Lessons Learned in Attempting to Survey Hard-to-Reach Ethnic Segments Along with the Presentation of a Comprehensive Questionnaire

MTI Report WP 10-02

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MTI Report WP-10-02

LESSONS LEARNED IN ATTEMPTING TO SURVEY HARD-TO-REACH ETHNIC SEGMENTS ALONG WITH THE PRESENTATION OF A COMPREHENSIVE QUESTIONNAIRE THAT INCLUDES SOME UNCOMMON INDEPENDENT VARIABLES AND SOME UNCOMMON METHODS OF MEASUREMENT

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16. Abstract

A survey questionnaire was developed and administered to transit users in the Sacramento Metropolitan Area to analyze the degree to which global satisfaction with transit is impacted by ethnicity and other relevant independent variables

Although the data collected was not analyzed because the sample size was substantially smaller than required, the questionnaire used, which is included in its entirety in an appendix, has some uncommon variables and measurement approaches that can be used in a number of other survey questionnaires used in transit studies. Options involving sampling methodology and methods of administering the questionnaire that would have generated an acceptable sample size also are discussed.

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EXECUTIVE SUMMARY

This project involved using a telephone-administered survey questionnaire, administered in the Sacramento metropolitan area, to collect data focusing on the impact of ethnicity on attitudes toward transit. More specifically, the primary dependent variable studied was global satisfaction with transit among those who used either rail or bus transit for commuting.

The intent was to compare and contrast the degree of global satisfaction toward transit with four ethnic groups, specifically Caucasians; African Americans; Hispanics who either were born in the United States or else moved to the United States before they were 16 years old; or Hispanics who moved to the United States after they were at least 16 years old. Since many variables might influence global satisfaction with transit, data was collected on a large number of other independent variables, including a number that have not been commonly examined in prior transit studies. The independent variables beyond ethnicity involved attribute importance, attribute perceptions, trip characteristics, neighborhood characteristics, psychographics, and demographics. The more uncommon independent variables are listed below.

- Perceived comparative neighborhood quality
- Perceived travel distance AND perceived travel time
    - If anything is uncommon here, it is using both travel distance and travel time
- Need for equal transit availability during atypical commute departure times
- Need for route flexibility
- Need for equal transit availability on weekends as on weekdays
- Overall or global need for flexibility
- Perceived safety of neighborhood of residence
- Perceived safety of area surrounding most common work location in past six months
- Degree of environmental consciousness
- Degree of perceived financial consciousness
- Degree of job satisfaction

When multiple independent variables are included, it is necessary to try to separate and isolate the impact of different variables. This isolation is accomplished through a multivariate analysis that holds some variables constant while varying other variables. A larger sample size is needed to conduct such a multivariate analysis. More specifically, a minimum of 150 completed questionnaires was needed from **each** of the four targeted ethnic groups to conduct this necessary multivariate analysis. Due largely to not placing enough weight on selecting a geographic sampling frame with a large number of transit users, only 216 questionnaires were completed. As a result of this substantial sampling shortfall, the decision was made to not conduct any statistical analysis of the 216 completed questionnaires.

A chapter of the report is devoted to analyzing why the number of completed questionnaires was substantially less than needed and than expected. To summarize this analysis, one

difficulty involved obtaining enough transit users, within budget, in each of the four ethnic segments to provide their phone number during on-board recruitment, particularly with the two Hispanic segments. Even more surprising was the large number of recruits who gave a phone number that was a nonworking number or was a working number, but the person answering the phone claimed they had not agreed to participate or otherwise claimed they were not in a targeted ethnic segment. In other words, a significant majority of recruits indirectly refused to participate, even with an incentive of participating in a drawing to receive a free monthly transit pass. More specifically, only 20.9 percent of recruits completed the questionnaire. It appears easier to increase the number of recruits by selecting a geographic sampling frame with a larger number of transit users than it is to increase the completion percentage. For example, it would have been a lot easier to recruit enough people within budget in San Francisco County than in Sacramento.

Some uncommon measurement approaches were used with attribute importance and global satisfaction. Pairwise tradeoff measurement was used to measure attribute importance. Based on pretesting results, this measurement approach appeared to work well even with telephone interviewing where respondents must remember the specific tradeoffs rather than being able to read the tradeoffs and having them in front of them while thinking about and responding to each tradeoff. A primer for constructing pairs is presented in Appendix B. An explicit comparative scale was used to measure global satisfaction with transit. This measurement approach also was a sound one based upon pretesting results.

INTRODUCTION

BRIEF DESCRIPTION OF PROJECT OUTCOME

This project involved collecting primary data, generated by a survey questionnaire, to compare and contrast how different ethnic groups use and view various transit modes, with the ethnic groups initially being Asians, Caucasians, Hispanics, and African-Americans, with both Asians and Hispanics being further segmented into two subgroups, (a) those who were born either in the United States or else were born outside the United States but immigrated to this country before they were 16 and (b) those who immigrated when they were at least 16 years of age. Asians were excluded prior to the onset of data collection, largely for cost reasons, but also due to the difficulty of getting interviewers who speak the multiplicity of languages that would have been needed. Nontransit users also were excluded. The decision to include the further segmentation, only with Hispanics based upon how long they have lived in the United States, was made for budgetary reasons. Including this length of time in the United States variable only with Hispanics would have allowed some investigation of its impact on attitudes toward transit, although it did not allow an analysis of any possible interaction effects between ethnicity and length of time in the United States.

Given the research objective stated in the prior paragraph, it would have been inappropriate to use a qualitative research approach using a nonrandom sampling approach, such as focus groups.

In order to begin to understand the impact of ethnicity on transit usage and attitudes, additional independent variables had to be included along with conducting a multivariate analysis to try to separate the impact of ethnicity on these attitudes from the impact of other variables, particularly those related to ethnicity such as income, education, and length of residence in the United States. In general, the intended analysis would have involved holding independent variables not directly involving ethnicity constant, while comparing the different ethnic groups. Since this multivariate analysis involved comparing subsets of each of the below ethnic groups, a large sample size was required. More specifically, the goal was to have at least 150 completed questionnaires from each of the four sample groups:

1. Caucasian transit users born in the United States
2. African American transit users born in the United States
3. Hispanic transit users who were born either in the United States or a Spanish-speaking country and immigrated to the United States before they reached the age of 16
4. Hispanic transit users born in a Spanish-speaking country who immigrated to the United States when they were at least 16 years of age

For a multitude of reasons that will be identified and discussed in the next chapter, only 216 of the minimally necessary 600 survey questionnaires were completed, with the majority

of these completed by Caucasians. Rather than attempting to conduct data analysis with a sample that fell well short of the size needed, the decision was made to not conduct any data analysis. In general, given that at least 50 respondents are needed for reliable statistics for each category of an independent variable and that each of the four ethnic subgroups would be further subdivided to try to separate the impact of ethnicity from other independent variables, the minimum target of 150 respondents in each of the four groups truly was a bare minimum. For example, only 63 Hispanics completed the interview, which was well short of the minimum number of 300 completed interviews for Hispanics. To determine the impact of ethnicity on such factors as global customer satisfaction, it would have first been necessary to subdivide Hispanics by the primary mode of transit used, namely bus or light rail. Even assuming an approximate equal distribution, which is unlikely, this would have resulted in about 30 Hispanic light rail users and about the same number of Hispanic bus users. It then would have been necessary to further subdivide these groups by income to try to separate the impact of ethnicity from the impact of income on global satisfaction. Even if income had been equally distributed for Hispanics and if only two income subgroups were used and if no item non-response existed with income, only about 15 lower-income Hispanic bus riders would have existed with about the same number of higher-income Hispanic bus riders. These cell sizes are much lower than what is needed for reliable statistical analysis.

Although the expected outcome was not accomplished with this project, there were lessons learned.

First, the survey questionnaire instrument included both some uncommon independent variables and some uncommon measurement approaches. This questionnaire can be used in future projects, in whole or in part, for the targeted ethnic groups or for other segments of transit users. The questionnaire is included in Appendix A and is discussed in the last chapter of this report. Second, much was learned about how to try to efficiently and effectively survey hard-to-reach segments. This topic is comprehensively discussed in the next chapter to help future researchers avoid some of the pitfalls encountered in this project.

SURVEY METHODOLOGY OPTIONS FOR SAMPLING HARD-TO-REACH SEGMENTS

SECTION OVERVIEW

A description of the data collection methodology used will be provided as a starting point. This description will be followed by an analysis that focuses on what could have been done differently to obtain the needed number of completed surveys with each of the four segments targeted for a separate comparative data analysis.

GENERAL DESCRIPTION OF DATA COLLECTION METHODOLOGY USED

Note that this subsection is intended to be only a description of the data collection methodology. After this description is completed, the methodology will be evaluated, with the evaluation focusing on ways of improving the methodology. More specifically, the evaluation following this description focuses on two issues. The first issue is the selection of the geographic sampling frame. As discussed in the ensuing evaluation, it was a mistake to select the Sacramento, California metropolitan area. The second issue evaluated is the method of administering the survey, where telephone administration is compared to onboard administration.

The survey was administered in the Sacramento metropolitan area. The questionnaire was administered using computer-assisted-telephone interviewing (CATI). Random digit dialing is normally used with CATI. However, random-digit is extremely inefficient to use with segments that are a small percentage of the general population, which is the case with this project. More specifically, the population here consisted only of those who use transit for commuting, with these transit users consisting of less than 10 percent of the general population. Thus, some method of recruitment was needed, and the method used in this study was onboard recruitment, defined broadly to include recruitment at bus stops and light rail stations. This recruitment involved asking a few scripted questions to first determine whether a transit rider could be classified in any of the four targeted subsegments. If so, then a contact phone number was requested, along with a name and an appropriate time to call. Recruiting was conducted by the Sacramento-based research collection agency used to administer the telephone interviews of the survey questionnaire. Their expertise was used to determine the specific locations used where they believed they were more likely to find recruits from the targeted ethnic segments. Recruitment was conducted during normal morning and afternoon commute times. To encourage riders to agree to participate by providing a first name and phone number, the script indicated that participants would be entered into a drawing, with the winners receiving a free monthly transit pass.

The goal was to recruit 300 respondents from each of the four segments. This number was arrived at largely to stay within budget, but was also based on the assumption that approximately 50 percent of the recruited people who voluntarily agreed to respond to the telephone survey by providing their phone number would actually complete the survey. In other words, if 50 percent of the recruited people in each segment had completed the

questionnaire, the minimum needed number of 150 respondents per segment would have been achieved. Since a systematic literature search was not conducted on response rates with the combination of onboard recruitment and telephone administration of a questionnaire, this 50 percent completion rate was merely a guesstimate. This guesstimate proved to be overly optimistic by a large margin, as only 216 of the recruits completed the questionnaire administered by telephone, which resulted in a response rate of only 20.9 percent. Although it is possible that a systematic literature search would not have discovered a response rate with the combination of onboard interviewing and telephone administration of a questionnaire, the attempt should have been made to conduct such a search, particularly since the response rate was an important parameter. If the search had discovered a relevant response rate with onboard recruiting and telephone interviewing similar to the one that existed in this study, a reevaluation of the sampling and data collection methodology should have been conducted.

RESULTS OF RECRUITMENT

The targeted number of Caucasians and African Americans was achieved within budget. However, it proved to be much more difficult to recruit Hispanics than expected. Since there were two Hispanic subgroups based upon when they moved to the United States, the goal was to recruit a total of 600 Hispanics, but only 358 were actually recruited. In tracking daily recruitment totals, the amount of time spent in the last three or four days of recruiting was generating very few additional Hispanic recruits. Accordingly, the decision was made to terminate additional recruiting of Hispanics. If the estimated 50 percent completion rate had been achieved, then over 150 completed interviews with Hispanics would have been achieved. Although this total was well short of what was needed to separately analyze Hispanics based on when they arrived in the United States, it would have been enough to analyze Hispanics as a single segment. Thus, the decision was made to continue with the telephone interviewing rather than terminating the project at this time.

RESULTS OF TELEPHONE INTERVIEWING

Without any prior warning from the research organization responsible for both the recruiting and telephone interviewing, the organization suddenly reported that the pool of recruits was entirely depleted, with only 216 completed interviews. This is a completion percentage of only 20.9 percent, a percentage that was less than half of the guesstimate of 50 percent.

The research organization indicated that 156 surveys were completed by Caucasians and African Americans combined, although the questionnaire allowed a separation of these two segments. However, this more detailed breakdown was not requested of the research organization due to budget constraints. The combined total for Caucasians and African Americans is only slightly higher than the minimum number of 150 completed surveys for each of these two groups separately. Thus, it can be concluded that the number of completed surveys fell well short of the required minimum number of 150 completed surveys for each of the four groups. This shortfall was particularly troublesome

with the two Hispanic subgroups, where 300 completed interviews were targeted but only 63 interviews were completed.

The response rate was slightly lower for Hispanics (18.2 percent) than for Caucasians and African Americans combined (23 percent). Thus, it can be concluded that the low completion percentage existed due to a general problem with the methodology used, rather than existing due to a more specific problem with one of the targeted groups.

Given this very disappointing and surprising completion percentage, it is necessary to try to determine what caused so many recruits, each of whom agreed to participate and gave a phone number and a name, to not complete the questionnaire. Table 1 provides the data for this analysis. The first row in this table is the total number of recruits and each of the remaining rows places these 1033 recruits into a relevant category.

For starters, it should be noted that the completion percentage would have been higher if the research organization had utilized more frequent call-backs with the 268 recruits who either did not answer a working number (the 179 recruits in the third row) or otherwise said they were busy and requested a call-back (the 89 recruits in the fourth row). Based upon the high refusal rate, many of these recruits would not have completed the questionnaire even if they had answered the phone.

