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Preparing for the Next Generation of Senior Population: An Analysis of Changes in Senior Travel Behavior over the Last Two Decades

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Preparing for the Next Generation of Senior Population:

An Analysis of Changes in Senior Travel Behavior over the Last Two Decades

by

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DEDICATION

This thesis is dedicated to my family who loved and supported me throughout my life and school career, providing me with countless opportunities. To my loving fiancée Meghan who has given me motivation to persevere, even when it seemed like I would never finish. Finally, I would like to thank my friends whom I have share countless laughs with and made this process much more enjoyable.

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ABSTRACT

Over the past several decades, the senior age group has become the fastest growing segment of the population in the United States (Warner, 2011). This study seeks to contribute to the ongoing discussion of the impacts that the increases in senior travel will have on the future transportation systems and planning efforts. The main objective of this research is to conduct an explorative analysis of the changes in senior travel behavior over the past two decades and discuss the implications of these changes to transportation planning in the future. This thesis seeks to further understanding of this topic by providing a detailed analysis and consideration of relevant contexts through a review of previous studies and the author's background in the field of transportation.

Results indicate significant changes in travel behaviors and make-up of the senior population. Over the three (1990, 2001, and 2009) survey periods, senior travel changed as a result of increased activity and a need to maintain their typical way of life well into older age.

As the baby boom generation continues to out travel each previous generation, there is no evidence to assume that as they reach retirement age that trend will end. Seniors today are remaining active and working well into their older age and the age group has continued to increasingly contribute to total travel. These increases will be echoed by the baby boom generation and must be considered by traffic forecasters, researcher and policy makers in the future.

CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 Background

In recent years, the changing travel demand and needs of seniors has become a point of concern among transportation planners, travel behavioral analysts, and researchers (Lynott, 2011). Seniors today are far more active later in life than in previous decades and understanding how the socio-demographics and attitudes of the senior population have changed is essential to realizing how senior travel may continue to evolve in the future (Chen & Millar, 2000; Chu, 1994). As seniors continue to make up a larger percentage of the population, understanding how and why seniors travel is essential to comprehending the impacts that increases in senior travel will generate (Burkhardt & McGavock, 1999). This chapter provides an introduction to the topic and a review of literature documenting changes in senior travel patterns, attitudes of seniors toward travel, and how the role of seniors in the community has evolved.

1.2 Changes in Travel among Seniors

Senior population (i.e., age 65 and above) is growing at an unprecedented rate and is more active than ever (Warner, 2011; Scott, Newbold, Spinney, Mercado, Páez, & Kanaroglou, 2009). By the year 2020, at least one out of every five citizens in North America will be over the age of 65 (Rosenbloom, 2002). The impact of the growth of these aging groups has been so substantial that the US Census Bureau considers the

growth as a "preeminent worldwide phenomenon" (Scott et al., 2009). As senior populations continue to increase, so do their transportation needs. This demographic shift increases the need for planning to address future mobility concerns. A person's mobility is typically derived from the ability to travel to everyday activities. As seniors continue to be more active later into life, this ability to travel also has increased. Understanding changes in senior mobility and travel demand will allow for planners and policy makers to provide for the transportation needs of the future.

The transportation patterns and needs of seniors have changed over the last several years and will continue to change as the baby boom generation reaches retirement age. Heaslip (2007) explored the effects of the aging population on travel demand by exploring data sets from the Nationwide Transportation Survey, American Travel Survey (ATS), and 2001 National Household Travel Survey (NHTS). Heaslip (2007) concluded that seniors are making more and longer trips than seniors in the past delaying retirement, and increasing their work related travel. Moreover, seniors who retire may still make trips during peak travel hours simply out of habit (Collia, Sharp, & Giesbrect, 2003). Overall, research suggests that senior travel is not limited to off-peak hours, contrary to expectations (Heaslip, 2007).

Rosenbloom and Ståhl (2002) examined the increase of senior trip volumes and travel lengths as it pertained to increasing dependency upon personal vehicles, or "automobility", for travel needs. This increased "automobility" of seniors can have substantial mobility implications as physical and mental capabilities decrease with age (Benekohal, Michaels, Shim, & Resende, 1994; Freedman & Martin, 1998). For instance, many seniors could find themselves without a means of transportation, leading to

difficulties in carrying out everyday activities. Mobility loss is a problem not only because of the large number of seniors that will be facing mobility loss in the future, but also because many seniors have based residential, employment, and several other decisions on being able to drive (Frey, 1999). This decentralization of seniors adds complexity to the issue of alternative mobility options for seniors due to the costs associated (Hjorthol, 1998). These results indicate that seniors may be willing to shift their transportation mode if opportunities existed, but many have made decisions about their lifestyle based on driving a personal vehicle which preclude them from participating in other forms of transportation. This loss of mobility could have many negative implications, including limited interaction within communities.

Rosenbloom (2003) addresses many misconceptions about senior travel and contends that many policy makers separate seniors into two separate groups, those who need substantial government assistance and those who do not. These basic assumptions hinder effective transportation policy and planning, leading to ineffective transportation solutions (Rosenbloom, 2003). Approximately half of seniors in the United States live in suburban areas where they have lived for several years (Rosenbloom, 2003 Genevieve et al., 2001). These increases are often assumed to be a sign of increased mobility due to the increase in trips, but this is more indicative of poor access to transportation alternatives and an increase in decentralization of seniors (Rosenbloom, 2003). As seniors become less physically mobile, it becomes more difficult to walk to and from public transportation, which leads to a decrease in public transit use (Rosenbloom, 2003). This decrease in physical mobility does not generally impact the ability to drive until later in life and so seniors will become more dependent on their automobile (Frey, 2003).

Current policies on paratransit services from senior's homes to transit stations encourage seniors to drive instead of making use of transportation services (Pucher & Renne, 2003). Many metropolitan areas limit access to paratransit services due to the high cost of operating to the American's with Disabilities (ADA) requirements. To overcome these costs, many transit operators restrict eligibility and many seniors disabilities are not seen as severe enough to warrant such a service (National Council on Disability, 2003).

Individuals approaching senior-status in the upcoming decades will, in general, have greater education, health, activity levels, and affluence than previous generations (Rosenbloom, 2002; Srinivasan, McGuckin, & Murakami, 2006). Seniors are remaining active by doing everything from going on vacations, furthering their educations by returning to school, and even remaining in the workforce well past the typical retirement age (Srinivasan et al., 2006). Changes in travel time and total trips among the total population potentially may be due to a shift in cultural trends, such as smaller households and changes in traditional behaviors (Toole-Holt, Polzin, & Pendyala, 2005). Increases in the number of women in the workforce, a greater propensity for eating out, and an increased need for socialization all spur an increased need for travel (Toole-Holt, et al., 2005). As the baby boom generation reaches retirement age, these changes in travel culture will become a part of senior culture. The baby boom generation has enjoyed high levels of mobility their entire lives and may be resistant to change their habits.

As the baby boom generation (the roughly 76 million Americans born between 1946 and 1964 (Srinivasan et al., 2006)) begins to retire, it is vital to appropriately plan and engineer our transportation system to provide for the needs of the increasing numbers of senior travelers who utilize it. Retirement has a different meaning for the baby boom

generation and it is not appropriate to assume that they will engage in the same travel behaviors as past generations (Heaslip, 2007). In a study similar to this research effort, Nancy McGuckin explored the impact of baby boomers on U.S. Travel by examining NHTS data from 1969 to 2009. By all measures of travel observed, the baby boom age cohort travel more than their counterparts in each age group (McGuckin, 2012). Understanding how these baby boomers differ from the generation of the past is essential to conceptualizing how their habits, travel patterns, and unique problems will influence their future travel.

