This is to certify that the

thesis entitled

MOBILITY PATTERNS OF THE NEXT GENERATION OF OLDER PERSONS

presented by

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has been accepted towards fulfillment of the requirements for

M.S. degree in Civil and Environmental Engineering

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Date 7/28/94

MOBILITY PATTERNS OF THE NEXT GENERATION OF OLDER PERSONS

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Civil and Environmental Engineering

1994

ABSTRACT

MOBILITY PATTERNS OF THE NEXT GENERATION OF OLDER PERSONS

By

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Considerable recent research has established that older drivers have accident involvement rates that are as high or higher than those of other age-group drivers. On the other hand, a large number of persons "self-test" off the highway system when they get older. These characteristics may be significantly changed for the next generation of older people. In the future, the absolute number and percentage of older persons will greatly increase; most older persons may live in lower density residential locations; and they may be unwilling to change driving habits. The purpose of this study is to examine the mobility pattern differences between current older people and those predicted for the next generation of older people.

The research is based on a mail-out survey in Michigan. Those people who currently live in non-city areas, are called non-traditional people and are more representative of future older people. Others, who currently live in cities are called traditional people and are more representative of current older people. The comparisons were conducted between four groups: traditional vs. non-traditional older people, traditional vs. non-traditional younger people, younger vs. older people, and traditional vs. non-traditional people in general.

The most important findings from the study is that the average trip lengths and total miles of travel and driven for future older people will increase as much as one-third more miles than current older people, although the number of trips will not be significantly changed. In the future, older people will hardly depend on transit or others, but almost exclusively drive automobiles. In terms of driving attitudes, they will be less likely to self-test off the road and less concerned about safety issues. The future older people will have slightly lower accident rates--however, in the context of the burgeoning population of older persons, the absolute number of accidents for older people will increase significantly in the future.

To

my motherland China

my parents,

my husband Wei Chen, and

my daughter Yan-Jiao Chen

ACKNOWLEDEGMENT

The author offers the most grateful thanks to Dr. Richard W. Lyles for his sincere guidence and encouragement over the past years, under whose supervision this research was conducted.

Special thanks are extended to Dr. John Schweitzer and Dr. William C. Taylor for their beneficial discussions, suggestion, and comments about this research work.

Appreciations are also expressed to Urban Affair Program at Michigan State University for providing part of the finacial support during my graduate study.

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INTRODUCTION

Considerable recent research has established that older drivers have accident involvement rates that are as high or higher than those of other age-group drivers. Prevalent accidents for older drivers are left-turn and rear-end accidents which mostly happen in intersection areas on non-interstate roads. The major violations in those accidents include failure to yield the right of way, following too close, improper turns, and improper lane use. Intuitively, those violations can be linked to the aging process, that is, the generally deteriorating physiological and psychological characteristics of older persons. Researchers have found that people have declining sensory abilities such as seeing, hearing, and reacting as they age. They conclude that these aging phenomena may put older drivers at risk while driving if they are not aware of those changes and modify their travel behavior accordingly.

On the other hand, researchers have also found that a large number of persons "self-test" off the highway system when they get older, that is, they voluntarily restrict their driving behavior. Often then, in order to travel, those who live in dense residential areas have to depend on public transit or personal relationships, such as getting a ride with friends or relatives. Others, who cannot reach public transit or catch a ride with a personal friend, have to reduce their travel frequencies and may, at the limit, essentially be marooned in their own homes.

The characteristics just noted may not be the case for the next generation of older people. In the future, older people will be more healthy and more active than ever before; the absolute number and percentage of older persons will greatly increase; and most older persons may live in lower density residential locations such as the suburbs and rural areas which do not have good access to public transit. The next generation of older people will also have had much greater experience with driving than current older people, and they may be unwilling to change driving habits even though their driving skills may have declined. All of this implies that the mobility patterns of the next generation of older people may be significantly different from today's older persons, more and more older people may depend on automobiles for their daily lives, and the safety problems of older drivers may become critical. While the traffic safety-related problems are largely indisputable, the question remains as to "how big" the problem will be in the future: will large numbers of older drivers continue to self-test off the system or will the older driver safety-related problems become even more serious.

The purpose of the study here is to examine the mobility pattern differences between current older people and those predicted for the next generation of older people. Among other things, this will provide insight into the extent of safety problems for older drivers in the future. Whether the mobility patterns of current older people and those of the next generation

of older people are significantly different is an important topic that greatly influences future transportation policy making. This study consists of the following five parts:

1. **LITERATURE REVIEW**

   A literature review is presented which covers: the general mobility issues confronting older people; the different schools of thought with respect to predicting the travel behavior of the next generation of older people; and finally, an overall review of the major dimensions of the problems of older persons, e.g., characteristics of the aging phenomena, demographic trends, residential location changes, and accident characteristics.

2. **OBJECTIVES AND HYPOTHESES**

   The research objectives and hypotheses of this study are based on the results of the literature review. The main objective of this study is to predict whether there are likely to be significant changes in the mobility and travel patterns between today's and the next generation of older people. The general null hypothesis is that the mobility pattern of the next generation of older people will not be significantly different from those of the past and current older people. To address this hypothesis, more detailed sub-objectives and hypotheses are defined.

3. **STUDY METHODOLOGY**

   The research hypotheses will be tested using data obtained from a mail-out survey. The survey instrument is meant to

cover all of the mobility related issues such as socio-economic background information, residential location changes, general travel habits, driving habits, and driving attitudes. The survey subjects were drawn from driver license files provided by the Michigan Department of State.

4. DATA ANALYSIS

The data from the survey are analyzed to test the research hypotheses and used to construct profiles of the mobility needs of the current and future generations of older drivers. The mobility-related characteristics such as travel modes, personal miles of travel, number of trips, driving experiences, driving attitudes are compared for the two groups of people.

5. CONCLUSIONS AND RECOMMENDATIONS

The results from the data analysis will support or deny the hypothesis that there are significant differences between the mobility patterns of current and future generation of older people. Based on the results, recommendations will be developed for reacting to the mobility needs of the next generation of older persons.

LITERATURE REVIEW

The literature review begins with an overall review of the transportation problems of older people, and then focuses on three specific topics which are related to the evolving mobility patterns of older people, especially for the next generation of older people.

Since the late 1960s and early 1970s, there has been an increase in concern about the travel-related problems of older persons. Numerous studies have been undertaken and covered topics such as: the mobility problems of older persons; the highway safety problems of older drivers; physiological and psychological characteristics of older people; and highway improvements and educational programs related to the safety of older people.

In the late 1960s and early 1970s, the fundamental problem of most transportation-oriented researchers concerned with older persons was their quality of life as related to their ability to travel. Older people were often portrayed as alone and lonely without social support or resources, and often lacking contact with kin and friends. Some researchers found that a large proportion of older people were literally marooned in their own homes after they retired. Many of them were not freely able to meet their transportation needs by driving automobiles because they did not drive or for whatever reason (including cost) did not have a car. On the other hand, public transportation did not serve them well. Although most older people were not living in

low density areas at that time, long walking distances to the nearest bus stop and the difficulty and inconvenience of getting on and off buses became the factors which diminished their public transportation usage. A study by Carp in 1971 (1) is one of the earliest research efforts in this area. Typical solutions offered at that time included the development of community-run paratransit and taxi services that would provide access to community, shopping, and health-related opportunities. Carp concluded, "the overall view of vehicular transport during retirement years is not encouraging" (p10).

However, over time, more and more people have obtained drivers' licenses and depend on automobiles for their daily activities even when they become older. Therefore, one of the central issues for older persons becomes safety problems while using the highway system. A considerable amount of research done at Michigan State University and elsewhere has indicated that, in general, older drivers are more likely to be disproportionately involved in the traffic accidents than other age groups (except the youngest).

Researchers have also attempted to focus on the physiological and psychological characteristics of older drivers in order to determine the root causes of their safety problems. Until recently however, not much significant progress has been made in identifying causal relationships. Most recently, Ball (5) has made breakthrough progress in finding visual/cognitive correlates of vehicle accidents for older drivers.

Based on numerous accident involvement studies, attention has been given to how to make the system more "user-friendly" for older persons. Thus, studies about highway improvements such as traffic control devices for older drivers have become focal points for identifying realistic strategies for coping with the expected safety problems for the next generation of older people. In addition, training and retraining older drivers have also become important issues with respect to ameliorating the safety problem (8).

The above provides a sense of the scope of problems facing older persons, and the various strategies to deal with these problems. The questions that remain to be answered are: will the mobility patterns of future older people significantly change, and will the future safety problems be more critical than today's. Answering these questions is the main task of the study conducted here. Therefore, for the purposes of this study, the following literature review will focus on three aspects of the mobility patterns of older people, and especially for the next generation of older people: the evolving nature of the general mobility problems of older persons; exploring two schools of thought regarding the seriousness of mobility and safety problems of future older people; and identifying the major dimensions of the mobility problems.

GENERAL MOBILITY ISSUES FOR OLDER PERSONS

Since the 1960s, the mobility patterns of older people have undergone significant change. In particular, a study conducted

by Carp in 1971 will be contrasted with similar work done by Rosenbloom (8) in 1988 in order to compare the perceived changes in mobility patterns of older persons over about twenty years.

Carp's research was based on home interviews of retired people in San Antonio and San Francisco. The survey results indicated that in the early 1970s, while nearly 90 percent of households headed by persons under 65 had automobiles, less than half of the households headed by persons 65 and older owned automobiles. However, many non-drivers lived in households that included someone who was a car owner. Two out of three older people interviewed in this study did not drive at all. The conclusion by Carp was that older persons impose significant travel restrictions on themselves. More specifically:

1) auto trips may not be taken at night due to physiological reasons such as reduced night vision, problems with headlight glare, and poor/low visibility of highway signs and markings;
2) older persons avoid driving during inclement weather or congested traffic conditions;
3) older persons may drive only in certain familiar areas or around their own neighborhood; and
4) a large proportion of retired people are "marooned" in their own homes.

Although Rosenbloom agrees with some of Carp's findings, she indicates that the elderly face a variety of personal and environmental barriers to initial or continued use of automobiles

for travel, she challenges many of the myths about the elderly. She found that in 1986, two-thirds of the elderly in the United States live in the suburbs or rural areas, 70 percent live in single-family homes, and over 90 percent of men and 40 percent of women are licensed to drive. Moreover, the car is the dominant travel mode for all of these travelers, and even the most disadvantaged of the elderly make the majority of their trips by car. She indicated that from 1977 to 1983 the auto mode had increased in importance in the total travel pattern of the elderly, whereas walking and transit became less important. Rosenbloom predicts that almost 100 percent of people will have driven by the turn of the century--a significant change from past generations.

Compared with the study by Carp in 1971, the study conducted by Rosenbloom in 1988 provides a different profile of mobility patterns for older people that implies the changing trend of mobility patterns of older persons in this country--more and more older persons are going to depend on automobiles for their daily activities.

SCHOOLS OF THOUGHT REGARDING OLDER PERSONS IN THE FUTURE

There have been great changes in older people's travel patterns during past decades. A number of current researchers (e.g., Rosenbloom) have also predicted the mobility trends of older people in the future. Generally speaking, there are two opposing schools of thought regarding how critical mobility problems are for the next generation of older people who are

generally perceived to be more dependent on the automobile.

One of the schools of thought suggests that the older drivers do not, and will not, present a critical transportation problem in the future. The reason is that a large proportion of older drivers will "self-test off" the highway system under certain conditions. The prevailing scenario is that they are aware of their diminished capabilities and reduce their driving (9), and/or have less desire to travel. This argument goes that, after retirement, older persons have fewer activities and are less physically able to travel. Moreover, even if they do not self-test off the system, transportation policies such as strict eye tests for driver license renewal should and will be set up to restrict the driving privileges of unsafe older drivers (10).

The opposing school of thought suggests that the older driver "problem" is going to become increasingly serious. The fastest growing age group in the United States, in both absolute and relative terms, is older people, and most of them will live in low density areas such as suburbs and rural areas, which, in turn, create an environment where older people will have to increase their use of the highway system over current levels (8, 10, 12). In addition, the older people in the future will be much more healthy and active than ever before, and will have a great desire to travel. While they may cut down on their frequency of driving and adjust their travel schedule, they will resist any significant changes in their preferred mode of travel (9). Proponents of this school of thought conclude that

self-regulation and policy-regulation are not realistic strategies for reducing exposure to potential accidents among older drivers. The solutions they suggest include making the highway system safer and creating more training and retraining programs for older drivers.

A study by Evans (10) supports the view that policies should be implemented for restricting older people from driving. He examines the crash risks which older drivers face themselves and impose on others in terms of various crash and fatality rates based on age and sex. He compares the 64-year-old and older age group with the teenage age group and finds that, even though both have high accident involvement rates, the teenage group's was higher than the elderly's. However, minor reductions in young-driver crash risk can generate many more safety benefits than do much larger reductions in older driver crash risks in terms of increased driver longevity and reduced harm to others. The conclusion he arrives at is that the older-driver problem may be one of reduced driving more than one of reduced safety.

From Evans's perspective, it's more cost-effective to restrict the driving of older persons by restrictive policies than to improve the highway system in terms of the safety of older drivers. While this may be theoretically true, the realistic problems are: how to change these people's preferred mode of travel; whether it is desirable to decrease their mobility level; and how much is realistic to spend on alternative modes such as paratransit or dial-a-ride for older people.

The research work conducted by Kosnik et al. (14) also indicates that since many older drivers limit their driving to "safer" times (e.g., daylight hours in light traffic), self-regulation may be sufficient for minimizing older driver problems. This point of view implies that older people will self-test off the highway system when they no longer can drive safely. However, the critical question is whether self-regulation is an adequate solution for the emerging highway safety problems of older persons.

Contrary to the assumptions of Kosnik et al., Rabbitt (12) indicates that most older people lack of awareness of their changes in visual ability and, thus, present themselves as "fit to drive." Rabbitt used a survey and a simple eyesight and hearing test to compare the pattern of self-reported and measured sensory abilities and the relationships between self-reported compensatory changes in road use behavior and self-reported accident rates for older people. His results indicate that for subjects aged 60 and over, although their eyesight was worse than that of the people in their 50s, they still reported few problems. He also discussed the implications of older people's lack of awareness of changes in their sensory abilities to their safety on the roads. Rabbitt asserts that safety issues will become more critical for older people due to their lack of awareness of declined sensory ability.

Rosenbloom also supports the contention that the safety problems of older persons will be more critical in the future.

Her conclusion is based on demographic trend analysis, residential location changes, and analysis of the driving habits of older people. She recommends training and retraining programs for automobile drivers instead of restrictions per se.

Although these two schools of thought view the older people problems from different perspectives, they are not mutually exclusive. Proponents of both perspectives agree on the major components of the next generation of older persons such as the aging phenomena, demographic trends, suburbanization of older people, and the accidents characteristics of older people. The difference is that one suggests that the older driver problem is not critical, because most of them will self-test off the system or more restrictive policies will curtail their driving, while the other suggests that more and more older people will have to depend on driving and older-driver problems will become critical. The latter, of course, implies the need for strategies concerned with improving highway safety. The study conducted here is, in part, an attempt to verify which perception of future problems is more accurate.

MAJOR DIMENSIONS OF AGING AND ITS RELATION TO MOBILITY

As noted, although various researchers describe future older persons from different perspectives, most agree on the major characteristics of aging. These characteristics will be discussed in more detail below.

AGING PHENOMENA

Most researchers define older people as 65 years old or

older. For example, almost all of the articles in the Transportation Record Board Special Report on Older Drivers (8) define older people or elderly as 65 years old or greater. This definition is adopted here as well. However, since some older people have capabilities on a par with those of other age groups, they do not have driving problems at all. Thus, age per se is not the only criterion for representing a person's physiological and psychological characteristics. This also implies that, among other things, the variance on physiological and psychological tests may be greater for older persons. Notwithstanding increasing variance, numerous researchers have found that, on average, the physiological and psychological characteristics of ordinary persons will be quite different when they get old, and those deficits will generally become more severe as they age. Results of different laboratory studies (12,15) have helped define the important physiological and psychological characteristics of older people that relate to the driving task:

1) deteriorating vision;
2) slowing of response times;
3) nervousness; and
4) physical limitations.

It is recognized that visual ability, one of the most important functional abilities for driving, declines with age. The loss of visual ability is manifested in difficulties in clearly seeing and focusing on objects, changing focus, loss of depth perception and peripheral vision, and increasing difficulty

in recognition of certain colors (7). Moreover, older drivers need greater illumination to see objects clearly, and glare is more likely to affect older persons to a greater extent than others (8).

In addition to visual input, the driving task also requires some central functions such as information processing for response. About two-thirds of older people suffer some level of cognitive deficiency that is most often demonstrated by confusion, inattention, and slow reaction and decision times (17). Such deficiencies should clearly contribute to highway accidents, however, demonstrated cause and effect relationships are lacking.

Nervousness and anxiety have also been investigated as relating to the driving task of older drivers (8). Although self-reporting by older persons indicated that some have tried to avoid more complex and higher stress driving situations, the statistical evidence has not been sufficient to support or reject a hypothesis that older drivers avoid high-stress situations.

Finally, the loss of physical mobility also inhibits driving maneuvers. When people get old, bones become more brittle because of a decline in mineral content, joint function is diminished, and resilience is lessened by a loss in the extensibility of collagen fibers (8). All these changes result in slower and more deliberate movements which, in certain circumstances, may make crashes more likely, as well as lowering the tolerance to injury in the event of a crash.

All of the above problems intuitively relate to the highway traffic accidents of older drivers. A summary of typical physiological/psychological problems of older drivers and potential safety problems is presented in table 1 (6). For example, deteriorating vision should be related to night, run-off-road, and sideswipe accidents. Slow mental processing may lead to accidents at intersections and merge areas on freeway accidents. Longer reaction times may result in rear-end and intersection accidents.

Although some correlations have been demonstrated between psychological and accident involvement, strong empirical linkages are lacking. In relatively recent studies, Ball et al. (15) have developed the concept of "useful field of view" (UFOV) and demonstrated a correlation between some vision-related characteristics and accident involvement. UFOV has been defined as the visual field area over which information can be acquired during a brief glance (16). The point being that while overall field of view may not be diminished for some persons, the information contained therein cannot be adequately processed. For example, a study was conducted to test how accident frequency in older drivers relates to the visual/cognitive system at a number of levels: phthalmological disease, visual function, visual attention, and cognitive function. Correlation has been found between the accident frequency of older drivers and their visual/cognitive system at certain levels (15).

In summary, the physiological and psychological problems of

Table 1. Physiological, Psychological Problems of Older Driversand Associated Accident Situations

Physiological & Psychological Problem	Associated Safety Problem
acuity at night is worse than acuity at daytime	run-off-road accidents, sideswipe accidents, and head-on accidents
vision degradation not detected by licensing eye exam	following-too-closely and rear-end accidents
mental processing speed - the more difficult the task, the more information that has to be processed	intersection accidents, merge areas accidents, heavy traffic periods accidents, and problems in unfamiliar areas
anxiety in complex or uncomfortable situations	missed signs or signals, driving too slowly, and poor decision making
reaction time is longer compared to younger drivers	rear-end accidents and intersection accidents
glare (day and night)	night-time accidents and day-time accidents when driving into the "sun"

older drivers will deteriorate as they age, and, intuitively at least, these problems will contribute to traffic accidents of older drivers. However, as Kosnik et al. (14) argued, if older persons are reasonably aware of their diminished capabilities resulting from aging and the correlation of these diminished function with traffic accidents, they may self-test off the road most of the time and voluntarily avoid situations where they are at higher risk. Indeed, there is some evidence, that some older drivers do just that.

DEMOGRAPHIC TRENDS

In the beginning of the twentieth century, only 4% of the people in the United States lived to be 65 years of age. This percentage had risen to 12% in 1988; and it is expected that by 2030, this percentage will be about 21%. Moreover, as an age group, the number of those over 75 is growing more rapidly than those between 65 and 74. The oldest age group, those 85 and older, accounted for about 1% of the total population in 1980, and is expected to triple in size by 2010 (8). According to the latest summary data (6), by 2020 over 50 million people will be 65 years old and over, and 25 million people will be 75 years old and over. This fundamental change occurring in the age distribution of the population is called "squaring the pyramid" (8) (figure 1): the population structure was once pyramidal with many young people at the base and a few very old people at the pinnacle; now it is fast becoming a rectangle with an equivalent number of people in each age group. This is mainly due to three

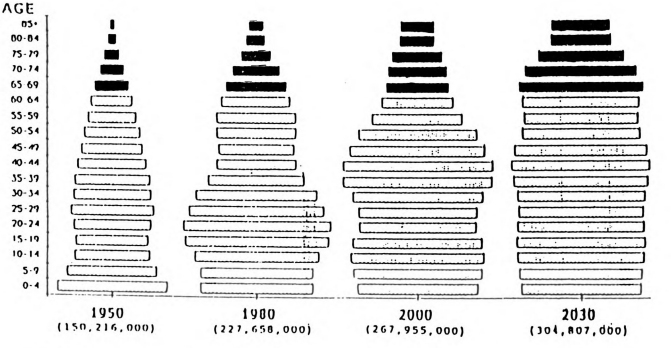


FIGURE 1: Squaring the U.S. Population Pyramid

Source: Transportation Research Board Special Report 218

factors:

1) improvements in the health care system;
2) the high birth rate that resulted in the "baby-boom" generation from 1945 to 1970 is aging; and
3) recently, lower birth rates.

These significant demographic trends indicate that it is time for society to pay more attention to the older age group--the potential for serious mobility-related problems is clear. For the transportation professionals, sustaining the mobility level of people as they age is one of the key factors in maintaining the older person's quality of life.

RESIDENTIAL LOCATION CHANGES

Contrary to popular belief that everybody moves to Florida, Arizona, or some other "sun belt" location when they are old enough to retire, most recent research shows that the majority of older persons grow old and remain in the same areas where they have lived most of their lives. Currently, there are fairly large concentrations of older persons in the older central city neighborhoods of many metropolitan areas, but the next generation of older people will more likely be long-time suburban dwellers. From 1960 to 1980 there was a steady growth rate for those over 65 in the suburbs and declining percentages for the same group in the central cities. Between 1970 and 1980, the number of persons over 65 living in the suburbs increased by 70% (8). In Michigan (6), the fraction of the state's population over 65 years old living in central cities decreased slightly

from 1960 to 1980 (3.1% to 2.7%) and then increased very slightly from 1980 to 1990 (to 2.8%). Older people living in fringe areas, on the other hand, increased steadily over the period from 1.5% in 1960 to 4.6% in 1990. In absolute terms, the changes for fringe areas were dramatic: from about 119,000 in 1960 to about 427,000 in 1990, which shows an increase of 258% for older persons. In the same period, the general population increased in fringe areas in Michigan by 55.7% (figure 2).

Older persons living in central cities today are likely to have used public transit and/or walked extensively at some point in their lives, and may still use non-automobile modes. However, the low-density residential location of future older people may, in all likelihood, create an environment for older people where they have to depend on the private automobile for their daily lives, as they have for virtually their entire lives. Moreover, these long-time drivers may be less likely to choose not to drive than current older drivers. If this is true, the safety problems of older drivers will become critical in the future, and highway improvements and driver training/retraining will have to be relied upon for solving these critical problems.

