Older adults have "heard" this stereotype, and may be reluctant to stop driving when needed. Emphasis must remain with the goal of keeping older adults driving safely, as long as possible. But accurate information about "life as

a former driver" should also be carefully disseminated.

Conclusions

This study explored the mobility adaptation, mobility consequences and quality of life of a group of older adults who had stopped driving.

In contrast to previous studies, the perceived quality of life of former drivers in this study was not significantly different from that of current drivers once health was taken into consideration. For the sample as a whole, variables related to health and social interaction were most predictive of quality of life; no variables directly related to driving or driving status were significant.

Actual and perceived health status were also the major predictors of quality of life for former drivers as an individual group. In contrast to the total sample however, participation in higher order activities and the relative ease of availability of a driver (or transportation) were also influential. Although the act of driving was not important in the total sample's overall life satisfaction, the ability to continue to participate in recreation, jobs, religious services and visits to family and friends that is afforded by proximate transportation is important to former drivers. The question arises as to whether the unmeasured (subjective) benefits received from participation in higher order activities somehow substitutes for an unmeasured (subjective) loss from the cessation of driving. The findings suggest that

access to resources, generally provided by transportation (mobility), assumes a more important role in maintaining quality of life for older persons who can no longer drive. Thus, in order to sustain quality of life, the importance of maintaining and improving transportation options for this potentially ever-growing population is strongly urged.

Former drivers were traveling to most individual destinations less often than current drivers. The most common means of travel was as a car passenger, in an automobile driven by family or friends. Former drivers were also using resources other than transportation (e.g. phone, mail, catalogs, other people) to meet various life needs. What is unknown is how their previous rate of travel (as a driver) compares to their current rate of travel, and the level of satisfaction that they have with their current level of mobility specifically related to availability of transportation.

The findings suggest that quality of life is a multi-faceted construct that is strongly influenced by subjective perceptions, and perhaps personality, rather than external, objective criteria. The significant predictor variables that appear to be objective--contacts, higher order trips, available driver--may actually be surrogate measures of phenomena experienced by the subjects. Caution is advised in regard to evaluating an older adult's quality of life against objective standards that may not reflect actual desires;

rather it is desireable to consider both objective and subjective evaluations of quality of life domains.

The findings suggest that "health" is the most important variable in the study. As with previous research studies, perceived health status is directly and significantly influencing quality of life. Actual health status is directly influencing ability to drive. Health status must also be considered in the desire and ability of an older person to travel to various destinations. Support is provided for public health activities that work to maintain or improve the health status of older persons.

Care must be taken that the findings of this study not be used against older adults in their desire to continue to safely drive, nor as evidence for the discontinuation of paratransit services. Rather, emphasis should be placed on the fact that the majority of older adults are self-regulating when it comes to the cessation of driving. They are making adjustments in their lives to meet their needs through a variety of resources. Credit should be given to older adults who adapt in a healthy manner to the multiple losses in their life, including driving. We are reminded of the heterogeneity of people, needs and responses within the older population. Generalizations, based on speculation, can only prove a disservice.