Research has shown that the observed increases in senior travel trends are not limited to the United States (Scott et al., 2009; Hjorthol, Levin, & Siren, 2010). Seniors in Canada travel during the peak periods at a greater rate than previous generations (Scott et al., 2009; Mercado, Paez, Scott, Newbold, & Kanaroglou, 2007). This increased rate of peak period travel can be partially attributed to a particular routine that seniors followed before retirement. Now they follow a similar timeline, but may substitute work for more non-work and recreational activities (Heaslip, 2007).

1.3 The Working Retired

The Bureau of Labor Statistics (BLS) reported that workforce participation by seniors is currently at historic highs, increasing roughly 101 percent from 1977 to 2007 (McGuckin, 2011; United States Department of Labor Bureau of Labor Statistics, 2008). It was also noted that while those over the age of 75 represent a small portion of those employed, this group realized the most dynamic gain over the period, growing by 172 percent (United States Department of Labor Bureau of Labor Statistics, 2008).

Employment rates of the total population of working aged persons observed during the study only grew by roughly 60 percent (United States Department of Labor Bureau of Labor Statistics, 2008). The population of seniors only grew by approximately 60 percent (United States Department of Labor Bureau of Labor Statistics, 2008). During this time, the workforce participation rate for seniors has been increasing significantly and at an even greater rate than that of the rest of the population. The BLS also noted a dramatic shift of seniors' job classification, changing from part time work to more full time positions (United States Department of Labor Bureau of Labor Statistics, 2008). The BLS attributes much of this growth to changes in education of the current senior population, with those having some college education or better increasing from 46.1 percent in 1997 to 53.1 percent in 2007 (United States Department of Labor Bureau of Labor Statistics, 2008). It is projected that workforce participation is to increase by roughly 8.5 percent by 2016, but workers ages 16 to 24 will see a slight decrease with ages 25 to 54 only seeing a small increase. Senior work participation is expected to rise from 3.6 percent in 2006 to 6.1 percent in 2016, and with the baby boom generation moving into retirement age that share could continue to grow for the foreseeable future.

With increased senior workforce participation, the concept of traditional retirement is changing. The Families and Work Institute found that instead of thinking of work as a path culminating in an end, seniors are continuing to work throughout their lives as a way to continue to learn and grow. Nancy McGuckin, a travel behavior analyst, showed that after retirement age seniors are remaining employed for intellectual engagement, staying active, and a way to be socially active (2011). For many seniors,

reaching retirement age no longer seems to be seen as an end to working but a transition into a more flexible and respected roles.

While some seniors may maintain employment well into retirement age to find purpose, others must remain employed due to financial problems and concerns. According to a recent AARP report (Rix, 2011), many of those over the age of 50 have serious doubts about their ability to retire. The survey showed that 52.6 percent felt that they were at least somewhat unsure if they would be financially stable enough to retire. While younger people may have the luxury of time to recoup from a lengthy recession by cutting back now to prepare for the future, seniors do not have that opportunity. Many may also continue working to maintain their way of life or current comfort level instead of pursuing retirement. Adding to the incentives for seniors to remain employed are the responses in confidence of current income levels to maintain quality of life. The survey found, when compared to how they felt about their income level as compared to before the recession, 57.4 percent of those age 50 and older felt less confident. The highest concern of seniors, 26.5 percent, found among those 50 and older was that they would not be able to maintain a reasonable standard of living in retirement. To combat these financial worries, 44.1 percent responded that they would work at least part time in retirement, with 33.4 percent of respondents deciding to postpone retirement.

In addition to changes in attitude about what retirement means and financial concerns, there are several social and health benefits associated with remaining employed. Remaining employed has been found to improve both physical and mental health of seniors working at least part-time. Part time and volunteer work not only help seniors who volunteer but also benefit the community (McGuckin, 2011). Benefit

packages associated with employment are an additional effect of remaining employed, sometimes even for part-time employment. Insurance and healthcare benefits provide major reasons for seniors remaining employed, as health becomes a growing concern with age (McGuckin, 2011).

Understanding how and why seniors are continuing to work well past the standard retirement age is essential for transportation planning forecasts. The transition from working to fully retired is no longer a simple transition, it is a complex movement that can often be carried out in phases. These transitionally employed seniors could have far reaching effects on morning and afternoon congestion, with many still traveling to and from work but their travel shifting more to mid-morning and early afternoon. If volumes increase significantly, the distinction between a.m. and p.m. peak periods could become unclear. With current modeling frameworks, travel demand is also often modeled on basis of employment in a household. If retirement is determined by mean age of the home, senior work travel could be unaccounted for. If seniors continue to travel for work as research suggests, these homes may be miscoded as retired and thus lose productions of trips in the area (Srinivasan et al., 2006). This becomes increasingly important as the baby boom generation reaches retirement age and current horizon years are 2035, accurately predicting this senior workforce participation is essential to accurately forecasting future travel demand.

Transportation travel analysis has been conducted in recent years in an effort to better understand how senior travel will evolve as the baby boom generation reaches senior status. Given the impact that senior age groups will have on the transportation network and policy development in the future, seniors and baby boomers (i.e., those who

will become seniors over the course of the next 20 years) will be the focus of this study. The following sections of this chapter will explore the motivation, objectives and organization of the thesis.

1.4 Motivation

With both the population and amount of travel by seniors increasing drastically, understanding the travel behavior of this group is becoming increasingly important for both transportation planning and policy. Understanding and preparing for both the increased travel demand and potential mobility concerns (e.g., if the ability to drive is lost) is essential due to the senior population's increased reliance upon personal automobiles.

The reviewed literature provides little evidence that personal automobile dependence will decrease as the baby boom generation reaches retirement age due to their experiences with affordable and accessible mobility throughout their lives (Heaslip, 2007). Planning and preparing feasible alternatives to the personal automobile may be the only way to ensure that options are available for the potential demand for mobility that may be encountered in the coming decades (Rosenbloom, 2002). While the concept of sustainability is driving much of the current discussion of transportation alternatives (Rosenbloom, 2003), the benefits transportation alternatives may have on senior mobility appears to be undervalued (Somerset, K., Foreman, C., Tucker, L., Flynn, J., West, M., 2003).

Travel patterns of seniors have shifted over time and include, in comparison to previous generations, more trips, a greater variety of trips, and greater distances of travel

(Scott et al., 2009). Seniors also have changed drastically when observing changes in socio-demographic data over time and are wealthier, healthier, and more active than ever (Heaslip, 2007). Understanding why, when, and how seniors travel has changed over time, is important to determine whether and how their future travel will impact travel demand.

As an increasing number of seniors continue to remain employed past the traditional retirement age, the impacts of senior trips on peak hour operations could be significant (McGuckin, 2011). In previous generations, seniors show a preference to travel in off peak periods, such as late morning and afternoon, avoiding both rush hour and night travel (Benekohal et al., 1994). Due to the more active life style of today's seniors, less self-relegated off peak driving may occur (Heaslip, 2007). As the decentralization of senior residential location continues and increases in non-work related trips continue to grow, there could be a point at which there is no longer a discernible difference between congestion rates between peak and non-peak periods (Mercado et al., 2007).