DIFFERENCE IN THE MOTORIZATION ENVIRONMENT

In studying mobility pattern changes of older people from 1963 to 1974 in New York, Kostyniuk and Kitamura (18) provided a theory of motorization that included defining the motorization environment as the spread across a population of the ownership and use of the automobile as a consumer technology. They

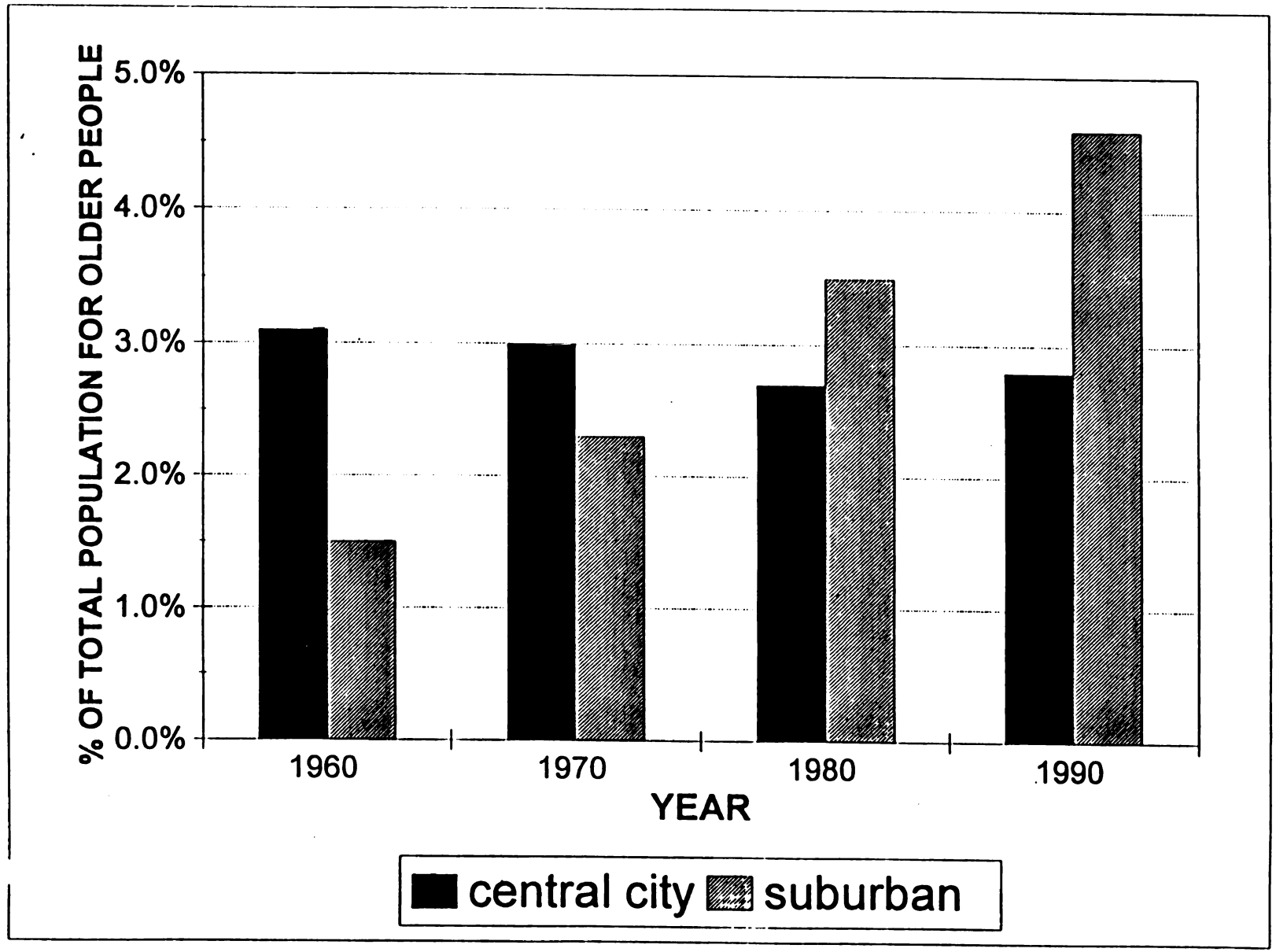
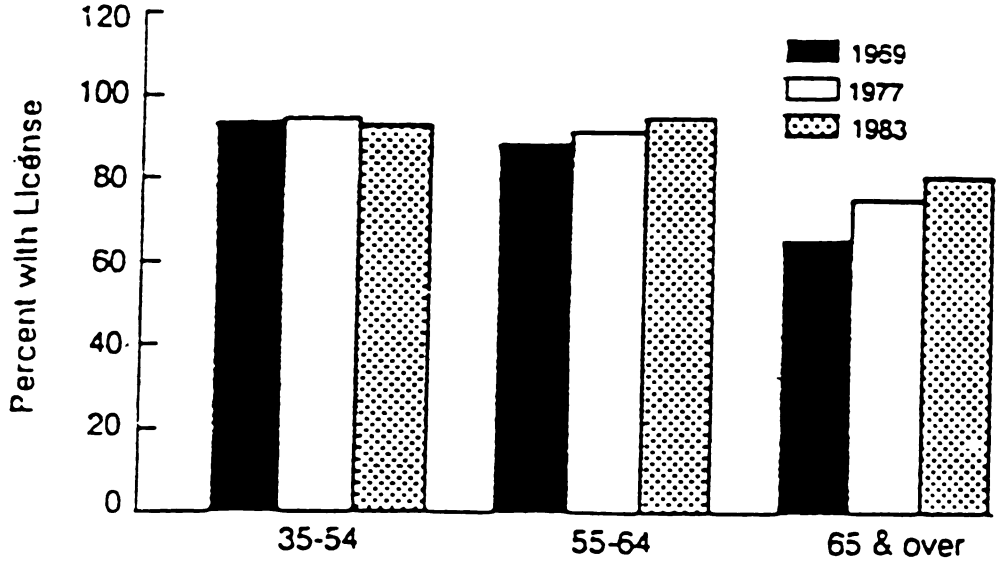


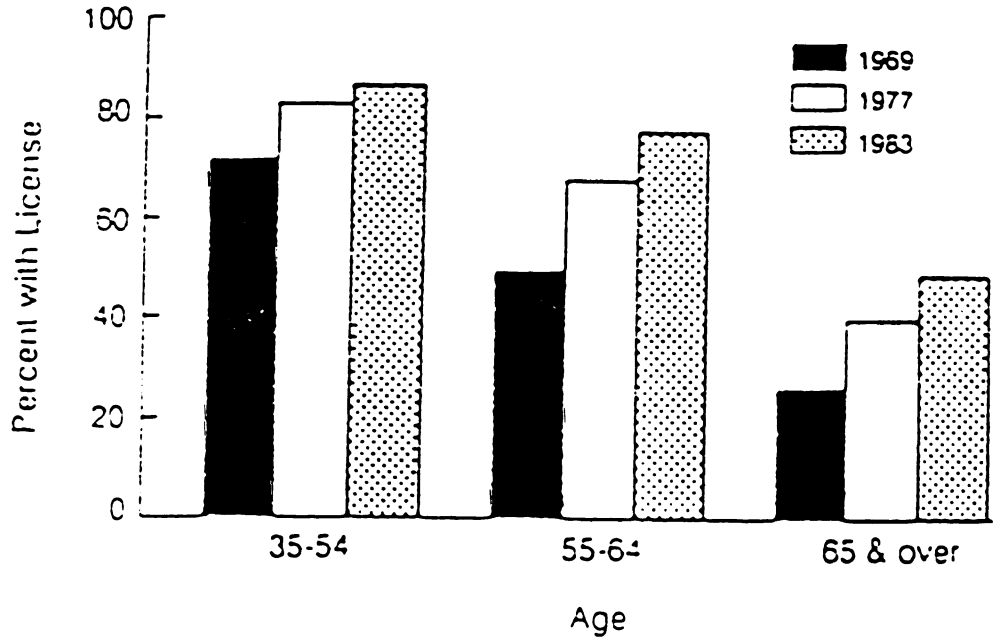
FIGURE 2. Michigan 65 Years Old and Over Population Percentage Distribution by Year

proposed a paradigm of cohort, age, and time effects to sort out the effects of motorization and aging on travel behavior. It was hypothesized that the age of a person during intense motorization of their environment will influence their perceptions, habits, and expectations about transportation throughout their lifetime. The results of the analysis indicated that the effects of age on an individual's mobility vary across cohorts.

The motorization process has been ongoing in this country since the early part of this century. The most rapid pace was right after World War II. Those individuals who were in their teens or twenties during the intense motorization process of the 1950s and 1960s are now reaching their fifties and sixties and will be "older" in the next twenty years. According to Kostyniuk and Kitamura, while many of today's older people, and even more of the older people of the past, may never have acquired a license to drive, a large portion of the future older people, on the contrary, will have a lifestyle in which automobiles are the central devices for pursuing daily activities. As a matter of fact, the dramatic increase of driver licenses among older people leads credence to their theory. According to Federal Highway Administration (FHWA) information (8), 43 percent of those over 65 had a driver's license in 1969, 55 percent in 1977, and 62 percent in 1983. In 1988, 94 percent of all adults 60-69 years old and almost 90 percent of men 70 and over have licenses. Figure 3 (8) shows the dramatic changes in the driver license population during the past twenty years.



Male Licensed Drivers by Age (1969, 1977, and 1983)



Female Licensed Drivers by Age (1969, 1977, and 1983)

FIGURE 3. Licensed Drivers Percentage Distribution by Age and by Year

Source: Transportation Research Board Special Report 218

Driving has become an integral part of the culture in US society. The people in the future older age cohorts who have experienced the intense motorization environment may remain emotionally and economically attached to their cars as a life-long habit despite any (likely) deterioration of their driving skills. If, then, Rabbitt, who argued that most people lack awareness of the deterioration of their driving skills, is correct, there will be more serious safety problems for older persons as well as for other drivers on the roads.

ACCIDENT INVOLVEMENT CHARACTERISTICS OF OLDER DRIVERS

When older people drive, most of them obey traffic rules and drive more carefully and politely than other age-group drivers (2). Nonetheless, a considerable body of research consistently shows that older drivers are more likely to be disproportionately involved in accidents than other age groups (except the youngest age group); and much of the time they are at fault. McKelvey et al. (2) studied the relationship between older drivers and highway safety in Michigan. The principal objectives of their research were to determine the accident patterns of older drivers and to identify factors contributing to these patterns. Recently, Lyles (6) reanalyzed some accident characteristics in Michigan, using 1990 and 1991 accident data and verified the research finding by McKelvey et al. and other researchers.

In all of the above studies, an approach based on quasi-induced exposure has been used for calculating highway accident rates. This approach incorporates a relative accident

"involvement ratio" (IR): a ratio is formed between the proportion of at-fault drivers for a specified accident type and the proportion of not-at-fault drivers (19). For example, figure 4 shows the matrix of "cleaned" at-fault drivers vs. not-at-fault drivers in two-vehicle accidents using 1992 Michigan accident data. The drivers were grouped in 10-year cohorts from 15 to 85 years of age and older (i.e., 15-24, 25-34, ..., >=85). The term "cleaned" means that alcohol and drugs were not suspected of being contributing causes, and only accidents which involving two passenger cars were considered. The IRs for driver age groups 15-24, 25-34,..., >=85 years old are 1.44, 0.89, 0.71, 0.70, 0.82, 1.18, 2.24, and 1.25, respectively. The IRs for older people (more than 65 years old) are all greater than 1, the values increase as age increases, and the IR is also greater than one for youngest age group (15-24 years old). On the other hand, IRs for other age groups are all less than 1. This indicates over-involvement in accidents for the older and youngest age groups and under-involvement for other age groups. Other accident characteristic patterns noted by McKelvey and further confirmed by Lyles can be summarized (2,3,4):

1) Older drivers are more likely to be involved in multi-vehicle than single vehicle accidents, and are more likely to be at fault in accidents.
2) The involvement rate for fatal accidents for older drivers is the highest of any of the driver age categories.

AGEGROU1 BY AGEGROU2

AGEGROU1: AT FAULT DRIVERS
AGEGROU2: NON-AT-FAULT DRIVERS

AGEGROU1	Count / Row Pct / Col Pct	AGEGROU2 1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	Row Total
15-24 yr old	1.00	11848	10961	8878	5268	3233	1982	653	955	43778
		27.1	25.0	20.3	12.0	7.4	4.5	1.5	2.2	34.3
		38.9	33.5	33.1	33.9	32.5	31.0	29.5	26.6	
25-34 yr old	2.00	6431	7808	6427	3591	2271	1373	490	604	28995
		22.2	26.9	22.2	12.4	7.8	4.7	1.7	2.1	22.7
		21.1	23.8	24.0	23.1	22.8	21.5	22.1	16.9	
35-44 yr old	3.00	4343	4898	4272	2357	1548	948	314	397	19077
		22.8	25.7	22.4	12.4	8.1	5.0	1.6	2.1	14.9
		14.3	15.0	15.9	15.2	15.6	14.8	14.2	11.1	
45-54 yr old	4.00	2393	2847	2300	1448	854	553	201	228	10824
		22.1	26.3	21.2	13.4	7.9	5.1	1.9	2.1	8.5
		7.9	8.7	8.6	9.3	8.6	8.6	9.1	6.4	
55-64 yr old	5.00	1833	2109	1689	982	694	484	184	169	8144
		22.5	25.9	20.7	12.1	8.5	5.9	2.3	2.1	6.4
		6.0	6.4	6.3	6.3	7.0	7.6	8.3	4.7	
65-74 yr old	6.00	1745	1940	1468	905	627	510	193	149	7537
		23.2	25.7	19.5	12.0	8.3	6.8	2.6	2.0	5.9
		5.7	5.9	5.5	5.8	6.3	8.0	8.7	4.2	
75-84 yr old	7.00	1069	1248	1000	554	411	333	110	110	4835
		22.1	25.8	20.7	11.5	8.5	6.9	2.3	2.3	3.8
		3.5	3.8	3.7	3.6	4.1	5.2	5.0	3.1	
85 and over	8.00	808	934	785	437	301	215	69	972	4521
		17.9	20.7	17.4	9.7	6.7	4.8	1.5	21.5	3.5
		2.7	2.9	2.9	2.8	3.0	3.4	3.1	27.1	
	Column Total	30470	32745	26819	15542	9939	6398	2214	3584	127711
		23.9	25.6	21.0	12.2	7.8	5.0	1.7	2.8	100.0

IR=INVOLVEMENT RATIO

FOR 15-24 YR OLD: IR=34.3/23.9=1.44
FOR 25-34 YR OLD: IR=22.7/25.6=0.89
FOR 35-44 YR OLD: IR=14.9/21.0=0.71
FOR 45-54 YR OLD: IR=8.50/12.2=0.70
FOR 55-64 YR OLD: IR=6.40/7.80=0.82
FOR 65-74 YR OLD: IR=5.90/5.00=1.18
FOR 75-84 YR OLD: IR=3.80/1.70=2.24
FOR 85 AND OLDER: IR=3.50/2.80=1.25

FIGURE 4. Exposure Measurement of Accident Involvment by Age

3) Older drivers have higher numbers of accidents in complicated situations such as interchanges or intersections, bad weather, at night, and during rush hour.

4) The major accident types for older drivers are left-turn, head-on, and angle accidents.

5) Traffic law violations for older persons include failure to yield the right of way, improper lane use, improper turns, and improper backing up.

6) Older drivers are considerably more involved in accidents in which their intention is to make a left turn, pass, or change lanes.

In conclusion, older drivers appear to have more problems with all types of accidents associated with turning maneuvers and in complex situations; and they are more troubled by glare. These results also reflect an intuitive correlation with the physiological and psychological problems reported earlier.

SUMMARY

The characteristics of the next generation of older drivers and their mobility-related problems include the following:

1) Older people's physiological and psychological problems may cause a deterioration of their driving skills and effectively restrict their travel.

2) There will be fundamental population distribution changes--the so-called "squaring of the pyramid" with more older persons than ever before.

3) There will be dramatic changes in the residential locations of older people--the next generation of older people will be long-time suburban dwellers.

4) The motorization environment for current and future older people will be different--a large portion of future older people have had, and will maintain, a lifestyle in which the automobile is the central device for pursuing daily activities.

5) The high accident involvement rates and vulnerability to injury of older persons will present significant safety problems for themselves as well as other drivers on the road.

Most of the above can be defined as "already known." What we do not know, but should, includes the following:

1) What will be the travel pattern of older people in the future?

2) What will be the driving pattern of older people in the future?

3) What will be their attitude about driving?

4) How will socio-economic factors influence their travel and driving?

5) How will the traffic violation and accident patterns for older drivers change?

To answer these questions, the general objective of the work conducted here is to compare the mobility pattern differences between current and future older people. The general hypothesis

is that the mobility patterns for the next generation of older people will be significantly different from those of current older people.

RESEARCH OBJECTIVES AND HYPOTHESES

Responding to the tasks discussed at the end of the last section, the basic research goal is to predict whether there are significant mobility and travel pattern differences between today's older persons and the next generation of older people. There are five related objectives which are part of this overall goal.

1) The extent of expected differences of travel habits between today's and the next generation of older people needs to be estimated. The objective is to determine the differences in daily trip numbers, person miles of travel, trip chaining, travel purposes, and temporal distribution.

2) The extent of expected differences of driving habits between today's and the next generation of older people needs to be estimated. The objective is to test the differences of daily trip numbers by driving, the percentages of travel miles by driving, the means of transportation, driving experiences, and car ownership.

3) The extent of attitudinal differences towards travel and driving between today's and the next generation of older people needs to be estimated. The objective is to describe the attitudes of both the current and the next generation of older people about using the automobile in general and driving at night, in bad weather, and in complex situations.

4) The extent to which socio-economic factors are related to driving for today's and the next generation of older people needs to be estimated. The objective is to examine the socio-economic characteristics of today's and the next generation of older people which include family structure, household income, marital status, education level, and employment. The key concern here is whether there are any causal reasons for discernible mobility pattern differences between the two groups.

5) The extent of traffic record differences between current and the next generation of older people needs to be estimated. The objective is to compare traffic violations and accidents for these two groups.

The general hypothesis of the research is that the mobility patterns of the next generation of older people will be significantly changed.

This hypothesis will be accepted or rejected by the analysis of actual survey data relating to five different issues:

1) The next generation of older people will have different travel patterns than current older people. For example, they will make more and longer daily trips than current older people.

2) Most future older people will have different driving patterns than current older people. For example, they will change their travel habits by focusing on the

automobile, even more than currently, and drive more and longer. They will also have longer-term car use/dependence and higher car ownership.

3) The next generation of older people will have a more confident attitude about driving. They will be less willing to self-restrict their driving such as decreasing travel overall and avoiding night-time, rush hour, bad weather, and other high-risk situations.

4) The next generation of older people will have somewhat different socio-economic characteristics such as higher education levels, higher household annual income and different living arrangements, and some will continue to work to more advanced ages.

5) Directly related to more miles of travel and more exposure to higher risk driving situations, the next generation of older people will likely have more traffic violation points and higher traffic accident involvement.

RESEARCH METHODOLOGY

The most reasonable approach for collecting data for this research is to use some sort of survey. There are several survey methodologies that could be used: mail, telephone, and face-to-face interviews. After careful consideration, a state-wide (Michigan) mail survey was chosen to be the most suitable methodology for this study. The several reasons for choosing this method are discussed below.

A mail survey is less threatening to older respondents than a face-to-face interview. Older people are very sensitive, even unhappy with people who ask them age-related questions. This may be because they are afraid that people think they are old and have fear for their personal safety. Although a face-to-face interview would typically obtain more accurate information and would lessen the major problems inherent with mail surveys (misinterpretation of the questions by respondents, failure to answer all questions, and non-response), the face-to-face approach is generally too aggressive for older respondents.

A telephone survey would likely have a higher response rate than a mail survey, but it would not produce the same quantity and quality of information. It is difficult to ask the large number of questions which need thoughtful detail over the phone. In addition, like a face-to-face survey, a telephone survey is also sometimes threatening for older respondents. For example, they may suspect that there is some problem with their driver's license.

Finally, a mail survey will be much cheaper and less time-

consuming than the other two approaches. Time and funding constraints made it impossible to visit or call large numbers of people.

After choosing the mail-out approach to data collection, the survey instrument was designed to include the necessary mobility-related questions. Several important issues related to this methodology are identified below and discussed in succeeding sections:

1) obtaining unbiased respondents;
2) designing the survey questions;
3) structuring the survey instrument; and
4) conducting the pilot study.

UNBIASED SURVEY RESPONDENTS

When using a survey methodology, several kinds of bias may exist between the selected data source and the target population; the survey sample and the data source; and the respondents with the survey sample. In order to mitigate bias, care has to be taken when choosing the data source and sampling. It is also necessary to test the biases before conducting data analysis.

In this study, the target population is defined as current and future older persons in Michigan. The data source was the Michigan Department of State's (MDOS) driver's license file. A sample of 10,000 subjects was randomly drawn (by MDOS) from all drivers who are 40 years old or older. The driver license file is considered a good data source due to the fact that it covers the vast majority of the Michigan population and virtually all

drivers. Most people have a driver's license since, even though some do not currently drive, they keep the license as identification (8). The driver license file also contains some useful information such as age, sex, name, and address as well as driving history information such as traffic violations and accident information. The variables to be used from the MDOS record are shown in appendix 1.

There is, however, some bias introduced by using the driver license file--i.e., it excludes those persons who have never had a license, have allowed their license to expire, or didn't pass the license renewal exam. Based on Michigan census data (23), in 1990, there was a total of 6.97 million people in the state who were 16 years old and older. According to DOS (Bureau of Information Systems), in the same year, there were about 6.5 million licensed drivers 16 years old and over. Thus, a total of 93% (6.5/6.97) of the people who were 16 years old and older people in Michigan had a driver's license in 1990. There is clearly a small segment of Michigan's population that is not considered in this research. However, since the interest here is with mobility and traffic safety-related issues, this bias is of little concern.

A total of 1,500 records was randomly drawn from the overall sample. Since it is a statistically random sample, it is assumed to be representative of the data source.

After the responses to the survey were coded, a statistical examination of the differences between respondents and non-

respondents was conducted to test for bias between respondents and non-respondents. There are six general characteristics on which respondent/non-respondent bias was examined: age, sex, driving restriction, total traffic violation points, total traffic accidents, and geographic distribution. The methodology for conducting the comparison will be discussed in the data analysis section.

DESIGN OF SURVEY QUESTIONS

In order to achieve a high response rate, obtain accurate data, and avoid misinterpretation of the questions and/or failure to answer all questions, the survey instrument must be very carefully designed and satisfy certain criteria. It must:

1) be interesting to the respondents;
2) be easy to read and complete;
3) avoid designer bias and leading respondents to "correct" answers; and
4) be careful with sensitive, recalling and calculating, and quantitative questions.

The following discussion indicates how the survey instrument was designed to satisfy these criteria.

BE INTERESTING TO THE RESPONDENTS

The purpose of the survey is clearly explained in the cover letter in order that the respondent understands it is an information-gathering exercise regarding mobility needs, an attempt to improve transportation conditions, and has nothing to do with driver license renewal or any other potentially punitive

use. This explanation hopefully encourages them to describe any difficulty when using the transportation system, their expected needs for transportation, and their suggestions to transportation professionals for potential improvements in the system. Also, the letter avoids the fact that it is a project related to "older persons" in order to avoid some older people's sensitivity to "old." Finally, the letter emphasizes the value of response and the importance of choosing them as respondents in order to attract subjects. The cover letter is in appendix 2.

BE EASY TO READ AND COMPLETE

If the survey is too complicated and difficult, respondents may lose interest in completing the survey or give incorrect answers. For older respondents, it is especially important to make the survey easy and understandable. It needs to be reasonably brief, use font sizes which are easy to read, and be written in a straight-forward fashion. All of these factors were considered in designing the survey--e.g., the letter size is reasonably large, and jargon such as "trips" and "combined trip purposes" are explained very clearly.

AVOID DESIGNER BIAS

Since the specific hypotheses to be tested have already been stated, there is a danger in the designer phrasing questions so as to "steer" the subjects to the desired answers. If this occurs, the final result could well be meaningless. To avoid this danger, special care is taken with respect to the wording of questions to prevent "steering" the respondent to a desired

answer. For example, the question "How often do you try to avoid rush hour traffic?" creates the image that it is known that the respondent is or should be trying to avoid rush hour travel. Better wording used in the survey is "Do you try to avoid rush hour traffic?" followed by "always, frequently, occasionally, rarely, and never" answer choices. This strategy was adopted throughout the instrument.

BE CAREFUL WITH SENSITIVE, RECALLING, AND QUANTITATIVE QUESTIONS

Bradburn et al. (20) indicate that there are three kinds of questions which should be very carefully worded: sensitive questions, recalling and calculating questions, and quantitative questions.

Sensitive questions

Questions about personal data and lifestyles such as marital status and income level are sensitive questions to answer, and if required at all, should be placed at the end of the instrument. Thus, respondents can, at least, finish other questions before reading these "tough" questions. Questions about driving behavior and performance questions such as whether they avoid night, rush hour, and bad weather driving are typical of those that older people are usually suspicious of people asking. The way such questions are asked in this instrument is to make questions comparable with five or ten years ago. For example,

> "Compared to 5 years ago, can you see signs, signals, and markings:
> ____much better ___better ___the same ___worse ___much worse"

Here, the real question asked is "Do you have problems when you want to see signs, signals and markings on the road while

driving?" However, if the question is asked directly, respondents who have visual problems may be upset and give up or be evasive answering it.

Recalling and calculating questions

Questions about the temporal and spatial characteristics of travel need to be answered by recalling and calculation. People usually do not like recall and complicated calculating questions because they require more thinking and take a longer time to answer than a simpler question. The questions used here are addressed to yesterday's travel behavior instead of other choices. For example, in estimating vehicle miles of travel, respondents may have trouble or limited ability to recall the numbers of vehicle miles driven in a week or a year, but "how many miles did you travel yesterday?" is much easier to recall. Although yesterday's travel may not be representative of an individual respondent's typical travel, the aggregation of travel reported by a number of respondents can provide a representative look at overall travel behavior. However, there may be bias if most respondents fill out the survey on the weekend.

Quantitative questions

Quantitative questions are more measurable and accurate than qualitative questions, therefore, it is better that as many questions as possible have quantitative answers. However, some questions are very difficult to quantify. Defining finer scales of answer choices is a way to get more accurate measurement - e.g., "always, frequently, occasionally, rarely and never" is

used instead of simply "yes, maybe, and no". A scale of five percentage ranges such as "0%, 10%, 25%, 50%, 75% and 100%" is used in questions such as "about what percentage of yesterday's auto travel was spent as a passenger not driving." Other quantitative-like scales such as "driving more than once a day, once a day, 3-6 days a week, 1-2 days a week, several days a month, and almost never" and "driving 0-5 miles, 6-15 miles, 16-25 miles, 26-35 miles, 36 miles or more" are used in the survey.

STRUCTURING THE SURVEY INSTRUMENT

The final survey instrument is provided in appendix 2 and includes five sections which were organized in the following sequence:

1) residential location changes;
2) general travel habits;
3) driving habits;
4) yesterday's travel characteristics; and
5) personal information.

These five parts are related to each other. Since "residential location" questions are the easiest part to answer, they are in the first section of the survey. The series of questions includes current residential location, residential location 2 to 20 years ago and future plans for moving. These questions are designed to provide answers about the differences in residential location patterns for different groups of older people. Related questions in this section include items such as

the main reason for moving, and where they want to live. These questions will separate long-time suburban from urban older people, help define the residential location change patterns of present and future older people, and be useful in testing the hypothesis that there are significant residential location differences between the current and next generation of older people. (That is, most future older people will be long-term suburban residents.)