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Appendix A

Driver

QUESTIONNAIRE

1. How many years have you driven a car?

   _____years ___1

2. Beside driving yourself, do you ever routinely

   a. use a BUS to get places? _____YES _____NO ___5

   b. use a TAXI to get places? _____YES _____NO ___6

   c. use Dial-A-Ride to get places? _____YES _____NO ___7

   d. WALK to get places? _____YES _____NO ___8

   e. ride with others to get places? _____YES _____NO ___9

PLEASE GO ON TO THE NEXT PAGE

Appendix A

Former Driver

QUESTIONNAIRE

1. How many years did you drive a car? ___ ___1

   _____years

2. When did you stop driving? ___ ___2
   (indicate year or # of years ago)

   _____

3. How was the decision made to stop driving?

4. Do you now have a valid driver's license? ___4

   _____YES

   _____NO

5. Before you stopped driving, did you ever routinely

   a. use a BUS to get places? _____YES _____NO ___5

   b. use a TAXI to get places? _____YES _____NO ___6

   c. use Dial-a-Ride to get places? _____YES _____NO ___7

   d. WALK to get places? _____YES _____NO ___8

   e. ride with others to get places? _____YES _____NO ___9

6. Since you stopped driving, have you moved? ___10

   _____YES (probe reason)

   _____NO

Appendix A

7. Would you please indicate, on average, how often you do the following activities?

	QD	2-3 X per week	QWK	2-3 X per month	QMO	Sev. X per yr.	QYR or less	NEVER*	Reason	
a.Attend clubs or meetings, including Sr. center activities										11
b. Attend religious services										12
c. Banking										13
d. Visit with your children or other family members outside of your home										14
e. Visit with your children/other family members in your home										15
f. Go to the beauty shop/barber										16
g. Talk on the phone to children/other family										17
h. Go to a Dr.'s appt (or other hcp)										18
i. Go to a drugstore to buy medications										19
j. Do things for recreation/entertainment, such as movies, sporting events, theatre, etc.										20

Appendix A

	QD	2-3 X per week	QWK	2-3 X per month	QMO	Sev. X per yr.	QYR or less	NEVER*	Reason
k. Eating in restaurants									
l. Visit with friends outside of your home									
m. Visit with friends in your home									
n. Talk with friends on the phone									
o. Grocery shopping									
p. Shopping other than for food									
q. Work at a paid job or volunteer job outside of your home									
r. Vacation									
s. Take someone somewhere									

Appendix A

8. Now I would like to ask you how you usually get to these activities. (only ask activities that R. identified in (

When you go to:	How do you usually get there?						*If a carpass, who usually drives?						
	Drive (1)	Walk (2)	DAR (3)	Bus (4)	Taxi (5)	Carpass* (6)	SP (1)	CH (2)	FAM (3)	FR (4)	HSP (5)	NB (6)	O (7)
a. clubs or meetings													
b. religious services													
c. the bank													
d. the beauty shop or barber													
e. visit with your family													
f. a doctor's appt.													
g. the drug store													
h. recreational or entertaining activities													
i. restaurants													
j. visit with friends													
k. the grocery													
l. other shopping													
m. work or a volunteer job													
n. vacation													
o. take someone somewhere													

Appendix A

9. How often are you able to go to the places you would like to go?

_____As often as you'd like

_____Fairly often

_____Not nearly as often as you'd like ____60

10. How often does transportation (or getting rides) trouble you?

_____Often

_____Sometimes

_____Never ____61

11. Now I would like you to think about the neighborhood or community where you live. Please evaluate your community on the following characteristics:

	EXC	VG	GD	FR	PR	
a. convenience for shopping						____62
b. near grocery stores						____63
c. convenient for visitors						____64
d. near medical services						____65
e. public transit						____66
f. access to public transit						____67
g. safety						____68
h. neighbors						____69
i. Senior Citizen transit						____70
j. structural features for walking; e.g. sidewalks, crosswalks with lights.						____71

Appendix A

HEALTH

The next series of questions asks about your health.

I am going to ask you whether you have any of a list of different medical conditions or illnesses. You can answer YES/NO. If you answer YES, I will ask how much the medical condition interferes with your activities.

	Y	N	NOT AT ALL	A LITTLE	A GREAT DEAL	
1. Arthritis/Rheumatism						142
2. Glaucoma						144
3. Asthma						146
4. Emphysema/chronic bronchitis						148
5. Tuberculosis						150
6. Hypertension						152
7. Heart disease						154
8. Circulation trouble in arms or legs						156
9. Diabetes						158
10. Ulcers, other stomach, intestinal, digestive problems						160
11. Liver disease						
12. Kidney disease or other urinary tract disorder						
13. Cancer						
14. Anemia						
15. Effects of a stroke						
16. Parkinson's Disease						

Appendix A

	Y	N	NOT AT ALL	A LITTLE	A GREAT DEAL
16.Epilepsy					
17.Cataracts					
18. Others?					