This paper seeks to expand upon many of the topics reviewed in the literature and contribute to the current research effort into senior travel behavior. By comparing the 1990 Nationwide Personal Transportation Survey (NPTS), the 2001, and 2009 National Household Travel Survey (NHTS) data sets, an extensive examination and cohort analysis of national wide senior travel data can be assessed over an approximately 20 year period. These comparisons will allow for identification of trends and increased understanding of the nature of senior travel behavior. Additionally, this analysis may provide insight into challenges that the baby boom generation will provide transportation

planners, engineers, and policy makers as they reach retirement age over the next 20 years.

1.5 Objectives

The current study seeks to provide insight on the travel behavior of individuals considered seniors, and those about to become seniors. A detailed analysis of the results of the 1990 NPTS, 2001, and 2009 NHTS will be used to understand how senior demographic and travel behaviors have evolved over time. The data sets are divided into household, person, and trip data sets and the samples can be divided into age groups and trip characteristics examined. The ages of particular interest are those who are of middle age (i.e., baby boomers), ages 45 to 64, and seniors, over the age of 65.

While changes in senior travel patterns and behaviors are a key objective of this study, those of the baby boom generation are of particular interest due to the impact that this age group will have on senior travel in the near future. The specific objectives of this study are as follows:

- To examine demographic information and observe changes in person and household level characteristics to identify possible factors affecting changes in travel patterns.
- To observe how trips, both quantity and type, have changed among middle and senior age groups.
- To examine work trips among the senior population and quantify the impact of these trips on peak congested periods.

- With increases in the ability of seniors to travel being attributed to advances in the medical field, an examination of how medical travel has changed will be conducted.
- To approximate the impact that the baby boom generation will have on future travel based on the trends observed in the senior travel analysis.

1.6 Organization of the Thesis

This thesis is organized as follows. Chapter 2 contains a detailed description of the 1990 NPTS, 2001, and 2009 NHTS. Chapter 3 contains household-level and person-level demographic analysis. Chapter 4 analyzes trip data by examining how number of trips and travel time of day has evolved over the 20 year period the data covers. Chapter 5 summarizes the findings of this report. Chapter 6 discusses the conclusions and implications of the research and suggests further research.

CHAPTER 2: NATIONAL HOUSEHOLD TRAVEL SURVEY (NHTS) DATA SET BACKGROUND

2.1 Background

The NHTS, one of the nation's longest running travel surveys, provided the necessary data to perform a detailed analysis of age groups over time. To analyze the trends and changes in senior and baby boomer travel behavior and trip characteristics, an approximately 20 year period of time will be analyzed using the 1990 NPTS, 2001, and 2009 NHTS data. The following sections will provide an overview of the aforementioned data sets. Additional and more detailed information can be obtained from the *User Guides* that accompany each data set.

2.2 National Household Travel Survey

The NHTS is the nation's most comprehensive travel data sets and is used by researchers and policy makers to understand how and why Americans travel. The survey was originally conducted via telephone interview and has been administered since 1969 at various intervals by the U.S. Department of Transportation's Federal Highway Administration. The selection of the NHTS sample is done via a random telephone number selection of the civilian, non-institutionalized population of the 50 states and the District of Columbia. This excludes medical institutions, prisons, and military barracks

as well as dormitories and sorority/fraternity housing where more than 10 people share a single phone number.

Recruiting interviews are conducted for each valid telephone number and if willing to participate, the household is assigned a travel date and provided a trip diary to record trip data. Data was recorded for all seven days of the week and included all holidays over a roughly year long period for each survey period. Follow up interviews were conducted to collect the information recorded in each household's trip diary.

2.2.1 1990 NPTS Data

The 1990 NPTS was collected over a one-year period from March 1990 until March 1991. Of eligible households contacted, the survey had an 84 percent response rate with a sample size of 21,172 households and received person level data for 47,499 of eligible residents.

Due to improvements in the accuracy of trip reporting, direct comparison between more recent surveys and the 1990 survey data was made difficult due to 1.9 billion trips being coded as "other" for their trip purpose. Research conducted by Hu and Reuscher (2004) provided an adjustment approach for the trip purpose to allow for comparison. The resultant adjustments factors used for comparison of trip purpose (WHYTRP90) of the 1990 NPTS to the 2001 and 2009 NHTS are displayed in Table 1 below.

Table 1: 1990 NHTS Trip Adjustment Factors

	Adjustment Factor
Work, School	1.00
Shopping	1.25
Other Family or Personal Business	1.41
Social or Recreational	1.32
Other	1.00

Source: Summary of Travel Trends: 2001 National Household Travel Survey, 2004

To analyze and extrapolate the data to a national scale, the NHTS provides weights for its person, trip, and household level data. The final weight values are as follows: final household weight "WTHHFIN", final travel day weight "WTTRDFIN", and final person weight "WTPERFIN".

2.2.2 2001 NHTS Data

The 2001 NHTS data was collected between March 2001 and May 2002. The sample size consists of 69,817 households with 160,758 eligible residents consisting of civilian, non-institutionalized population of the United States. The increased sample size allowed for more accurate projections.

The analysis of each data set required the application of a final weight to apply the values found in the survey to the population. The final weight variables are provided as part of the NHTS dataset and are as follows: final household weight "WTHHFIN", final travel day weight "WTTRDFIN", and final person weight "WTPERFIN".

2.2.3 2009 NHTS Data

The 2009 NHTS Data set is the most recent national household travel survey data in the U.S. The survey methodology between the 2001 and 2009 NHTS data sets remains roughly the same with slight adjustments made to the language found in some survey questions.

The survey took place between March 2008 and April 2009 with travel days being similarly assigned to households. Particular attention was paid to the refreshing of the sample of telephone numbers to ensure that all 50 states were well represented. The

sample size consisted of 150,147 households, consisting of 324,184 persons providing their travel information.

The significant increase in survey size allow for greater opportunity for researchers to study the unique relationships between the household and individual travel, as well as better understanding the person, vehicle, and trip level characteristics of that travel. The following weights provided in the NHTS data set are used: final household weight "WTHHFIN", final travel day weight "WTTRDFIN", and final person weight "WTPERFIN".

2.3 Defining Analysis Data

The NHTS provides four data files of various information including household level demographics (household size, number of vehicles available, household income, etc.), person level demographics (occupation, age, race, gender, education level, etc.), detailed trip information (number of trips, trip distance, dwell time, start time, trip purpose, mode, etc.), and vehicle files (estimated annual miles traveled, gas type, vehicle mile per gallon, etc.). For this study, only the day trip, household and person files were used.

For all analysis, the population is divided into age categories making use of the R_AGE variable included in the data sets. To analyze changes in the number of trips made, trip length, and total travel time from the day trip file was used. To observe changes in mode share, the mode variable TRPTRANS was used to identify what type of vehicle was used during each trip. The TRPTRANS was adjusted to only include 5 categories: Personally Operated Vehicles (POV) (Car, Van, SUV, Pickup, Truck, Other

truck, and Motorcycle), Transit (Local and Commuter Bus, Commuter Train, Street/Trolly, Subway/Elevated) (Polzin, Maggio, and Chu, 2007), Walk, Bike, and Other (Combination of all other remaining modes). To examine the various trip purposes, such as travel to work, medical and recreational, WHYTRP90 variable was used.

To examine increases in travel time, number of trips and travel distance per person per day, additional analysis was needed. To account for those who did not travel or did not report any trips, the trip table was related to person table to for more conservative calculations.

The examination of changes to demographic data over the course of the three survey periods may also provide valuable insight into some of the reasoning behind any observed changes in travel behaviors. For the analysis of household and person level demographics, the data sets of the same name are used to compare characteristics, such as education level, auto availability, and income level.