The second section of the survey is about general travel habits and includes questions about such things as car ownership, household structure, driving experience, preferred means of transportation, frequencies of travel, and problems experienced by older people in using public transit and automobiles. The key issue here is to obtain data to test the hypotheses regarding the mode choice of the next generation of older people. (That is, most future older people will more heavily depend on automobiles.)

The third section of survey is directed to an examination of driving-related information and to measuring the extent of attitudinal differences about driving between current and future older people. The questions are designed to obtain data about what factors restrict their driving, such as traffic, weather, time, and the behavior of other drivers on the road; who are those people who do not restrict their driving; and what is the attitude regarding driving when they get older. The responses to these questions will allow testing of the hypotheses that the

next generation of older people will be more confident about their driving and will be less likely to self-test off the road.

The fourth section of the survey is concerned with revealed driving patterns--respondents are asked to recall what happened yesterday, what kind of activities he(she) took part in yesterday, where and when the activities happened, the first and second means of transportation used, and how many miles they traveled and drove yesterday. The answers to these questions will reveal the actual differences in mobility patterns between current and future older people. This section is key in retrieving data to test the hypothesis that the mobility patterns of current and the next generation of older people will be significantly different.

The final part of the survey is addressed to personal questions such as: marital status, income, employment, profession, ethnicity, and education level. The hypothesis that socio-economic characteristics are the causal reasons for the mobility difference between the current and future generations of older people will be tested with the information gathered here.

THE PILOT SURVEY

The purpose of the pilot survey was to get feedback from experts and some typical respondents in order to improve the quality of survey before sending it out to a large number of subjects. In this study, pilot subjects were asked to fill out the questionnaires and answer some additional questions (appendix 3). A total of eighteen copies of the survey were sent to

"survey experts," professors, secretaries, and graduate students with sixteen completed questionnaires being returned. The time range for them to finish the questionnaire was 10-30 minutes. A number of suggestions and criticisms were received from the pilot study. For example, it was indicated that the letter size should be bigger for easier reading, the survey cover letter should be more attractive, and potentially confusing questions and unclear definitions were identified (e.g., the definition between "a trip" and "a drive".) The results of the pilot study provided for significant improvement of the final version of the survey instrument.

DATA ANALYSIS

After defining the research objectives and hypotheses, and selecting the appropriate research methodology, the data were collected and analyzed. Whether the objectives are achieved will be tested by analyzing the responses to the survey. The final conclusions are also based on the data analysis. The discussion here will focus on three aspects of the analysis: 1) data collection and preparation for the analysis; 2) the actual approaches to the analysis; and 3) the data analysis itself.

DATA COLLECTION AND PREPARATION FOR THE ANALYSIS

As stated before, 1500 random subjects were selected from the MDOS driver license files. The survey was then sent to those 1,500 subjects, alone with a pre-paid envelope for the response. Returned surveys were coded using SPSS.

DATA COLLECTION AND CHARACTERISTICS

A total of 541 usable responses were received in a two-month period (March and April, 1994) and represents a 37% response rate. A total of 173 variables were defined based on the 60 questions in the survey. Several other variables such as sex, birthday, and accident information from the drivers license file were joined with these 173 variables. Except for questions 60 (final comments) and 7b (city of prior residence) which were defined as string variables, all variables were numerical. Some variables had legitimate "skips" (no answer required) which were represented as 99. Missing data (as opposed to skips) were defined with a value of 0. All of the variable names, variable

labels, and value labels are listed in appendix 4. Since some of questions provided the opportunities for more open-ended responses (e.g., 'others, please specify'), the specified responses were also coded and are listed in appendix 4. For question 60, there is a variety of comments and suggestions, which are transcribed directly in a separate file (appendix 5).

RESPONDENTS VS. NON-RESPONDENTS

Respondents and non-respondents were compared by using driver's license record information to establish whether the respondents represent a random sample of the state-wide population. To do this, the survey data from the respondents were joined with the original random sample data (1,500 observations) from the driver's license file. After a variable which indicates whether a subject was a respondent or not was defined, six selected characteristics were tested to see if respondents and non-respondents were similar.

Age

Age is defined as two groups: 40-64 years old and 65 years old and over. (The original sample from MDOS has only Michigan residents aged 40 and over.) From table 1, it is noted that a higher percentage of older people are included in the respondent group than in the non-respondent group, the difference is 3.8%. To a certain extent, this verifies the popular belief that older people are more likely to reply to surveys than younger people. However, the chi-square statistic was not significant - the significance level is 0.11 (greater than 0.1). Therefore, it is

concluded that respondents are not significantly different from the larger sample in terms of age distribution.

Table 1. Respondent bias by age

	40-64 years old	65 years old and over
non-respondent	71.5%	28.5%
respondent	67.7%	32.3%
Chi-Square Pearson	Value 2.48	Significance 0.11

Sex

Table 2 shows that the respondent group has slightly more females than the non-respondent group. But, the difference is small, only 3.5%. This indicates that females are somewhat more likely to reply to the survey than males. However, again, since the significance level of chi-square test is greater than 0.1, it is concluded that the respondents are not significantly different from the larger sample in terms of male and female distribution.

Table 2. Respondent bias by sex

	female	male
non-respondent	51.4%	48.6%
respondent	54.9%	45.1%
Chi-Square Pearson	Value 1.69	Significance 0.19

Driving restrictions

Since the overall survey has to do with mobility patterns, it is interesting to know whether the respondent group has a percentage of people who have driving restrictions similar to the non-respondent group. Here, the driving restrictions include vision, hearing, or other physical problems which directly relate

to driving performance. From table 3, the difference is 7.9% with respondents more likely to have some restriction. This may be because people who have driving restrictions are more likely to be concerned about mobility-related questions. In addition, more older people have eye problems. The chi-square test indicates that the significance level is very low (<0.1), and it is concluded that the respondent group is significantly different from non-respondent group: the respondents are over-represented with respect to driving restrictions.

Table 3. Respondents bias by driving restriction

	without restriction	with restriction
non-respondent	59.5%	40.5%
respondent	51.6%	48.4%
Chi-Square Pearson	Value 10.4	Significance 0.006

Traffic violation points

From table 4 it is clear that people who have fewer traffic violation points were more likely to reply. This is most evident for persons with no points where almost 72% of the respondents had no points versus about 63% for non-respondents. The chi-square test also verifies that the respondents and the non-respondents are significantly different in terms of traffic violation points. In another words, the respondents were somewhat "safer" than non-respondents, assuming that traffic violation points are indicative of safety.

Table 4. Respondent bias by traffic violation points

	no point	1 or 2 points	3 or 4 points	>4 points
non-respondent	62.8%	15.8%	9.9%	11.5%
respondent	71.7%	15.0%	6.7%	6.7%
Chi-Square Pearson	Value 16.8		Significance 0.0008	

Total traffic accidents

Similar to the pattern of traffic violations, people who had fewer traffic accidents were more likely to answer the survey. The percent differences between non-respondents and respondents are 6.7%, 2.8%, 3.2%, and 1.9% for no accidents, one accident, two accidents and more than two accidents, respectively. The chi-square test confirmed these differences as being significant. This also indicates that the respondents were somewhat safer than non-respondents.

Table 5. Respondent bias by total traffic accidents

	no	one	two	> two
non-respondent	65.2%	23.4%	7.6%	3.9%
respondent	71.9%	21.6%	4.4%	2.0%
Chi-Square Pearson	Value 10.4		Significance 0.006	

Geographic distribution

It is popular belief that a lot of Michigan residents move to northern part of Michigan after the retirement. Therefore, it is worthwhile to examine the respondents and non-respondents bias in terms of geographic distribution. Michigan was generally divided into two parts, north and south by zip code. For northern Michigan, the zip code is equal or greater than 49600;

otherwise, it belongs to southern part. From table 6, northern residents were more likely reply to the survey (2.9% more). This may be due to the fact that more older people living in north area, and older people more likely reply survey than younger people. But the chi-square test shows that the difference is not significant. Therefore, it is concluded that respondents are not significantly different from the state-wide population in terms of this geographic distribution.

Table 6. Respondent bias by geographic distribution

	north michigan	south michigan
non-respondent	5.4%	94.6%
respondent	8.3%	91.7%
Chi-Square Pearson	Value 0.732	Significance 0.39

Summary

In general, testing age, sex, driver restrictions, traffic violation points, total traffic accidents, and geographic distribution for respondents and non-respondents showed the following:

1. Respondents are not significantly different from non-respondents in terms of age, sex, and geographic location. In this sense, respondents are representative of the state-wide population.
2. Respondents are significantly different from non-respondents in terms of driving restrictions, respondents are somewhat more likely to have driving restrictions.

3. Finally, considering the significant differences between respondents and non-respondents in terms of traffic violation and accidents, respondents somewhat safer than non-respondents in terms of traffic violation points and accident involvement.

In the situations were respondents and non-respondents appear to different, care has to be taken when analyzing data and drawing conclusions. The SPSS WEIGHT command was used to mitigate the problem. If one has a sample in which males have been over-sampled, one may want to give the data for males less weight in computations. In the current study, for example, the data to be analyzed under-represented people with traffic accidents on their driving records (28% for respondents vs. 35% non-respondents). To more accurately account for the true percentage (35%), the weighing factor adjusts the 28/72 (accident/no accident) distribution in the response (analyzed) sample to 35/65. Statistics are internally adjusted to reflect this difference. However, it has been found that the use of the weighing factors did not alter any of the results of the analysis on their significance.

ANALYTICAL APPROACHES

The appropriate techniques for analyzing the survey are determined by the types of questions that were asked, the types of data that are available, and the way the data are arranged. The following discussion is addressed to: 1) data stratification and definition; and 2) analysis models.

RESPONSE STRATIFICATION AND DEFINITIONS OF GROUPS

The fundamental analysis consists of comparisons of traveling and driving characteristics between current and future older people. As stated in the section on research objectives, age and residential location are the primary factors hypothesized to differentiate current older people and the next generation of older people.

It is hypothesized that the mobility patterns of current and future older persons may be substantially different, with current older drivers less dependent on the automobile than those of the future. In this context, it is assumed that older persons living in the city are more characteristic of current older persons while those living in the suburbs, small towns, and rural areas are more characteristic of the future. To the extent that the mobility patterns and attitudes of these two groups of older persons are different, insight can be gained about what the future holds in terms of, for example, the willingness of older drivers to self-test off the system and how much travel they will undertake.

In sum, it is argued that differences in traveling and driving characteristics between older people (65 years old and over) who live in the city (downtown or not downtown) and older people who likely live in non-city (suburbs, small cities or rural areas) describe the differences between current and future older people. The traveling and driving characteristic differences between "younger" people (40-59 years old) who live

in city and non-city are also indicative of the differences. In addition, since younger people will become older after twenty years, the differences between older and younger people may represent the differences of current and future older people in some circumstances.

In addition to age and residential location, whether or not a person has retired is also an important determinant of lifestyle changes--i.e., mobility patterns and needs are different upon retirement. In order to deal with the inherent ambiguity of drawing a line between "old" and "young", it was decided to also consider retirement status. Thus, people who are aged 60-64 and retired are considered to be in the "old" group and those in the same age group but still working are considered to be young.

Through consideration of these three characteristics, four different cohorts are defined for the analysis:

TRADITIONAL YOUNGER PEOPLE:

Age is 40-59 years old, and live in the city (downtown or not downtown,) or age is 60-64, currently have a job (including full time, part time, or self-employment), and live in the city.

NON-TRADITIONAL YOUNGER PEOPLE:

Age is 40-59 years old, and live in non-city area (rural, small city, or suburban,) or age is 60-64, currently have a job, and live in non-city areas.

TRADITIONAL OLDER PEOPLE:

Age is 65 and over, and live in the city or age is 60-64

years old, currently have no job, and live in the city.

NON-TRADITIONAL OLDER PEOPLE:

Age is 65 and over, and live in non-city areas or age is 60-64 years old, currently have no job, and live in non-city areas.

The distribution of the respondents is shown in table 7.

Table 7. Frequencies and percentages distribution by cohort

	young traditional	young non-traditional	old traditional	old non-traditional
frequency	63	235	68	166
percentage	11.8%	44.2%	12.8%	31.2%

Some other related terminology which will be used in the data analysis is also clarified here:

OLDER PEOPLE: older traditional and non-traditional groups;

YOUNGER PEOPLE: younger traditional and non-traditional groups

TRADITIONAL PEOPLE: younger and older traditional groups

NON-TRADITIONAL PEOPLE: younger and older non-traditional groups

The general comparisons that will be conducted are summarized as following:

1. traditional older people versus non-traditional older people;
2. traditional younger people versus non-traditional younger people;
3. older people vs. younger people in general; and
4. traditional people vs. non-traditional people.

Theoretically, the differences for comparison described

above can represent the differences between the next generation of older people and current older people. However, the most important comparison is traditional older people vs. non-traditional older people--they are more representative of current older people vs. the next generation of older people. As long as the difference between traditional and non-traditional older people is significant, conclusions can be drawn about the next generation of older people and current older people.

ANALYSIS MODELS

Since most of the variables in this survey provide data which are discrete or categorical, simple descriptive analysis such as frequency and cross-tabulation tables will be used as the main techniques for the analysis. In addition, chi-square tests will be used to examine the significance of the frequency statistics. Mean tables will be used for comparing means and standard deviations for interval or ratio variables. Analysis of variance will be used to test the significance level of mean differences for some comparisons. Finally, Correlations analysis will be used for testing the relationship between some of the variables.

General frequency statistics

Frequencies are simple descriptive statistics consisting of frequency counts of the values taken for individual variables. The frequencies for all of the variables are provided in appendix 4. Some of the significant findings are discussed later.

Two-dimension crosstabs statistics

Crosstabs produces contingency tables showing the joint distribution of two variables. The frequency and probability distribution of one variable are subdivided according to the values of another variable.

Chi-square statistics

Chi-Square is used to evaluate the difference (similarity) between a set of observed frequencies and a set of expected frequencies for category variables. The output includes Pearson chi-square, likelihood ratio, and Mantel-Haenszel linear association chi-square. If the significance level is small enough, the hypothesis that two variables are independent can be rejected. In this study, the significance level threshold is defined as 0.1.

Means tables statistics

Means tables display means, standard deviations, and group counts for interval or ratio variables within groups defined by independent variables. It has to be noted that in the analysis here the mean only represent the mean of value labels, not the actual values themselves. For example, for the age variable that has values of 40-44 years old, 45-49, ..., 85 and over has response (value) labels of 1, 2,..., 10 respectively. Thus, the mean of the variable is not the real mean of age (40 through 85+), but of coded value labels 1, 2, ..., 10.

Analysis of variances

The mean differences examined by means tables may be

attributed to chance and not represented by true differences between the four cohorts. One of the statistical procedures commonly used to test the hypothesis that multiple means are equal is analysis of variance (ANOVA). ANOVA is used to compare the mean values of a dependent variable grouped by one or more independent variables. If there is only one independent variable, it is called one-way ANOVA. In this study, one-way ANOVA will be used for an overall determination of the equality of group means and four groups of contrasts will be specified to compare specific sub-sets of groups (e.g., traditional and non-traditional older people). The four contrasted groups are: traditional vs. non-traditional older people, traditional vs. non-traditional younger people, younger vs. older people, and traditional vs. non-traditional people. Basically, the F-probability indicates the significance level of overall comparison, and T probabilities indicate the significance level of the contrasted groups. If T probability is small enough, the hypothesis that two contrasted means are equal is rejected. The threshold of what is "significance level" is defined as 0.1 for the ANOVA done in this study.

Correlations

Correlations is used to examine the relationship between two variables. Correlation coefficient has value of 0 to 1. The value of 0 indicates that there is no relationship at all between the two variables, while the value of 1 means that the correlation is perfect. Basically, the higher the coefficient,

the better the correlation between the two variables. Moreover, positive sign of correlation coefficient indicates the positive relationship between two variables. Otherwise, it is negative relationship.

DATA ANALYSIS

The data analysis consists of six different types of comparisons: 1) age and residential location; 2) traveling habits; 3) driving habits; 4) driving attitude; 5) traffic violations and accidents; and 6) related socio-economic factors. A clear picture of the mobility patterns of the next generation of older people will be developed as a result of these comparisons.

AGE AND RESIDENTIAL LOCATION COMPARISON

Since age and residential location are the main factors used to define the cohorts, it is necessary to test the consistency of these factors. The inconsistency of age and residential location may produce biased results. For example, if non-traditional older people are much younger than traditional older people, non-traditional older people may travel more than traditional older people.

Age distribution

Age is divided into 10 groups: 40-44 years old, 45-49,..., and 85 and over, which are referred to as values of 1, 2, ..., 10. Table 8-1 shows that there are some minor differences between traditional and non-traditional older people (the highest percentage difference is 8%). Traditional and non-traditional

young people have somewhat greater age differences. The largest difference is 16% in the 40-44 group. Overall, the traditional younger group is a little younger than its non-traditional counterpart. There is less of a pattern with the two groups of older people. Since age is a ratio variable, the mean table analysis (table 8-2) shows some aggregate information. As mentioned before, it should be noted that the means shown are not ages, but rather the mean of the value label 1-10. Nonetheless, the means table shows that non-traditional younger people are older than traditional younger people, with the difference of being 0.26. Non-traditional older people are slightly younger than traditional older people, with there being less difference. The ANOVA table indicates that although the overall F probability is less than 0.1, the differences between the two younger groups and the two older groups is not significant. Thus, it is concluded that neither the two younger groups nor the two older groups are significantly different.

Table 8-1. Age distribution by cohort

	(1)[1] 40-44[2]	(2) 45-49	(3) 50-54	(4) 55-59	(5) 60-64	(6) 65-69	(7) 70-74	(8) 75-79	(9) 80-84	(10) >84
trad. young	35%	25%	22%	16%						
n-trad. young	19%	33%	28%	20%						
trad. old					21%	28%	25%	19%	6%	2%
n-trad. old					29%	22%	22%	16%	7%	4%

Note: [1]. the value label [2]. the value content

Table 8-2. Means table of age by cohort

	mean	standard dev.	cases
trad. young	2.22	1.11	63
non-trad. young	2.48	1.01	235
trad. old	6.66	1.25	68
non-trad. old	6.63	1.43	166

Table 8-3. ANOVA table for two groups of comparisons

for overall comparison	F prob.	0.000
contrasted groups	T prob.	
trad. vs. n-trad. young	0.130	
trad. vs. n-trad. old	0.839	

Current residential location

Table 9 indicates the consistency of current residential location distribution for traditional younger people and traditional older people. More than 95% of the traditional people live in the city but not in the downtown area, while less than 5% live in downtown areas. Comparing non-traditional younger and older, although their percentage distribution in suburban, rural, and small towns are not the same, the similarity is that both of them have the highest percentage of living in suburban areas, the second highest percentage in rural areas, and the lowest in small towns.

Table 9. Current residential location by cohort

	rural	small town	suburb	city not downtown	downtown
trad. young				95.2%	4.8%
n-trad. young	34.9%	17.9%	47.2%		
trad. old				98.5%	1.5%
n-trad. old	36.1%	24.7%	39.2%		

Prior residential location

It is interesting to look at the prior residential location distribution of different groups of people. As indicated in table 10, more than 50% of the older people have not moved in the past twenty years. However, for younger people, just more than 20% of them have not moved. For those that moved, about 50% of them lived in the same types of areas as they live now (traditional in city area, non-traditional in non-city area). The percentage of those living in the same areas for traditional and non-traditional older people are very similar, although traditional people have slightly higher percentages of having moved to non-city areas than non-traditional people having moved to city areas. All of these indicate that younger people have higher possibilities of moving in the past twenty years than older people. People who moved, most likely moved to the same general type of areas as they live right now--that is, traditional people lived in city areas before, and non-traditional people lived in non-city areas.

Table 10. Prior residential moving patterns by cohort

	moved to non-city area	moved to city area	not moved
trad. young	25.9%	53.2%	21.0%
n-trad. young	50.8%	21.2%	27.3%
trad. old	23.6%	22.1%	51.5%
n-trad. old	32.4%	12.9%	54.0%

Preferred future residential location

Questions were also asked about the preferred future

residential location of people. Table 11 indicates that older people have a very high percentage of not wanting to move in the future (58% and 70% for traditional and non-traditional older, respectively.) If they would move, their first preference is suburban areas. The second preference for non-traditional older people is small towns; for traditional older people, the city, but not downtown. Non-traditional younger people are also fairly settled. (61% prefer not to move). If they do move, their first choice is also suburban areas. For traditional younger people, the situation is slightly different from the other three, only 40% do not want to move, with 34% preferring to move into the city but not to downtown areas. It is interesting to note that nobody in the four groups would like to live in downtown areas in the future. All of above demonstrates that most people would most like to live in the same area or type of area as they do now, with the exception of traditional people who, generally have a desire to move to suburban areas. This confirms the conventional wisdom of the on-going suburbanization trend in this country.

Table 11. Preferred future residential location by cohort

	rural	small town	suburb	city not downtown	not to move
trad. young	9.7%	8.1%	8.1%	33.9%	40.3%
n-trad. young	12.1%	7.4%	15.6%	2.2%	61.0%
trad. old	6.1%	6.1%	15.2%	13.6%	57.6%
n-trad. old	6.8%	8.0%	10.5%	3.7%	69.8%

In general, the above comparisons indicate that:

1. There is similar age distribution between traditional and non-traditional people.
2. For both traditional and non-traditional people, their current, prior, and preferred future residential location are generally consistent. That is, most people would prefer to live in the same general areas as they do now and have in the past. Non-traditional people, however, appear to have very strong preferences for not living in the city.
3. On the other hand, traditional people, while preferring the city more than other groups, do not necessarily wish to stay there or relocate within city.
4. Overall, there appears to be no lessening of people's desires to live in non-city areas although there is a cadre who will remain in the city.

TRAVELING HABITS COMPARISON

Before comparing the travel habits of the different cohorts, it is necessary to clarify some definitions. As indicated in the survey instrument, a "trip" is used to describe travel from home via any mode of transportation (private vehicle, public transportation, walking, bicycle, and others) and regardless of whether the person is a driver or a passenger. "A trip by driving" specifically refers to the respondents as drivers.

Daily trip numbers and yesterday trip numbers

As indicated in table 12-1, it is obvious that younger

people make more daily trips than older people. More than 70% of younger people make at least one trip per day. For older people, less than 57% do so. At the other extreme, less than 7% of younger people make 1 or 2 trips per week or less. However, more than 15% of older people do so. Contrary to what was expected, non-traditional people do not show markedly higher percentages of daily trips than traditional people. About 75% of traditional younger people make at least one trip per day compared with 70% of non-traditional younger people. For older people, 57% of traditional older people make at least one trip per day compared to 42% of non-traditional older people. This is an important result which suggests that older persons who live outside the city will take fewer trips--that is, in the future, the number of trips by this group will decrease. This may be somewhat mitigated by the fact that current non-traditional younger people make more trips than their traditional counterparts. The results here are somewhat conflicting in terms of what to expect in the future for older persons.

The means comparison (where the value of 1, 2, ..., 6 refers to "more than one trip a day," "one trip a day," ..., "almost never") in table 12-2 also indicates these differences. Since higher means represent lower numbers of daily travel, it is clear that non-traditional people have lower numbers of daily trips than traditional counterparts. However, the ANOVA analysis in table 12-3 indicates that for the four groups of comparisons, only the contrast of younger vs. older people has T probabilities

less than 0.1 (0.000), enough to reject the hypothesis that younger and older people have the equal means. The other three comparisons (traditional vs. non-traditional younger, traditional vs. non-traditional older, and traditional vs. no-traditional overall) all have T-probabilities greater than 0.1, not significant enough to reject the null hypothesis. The overall F probability, which is less than 0.1, is resulted from the differences of younger and older people comparison. Therefore, statistically, the conclusion can be drawn that although non-traditional people have lower percent of trip numbers than traditional people, the differences are not statistically significant.

Table 12-1. Daily trip numbers by cohorts

	(1) >1trip /day	(2) 1 trip /day	(3) 3-6 day a week	(4) 1-2 day a week	(5) few days a month	(6) almost never
trad.young	41.9%	33.9%	21.0%	3.2%	0%	0%
n-tra.young	48.9%	21.7%	23.0%	5.1%	1.3%	0%
trad. old	28.4%	28.4%	23.9%	16.4%	3.0%	0%
n-trad. old	24.7%	17.9%	35.8%	17.3%	3.1%	1.2%

Table 12-2. Means table of daily trip numbers by cohorts

	mean	standard dev.	cases
trad. young	1.85	0.87	63
n-trad. young	1.88	1.01	235
trad. old	2.37	1.15	67
n-trad. old	2.60	1.19	162

Table 12-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.000
contrasted groups	T prob.	
trad. vs. n-trad. young	0.865	
trad. vs. n-trad. old	0.149	
trad. vs. n-trad. people	0.251	
younger vs. older people	0.000	

It should also be remembered that table 12 requires respondents to estimate their general trip-making characteristics over relatively long time periods. Considering the difficulties for respondents to recall and calculate the average daily travel patterns such as daily trip numbers and daily travel mileage over time, a group of questions regarding yesterday's travel patterns was part of the survey. Recalling yesterday's travel pattern should presumably, give more accurate results. Although yesterday's travel may not be representative of an individual respondent's typical daily travel, the aggregation of travel reported by a number of respondents provides a representative "snapshot" of overall travel behavior.