SF-36 HEALTH SURVEY

Instructions: This part of the survey asks for your views about your health. Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

(circle one)

Excellent.....1

Very good.....2

Good.....3

Fair.....4

Poor.....5

Appendix A

2. Compared to one year ago, how would you rate your health in general now?

(circle one)

Much better now than one year ago.....1

Somewhat better now than one year ago.....2

About the same as one year ago.....3

Somewhat worse now than one year ago.....4

Much worse now than one year ago.....5

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3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(circle one number on each line)

ACTIVITIES	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking **more than a mile**	1	2	3
h. Walking **several blocks**	1	2	3
i. Walking **one block**	1	2	3
j. Bathing or dressing yourself	1	2	3

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Appendix A

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities.	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the **kind** of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

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5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(circle one number on each line)

	YES	NO
a. Cut down the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Didn't do work or other activities as **carefully** as usual	1	2

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Appendix A

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

(circle one)

Not at all.....1

Slightly.....2

Moderately.....3

Quite a bit.....4

Extremely.....5

——167

7. How much bodily pain have you had during the past 4 weeks?

(circle one)

None.....1

Very mild.....2

Mild.....3

Moderate.....4

Severe.....5

Very severe.....6

——168

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

(circle one)

Not at all.....1

A little bit.....2

Moderately.....3

Quite a bit.....4

Extremely.....5

——169

Appendix A

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks-

(circle one number on each line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a.Did you feel full of pep?	1	2	3	4	5	6
b.Have you been a very nervous person?	1	2	3	4	5	6
c.Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d.Have you felt calm and peaceful?	1	2	3	4	5	6
e.Did you have a lot of energy?	1	2	3	4	5	6
f.Have you felt downhearted and blue?	1	2	3	4	5	6
g.Did you feel worn out?	1	2	3	4	5	6
h.Have you been a happy person?	1	2	3	4	5	6
i.Did you feel tired?	1	2	3	4	5	6

Appendix A

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

(circle one)

All of the time.....1

Most of the time.....2

Some of the time.....3

A little of the time.....4

None of the time.....5

____172

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a.I seem to get sick a little easier than other people	1	2	3	4	5
b.I am as healthy as anybody I know	1	2	3	4	5
c.I expect my health to get worse	1	2	3	4	5
d.My health is excellent	1	2	3	4	5

____173

12. Taking everything into consideration, how would you describe your overall satisfaction with your life at the present time?

_____EXCELLENT
_____VERY GOOD
_____GOOD
_____FAIR
_____POOR

____174

Appendix A

1. What is your age?

_____years ____175

2. What is your marital status?

_____Never married

_____Now married

_____Widowed/widower

_____Separated

_____Divorced

_____Other ____176

3. What was your total annual income (from all sources) for the last year?

_____$0 - $4999

_____$5000 - $9999

_____$10,000 - $19,999

_____$20,000 - $29,999

_____$30,000 - $39,999

_____$40,000 +

____177

4. What is your race?

_____Asian

_____African-American

_____Hispanic/Latino

_____Native American Indian

_____White

_____Other group not listed

____178

5. What is the highest grade or year of school you have completed?

ELEMENTARY	1	2	3	4	5	6	7	8
HIGH SCHOOL	9	10	11	12				
COLLEGE/TRAINING	13	14	15	16	17	18	19	20

____179

6. How would you describe your type of residence?

____180

Appendix A

The Quality of Life Index

The Quality of Life Index (Ferrans & Powers, 1985) has not been reproduced at the request of the copyright owner. The questionnaire can be obtained from: Carol E. Ferrans, RN, Ph.D., College of Nursing, University of Illinois at Chicago, 845 South Damen Avenue, Chicago, Illinois 60612-7350.