2.4 Possible Complications in Data Set Comparison

As this research was conducted it was discovered that the sample sizes were significantly different between the 1990 NPTS, 2001 and 2009 NHTS data sets. With the relatively small sample size in the 1990 NPTS data set, caution should be used when interpreting trends based on these results. As noted previously, factors were applied to the 1990 NPTS data set to account for differences in the survey questioning which may have impacted the results.

It should also be noted that the 2009 NHTS data set was collected during a period of economic recession, record high gas prices, and rising unemployment rates. The

period effects present in the 2009 NHTS data may have influenced demographic characteristics and other aspects of travel that may make trend analysis difficult.

The reader is cautioned that many of the trends observed in this document were developed with the knowledge of these caveats existence and recommends that future analysis be conducted to verify these findings. These issues prevent definitive conclusions from being drawn from the three data sets.

CHAPTER 3: DEMOGRAPHIC ANALYSIS

The exploration of both household and person level demographic characteristics will allow for context to be given to the age groups discussed in the trip analysis in Chapter 4. Examining these characteristics can allow for the possible identification of factors that directly contribute to changes in travel behavior.

3.1 Household-Level Demographic Analysis

Table 2: Household-Level Demographics

	All Households			Households with Older Population					
				Age 45 to 64 (Middle Aged)			Age 65 and Older (Seniors)		
	1990	2001	2009	1990	2001	2009	1990	2001	2009
Sample Size	22,317	69,817	150,147	7,007	31,174	76,579	4,556	18,479	62,405
Weighted Households	93,347,000	107,365,346	113,101,330	28,184,880	45,100,195	58,667,038	19,755,386	26,718,802	33,865,629
Percent of Households				30%	42%	52%	21%	25%	30%
Household Size (Avg)	2.4	2.5	2.5	2.6	2.7	2.6	1.8	2.0	2.0
1 Person	25%	26%	28%	17%	20%	23%	22%	41%	42%
2 Persons	32%	33%	33%	42%	39%	38%	21%	43%	43%
3 or More Persons	43%	42%	39%	41%	41%	39%	56%	16%	16%
Household Type									
Couples w/ Children	33%	33%	30%	27%	31%	27%	6%	6%	6%
Couples w/out Children	37%	35%	38%	53%	45%	46%	49%	52%	52%
Single Person	25%	26%	28%	17%	21%	23%	45%	41%	41%
Single Parent	5%	6%	4%	3%	4%	3%	0%	0%	1%
PRISM Social Group									
Second City	N/A	18%	17%	N/A	16%	17%	N/A	21%	18%
Suburban	N/A	24%	25%	N/A	25%	24%	N/A	23%	23%
Town and Country	N/A	42%	40%	N/A	45%	42%	N/A	42%	41%
Urban	N/A	15%	18%	N/A	14%	17%	N/A	14%	18%
Vehicle Ownership (Avg)	1.8	2.2	2.2	2.1	2.4	2.3	1.3	1.6	1.6
0 Vehicle	9%	8%	9%	6%	6%	6%	18%	14%	13%
1 Vehicle	33%	31%	32%	26%	25%	26%	46%	43%	42%
2 or more vehicles	58%	60%	59%	69%	70%	67%	36%	44%	44%
Annual Income									
Less than $25,000	41%	29%	27%	35%	23%	21%	67%	47%	41%
$25,000 - $49,999	37%	33%	27%	36%	33%	26%	25%	34%	33%
More than $50,000	22%	38%	46%	29%	45%	53%	8%	19%	27%
Annual Income (1990 Dollar Value Based on CPI)									
Less than $25,000	41%	35%	38%	35%	29%	34%	67%	59%	62%
$25,000 - $49,999	37%	37%	32%	36%	37%	33%	25%	30%	26%
More than $50,000	22%	28%	30%	29%	33%	33%	8%	11%	12%

An overview of demographic characteristics for all households recorded in the 1990 NPTS, 2001, and 2009 NHTS data is provided in Table 2. The data is provided by total population, households with at least one person aged 45 to 64 present and households with at least one person aged 65 or older present. The table also provides and compares the household size, household type, PRISM social group, vehicle ownership, and average annual income of households in each age category.

Among the general population, households are generally multi-person however; there are increasing amounts of single person households. There also appears to be a decrease in the amount of households with children present. The changing of the make-up of households may have significant impacts on travel. A small percentage of households seems to be transitioning from second cities (satellite cities surrounding major metropolitan areas (Claritas, 2004)) and rural areas (town and country) to urban city centers. Suburban households showed little change between the survey periods, representing approximately a quarter of households.

Middle age households have also changed very little over the survey periods. Typically, middle aged households consist of couples without children, and reside in town and country areas. When comparing the baby boomers (represented by the 2009 middle age group) to other middle age households, an increasing amount of single person households can observed. A small percentage of baby boomers also seem to be leaving rural areas and small towns in favor of urban city centers. The transition to urban areas may be due in part to increased employment options available in urban areas. Suburban living remains relatively the same, representing approximately a quarter of all middle aged households.

The typical senior household is lower in household size than the rest of the population. The household level demographic data shows that seniors typically live in couples or as singles. More than likely, seniors reside with their spouse until one passes away and then transitions into a single occupancy household. Senior household seem to be transitioning from second cities to urban areas. This transition may be due to increased medical needs or social needs of senior households but may also be due to urban sprawl and a reclassification of the household area. Suburban senior households represent roughly a quarter of total senior households.

Economic down turn and record gas prices in 2009 may be attributed to the slight shift of several households from rural and second city living to urban areas. By moving to urban areas, people have greater access to different mobility options, better access to medical facilities, and are in closer proximity to employment areas.

Results indicate that there is an increasing amount of single occupancy households among all age groups. The presence of a spouse or children can have substantial time commitments and can heavily impact travel behavior (Toole-Holt et al., 2005). Increasing amounts of single occupancy households may lead to additional social or recreation travel to fulfill needs to socialize or have identity outside of employment that may be realized in a relationship or with children.

The percentage of households in suburban areas represented roughly a quarter of households in each group. This evidence supports the concept of the "aging in place phenomenon" which suggests that people will remain in their homes where they lived while working and raising children (Rosenbloom, 2003; Frey, 2003).

Combining the "aging in place" phenomenon with the increasing number of single person senior households, the sudden loss of driving ability could provide significant mobility challenges to those residing in suburban areas. With the baby boomers showing similar trends in residential location and the number of single person households continues to increase, providing mobility options to suburban areas should become a priority of policy makers in the near future.