Before examining "yesterday's" travel patterns, it is necessary to examine the distributions of "yesterday" for four groups. Table 13 indicates that while the percentage distributions are not identical for each day of a week for four groups, there are some similarities. That is, Sunday, Friday, and Monday for all four groups have higher percentages than the other four days. This establishes some consistencies of comparison among four groups. However, in certain circumstances,

it is necessary to examine the data by separating "yesterday" as weekday and weekend.

Table 13. the day of yesterday by cohort

	MON.	TUE.	WEN.	THU.	FRI.	SAT.	SUN.
trad. young	14%	10%	13%	10%	27%	10%	18%
n-trad. young	22%	13%	13%	5%	20%	10%	17%
trad. old	17%	11%	14%	8%	17%	15%	20%
n-trad. old	25%	13%	7%	7%	17%	9%	22%

The comparison of yesterday's travel in table 14 indicates that most people (more than 60% for each group) made one or two trips yesterday. However, non-traditional older people have the highest percentage of no trips yesterday--8 points more than traditional older people. Also, non-traditional younger people are slightly more likely to have made no trips than traditional younger people.

Comparing the differences in means (with no trip, 1 trip, ..., > 5 trips referring to values of 1, 2, ..., and 7, respectively), it is seen that non-traditional people have slightly smaller means than traditional people--that is, they have lower trip numbers than traditional persons. This conclusion is fairly consistent with daily trip numbers discussed earlier (table 12). By the same token, the mean difference within age groups is small: only 0.02 points for younger people, and 0.11 for older people. Testing the significance level of the differences, the ANOVA table (table 14-3) indicates that the overall F probability is insignificant as are all four contrasts: none of the hypotheses are rejected (the means are about equal).

Therefore, it is concluded that there are no significant differences among the four groups of people in terms of yesterday's trip numbers. To a point, this finding belies the observed fact that a relatively high percentage of non-traditional older persons take no trip yesterday.

Since both daily travel numbers and yesterday's travel numbers do not indicate significant differences, it can be concluded that future older people will not make more trips than current older people. This, in turn, rejects the hypothesis that the next generation of older people will have higher daily trip frequencies than current older people.

More specifically, by considering non-traditional older people as the next generation of older people and estimating the actual numbers of trips from the means table of yesterday's travel, the next generation of older people will average one to two trips per day, similar to current older people. Younger people independent of whether they are "traditional", will still have at least two trips per day.

Table 14-1. Yesterday trip numbers by cohort

	(1) none trips	(2) 1 trip	(3) 2 trips	(4) 3 trips	(5) 4 trips	(6) 5 trips	(7) >5 trips
trad. young	4.8%	32.3%	35.5%	14.5%	11.3%	0.0%	1.6%
n-tra.young	6.5%	32.8%	31.9%	19.0%	5.2%	3.0%	1.7%
trad. old	6.2%	36.9%	35.4%	12.3%	3.1%	4.6%	1.5%
n-tra. old	14.1%	29.4%	31.9%	18.4%	3.1%	1.2%	1.8%

Table 14-2. Means tables of yesterday trip numbers by cohort

	mean	standard dev.	cases
trad. young	3.02	1.18	62
n-tra. young	3.00	1.24	232
trad. old	2.89	1.24	65
n-tra. old	2.78	1.24	163

Table 14-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.000
contrasted groups	T prob.	
trad. vs. n-trad. young	0.377	
trad. vs. n-trad. old	0.613	
trad. vs. n-trad. people	0.802	
younger vs. older people	0.933	

Person miles of travel (PMT) yesterday

Although the above analysis indicates that non-traditional people do not have higher trip numbers than traditional people, table 15 shows that non-traditional people travel further. More specifically, about 48% of non-traditional younger people traveled more than 25 miles yesterday while for traditional younger people, the percentage is only 34%. On the other hand, more than 35% of non-traditional older people traveled more than 25 miles yesterday, and only 17% of traditional older people did so. At the other extreme, more than 67% of traditional older people traveled less than 15 miles yesterday, but only 50% of non-traditional older people did so. Similar conclusions are drawn from the means table. The ANOVA results further indicate that the mean differences are significant for three groups: traditional vs. non-traditional older people, traditional vs.

non-traditional people in general, and younger vs. older people. Only the comparison of traditional vs non-traditional younger people is not statistically significant. These results support the conclusions that non-traditional people and younger people travel longer than traditional people and older people, respectively. Estimating the actual milage, non-traditional older people travel about 18.4 miles per day while traditional older people travel 13.8 miles, non-traditional younger people travel 23.8 miles per day while traditional younger people travel 21 miles. Younger people, in general, travel further distances--39% more. Moreover, there is 33% of difference between traditional and non-traditional older people. The difference between traditional and non-traditional younger people is slightly smaller, only 13.3%. In sum, it is reasonable to conclude that the next generation of older drivers will travel as much as one-third more miles than the current one.

Table 15-1. Yesterday total travel miles by cohort

	(1) 0-5 mi	(2) 6-15 mi	(3) 16-25 mi	(4) 26-35 mi	(5) >35 mi
trad. young	11.3%	25.8%	29.0%	9.7%	24.2%
n-trad. young	12.1%	20.7%	19.0%	14.2%	34.1%
trad. old	28.6%	38.1%	15.9%	3.2%	14.3%
n-trad. old	27.7%	22.6%	13.8%	10.1%	25.8%

Table 15-2. Mean tables of yesterday total travel miles by cohort

	mean	standard dev.	cases
trad. young	3.10	1.34	62
n-trad. young	3.38	1.44	232
trad. old	2.37	1.32	63
n-trad. old	2.84	1.57	159

Table 15-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.000
contrasted groups	T prob.	
trad. vs. n-trad. young	0.181	
trad. vs. n-trad. old	0.030	
trad. vs. n-trad. people	0.013	
younger vs. older people	0.000	

The fact that non-traditional people traveled more miles but did not take significantly different numbers of trips implies that the average trip length for non-traditional people is longer than for traditional people (average trip length * numbers of trips per day = total miles of travel per day). The reason is likely found in the difference in residential location: non-traditional people live in non-city areas, while traditional people in cities. Trips in non-city areas are likely to be much longer than urban trips simply because of generally greater distances between trip origins and destinations. For example, assuming older people make 2 trips per day, the average trip length for non-traditional older people would be 9.2 miles, while for traditional older people, 6.9 miles.

It is recalled that there were some differences in the distribution of travel by day of the week for the different

groups (table 13). Thus, there may still be some doubts about whether the person miles of travel (PMT) yesterday represents typical daily travel patterns. PMT for weekdays and weekends is presented separately in tables 16-1 and 16-2--results consistent with those just noted: non-traditional and younger people have more PMT than traditional people and older people. The percentage differences are similar to the overall comparisons--thus, it is concluded that the differences in distribution of PMT by weekday and weekend make no difference.

Overall, the hypothesis that the next generation of older people will travel more than current older people has been supported--at least as far as PMT is concerned.

Table 16-1. Yesterday total travel miles by cohort for weekdays

	(1) 0-5 mi	(2) 6-15 mi	(3) 16-25 mi	(4) 26-35 mi	(5) >35 mi
trad. young	14.3%	35.7%	21.4%	7.1%	21.4%
n-trad. young	13.9%	22.1%	19.7%	11.5%	32.8%
trad. old	25.8%	41.9%	16.1%	3.2%	12.9%
n-trad. old	31.7%	23.2%	13.4%	8.5%	23.2%

Table 16-2. Yesterday total travel miles by cohort for weekends

	(1) 0-5 mi	(2) 6-15 mi	(3) 16-25 mi	(4) 26-35 mi	(5) >35 mi
trad. young	8.8%	17.6%	35.3%	11.8%	26.5%
n-trad. young	10.2%	18.5%	18.5%	16.7%	36.1%
trad. old	31.3%	34.4%	15.6%	3.1%	15.6%
n-trad. old	21.6%	23.0%	14.9%	12.2%	28.1%

Daily trip chains and yesterday trip chains

If people have to make longer trips, they may be more likely to combine their trip purposes, (i.e, make trip chains)--for

example, a trip that includes stops at the grocery store, dry cleaners, and the bank rather than separate trips to each destination. Table 17 shows the results from the question regarding whether respondents plan local travel to combine purposes. It is clear that non-traditional older people have a higher probability for combining purposes of travel than traditional older people. That is, almost 52% of non-traditional older people chain trips compared with 41% of traditional older people. Non-traditional older persons, "always" trip chain more than any other group. When "frequent" trip chaining is added in, the results are somewhat less striking, and younger people catch up to older persons. The comparisons of means (table 17-2) shows somewhat contradicting results--non-traditional older people have a lower mean than traditional older people, but non-traditional younger people have a higher mean than traditional younger people. The overall ANOVA (F) shows that the means are not significantly different (which implies that contrasts should be interpreted with caution). That notwithstanding, the contrasts verify that the mean differences are significant only for the comparison of traditional vs. non-traditional younger people, and younger vs. older people, but not for the comparison of traditional vs. non-traditional people in general and traditional vs. non-traditional older people. With the significant exception that non-traditional older persons respond that they always trip chain more than any other group, it is reasonable to say that there is no significant difference between the next generation of

older people and current people in terms of trip chaining.

Table 17-1. Daily trip chains by cohort

	(1) always	(2) frequently	(3) occasional	(4) rarely	(5) never
trad. young	46.0%	49.2%	4.8%	0%	0%
n-trad. young	38.2%	52.2%	6.6%	1.3%	1.8%
trad. old	41.0%	44.3%	8.2%	1.6%	4.9%
n-trad. old	51.9%	31.6%	9.5%	3.2%	3.8%

Table 17-2. Mean tables of daily trip chains by cohort

	mean	standard dev.	cases
trad. young	1.59	0.59	63
n-trad. young	1.76	0.78	228
trad. old	1.85	1.00	61
n-trad. old	1.75	1.01	158

Table 17-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.2205
contrasted groups	T prob.	
trad. vs. n-trad. young	0.163	
trad. vs. n-trad. old	0.210	
trad. vs. n-trad. people	0.958	
younger vs. older people	0.079	

By examining trip chaining behavior yesterday, table 18-1 shows that younger people had higher probabilities or combining trips than older people. This is supportive of the general conclusions just made. The table also shows that non-traditional people have lower percentages of combining trips than traditional people. The difference in yesterday's trip-chaining behavior between traditional and non-traditional younger people is very small. While non-traditional older people show much lower

percentages of combining trips than traditional older people. Specifically, only 57% of non-traditional people, vs. 64.5% of traditional older people, answered "yes" to whether they combined trips yesterday. However, the chi-square test indicates that there is no significant difference among the four groups (significance level is greater than 0.1).

In summary, it is seen that, at least statistically, there are not significant differences among the four groups, with respect to trip chaining. The analysis failed to show that groups of people who make longer trips are also more likely to combine their trip purposes. These points notwithstanding, the conclusion can be drawn that the majority of all people like to combine trip purposes and younger people are somewhat more likely to combine trip purposes than older people. Finally, while not statistically significant, it was also shown that non-traditional older people are far more likely than other groups to "always" chain trips together (table 17). Overall the results here are somewhat mixed.

Table 18-1. Trip chains yesterday by cohort

	yes	no	not sure
trad. young	68.3%	31.7%	0%
n-trad. young	67.2%	31.4%	1.3%
trad. old	64.5%	33.9%	1.6%
n-trad. old	57.5%	40.5%	2.0%
Chi-Square pearson	Value 5.20	significance 0.52	

Yesterday trip purposes

Table 19 indicates that younger people not unexpectedly, make more working trips than older people (25% vs. 10%). The percentages of working trips are not significantly different between traditional people and non-traditional people. Specifically, non-traditional people have only 1% more working trips than traditional people. This does not support the hypothesis that the next generation of older people will have more working trips than current older people. Shopping and visiting trips comprise a very high percentage for all four groups, especially for older people (more than 50% for each older group.) Comparing non-traditional with traditional, the former make more shopping trips, 5% higher, than the later. This may relate to the difference of economic factors, for example, household income, which will be tested later or simply be due to more dispersed destinations which, in turn, requires more trips of this type. On the other hand, non-traditional people have lower percentages of recreation trips (about 4% difference). Medical care, visiting trips and other types of trips are very similar between non-traditional and traditional people. In general, the percentage differences of trip purposes between traditional and non-traditional people are not significant, except that younger people make more working trips than older people. Furthermore, it is interesting to consider travel purposes in conjunction with trip temporal distributions together--travel purposes are related to trip temporal

distributions (e.g., shopping trips are rarely made at night or early morning.)

Table 19. Yesterday trip purposes by cohort

	WORK.	SHOP.	RECREAT.	MED. CARE	VISIT.	OTHER
trad. young	25%	23%	14%	5%	20%	14%
n-trad. young	26%	28%	9%	3%	20%	14%
trad. old	10%	28%	14%	6%	22%	21%
n-trad. old	11%	33%	11%	6%	22%	18%

Yesterday trip temporal distribution

The time distribution of yesterday's travel for the four cohorts (table 20) indicates that older people are much more likely to travel between 9:00 am and 4:00 pm, approximately 50% of their trips are taken during this time period. As noted, this is presumably related to travel purposes. More than 50% of trips for older people are shopping and visiting, and these trips are usually taken during the day. By contrast, the percentage of trips conducted during this time period is only about 35% for younger people. This is because the highest percentage of trips for younger people are working trips, which are usually made before 9:00 am and after 4:00 pm.

Somewhat surprisingly, older persons are not avoiding rush hour conditions as much as would be expected (from the literature). They undertake about the same amount of travel as younger persons in the AM rush and only slightly less (3%) during the PM rush. As expected, older persons drive less after 6:00 pm regardless of whether they are traditional.

Comparing non-traditional with traditional, slightly more

non-traditional people make trips in the early morning (before 7:00 am and 7:00 to 9:00 am), about 4% difference. Regarding evening or night-time travel (4:00-6:00 pm and after 6:00 pm), there are no differences between non-traditional and traditional older people. Non-traditional younger people, however, have slightly lower percentages of night-time travel than traditional younger people.

Considering both trip purposes and time distributions, the general conclusion can be drawn is that when people get older, their trip activities are more likely to be shopping, visiting, and recreation, and they are more likely to travel between 9:00 am and 4:00 pm. These findings somewhat reject the hypothesis that the next generation of older people will have different travel purposes and travel time distributions from current older people. It needs to be noted that although 50% of trips for older people are taken between 9:00 am and 4:00 pm, the other 50% of trips are executed at higher risk times, such as at night, in the early morning, and rush hour, which may create safety problems for older people.

Table 20. Temporal trip distribution by cohort

	be. 7am	7-9 am	9-4 pm	4-6 pm	af. 6pm
trad. young	5%	15%	34%	22%	24%
n-trad. young	8%	16%	36%	20%	19%
trad. old	3%	15%	52%	18%	12%
n-trad. old	6%	16%	49%	18%	12%

Summary

By way of a summary of the travel habits comparison, the most important finding is that the next generation of older people will have longer average trip lengths than current older people, and consequently, higher PMT. The actual milage of travel per day for traditional and non-traditional younger, traditional and non-traditional older are estimated as 21 miles, 23.8 miles, 13.8 miles, and 18.4 miles, respectively. The next generation of older persons will travel about 4.6 miles further than current older people daily, and the annual mileage will increase by about 1900 miles for the next generation of older people. This represents a 33% mileage increase from current older people to the next generation of older people. However, it has been found that the next generation of older people may not necessarily have higher numbers of daily trips. They will make 1 or 2 trips per day, the similar as the current older people. The average trip lengths for the next generation of older people and current older people are 9.2 and 6.9 miles, respectively.

The overall conclusion from the above is that the next generation of older people will travel further--that is, they will be significantly more exposed to (on) the road system. In this sense, they will have higher mobility levels than the current older people.

Some other findings from the analysis for the next generation of older people are:

1. The majority of people combine trip purposes. Younger

people have a higher propensity to combine trip purposes than older people. There were no significant differences between traditional and non-traditional older persons in terms of trip chaining behavior. However, if the propensity of younger persons to chain trips is maintained as they grow older, trip chaining may increase slightly.

2. In terms of travel purposes, not surprisingly, older people have high percentage of shopping and visiting trips and less working trips than younger people. The difference in trip purpose distributions for non-traditional and traditional people is not significant.

3. Older people have less night-time and early morning travel than younger people with about 50% of their trips conducted during the day. Again, the difference between non-traditional and traditional people is not significant. In this sense, there would be appear to be no big differences between the next generation of older people and current older people in terms of trip purposes and trip time distribution. However, it should be borne in mind that the 50% of the trips by older persons continue to be conducted in other higher risk time periods.

DRIVING HABITS COMPARISON

In this section, the differences in driving behavior between current and future older people, which more directly relate to safety issues are examined. Six different dimensions will be addressed: primary means of transportation; secondary means of

transportation; car ownership; driving experience; daily trip numbers by driving; and daily driving miles.

Primary means of transportation

Table 21-1 shows some striking numbers about transportation modes: about 92% of the respondents specify that their main means of transportation is auto with themselves driving; of the remaining 8%, more than 98% of them travel as auto passengers. Clearly, the automobile is the dominant mode of transportation for all groups of people. Very few people use public transportation, dial-a-ride, or other modes.

By examining the main means of transportation by cohort, it is clear that younger people have higher percentages of choosing auto as driver than older people, 93% versus 87%. Moreover, non-traditional people are slightly more likely to depend on driving than traditional people: the difference for young people is 5%; for older people, 1.5%. These findings confirm that the automobile is clearly the most important mode for all groups. They also suggest that somewhat more trips are made as passengers as persons age (possibly due to sharing driving among couples as they age). There is a slightly higher use of automobiles by younger, non-traditional people that does not continue later in life.

Table 21-1. Distributions of primary means of transportation

	driver	passeng.	bike/walk	transit	dial-a-ride	other
frequency prob.	487 (91%)	43 (8.2%)	1 (0.2%)	2 (0.4%)	0 (0%)	1 (0.2%)

Table 21-2. Primary means of transportation by cohort

	driver	passeng.	bike /walk	transit	dial-a-ride	other
trad. young	90.5%	6.3%	1.6%	1.6%	0%	0%
n-trad young	95.3%	4.3%	0%	0%	0%	0.4%
trad. old	86.2%	12.3%	0%	1.5%	0%	0%
n-trad. old	87.7%	12.3%	0%	0%	0%	0%
Chi-Square pearson		Value 25.1		Signif. 0.014		

Secondary means of transportation

Automobile is not only the main means of transportation for virtually everyone but also the second most important mode for the vast majority. Table 22 indicates that approximately 21% of people still choose auto as drivers as their second means of transportation, while 63% of them choose auto as passengers as the second means of transportation--if they can't drive the car, they ride in one. While, overall, more older people travel as passengers than younger people (table 21), more traditional older people choose their second means of transportation as auto as passenger than the non-traditional older people, the difference between traditional and non-traditional older people is 6%. In another words, more non-traditional older people choose auto as drivers as their second means of transportation. The chi-square also confirms that the differences among the four groups of cohorts are significant.

By examining the first and second choice of transportation, it is clear that non-traditional people will more likely depend on the auto as drivers. The primary difference between non-

traditional and traditional older persons is that the former are more likely to consider the automobile as their second choice as well whereas traditional older persons used transit or some "other" means. While it is not clear how much more auto travel this would result in, it is clear that there is at least some increase. Overall, there is some indication that the next group of older persons will more be dependent on the automobile than the current one.

Table 22-1. Distributions of secondary mode of transportation

	driver	passeng.	bike/walk	transit	dial-a-ride	other
frequency prob.	109 (21%)	327 (63.3%)	61 (11.8%)	9 (1.7%)	4 (0.8%)	7 (1.4%)

Table 22-2. The secondary mode of transportation by cohort

	driver	passeng	bike/walk	transit	dial-a-ride	other
trad. young	12.9%	69.4%	14.5%	3.2%	0%	0%
n-trad young	17.7%	69.7%	10.8%	0%	0%	1.7%
trad. old	16.9%	60.0%	10.8%	6.2%	1.5%	4.6%
n-trad. old	30.0%	54.0%	12.0%	2.0%	2.0%	0%
Chi-Square pearson		Value 44.85		Signif. 0.0012		

Car ownership

The high usage of automobile should be intuitively related to high car ownership. In order to test car ownership appropriately, a new variable is calculated (using survey data) to represent the number of cars per driver in the household: number of cars in the household divided by the number of people with a valid driver's license in the household. From table 23, it is clear that for all four groups, the vast majority of

respondents in all groups fall into the "middle" category--0.5 < car ownership/driver <= 1--86-88% of each group. The differences among groups are less than 1.5%. It is interesting to note that there are some differences in the extremes. Non-traditional older people have more cars/driver than traditional counterparts. At the same time, an appreciably higher percentage of non-traditional younger people have higher car ownership rates. Clearly, non-traditional people in general have higher car ownership rates. Higher car-ownership contributes to higher dependence of automobile and is indicative of higher mobility in general. This may be one of the reasons why non-traditional people are more likely to depend on automobile as drivers.

Table 23. Car-ownership/driver by cohort

	car-owner. <=0.5	car-owner. <=1	car-owner. >1
trad. young	3.2%	87.2%	9.6%
n-trad young	2.2%	86.0%	12.0%
trad. old	7.5%	88.1%	4.5%
n-trad. old	2.4%	87.9%	9.6%

Driving experiences

Driving experience is represented by how old the respondent was when he/she first got a driver's license. The data in table 24 indicate that fewer non-traditional people got their driver's license when they were older. Specifically, non-traditional younger people got their licenses at younger age than their traditional counterparts (9% more non-traditional younger persons got their licenses when they were 13-19). For older people, the

traditional and non-traditional groups are not very different at the one end of the distribution (13-19 when license was obtained). The big difference is in 20-29 and 30-60 categories where non-traditional older people clearly got their licenses earlier in life than their traditional counterparts. All of these logically imply that non-traditional people have longer driving experience and, presumably higher auto dependency than traditional people. This supports the hypothesis that the next generation of older people will have longer driving experiences than current older people. Driving will more likely be a life-long behavior for the next generation of older people.

Table 24. Driving experiences by cohort

	13-19 yr old	20-29 yr old	30-60 yr old
trad. young	82.5%	11.1%	6.3%
n-trad. young	91.5%	6.4%	0.9%
trad. old	68.2%	10.6%	18.2%
n-trad. old	69.9%	19.3%	7.8%

Daily trip numbers and yesterday trip numbers by driving

The daily and "yesterday" trip numbers for the four groups of people, regardless whether the trip is by driving or by other transportation mode, have been examined earlier. It is also interesting to examine the daily and "yesterday" trip numbers only by driving. Specifically, the means table (table 25-1) displays the mean trip numbers by driving for the four groups. A smaller mean represents more trip numbers by driving (see the category explanation in table 25-1). From table, while non-

traditional younger people have smaller means than traditional younger people, non-traditional older people have higher means than traditional older people. The latter means that non-traditional older people made fewer trips by driving than their traditional counterparts. Moreover, the ANOVA (table 25-2) indicates that the differences between younger and older people in general, traditional and non-traditional older people are significant. This implies that older people and non-traditional older people take trips by driving significantly less often than younger people and traditional older people, respectively.

Table 25-1. Responses to Q27
(How often do you drive your car from home?)

	mean*	standard dev.	counts
trad. young	2.11	1.32	63
n-trad. young	1.83	1.03	235
trad. old	2.38	1.24	65
n-trad. old	2.70	1.31	164

* note that value range: 1. more than once/day 2. once/day 3. 3-6 days/week 4. 1-2 days/week 5. several days/month 6. almost never

Table 25-2. ANOVA table for four groups of comparisons

for overall comparison	F prob. 0.000
contrasted groups	T prob.
trad. vs. n-trad. young	0.101
trad. vs. n-trad. old	0.063
trad. vs. n-trad. people	0.840
younger vs. older people	0.000

Moreover, examination of "yesterday's travel" (table 26-1), confirms that non-traditional younger people drive more often than the traditional younger group, but non-traditional older

people make fewer trips by driving than traditional older persons. The ANOVA (table 26-2) only verifies that the mean differences between younger and older people are significant. The important conclusion from table 25 and table 26 is that the next generation of older people may have somewhat lower numbers of trips by driving than current older people. This may, however, be somewhat offset by the fact the non-traditional older persons are shifting somewhat in terms of their virtually absolute dependence on the private auto.