Appendix A

This questionnaire includes the following copyrighted instruments:

Appendix B

UIC The University of Illinois at Chicago

Department of Medical-Surgical Nursing (M/C 802)
College of Nursing
845 South Damen Avenue, 7th Floor
Chicago, Illinois 60612-7350
(312) 996-7900

June 24, 1993

Ms. Mary Ann Thompson
31 Prospect Street
Bloomfield, CT 06002

Dear Ms. Thompson:

Thank you for your interest in the Quality of Life Index (QLI). I have enclosed the generic version of the QLI and the computer program for calculating scores. I also have included a list of the weighted items that are used for each of four subscales: health and functioning, social and economic, psychological/spiritual, and family, as well as the computer commands used to calculate the subscale scores. The same steps are used to calculate subscale scores and overall scores.

There is no charge for use of the QLI. You have my permission to use the QLI for your study. In return, I ask that you send me any publications of your findings using the QLI. Such reports are extremely important to me.

If I can be of further assistance, please do not hesitate to contact me. I wish you much success with your research.

Sincerely,

Carol Estwing Ferrans, PhD, RN
Assistant Professor

Appendix B

Medical Outcomes Trust
Post Office Box 1917
Boston, MA 02205-8516

Alvin R. Tarlov, M.D., President

March 31, 1994

Mary Ann Thompson
31 Prospect Street
Bloomfield, CT 06002-3038

Dear Ms. Thompson:

The Medical Outcomes Trust is pleased to provide the enclosed information about the **SF-36 Health Survey** as requested in your letter of March 29, 1994.

We are pleased, by this letter, to grant permission to you to use the **SF-36 Health Survey**. Enclosed are copies of both the more commonly used 4-week recall format and the acute 1-week recall format, either of which you may reproduce for your use. Also enclosed is a copy of How to Score the SF-36 Health Survey, published by the Medical Outcomes Trust, as well as reprints of publications that may be of interest to you.

If you should decide to use the **SF-36 Health Survey**, we ask that you simply provide us with a brief description of the work for which the instrument will be used and the name of the person in charge of the trial/study, if you have not already done so. The Trust in this way can be informed of progress in the field, be alert to the need for new technology and information, promote standardization, and generally serve to advance the field. We will put you on our mailing list and you will receive copies of the Medical Outcomes Trust Bulletin (enclosed) which is published six times a year, as well as other information.

When reproducing the **SF-36 Health Survey** please include an identifier as follows:

> SF-36 Health Survey, Copyright © 1992 Medical Outcomes Trust. All Rights Reserved.
> Reproduced with permission of the Medical Outcomes Trust

If you add any questions to it, as we and other users often do, or embed it in a larger questionnaire, please give the larger questionnaire its own name and indicate the following in small type anywhere on the form including at the end: This questionnaire includes the **SF-36 Health Survey**, item numbers x to y in this questionnaire, Reproduced with permission of the Medical Outcomes Trust, Copyright © 1992.

If for any reason you change the wording of any part of the **SF-36 Health Survey**, or delete any questions or responses, please do not refer to it as the **SF-36 Health Survey**. This is for purposes of standardization of content, scoring, and labeling. We wish to assure users that the designation **SF-36 Health Survey** refers to the identical instrument and scoring rules in all cases. This will allow comparison of scores across multiple reports.

Two books related to the Medical Outcomes Study and to the **SF-36 Health Survey** have been published commercially. Measuring Functioning and Well-Being: The Medical Outcomes Study Approach, Stewart, A.L. and Ware, J.E. Jr., Editors, Duke University Press, 1992; and SF-36 Health Survey: Manual and Interpretation Guide, Ware, J.E. Jr., Snow, K.K., Kosinski, M., and Gandek, B., The Health Institute, New England Medical Center, Boston, Massachusetts.

Appendix B

We wish you the best of good fortune in pursuing your goals with the SF-36 Health Survey. Please contact us if we can be of assistance.