The most striking and disappointing conclusion to be drawn from Table 1 is the extremely large number of what could be termed an indirect refusal to participate. Most, if not all, of the recruits in the fifth, seventh, and eighth rows can be classified as indirect refusals, and the sum of these three rows is 500 recruits, which is almost 50 percent of all recruits. The 200 recruits in the "nonworking residential phone number" category can be labeled indirect refusals because they all provided a phone number and agreed to participate. Although a few of these numbers might have been due to an incorrect recording by the recruiter or

Table 1. Classification of Telephone Interviewing Results – Total Sample

Category Description	Number in Category
Number of Recruited People (sum of remaining categories)	1033
Number of Completed Interviews	216
No Person Answered a Working Number (includes busy numbers, no answers, and answering machine)	179
Person answered and requested a callback (but no callback was made)	89
Nonworking residential phone number	200
Explicit Refusals	16
Probable Indirect Refusals. Includes (a) respondent claimed that person was not at that number or (b) respondent claimed that he or she was not in the target population).	209
Call Blocked (which also could be considered a probable indirect refusal)	91
Miscellaneous	33

by the recruit moving or disconnecting their phone shortly after agreeing to participate, it is likely that most of these 200 recruits intentionally gave the recruiter a false number to avoid needing to explicitly refuse to participate. The 209 recruits in the seventh row, where the recruit, when contacted by phone, directly contradicted the information provided to the recruiter about their name and/or ethnicity also should be said to have indirectly refused to participate. Finally, some of the 91 recruits in the blocked number category could be indirect refusals since they could have unblocked the number.

To summarize the results, two shortfalls contributed to the shortage of completed interviews. One was the recruiting shortfall, with the second shortfall being the lower than predicted ratio of completed surveys to recruits. In searching for methodological changes that would have produced a higher number of completed interviews, the first of these two shortfalls, namely the size of the recruitment pool, is discussed in the next subsection, focusing on using a geographic sampling frame with a larger number of transit riders than Sacramento. The second shortfall, dealing with increasing the response rate or completion percentage is discussed in the later subsection regarding the method of questionnaire administration.

Evaluation of the Selection of the Geographical Sampling Frame

Since the study was funded by the US Departement of Transportation, Research and Innovation Technology Administration and the California Department of Transportation (Caltrans), the logical starting point was to use a transit system in the state of California, with a preference for the northern part of the state, as this corresponded with the residence of the principle investigator.

In retrospect, it was a mistake to select the Sacramento metropolitan area as the location of the study. It was much harder than expected to recruit enough people in each of the four targeted segments, particularly in the two Hispanic segments. San Francisco County would have generated a much larger pool of potential recruits than Sacramento County due to the significantly larger number of transit riders in San Francisco than in Sacramento. More specifically, approximately seven or eight times as many transit users reside within the service area of Bay Area Rapid Transit (BART) and the San Francisco Muncipal Transportation system (MUNI) than with Sacramento Regional Transit.

Some statistics can be presented to demonstrate that the size of the recruiting pool would have been substantially larger in San Francisco than in Sacramento due to the difference in transit ridership in these two locations. The American Public Transit Association (APTA) published the estimated number of unlinked weekday trips on transit in Sacramento versus San Francisco in 2010, with the number for Sacramento being 110,100 transit users, compared to 656,000 transit users for San Francisco. This figure for San Francisco does not include BART riders. The comparable estimate of unlinked weekday trips on BART by APTA is 343,200, realizing that not all BART trips include San Francisco as a destination (American Public Transit Association 2010).

The underlying mistake in selecting the geographic sampling frame was that the difficulty of recruiting a sufficient number of transit riders from each of the four targeted groups

was underestimated. This underestimation resulted in too little weight being placed on transit ridership numbers, with too much weight being placed on each of the criteria or characteristics, including.

- Aggregate population statistics and the ethnic breakdown of these statistics,
- The ease of getting an appropriate research organization to recruit respondents and administer the questionnaire,
- The degree to which the transit system and transit ridership was comparable to other transit systems with both a bus and a rail component, and
- The attitude of the transit system toward onboard recruiting.

Although no formal weighting was actually used to select the geographic sampling frame, the reasoning process used for screening and then selecting Sacramento demonstrates improper weighting.

San Francisco County was rejected because transit ridership is atypically high in San Francisco. The thinking was that the responses to the survey might be different because of the atypical nature of transit in San Francisco. For example, a relatively common criticism of rail systems is that they tend to serve more upscale suburbanites. Yet, this is not the case in San Francisco, particularly with BART and Hispanics. Thus, Hispanics might have been significantly more satisfied with rail access in San Francisco than in many other communities. In retrospect, if primary weight had been placed on transit ridership, which probably should have been the case, San Francisco would have been the location given the highest priority for selection. A concerted effort should have been made to locate an appropriate research organization in San Francisco. No attempt was made to do this because it was quickly and inappropriately rejected due to its atypicality. It is likely that such an appropriate research organization would have been found.

Alameda County also was considered, but rejected because BART officials indicated that they would not allow onboard recruiting due to heightened security after 9/11. In retrospect, if the difficulty of generating a sufficient number of recruits had been recognized, an attempt would have been made to use Mineta Transportation Institute (MTI) contacts with BART to obtain their approval of onboard recruiting.

If the number of transit riders used in each of the three candidate locations had been the primary criterion used to select the geographic sampling frame, San Francisco would have been selected, assuming that a reputable research organization would have been found with a bid competitive with a bid from a potential research organization from Alameda.

Evaluation of the Method of Administering the Questionnaire

The questionnaire required a moderate to a substantial amount of skipping, branching, and conditional question wording. (Some questions are relevant only to some respondents and thus are “skipped” by other respondents. For example, a question was asked at the beginning of the questionnaire to verify the ethnicity given in recruiting. If the check proved incorrect, a follow-up question was asked to identify ethnicity but this question was skipped if the ethnicity check was correct. At other times, instead of skipping questions,

different respondents are asked different questions, which involves "branching." As one example, discussed in more detail in Appendix B, different pairs were presented to some respondents in the pairwise tradeoff questions than the specific pairs presented to other respondents. The specific wording of a question depends on a response to a prior question with conditional question wording. For example, respondents who first said they were satisfied with transit then were asked to select a number between 1 and 5 to indicate their degree of satisfaction, while those who first said they were dissatisfied were then asked to select a number from 1 to 5 to indicate their degree of dissatisfaction.) Given these questionnaire characteristics, it definitely would have been inappropriate to have the questionnaires be self-administered. Thus, either telephone interviewing or onboard interviewing could have been used, with an important role of the interviewer being to guide people through the complicated skipping, branching, and conditional question wording. Since only a very small percentage of the general population were in the relevant sampling frame of transit users in targeted ethnic groups, the normal method of telephone interviewing involving some form of random-digit dialing was very inefficient in the sense that virtually all numbers selected would have involved reaching people who did not use transit or who used transit but were not in one of the targeted ethnic segments. Thus, two methods of administering the questionnaire realistically existed and are identified:

- **Onboard recruitment used in combination with telephone interviewing**. The onboard recruiting was used to determine whether the rider had taken transit to work at least once a week during the past six months and then to identify whether the respondent was in one of the targeted ethnic segments. If so, the rider was told about the participation incentive involving a drawing for a free monthly pass and then asked to provide a phone number and a first name. Qualified riders who gave a phone number were called at a later date to actually administer the questionnaire.

- **Onboard personal interviewing**.

Determining which one of the two administration methods to use was an important and difficult decision, as each method had one or more comparative advantages and disadvantages.

The evaluation of these two administration methods is discussed using two criteria: (a) the fit between the method of administration and the questionnaire characteristics, and (b) the likely completion percentage.

Degree of Fit Between the Method of Administration and the Questionnaire Characteristics

The relevant questionnaire characteristics involved (a) the length of time needed for a respondent to complete the questionnaire; (b) the amount of thought and privacy needed to answer the questions; and (c) the amount of skipping, branching, and conditional question wording, along with the degree of difficulty of an interviewer following the skipping and branching instructions. The method of administration used, which involved

telephone administration of the questionnaire, better fits the relevant characteristics of the questionnaire on each of these three factors.

The questionnaire itself took about 15 minutes to complete. Some might think that the length of this questionnaire adversely impacted the response rate and/or the accuracy of responses. However, the response rate was not adversely influenced as no respondent who started the interview then terminated it prior to completion. A few points will be made to support the argument that the accuracy of the responses were not influenced by the length of the questionnaire. First, as is done with good questionnaire design, the questions that required more thought were toward the beginning of the questionnaire. Second, this questionnaire is not close to being on the long extreme. For example, a telephone questionnaire done under the careful peer review of the Transit Cooperative Research Program (TCRP) research panel took about 40 minutes to complete (Elmore and Yalch 1998). For the questionnaire used in this study, including the time involved in qualifying riders, the process took between 15 and 20 minutes to complete, and this was only after many relevant questions from earlier drafts were excluded from the questionnaire. Even if the interview with each rider could have begun as soon as they boarded the bus or train, more than a few would have disembarked from the bus or train, either due to the need to transfer or because they reached their destination, prior to completion of onboard administration of the questionnaire. In addition, lack of completion would have suppressed the response rate. This lack of completion problem, influenced by a comprehensive questionnaire, existed to a lesser extent with telephone administration, partly because a call-back could be made to complete the interview when necessary.

The most critical portions of the questionnaire, which are discussed in more detail in the next section, involved measuring perceptions, attitudes and even values related to transit. Questions involving attitudes, perceptions, and values often involve reflection and questions about values also may involve divulging somewhat private information. The distractions that exist on a bus or train, with people constantly talking and moving around, or some riders not even able to sit during prime commute times, would all have been problematic to careful reflection and privacy if onboard administration had been used. A few examples of questionnaire questions that involve thinking and/or privacy include:

Q22A Now thinking about the quality of light rail and bus service combined … Would you say your neighborhood has better or worse combined quality than other neighborhoods?

1BETTER

2 WORSE

3 INSISTS ON NO DIFFERENCE (SKIP TO Q23)

7 DEPENDS, NO OPINION, REFUSED (SKIP TO Q23)

Q22B And would that be a 1 for slightly (Q22A ANSWER), a 5 for much (Q22A ANSWER), or a 2, 3, or 4?

Q37 Now I am going to offer you some choices so you can tell us what is most important to you. The first set of choices is between faster light rail trains that will save you 8 minutes for every 30 minutes you are on the train and security guards at the train stations you use. Which would you choose?

1 FASTER TRAINS (SKIP TO Q39)

2 SECURITY GUARDS (CONTINUE)

7 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q43)

IF SECURITY GUARDS, ASK:

Q38 What if the trains were even faster and saved you 12 minutes for every 30 minutes you are on the train. Would you still choose the security guards, or would you choose the faster trains?

1 FASTER TRAINS

2 SECURITY GUARDS

I:SKIP TO Q40.

IF FASTER TRAINS, ASK:

Q39 What if the faster trains would only save you 4 minutes for every 30 minutes you were on the train? Would you still choose the faster trains, or would you choose the security guards?

1 FASTER TRAINS

2 SECURITY GUARDS

Q92 The government should be doing more to reduce pollution and improve the environment even if it hurts the environment. Do you agree strongly, agree moderately, agree slightly, disagree slightly, disagree moderately, or disagree strongly with this statement?

The third relevant questionnaire characteristic is the degree of skipping and branching. As indicated even with the few questions above, a significant amount of skipping and branching existed, as well as inserting an answer from one question into the wording of a later question. Examining the questionnaire itself at the end of this report demonstrates that such skipping, branching, and conditional question wording exists throughout the entire questionnaire. Such skipping, branching, and conditional question wording requires the use of computer-assisted interviewing. Most research organizations have software and computers onsite for computer-assisted telephone interviewing. However, most research organizations, including the one used, did not yet have the appropriate hardware and software needed to conduct computer-assisted onboard interviews at the time the data was collected.

In summary, the degree of fit between the relevant questionnaire characteristics and the method of administration is significantly better with telephone administration than with onboard administration of the questionnaire.

Impact of the Method of Questionnaire Administration on the Completion Rate

Even after adjusting for the inability to complete some onboard interviews due to the length of the questionnaire, it is likely that the completion rate would have been higher with these interviews than with the method selected, which involved using onboard recruiting combined with telephone administration of the questionnaires.

Refusing to participate with onboard interviewing involves a face-to-face direct refusal, which some riders would have felt uncomfortable doing. In contrast, the evidence suggests that a number of riders agreed in the onboard recruiting to participate to avoid having to directly refuse to participate, without ever expecting to participate. As indicated in Table 1, up to approximately 40 percent of those who agreed to participate by giving a phone number during onboard recruiting could have planned on avoiding to participate. More specifically, of the 1033 riders who were recruited, 200 of the numbers given by recruits to researchers were nonworking numbers. Although some of these numbers may have been due to disconnected numbers during the time between recruitment and administration of the questionnaire, it is not unreasonable to assume that many of these numbers were falsely given to avoid having to participate without directly refusing to do so. Another 209 recruits answered the phone but either claimed that he or she was not in the target population, although they had indicated during onboard recruitment that they were in the target population, or claimed that the name given for the number during onboard recruitment did not live at that residence.

The above information demonstrates that as many as 409 riders recruited who gave their name and a phone number ended up indirectly refusing to participate. Of course, it is not appropriate to conclude that all, or almost all, of these riders would have completed the questionnaire if it had been administered onboard. For starters, some of these riders would have directly refused to participate if onboard administration had been used. In addition, some of the riders would have disembarked from the bus or train prior to completion because the questionnaire took about 20 minutes to complete. It is unlikely that as many as 50 percent would have directly refused to participate and also unlikely that more than 33 percent would have needed to depart prior to completion. Adjusting the completion rate based upon these two estimated adjustments, approximately 135 additional interviews might have been completed with onboard administration.

In addition, the problem of getting someone to answer a working phone, which totaled 179 recruited respondents, would not have existed with onboard administration. Although some of these riders would have completed the questionnaire over the telephone with more aggressive call-backs, this issue does not exist with onboard administration of the questionnaire. Assuming that 50 percent of these riders would have directly refused to participate with onboard administration, and that 33 percent would have disembarked from the bus or train prior to completion, it is estimated that about 65 of these respondents would have completed the questionnaire with onboard administration.

Consequently, it is estimated that approximately 200 additional completed questionnaires would have been generated if onboard administration had been used in Sacramento. This would have almost doubled the actual completion percentage.