Table 26-1. Responses to Q45
(How many times did you drive from your residence yesterday?)

	mean*	standard dev.	counts
trad. young	2.65	1.12	63
n-trad. young	2.71	1.11	234
trad. old	2.49	1.15	63
n-trad. old	2.35	1.07	164

* note that value range: 1. none 2. one 3. two 4. three 5. more than three

Table 26-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.0117
contrasted groups	T prob.	
trad. vs. n-trad. young	0.689	
trad. vs. n-trad. old	0.480	
trad. vs. n-trad. people	0.817	
younger vs. older people	0.017	

Total miles driven yesterday

The above discussion indicates that non-traditional people may make fewer trips by driving than traditional people. However, this does not mean non-traditional people drive less per

se--as discussed before, non-traditional people travel more miles when they do travel. Suppose non-traditional older people who have higher PMT, also have very similar or lower percentages of travel as passenger, it is reasonable to conclude that they will drive further. Table 27 describes the means comparison of the percent of auto travel spent as a passenger. The smaller the mean in absolute terms, the lower the percentage that was spent as passenger. It is clear that there is very similar distribution between non-traditional and traditional people. The difference in means is less than 0.07 which indicates that non-traditional and traditional people have very similar percentage of trips as passenger/driver. The ANOVA verifies that there are no statistically significant differences among the groups. Therefore, it is reasonably concluded that non-traditional people drive further than traditional people. More specifically, by recalculating the actual average percentage of travel as passenger, approximately 16.4% and 18.3% of yesterday's travel for younger and older people, respectively, will be as passengers. Therefore, non-traditional older people will drive 15.0 miles per day while traditional older people will drive 12.5 miles. Non-traditional younger people will drive 20 miles while traditional younger people will drive 17.6 miles. The next generation of older people will drive approximately 2.7 miles more than current older people. From the foregoing, it is evident that higher mobility levels and higher dependence on the automobile (and driving) may create more safety problems for the

next generation of older people.

Table 27-1. The percentage as a passenger yesterday by cohort

	0%	1-20%	21-40%	41-60%	61-80%	81-100%
trad. young	68.3%	17.5%	4.8%	3.2%	1.6%	4.8%
n-trad young	77.5%	8.4%	3.1%	2.6%	0.9%	7.5%
trad. old	70.5%	11.5%	4.9%	3.3%	0%	9.8%
n-trad. old	73.9%	7.0%	3.2%	1.9%	2.5%	11.5%

Table 27-2. Means table by cohort

	mean*	standard dev.	counts
trad. young	1.67	1.30	63
n-trad. young	1.63	1.44	227
trad. old	1.80	1.57	61
n-trad. old	1.87	1.71	157

Table 27-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.4953
contrasted groups	T prob.	
trad. vs. n-trad. young	0.882	
trad. vs. n-trad. old	0.784	
trad. vs. n-trad. people	0.923	
younger vs. older people	0.245	

Summary

The above comparisons of driving habits supports the most important hypothesis in this research--that is, the next generation of older people will increase their dependence on automobile as drivers and they will drive longer than current older people (although they may have lower numbers of trips by driving). Specifically, 88% of the next generation of older people will use auto as drivers as their primary means of transportation and will drive 4.5 miles per day more than current

older people. This increased mobility level and highly dependence on the automobile will bear directly on the safety problems of older drivers. Other important findings are:

1. The next generation of older people will have longer experience with driving than current older people. This, in conjunction with their lack of experience with other modes and personal preferences helps to define their virtually absolute dependence on the automobile for travel.
2. The next generation of older people will also have higher car ownership rates than current older people. This further verifies that driving will be an established life-long behavior for the next generation of older people.

DRIVING ATTITUDE

Although the growth of dependence on the automobile and the increase in miles traveled and driven by the next generation of older persons have been verified, perceptions of safety and driver attitudes may in general still restrict the mobility of the next generation of older people. The following analysis is an examination of how the current and next generation of older persons impose travel restrictions on themselves--for example, auto trips may not be taken at night. Since most of the variables from the survey for these questions provide ratio and interval data, the discussion focuses on aggregate data analysis, that is, the comparison among the means of the four cohorts.

Decreases in driving in the future

A person's perception of whether they will decrease their

driving in the future is important in terms of assessing how respondents think about their driving performance and safety problems in the future when they get older. Table 28 indicates that more older people expect to decrease their driving in the future than do younger people--the difference is about 9%. This is no surprise. However, it is important to note that in comparing non-traditional with traditional people, more of the former indicate that they will not decrease their travel in the future. Specifically, 74% of traditional younger people (versus 79% of non-traditional), and 34% of traditional older people (versus 41% of non-traditional) indicate that they will not decrease their travel in the future. This indicates that either non-traditional people are more confident about their driving abilities in the future or acknowledge their dependence on that mode of travel.

In addition, non-traditional and younger people display different reasons for changes in their future travel when compared to traditional and older people, respectively. Table 28-2 indicates that, notwithstanding reductions in activities which require travel, vision problems constitute the major concern for traditional older people, and comfort is the main reason for traditional younger people and non-traditional older people. Some other specific reasons such as not necessary, aging, and retirement were also noted by respondents. In general, about 50% of people think it will result from fewer activities in the future. It is also interesting to note that,

assuming vision problems will impact non-traditional and traditional older persons in a similar fashion, traditional older people appear more likely to acknowledge the existence of potential problems. The non-traditional older people, on the other hand, do not--moreover, they tend to drive longer distances.

Table 28-1. Responses to Q41
(Do you think that you will be decreasing your driving over the next 5 years?)

	yes	maybe	no
trad. young	4.8%	21.0%	74.2%
n-trad. young	4.3%	16.6%	79.1%
trad. old	13.8%	52.3%	33.8%
n-trad. old	14.1%	43.6%	41.1%
Chi-Square pearson	Value 84.6	Significance 0.000	

Table 28-2. The reason to decrease driving by cohort

	too expensive	can't see well	uncomfor table	fewer activities	un-able	other
trad. young	5.9%	0%	23.5%	47.1%	5.9%	17.6%
n-trad. young	4.3%	0%	13%	67.4%	2.2%	13%
trad. old	2.5%	12.5%	7.5%	67.5%	0%	10%
n-trad. old	2.3%	0%	14%	61.6%	5.8%	16.3%

Whether other drivers drive too fast

The means table (table 29-1) describes how the four cohorts think about the speed at which others drive on the road. The smaller means represent respondents more likely to think people drive too fast. Older people have means smaller than 2.5, which means that they think other people drive too fast. On the other hand, traditional younger people have a mean greater than 2.5

which on average, means that they don't think other people are driving too fast, although it should be noted that the two non-traditional groups are very similar, independent of age. The ANOVA table indicates that although the mean difference between younger and older people is significant, other comparisons are not significant. The overall conclusion is that although older and younger persons have different perceptions of the speeds of other drivers, there is no difference between traditional and non-traditional groups.

Table 29-1. Responses to Q31
(When you drive, how do you fell that other drivers drive?)

	mean*	standard dev.	cases
trad. young	2.52	0.96	60
n-trad. young	2.31	0.91	235
trad. old	2.03	0.81	65
n-trad. old	2.27	0.82	162

* note that value range: 1. much too fast 2. a little fast 3. at right speed 4. a little slow 5. much too slow

Table 29-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.0464
contrasted groups	T prob.	
trad. vs. n-trad. young	0.109	
trad. vs. n-trad. old	0.143	
trad. vs. n-trad. people	0.928	
younger vs. older people	0.008	

Familiarity of road

How people think about driving on a familiar road or in a strange place is described in table 30-1. Non-traditional people have higher means than non-traditional people which means that

they are less likely to feel unsafe in a "strange place" Non-traditional younger people have a mean 0.27 higher than traditional younger people, and non-traditional older people have a mean 0.03 higher than traditional older people. However, the overall ANOVA is not significant (and, hence, contrasts should be interpreted with caution). That point notwithstanding, the comparisons show that the only meaningful difference is between the two groups of younger people.

Table 30-1. Responses to Q34
(How do you feel the statement: driving on a familiar road is much more safe than driving in a strange place.)

	mean	standard dev.	cases
trad. young	2.24	0.87	63
n-trad. young	2.51	1.14	232
trad. old	2.33	1.16	64
n-trad. old	2.36	1.21	163

* note that value range: 1. strongly agree 2. agree 3. neutral 4. disagree 5. strongly disagree

Table 30-2. ANOVA table for four groups of comparisons

for overall comparison	F prob. 0.2752
contrasted groups	T prob.
trad. vs. n-trad. young	0.093
trad. vs. n-trad. old	0.815
trad. vs. n-trad. people	0.181
younger vs. older people	0.790

Preferences between local roads and freeways

Although most researchers have found that freeways are safer than local roads, the former requires higher speeds, quicker execution of driving tasks and faster information processing capabilities. In this regard it has also been noted that older

drivers are often represented as preferring to drive on local roads rather than freeways. To that end, table 31 describes the comparisons of the means among cohorts. The smaller mean value indicates that the respondents are more likely choose local roads. Generally, all four cohorts have means between 2 and 3, which implies that all of them frequently or occasionally choose local roads over freeways to make the same trip. Younger people have somewhat higher means than older people--that is, they are more likely to choose freeways instead of local roads. This is consistent with what was expected. What is a surprise is that non-traditional people have lower means than their traditional counterparts. The mean differences are 0.23 for younger people and 0.21 for older people, which indicate that non-traditional people are more likely to use local roads than traditional older people. In addition, the ANOVA analysis (table 31-2) indicates that the mean differences are significant when comparing younger with older, and traditional with non-traditional people. Therefore, the conclusion can be drawn is that non-traditional people and older people are more likely to choose local roads rather than freeways.

Coupled with earlier results, this shows that non-traditional older persons (and presumably the older people in the future) will be traveling longer distances (albeit making fewer trips) on roads that tend, in general, to be less safe.

Table 31-1. Responses to Q28
(On a trip of 15-30 miles, if you have a choice, would you drive local roads or streets rather than a freeway?)

	mean*	standard dev.	cases
trad. young	2.92	1.14	63
n-trad. young	2.69	1.10	238
trad. old	2.66	1.13	64
n-trad. old	2.45	1.16	164

* note that value range: 1. always 2. frequently 3. occasionally 4. rarely 5. never

Table 31-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.0278
contrasted groups	T prob.	
trad. vs. n-trad. young	0.148	
trad. vs. n-trad. old	0.206	
trad. vs. n-trad. people	0.056	
younger vs. older people	0.029	

Driving in merging areas on freeways

One of the most critical situations on a freeway is at merging areas. Such areas provide for complex driving tasks and are well-known to present special problems for older persons. In the means table for the responses to the question of whether merging areas on high speed road bother you (table 32-1), all four groups have means greater than 3.5, which means that, on average, most of the respondents only occasionally or rarely worry about merging areas. Non-traditional younger people have higher means than traditional younger, while non-traditional older people have lower means than traditional ones, the patterns here are somewhat inconsistent. While the overall ANOVA test indicates that the mean differences are not significantly

different for all of four group comparisons. Therefore, it is concluded that there is no significant pattern of differences among the four groups of people in terms of merging areas on high speed roads.

Table 32-1. Responses to Q29
(Do merging areas on high speed roads bother you at all?)

	mean*	standard dev.	cases
trad. young	3.56	1.15	63
n-trad. young	3.73	1.07	234
trad. old	3.65	1.26	66
n-trad. old	3.53	1.17	164

* note that value range: 1. always 2. frequently 3. occasionally 4. rarely 5. never

Table 31-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.3464
contrasted groups	T prob.	
trad. vs. n-trad. young	0.291	
trad. vs. n-trad. old	0.391	
trad. vs. n-trad. people	0.951	
younger vs. older people	0.789	

Whether to avoid rush hour traffic

For examining whether people try to avoid rush hour traffic, the means table (table 33) indicates that older people have lower means than younger people--that is, older people are more likely to avoid rush hour traffic. Traditional and non-traditional older people have similar means which are both less than 2.5. This indicates that they are equally likely to avoid rush hour. While non-traditional younger people have lower means than non-traditional younger people, the difference is only 0.07. The

ANOVA analysis indicates that the differences between the comparison groups are not significant--the overall F is insignificant and none of the contrasts are significant. The findings reported here are consistent with those noted earlier--the temporal distribution of travel reported earlier (table 20) is similar with driver perceptions here.

Table 33-1. Responses to Q32
(Do you try to avoid rush hour traffic?)

	mean*	standard dev.	cases
trad. young	2.42	0.96	63
n-trad. young	2.35	1.02	235
trad. old	2.26	1.00	65
n-trad. old	2.26	1.02	165

* note that value range: 1. always 2. frequently 3. occasionally 4. rarely 5. never

Table 33-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.6966
contrasted groups	T prob.	
trad. vs. n-trad. young	0.657	
trad. vs. n-trad. old	0.934	
trad. vs. n-trad. people	0.712	
younger vs. older people	0.267	

The fact that people who have similar propensities to avoid rush hour traffic does not necessarily mean that they have similar attitudes about rush hour traffic. They may avoid rush hour for any one of a variety of reasons--e.g., time delay. Table 34 indicates that most people consider "too crowded" as the main reason, about 40% in each group (except for non-traditional younger people). More younger people avoid rush hour because of

time delay, and more traditional people avoid rush hour because of time delay too. Non-traditional people are more concerned being "comfortable" and less about the perceived danger of traveling in rush hour traffic.

Table 34. The reason to avoid rush hour by cohort

	too crowd	too dangerous	uncomfortable	delay
trad. young	40%	17%	16%	27%
n-trad. young	34%	25%	16%	25%
trad. old	43%	23%	13%	21%
n-trad. old	44%	15%	24%	18%

Driving at night

People who have vision problems or other physiological and psychological problems may try to avoid driving at night. Table 35-1 indicates that younger people have lower means than older people, which to an extent, verifies that older people are more likely avoid night driving than younger people. By comparing traditional people with non-traditional people, traditional older people have lower means than non-traditional older people, However the difference is very small. Only 0.03 and 0.08 for younger and older people, respectively. It seems that non-traditional older people are more likely to restrict their night driving than traditional older people. However, the ANOVA shows that the difference is not significant for traditional and non-traditional people although the older vs. younger comparison indicates that difference is significant.

Table 35-1. Responses to Q37
(Compared to 5 years ago, do you drive at night:)

	mean*	standard dev.	cases

trad. young	3.29	0.68	63
n-trad. young	3.26	0.67	238
trad. old	3.56	0.73	64
n-trad. old	3.64	0.74	164

* note that value range: 1. much more 2. more 3. about the same 4. less 5. much less

Table 35-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.000
contrasted groups	T prob.	
trad. vs. n-trad. young	0.793	
trad. vs. n-trad. old	0.402	
trad. vs. n-trad. people	0.674	
younger vs. older people	0.000	

Analyzing the reasons for avoiding driving at night (table 36), fewer non-traditional people choose "can't see well", "uncomfortable", or "unsafe" in favor of "no activity". As noted earlier, there is an implication here that the non-traditional older person is not facing up to diminishing skills and physiological problems--if this is the case, "self-testing off" the system becomes problematic. On the other hand, more traditional people consider "can't see well" and "uncomfortable."

Table 36. The reason to decrease night time driving by cohort

	no activity	can't see well	unable	uncomfortable	unsafe	other
trad. young	23%	13%	0%	37%	10%	17%
n-trad. young	26%	12%	0%	35%	12%	14%
trad. old	20%	12%	0%	37%	20%	12%
n-trad. old	30%	5%	2%	30%	17%	8%

Driving in bad weather

Table 37-1 indicates that all four groups of people are more likely to avoid driving in bad weather than they did 5 years ago (All of the means are less than 3.) However, non-traditional older people have slightly smaller means than traditional older people. There is 0.19 mean difference for younger people, but only 0.06 mean difference for older people. the ANOVA suggested that the differences are not significant among the four groups. It is concluded that the four groups have similar attitudes about driving in bad weather.

Table 37-1. Responses to Q39
(Compared to 5 years ago, how much do you avoid driving in bad weather?)

	mean*	standard dev.	cases
trad. young	2.69	0.78	63
n-trad. young	2.80	0.71	235
trad. old	2.77	0.87	64
n-trad. old	2.71	0.78	163

* note that value range: 1. much more 2. more 3. about the same 4. less 5. much less

Table 37-2. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.6795
contrasted groups	T prob.	
trad. vs. n-trad. young	0.377	
trad. vs. n-trad. old	0.613	
trad. vs. n-trad. people	0.802	
younger vs. older people	0.933	

The primary reasons for avoiding bad weather (table 38) are "uncomfortable" and "unsafe" for all four groups. This implies that older drivers are no more or less likely to self-test off

the system than other drivers. When they do, the reasons are the same. In turn, this could imply that older drivers may be less aware of some problems that they have.

Table 38. The reason to avoid bad weather by cohort

	no activity	can't see well	unable	uncomfortable	unsafe	other
trad. young	4%	0%	0%	38%	50%	8%
n-trad. young	8%	3%	1%	32%	44%	12%
trad. old	3%	3%	0%	31%	55%	7%
n-trad. old	10%	0%	0%	42%	35%	13%

Correlations of attitude characteristics with PMT

The correlations of the eight driving attitudes characteristics with PMT have been examined for overall respondents and each group of cohort. The correlation coefficients are summarized in table 39. Specifically, for both traditional and non-traditional younger people, "driving at night," "preferences between local road and freeways," and "whether to avoid rush hour traffic" have higher correlations with PMT (coefficients>0.15). This indicates that younger people are more likely to drive at night, and likewise, more likely to higher PMT. At the same time, they are more likely to drive on freeways (rather than local roads) and more likely to have higher PMT. Finally they are less likely to avoid rush hour, the more likely they will have higher PMT. (For "driving at night," since the higher value represents being less likely to drive at night, there are negative signs for the correlation coefficients.)

More importantly, for older people, "decreases in driving in

the future" is the most important factor for both traditional and non-traditional persons. This indicates that older people, if they are less likely to decrease driving in the future, they are more likely to have higher PMT. However, "driving at night" and "preferences between local roads and freeways" have higher correlations with PMT for non-traditional older people, while "driving in merging areas" has a higher correlation with PMT for traditional older people. This means that for non-traditional older people, the more likely they are to drive at night, the more likely they will have higher PMT. Also the more likely they are to drive on freeway, the more likely they will have higher PMT. For traditional older people, if they are less likely to worry about merging areas, they are more likely to have higher PMT. Overall (for four groups,) "driving at night," "decrease in driving in the future," and "preferences between local road and freeways" are the three characteristics which have highest correlations with PMT.

Table 39. Correlation of PMT with driving attitude factors

driving attitude factors:	trad. young	n-tra. young	trad old	n-tra. old	all
driving at night	-0.25	-0.15	-0.02	-0.23	-0.26
decrease driving in future	0.072	0.058	0.41	0.15	0.19
preferences: local & freeways	0.39	0.13	0.1	0.17	0.16
whether to avoid rush-hour	0.17	0.01	0.12	0.13	0.11
driving in merging areas	0.05	0.14	0.22	0.07	0.11
whether others drive too fast	0.05	0.16	-0.05	0.09	0.09
driving in bad weather	0.13	0.05	0.03	0.07	0.03
familiarity of road	0.00	0.02	0.12	-0.02	0.02

Summary

Of the eight characteristics of driving attitudes, six of them did not show significant differences between traditional and non-traditional older people. However, regardless of significance level, some factors indicate that non-traditional older people are less likely to avoid high risk conditions than traditional older people while others do not. Furthermore, some characteristics show higher correlations with PMT for different groups while others do not. The overall summary with respect to driving attitude characteristics is as following:

1. Non-traditional older people will be significantly less likely to decrease their driving in the future. This implies either they are more confident about their driving abilities or acknowledge their dependence on automobile. In another words, they are less likely to self-test off the road system.
2. They will be significantly more likely to choose local roads rather than freeways, which may impose more safety problems for them in the future since the former are acknowledged to be less safe.
3. The next generation of older people will have attitude similar to current older people in terms of "driving at night," "whether to avoid rush hour traffic," "driving in merging areas," "whether other drivers drive too fast," "driving in bad weather," and "the familiarity of roads."
4. It has also been consistently shown that non-traditional

older people are less concerned about safety issues. They are more likely to choose "uncomfortable" and "no activities" rather than "unsafe" as the reasons for not driving at night, bad weather, and in other high risk situations.

5. "Decrease in driving in the future" have higher correlations with PMT for both traditional and non-traditional older people. However, the difference between the two groups of older people is that for the traditional group, "driving in merging areas" has higher correlation with PMT, while "driving at night" and "preferences between local roads and freeways" have higher correlations with PMT for the non-traditional group.
6. Overall, "driving at night," "decrease in driving in the future," and "preferences between local roads and freeways" have higher correlations with PMT for all groups of cohorts. This indicates that people who are more likely to drive at night, less likely to decrease driving in the future, and prefer to drive on freeway are more likely to have higher PMT.

In general, it is reasonable to conclude that the next generation of older people will be somewhat less likely to be concerned about safety issues. To some extent, they will be less likely to self-test off the roads. Part of the daily trips for the next generation of older people will be conducted in high risk situations.

ACCIDENT CHARACTERISTICS COMPARISON

So far, it is known that the next generation of older people will increase their trip lengths and the total miles of travel and driving, will be highly dependent on the automobile as drivers, will have driving attitudes towards driving that will apparently lead to less self-testing off the road systems, and will less concern about safety issues. The remaining questions are related to traffic accidents and violations.

First, traffic violation points are examined. Table 40-1 indicates that a higher percentage of older people have no point than younger people (about 80% vs. 65%). Non-traditional older people also have a higher percentage of no point than traditional older people (83% vs. 65%). It seems that older people and non-traditional older people have fewer traffic violations than younger and traditional older people, respectively. Non-traditional younger people, on the other hand, have 2% lower of no points than traditional younger people. From the means table (40-2), the mean difference is very small between traditional and non-traditional older people, but reasonably large between traditional and non-traditional younger people and younger and older people. However, the ANOVA table indicates that in addition, to overall significant differences, only the mean difference between younger and older people is significant. It is concluded that the next generation of older people will not necessarily have increased traffic violation points than current older people, notwithstanding the difference in the percentages

of traditional and non-traditional older people having zero points.

Table 40-1. Distribution of traffic violation points by cohort

	(1) no points	(2) 1 or 2	(3) 3 or 4	(4) >4 points
trad. young	66.7%	14.3%	4.8%	14.3%
non-trad young	64.7%	18.3%	8.9%	8.1%
trad. old	75%	13.2%	7.4%	4.4%
non-trad old	83.1%	9.6%	4.2%	3.0%

Table 40-2. Mean tables by cohort

	mean	standard dev.	cases
trad. young	0.67	1.09	63
non-trad young	0.60	0.95	235
trad. old	0.41	0.81	58
non-trad old	0.27	0.68	166

Table 40-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.0007
contrasted groups	T prob.	
trad. vs. n-trad. young	0.617	
trad. vs. n-trad. old	0.267	
trad. vs. n-trad. people	0.253	
younger vs. older people	0.001	

Meanwhile, table 41-1 indicates that older people and non-traditional older people have a higher percentage of no accidents than younger people and traditional older people, respectively. Comparing non-traditional with traditional younger people, it is seen that the former has a lower percentage without accidents.

With respect to older persons, the non-traditional group has been a greater percentage with no-accidents (6%) and more with

two or more accidents (2%)--there are differences in both "tails" of the accident distribution for the two groups. However, summing the categories of one accident, two accidents, and more than two accidents (assuming that it equals 3 accidents), traditional older people are estimated to have 31 accidents per 100 persons, while non-traditional older people have 27. In general, it seems that non-traditional older people will be safer than traditional older people. The means table also clearly indicates that younger people have higher means than older people, traditional older people and non-traditional younger people have slightly higher means than non-traditional older people and traditional younger people. However, the ANOVA test verifies that only the mean difference between younger and older people is significant. Thus, the conclusion is that the next generation of older people will probably be somewhat safer, in terms of accident involvements per 100 people.

Table 41-1. Distribution of total accidents by cohort

	no accident	one accident	two accidents	> two accidents
trad. young	68.3%	25.4%	4.8%	1.6%
non-trad young	66.4%	25.1%	6.4%	2.1%
trad. old	73.5%	23.5%	1.5%	1.5%
non-trad old	79.6%	15.0%	2.4%	2.4%

Table 41-2. Means table by cohort

	mean	standard dev.	cases
trad. young	0.40	0.66	63
non-trad young	0.44	0.71	235
trad. old	0.31	0.60	68
non-trad old	0.27	0.63	166

Table 41-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.	0.068
contrasted groups	T prob.	
trad. vs. n-trad. young	0.627	
trad. vs. n-trad. old	0.693	
trad. vs. n-trad. people	0.953	
younger vs. older people	0.054	

The above somewhat rejects the hypothesis that the next generation of older people will have higher number of traffic accidents and violations in which they are involved than current older people. More specifically, the next generation of older people will have 27 accidents per 100 persons, compared to 31 accidents per 100 persons for current older people. In this sense, the next generation of older people will not be less safe than current older people.

It is also interesting to consider the impacts of the accident differences in the context of the burgeoning population of older persons. The population of older people will increase significantly in the future, therefore, the absolute numbers of accidents should increase significantly for the next generation of older people in the aggregate.

Furthermore, the question should be asked is why the next

generation of older people will travel and drive further, but will not have higher accident rates. This may be due to their better driving performance, less driving restrictions, or some other reasons. In fact, from table 42, it has been found that non-traditional older people have fewer driving restrictions than traditional older people. The difference is 5%.

Table 42. Driving restriction by cohort

	0 (no restrictions)	1 (with restrictions)
trad. young	60.3%	39.7%
non-trad young	61.3%	38.7%
trad. old	36.8%	63.2%
non-trad old	41.6%	58.4%

SOCIO-ECONOMIC FACTORS COMPARISON

Socio-economic factors are also presumably related to travel and driving patterns. Age, residential location, and retirement status were used to differentiate the four cohorts, and they have been discussed in detail in earlier sections. In this section, the discussion will be addressed to other socio-economic factors: type of home, household size, family structure, marital status, household income, physical capability, education level, and ethnic background of respondents, and their relationships with the four groups of cohorts. Finally, how all of the factors correlate with general mobility patterns is also examined.