3.2 Personal-Level Demographic Analysis

Table 3: Person-Level Demographics

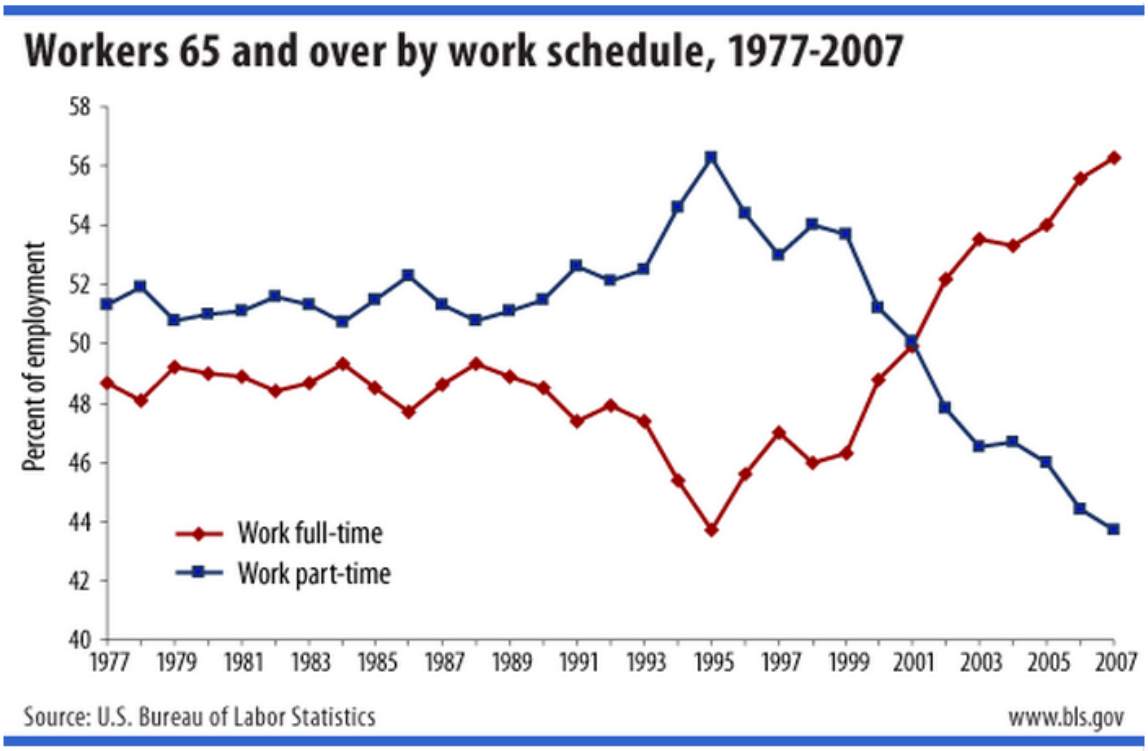
Person Characteristics	Total Population			Older Population					
				Age 45 to 64 (Middle Aged)			Age 65 and Older (Seniors)		
	1990	2001	2009	1990	2001	2009	1990	2001	2009
Sample Size	48,385	158,359	150,147	9,779	43,724	112,402	5,917	24,634	86,112
Weighted Population	222,100,829	272,766,630	283,053,872	45,015,577	59,713,513	78,364,856	26,955,210	32,884,069	38,870,018
Percent of Population	N/A	N/A	N/A	20%	22%	28%	12%	12%	14%
Annual Growth Rate	N/A	2%	0%	N/A	3%	4%	N/A	2%	2%
Age									
5-16 Years	18%	25%	17%	N/A	N/A	N/A	N/A	N/A	N/A
17-44 Years	49%	41%	41%	N/A	N/A	N/A	N/A	N/A	N/A
45-54 Years	11%	13%	15%	54%	60%	52%	N/A	N/A	N/A
55-64 Years	9%	9%	13%	46%	40%	48%	N/A	N/A	N/A
65-74 Years	8%	7%	8%	N/A	N/A	N/A	62%	56%	54%
75-84 Years	4%	4%	5%	N/A	N/A	N/A	31%	35%	34%
85 Years or older	1%	1%	2%	N/A	N/A	N/A	7%	9%	12%
Education Level									
High School or less	64%	44%	39%	62%	43%	35%	74%	58%	52%
Some College	29%	26%	29%	28%	25%	29%	20%	20%	24%
Bachelor/Higher	7%	30%	32%	10%	32%	36%	6%	22%	24%
Employment Status									
Employed	53%	66%	64%	67%	75%	73%	11%	15%	21%
Unemployeed	47%	34%	36%	34%	25%	27%	89%	85%	79%
Job Type									
Full time	N/A	81%	76%	N/A	86%	83%	N/A	40%	45%
Part time	N/A	19%	23%	N/A	13%	17%	N/A	60%	54%
Multiple Jobs	N/A	0%	1%	N/A	1%	1%	N/A	0%	1%
Driver Status									
Licensed Driver	88.20%	86.40%	87.50%	91.50%	94.10%	93.70%	75.30%	79.30%	79.50%
Not a driver	11.80%	13.60%	12.50%	8.50%	5.90%	6.30%	24.70%	20.70%	20.50%
Primary Activity Last Week									
Working	56%	55%	57%	59%	63%	65%	8%	9%	16%
Temp absent from a job	N/A	4%	N/A	N/A	5%	N/A	N/A	1%	N/A
Looking for work	1%	2%	4%	1%	2%	3%	0%	0%	0%
A homemaker	14%	10%	10%	17%	10%	8%	12%	7%	8%
Going to school	7%	6%	7%	1%	0%	0%	0%	0%	0%
Retired	14%	17%	17%	11%	14%	12%	73%	81%	71%
Doing something else	8%	5%	7%	11%	6%	6%	6%	2%	4%

An analysis of person level demographics is conducted in Table 3 for each person in the 1990 NPTS, 2001, and 2009 NHTS data sets. The age groups will compared by the share of the total population, race, education level, employment, job type (excluding 1990), driver status, and the primary weekly activity.

When examining the total weighted population of each age group, the aging of the total population reflected in the literature can be observed. The senior age group represents a rapidly growing segment of the population. By 2009, senior represented roughly one in every seven people, or 13.73 percent of the total population. As baby boomers (reflected in the 2009 middle aged group) transition into senior age from 2011 to 2030, demographic trends suggest that seniors could account for one in five persons in the population.

Education level among the middle and senior age groups increased over the survey period. The increase in education level may contribute to increases in the number of seniors classifying themselves as employed. Increased education is directly related to having professional or technical careers which are less physically demanding that can be kept into older working years (Srinivasan et al., 2006).

The change in job types of those employed between the 2001 and 2009 survey periods shows a shift among seniors from part-time to full-time work classification. These findings are further supported by the Bureau of Labor Statistics (Figure 1) and indicate that the shift of those over that age of 65 working more traditional, full time jobs accounted for roughly 56 percent of senior workers in 2007.



Source: United States Department of Labor Bureau of Labor Statistics, 2008 (Public Domain image.)

Figure 1: Workers 65 and over by Work Schedule, 1977-2007

Higher levels of education seem to be allowing for seniors to continue working in traditional, full-time, positions later into life. With the ability to work, the results of the person-level demographic data indicate that senior appear to be putting off retirement and remaining in the work force. The results indicate that baby boomers are better educated than seniors of today and will more than likely obtain jobs that allow them to work well past the age of traditional retirement.

CHAPTER 4: HISTORICAL ANALYSIS OF TRIP DATA

To understand how travel among seniors has changed over the 20 year period that the three surveys cover, the following chapter examines the changes in total daily travel, person trip rates per day, mode share, and trip purpose. This analysis will serve to identify how trips have changed among the study cohorts.

4.1 Number of Trips

To understand whether total travel is actually increasing, a general understanding of the travel trends between the survey periods should be examined. For each trip, a person is either the driver of a personal vehicle, the passenger in a vehicle, or is using another mode of transportation. When a person drives themselves, this is what is known as a "vehicle trip". A "person trip" refers to any trip made by an individual regardless of what mode is used. This section will focus on person trips and trip purpose to draw conclusions about changes in baby boomer and senior trip making.

Figure 2 presents percent share of total trips by each age category. As middle and senior age groups continue to increase their share in total population, so to does their share in total travel. It is worth noting that percent trip share of baby boomers (middle aged group in 2009) was larger than it's population share.