Summary of Evaluation of Onboard Administration Compared to Telephone Administration of the Questionnaire

The original decision to administer the questionnaire combined with onboard recruiting was based upon the better fit between this method and the questionnaire characteristics than onboard administration of the questionnaire. The large number of recruits who appeared to indirectly refuse to participate either by giving a false phone number or by later contracting over the phone the information they had provided during recruiting was definitely a big surprise. As previously observed, as many as 409 of the 1033 recruits may have indirectly refused to participate after initially agreeing to do so during the onboard recruiting. In retrospect, a concerted effort should have been made to try to identify a research organization with the necessary hardware and software to conduct onboard computer-assisted administration of the questionnaire. If such an organization had been located, then still another attempt could have been made to shorten the questionnaire to lessen the problem of respondents disembarking the bus or train prior to completion of the questionnaire. If such an organization had not been found, an attempt could have been made to simplify the questionnaire by eliminating almost all skipping and branching and conditional question wording. However, this simplification would have been difficult to do without substantially compromising the value of the information collected. If a better geographic sampling frame with more transit riders had been selected to generate more recruits, using telephone administration probably would have generated a sufficient number of completed interviews even with a relatively high indirect refusal rate.

SUMMARY

A minimum of 150 completed questionnaires with each of the four targeted ethnic groups identified at the beginning of this chapter were needed to conduct the multivariate analysis necessary to separate the impact of ethnicity on possible differences in transit behavior and/or attitudes from the impact of other possible independent variables. The 216 completed questionnaires fell well short of this aggregate requirement of 600 completed questionnaires. This problem was not anticipated or expected.

The single most important thing that should have been done to obtain the needed number of completed questionnaires would have been to use a geographic location with a substantially greater number of transit users than in Sacramento County, the geographic location chosen. San Francisco County, which has approximately eight times as many transit users as Sacramento County, should have been used.

The questionnaire, which is presented as Appendix A and discussed in detail in the next chapter, required computer-assisted interviewing due to the substantial amount of skipping, branching, and conditional question wording. Even though the completion percentage or response rate would have been somewhat higher with onboard administration of the questionnaire, this method of administration realistically could have been used only if a

research organization had been found that had the hardware and software to allow onboard administration. Although such a research organization might not have been found, a more energetic attempt should have been made to identify such an organization.

THE SURVEY QUESTIONNAIRE

CHAPTER OVERVIEW

The survey questionnaire developed and used is in Appendix A. Considerable effort was expended in the development, refinement, and pretesting of the questionnaire instrument. It makes an important contribution to transit research for two reasons: (1) because some variables measured are not commonly measured, and (2) because some of the measurements are uncommon. It is recommended that parts of the questionnaire be used as is, or adopted, for use in in other studies that collect structured quantitative data concerning transit behavior and attitudes, even if the focus is something other than trying to compare attitudes of different ethnic groups. In other words, the quality of the questionnaire is very good and is the primary redeeming feature of this project, even though the number of completed questionnaires fell well short of the minimum number needed for the multivariate analysis that was planned.

This chapter discusses three basic issues relevant to the questionnaire.

The first issue discussed is the structure of the questionnaire. This needs to be discussed because the questionnaire was designed so that each respondent answered only about half of the questions. This structural issue will be discussed in this chapter.

The second issue discussed are the variables measured on the questionnaire. This issue is discussed because some rather uncommon variables were measured. In addition, since no quantitative analysis was conducted, the discussion of the logic behind the selection of the variables measured, focusing on how they would have been included in the analysis, can be helpful in suggesting some possible analyses for further studies, regardless of whether the focus is on ethnic differences.

Selected survey measurement issues will be the final issue discussed in this chapter. The discussion of different attitude scaling issues is the primary, but not the exclusive focus here.

THE STRUCTURE OF THE QUESTIONNAIRE

The questionnaire was designed so that each respondent answered about half of the questions. This is important to emphasize and explain, because a cursory view of the questionnaire which ignores branching instructions toward its beginning, will significantly overestimate the time commitment for each respondent.

More specifically, the questionnaire presented one set of questions for those who rode on light rail, whether or not they also rode on a bus for part of their trips. This section of the questionnaire started with Q2 at the bottom of the questionnaire's page 3 and ended with Q45. The variables measured in this set of questions will be identified and explained in the next subsection of this section. The goal in this subsection is to only discuss the structure of the questionnaire. These light rail riders then skipped Q46 through Q91 as these questions applied to bus riders who did not take light rail. On the other hand, bus riders,

who did not also take light rail, skipped questions Q2 through Q45 as these questions applied primarily to light rail riders. To put this another way, Q2 through Q45 are the same questions as Q46 through Q91, except that the first group of questions primarily address attitudes, perceptions, and values regarding light rail ridership, while the second set of questions primarily address exactly the same information, except that the focus changes to bus ridership. A couple of specific questions are presented below to clarify both the similarity and the difference between these two sets of questions.

Q8

Now I would like to ask you some questions about using light rail versus driving a car to get to and from work. (We would like your opinion even if you don't drive yourself.) Overall, are you more satisfied taking light rail or driving to and from work?

1 TAKING LIGHT RAIL (CONTINUE)

2 DRIVING (CONTINUE)

7 INSISTS ON NO DIFFERENCE (SKIP TO Q10)

Q52

Now I would like to ask you some questions about using the bus versus driving a car to get to and from work. (We would like your opinion even if you don't drive yourself.) Overall, are you more satisfied taking the bus or driving to and from work.

1 TAKING THE BUS (CONTINUE)

2 DRIVING (CONTINUE)

3 INSISTS ON NO DIFFERENCE (SKIP TO Q54)

Note that the only difference between Q8 and Q52 above is that the former asks for a comparison of satisfaction with driving versus light rail, while the latter asks for this comparison to taking the bus. Both of the above questions have the same follow-up, which presents a 5-point satisfaction scale to measure the degree of satisfaction for the mode selected above over the other mode.

Although the two sections of the questionnaire described to this point (one for light rail riders and one for bus riders) includes most of the questionnaire, some common sections existed that were asked of all respondents, with a couple of short sections at the beginning and some at the end.

The questions on the first couple of pages have two objectives. Questions B through E at the very beginning are questions to redetermine the appropriate ethnic segment of each respondent. "Redetermination" is the appropriate term to use because this information was collected during onboard recruiting. Following this redetermination of ethnicity, Q1 is used to determine whether the respondent should be asked the set of questions involving

light rail, or instead, asked the set of questions involving bus ridership. In other words, the only purpose of Q1 is for branching.

The last section on the questionnaire, Q92 through Q109 identifies classification information, with this information being divided into three categories: (1) a few psychographic variables, (2) questions to assess the degree of transit dependency, and (3) demographic variables. These variables are identified more specifically in the next part of this chapter.

A summary of the questionnaire is presented below.

1. Redetermination of ethnicity (QB through QE)
2. Determination of whether the respondent should be classified as a light rail rider or, instead, classified as a bus rider (Q1)
3. A large number of questions asked about light rail ridership and trip characteristics asked only of those who are light rail riders (Q2 through Q45). The nature of these questions and the variables measured will be discussed in more detail in the remainder of this section.
4. A large number of questions about bus ridership and trip characteristics asked only of those who are not light rail riders (Q46 through Q91).
5. Classification information (Q92 through Q109)

Selection of the Dependent Variables

This subsection on dependent variables, and the ensuing subsections on independent variables do not present nor do they discuss measurement issues. These measurement issues will be discussed at the end of this chapter. The focus is on what variables were measured rather than how they were measured.

In a request for proposals, Caltrans invited a proposal on the topic of “The Impact of Ethnic Diversity on Transit: How do Various Population Groups View and Utilize Various Transit Modes?” This topic was the focus of this study.

It is appropriate to begin with a discussion of what was not the focus of this study. Although the Caltrans description allows considerable latitude in selecting the specific measurement variables, the focus seems to be on transit. Thus, the decision was made at the beginning of variable selection to exclude attempting to better understand why some people use transit while other people opt for commuting by car, a topic that had already been studied through a large number of prior studies. With a focus only on transit users, it was plausible to study why some people opted for bus transit while others opted for rail transit. Although an attempt was made to sample both bus and rail users, the attempt to differentiate between bus and rail users also was not a primary objective, largely because it was thought the transit mode selection is based on availability and access to rail transit. More specifically, it was thought that transit users with good access to rail at both ends of the daily commute would select it over bus transit due to faster trip times.

Based upon the elimination of studying transportation mode selection, or transit mode selection, the general focus was narrowed down to the question of how various population

groups “view various transit modes.” Once this decision was made, the selection of the primary dependent variable was rather straightforward, with the variable being the global degree of satisfaction with the mode of transit used. Q6 and Q7 measured this variable with light rail users, followed by a comparative global satisfaction measure with Q8 and Q9, with the comparison being the automobile. Mirror questions were asked of bus users, with the relevant questions being Q50 through Q53. For the convenience of the reader, these questions are identified below for light rail users.

Q6 Overall, would you say you are satisfied or dissatisfied with taking light rail to and from work?

1 SATISFIED

2 DISSATISFIED

3 INSISTS ON NEUTRAL (SKIP TO Q8)

8 NO OPINION

Q7 Select any number from 1 to 5 to indicate how ((ANSWER TO Q6) you are. A one means you are slightly (ANSWER TO Q6), a five means you are very ANSWER TO Q6, with 2, 3, and 4 in between

1

2

3

4

5

Q8 Now I would like to ask you some questions about using light rail versus driving a car to get to and from work. (We would like your opinion even if you don’t drive yourself.) Overall, are you more satisfied taking light rail or driving to and from work?

1 TAKING LIGHT RAIL (CONTINUE)

2 DRIVING (CONTINUE)

7 INSISTS ON NO DIFFERENCE (SKIP TO Q10)

Q9 Select any number from 1 to 5 to indicate how much more satisfied you are with (ANSWER TO Q8) where one means you are slightly more satisfied, five means you are much more satisfied with 2, 3, and 4 in between.

1

2

3

4

5

Selection of the Independent Variables

Once the primary dependent variables were selected, the selection of independent variables was guided largely by thinking about variables likely to differentiate between transit users with higher levels of global satisfaction with the mode of transit used versus those users with lower levels of global satisfaction.

The independent variables hypothesized as having the most direct impact on global satisfaction were (a) the degree to which perceptions towards transit on relevant specific attributes, and (b) the degree of importance of these attributes. Each of these two types of independent variables are discussed, followed by a discussion of additional independent variables likely to impact attribute perceptions and/or attribute importance. The attributes selected for measurement of perceptions are also listed. The specific questions that measured each of these attributes is listed in parentheses, with the first question being the relevant one for light rail users and the second one being the relevant one with bus users. Although the questions are listed, it is not necessary for readers to refer to the questionnaire after each and every reference, as this continual skipping between the questionnaire and this discussion is disruptive for readers. It is only necessary to refer to the questionnaire if a reader is confused about the nature of the variable described below.

Identification of Attributes on Which Perceptions were Measured

- Perceived safety (Q10 and Q11 and Q54 and Q55)
- Perceived frequency of observance/experience of discourteous behavior on mode and/or at station (Q12 and Q56)
- Perceived frequency of observation/experience of scary behavior (Q15 and Q16 and Q59 and Q60)
- Perceived degree of relaxation while traveling (Q17 and Q18 and Q61and Q62)
- Perceived utilization of time while traveling (Q19 and Q20 and Q63 and Q64)
- Perceived degree of flexibility (Q21 and Q22 and Q65 and Q66)
- Perceived comparative neighborhood quality of transit Q22A and Q22B and Q67 and Q67A)
- Perceived travel distance (Q26 and Q71) AND perceived travel time (Q27 and Q72). Note that travel time allows a comparison with time by automobile.

Although most of the above attributes are commonly measured, at least based on a cursory literature review, a couple are not commonly measured. The most uncommon one involves the perceived transit quality in the neighborhood. This was measured due to the ethnic focus of this study, with the hypothesis being that groups that perceive themselves as being underserved and disenfranchised might perceive that the quality of transit they receive is less than that in other neighborhoods, and, accordingly, they might be less satisfied. The measurement of both travel time and distance also seems somewhat uncommon. This was done because it was hypothesized that these two variables might interact to influence satisfaction. More specifically, it was thought that travel distance would impact normative expectations of travel time. In other words, those traveling shorter distances would have higher normative expectations regarding travel time. This simply means that those with a shorter trip will expect that travel time should be less than those with a longer trip.

Selection of Attributes on Which Importance was Measured

Based upon reasoning presented later in the measurement subsection of this chapter, tradeoff or conjoint measurement was used to measure attribute importance. This measurement approach will be described generally in the later subsection on measurement and is described in more detail in Appendix B.

Because the number of specific tradeoffs presented increases exponentially with an increase in the number of attributes measured, only three attributes were included in the tradeoff questioning portion of the questionnaire. These three attributes were: (a) security/safety, an attribute on which perceptions also were measured; (b) travel time, an attribute on which perceptions also were measured; and (c) transit fares, an attribute on which perceptions were not measured. Perceptions were not measured on this attribute even though it was hypothesized to significantly influence global satisfaction. The reasoning for not measuring perceptions on this variable is that it is a constant across respondents rather than being a variable. In other words, with the exception of such things as senior and youth discounts, transit fares in a given time frame are constant.

Independent Variables that Might Indirectly Influence Global Satisfaction

Although attribute perceptions and the relative importance of these perceptions tend to have the most direct impact on global satisfaction, other independent variables were selected for measurement that were hypothesized to possibly influence these attribute perceptions and/or their importance. Priority was given to those candidate variables that also were hypothesized as being related to ethnicity, since the primary objective of this study involved comparing results with different ethnic segments. These indirect independent variables can be placed into four categories for discussion purposes, with the categories being variables involving (a) trip characteristics, (b) perceived neighborhood characteristics, (c) psychographic characteristics, and (d) demographic characteristics. These four categories are discussed in more detail below.