Respectfully,

Alvin R. Tarlov

Alvin R. Tarlov

ART/lpb

Enclosures

Appendix B

DUKE UNIVERSITY MEDICAL CENTER
CENTER FOR THE STUDY OF AGING AND HUMAN DEVELOPMENT

Office of the Director

April 14, 1994

Mary Ann Thompson, RN, MSN
31 Prospect Street
Bloomfield, CT 06002-3038

Dear Ms. Thompson:

You have our permission to reproduce and use the OARS/MFAQ for the purposes stated in your letter. We have one requirement and one suggestion. The requirement is that the Duke Center copyright appear on the face of all reproductions of the instrument and that any modifications of the instrument must also be noted on the face page, reported to us, and noted in publication of results.

The suggestion is that you keep in touch with us as your work progresses. There are over 150 users of the OARS/MFAQ nationwide. You may want to be in touch with other users with interest similar to your own..

The person with whom you would correspond in the future about OARS is Dr. Gerda Fillenbaum. You can write to her at Box 3003, Duke University Medical Center, Durham, NC 27710.

Sincerely,

Harvey Jay Cohen, M.D.
Professor of Medicine,
Aging Center Director and
Chief, Geriatrics Division
Associate Chief of Staff for
Geriatrics and Extended Care,
and Director, GRECC, VAMC

HJC/wh

Box 3003 • Durham, North Carolina 27710 • Telephone (919) 660-7500 • FAX (919) 684-8569

Appendix B

TO: Mary Ann Thompson, RN, MSN

FROM: Darlene Yee, Ed.D., CHES

DATE: April 28, 1994

SUBJECT: Response to 4/14/94 Letter

I apologize for the delay in responding to your letter of 4/14/94. I just returned from a Sigma Xi meeting in Atlanta, GA and will be leaving today for a National Council on the Aging meeting in Washington, DC.

You are welcome to use items 122-129 on page 12 of the MY-CODA instrument-- just be sure to reference the source in your bibliography. Also attached you will find a copy of the Spielberger instrument for your interest as discussed.

Please let me know if you have additional questions or require additional information. Good luck on your doctoral dissertation.

Enclosure/

Appendix B

From: INZ"DFQ@CU.NIH.GOV" 20-APR-1994 15:16:44.12
To: INZ"thompsom@ganesha.sjc.edu"
CC: INZ"DFQ@CU.NIH.GOV"
Subj: Older drivers

Return-path: <DFQ@CU.NIH.GOV>
Received: from CU.NIH.GOV by ganesha.sjc.edu (PMDF V4.2-11 #4161) id
<01BEI69N2B4002UG0@ganesha.sjc.edu>; Wed, 20 Apr 1994 15:16:33 EDT
Date: Wed, 20 Apr 1994 15:01:51 -0400 (EDT)
From: DFQ@CU.NIH.GOV
Subject: Older drivers
To: thompsom@ganesha.sjc.edu
Cc: DFQ@CU.NIH.GOV
Message-id: <01HBEI6AV03M002UG0@ganesha.sjc.edu>
Content-transfer-encoding: 7BIT
X-Notify:

Dear Mary Ann,

I have submitted some of the discriptive data on the older drivers to the Am J Pub Hlth including findings on health status and driving practices. Needless to say the reviewers were more concerned with the drivers only and their risks for crashing and in the risk for quitting associated with health declines.
Less interest was expressed on the nondrivers and in trip taking, or perhaps it was simply in my organization and delivery of these results. Although I was discouraged I will probably rework the the results and resubmit them to another journal by the end of the summer.
In the interim. I may inquire as to the content of the 19 NHTSA survey entitled Nationwide Personal Transportation Survey to see if I can juxtapose the EPESE data with national data on trip taking.
Regarding nondrivers. I have done little and would encourage you to consider this group, especially women living alone.