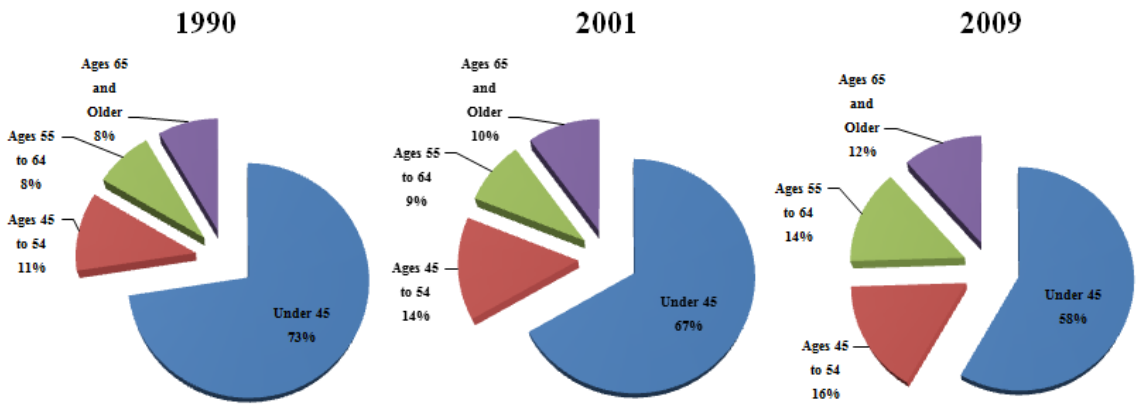


Figure 2: Percentage Share of Total Trips

An analysis of the person trip rates per day (Figure 3) reveals that Americans are traveling less in 2009 than they did in 2001. Seniors do make fewer number of trips than their younger counter parts though they seem to be willing to continue to travel (i.e. those age 74 to 85 maintaining about 3 trips per day per person between 2001 and 2009) until they are unable to do so.

Baby boomers travel more miles than their counter parts in any other age group. While the age range is broad, baby boomers (ages 25 to 44) in 1990 were represented by the 17 to 44 age group, corresponding to a person trip rate of 4.43 trips per day, well above the total population person rate of 3.08 trips per day. In 2001, the baby boomers were split by into two age groups. Those baby boomers ages 35 to 44 were still represented by the 17 to 44 age group while the older half of the generation was represented by the 45 to 54 age group. While the high 1990 person trip rates of the baby boomers maybe attributed to being a part of such a large age range, in 2001 the baby boomers ages 45 to 54 traveled at the highest rate, 4.49 trips per day, when compared to other age groups. While trip rates decreased in 2009, likely due to economic conditions

and high gasoline prices, baby boomers still showed the highest tendency to travel. In the 2009 results, the baby boomers (represented by both the 45 to 54 and 55 to 64 age groups) continued to be two of the highest traveled age groups. Baby boomers have exhibited a continued need to travel at the highest rates among the population.

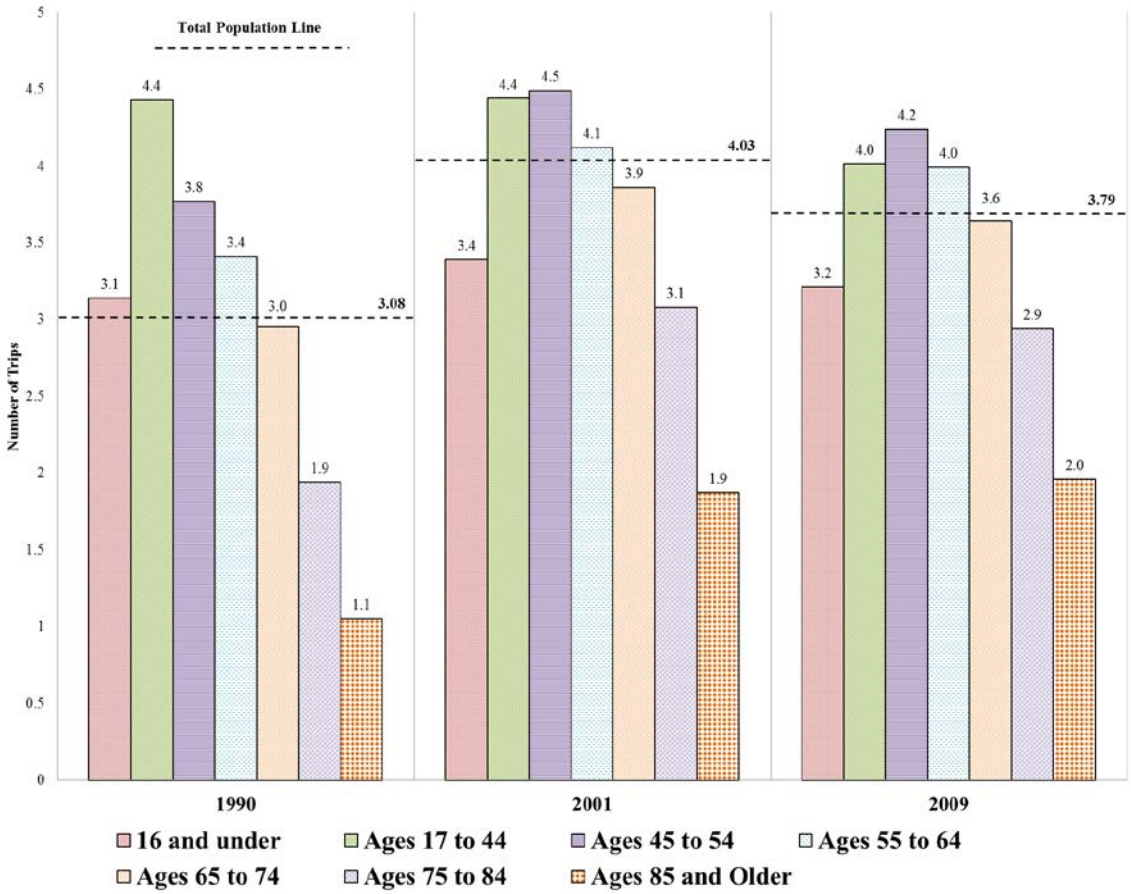


Figure 3: Daily Person Trip Rate

Examination of the average miles of travel per day (Figure 4) reveals the relatively small effect the decrease in the total population's average daily mileage had on senior age groups daily mileage in comparison to those between the ages of 17 and 54. Average miles per trip among those ages 17 to 44 fell 6.97 miles. Travel for those ages 45 to 54 fell by 6.19 miles. The largest decrease in travel miles for those over the age of

55 was a 3.5 mile reduction witnessed in those 65 to 74. The large decreased experienced by this age group could be attributed to being more conscience about extra, non-essential trips in an attempt to save more due to the recession that was beginning in 2009.