Independent Variables Involving Trip Characteristics

The trip characteristics were selected for measurement largely because each one was hypothesized as influencing perceptions on the flexibility attribute, in addition to possibly influencing global satisfaction with transit. It was hypothesized that global satisfaction with transit decreases as the need for trip flexibility increases. This inverse relationship was hypothesized because transit is not as flexible a mode of transportation as the automobile. It also was thought that the need for flexibility might be related to ethnicity, with some ethnic groups possibly needing more flexibility due to work schedules and work times. As a reminder, the relevant question with light rail users is the first one in parenthesis with the second one being the relevant question for bus users, and it is usually unnecessary for readers to review the specific working of each trip characteristic on the questionnaire.

- Need for equal transit availability during atypical commute departure times (Q31 and Q7)
- Need for route flexibility (Q34 and Q80)

- Need for equal transit availability on weekends as on weekdays (Q36 and Q82)
- Overall or global need for flexibility (Q23 and Q70)

Independent Variables Involving Neighborhood Characteristics

Only two independent variables were measured here. Both were hypothesized as being related to perceptions of safety and/or relaxation along with possibly influencing the importance of safety or security. Since safety probably varies significantly across neighborhoods, these variables also were thought to possibly vary across ethnic segments. Both of these variables have been overlooked in most prior studies of transit users.

- Perceived safety of neighborhood of residence (Q13 and Q57)
- Perceived safety of area surrounding most common work location in past six months (Q14 and Q58)

Independent Variables Involving Psychographic Characteristics

Psychographic variables have been largely overlooked in prior studies of transit users. Three psychographic variables were measured in this study. For reasons discussed after identifying the variables, each of these three variables was thought to influence the degree of global satisfaction with transit, largely through influencing the importance of attributes on which transit is likely to have a perceived advantage or disadvantage. Although it is far from certain that any of these psychographic variables are correlated with ethnicity, it is appropriate to include them in the survey because they are likely to influence the degree of global satisfaction with transit.

- Degree of environmental consciousness (The degree of agreement/disagreement with the first three statements under Q92)

  Since it is generally agreed that transit generates less air pollution than commuting by car and since transit used limited oil and gas resources more efficiently than cars, the positive environmental impact of transit is likely to be a perceived advantage. Those users who have a high degree of environmental consciousness are likely to place more importance on this advantage than those users who have a lower degree of environmental consciousness.

- Degree of perceived financial consciousness (The degree of agreement/disagreement with the fourth, fifth, and sixth statements under Q92)

  Of the three psychographic variables measures, it is more difficult to determine the direction of the correlation between this financial consciousness variable and global satisfaction than it is to determine this direction with the other two psychographic variables. This greater difficulty of determining the direction of the possible correlation exists because it is unclear how users perceive the comparative cost of transit to the cost of driving. If users look only at the incremental cost of operating a car, such as gasoline and parking, then it is almost certain that transit would be perceived as costing less than driving to work. If this is the case, then those with a high degree of financial consciousness would be more satisfied with transit than those with a

lower degree of financial consciousness. On the other hand, some users who have a car may perceive that it is wasteful to leave the vehicle at home while they are paying for insurance and possibly monthly car payments. Another complicating factor is that those with a high degree of financial consciousness may be transit dependents who actually have a lower degree of global satisfaction because they resent being forced to take transit.

Even though the direction and nature of the correlation between financial consciousness is thought to be uncertain, it is relevant to measure this variable as the results could have helped to reduce this uncertainty.

- Degree of job satisfaction (This variable was measured by the last three statements under Q92)

  Although it is not necessarily a rational linkage, it was hypothesized that those with lower levels of job satisfaction might also be less satisfied with transit than those with higher levels of job satisfaction. Since they are using transit to get to and from the work experience that they are dissatisfied with, this dissatisfaction with work may be linked to dissatisfaction with the means of getting to and from work.

Independent Variables Involving Demographic-type Characteristics

With one possible exception, the demographic type variables measured are commonly measured in other studies. In addition to examining the relationship between the standard demographic variables and degree of satisfaction with transit, they also would have been analyzed as control variables, holding them constant, while examining the relationship between the different ethnic segments and global satisfaction with transit. The demographic type variables measured are:

- Age when respondent moved to the United States if born outside the USA (QC through QD1 at the beginning of the questionnaire)

  This is the one demographic variable that is not commonly measured. Given the ethnic focus of this study it is an important variable to measure, as it is hypothesized that those who move to the United States at an earlier age or are born in the United States may be less similar to those of the same ethnicity who move to the USA when they are older.
- Degree of transit dependency (Q93 through Q97)
- Ethnicity (QB)
- Zip code of residence (Q99)
- Household size (Q100)
- Number of those in HH who are at least 18 years old AND who work or go to school at least two days a week (Q101)

  This variable probably is not measured as frequently as most of the other demographic type variables listed. It was measured in this study to help determine transit dependency by comparing the number of vehicles in the HH to the number of commuters in the HH.

- Education level of respondent (Q102)
- Age of respondent (Q104)
- Household income before taxes (Q105 through Q107)

Summary of Discussion of the Dependent and Independent Variables Measured

Even though each and every dependent and independent variable has been identified, this summary will identify those independent variables that are less commonly measured in studies of transit users. This is done for a couple of reasons. First, one of the important potential contributions of this study involves researchers using some of these uncommon variables in future studies. Second, since these uncommon variables have been distributed over multiple subsections, identifying them a second time in one subsection allows easier identification and use of these uncommon variables. Those independent variables that have been used less commonly are:

- Perceived comparative neighborhood quality
- Perceived travel distance AND perceived travel time
    - If anything is uncommon here, it is using both travel distance and travel time.
- Need for equal transit availability during atypical commute departure times
- Need for route flexibility
- Need for equal transit availability on weekends as on weekdays
- Overall or global need for flexibility
- Perceived safety of neighborhood of residence
- Perceived safety of area surrounding most common work location in past six months
- Degree of environmental consciousness
- Degree of perceived financial consciousness
- Degree of job satisfaction
- Age when respondent moved to the United States if born outside the USA

Discussion of Important Measurement issues

Three such measurement issues are discussed, with the first two issues involving attitude scaling. The first measurement issue is the use of pairwise conjoint or tradeoff measurement to measure attribute importance. This is followed by the measurement of global satisfaction, with the last of these measurement issues being the measurement of income.

Use of Pairwise Conjoint/Tradeoff Analysis to Measure Attribute Importance

Conjoint measurement has been used for decades by marketing researchers to measure attribute importance (Cattin and Wittink 1982; Wittink and Cattin 1989). This measurement technique has proved to be more accurate than direct scales of importance, including constant sum scales, which ask respondents to allocate quantitative percentage importance weights to different attributes, subject to the constraint that their weights need

to sum to 1.0 (Tumbusch 1991). The problem with such direct importance scales is that respondents tend to give each attribute approximately equal importance weights. For example, purchasers who purchase higher quality but higher priced brands often will indicate through direct importance scales that they place approximately equal importance on price and quality even though their purchasing behavior indicates that quality is more important than price.

The basic concept of pairwise conjoint measurement is that it presents two options with the respondent selecting one of these two options. Multiple pairs are presented to each respondent, with each and every pair involving a tradeoff. The more important attribute is the one that the respondent is less willing to tradeoff. To provide a general example, if a consumer is given a choice between a higher quality, but higher priced option and a lower priced but lower quality option and selects the higher quality option, then it can be inferred that quality is more important than price. Once the more important attribute is determined from an initial paired tradeoff, one or more follow-up pairs are presented to each respondent to determine how much more important this attribute is. To continue with the example of price and quality, if the respondent continues to choose the higher quality option even when its price is increased in comparison with the initial choice, then it can be inferred that quality is a lot more important than price.

Description of the Use of Pairwise Tradeoff Measurement in this Study

As discussed in an earlier subsection in this section involving the selection of the attributes on which importance was measured, three attributes were used with pairwise tradeoff measurement, with the three being (a) security, (b) travel time, and (c) fare level. For reasons discussed in Appendix B which focuses on a more detailed but also more technical discussion of this measurement approach, each tradeoff involved only two of these three attributes. More specifically, one tradeoff involved security versus travel time, a second one involved security versus fare level, and the third involved fare level versus travel time. The pair below was used with the tradeoff involving security versus travel time.

> Q37 Now I am going to offer you some choices so you can tell us what is most important to you. The first set of choices is between faster light rail trains that will save you 8 minutes for every 30 minutes you are on the train and security guards at the train stations you use. Which would you choose?
>
> 1 FASTER TRAINS (SKIP TO Q39)
> 2 SECURITY GUARDS (CONTINUE)
> 7 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q43)

To briefly explain the logic in the above example, security is thought to be more important than travel time, at least with the specific time saving of 8 minutes for every 30 minutes on the train, if a respondent selects the security guard option that does not offer the faster time. On the other hand, travel time is thought to be more important than security if a respondent selects the faster time option even though it does not involve a security guard.

Although the pairwise tradeoff identifies which of the two attributes involved is more important, the pair does not identify the degree to which this attribute is more important. An additional pair or pairs is needed, still involving a tradeoff between security and travel time, to determine this degree of additional importance. The basic concept with the additional pair or pairs is to determine how long the respondent sticks with their initial choice when they are given an additional incentive to switch to the unchosen option in the previous pair. The longer the respondent sticks with their initial choice, the more important this attribute becomes. The additional incentive to switch involves making the chosen option less attractive or else making the unchosen option more attractive. For example, the pair below was the one additional pair asked of respondents who previously selected security guards.

> What if the trains were even faster and saved you 12 minutes for every 30 minutes you are on the train. Would you still choose the security guards, or would you choose the faster trains?
>
> 1 FASTER TRAINS
>
> 2 SECURITY GUARDS

Note that the only difference between the additional pair and the prior pair is that the unchosen option from the first pair, namely the faster time option for those who selected security guards previously, involved increasing the time saving from 8 minutes in the first pair to 12 minutes in the additional pair. As previously explained, the concept of the additional pair is to determine how much resistance to switching exists by making the chosen option less attractive or making the unchosen option more attractive. For respondents initially selecting the security guard option, the unchosen option of faster trains was made more attractive by making it even faster. If respondents still stick with security guards, then we know that this attribute is significantly more important than travel time.

Although it has been demonstrated in numerous studies that conjoint measurement is more accurate than direct importance scales, it has not been as widely used as its potential suggests. Two reasons probably exist for its limited use, with each reason being correctable rather than being inherent. First, because multiple pairs of choices need to be presented to each respondent, pairwise conjoint measurement can be time-consuming. However, this study demonstrates that pairwise tradeoff questioning does not necessarily involve a large number of pairs being presented to each respondent, although presenting fewer pairs involves less precise quantitative estimates of attribute importance. Second, it is difficult to construct the specific pairs without appropriate guidance and many of those with the expertise do not provide such guidance as they have developed profitable commercial software to construct the pairs. Because the author of this study is not involved in the commercial software industry, guidance will be provided to allow more people to use this powerful and accurate technique that actually is not as daunting as it first appears.

A primer is presented to guide researchers in the construction of specific pairs. However, since many readers of this report are managers rather than researchers involved in actually constructing questionnaires, this primer is put in an appendix, namely Appendix B. However, before moving on to the next measurement issue, pretesting results, relevant to pairwise tradeoff measurement, are presented and discussed below.

Pretesting Results with Pairwise Tradeoff Measurement

The only data available to examine is the pretest results of 14 respondents. This data is presented in Tables 2 through 4. Separate tables are used for each of the three tradeoffs examined—security versus travel time, security versus fare level, and fare level versus travel time. The rows in each table identify the choice made in the initial pair and the columns represent whether or not the respondent stuck with this choice in an additional, or follow-up pair, which gave an additional incentive to switch away from this initial choice. A discussion of the results follows the presentation of these three tables.

Table 2. Pretesting Responses of Tradeoff Involving Security Versus Reduced Travel Time

	Did Not Switch in Follow-up Pair	Switched in Follow-up Pair	Total
Selected security guards in starting pair	0	2	2
Selected faster trip in starting pair	9	1	10
Total	**9**	**3**	**12**

Table 3. Pretesting Responses of Tradeoff Involving Security Versus No Fare Increase

	Did not Switch in Follow-up Pair	Switched in Follow-up Pair	Total
Selected security guards in starting pair	4	1	5
Selected no fare increase in starting pair	5	2	7
Total	**9**	**3**	**12**

Table 4. Prestesting Responses of Tradeoff Involving No Fare Increase Versus Reduced Travel Time

	Did not Switch in Follow-up Pair	Switched in Follow-up Pair	Total
Selected no fare increase in starting pair	2	3	5
Selected faster trip in starting pair	5	2	7
Total	**7**	**5**	**12**

The most critical issue in assessing how well the specific pairs work is that of whether the follow-up pair or pairs are constructed in an appropriate manner to truly encourage switching to the unchosen option in the starting pair. This number is the total of the second column in each of the three tables. Although low switching rates can simply mean that high resistance to change realistically exists, low switching rates can also mean that (a) the changes made from the starting pair were too small to encourage switching, and/or (b) respondents were having trouble with the specifics of the questions and simply decided to respond consistently without really thinking carefully enough. The pretest results, as a whole, suggest that the pairs worked to reflect reality rather than there being a measurement problem.

The amount of switching varied depending on the two attributes in the starting pair, with the most switching involved when the starting pair was fares versus travel time (Table 4). Here, of the 12 pretested respondents who completed this section of the questionnaire, five of them switched to the unchosen option from the starting pair in the follow-up pair (the total in the second column of this table). With the other two starting pairs, only three of the 12 respondents switched. However, particularly with the starting pair involving security versus travel time (Table 2), the low switching rate appeared to be a function of the fact that travel time realistically was a lot more important than security to most of the respondents. This conclusion is drawn because only two of the 12 respondents selected security guards over faster trains. This very low tendency to select security guards indicates that faster trains probably were realistically a lot more important than security guards. To support this conclusion, the two people who selected security guards in the starting pair both switched, suggesting that security guards are only slightly more important even for those who thought security guards were more important than faster trains initially.