Type of home

Table 43 indicates that more than 87% of young people and non-traditional older people, but only about 75% of traditional older people, live in single-family houses. This difference is

no doubt due to traditional older persons living in denser areas of cities where single family houses are somewhat less common as well as ownership. The distribution of type of dwelling unit is about as would be expected.

Table 43. Type of home by cohort

	house	apartment	duplex	condo /townhse	retirement home	other
trad. young	87.1%	3.2%	0%	9.7%	0%	0%
n-trad. young	87.7%	0.9%	0%	5.7%	0.9%	4.7%
trad. old	75.8%	9.1%	6.1%	6.1%	0%	3.0%
n-trad. old	87.8%	1.4%	0%	5.4%	0%	5.4%

Household size and family structure

Table 44 shows that more older people live in two-person households than younger people, the difference is about 30%. Also, more non-traditional people, especially non-traditional older people, live in two-person households. The difference for traditional and non-traditional older people is 6.8%, and for younger people is only 0.6%. On the other hand, non-traditional people have fewer one-person households. Non-traditional younger people have 6% lower than their traditional counterparts, and non-traditional older people have 5% lower than their counterparts.

By further examining the persons living with respondents (table 45), it is evident that for older people, most of them live with their spouse (only). The percentage is much higher than younger people (76% vs. 37%), who have much higher percentages of living with their spouse and children than older people (52% vs.

14%). In addition, non-traditional older people have a higher percentage of living with the spouse only than do traditional people. They also have lower percentages of living with children only than traditional older people. The question remains as to whether these characteristics contribute to the differences of travel patterns between the non-traditional and traditional people. This will be tested later.

Table 44. Household size by cohort

	1 person hld.	2-person hld.	>2-person hld.
trad. young	11.1%	38.1%	50.8%
n-trad. young	4.7%	38.7%	56.6%
trad. old	23.4%	65.6%	10.9%
n-trad. old	17.8%	72.4%	9.8%

Table 45. Family structure by cohort

	spouse only	children only	spouse/ children	parent/ sibling	friend/ relative	other
trad. young	39.3%	7.1%	53.6%	0%	0%	0%
n-trad. young	35.6%	3.8%	51.9%	1.9%	1.9%	4.8%
trad. old	75.9%	3.4%	13.8%	3.4%	0%	3.4%
n-trad. old	78.1%	1.6%	14.1%	0%	0%	6.3%

Marital status

Marital status also significantly relates to home type, household size, and family structure of respondents. From table 46, more than 68% of people are married in each group. Of the rest, younger people tend to more likely be divorced and separated than older people. Older people, on the other hand, are obviously more likely to have a deceased spouse. Non-traditional people have more likely to be married, and likely to

be less single, or divorced than traditional people.

Table 46. Marital status by cohort

	single	married	divorced	separated	widowed
trad. young	7.9%	74.6%	12.7%	1.6%	3.2%
n-trad. young	3.8%	88%	5.1%	1.7%	1.3%
trad. old	5.9%	67.6%	5.9%	0%	20.6%
n-trad. old	1.2%	74.7%	4.3%	0%	19.8%

Household income

It is hypothesized that non-traditional people have higher annual household income than traditional people. From table 47, younger people have higher means than older people and non-traditional younger people have higher annual household income than traditional younger people. However, it doesn't show that non-traditional older people have higher annual income than traditional older people--they are effectively the same. Therefore, the conclusion is that income may contribute to the difference of travel patterns between younger people and older people, but should not contribute to the differences in travel patterns between traditional and non-traditional people.

Table 47-1. Household income by cohort

	$10*	$10-19	$20-29	$30-39	$40-49	$50-59	$60-69	$70-80	>$80
trad. young	4.8%	7.9%	11.1%	15.9%	12.7%	6.3%	9.5%	9.5%	19%
non-trad young	2.1%	6.8%	7.7%	12.8%	12.8%	14%	6.4%	9.4%	22%
trad. old	11.8%	16.2%	25%	13.2%	7.4%	1.5%	2.9%	4.4%	1.5%
non-trad old	9.6%	26.5%	18.7%	12.7%	4.2%	3%	4.8%	3%	2.4%

* $1,000

Table 47-2. Means table by cohort

	mean	standard dev.	cases
trad. young	5.51	2.55	61
non-trad young	5.90	2.39	220
trad. old	3.42	1.97	55
non-trad old	3.39	2.03	141

Table 47-3. ANOVA table for four groups of comparisons

for overall comparison	F prob.
contrasted groups	T prob.
trad. vs. n-trad. young	0.227
trad. vs. n-trad. old	0.931
trad. vs. n-trad. people	0.450
younger vs. older people	0.000

Physical capability

From table 48, the majority of the respondents replied that their health is excellent or good (average 83% people). Not unexpectedly, more younger people indicated that they were in excellent and good health. Non-traditional older people also have higher percentages replying that they are in excellent and good health than traditional older people (overall 80% vs. 74% for the two categories combined). Traditional older people have the lowest percentage in the categories of excellent and good physical capability. The percentage differences noted may contribute to earlier findings that non-traditional people and younger people have higher mobility levels than traditional and older people.

Table 48. Physical condition by cohort

	excellent	good	fair	poor
trad. young	27%	61.9%	9.5%	1.6%
non-trad young	28.2%	61.1%	10.7%	0%
trad. old	17.6%	55.9%	23.5%	2.9%
non-trad old	21.1%	59%	18.6%	1.2%

Education level

Generally, younger people have achieved higher education levels than older people. However, non-traditional people do not necessarily have higher education levels than traditional people. In fact, table 49 shows that non-traditional older people have lower percentages of having completed college and higher education levels, but higher percentages of elementary and high school education levels than traditional older people. This is opposed to the popular belief that the next generation of older people will have higher education levels and people who have completed higher education levels usually have higher mobility levels, and are more likely to depend on automobiles. In this case, non-traditional older people travel further but do not have higher education levels than traditional older people. It can be seen that education level does not necessarily contribute to the differences in travel patterns between traditional people and non-traditional people, but should contribute to the differences between younger people and older people.

Table 49. Education level by cohort

	elementary school	high school	college	graduate school
trad. young	1.6%	36.5%	47.6%	14.3%
non-trad young	0%	48.3%	34.2%	17.5%
trad. old	2.9%	58.8%	22.1%	16.2%
non-trad old	11.3%	52.5%	27.5%	8.8%

Ethnic background

It is also worthwhile to examine the ethnic background differences among the four groups. It is a popular belief that more minority poor people live in central cities and have low mobility and system accessibility. Here, the majority of respondents, and especially the non-traditional people, are white. Indeed, the sample of non-traditional younger people include 18% more whites than traditional younger people, non-traditional older people have 7.6% higher of whites than traditional older people. The differences in the fractions of whites in the different cohorts are presumed to be due to the largely segregated nature of suburbs and rural areas. Ethnic characteristics may contribute to travel pattern differences between traditional and non-traditional people.

Table 50. Ethnic background by cohort

	white	african Americ.	hispanic Ameri.	asian Ameri.	native Ameri	other
trad. young	76.2%	17.5%	4.8%	0%	0%	0%
n-trad. young	94.4%	1.3%	0.4%	0.9%	0.9%	0.4%
trad. old	88.2%	2.9%	1.5%	0%	5.9%	0%
n-trad. old	95.8%	0%	0%	0%	1.2%	0%

Correlations of socio-economic factors with PMT

It is hypothesized that all of the socio-economic factors may have causal correlations with the mobility patterns for different groups. For testing the correlations, travel patterns are represented by the key factor--person miles of travel yesterday (PMT). Since all nine factors are category variables, they must be changed to dummy variables which contain the values of 1 and 0. For example, marital status has been recoded into married or not: 1 indicates married, 0 means not married and includes single, separated, divorced, and widowed. Residential location has a value of 1 for non-city areas, and a value of 0 for city areas.

Table 51 shows the correlation between PMT and each of the nine factors for all four groups. Generally speaking, none of the correlations is very high. Retirement status, household income, age, residential location, physical capability, and education level have relatively higher correlations with person miles of travel ($R>0.1$). Other factors such as household size, marital status, type of home, and race have rather weak correlations with travel pattern ($R<0.1$). Overall, this indicates that people who are not currently retired, have higher household income, are somewhat younger, live in non-city areas, have better physical capability, and higher education levels have higher PMT.

Table 51. Correlation of PMT with socio-economic factors for four groups

	age	resid.	home	hld.	marri.	phy.	edu.	retir.	race	incom
PMT	-0.2	0.12	0.07	0.03	0.07	0.12	0.13	0.30	0.01	0.29

Note the value labels:

age:	1. >64 yr old;	0. 40-64 yr
residences:	1. live in non-city areas;	0. live in city areas
home	1. house;	0. not house (e.g., apartment)
household	1. 1-person household;	0. other than 1-person hld
marital status	1. married;	0. not married
physical cond.	1. excellent or good	0. fair or poor
education	1. college or higher	0. elementary or high school
retirement	1. employed	0. not employed
ethnic	1. white	0. minority
income	1. >$30,000	0. less than $30,000

Summary

The examination of the socio-economic factors for the four groups of cohorts indicates that the next generation of older people will be more likely to live in single-family houses, the household size for them are more likely to be two-person, most of them will live with spouse (only), have more stable marital status, and better physical capabilities. However, what is a surprise is that the household income for older people will not be significantly different in the future. The education levels for the future older people will not necessarily be higher than current older people. The correlations of these socio-economic factors with PMT indicate that retirement status, household income, age, residential location, physical capability, and education level have relatively higher correlations with person miles of travel (R>0.1). This implies that people who are not currently retired, have higher household income, younger age, live in suburban, have better physical capability and better education levels are more likely have higher PMT.

CONCLUSION AND RECOMMENDATION

It is indisputable that older people have higher accident involvement rates than any other age groups except the very youngest drivers. It also appears likely that the residential location for the next generation of older people will be significantly different. The majority of older people will live in non-city areas such as suburbs, small towns, and rural areas in the future. Moreover, the demographic trend of older people will dramatically change over the next twenty years--that is, the "baby boom" generation is getting older and will increase the absolute numbers and percentages of "older" population dramatically. Currently older people (65 years old and older) only count about 12% of total population. This fraction of population will increase to 21% in 2003. Furthermore, the number of those over 75, especially those 85 and older is growing much more rapidly than those between 64 and 74. In this context, it is imperative that more attention should be paid to the needs of older people, especially their mobility requirements and safety on the highway. Although there will be a great number of older people in the future and this implies a greater highway safety problem, there are two school of thoughts regarding whether the safety problems of older drivers in the next twenty years will become critical. One school of thought asserts that the safety problems will become critical because of the dramatic changes in demographic, residential location, and motorization characteristics. The opposing school of thought argues that the

problem will not become critical due to the likelihood that older drivers will voluntarily self-test off the highway. Since the safety problem is greatly related to mobility patterns, the objective of this research was to examine the hypothesis that the mobility patterns of next generation of older people will be significantly different from current older people.

This research is based on a mail-out survey in Michigan which yielded 541 usable responses. Age, residential location, and retirement status were used to differentiate between traditional and non-traditional people, as well as younger and older people. Based on the review of the literature and observed demographic trends, it is argued that the next generation of older people will be more likely to live in non-city areas such as suburban, rural, and small towns. These people who currently live in non-city areas, are called non-traditional people and are more representative of future older people. On the other hand, people who currently live in cities are called traditional people and are more representative of current older people. Comparisons were conducted between four groups: traditional vs. non-traditional older people, traditional vs. non-traditional younger people, younger vs. older people, and traditional vs. non-traditional people in general. The most important concern is the comparison of traditional and non-traditional older people, and the conclusions are mostly based on that comparison--that is, the mobility patterns of the next generation of older people are represented by those of non-traditional older people.

The important findings from this study are summarized as following:

- In terms of residential patterns, most people would prefer to live within the same general areas as they do now and in the past. Specifically, non-traditional people prefer to live in non-city areas, and traditional people prefer to live in city areas. Thus, based on current residential patterns, it is reasonable to predict that the next generation of older people is more likely to live in non-city areas. On the other hand, if moving is anticipated, traditional people have a desire to move from city areas to non-city areas, which reflects the overall suburbanization trend, and further supports the contention that the next generation of older people will more likely live in non-city areas.
- Examination of daily travel patterns and specific trips taken "yesterday" consistently showed that non-traditional older people do not have higher daily trip numbers than traditional older people. The differences are not, however, statistically significant. They will still travel once or twice per day. Younger people, on the other hand, will travel at least twice a day.
- The analysis of "yesterday's travel" showed that non-traditional older people will make longer trips than traditional older people. It is estimated that the next generation of older people will travel 4.6 miles/day

further than current older people, or about 1900 miles additional annually. This represents an increase of 33% for older people in the future. This significant increase in total miles of travel lends support to the notion that the next generation of older people will have increased mobility.

- Most people combine trip purposes into trip chains. Younger people are more likely to combine trip than older people. However, it does not appear that the next generation of older people will be more likely to combine trip purposes than current older people. This is somewhat surprising in light of the dispersed destinations more prevalent in non-city areas.
- Shopping, visiting, and recreation will still be the main trip purposes for the next generation of older people. The temporal distribution of travel yesterday indicates that about 50% of older people's travel will be conducted between 9:00 am to 4:00 pm. The revealed distributions indicate that while older people consciously avoid night driving, they do not necessarily avoid other "high risk" times (e.g., rush hour)--this latter finding is somewhat contrary to conventional wisdom.
- About 88% of non-traditional older people choose driving the auto as their main means of transportation with hardly anyone choosing non-automobile modes. In addition, 30% of them still choose driving auto as their second means of

transportation. Non-traditional people are even more likely to depend on driving. In this sense, the next generation of older people will depend more on automobile than the current older people.

- Car ownership per driver and amount of driving experience (over time) also indicated that the next generation of older people will be more "car-oriented." Driving has indeed become an integral part of the culture in this country.
- Similar to the overall numbers of trips, yesterday's trips by driving do not show significant differences between traditional and non-traditional people in general. On the other hand, trips by driving indicate that non-traditional older people have significantly lower numbers of trips by driving than traditional older people.
- Since non-traditional and traditional people have similar percentages of yesterday's travel as passenger, (about 18.3% for older people and 16.4% for younger people), and also non-traditional older people make longer trips than traditional older people, the former will drive further than traditional older people. The next generation of older people will drive about 2.7 miles further per day than current older people.
- The overall conclusion regarding driving attitudes is that the next generation of older people will be somewhat less likely concerned about safety and less likely to self-test

off the road system. More specifically, there is a significant difference in driving attitudes between the next generation of older people and current older people in terms of whether they will drive less in the future. About 41% of non-traditional older people said "no" when asked if they would decrease their driving in the future versus 34% of traditional older people. Non-traditional older people are also significantly less likely to drive on freeways (vs. local streets) than traditional older people. The attitudes about other situations such as driving at night, in bad weather, during rush hour, and in merging areas were not different. In addition, It has been found that "driving at night," "whether decrease driving in the future," and "preferences between local roads and freeways" are three factors which have higher correlations with travel patterns (PMT) for all four groups of people.

- In terms of traffic violations and accidents, the analysis did not show significant differences between non-traditional and traditional people. In fact, non-traditional older people showed slightly lower accident rates than older people (27 accidents per 100 persons vs. 31 accidents per 100 persons). However, the burgeoning population of older people will contribute to significant increases in the absolute number of accidents for older people in the future.
- The examination of socio-economic factors such as type of home, household size, family structure, marital status,

household income, physical capability, education levels, and ethnic background indicates that the next generation of older people will be more likely to live in single-family houses, their household size are more likely to be two persons, they will live with spouse (only), have more stable marital status, and better physical capabilities. However, the household income for older people will not significantly change in the future. The education levels for the future older people will not necessarily be higher than current older people. Finally, the examination of correlation of these socio-economic factors with PMT indicate that retirement status, household income, age, residential location, physical capability, and education level have relatively higher correlations with PMT.

This study has generates important findings in terms of describing the mobility pattern differences between the next generation of older people and current older people. However, it must be understood that all of the findings are based on some assumptions. There are also some data limitations and confounding effects for this study which could not be controlled. In order to better understand the context of the findings, it is necessary to state or restate the major assumptions, data limitations, and confounding effects of this study.

One major assumption for this study is that non-traditional older people represent the next generation of older people, who are mainly characterized by living in non-city areas such as

suburban, rural, and small towns. On the other hand, traditional older people represent current older people, who are mainly characterized by living in city areas (downtown or not downtown). Here, residential location was assumed to be the most important factor to differentiate between current and future older people.

In terms of data limitations, as noted, the 541 usable respondents are supposed to represent Michigan residents of 40 years old and older. However, there are some deviations between the target population and the data source, the respondents and non-respondents, and even in the random sampling of the data source. For example, the data source from MDOS excluded people who do not currently have drivers' licenses. Respondents, on the other hand, under-represented people who have traffic violations and traffic accidents. These unavoidable biases may generate some errors when testing the hypotheses. From a statistical perspective, it should be noted that the results is that all of the conclusions are based on 90% of confidence intervals. This means only 90-out-of 100 times the conclusions are true. In another words, there is a 10% chance that a conclusion may not be true.

Finally, it should be noted that in the next twenty years, there will be expected and unexpected developments affecting mobility. lot of things may be happened without expectation. For example, Intelligent Vehicle Highway System (IVHS) may significantly change people's driving attitude and safety issues. With the signing of the Intermodal Surface Transportation

Efficiency Act (ISTEA) and Clean Air Act Amendments (CAAA), public transportation systems will receive more attention. These changes may affect the travel behavior of older people, as well as other groups.

Bearing all of the above in mind, this study still provides a clear picture of the next generation of older people--that is, older people will be more likely to travel and drive on the road in the future. The average trip lengths and total miles of travel and driving for the next generation of older people will increase as much as one-third more than current older people, However, the number of trips will not have significant changes. In the future, older people will hardly depend on transit or other transportation modes, but primarily drive automobiles. In terms of driving attitude, they will be somewhat less likely to self-test off the road system, and less likely to be concerned about safety issues. Traffic violation and accident rates will not necessarily increase in the future. However, it is well-known that the population of older people will increase significantly in the next twenty years. It is reasonable to predict that the safety problems will become critical in the future. In another words, the safety issues of older people will become one of the most important concerns for transportation professionals. The change of mobility patterns of the next generation of older people should greatly influence the transportation policy making in the future. More research about the transportation problems of the next generation of older

people, improving roadway and operation, and older drivers training and retraining programs are strongly recommended from this study.

The most important recommendation from the study is that more attention should be paid to the highway-safety-related needs of older people. In order to do that, additional research regarding the mobility requirements of older people and their safety on the highway are encouraged. In addition, further research about the physiological and psychological characteristics is required in order to discover the causal reasons of their accidents.

Since the next generation of older people will increase their exposure on the highway system (more depend on driving for mobility and less will self-test off the road), the highway system has to be safer than ever before. In addition, the majority of the next generation of older people will live in non-city areas, and their trip lengths will increase significantly. Thus, the safety of suburban and rural highways is especially important for them. Highway design and operation have to be improved. For example, traffic control devices such as signs, signals, and pavement markings should be improved to compensate for the physiological and psychological deficits of older people. Clear, unambiguous, coherent, prominent and complete road information systems both during the day and at night are required for safe driving by older people as well as other age groups.

Training and retraining program will also greatly benefit

older drivers. The next generation of older people will have longer driving experiences. Since most of them first learned how to drive, many of them have not kept abreast of the changes on the highway. Retraining program can help them catch up on changes and improve their driving performances. Moreover, since much of the driving for the next generation of older people will be at night, during rush hour, and in bad weather, training programs which can help older people to recognize and compensate for the effects of their physical and psychological deficiencies in those high risk situations.

America is an aging society. One of the most important responsibilities for this changing society is to provide better mobility and accessibility for older persons in order to improve their quality of life.

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APPENDIX 1

DRIVER LICENSE FILE VARIABLE NAMES AND LABELS

```
     drnum 1-13 (A)
     lictype 14
     licext 15  (A)
     restrict 16
     probat 17 (A)
     sex 18 (A)
     birthday 19-25
     city 26-44 (A)
     state 45-46 (A)
     zip 47-51
     county 52-53
     street 54-89 (A)
     name 90-125 (A)
     specres 126-137 (A)
     convicts 138-139 (A)
     points 140-141 (A)
     spdiff1 142-143 (A)
     vtype1 144-145 (A)
     spdiff2 146-147 (A)
     vtype2 148-149 (A)
     spdiff3 150-151 (A)
     vtype3 152-153 (A)
     spdiff4 154-155 (A)
     vtype4 156-157 (A)
     totalacc 158-159
     cntveh1 160-161
     cntinj1 162-163
     cntkll1 164-165
     viol1 166-167
     drink1 168
     crshveh1 169 (A)
     cntveh2 170-171
     cntinj2 172-173
     cntkll2 173-175
     viol2 176-177
     drink2 178
     crshveh2 179 (A)
     cntveh3 180-181
     cntinj3 182-183
     cntkll3 184-185
     viol3 186-187
     drink3 188
     crshveh3 189 (A)
     cntveh4 190-191
     cntinj4 192-193
     cntkll4 194-195
     viol4 196-197
     drink4 198
     crshveh4 199 (A).

var labels
     drnum 'driver license no.'
     lictype 'license type'
     licext 'license extension'
```

```
restrict 'header restriction'
PROBAT 'PROBATION CODE'
sex 'sex'
birthday 'birthday'
city 'city'
state 'state'
zip 'zip code'
county 'county'
street 'street'
name 'name'
specres 'special restriction code'
convicts 'total no. of conviction'
points 'total no. of points'
spdiff1 'speed diff. of 1st'
vtype1 'type of veh. of 1st'
spdiff2 'offense code of 2nd'
vtype2 'type of veh. of 2nd'
spdiff3 'offense code of 3rd'
vtype3 'type of veh. of 3rd'
spdiff4 'offense code of 4th'
vtype4 'type of veh. of 4th'
totalacc 'total number of accidents'
cntveh1 'counts of 1st rec crash(veh.)'
cntinj1 'counts of 1st crash (injured)'
cntkll1 'counts of 1st crash (killed)'
viol1 'violation code for 1st'
drink1 'drinking code for 1st'
crshveh1 'type of veh of 1st'
cntveh2 'counts of 2nd rec crash(veh.)'
cntinj2 'counts of 2nd crash (injured)'
cntkll2 'counts of 2nd crash (killed)'
viol2 'violation code for 2nd'
drink2 'drinking code for 2nd'
crshveh2 'type of veh of 2nd'
cntveh3 'counts of 3rd rec crash(veh.)'
cntinj3 'counts of 3rd crash (injured)'
cntkll3 'counts of 3rd crash (killed)'
viol3 'violation code for 3rd'
drink3 'drinking code for 3rd'
crshveh3 'type of veh of 3rd'
cntveh4 'counts of 4th rec crash(veh.)'
cntinj4 'counts of 4th crash (injured)'
cntkll4 'counts of 4th crash (killed)'
viol4 'violation code for 4th'
drink4 'drinking code for 4th'
crshveh4 'type of veh of 4th'
```

APPENDIX 2

SURVEY COVER LETTER AND INSTRUMENT

MICHIGAN STATE
UNIVERSITY

4 April 94

Subject: Survey on older driver research

Dear Transportation Professional:

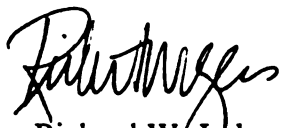
Michigan State University is currently undertaking a National Cooperative Highway Research Program project entitled "Improved Traffic Control Device (TCD) Design and Placement to Aid the Older Driver." The purpose of the research is to discover the "best" way to supply traffic control information to older drivers. "Best" implies such things as the actual location of the signs and/or markings, the size of the lettering on the sign, and the message itself.

While the major portion of this project is directed toward developing and field testing different TCD treatments, it also includes a review of the efforts by others. In this regard, we would like to know what type(s) of projects related to older persons your agency has undertaken, either in conjunction with another agency or on your own. We would also be interested in any information on implementation projects regarding older people that may not be research-oriented *per se* (e.g., a project wherein the size of street name signs was increased to aid older persons, but there was no formal analysis of the results).

Please take a few minutes to fill out the enclosed questionnaire. If your agency has not done any research or undertaken any other projects directed to assisting older persons, but you know of another jurisdiction which has, please let us know about that work.

If you have any questions, please contact me at your convenience. Thank you very much for your cooperation and any information that you can make available to us.

Yours truly,



Richard W. Lyles
Professor
Transportation Engineering and Planning

enclosures: survey on older people research

The Department of Civil and Environmental Engineering at Michigan State University is conducting this survey to investigate the travel behavior of Michigan residents. Please answer all questions as best you can by checking the pertinent items. (Only one answer unless indicated) **Thank you for your help!**

PLEASE TELL US SOMETHING ABOUT WHERE YOU LIVE

Q1. How many people are in your household?

____one person **(skip to Q3)** ____two persons ____more than two

Q2. Who are the people living in your household other than yourself? (You may check more than one.)

____my spouse only ____my spouse and children ____friends and/or relatives
____my children only ____my parents and/or siblings ____other, specify_____

Q3. In what kind of area do you live?

____rural area (5,000 or less population) ____within a city, but not downtown
____small town (10,000 or less population) ____downtown area of big city (e.g., downtown Detroit)
____suburban area ____other, specify_____

Q4. If you live in a city, how large is it?