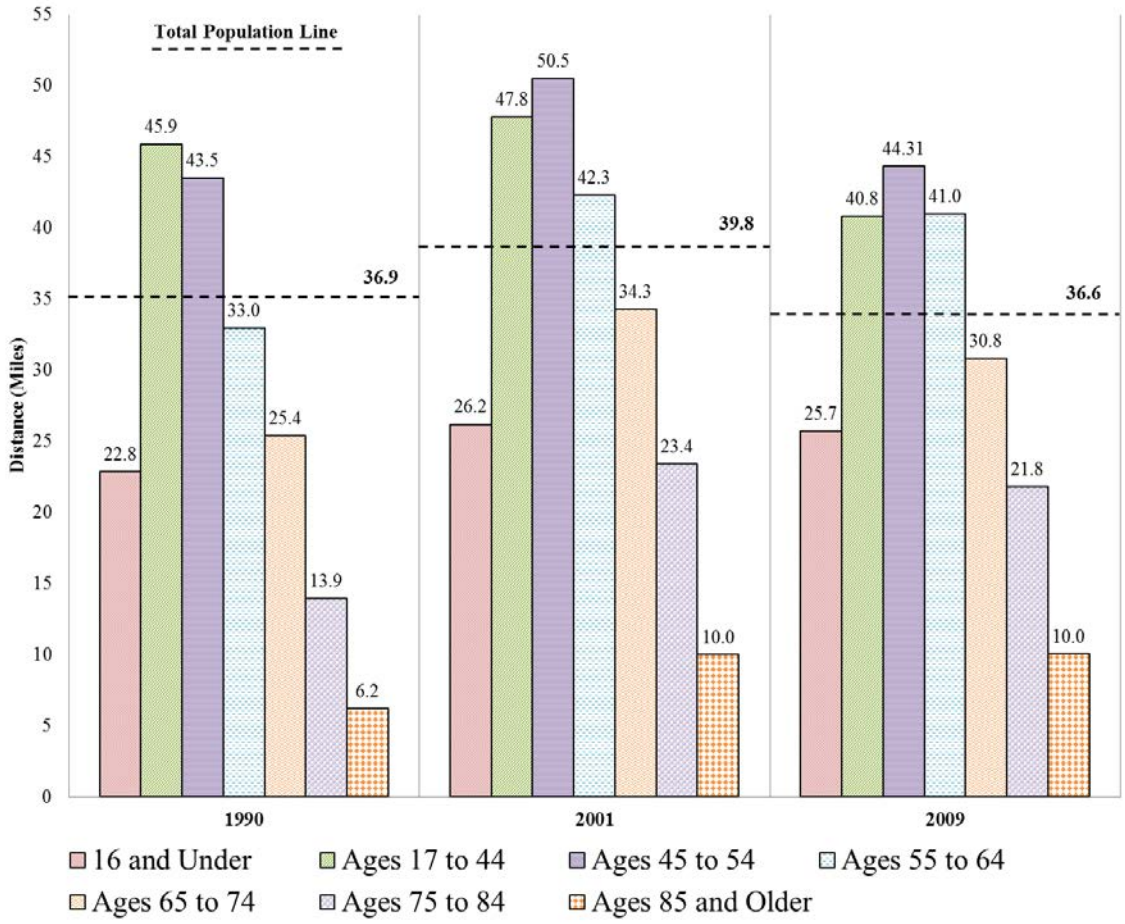


Figure 4: Average Mileage per Day

4.2 Mode Choice

The choice of transportation mode is very important to researchers and policy makers. The personal vehicle still is the most utilized mode of transportation (Figure 5) but it has been decreasing steadily among the total population, middle and senior age

groups (Figure 6). Though POV still accounts for the vast majority of trips, increases in shares of transportation alternatives can be noticed.

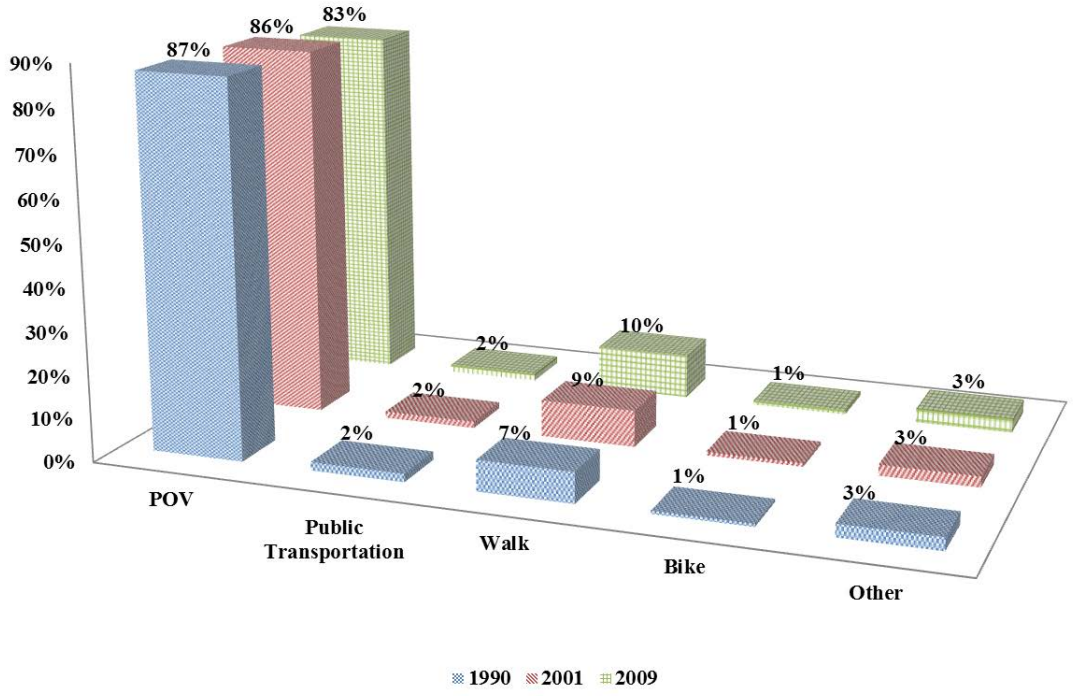


Figure 5: Mode Share of Total Trips

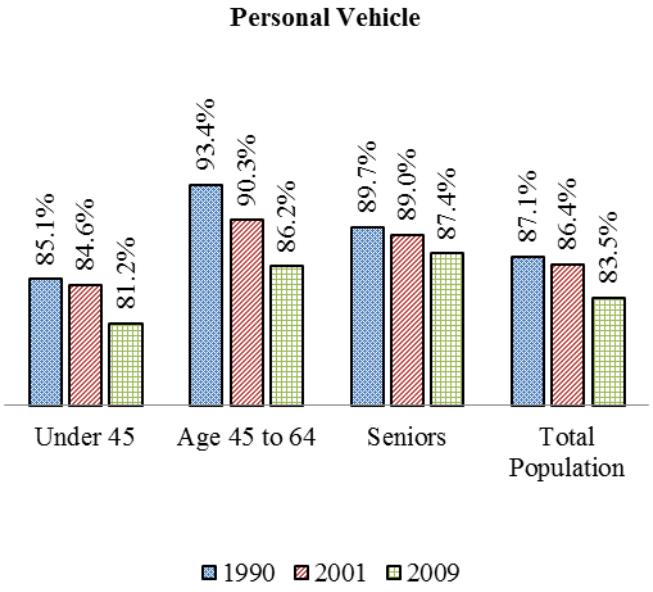


Figure 6: Personal Vehicle Mode Share of Trips by Age

Examination of average vehicle occuancy (Figure 7) shows that people are increasingly driving alone for their various trip purposes. Senior's have shown decreases in auto occupancy over each survey periods suggesting that they are becoming increaslying dependant upon personal ability to drive.