Another important issue to assess with the specific pairs is whether each starting pair is realistically balanced. This can be determined by examining whether a reasonable diversity of responses exists with each starting pair. The results were quite positive with two of the three starting pairs, namely the one involving fares versus security (Table 3) and the one involving fares versus travel time (Table 4). With each of these two starting pairs, five respondents chose one option and the other seven chose the other option. This split is almost a 50-50 one. There was very little response diversity with the starting pair involving security versus travel time (Table 2). Here 10 of the 12 respondents chose the faster travel time option with no security guards. However, given that nine of these 10 respondents who selected faster trains in the starting pair stuck with the faster train option even when the time saving was only 4 minutes for each 30 minutes on the train or bus. Thus, it appears that respondents would not have switched to security guards unless there was virtually no travel time advantage with the option that did not have security guards.

In conclusion, the pretesting results with conjoint measurement support the effectiveness of this technique. More specifically, the pretesting results demonstrate that even in a telephone interview, where respondents need to listen to and remember the tradeoffs, they seem to understand the questions, both in a general sense that they involve a tradeoff, and in a more specific sense that they understand the specific tradeoffs and how they change from a starting pair to a follow-up pair. It also is worthy of mention that this method seems to be understood by respondents when they are not college educated. Only one of the respondents pretested had a degree from a four-year university.

The Measurement of Global Satisfaction

Now that the lengthy discussion of conjoint measurement is complete, two other measurement issues will be discussed, namely the measurement of global satisfaction in this subsection and the measurement of income in the remaining measurement subsection.

A somewhat uncommon thing was done in measuring this critical global satisfaction variable. This somewhat uncommon measurement approach taken was to use an explicit comparative scale, with the initial question identified below. A mirror question was asked for bus riders, with the only difference being that the comparison involved buses rather than light rail. (Regardless of their answer to the question that follows, a 5-point scale was presented for them to indicate the degree of comparative satisfaction with the mode selected.)

> Now I would like to ask you some questions about using light rail versus driving a car to get to and from work. (We would like your opinion even if you don't drive yourself.) Overall, are you more satisfied taking light rail or driving to and from work?
>
> 1 TAKING LIGHT RAIL (CONTINUE)
>
> 2 DRIVING (CONTINUE)
>
> 7 INSISTS ON NO DIFFERENCE (SKIP TO Q10)

Instead of asking for an explicit comparison, two other approaches are more commonly used. One more common approach involves the use of separate satisfaction scales to measure satisfaction with (a) the mode of transit used, and (b) the automobile. This approach can be termed an implicit comparison approach since the results of the two scales can be compared even though respondents are not required to truly think comparatively in responding to the separate scales. The other common approach does not even allow an implicit comparison. It presents only one scale, which would involve light rail for light rail users or involve the bus for bus riders. Since common sense suggests that comparative results will be more accurate when respondents are required to think comparatively, it is difficult to understand why explicit comparative scales are not more widely used.

In addition to the explicit comparison scale, a separate scale was used that asked of satisfaction with transit with no comparison. This question for light rail riders is pasted below. The use of this noncomparative scale allowed a comparison to be made to the results with the explicit comparative scale previously identified.

> Overall, would you say you are satisfied or dissatisfied with taking light rail to and from work?
>
> 1 SATISFIED
>
> 2 DISSATISFIED
>
> 3 INSISTS ON NEUTRAL (SKIP TO Q8)
>
> 8 NO OPINION

Tables 5, 6, and 7 summarize the pretesting results on the two global satisfaction measures, with separate tables presented for each response to the global noncomparative scale. To facilitate understanding of these tables, two points of clarification should be made. First, both the noncomparative and the explicit comparative scales had a 5-point numeric scale used to indicate the degree of satisfaction or dissatisfaction. A rating of 5 indicates very high satisfaction and a rating of 1 indicates slight satisfaction. Second, the value of the tables below is that they indicate the degree of inconsistency in responses to the explicit comparative versus the noncomparative scale. Since those in the first two tables below indicated they were highly satisfied with transit on the noncomparative scale, with satisfaction ratings of 5 out of 5 in Table 5, and 4 out of 5 in Table 6, an inconsistent response is one that indicates significantly less satisfaction with transit than with driving on the explicit comparative scale. In other words, it is inconsistent to be highly satisfied with transit but then to be significantly less satisfied with transit than with driving. Since those in Table 7 were still moderately satisfied with transit, with a satisfaction score of 3 out of 5, those in the table who indicated that they were still significantly less satisfied with transit than driving exhibited inconsistency. Putting this more concretely, inconsistency existed with respondents in the bottom rows of each table. To aid readers in identifying inconsistent responses, either one or two asterisks is used in cells that exhibit inconsistency, with one asterisk indicating moderate inconsistency, and two asterisks indicating very high inconsistency.

Table 5. Responses to Global Comparative Satisfaction Scale for Those Who Gave Transit a Satisfaction Rating of 5 with the Noncomparative Scale

	Total
More satisfied with transit than driving and a rating of 5	5
More satisfied with transit than driving and a rating of 4	0
More satisfied with transit than driving and a rating of 3, 2 or 1	0
More satisfied with driving than transit and a rating of 5	1**
More satisfied with driving than transit and a rating of 4	0
More satisfied with driving than transit and a rating of 3, 2, or 1	0
Total	**6**

** Indicates high inconsistency.

Table 6. Responses to Global Comparative Satisfaction Scale for Those Who Gave Transit a Satisfaction Rating of 4 with the Noncomparative Scale

	Total
More satisfied with transit than driving and a rating of 5	0
More satisfied with transit than driving and a rating of 4	2
More satisfied with transit than driving and a rating of 3, 2 or 1	1(3)
More satisfied with driving than transit and a rating of 5	0
More satisfied with driving than transit and a rating of 4	1**
More satisfied with driving than transit and a rating of 3, 2, or 1	0
Total	**4**

** Indicates high inconsistency.

Table 7. Responses to Global Comparrative Satisfaction Scale for Those Who Gave Transit a Satisfaction Rating of 3 with the Noncomparative Scale

	Total
More satisfied with transit than driving and a rating of 5	0
More satisfied with transit than driving and a rating of 4	1
More satisfied with transit than driving and a rating of 3, 2 or 1	0
More satisfied with driving than transit and a rating of 5	0
More satisfied with driving than transit and a rating of 4	2*
More satisfied with driving than transit and a rating of 3, 2, or 1	0
Total	**3**

* Indicates moderate inconsistency.

Tables 5, 6, and 7 include 13 of the 14 pretested respondents who completed the two relevant global satisfaction measures. It did not seem appropriate to construct a fourth table with only one respondent. This respondent gave a consistent response. He or she was the only one who indicated some dissatisfaction with transit on the noncomparative scale but the rating was only 1, indicating only very mild dissatisfaction. In response to the global comparative scale, this respondent indicated equal satisfaction with both transit and driving.

In summarizing the results in Tables 5, 6 and 7, which concern the degree of inconsistency, four of the 14 respondents (31 percent) had at least somewhat inconsistent responses. This is not a dramatic degree of inconsistency. However, given that almost a third of the pretested respondents showed at least moderate inconsistency, explicit comparative scales should be used to make reasonable comparisons involving global satisfaction. Each of the four inconsistent sets of responses will be described to indicate the nature of the inconsistency, realizing that the general pattern is that the noncomparative scale overestimated comparative satisfaction towards transit in each of these four instances. Table 5 includes one highly inconsistent set of responses, with the noncomparative rating being a 5. Given this highest possible satisfaction rating, it was expected that this person should be at least equally satisfied with transit as with driving. Yet, the respondent was significantly more dissatisfied with transit than with driving when asked for a direct comparison. The one set of inconsistent responses in Table 6, is similar to this one, but not quite as extreme. This respondent was highly satisfied with transit in the noncomparative scale, but significantly more dissatisfied with transit in the comparative scale. The two inconsistent responses in Table 7 are similar to the other inconsistencies but not quite as extreme. Again, given their moderate to high satisfaction with transit in the noncomparative scale, it was inconsistent to be highly dissatisfied with transit compared to driving.

Measurement of Income

Researchers tend to understand that income probably is the most challenging demographic variable to measure, both because many respondents may be unaware of their specific income and because others may feel uncomfortable disclosing this potentially sensitive information to researchers. As a result of both of these factors, many respondents either respond that they do not know their income or else refuse to identify it, with the former being

more common. To deal with this item nonresponse challenge, many researchers use rather broad income categories when measuring income. This study adopted this categorical measurement approach in a rather uncommon way. In general, the measurement involved two steps rather than the commonly used single-step approach. The first step involved simply asking whether income was greater or less than $45,000. Those indicating income was less than $45,000 were then asked whether it was greater or less than $30,000. On the other hand, those indicating income was greater than $45,000 were then asked whether it was under or over $60,000.

Q105 Was your total annual household income before taxes in 2002 under or over $45,000?

1 UNDER ($0-$44,999) (ASK Q106)

2 OVER ($45,001+) (ASK Q107)

6 EXACTLY $45,000 (END INTERVIEW)

9 DON'T KNOW (END INTERVIEW)

10 REFUSED (END INTERVIEW)

IF UNDER $45,000 ASK:

Q106 And was it under or over $30,000?

03 UNDER ($0-29,999)

05 OVER ($30,001-44,999)

04 EXACTLY $30,000

99 DON'T KNOW

20 REFUSED

IF OVER $45,000 ASK:

Q107 Was it under or over $60,000?

07 UNDER ($45,001-59,999)

08 EXACTLY $60,000

09 OVER ($60,001+)

99 DON'T KNOW

30 REFUSED

It was thought that measuring income in two steps, with the first step being as broad as possible with only two categories, was likely to increase the response rate, at least with the first step. The pretesting results supported this expectation as nine of the 10 pretested

respondents completing the demographic section did indicate whether their income was under or over $45,000. In addition, eight of these nine respondents responded to the second step. This good response to the second step suggests that once people respond to a very broad income question, they are likely to respond to a more specific follow-up income question.

SUMMARY OF SECTION

Following a brief explanation of the structure of the questionnaire, provided as Appendix A, this chapter started by identifying the primary dependent variable used, namely the degree of global satisfaction with transit. The independent variables, hypothesized as being related to global satisfaction were then categorized and identified, with many of these variables being ones that have not been commonly measured in prior transit studies. The categories are:

- Respondent perception of relevant attributes, with eight attributes used
- Degree of importance placed on relevant attributes with three attributes used
- Trip characteristics, with four variables being used
- Neighborhood characteristics, with two variables being used
- Psychographic characteristics, with three variables being used
- Demographic characteristics, with nine variables being used

Three measurement issues were then discussed, each of which involved a somewhat uncommon measurement approach. The first of these measurement issues involved using pairwise tradeoff measurement to identify the degree of attribute importance. The second one involved using an explicit comparison scale to measure global satisfaction, and the third involved a two-step approach to measure income. Pretesting results supported the use of each of these measurement approaches.

CONCLUSIONS AND RECOMMENDATIONS

It was realized at the beginning of this project that generating a sufficient number of completed questionnaires would be difficult for a number of reasons. First, transit users in different ethnic groups are hard to reach through normal random sampling because they are such a small percentage of the population at large. Second, it was thought that some ethnic sub-segments, such as immigrants, might be cautious about responding to a questionnaire. Third, a rather lengthy questionnaire was needed to collect the desired information and the questionnaire also involved a reasonable amount of skipping and branching. Using on-board administration of the questionnaire, which might have boosted the completion rate, was unrealistic with these data needs.

It was thought that the use of on-board recruiting with a relevant and potentially valuable incentive to complete the questionnaire, namely being able to participate in a drawing for a free monthly pass would overcome a caution to participate. However, the ability to generate a sufficient number of recruits within budget was much more difficult than expected, at least in the geographic sampling frame chosen, namely the Sacramento metropolitan area. In retrospect, selecting San Francisco County would have been a much better geographic selection to generate a sufficient number of recruits in each of the four ethnic segments (Caucasians, African Americans, Hispanics who were born in the United States or moved to the United States before they were 16 years old, and Hispanics who moved to the United States when they were at least 16 years old.)

Of those recruits who willingly gave their phone number during onboard recruiting and indicated that they were in one of the four relevant ethnic groups, only 20.9 percent completed the questionnaire. This low percentage was surprising given that all the recruits agreed to participate during the onboard recruiting phase. At least with telephone administration of a questionnaire, it appears difficult to increase this completion percentage, at least with some ethnic groups, particularly those individuals who are immigrants. Offering even larger incentives than the possibility of winning a free monthly pass might have increased this completion percentage to some degree. However, increasing the incentive would have been quite expensive and it might have resulted in respondents rushing through the questionnaire just to get a chance of winning the valuable incentive. Assuming that not much can be done to increase this completion percentage, the importance of generating a large recruitment pool, approximately five times more than the needed number of completed interviews is of paramount importance. It is strongly recommended that a geographic sampling frame with a large recruiting pool be used, meaning that the frame selected needs to have a large number of transit users.

A brief summary of the sampling-related recommendations is listed below for reader convenience.

1. At least if telephone administration of the questionnaire is used, it is recommended that onboard recruitment be used to generate the sample.

2. In determining the number of recruits to generate, it should be recognized, based on the results of this study, that approximately five times as many recruits are needed as the target number of completed questionnaires.

3. Due to the large number of recruits needed because of a likely low completion percentage, geographic sampling frames with a large number of transit riders should be considered. Specifically, a large recruitment pool is needed.

Although the questionnaire was designed to collect data related to the impact of ethnicity on attitudes toward transit, many components of the questionnaire, both in terms of the variables measured and the means of measurement, should have relevance to a wide range of researchers. This is because many of the independent and dependent variables measured on the questionnaire have relevance in a wide range of studies. For example, the dependent variable used, namely global satisfaction with transit, is an important metric in assessing transit service. Many of the independent variables dealing with perceptions toward transit on various attributes and the importance of these attributes are relevant in determining how to increase transit ridership by improving attitudes toward it.

The questionnaire used has some elements that are rather uncommon in prior survey questionnaires used in transit studies. Some of the independent variables measured and some of the means of measurement have not been commonly included.