Also. you are free to duplicate the questionnaire in any way you desire since it was developed under the auspices of the federal government. primarily myself and several other colleagues at Iowa and Yale.

Please feel free to call and discuss things further if you would like.

Sincerely.

Dan Foley
National Institute on Aging

Appendix C

May , 1994

Subject's name
Subject's street address
Subject's town, state

Dear _____,

My name is Mary Ann Thompson. I am a Registered Nurse who teaches at Saint Joseph College in West Hartford, I am also a doctoral student at Columbia University, School of Public Health, in New York City.

1678 Asylum
Avenue
West Hartford
Connecticut
06117-2700
Tel 203-232-4571
Fax 203-233-5695

I am writing to invite you to participate in a research project that I am doing as part of the requirements for my doctorate. I obtained your name and address from the list of registered voters for the town of _____. Over 400 people in the Greater Hartford area are being included in this request.

The purpose of my project is to try to learn more about the similarities and differences between persons over the age of 65 who drive and those who have stopped driving. By getting input from people like you, I hope to contribute knowledge on the importance of keeping older persons driving safely as long as possible, as well as information on how to keep former drivers as mobile as they would like.

So how can you help? If you are a current driver or a person who has stopped driving for any reason, I would like to interview you. The interview takes about one hour, and can be done at your home, at Saint Joseph College, or any other mutually agreed upon location. All information that you give during the interview is confidential.

Because I have received some funding from a Professional Nurse Traineeship Grant, I am able to offer you a stipend of $20 for your help with the study.

Whether you are, or are not interested in participating, please return the enclosed self-addressed stamped post card. If I do not hear from you within two weeks, I will phone you to determine your interest in participating. If you have any questions about the study, please phone me at _____.

Thank you. I look forward to hearing from you soon.

Sincerely,

Mary Ann Thompson

Appendix C

Informed Consent

My name is Mary Ann Thompson. I am a Registered Nurse who teaches nursing at Saint Joseph College, West Hartford. I am also a doctoral student at Columbia University, School of Public Health, New York.

I would like to invite you to participate in a research study that I am conducting as part of my studies at Columbia. The purpose of this study is to gain a better understanding of older persons who have stopped driving.

If you agree to participate, I will ask you a series of questions about transportation, types of trips taken, your general health, and your personal evaluation of your current life situation. This should take approximately 60 minutes.

There are no physical or mental risks expected from this study. The only inconvenience to you is the time involved in answering the questions. You should expect no direct benefits from this study. However, the results may lead to a better understanding of the transportation needs of all older persons.

Your name will not be recorded in any way on the answer sheet. There will be no way to identify your particular answers. Specific answer sheets will only be seen by me. Your responses will be grouped with others, and written into a report to be submitted to Columbia University.

At any time, you may feel free to decide not to participate in the

Appendix C

study. This will not affect you in any way.

Answering the questions will serve as verbal agreement that you have:

1. read this form, or have had it read to you,
2. understood the general purpose of the study, and
3. understood the possible inconveniences.

At this point, please ask me any questions you might have.

Table 25

Pearson Correlations for Total Trips Per Year (N = 210)

	Total trips	Age	Driver	General Health	Income	Physical Function	Resi-dence	Driving Status
Age	-.36***							
Driver[a]	-.29***	.51***						
General health	.24***	-.02	-.08					
Income	.28***	-.28***	-.40***	.13				
Physical Function	.29***	-.42***	-.30***	.45***	.18*			
Resi-dence[b]	-.35***	.55***	.62***	-.23**	-.44***	.37***		
Driving Status[c]	-.33***	.54***	.91***	-.17*	-.41***	-.40***	.65***	

[a]"Driver" is a hierarchical variable for the primary driver resource for trips, ranging from "self" (lowest number) to "public agencies" (highest number). [b]"Residence" is a dichotomous variable, 0 = non-senior housing; 1 = any type of dedicated senior housing. [c] "Driving status" is a dichotomous variable; 0 = current driver; 1 = former driver.
*p = .01. **p = .001. ***p = .000.