____I do not live in a city ____more than 75,000 and less than 100,000 population
____25,000 or less population ____more than 100,000 and less than 500,000 population
____more than 25,000 and less than 50,000 population ____more than 500,000 and less than 1,000,000 population
____more than 50,000 and less than 75,000 population ____1,000,000 or more population

Q5. In what type of home do you live?

____single family house ____condominium/townhouse
____apartment ____retirement home
____duplex ____other, specify_____

Q6. How long have you resided at your present address?

____less than 2 years ____7 to 11 years ____17 to 20 years
____2 to 6 years ____12 to 16 years ____more than 20 years

Q7. Where did you live before you moved to your current home?

_____state _____city _____zip code ____have not moved in last 20 years **(skip to Q12)**

Q8. In what type of area did you live?

____rural area (5,000 or less population) ____within a city, but not downtown
____small town (10,000 or less population) ____downtown area of big city (e.g., downtown Detroit)
____suburban area ____other, specify_____

Q9. If you lived in a city, how large was it?

____I didn't live in a city ____more than 75,000 and less than 100,000 population
____25,000 or less population ____more than 100,000 and less than 500,000 population
____more than 25,000 and less than 50,000 population ____more than 500,000 and less than 1,000,000 population
____more than 50,000 and less than 75,000 population ____1,000,000 or more population

Q10. In what type of home did you live?

____single family ____duplex ____retirement home
____apartment ____condominium/townhouse ____other, specify_____

Q11. What were your main reasons for moving? (You may check more than one.)

____moved to bigger or better house or apartment
____moved to smaller or cheaper house or apartment
____near family or close friends
____closer to bus or other public transit
____more convenient to stores and/or other services
____change in workplace
____retired
____more convenient to work place
____personal preference (e.g., I like the place)
____other, specify_____

Q12. Do you have any intentions to move within the next 5 years

____yes ____maybe ____no **(skip to Q17)**

Q13. If the answer to Q12 is yes or maybe, where do you want to move?

____out of state, "sunbelt" area
____in the state, another location
____out of state, not "sunbelt" area
____in the same general area

Q14. In what type of area do you want to live?

____rural area (5,000 or less population)
____small town (10,000 or less population)
____suburban area
____within a city, but not downtown
____downtown area of big city (e.g., downtown Detroit)
____other, specify_____

Q15. In how large a city do you want to live?

____I don't want to live in a city
____25,000 or less population
____more than 25,000 and less than 50,000 population
____more than 50,000 and less than 75,000 population
____more than 75,000 and less than 100,000 population
____more than 100,000 and less than 500,000 population
____more than 500,000 and less than 1,000,000 population
____1,000,000 or more population

Q16. Why do you want/need to move? (You may check more than one.)

____move to bigger or better house or apartment
____move to smaller or cheaper house or apartment
____near family or close friends
____closer to bus or other public transit
____more convenient to stores and other public services
____change in workplace
____retire
____more convenient to work place
____personal preference (e.g., I like the place)
____other, specify_____

PLEASE TELL US SOMETHING ABOUT YOUR TRAVEL HABITS

Q17. How many usable cars are there in your household?

____none ____one car ____two cars ____more than two cars

Q18. How many people in your household have a driver's license?

____none ____one person ____two persons ____more than two persons

Q19. How old were you when you first got your driver's license?
Please specify age_____.

Q20. How often do you make trips (for example, to shop or work) from your home?

___more than once a day ___3-6 days a week ___several days a month
___once a day ___1-2 days a week ___almost never

Q21. Which means of transportation do you use most?

____auto with yourself as driver **(skip to Q23)** ____public transit
____auto with yourself as passenger ____dial-a-ride
____bicycle and/or walking ____other, specify_____

Q22. If you **didn't choose** "auto with yourself as driver" in **Q21**, what are the reasons? (You may check more than one.)

____spouse likes to drive more than I do ____driving is too expensive ____I like public transit better
____driving is too stressful ____driving is not safe ____I don't have a car
____driving is inconvenient ____somebody gives me a ride ____other, specify_____

Q23. What is your second most likely means of transportation?

____auto with yourself as driver ____public transit
____auto with yourself as passenger ____dial-a-ride
____bicycle and/or walking ____other, specify_____

Q24. If you didn't choose "public transit" in **Q21/Q23**, why? Otherwise go to next question. (You may check more than one.)

____not necessary (for example, my household has car) ____it is too slow
____the nearest stop is too far away from my home ____it does not operate on schedule
____it is not convenient to get on and get off ____it is dangerous due to the crime rate
____there is no transit service in my area ____other reason, specify_____

Q25. About how often do you use public transit?

___more than once a day ___3-6 days a week ___several days a month
___once a day ___1-2 days a week ___almost never

Q26. Do you plan local travel to combine purposes (e.g., a trip including stops at the store, dry cleaner, and the bank)?

____always ____frequently ____occasionally ____rarely ____never

PLEASE TELL US ABOUT YOUR DRIVING HABITS

Q27. How often do you drive your car from home? (You are the driver.)

___more than once a day ___3-6 days a week ___several days a month
___once a day ___1-2 days a week ___almost never

Q28. On a trip of 15-30 miles, if you have a choice, would you drive local roads or streets rather than a freeway?

____always ____frequently ____occasionally ____rarely ____never

Q29. Do merging areas on high speed roads (for example, on or off ramps) bother you at all?

____always ____frequently ____occasionally ____rarely ____never

Q30. How often does someone drive with you? (You are the driver, others are passengers.)

____always ____frequently ____occasionally ____rarely ____never

Q31. When you drive, how do you feel that other drivers drive?

___much too fast ___a little fast ___at the right speed ___a little slow ___much too slowly

Q32. Do you try to avoid rush hour traffic?

____always ____frequently ____occasionally ____rarely ____never

Q33. If the answer to Q32 is "always/frequently," why? Otherwise go to next question. (You may check more than one.)

___too crowded ____too dangerous ____uncomfortable ____time delay

Q34. How do you feel about the statement: driving on a familiar road is much more safe than driving in a strange place.

____strongly agree ____agree ____neutral ____disagree ____strongly disagree ____don't know

Q35. How safe do you feel when you drive now compared to when you drove in the past 10-15 years?

____much safer ____safer ____the same ____less safe ____much less safe

Q36. Compared to 5 years ago, can you see signs, signals, and markings on the road:

____much better ____better ____the same ____worse ____much worse

Q37. Compared to 5 years ago, do you drive at night:

___much more ____more ____about the same ____less ____much less

Q38. If the answer to Q37 is "less/much less," why? Otherwise go to next question. (You may check more than one.)

____no activities at night
____cannot see very well
____not physically able to drive at night
____not comfortable to drive at night
____it's not safe driving at night (easier to have accidents)
____other, specify_____

Q39. Compared to 5 years ago, how much do you avoid driving in bad weather?

____much more ____more ____about the same ____less ____much less

Q40. If the answer to Q39 is "much more/more," why? Otherwise, go to next question. (You may check more than one.)

____no activities during bad weather
____cannot see very well
____not physically able to drive in bad weather
____not comfortable driving during bad weather
____not safe driving during bad weather (easier to have accidents)
____other, specify_____

Q41. Do you think that you will be decreasing your driving over the next 5 years?

____yes ____maybe ____no **(skip to Q43)**

Q42. Why?

____driving is too expensive
____can not see very well
____do not feel comfortable driving
____there will be fewer activities that I need to drive to
____not physically able to drive a car
____other, specify_____

PLEASE TELL US ABOUT YOUR TRAVEL YESTERDAY

Q43. What day of the week was yesterday? _____

Q44. How many trips did you make from your residence yesterday? ("Trips" are trips from your home regardless of the means of transportation. It includes walking and biking.)

____none ____one ____two ____three ____four ____five ____more than five

Q45. How many times did you drive from your residence yesterday? (You were the driver.)

____none ____one ____two ____three ____ more than 3

Q46. About how far did you travel in an automobile yesterday? (Regardless of whether you were the driver.)

___0-5 miles ___6-15 miles ___16-25 miles ___26-35 miles ___36 miles or more

Q47. During your travel yesterday, did you combine your trip purposes? (for example, a trip that included stops at the grocery store, dry cleaners, and the bank.)

____yes ____no ____not sure

Q48. About what percentage of yesterday's auto travel was spent as a passenger? (not driving)

____0% ____1-20% ____21-40% ____41-60% ____61-80% ____81-100%

Q49. Other than auto, how did you travel yesterday? (You can check more than one.)

____none
____public transit
____dial-a-ride
____bicycles
____walking
____other, specify_____

Q50. What type of activities did you undertake yesterday? (You may check more than one.)

____working
____shopping
____recreation
____medical care
____visiting or dinner/lunch
____other, specify_____

Q51. When did you make the trips noted in Q50? Fill in the table. (You may check more than one.)

	working	recreation	visit,dinner and lunch	shopping	medical-care	other,specify
before 7:00 am						
7:00-9.00 am						
9:00-4:00 pm						
4:00-6:00 pm						
after 6:00 pm						

WE'RE ALMOST FINISHED! PLEASE TELL US A LITTLE ABOUT YOURSELF

Q52. What is your marital status?

____single ____married ____divorced ____separated ____widowed

Q53. How would you describe your physical condition?

____excellent ____good ____fair ____poor

Q54. Do you have a handicapper parking permit?

____yes ____no

Q55. What is the highest education level that you have completed?

____elementary ____high school ____college ____graduate school

Q56. What is your present employment status? (You may check more than one.)

____full time work (35-40 hours or more a week)
____part-time
____retired, but still work full or part time
____retired (no work)
____volunteer work
____home-maker
____self-employed
____currently no job
____unemployed
____other, specify_____

Q57. What kind of occupation do you have? If you are retired, what kind did you have before retirement? (You may check more than one, and use "b" and "a" to indicate your occupation "before" and "after" retirement respectively.)

____administrative ____sales ____home maker
____clerical ____service ____self-employment
____technical ____professional ____other, specify_____

Q58. What is your ethnic background?

____White ____Hispanic ____Native American
____African American ____Asian ____other, specify_____

Q59. What is your annual household income?

____under $10,000 ____$30,000-39,999 ____$60,000-69,999
____$10,000-19,999 ____$40,000-49,999 ____$70,000-80,000
____$20,000-29,999 ____$50,000-59,999 ____over $80,000

Q60. In closing, is there anything that you would like to say about your travel habits we have not covered?

Our mailing address:
Department of Civil and Environmental Engineering, Michigan State University, East Lansing, MI 48824-1226

Thank you, we appreciate your time!

APPENDIX 3

PILOT STUDY ADDITIONAL QUESTIONS

Transportation Program
Civil and Environmental Engineering Department
Michigan State University

Oct. 6, 1993

This is a pilot study of the enclosed **Mobility Survey.** The purpose is to get first-hand information from several respondents in order to improve the quality of the survey.

Please fill out the enclosed questionnaire as best you can and answer the additional questions as following:

1. How long did you take to fill out the questionnaire?

   Specify_____

2. Are there any questions which confused you?

   ____yes ____no

   If the answer is yes, please specify_____

3. Are there any questions which you can not understand?

   ____yes ____no

   If the answer is yes, please specify_____

4. Do you have any other problems when you filled out the survey?

5. Do you have any suggestions about this survey?

Thank you, we appreciate your time!

APPENDIX 4

VARIABLE NAMES & LABELS, VALUE LABELS, AND FREQUENCIES FOR THE SURVEY

VAR	VAR LABELS	VALUE LABELS	FREQS
ID	ID NUMBER FOR RESPONDENTS		641
Q1	# OF PERSONS IN HOUSEHOLD	0 NOT AVAILABLE	
		1 ONE PERSON	64
		2 TWO PERSON	278
		3 MORE THAN TWO	194
Q2A	LIVE WITH SPOUSE ONLY	0 NOT AVAILABLE	
		1 AVAILABLE	122
		99 LEGITIMATE SKIP	
Q2B	LIVE WITH CHILDREN ONLY	0 NOT AVAILABLE	
		1 AVAILABLE	24
		99 LEGITIMATE SKIP	
Q2C	LIVE WITH SPOUSE AND CHILDREN	0 NOT AVAILABLE	
		1 AVAILABLE	173
		99 LEGITIMATE SKIP	
Q2D	LIVE WITH PARENT AND SIBLING	0 NOT AVAILABLE	
		1 AVAILABLE	11
		99 LEGITIMATE SKIP	
Q2E	LIVE WITH FRIENDS AND RELATIVES	0 NOT AVAILABLE	
		1 AVAILABLE	9
		99 LEGITIMATE SKIP	
Q2F	LIVE WITH OTHERS:	0 NOT AVAILABLE	
	GRANDCHILDREN, COMBINE Q2C WITH Q2D	1 AVAILABLE	16
		99 LEGITIMATE SKIP	
Q3	IN WHAT KIND OF AREA DO YOU LIVE	0 NOT AVAILABLE	
		1 RURAL AREA (<5,000 POP)	142
		2 SMALL TOWN (<20,000 POP)	83
		3 SUBURBAN AREA	176
		4 IN A CITY, NOT DOWNTOWN	127
		5 DOWNTOWN OF BIG CITY	4
		6 OTHERS	4
Q4	HOW LARGE IS THE CITY	0 NOT AVAILABLE	
		1 I DON'T LIVE IN A CITY	199
		2 <25,000 POPULATION	75
		3 >25,000,<50,000 POP	51
		4 >50,000,<75,000 POP	27
		5 >75,000,<100,000 POP	28
		6 >100,000,<500,000 POP	35
		7 >500,000,<1,000,000 POP	7
		8 >1,000,000 POP	14
Q5	IN WHAT TYPE OF HOME DO YOU LIVE	0 NOT AVAILABLE	
		1 SINGLE FAMILY HOUSE	450
		2 APARTMENT	26
		3 DUPLEX	6
		4 COMDOMINIUM/TOWNHOUSE	30
		5 RETIREMENT HOME	1
		6 OTHER:MOBILE HOME	26
Q6	HOW LONG HAVE YOU RESIDED HERE	0 NOT AVAILABLE	
		1 < 2 YR	43
		2 2-6 YR	86

		3	7-11 YR	83
		4	12-16 YR	70
		5	17-20 YR	52
		6	>20 YR	205
Q7A	STATE LIVED BEFORE	ST		
Q7B	CITY LIVED BEFORE	ST		
Q7C	ZIP CODE BEFORE			
Q7D	WHETHER MOVED IN LAST 20 YEARS	0	NOT AVAILABLE	
		1	AVAILABLE	202
Q8	IN WHAT TYPE OF AREA DID YOU LIVE	0	NOT AVAILABLE	
		1	RURAL AREA (<5,000 POP)	62
		2	SMALL TOWN (<20,000 POP)	41
		3	SUBURBAN AREA	102
		4	IN A CITY, NOT DOWNTOWN	113
		5	DOWNTOWN OF BIG CITY	6
		6	OTHERS	7
		99	LEGITIMATE SKIP	
Q9	HOW LARGE WAS THE CITY	0	NOT AVAILABLE	
		1	I DON'T LIVE IN A CITY	97
		2	<25,000 POPULATION	41
		3	>25,000,<50,000 POP	35
		4	>50,000,<75,000 POP	20
		5	>75,000,<100,000 POP	13
		6	>100,000,<500,000 POP	37
		7	>500,000,<1,000,000 POP	9
		8	>1,000,000 POP	22
		99	LEGITIMATE SKIP	
Q10	IN WHAT TYPE OF HOME DID YOU LIVE	0	NOT AVAILABLE	
		1	SINGLE FAMILY HOUSE	269
		2	APARTMENT	34
		3	DUPLEX	8
		4	COMDOMINIUM/TOWNHOUSE	11
		5	RETIREMENT HOME	0
		6	OTHER:MOBILE HOME	11
		99	LEGITIMATE SKIP	
Q11A	MOVED TO BIGGER OR BETTER HOUSE OR APARTMENT	0	NOT AVAILABLE	
		1	AVAILABLE	121
		99	LEGITIMATE SKIP	
Q11B	MOVED TO SMALLER OR CHEAPER HOUSE OR APART.	0	NOT AVAILABLE	
		1	AVAILABLE	22
		99	LEGITIMATE SKIP	
Q11C	NEAR FAMILY OR CLOSE FRIENDS	0	NOT AVAILABLE	
		1	AVAILABLE	13
		99	LEGITIMATE SKIP	
Q11D	CLOSER TO BUS OR OTHER PUBLIC TRANSIT	0	NOT AVAILABLE	
		1	AVAILABLE	0
		99	LEGITIMATE SKIP	
Q11E	MORE CONVENIENT TO STORES AND/OR OTHER SERVICES	0	NOT AVAILABLE	
		1	AVAILABLE	2
		99	LEGITIMATE SKIP	

Q11F	CHANGE IN WORKPLACE	0	NOT AVAILABLE	
		1	AVAILABLE	14
		99	LEGITIMATE SKIP	
Q11G	RETIRED	0	NOT AVAILABLE	
		1	AVAILABLE	48
		99	LEGITIMATE SKIP	
Q11H	MORE CONVENIENT TO WORKPLACE	0	NOT AVAILABLE	
		1	AVAILABLE	22
		99	LEGITIMATE SKIP	
Q11I	PERSONAL PREFERENCE	0	NOT AVAILABLE	
		1	AVAILABLE	76
		99	LEGITIMATE SKIP	
Q11J	OTHERS:	0	NOT AVAILABLE	
	REMARRIED, DIVOICED, BETTER SCHOOL DISTRICT,	1	AVAILABLE	86
	SAFETY CONCERN, BURNED OUT, SON MOVED BACK,	99	LEGITIMATE SKIP	
	TROUBLE WITH FORMAL OWNER			
Q12	DO YOU HAVE ANY INTENTIONS TO MOVE	0	NOT AVAILABLE	
	WITHIN THE NEXT 5 YEARS	1	yes	65
		2	maybe	149
		3	no	325
Q13	WHERE DO YOU WANT TO MOVE	0	NOT AVAILABLE	
		1	OUT OF STATE, SUNBELT AREA	47
		2	IN THE STATE, ANOTHER LOCATIO	62
		3	OUT OF STATE, NOT SUNBELT ARE	23
		4	IN THE SAME GENERAL AREA	75
		99	LEGITIMATE SKIP	
Q14	IN WHAT TYPE OF AREA DO YOU WANT TO LIVE	0	NOT AVAILABLE	
		1	RURAL AREA (<5,000 POP)	50
		2	SMALL TOWN (<20,000 POP)	39
		3	SUBURBAN AREA	68
		4	IN A CITY, NOT DOWNTOWN	41
		5	DOWNTOWN OF BIG CITY	0
		6	OTHERS	7
		99	LEGITIMATE SKIP	
Q15	IN HOW LARGE A CITY DO YOU WANT TO LIVE	0	NOT AVAILABLE	
		1	I DON'T LIVE IN A CITY	102
		2	<25,000 POPULATION	34
		3	>25,000,<50,000 POP	19
		4	>50,000,<75,000 POP	13
		5	>75,000,<100,000 POP	10
		6	>100,000,<500,000 POP	13
		7	>500,000,<1,000,000 POP	4
		8	>1,000,000 POP	1
		99	LEGITIMATE SKIP	
Q16A	MOVED TO BIGGER OR BETTER HOUSE OR APARTMENT	0	NOT AVAILABLE	
		1	AVAILABLE	18
		99	LEGITIMATE SKIP	
A16B	MOVED TO SMALLER OR CHEAPER HOUSE OR APART.	0	NOT AVAILABLE	
		1	AVAILABLE	32
		99	LEGITIMATE SKIP	

Q16C	NEAR FAMILY OR CLOSE FRIENDS	0 NOT AVAILABLE	
		1 AVAILABLE	29
		99 LEGITIMATE SKIP	
Q16D	CLOSER TO BUS OR OTHER PUBLIC TRANSIT	0 NOT AVAILABLE	
		1 AVAILABLE	1
		99 LEGITIMATE SKIP	
Q16E	MORE CONVENIENT TO STORES AND/OR OTHER SERVICES	0 NOT AVAILABLE	
		1 AVAILABLE	12
		99 LEGITIMATE SKIP	
Q16F	CHANGE IN WORKPLACE	0 NOT AVAILABLE	
		1 AVAILABLE	18
		99 LEGITIMATE SKIP	
Q16G	RETIRED	0 NOT AVAILABLE	
		1 AVAILABLE	71
		99 LEGITIMATE SKIP	
Q16H	MORE CONVENIENT TO WORKPLACE	0 NOT AVAILABLE	
		1 AVAILABLE	4
		99 LEGITIMATE SKIP	
Q16I	PERSONAL PREFERENCE	0 NOT AVAILABLE	
		1 AVAILABLE	73
		99 LEGITIMATE SKIP	
Q16J	OTHERS:	0 NOT AVAILABLE	
	MOVE TO COUNTY,FARM, BUY OWN HOME.WIDOWED,	1 AVAILABLE	43
	TAX TOO HIGH HERE, HANDICAPTED, GET OLDER,	99 LEGITIMATE SKIP	
	GET REMARRIED, MORE PRIVACY		
Q17	HOW MANY USABLE CARS IN YOUR HOUSEHOLD	0 NOT AVAILABLE	
		1 NONE	12
		2 ONE CAR	139
		3 TWO CARS	252
		4 MORE THAN TWO CARS	137
Q18	HOW MANY PEOPLE IN YOUR HOUSEHOLD HAVE	0 NOT AVAILABLE	
	A DRIVER'S LICENSE	1 NONE	1
		2 ONE PERSON	82
		3 TWO PERSONS	320
		4 MORE THAN TWO PERSONS	136
Q19	HOW OLD WHEN YOU FIRST GOT YOUR DRIVER'S LICENSE		
Q20	HOW OFTEN DO YOU MAKE TRIPS	0 NOT AVAILABLE	
		1 MORE THAN ONCE A DAY	203
		2 ONCE A DAY	122
		3 3-6 DAYS A WEEK	144
		4 1-2 DAYS A WEEK	53
		5 SEVERAL DAYS A MONTH	11
		6 ALMOST NEVER	2
Q21	WHICH MEANS OF TRANSPORTATION YOU USE MOST	0 NOT AVAILABLE	
		1 AUTO AS DRIVER	487
		2 AUTO AS PASSENGER	43
		3 BICYCLE AND/OR WALKING	1

		4 PUBLIC TRANSIT		2
		5	7	0
		6 OTHER:MOTORCYCLE		1
Q22A	SPOUSE LIKES TO DRIVE MORE THAN I DO	0 NOT AVAILABLE		
		1 AVAILABLE		35
		99 LEGITIMATE SKIP		
Q22B	DRIVING IS TOO STRESSFUL	0 NOT AVAILABLE		
		1 AVAILABLE		6
		99 LEGITIMATE SKIP		
Q22C	DRIVING IS INCONVENIENT	0 NOT AVAILABLE		
		1 AVAILABLE		1
		99 LEGITIMATE SKIP		
Q22D	DRIVING IS TOO EXPENSIVE	0 NOT AVAILABLE		
		1 AVAILABLE		0
		99 LEGITIMATE SKIP		
Q22E	DRIVING IS NOT SAFE	0 NOT AVAILABLE		
		1 AVAILABLE		2
		99 LEGITIMATE SKIP		
Q22F	SOMEBODY GIVES ME A RIDE	0 NOT AVAILABLE		
		1 AVAILABLE		5
		99 LEGITIMATE SKIP		
Q22G	I LIVE PUBLIC TRANSIT BETTER	0 NOT AVAILABLE		
		1 AVAILABLE		0
		99 LEGITIMATE SKIP		
Q22H	I DON'T HAVE A CAR	0 NOT AVAILABLE		
		1 AVAILABLE		4
		99 LEGITIMATE SKIP		
Q22I	OTHERS:	0 NOT AVAILABLE		
		1 AVAILABLE		6
		99 LEGITIMATE SKIP		
Q23	WHAT IS YOUR SECOND MOST LIKELY MEANS OF TRANSP.	0 NOT AVAILABLE		
		1 AUTO AS DRIVER		109
		2 AUTO AS PASSENGER		327
		3 BICYCLE AND/OR WALKING		61
		4 PUBLIC TRANSIT		9
		5 DIAL-A-RIDE		4
		6 OTHER		7
Q24A	NOT NECESSARY	0 NOT AVAILABLE		
		1 AVAILABLE		293
		99 LEGITIMATE SKIP		
Q24B	THE NEAREST STOP IS TOO FAR AWAY	0 NOT AVAILABLE		
		1 AVAILABLE		55
		99 LEGITIMATE SKIP		
Q24C	NOT CONVENIENT TO GET ON AND GET OFF	0 NOT AVAILABLE		
		1 AVAILABLE		40
		99 LEGITIMATE SKIP		