The more uncommon independent variables measured on the questionnaire are listed below.

- Perceived comparative neighborhood quality
- Perceived travel distance AND perceived travel time
    - If anything is uncommon here, it is using both travel distance and travel time.
- Need for equal transit availability during atypical commute departure times
- Need for route flexibility
- Need for equal transit availability on weekends as on weekdays
- Overall or global need for flexibility
- Perceived safety of neighborhood of residence
- Perceived safety of area surrounding most common work location in past six months
- Degree of environmental consciousness
- Degree of perceived financial consciousness
- Degree of job satisfaction
- Age when respondent moved to the United States if born outside the United States

In terms of measurement, the most uncommon and useful measurement approach involved the use of pairwise tradeoff measurement to measure attribute importance. The pretesting results indicated that this method works even with telephone administration where respondents must briefly remember the specific tradeoffs based only on hearing them read over the phone and with segments that do not have a high level of education. A primer on constructing pairs is included in Appendix B, which should provide needed guidance to researchers using this powerful measurement approach.

An explicit comparative scaling approach was used with the critical global satisfaction variable, rather than the more commonly used implicit comparative scaling approach. The pretesting results supported the use of this explicit comparative approach.

Last, a two-step measurement approach was used with income variable, rather than a more common measurement approach that measures income in a single step. This two-step approach, with the first step using only two income categories, was used to increase the response rate with this potentially sensitive information. The pretesting results indicated that this two-step approach did generate a very good response rate.

APPENDIX A: THE QUESTIONNAIRE

Interviewer:	Red Checked by:	Checked by:	Re-checked by:	Corrected by:	Correction Checked by:	Coded by:	Coding Checked by:

JDFR #330
FINAL

SACRAMENTO REGIONAL TRANSIT DISTRICT

RIDER SURVEY

ASK FOR RESPONDENT BY NAME. IF NOT AVAILABLE, OBTAIN AND RECORD CALLBACK TIME.

Introduction

Mr./Ms. _____, my name is YOUR FULL NAME and I am calling from (name of research organization included here). The reason I am calling is to do the survey you agreed to do when we spoke with you on the (bus) (train) on (DATE). Remember that you will be entered into a drawing for a free monthly transit pass if you answer all the questions.

Screening

Q:QB.
T:
Now we have here that you consider yourself all or part ETHNICITY. Is that correct? IF INCORRECT ASK B1. If correct, skip to Q:QC

1 CORRECT/YES – SKIP TO Q:QC
2 INCORRECT/NO – CONTINUE WITH Q:QB1

Q:QB1 Sorry we got that wrong. To get it correct, do you consider yourself all or part Caucasian; African-American or Black; Chicano, Hispanic, or Latino, or do you consider yourself to be in some other ethnic group.

1 Caucasian
2 African American or Black
3 Chicano, Hispanic, or Latino
4 Something else (TERMINATE)

Q:QC
T:
And you were born (in) (outside of) the United States?

1 CORRECT/YES - CONTINUE
2 INCORRECT/NO CONTINUE AND CHANGE QUOTA GROUP

ASK IF OUTSIDE OF THE UNITED STATES:

Q:QD
T:
And you moved to the United States when you were AGE?

1 CORRECT/YES – SKIP TO Q:QE
2 INCORRECT/NO – CONTINUE WITH Q:QD1

Q:QD1 Sorry we got that wrong. To get it correct, what was your age when you moved to the United States?

_____ years old

Q:QE
T:
RECORD QUOTA GROUP

1 AFRICAN-AMERICAN/BLACK
2 CAUCASIAN
3 CHICANO/HISPANIC/LATINO - BORN HERE
4 CHICANO/HISPANIC/LATINO - BORN ABROAD

Interview

Q:Q1
T:
During the past six months, did you travel to and from work more frequently by light rail in combination with taking the bus to and from rail stops, by light rail without taking the bus to and from rail stops, or by bus without taking light rail?

1 BUS ALONE (SKIP TO Q46)
2 RAIL ALONE (CONTINUE)
3 BUS AND RAIL COMBINED (CONTINUE)

IF RAIL ALONE OR BUS AND RAIL, ASK:

Q:Q2
T:
(Not counting days when you took the bus to light rail stops), (And) would you say you used the bus to get to and from work no days, between one and ten days, or more than ten days during the past six months?

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q3
T:
During the same time period, did you drive a car, truck, van, or motorcycle to and from work no days, between one and ten days, or more than ten days?

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q4
T:
How about riding in a car, truck, van, or motorcycle with someone else driving? (Did you ride in a car, truck, van, or motorcycle to and from work no days, between one and ten days, or more than ten days during the past six months?)

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q6. Overall, would you say you are satisfied or dissatisfied with taking light rail to and from work?

1 SATISFIED
2 DISSATISFIED
3 INSISTS ON NEUTRAL (SKIP TO Q8)
8 NO OPINION

Q:Q7
T:
Select any number from 1 to 5 to indicate how (ANSWER TO Q6) you are. A one means you are slightly (ANSWER TO Q6), a five means you are very (ANSWER TO Q6), with 2, 3, and 4 in between

1
2
3
4
5

Q:Q8
T:
Now I would like to ask you some questions about using light rail versus driving a car to get to and from work. (We would like your opinion even if you don't drive yourself.) Overall, are you more satisfied taking light rail or driving to and from work?

1 TAKING LIGHT RAIL (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS ON NO DIFFERENCE (SKIP TO Q10)

IF TAKING RAIL, OR DRIVING, ASK:

Q:Q9
T:
Select any number from 1 to 5 to indicate how much more satisfied you are with (ANSWER TO Q8), where one means you are slightly more satisfied, five means you are much more satisfied with 2, 3, and 4 in between.

1
2
3
4
5

Q:Q10. Do you feel safer when you are taking light rail, or when you are driving?

1 TAKING LIGHT RAIL (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS NO DIFFERENCE (SKIP TO Q12)

IF TAKING LIGHT RAIL, OR DRIVING, ASK:

Q:Q11
T:
And would that be a 1 for slightly safer, a 5 for much safer, or a 2, 3, or 4?

1
2
3
4
5

Q:Q12
T:
Would you say that you observe or experience discourteous behavior by passengers or light rail staff on light rail trains or at light rail stations every day, most days, many days, a few days, or never?

5 EVERY DAY
4 MOST DAYS
3 MANY DAYS
2 A FEW DAYS
1 NEVER

Q:Q13
T:
Now thinking about the neighborhood where you live … Would you say that it is very safe, somewhat safe, neither safe nor unsafe, somewhat unsafe, or very unsafe?

5 VERY SAFE
4 SOMEWHAT SAFE
3 NEITHER SAFE NOR UNSAFE
2 SOMEWHAT UNSAFE
1 VERY UNSAFE
9 DON'T KNOW/NO OPINION

Q:Q14
T:
How about the area where you work? (Is it very safe, somewhat safe, neither safe nor unsafe, somewhat unsafe, or very unsafe?) IF WORK IN MORE THAN ONE AREA, PROBE: Think of the area where you have worked **the most** in the past six months.

5 VERY SAFE
4 SOMEWHAT SAFE
3 NEITHER SAFE NOR UNSAFE
2 SOMEWHAT UNSAFE
1 VERY UNSAFE
9 DON'T KNOW/NO OPINION

Q:Q15
T:
In the past six months, has someone said or done something while you were getting to or from light rail, at a light rail station, or on a light rail train that scared you?

1 YES (CONTINUE)
2 NO (SKIP TO Q17)
9 DON'T RECALL (SKIP TO Q17)

IF YES, ASK:

Q:Q16
T:
And about how many times has that happened in the past six months?
___ ___

Q:Q17
T:
Now thinking about being relaxed … Do you feel more relaxed when you are taking light rail or when you are driving?

1 TAKING LIGHT RAIL (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS NO DIFFERENCE (SKIP TO Q19)

IF TAKING RAIL, OR DRIVING, ASK:

Q:Q18
T:
And would that be a 1 for slightly more relaxed, a 5 for much more relaxed, or a 2, 3, or 4?

1
2
3
4
5

Q:Q19
T:
Now thinking about how well your time is used, including both the time you spend traveling and other ways you could use the same time, would you say that taking light rail or driving makes better use of time?

1 TAKING LIGHT RAIL (CONTINUE)
2 DRIVING (CONTINUE)
3 INSISTS NO DIFFERENCE (SKIP TO Q21)

IF TAKING RAIL, OR DRIVING ASK:

Q:Q20
T:
And would that be a 1 for slightly better use of time, a 5 for much better use, or a 2, 3, or 4?

1
2
3
4
5

Q:Q21
T:
Now as you may know, some people need flexible ways of traveling because they start and end work at different times, need to make stops before or after work, or need to travel during work hours. Would you say that taking light rail or driving meets the flexibility needs of these people better?

1 TAKING LIGHT RAIL (CONTINUE)
2 DRIVING (CONTINUE)
3 INSISTS NO DIFFERENCE (SKIP TO Q22A)

IF TAKING RAIL, OR DRIVING, ASK:

Q:Q22
T:
And would that be a 1 for slightly more flexible, a 5 for much more flexible, or a 2, 3, or 4?

1
2
3
4
5

Q:Q22A
T:
Now thinking about the quality of light rail and bus service combined … Would you say your neighborhood has better or worse combined quality than other neighborhoods?

1 BETTER
2 WORSE
3 INSISTS ON NO DIFFERENCE (SKIP TO Q23)
7 DEPENDS, NO OPINION, REFUSED (SKIP TO Q23)

Q:Q22B
T:
And would that be a 1 for slightly (Q22A ANSWER), a 5 for much (Q22A ANSWER, or a 2, 3, or 4?

1
2
3
4
5

Q:Q22C
T:

Q:Q23
T:
Now thinking about the amount of flexibility **you** need in traveling to and from work … Would you say you need a lot more, somewhat more, somewhat less, or a lot less flexibility than most people?

4 A LOT MORE
3 SOMEWHAT MORE
2 SOMEWHAT LESS
1 A LOT LESS
9 DON'T KNOW/NO OPINION

Q:Q24
T:

NOTE THAT THERE IS NO Q25

Q:Q26
T:
Now turning to distance … What is the one-way distance in miles between your home and your most frequent place of work in the past six months? (IF NOT SURE, ASK - Could you just give me a guess?)

___ ___ miles

99 DON'T KNOW
00 REFUSED

Q:Q27
T:
And turning to travel time … About how many minutes does it take to travel one-way between your home and your most frequent place of work in the past six months using light rail?

___ ___ minutes

77 INSISTS VARIES TOO MUCH (SKIP TO Q29)
99 DON'T KNOW
00 REFUSED

Q:Q28
T:
And about how many of those minutes are actually on the train?

___ ___minutes

99 DON'T KNOW
00 REFUSED

Q:Q29
T:
About how many minutes would it take you to drive one-way between your home and your most frequent place of work in the past six months? IF NOT SURE, ASK: Could you just give me a guess?

___ ___ STATED

___ ___ GUESS

77 INSISTS VARIES TOO MUCH
99 UNABLE TO GUESS

Q:Q30
T:

Q:Q31
T:
Now I am going to read three statements about the time you typically leave work. After I have read all three, please tell me which one best describes when you leave work.

1 Except for one or two days a month, I leave work between 4 and 7 in the afternoon or evening.

2 Except for one or two days a month, I leave work before 4 or after 7 in the afternoon or evening.

3 I leave work more than a couple of days a month between 4 and 7 and I leave more than a couple of days a month before 4 or after 7.

Q:Q32
T:
How do you typically get from your home to the light rail station on your way to work?

1 DRIVE ALONE
2 DRIVE WITH OTHERS
3 DRIVEN
4 BUS
5 WALK
6 BICYCLE
7 MULTIPLE
8 OTHER

Q:Q33
T:
And how do you typically get to the light rail station when leaving work?

1 DRIVE ALONE
2 DRIVE WITH OTHERS
3 DRIVEN
4 BUS
5 WALK
6 BICYCLE
7 MULTIPLES
8 OTHER

Q:Q34
T:
Now thinking about stopping off between home and work to do such things as run errands or drop off children at child care … On how many days per week do you typically make at least one such stop_____ either on the way to work or on the way home?

1 one such stop ___ days/week

Q:Q35
T:

Q:Q36
T:
In a typical month, on about how many weekend days do you work outside the home?

9 DON'T KNOW
0 REFUSE

Q:Q37
T:
Now I am going to offer you some choices so you can tell us what is most important to you. The first set of choices is between faster light rail trains that will save you 8 minutes for every 30 minutes you are on the train and security guards at the train stations you use. Which would you choose?

1 FASTER TRAINS (SKIP TO Q39)
2 SECURITY GUARDS (CONTINUE)
7 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q43)

IF SECURITY GUARDS, ASK:

Q:Q38
T:
What if the trains were even faster and saved you 12 minutes for every 30 minutes you are on the train. Would you still choose the security guards, or would you choose the faster trains?

1 FASTER TRAINS
2 SECURITY GUARDS

I:**SKIP TO Q40.**

IF FASTER TRAINS, ASK:

Q:Q39
T:
What if the faster trains would only save you 4 minutes for every 30 minutes you were on the train? Would you still choose the faster trains, or would you choose the security guards?

1 FASTER TRAINS
2 SECURITY GUARDS

Q:Q40
T:
The second set of choices is between security guards at the light rail stations you use and a fare increase. You could choose to have security guards and a 20-cent increase in the one-way fare or no security guards and no fare increase. Which would you choose?

2 SECURITY GUARDS (CONTINUE)
3 NO FARE INCREASE (SKIP TO Q42)
7 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q43)

IF SECURITY GUARDS, ASK:

Q:Q41
T:
What if the increase were 35 cents for a one-way fare? Would you still choose the security guards and the fare increase, or would you choose no security guards and no fare increase?

2 SECURITY GUARDS
3 NO FARE INCREASE

I:**SKIP TO Q43.**

IF NO FARE INCREASE, ASK:

Q:Q42
T:
What if the increase were 5 cents for a one-way fare. Would you still choose no security guards and no fare increase, or would you choose security guards and a fare increase?