Table 26

Pearson Correlations for Quality of Life (N = 210)

	QOL	Age	Contacts	Eye Inter	GH	Income	Carp High
Age	-.09						
Contacts	.19 (.005)	-.11					
Eyes Interfere[a]	-.16 (.017)	.40 (.000)	-.07				
General Health	.53 (.000)	-.02	.00	-.16 (.019)			
Income	.17 (.012)	-.28 (.000)	.01	-.21 (.002)	.13		
Carp High[b]	.28 (.000)	-.25 (.000)	.45 (.000)	-.17 (.010)	.23 (.001)	.22 (.001)	

(table continues)

	QOL	Carpmain	MH	PF	Recr.Trip	Status	Tot.Hlth
Carpmain[c]	.00						
Mental health	.60 (.000)	.00					
Physical Function	.32 (.000)	.25 (.000)	.22 (.001)				
Recrea-tion Trips/Yr.	.23 (.001)	.17 (.013)	.16 (.019)	.21 (.002)			
Driving Status[d]	-.19 (.004)	-.42 (.000)	-.17 (.013)	-.40 (.000)	-.29 (.000)		
Total # of health problems	-.33 (.000)	-.19 (.005)	-.19 (.004)	-.50 (.000)	-.18 (.007)	.32 (.000)	

(table continues)

	QOL	Vitality	Friends	Family
Vitality	.52 (.000)			
Visits with friends	.20 (.003)	.13 (.05)		
Visits with family	.08	-.03	.05	

[a]"Eyes interfere" is a dichotomous variable indicating presence or absence of interference in activities from eye problems. [b]"Carp high" is the total number of trips/year to higher order destinations, including clubs, recreation, jobs, religious services, and visits to family and friends. [c]"Carp main" is the total number of trips per year to life maintenance destinations, including grocery shopping, other shopping, health care, pharmacy and the bank. [d]"Driving status" is a dichotomous variable, 0 = current driver; 1 = former driver.

Table 27

Pearson Correlations for Quality of Life: Former Drivers (n = 81)

	QOLI	Age	Contacts	EyeInter	GH	Income	CarpHigh	CarpMain
Age	-.009							
Contacts	.15	-.06						
Eye Inter-ference[a]	-.003	.34 (.002)	-.07					
General Health	.48 (.000)	.18	-.02	-.03				
Income	.10	.03	-.13	.11	.02			
Carp High[b]	.41 (.000)	-.02	.21	.008	.25 (.02)	.06		
Carp Main[c]	-.12	-.27 (.01)	.17	-.08	.09	-.14	.04	

(table continues)

	QOLI	Mental H	PhysFunc	Recr	Driver	T.Health	T. Trips	Vitality
Mental Health	.58 (.000)							
Physical function	.15	.07						
Recreational Trips	.27 (.01)	.26 (.01)	-.02					
Driver[d]	-.12	.06	.16	.07				
Total health problems	-.15	-.03	-.46 (.000)	.17	-.10			
Total trips/yr	.32 (.003)	.21 (.055)	.26 (.019)	.23 (.034)	.19	-.10		
Vitality	.47 (.000)	.30 (.005)	.36 (.001)	.19	.27 (.014)	-.32 (.003)	.29 (.007)	

(table continues)

	QOLI	Friends	Family
Contacts with friends	.19 (.086)		
Contacts with family	.00	-.09	

[a]"Eye Interference" is a dichotomous variable indicating presence/absence of interference with activities due to eye problems. [b]"Carp High" is total number of trips per year to the following destinations: clubs, religious services, recreation, jobs, and visits to family and friends. [c]"Carp Main" is total number of trips per year to life maintenance destinations, including: health care, pharmacy, grocery, other shopping, and the bank. [d]"Driver" is a hierarchical variable for available drivers; low numbers indicate family, friends; high numbers indicate public resources.