Q24D	NO TRASIT SERVICE IN MY AREA	0	NOT AVAILABLE	
		1	AVAILABLE	185
		99	LEGITIMATE SKIP	
Q24E	IT IS TOO SLOW	0	NOT AVAILABLE	
		1	AVAILABLE	39
		99	LEGITIMATE SKIP	
Q24F	IT DOES NOT OPERATE ON SCHEDULE	0	NOT AVAILABLE	
		1	AVAILABLE	31
		99	LEGITIMATE SKIP	
Q24G	DANGEROUS DUE TO THE CRIME RATE	0	NOT AVAILABLE	
		1	AVAILABLE	15
		99	LEGITIMATE SKIP	
Q24H	OTHER:	0	NOT AVAILABLE	
	IN ADEQUATE ROUTES & SCHEDULES	1	AVAILABLE	26
	DOESN'T GO WHERE I NEED TO GO	99	LEGITIMATE SKIP	
	NEED TO TAKE MY SMALL KIDS EASIER IN CAR			
Q25	HOW OFTEN DO YOU USE PUBLIC TRANSIT	0	NOT AVAILABLE	
		1	MORE THAN ONCE A DAY	1
		2	ONCE A DAY	0
		3	3-6 DAYS A WEEK	0
		4	1-2 DAYS A WEEK	3
		5	SEVERAL DAYS A MONTH	3
		6	ALMOST NEVER	467
Q26	DO YOU PLAN LOCAL TRAVEL TO COMBINE PURPOSES	0	NOT AVAILABLE	
		1	ALWAYS	227
		2	FREQUENTLY	229
		3	OCCASIONALLY	38
		4	RARELY	9
		5	NEVER	14
Q27	HOW OFTEN DO YOU DRIVE CAR FROM HOME	0	NOT AVAILABLE	
		1	MORE THAN ONCE A DAY	210
		2	ONCE A DAY	113
		3	3-6 DAYS A WEEK	143
		4	1-2 DAYS A WEEK	39
		5	SEVERAL DAYS A MONTH	19
		6	ALMOST NEVER	11
Q28	DO YOU DRIVE LOCAL ROADS RATHER THAN A FREEWAY	0	NOT AVAILABLE	
		1	ALWAYS	100
		2	FREQUENTLY	151
		3	OCCASIONALLY	156
		4	RARELY	101
		5	NEVER	26
Q29	DO MERGING AREAS BOTHER YOU AL ALL	0	NOT AVAILABLE	
		1	ALWAYS	37
		2	FREQUENTLY	37
		3	OCCASIONALLY	139
		4	RARELY	187
		5	NEVER	136
Q30	HOW OTEN DOES SOMEONE DRIVE WITH YOU	0	NOT AVAILABLE	
		1	ALWAYS	21

		2	FREQUENTLY	230
		3	OCCASIONALLY	210
		4	RARELY	67
		5	NEVER	7
Q31	HOW DO YOU FEEL THAT OTHER DRIVERS DRIVE	0	NOT AVAILABLE	
		1	MUCH TOO FAST	96
		2	A LITTLE FAST	240
		3	AT THE RIGHT SPEED	147
		4	A LITTLE SLOW	44
		5	MUCH TOO SLOWLY	5
Q32	DO YOU TRY TO AVOID RUSH HOUR TRAFFIC	0	NOT AVAILABLE	
		1	ALWAYS	118
		2	FREQUENTLY	213
		3	OCCASIONALLY	141
		4	RARELY	51
		5	NEVER	15
Q33A	AVOID RUSH HOUR DUE TO TOO CROWED	0	NOT AVAILABLE	
		1	AVAILABLE	192
		99	LEGITIMATE SKIP	
Q33B	AVOID RUSH HOUR DUR TO TOO DANGEROUS	0	NOT AVAILABLE	
		1	AVAILABLE	104
		99	LEGITIMATE SKIP	
Q33C	AVOID RUSH HOUR DUE TO UNCOMFORTABLE	0	NOT AVAILABLE	
		1	AVAILABLE	90
		99	LEGITIMATE SKIP	
Q33D	AVOID RUSH HOUR DUE TO TIME DELAY	0	NOT AVAILABLE	
		1	AVAILABLE	115
		99	LEGITIMATE SKIP	
Q34	WHETHER FAMILIAR ROAD IS MUCH MORE SAFER	0	NOT AVAILABLE	
		1	STRONGLY AGREE	110
		2	AGREE	219
		3	NEUTRAL	113
		4	DISAGREE	66
		5	STRONGLY DSIAGREE	14
		6	DON'T KNOW	10
Q35	HOW SAFE DO YOU FEEL	0	NOT AVAILABLE	
	COMPARED TO IN THE PAST 10-15 YEARS	1	MUCH SAFE	24
		2	SAFER	59
		3	THE SAME	238
		4	LESS SAFE	182
		5	MUCH LESS SAFE	31
Q36	COMPARED TO 5 YEARS AGO.	0	NOT AVAILABLE	
	CAN YOU SEE SGINS, SIGNALS, AND MARKINGS	1	MUCH BETTER	19
		2	BETTE4R	86
		3	THE SAME	396
		4	WORSE	32
		5	MUCH WORSE	0
Q37	COMPARED TO 5 YEARS AGO, DO YOU DRIVE AT NIGHT	0	NOT AVAILABLE	
		1	MUCH MORE	4
		2	MORE	19

		3	ABOUT THE SAME	305
		4	LESS	164
		5	MUCH LESS	44
Q38A	NO ACTIVITIES AT NIGHT	0	NOT AVAILABLE	
		1	AVAILABLE	76
		99	LEGITIMATE SKIP	
Q38B	CANNOT SEE VERY WELL AT NIGHT	0	NOT AVAILABLE	
		1	AVAILABLE	27
		99	LEGITIMATE SKIP	
Q38C	NOT PHYSICALLY ABLE TO DRIVE AT NIGHT	0	NOT AVAILABLE	
		1	AVAILABLE	2
		99	LEGITIMATE SKIP	
Q38D	NOT COMFORTABLE TO DRIVE AT NIGHT	0	NOT AVAILABLE	
		1	AVAILABLE	105
		99	LEGITIMATE SKIP	
Q38E	NOT SAFE DRIVING AT NIGHT	0	NOT AVAILABLE	
		1	AVAILABLE	44
		99	LEGITIMATE SKIP	
Q38F	OTHERS	0	NOT AVAILABLE	
	CRIME	1	AVAILABLE	33
		99	LEGITIMATE SKIP	
Q39	COMPARED TO 5 YEARS AGO,	0	NOT AVAILABLE	
	HOW MUCH DO YOU AVOID DRIVING IN BAD WEATHER	1	MUCH MORE	38
		2	MORE	118
		3	ABOUT THE SAME	331
		4	LESS	34
		5	MUCH LESS	14
Q40A	NO ACTIVITIES DURING BAD WEATHER	0	NOT AVAILABLE	
		1	AVAILABLE	17
		99	LEGITIMATE SKIP	
Q40B	CANNOT SEE VERY WELL DURING BAD WEATHER	0	NOT AVAILABLE	
		1	AVAILABLE	4
		99	LEGITIMATE SKIP	
Q40C	NOT PHYSICALLY ABLE TO DRIVE IN BAD WEATHER	0	NOT AVAILABLE	
		1	AVAILABLE	1
		99	LEGITIMATE SKIP	
Q40D	NOT COMFORTABLE TO DRIVE DURING BAD WEATHER	0	NOT AVAILABLE	
		1	AVAILABLE	84
		99	LEGITIMATE SKIP	
Q40E	NOT SAFE DRIVING DURING BAD WEATHER	0	NOT AVAILABLE	
		1	AVAILABLE	100
		99	LEGITIMATE SKIP	
Q40F	OTHERS	0	NOT AVAILABLE	
	IF YOU DON'T NEED TO, WHY GO OUT	1	AVAILABLE	25
	TOO MANY PEOPLE DON'T KNOW HOW TO DRIVE IN BAD WEATHER	99	LEGITIMATE SKIP	
Q41	DO YOU THINK THAT YOU WILL BE DECREASING YOUR	0	NOT AVAILABLE	

	DRIVING OVER THE NEXT 5 YEARS	1	YES	46
		2	MAYBE	162
		3	NO	325
Q42	WHY YOU WILL DECREASE YOUR DRIVING OVER THE NEXT 5 YEARS	0	NOT AVAILABLE	
		1	DRIVING IS TOO EXPENSIVE	7
		2	CANNOT SEE VERY WELL	5
		3	DON'T FEEL COMFORTABLE	25
		4	FEWER ACTIVITIES NEED TO DRIVE	121
		5	NOT PHYSICALLY ABLE TO DRIVE	7
		6	OTHER:AGING, RETIREMENT,	27
		99	LEGITIMATE SKIP	
Q43	WHAT DAY OF THE WEEK WAS YESTERDAY	0	NOT AVAILABLE	
		1	MONDAY	115
		2	TUESDAY	65
		3	WEDESDAY	59
		4	THURSDAY	33
		5	FRIDAY	105
		6	SATURDAY	53
		7	SUNDAY	101
Q44	HOW MANY TRIPS FROM YOUR RESIDENCE YESTERDAY	0	NOT AVAILABLE	
		1	NONE	47
		2	ONE	172
		3	TWO	172
		4	THREE	92
		5	FOUR	26
		6	FIVE	12
		7	MORE THAN FIVE	9
Q45	HOW MANY TIMES YOU DRIVE FROM YOUR RESIDENCE YESTERDAY	0	NOT AVAILABLE	
		1	NONE	89
		2	ONE	200
		3	TWO	138
		4	THREE	72
		5	MORE THAN THREE	34
Q46	HOW FAR DID YOU TRAVEL IN AN AUTO YESTERDAY	0	NOT AVAILABLE	
		1	0-5 MILES	99
		2	6-15 MILES	127
		3	16-25 MILES	94
		4	26-35 MILES	54
		5	36 MILES OR MORE	147
Q47	DID YOU COMBINE YOUR TRIP PURPOSES	0	NOT AVAILABLE	
		1	YES	326
		2	NO	182
		3	NOT SURE	7
Q48	WHAT PERCENT OF YESTERDAY'S AUTO TRAVEL WAS SPENT AS A PASSENTER	0	NOT AVAILABLE	
		1	0	380
		2	1-20%	50
		3	21-40%	18
		4	41-60%	13
		5	61-80%	7
		6	81-100%	44
Q49A	OTHER THAN AUTO, USE NONE	0	NOT AVAILABLE	
		1	AVAILABLE	380

Q49B	OTHER THAN AUTO, USE PUBLIC TRANSIT	0 NOT AVAILABLE	
		1 AVAILABLE	6
Q49C	OTHER THAN AUTO, USE DIAL-A-RIDE	0 NOT AVAILABLE	
		1 AVAILABLE	2
Q49D	OTHER THAN AUTO, USE BICYCLES	0 NOT AVAILABLE	
		1 AVAILABLE	6
Q49E	OTHER THAN AUTO, USE WALKING	0 NOT AVAILABLE	
		1 AVAILABLE	100
Q49F	OTHER THAN AUTO, USE OTHER: AIRPLANE	0 NOT AVAILABLE	
		1 AVAILABLE	14
Q50A	WORKING YESTERDAY	0 NOT AVAILABLE	
		1 AVAILABLE	204
Q50B	SHOPPING YESTERDAY	0 NOT AVAILABLE	
		1 AVAILABLE	286
Q50C	RECREATION YESTERDAY	0 NOT AVAILABLE	
		1 AVAILABLE	107
Q50D	MEDICAL CARE YESTERDAY	0 NOT AVAILABLE	
		1 AVAILABLE	42
Q50E	VISITING OR DINNER/LUNCH YESTERDAY	0 NOT AVAILABLE	
		1 AVAILABLE	212
Q50F	OTHER:CHURCH, MEETING, SCHOOL, HEALTH CLUB LONG DISTANCE TRAVEL, BODY FITTING, BANK, MAIL, DIDN'T LEAVE HOME, VOLUNTEER, BEAUTY SHOP.	0 NOT AVAILABLE	
		1 AVAILABLE	160
Q51A	WORKING BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	70
Q51B	WORKING 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	99
Q51C	WORKING 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	70
Q51D	WORKING 4:00-6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	52
Q51E	WORKING AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	27
Q51F	RECREATION BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	9
Q51G	RECREATION 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	17
Q51H	RECREATION 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	50
Q51I	RECREATION 4:00-6:00 PM	0 NOT AVAILABLE	

		1 AVAILABLE	31
Q51J	RECREATION AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	37
Q51K	VISITING,DINNER AND LUNCH BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	2
Q51L	VISITING, DINNER, AND LUNCH 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	10
Q51M	VISITING, DINNER, AND LUNCH 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	118
Q51N	VISITING, DINER, AND LUNCH 4:00-6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	74
Q51O	VISITING, DINNER, AND LUNCH AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	76
Q51P	SHOOPING BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	3
Q51Q	SHOPPING 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	33
Q51R	SHOPPING 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	182
Q51S	SHOPPING 4:00-6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	55
Q51T	SHOPPING AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	39
Q51U	MEDICAL-CARE BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	0
Q51V	MEDICAL-CARE 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	5
Q51W	MEDICAL-CARE 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	38
Q51X	MEDICAL-CARE 4:00-6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	3
Q51Y	MEDICAL-CARE AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	3
Q51Z	OTHER, BEFORE 7:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	10
Q51AA	OTHER, 7:00-9:00 AM	0 NOT AVAILABLE	
		1 AVAILABLE	40
Q51BB	OTHER, 9:00-4:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	74
Q51CC	OTHER, 4:00-6:00 PM	0 NOT AVAILABLE	

		1 AVAILABLE	41
Q51DD	OTHER, AFTER 6:00 PM	0 NOT AVAILABLE	
		1 AVAILABLE	0
Q52	WHAT IS YOUR MARITAL STATUS	0 NOT AVAILABLE	
		1 SINGLE	20
		2 MARRIED	428
		3 DIVOICED	31
		4 SEPARATED	5
		5 WIDOWED	52
Q53	HOW WOULD YOU DESCRIBE YOUR PHYSICAL CONDITION	0 NOT AVAILABLE	
		1 EXCELLENT	130
		2 GOOD	321
		3 FAIR	79
		4 POOR	5
Q54	DO YOU HAVE A HANDICAPPER PARKING PERMIT	0 NOT AVAILABLE	
		1 YES	47
		2 NO	486
Q55	WHAT IS THE HIGHEST EDUCATION THAT YOU HAVE	0 NOT AVAILABLE	
		1 ELEMENTARY	22
		2 HIGH SCHOOL	267
		3 COLLEGE	170
		4 GRADUATE SCHOOL	75
Q56A	FULL TIME WORK	0 NOT AVAILABLE	
		1 AVAILABLE	218
Q56B	PART-TIME WORK	0 NOT AVAILABLE	
		1 AVAILABLE	47
Q56C	RETIRED, BUT STILL WORK FULL OR PART TIME	0 NOT AVAILABLE	
		1 AVAILABLE	40
Q56D	RETIRED (NO WORK)	0 NOT AVAILABLE	
		1 AVAILABLE	156
Q56E	VOLUNTEER WORK	0 NOT AVAILABLE	
		1 AVAILABLE	52
Q56F	HOME-MAKER	0 NOT AVAILABLE	
		1 AVAILABLE	121
Q56G	SELF-EMPLOYED	0 NOT AVAILABLE	
		1 AVAILABLE	49
Q56H	CURRENTLY NO JOB	0 NOT AVAILABLE	
		1 AVAILABLE	12
Q56I	UNEMPLOYED	0 NOT AVAILABLE	
		1 AVAILABLE	9
Q56J	OTHER: HELP WIFE IN HER BUSINESS	0 NOT AVAILABLE	
		1 AVAILABLE	25
Q57A	ADMINISTRATIVE	0 NOT AVAILABLE	
		1 AVAILABLE	60

Q57B	CLERICAL	0 NOT AVAILABLE	
		1 AVAILABLE	81
Q57C	TECHNICAL	0 NOT AVAILABLE	
		1 AVAILABLE	59
Q57D	SALES	0 NOT AVAILABLE	
		1 AVAILABLE	54
Q57E	SERVICE	0 NOT AVAILABLE	
		1 AVAILABLE	62
Q57F	PROFESSIONAL	0 NOT AVAILABLE	
		1 AVAILABLE	140
Q57G	HOME MAKER	0 NOT AVAILABLE	
		1 AVAILABLE	107
Q57H	SELF-EMPLOYMENT	0 NOT AVAILABLE	
		1 AVAILABLE	59
Q57I	OTHER: LABOR, AGRICULTURE, BOILER OPERATOR PHYSICAL THERAPY AIDE, TRUCK DRIVER TEACHER, FACTORY WORKER	0 NOT AVAILABLE	
		1 AVAILABLE	90
Q58	WHAT IS YOUR ETHNIC BACKGROUND	0 NOT AVAILABLE	
		1 WHITE	497
		2 AFRICAN AMERICAN	16
		3 HISPANIC	5
		4 ASIAN	2
		5 NATIVE AMERICAN	8
		6 OTHER	1
Q59	WHAT IS YOUR ANNUAL HOUSEHOLD INCOME	0 NOT AVAILABLE	
		1 UNDER $10,000	33
		2 $10,000-19,999	76
		3 $20,000-29,999	76
		4 $30,000-39,999	73
		5 $40,000-49,999	50
		6 $50,000-59,999	44
		7 $60,000-69,999	31
		8 $70,000-80,000	36
		9 OVER $80,000	68
Q60	ANY OTHER COMMENTS	0 NOT AVAILABLE	416
		1 WITH COMMENTS	125

APPENDIX 5

RESPONSES TO QUESTION #60

QUESTION #60 COMMENTS IN MOBILITY SURVEY

1406
I don't like to drive much cause of my age. Losing ability to determine or judge distances. Fell uncomfortable in highway traffic.

1041
I can average 75-100 miles per day driving at work.I am not a truck driver. I am a data collector for MDOT

628
cars are better and more efficient than 5 years age. Probably safer too.

333
roads are very bad after hard winter-pot holes and rough

1121
many roads in Michigan are worse than they have ever been in the last 40 years. Also we feel that freeway speed limits aught to be raised. A person is more alert at higher rate of speed.

691
Vacation by car or plane.

1201
We like to make frequent stops for more comfort. Also we use our signal lights when changing lanes and turning. Wish everyone would do the same.

624
Design roads so heavy vehicles have separate lane-not along side of regular lanes.

702
I cannot avoid rush hour traffic because of the hours I work :7am-4:30pm about safety. The big trucks travel too fast. 90% of my time is on the freeway. People with car phones should have one or two lanes to be to be in what missing their phones, with a lower speed limit because these people are flat out not paying attention to their driving!

230
I am a realtor, so I use my car a great deal and often have customers and clients a passenger. I drive all around Washington county. Usually people drive well and roads are well mashed. Ann arbor streets are in terrible condition.

1140
The only thing is that I not only drive to work and have to drive as part of my work, but also I'm a passenger.

989
My spouse and I take frequent trips around the U.S.. towing a travel trailer with a truck. We avoid night time driving and bad weather travel as much as possible for safety reasons.

349
When you asked about biking and walking in this survey, it did not seem matter to you that it is now in winter and I walk in nicer weather but not now.

388
Bike paths in temperance not where schools or library are located.

844
As I get older-I do travel less (10-15% per year)

896
Take 1-3 trips/yr of 1000-6000 miles by car or by plane with car rental at destination

104
Drivers all rude, inconsiderate, following too close, drive too fast.

964
Prefer to travel during daylights because of tail gating and bright light.

387
Once a year, we travel south for a family vacation. We travel the week after Eastern and usually travel about 800 miles (one way).

1305
Highway signing very gad including freeway system

605
Would love to see better public trans. across the nation-rail service included. Have done much travel in Europe and enjoy not having to drive. wish we had same.

392
I travel less in the winter than I do other times of the year

927
For 13 yrs, we traveled nearly every weekend from Dearborn to here. Sharing the driving choices without accident and only 2 tickets. Question about driving on freeway doesn't apply in our area.

199
I am aged and still have my faculties but truly believe we who are 65 and over should be required to test driving.

1034
I see a need for more cheap as transportation for senior citizens

669
I travel a lot by car, I like to drive more than flying.

605
I would love to see better public trans. across the nation-rail service included. Have done much travel in Europe and enjoy not having to drive. Wish we had the same.

1305
Highway signing very bad including freeway system.

318
I do less nighttime traveling alone, when I do travel alone at night. it is on familiar streets, and not the freeway. Use car phone when traveling alone on trips or on the freeway.

435
I live in a suburb and work in the Detroit medical center. I would like to use public transportation to work (at least sometimes) but it is not convenient, direct or perception safe. If some of these impediments were removed, I would take advantage of public transportation. I also enjoy cycling I would ride to work if I didn't ave to ride through very high crime areas.

1408
We make many bicycle trips during good weather.

1468
During winter we travel very little except 3 or 4 times a month about 30 miles to larger town for supplies. Summertime we travel almost every weekend.

1162
We have a travel trailer with which we make several tripes each summer. We, have also make the trip around lake.

1176
My 19 year old daughter borrow my car sometimes.

151
At times I feel like a taxi drivers with children and there different activities, but they differ day to day.

327
Weather and purpose determine which vehicle I use. Most trips are made in the afternoon.

393
Long distances I travel by air.

1434
I work from a "home" office which eliminates daily work commuting. My total work related mileage however averages 25,000 miles/yr- Absent inclement weather, and schedule I often abandon the freeway

for more service routes.

394
I make monthly trips to the west side of the state. In general the condition of freeway, rural roads, and streets are improving.

88
They should not have turn on red coming off freeway. Big mistake. Also, they should put more delay turn left at all intersections. People are very slow when making left turn and cause many accident. Also all drivers when they turn age 70, they should have special road test for them. Most drivers at that age have slower reflects.

5
Travel by private automobile is a magic carpet. We north Americans are very fortunate to have the highway system we have.

742
We need public transport to Flint as do several of our friends.

411
Too many people run yellow traffic lights.

1155
Drive about twice a year to Sun city west. Have 109500 miles on my 1989 wagon.

288
I like to drive. I drive reasonably well, generally faster than posted speeds, but not aggressively.

446
I commute 70 miles one way 3 times per week.

328
I have never had a ticket on a accident that was my fault. I had one accident in my life where a woman hit me from behind as I was pulling in a driveway. I hope that I will always be carefully because I never want to hurt anyone.

388
Bike paths in temperance not where schools or library are located.

573
My travel habits during the week are usually restricted to work locally or national travel. Local trips for errands are usually made on week-end.

797
my age is 78 years.

946
I am a salesman and average 800 mi per week in mich., Ind., Ill., and Wisc.

32
I am more cautious now at 45, than I was at 19. Age may help you whatever.

1315
About three times per month, I travel 100 miles to and from another city Often travel to work during evening and night.

674
I drive about 12,000 to 15,000 miles a year and I lease two cars a year.

1329
You didn't ask about carpooling.

334
My wife and I enjoy car travel vacations and make several trips per year. Last year we made 10 such trips.

1392
As alder seniors we do not travel very long distances by car anymore.

59
Frustrated more easily by other drivers.

115
Travel north during spring, summer, and fall to cottage on weekends and vacations.

1005
I travel frequently by air. Using commercial and my own aircraft. Aviation is a very important mode of travel and deserves more recognition.

342
I do all of my driving except for weekend when my husband drives if we go out.

1461
I travel south each year for 4 months to Fla.

1309
I drive out of state about 80% of the time.

1023
We don't make long trips by car any more. We use airlines.

1314
We need better roads in Michigan-tear up short distances at one time instead of miles where no one is working on them.

1188
It is becoming much more dangerous to drive at night-especially in

an unfamiliar area-because of crime.

427
We live in Fla. 6 months of the year and drive now and back the end of April. (1200 mi)

1220
We are in Fla now so the Q43 to Q51 can not apply cause we are not at home.

43
Less stress traveling if roads were better.
Street names hanging high as in Calif.
More posted speed limits.

169
Too many young 16-25 years old people going over speed limit and chaning lanes without signalling.

376
I have higher speed in this state to feel save on Mich highways. If I do the speed limit I am a faraid of getting run over. That doesn't say much for mich law enforement.

1172
Rural areas are terrible on automobiles.

679
I wear my seat belts at least 90% of the time.

1372
We make several long weekend trips throughout the summer on freeways.

946
I'm a traveling sales person. Average 800 miles per week.

416
I have loved to travel over the years.

1061
Short trips to work. Weekly trips to nursing home (mother) in another state.

471
I like to drive.

389
If bus transportation were available I would use it.

1483
People down state forget the need of the U.P. Travel here is just a bit ifferent than big cities.

444
Why do people drive the samespeed in both 55-65 zones and 10-20 over that? I drive speed limits if safe and never had a ticket for that.

24
Looking at todays drivers, there should be a strick. Drivers test to get a licence. Some drivers hsould not be on the road.

1017
Would like to use more local main roads upgraded. The freeways are wonderful for longer distances.

1229
I enjoy driving when everybody working-No rush hours-that when I stay home.

1494
Have more strict enforcement of speed limits.

1219
Need to increase major freeways to min. 3 lanes--most highways were built in the 60's and are over crowded. Today at mos times day or night.

1423
Retired and traveling to warmer places 4-5 mo. of year in motor home.

737
We aren't required to make any trips in bad weather and pay strict attention to weather forecasts and traffic forecasts.

1171
There are too many trucks on the road.

926
When the eather is nicer, I ride my bicycle to town for some of my activities (bank, post office, library, etc.), I do this to save money and to get some exercise.

1103
Driving in thsi area and many other areas in this state is not pleasant because of rough deteriarating highways and side roads.

332
Travel has been limited due to health, family conflicts with time and lack of funds. There is much more of Michigan I 'd like to see.

781
I usually travel by air lines or train.

594
I donot own a car, adn I travel by city bus. My income much less than anone of those about.

1345
I travel 17 miles oneway to work, or 34 miles round trip five days a week.

1003
Mich. drivers-tailgate. One can travel 2 miles without meeting any oncoming traffic-then meet 4 to 10 cars not 3 feet apart.
Driver ginals for a turn-trailing driver ignores signal and finally stops within inches of car making turn.

360
I take 2-3 trips a year and traveling 400-700 miles, driving by myself.