2 SECURITY GUARDS
3 NO FARE INCREASE

Q:Q43
T:
The last set of choices is between faster trains that would save you 8 minutes for each 30 minutes on the train and a 20-cent increase in the one-way fare or trains that are not faster with no fare increase. Which would you choose?

1 FASTER TRAINS (CONTINUE)
3 NO FARE INCREASE (SKIP TO Q45)

IF FASTER TRAINS, ASK:

Q:Q44
T:
What if the increase were 35 cents for a one-way fare? Would you still choose the faster trains and the fare increase, or would you choose trains that are not faster and no fare increase?

1 FASTER TRAINS
3 NO FARE INCREASE

I:**SKIP TO Q92.**

IF NO FARE INCREASE, ASK:

Q:Q45
T:
What if the increase were 5 cents for a one-way fare. Would you still choose no faster trains and no fare increase, or would you choose faster trains and a fare increase?

1 FASTER TRAINS
3 NO FARE INCREASE

I:SKIP TO Q92.

IF BUS ALONE (Q1=1)

Q:Q46
T:
And would you say you used light rail to get to and from work no days, between one and ten days, or more than ten days during the past six months?

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q47
T:
During the same time period, did you drive a car, truck, van, or motorcycle to and from work no days, between one and ten days, or more than ten days?

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q48
T:
How about riding in a car, truck, van, or motorcycle with someone else driving? (Did you ride in a car, truck, van, or motorcycle to and from work no days, between one and ten days, or more than ten days during the past six months?)

1 NO DAYS
2 1 - 10 DAYS
3 MORE THAN 10 DAYS

Q:Q49
T:

Q:Q50
T:
Overall, would you say you are satisfied or dissatisfied with taking the bus or buses to and from work?

1 SATISFIED
2 DISSATISFIED
3 INSISTS ON NEUTRAL,
8 no opinion

Q:Q51
T:
Select any number from 1 to 5 to indicate how (ANSWER TO Q50) you are. A one means you are slightly (ANSWER TO Q 50), a five means you are very (ANSWER TO Q50), with 2, 3, and 4 in between?

1
2
3
4
5

Q:Q52
T:
Now I would like to ask you some questions about using the bus versus driving a car to get to and from work. (We would like your opinion even if you don't drive yourself.) Overall, are you more satisfied taking the bus or driving to and from work?

1 TAKING THE BUS (CONTINUE)
2 DRIVING (CONTINUE)
3 INSISTS ON NO DIFFERENCE (SKIP TO Q54)

IF TAKING BUS, DRIVING, OR BEING DRIVEN, ASK:

Q:Q53
T:
Select any number from 1 to 5 to indicate how much more satisfied you are with (ANSWER TO Q52), where one means you are slightly more satisfied, five means you are much more satisfied, with 2, 3, and 4 in between?

1
2
3
4
5

Q:Q54
T:
Do you feel safer when you are taking the bus or when you are driving?

1 TAKING THE BUS (CONTINUE)
2 DRIVING (CONTINUE)
3 INSISTS NO DIFFERENCE (SKIP TO Q56)

IF TAKING THE BUS, DRIVING, OR BEING DRIVEN, ASK:

Q:Q55
T:
And would that be a 1 for slightly safer, a 5 for much safer, or a 2, 3, or 4?

1
2
3
4
5

Q:Q56
T:
Would you say that you observe or experience discourteous behavior by passengers or bus drivers at bus stops or on buses every day, most days, many days, a few days, or never?

5 EVERY DAY
4 MOST DAYS
3 MANY DAYS
2 A FEW DAYS
1 NEVER

Q:Q57
T:
Now thinking about the neighborhood where you live … Would you say that it is very safe, somewhat safe, neither safe nor unsafe, somewhat unsafe, or very unsafe?

5 VERY SAFE
4 SOMEWHAT SAFE
3 NEITHER SAFE NOR UNSAFE
2 SOMEWHAT UNSAFE
1 VERY UNSAFE
9 DON'T KNOW/NO OPINION

Q:Q58
T:
How about the area where you work? (Is it very safe, somewhat safe, neither safe nor unsafe, somewhat unsafe, or very unsafe?) IF WORK IN MORE THAN ONE AREA, PROBE: Think of the area where you have worked **the most** in the past six months.

5 VERY SAFE
4 SOMEWHAT SAFE
3 NEITHER SAFE NOR UNSAFE
2 SOMEWHAT UNSAFE
1 VERY UNSAFE
9 DON'T KNOW/NO OPINION

Q:Q59
T:In the past six months, has someone said or done something while you were getting to or from the bus, at a bus stop, or on the bus that scared you?

1 YES (CONTINUE)
2 NO (SKIP TO Q61)
9 DON'T RECALL (SKIP TO Q61)

IF YES, ASK:

Q:Q60
T:
And about how many times has that happened in the past six months? ___ ___

Q:Q61
T:
Now thinking about being relaxed … Do you feel more relaxed when you are taking the bus or when you are driving?

1 TAKING THE BUS (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS NO DIFFERENCE (SKIP TO Q63)

IF TAKING THE BUS, DRIVING, OR BEING DRIVEN, ASK:

Q:Q62
T:
And would that be a 1 for slightly more relaxed, a 5 for much more relaxed, or a 2, 3, or 4?

1
2
3
4
5

Q:Q63
T:
Now thinking about how well your time is used, including both the time you spend traveling and other ways you could use the same time, would you say that taking the bus or driving makes better use of time?

1 TAKING THE BUS (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS NO DIFFERENCE (SKIP TO Q65)

Q:Q64
T:
And would that be a 1 for slightly better use of time, a 5 for much better use, or a 2, 3, or 4?

1
2
3
4
5

Q:Q65
T:
Now as you may know, some people need flexible ways of traveling because they start and end work at different times, need to make stops before or after work, or need to travel during work hours. Would you say that taking the bus or driving meets the flexibility needs of these people better?

1 TAKING THE BUS (CONTINUE)
2 DRIVING (CONTINUE)
7 INSISTS NO DIFFERENCE (SKIP TO Q67)

IF TAKING THE BUS, DRIVING, OR BEING DRIVEN, ASK:

Q:Q66
T:
And would that be a 1 for slightly more flexible, a 5 for much more flexible, or a 2, 3, or 4?

1
2
3
4
5

Q:Q67
T:
And thinking about the quality of bus and light rail service combined … Would you say your neighborhood has better or worse combined quality than other neighborhoods?

1 BETTER
2 WORSE
3 INSISTS ON NO DIFFERENCE (SKIP TO Q70)
7 DEPENDS, NO OPINION, REFUSED (SKIP TO Q70)

Q:Q67A
T:
And would that be a 1 for slightly (Q67 ANSWER), a 5 for much (Q67 ANSWER), or a 2, 3, or 4?

1
2
3
4
5

Q:Q68
T:

Q:Q69
T:

Q:Q70
T:
Now thinking about the amount of flexibility **you** need in traveling to and from work … Would you say you need a lot more, somewhat more, somewhat less, or a lot less flexibility than most people?

4 A LOT MORE
3 SOMEWHAT MORE
2 SOMEWHAT LESS
1 A LOT LESS
9 DON'T KNOW/NO OPINION

Q:Q70
T:

Q:Q71
T:
Now turning to distance … What is the one-way distance in miles between your home and your most frequent place of work in the past six months? IF NOT SURE, ASK – Could you just give me a guess?)

___ ___miles

99 DON'T KNOW
00 REFUSED

Q:Q72
T:
And turning to travel time … About how many minutes does it take to travel one-way between your home and your most frequent place of work in the past six months using the bus?

___ ___minutes

77 INSISTS VARIES TOO MUCH (SKIP TO Q74)
99 DON'T KNOW
00 REFUSED

Q:Q73
T:
And about how many of those minutes are actually on the bus?

___ ___minutes

99 DON'T KNOW
00 REFUSED

Q:Q74
T:
And how many buses do you have to take on that trip?

___ ___buses

Q:Q75
T:
About how many minutes would it take you to drive between your home and your most frequent place of work in the past six months? IF NOT SURE, ASK: Could you just give me a guess?

___ ___ STATED

___ ___ GUESS

77 INSISTS VARIES TOO MUCH
99 UNABLE TO GUESS

Q:Q76
T:

Q:Q77
T:
Now I am going to read three statements about the time you typically leave work. After I have read all three, please tell me which one best describes when you leave work.

1 Except for one or two days a month, I leave work between 4 and 7 in the afternoon or evening.

2 Except for one or two days a month, I leave work before 4 or after 7 in the afternoon or evening.

3 I leave work more than a couple of days a month between 4 and 7 and I leave more than a couple of days a month before 4 or after 7.

Q:Q78
T:

Q:Q79
T:

Q:Q80
T:
Now thinking about stopping off between home and work to do such things as run errands or drop off children at child care … On how many days per week do you typically make at least one such stop either on the way to work or on the way home?

1 one such stop ___ DAYS PER WEEK

Q:Q81
T:

Q:Q82
T:
In a typical month, on about how many weekend days do you work outside the home?

99 DON'T KNOW
10 REFUSED

Q:Q83
T:
Now I am going to offer you some choices so you can tell us what is most important to you. The first set of choices is between faster buses that will save you 8 minutes for every 30 minutes you are on the bus and security guards at the bus stops you use. Which would you choose?

1 FASTER BUSES (SKIP TO Q85)
2 SECURITY GUARDS (CONTINUE)
3 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q89)

IF SECURITY GUARDS, ASK:

Q:Q84
T:
What if the buses were even faster and saved you 12 minutes for every 30 minutes you are on the bus. Would you still choose the security guards, or would you choose the faster buses?

1 FASTER BUSES
2 SECURITY GUARDS

I:**SKIP TO Q86.**

IF FASTER BUSES, ASK:

Q:Q85.
What if the faster buses would only save you 4 minutes for every 30 minutes you were on the bus? Would you still choose the faster buses, or would you choose the security guards?

1 FASTER BUSES
2 SECURITY GUARDS

Q:Q86
T:
The second set of choices is between security guards at the bus stops you use and a fare increase. You could choose to have security guards and a 20-cent increase in the one-way fare or no security guards and no fare increase. Which would you choose?

2 SECURITY GUARDS (CONTINUE)
3 NO FARE INCREASE (SKIP TO Q88)
7 WE ALREADY HAVE SECURITY GUARDS THERE (SKIP TO Q89)

IF SECURITY GUARDS, ASK:

Q:Q87
T:
What if the increase were 35 cents for a one-way fare? Would you still choose the security guards and the fare increase, or would you choose no security guards and no fare increase?

2 SECURITY GUARDS
3 NO FARE INCREASE

I:**SKIP TO Q89.**

IF NO FARE INCREASE, ASK:

Q:Q88
T:
What if the increase were 5 cents for a one-way fare. Would you still choose no security guards and no fare increase, or would you choose security guards and a fare increase?

2 SECURITY GUARDS
3 NO FARE INCREASE

Q:Q89
T:
The last set of choices is between faster buses that would save you 8 minutes for each 30 minutes on the bus and a 20-cent increase in the one-way fare or buses that are not faster with no fare increase. Which would you choose?

1 FASTER BUSES (CONTINUE)
3 NO FARE INCREASE (SKIP TO Q91)

IF FASTER BUSES, ASK:

Q:Q90
T:
What if the increase were 35 cents for a one-way fare? Would you still choose the faster buses and the fare increase, or would you choose buses that are not faster and no fare increase?

1 FASTER BUSES
3 NO FARE INCREASE

I:**SKIP TO Q92.**

IF NO FARE INCREASE, ASK:

Q:Q91
T:
What if the increase were 5 cents for a one-way fare? Would you still choose no faster buses and no fare increase, or would you choose faster buses and a fare increase?

1 FASTER BUSES
3 NO FARE INCREASE

EVERYONE CONTINUES HERE

Q:Q92
T:
That concludes the choice questions. Now I am going to read a few statements that you may or may not agree with. After I read each one, please tell me whether you agree strongly, agree moderately, agree slightly, disagree slightly, disagree moderately, or disagree strongly. START WITH STATEMENT CHECKED ☑.

	Agree Strongly	Agree Moderately	Agree Slightly	Disagree Slightly	Disagree Moderately	Disagree Strongly	Don't Know
❒The government should be doing a lot more to reduce pollution and improve the environment even if it hurts the economy.	6	5	4	3	2	1	9
❒The government should increase the sales tax on cars that get poor gas mileage.							
❒It is much better to find ways of conserving energy and gas than it is to drill for oil in such places as Alaska.							
❒Usually get very upset when waiting in line..							
❒I I usually feel under a lot of time pressure							
❒On most days, I need more hours in the day to do all the things that are expected of me.							
❒I determine ahead of time how much money to spend each month and usually do not spend more than this amount.							
❒There are many things I resist buying today so I can save for tomorrow.							
❒I hardly ever buy something unless it's on sale.							
❒Taking everything into consideration, I am very satisfied with my job as a whole							
❒I often think about quitting							
❒I will probably look for a new job in the next year							

Q:Q93
T:
Now thinking about personal motor vehicles such as cars, trucks, vans, minivans, and motorcycles. How many such vehicles are owned or leased by you and the other members of your household?

00 NONE
98 REFUSED

Q:Q94
T:
If your household income were $20,000 a year more than it actually is, would your household definitely, probably, probably not, or definitely not buy or lease an additional motor vehicle?

4 DEFINITELY (CONTINUE)
3 PROBABLY (CONTINUE)
2 PROBABLY NOT (CONTINUE)
1 DEFINITELY NOT (SKIP TO Q96)
9 DON'T KNOW/NOT SURE (CONTINUE)

IF DEFINITELY, PROBABLY, PROBABLY NOT, OR DON'T KNOW:

Q:Q95
T:
Assuming your household did buy another motor vehicle, would you usually drive, be driven, or take the bus or train to and from work?

1 DRIVE
2 BE DRIVEN
3 BUS OR TRAIN
9 NOT SURE

Q:Q96
T:
In the past six months, have you personally always, usually, sometimes, rarely, or never had a motor vehicle available to you to drive?

5 ALWAYS
4 USUALLY
3 SOMETIMES
2 RARELY
1 NEVER

Q:Q97
T:
Also in the past six months, have you driven a motor vehicle a total of 100 miles or more?

1 YES
2 NO
9 DON'T KNOW

Q:Q98
T:
Now in order to classify your responses along with others, I need to ask a few questions about you.

Q:Q99
T:
First, what is the Zip Code where you live?

9 DON'T KNOW
0 REFUSED

Q:Q100
T:
Including yourself, how many people live in your household?

IF ONE, SKIP TO Q102.

IF MORE THAN ONE, ASK:

Q:Q101
T:
Also including yourself, how many of these people are at least 18 years old and either work outside the home or go to school at least two days a week?

00 NONE
98 REFUSED

Q:Q102
T:
What was the last grade you completed in school?

1 LESS THAN HIGH SCHOOL
2 HIGH SCHOOL GRADUATE
3 VOCATIONAL/TRADE CERTIFICATE
4 SOME COLLEGE
5 TWO-YEAR DEGREE
6 FOUR-YEAR DEGREE OR HIGHER
0 REFUSED

Q:Q103
T:

Q:Q104
T:
What is your age, please?

Q:Q105
T:
Was your total annual household income before taxes in 2002 under or over $45,000?

1 UNDER ($0-$44,999) (ASK Q106)
2 OVER ($45,001+) (ASK Q107)
6 EXACTLY $45,000 (END INTERVIEW)
9 DON'T KNOW (END INTERVIEW)
10 REFUSED (END INTERVIEW)

IF UNDER $45,000 ASK:

Q:Q106
T:
And was it under or over $30,000?

03 UNDER ($0-29,999)
05 OVER ($30,001-44,999)
04 EXACTLY $30,000
99 DON'T KNOW
20 REFUSED

IF OVER $45,000 ASK:

Q:Q107
T:
Was it under or over $60,000?

07 UNDER ($45,001-59,999)
08 EXACTLY $60,000
09 OVER ($60,001+)
99 DON'T KNOW
30 REFUSED

THANK RESPONDENT!

Q:Q108
T:
RECORD GENDER:

1 MALE
2 FEMALE

Q:Q109
T:
RECORD LANGUAGE OF INTERVIEW:

1 ENGLISH
2 SPANISH

TIME ENDED: ___ ___ : ___ ___

ELAPSED TIME: ___ ___

DATE: ___ ___ / ___ ___ /03

INT ID #: ___ ___ ___ ___

PAGE: _____

LINE: _____

NAME: _____

PHONE #: ( ) _____ - _____

CHECKER ERROR r_1

APPENDIX B: PRIMER ON PAIRWISE TRADEOFF MEASUREMENT

This appendix presents a primer on constructing starting pairs and follow-up pairs when using pairwise tradeoff measurement, along with two preliminary issues with this measurement technique. The two preliminary issues are:

- Selecting the number of attributes to present in each pair
- Selecting the number of pairs to present with each set of pairs

This primer is important for researchers involved in questionnaire design. However, it is recommended that this appendix be skipped by other readers.

SELECTING THE NUMBER OF ATTRIBUTES TO PRESENT WITH EACH PAIR

One of the underlying decisions in using pairwise tradeoff measurement involves the number of attributes presented with each pair. At least with telephone administration, which was used in this study, it is important that each choice be a simple tradeoff since respondents cannot see or read the details in the choice. Instead, they must listen to the description and then briefly recall the description. Given this information processing constraint, it is recommended that only two attributes be involved in each pair. More than two attributes can be used, but separate starting pairs are needed with each combination of attributes. For example, the three attributes used in this study were: (a) travel time; (b) security provided, as measured by the presence or absence of a security guard at a station; and (c) cost of a transit fare. However, rather than having each option have a price, a time, and a level of security, each pair had only two of these three attributes. One starting pair had a tradeoff between security and travel time, a second had a tradeoff between security and fares, and the third starting pair had a tradeoff between fares and travel time.

SELECTING THE NUMBER OF FOLLOW-UP PAIRS TO PRESENT WITH EACH STARTING PAIR

Another important underlying decision involves the number of follow-up pairs to present with each starting pair. Before discussing this decision, some background information needs to be presented regarding the objective of both a starting pair and of the follow-up pairs, along with how the objective of the follow-up pairs is achieved.

The concept of the starting pair is to present a relatively balanced tradeoff, to determine which one of the two attributes involved is more important. This needs to be known to determine how to change the follow-up pair or pairs, as will be explained in the below discussion on follow-up pairs. An example using a starting pair from this study will clarify this concept.

> Now I am going to offer you some choices so you can tell us what is most important to you. The first set of choices is between faster light rail trains that will save you 8 minutes for every 30 minutes you are on the train and security guards at the train stations you use. Which would you choose?

Having security guards would be more important than having faster trains for a respondent who selects the security guard option but having faster trains is more important to a respondent who selects the faster train option. However, given this choice alone, the degree of additional importance attached to having security guards, for example, is unknown.

The goal of the follow-up pairs is to determine the degree of additional importance that the more important attribute has. The concept behind determining this degree of additional importance is to identify the degree to which a person sticks with their initial choice in the starting pair even when they are given a stronger motivation to switch their choice away from this option. The bigger the inducement needed to get the person to switch from their initial choice, the more important this attribute is. For example, if a respondent selects the option in the above starting pair that involves having security guards, the time saving of the other option would be increased from the starting pair to encourage the person to switch away from the option with security guards. The follow-up pair actually used for a respondent who selected the security guard option in the above starting pair in the text box that follows. If a respondent switches to the faster option after initially selecting the security guard but slower option in the above pair, then having security guards is more important than saving time, but not as important as for a person who still sticks with the security option below even when they have to sacrifice even more speed by sticking with this option.

> What if the trains were even faster and saved you 12 minutes for every 30 minutes you are on the train. Would you still choose the security guards, or would you choose the faster trains?

On the other hand, if the person selects the faster train option in the prior starting pair, then the chosen option is made less desirable by reducing the travel time as we see below.

> What if the faster trains would only save you 4 minutes for every 30 minutes you were on the train? Would you still choose the faster trains, or would you choose the security guards?

Now that the necessary background information has been presented, the discussion of the determination of the number of follow-up pairs to present to each respondent can be discussed. There is no single appropriate answer with this decision. Obviously, increasing the number of follow-up pairs per starting pair will increase the length of the questionnaire, particularly given that multiple starting pairs are presented to each respondent, at least if three or more attributes are involved. At the same time, increasing the number of follow-up pairs per starting pair will allow the importance weights to be more precisely determined. The reason for the greater precision is that having more follow-up pairs per starting pair allows a larger number of changes from the starting pair in the size of the tradeoff, going from very small changes from the initial pair to very large changes. This allows the researcher to more precisely identify the size of the additional motivation needed to before the respondent switches away from the choice with the more important attribute.

Again, the example from the study will be used to clarify this concept of precision. In this study, the first follow-up pair presented was the only follow-up pair presented to a respondent who selected the security guard, but slower option in the starting pair. The reason for having only one follow-up pair per respondent will be presented shortly. Here the point is to show that having only one follow-up pair lessened precision. For example, if the respondent stuck with the security option with the above follow-up pair, all the researcher knows is that they were not willing to switch when they saved four additional minutes from the starting pair. However, the researcher would have gotten a more precise indication of how much more important security guards are than saving time by having another follow-up pair or pairs that gave even greater time saving, such as 16 minutes and/or 20 minutes of time saving. Conversely, if the respondent did switch to the faster option with no security guards in the above follow-up pair, the researcher would not know if they would have switched with an even smaller time saving than the four minute one presented.

Given that increasing the number of follow-up pairs presented to each respondent involves a longer questionnaire, but, at the same time, increases precision, this appropriate number to select depends on the specific study objectives and the length of the questionnaire. In this study, the decision was made to use the absolute minimum number of follow-up pairs per respondent, namely only one follow-up pair, both because the questionnaire already was quite long and because the objective was to determine the extent that ethnicity and other factors influenced the degree of global satisfaction with transit. If the objective had been to determine how respondents might respond to specific fare increases being considered or if specific but costly things were being planned to improve travel time to different degrees, then obtaining more precise measures of importance would be critical and a larger number of follow-up pairs would need to be presented.

CONSTRUCTING THE STARTING PAIRS

In the common situation in which each attribute has more than two levels, the main guideline in constructing a starting pair involving two attributes is that a balanced tradeoff should be presented. The criterion of balance means that each choice or option in the pair should have the same summative preference level. For example, assuming that a starting pair had been presented that involved the fare level and time saving level attributes. Here, each of the three below starting pairs could have been used. In the below example, the travel time levels are 12 minutes faster, 8 minutes faster, 4 minutes faster and no time saving. The fare levels are no fare increase, a $.05 fare increase, a $.20 fare increase and a $.35 fare increase.

- Twelve minutes faster and $.05 increase OR 8 min faster and no fare increase
- Eight minutes faster and $.20 increase OR 4 min faster and $.05 increase
- Four minutes faster and $.35 increase OR no time saving and $.20 increase

To demonstrate that each of the two choices in the three above starting pairs has the same summative preference level, the left option in the first pair has the most preferred time (1) and the second most preferred fare (2) for a summative preference level of 3, while the right choice in this pair has the same summative preference level of 3, with the most preferred fare (1) and the second most preferred time (2). The summative preference level of the two options with the second starting pair above is 5, as it involves the second and

third most preferred levels of both fare and speed. The summative preference level of each option with the third starting pair is 7, involving the third and fourth most preferred levels of each attribute.

Each starting pair should be balanced because the goal is to determine which one of the two attributes is more important. This goal is achieved by constructing the choice so that there is an equal chance, at least in theory, of selecting each option. If imbalance exists, this equal chance would not exist. An example of an imbalanced starting pair is 12 min faster and $.35 increase OR 8 minutes faster and no fare increase.

To demonstrate that the previous pair is imbalanced, the left option has the most preferred time (1) and the least preferred price (4) for a summed preference of 5, while the right option has the second most preferred time (2) and the most preferred fare (1), for a summed preference of 3. This pair would favor the right option.

CONSTRUCTING THE FOLLOW-UP PAIRS

As previously mentioned in presenting background material on starting and follow-up pairs, the key concept involved in constructing a set of follow-up pairs is that the goal is to determine the degree of resistance to switching away from their choice in the starting pair. This degree of resistance is measured either by making the other option more attractive than it was in the starting pair or by making the chosen option in the starting pair less attractive. If multiple follow-up pairs are involved, the initial follow-up pair should present only a small inducement to switch. If the person does not switch, then the size of the inducement should be increased a little at a time until the respondent does switch. For example, with the same starting pair as before, where the time saving was eight minutes for the option without security guards, the first follow-up pair for a respondent who selected the security guard option in the starting pair could involve ten minutes of time saving, which is two extra minutes of saving compared to the starting pair. If the respondent still chooses the security guard option, the time saving of the other option could be increased to twelve minutes of time saving. If the respondent still selected the slower option because it had security guards, the time saving of the other option could be increased to fourteen minutes. Again, the key concept here is to make the unchosen option from the starting pair more attractive to ascertain the degree of resistance to change.

Realize that different specific follow-up pairs are needed for each choice in the starting pair. The discussion in the previous paragraph only presented the follow-up pairs for those respondents who selected the security guard option in the starting pair. Different follow-up pairs are needed for those who selected the faster train option without security guards in the starting pair. Here is why—remember that the goal of the follow-up pairs is to determine the degree of resistance to switching choices either by making the chosen option less attractive or by making the unchosen option more attractive, which is what was actually done above. However, if a respondent chose the option in the starting pair that saved eight minutes, then presenting them with a follow-up pair where they save even more time would not accomplish anything. Instead of giving an additional incentive to switch, it gives even more incentive not to switch. Thus, here either the unchosen option from the starting pair of security guards would need to be made more attractive

or else the time saving would need to be reduced to encourage switching to the security guard option. Realistically, it seems inappropriate to make the security guard option more attractive. About the only way of doing this would be to have multiple security guards per station but this probably would not really improve perceived security. Thus, in this situation, the follow-up pairs for respondents who selected the faster train option in the starting pair would involve reducing the time saving a little bit at a time from the starting pair. The first follow-up pair could have a time saving of six minutes. If the respondent does not switch to the security guard option with this inducement, the time saving could be lowered a little more to four minutes, etc.

In constructing the follow-up pairs, an additional guideline is needed, which is to make sure that a tradeoff exists with each and every follow-up pair. Because of this guideline, caution is needed when making the unchosen option from the starting pair more favorable or making the chosen alternative from the starting pair less favorable, remembering that both of these things are done to measure the degree of resistance to switching from the chosen alternative. The example, with one of the starting pairs suggested for a fare level/ travel time level is given again below for reader convenience, demonstrates this cautionary note: 12 min faster and $.05 increase OR 8 min faster and no fare increase

For a respondent who selects the left option, which demonstrates that speed is more important than the fare, one possible change would make this left option less desirable, as recommended, by reducing the time saving from 12 minutes to 8 minutes. However, note that this change would eliminate any tradeoff, and thus would violate the guideline of requiring every follow-up pair to have a tradeoff. More specifically, if the travel time saving were reduced from 12 minutes to 8 minutes, the travel times of both the left and right options would be the same so the only difference between these two choices is that the right option has no fare increase. Thus, everyone would select the right option regardless of the relative importance of these two attributes.

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Dr. Richard Werbel is a professor of marketing at San José State University. He has been the principle investigator or a co-author of several prior Mineta Transportation Institute studies, including *Factors Influencing Voting Results of Local Transportation Funding Initiatives With a Substantial Rail Transit Component: Case Studies of Ballots in Eleven Communities*; *Why Campaigns for Local Transportation Funding Initiatives Succeed or Fail: An Analysis of Four Communities and National Data; Land Use ad Transportation Alternatives: Constraint or Expansion of Household Choice*; and *Developer-Planner Interaction in Transportation and Land Use Sustainability*.

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