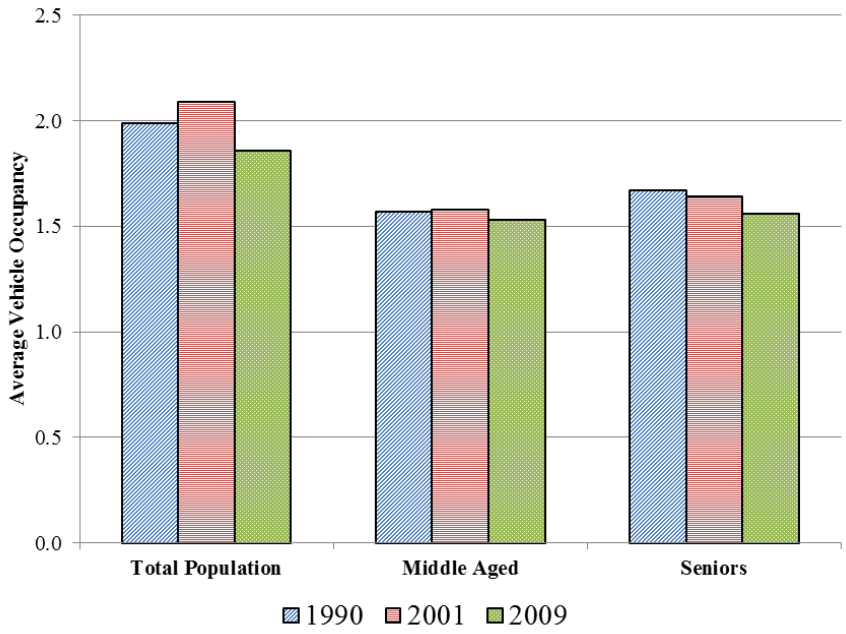


Figure 7: Average Vehicle Occupancy per Trip

Figure 8 examines public transportation mode share and number of trips. The results show that while the public transportation share of total trips still remains small, all age groups witnessed increases in public transportation usage between 2001 and 2009. The increase in mode share of public transportation may be related to the economic downturn and recession. To examine if this is a period effect or if the increases in public transportation indicate a trend, further research needs to be conducted to determine the policy implications of these findings.

The increase in baby boomers public transportation usage when compared to other 45 to 64 age groups is noticable. Baby boomers public transportation mode share represents the highest mode share observed by the 45 to 64 age group. The increase in baby boom mode share accounted for an additional 786.6 million public transportation trips among the 45 to 64 age group between 2001 and 2009.

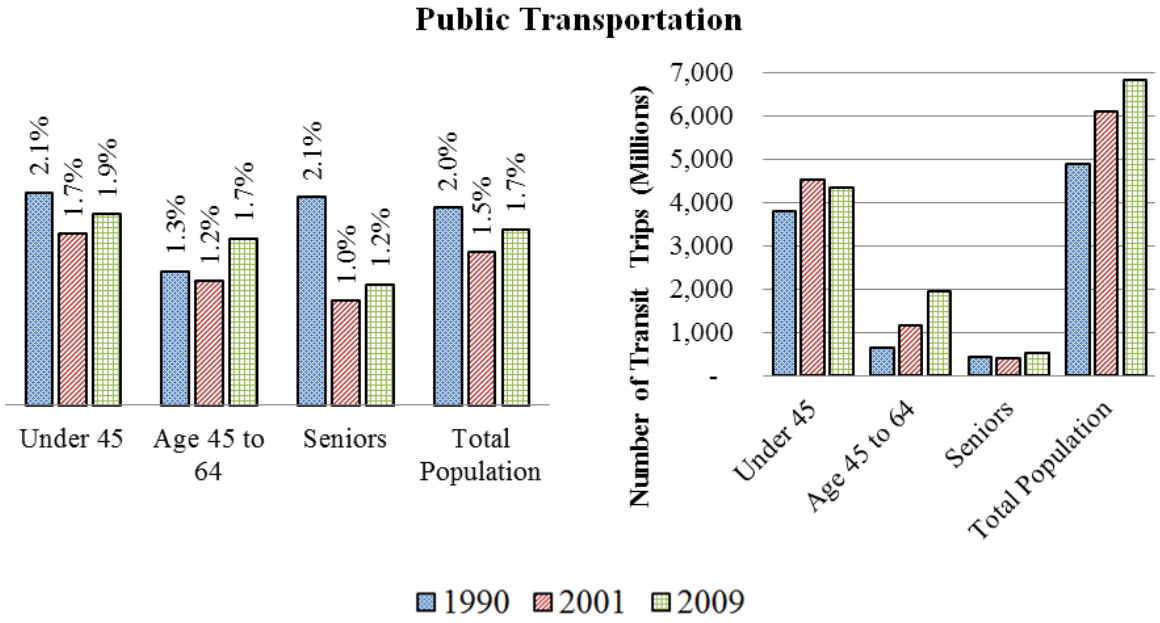


Figure 8: Public Transportation Percent Mode Share and Trips

To observe if the increase in public transportation is an effect of rapid population growth, public transportation person trip rates per day can be examined (Figure 9). While public transportation usage per person remained the same for much of the population, those between the ages of 45 and 74 saw increases in the number of daily public transportation trips between the survey periods (1990, 2001, and 2009). This provides evidence that the increases in the total number of trips may be due to increased usage among the baby boom generation and not simply an effect of population increase. It

should be noted that the increased use of public transportation may be due the aforementioned economic impacts.

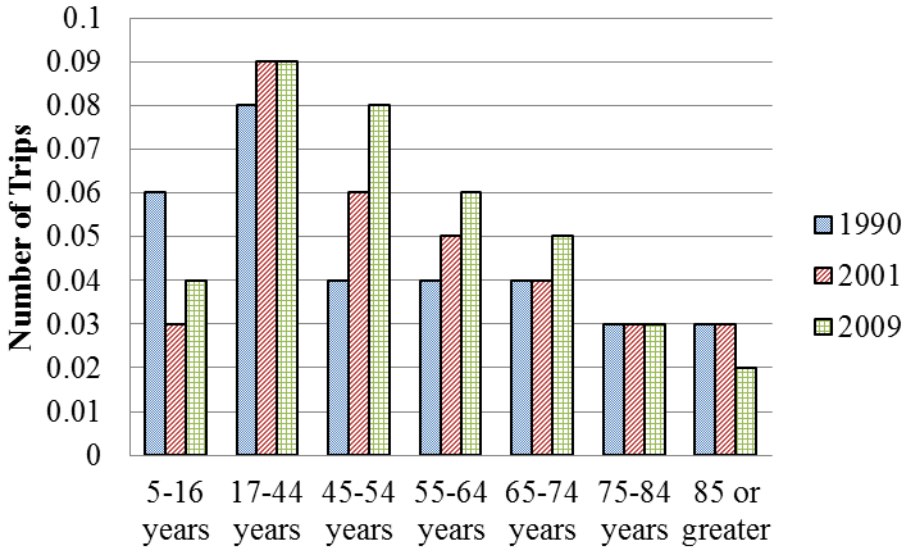


Figure 9: Public Transportation Person Trip Rates

4.3 Temporal Distribution of Trips

It is not only important to research the changes in number of trips but also to observe when these trips occur during the day. Peak hour travel refers to the most active travel hour of the day, typically occurring in the morning and evening when people travel to and from work. Typically, as people age and retire, they begin to shift their main travel time from these peak periods to more mid-day and evening travel to avoid the heavy traffic and long travel times the of the "rush hours" (Heaslip, 2007). Understanding the volumes of vehicles on roadways during these peak periods is essential to transportation forecasting and design. As seniors begin to travel more often during these peak periods, due to either remaining in the work force or out of habit, the increase in traffic volumes could compound problems with already congested roadways.

To analyze time of day, the NHTS STARTTIME variable was used to develop a time of day curve for each of the trip data sets (Figure 10). When examining the total population for all time periods, peaks can be seen between the hours of 7:00 to 9:00 AM, indicating early morning rush hour with drivers going to work, one in the noon to 2:00 PM interval, for lunch hour, and another peak from 4:00 until 7:00 PM, coinciding with people leaving work.

These travel peaks persist with all age groups between ages 17 and 54, however over the age of 55 a different trend begins to form. There are no clear peaks, with starting travel times forming more of a curve over the course of the travel day, the majority of travel is occurring during late morning and early evening. Moving through the age groups, a continuation of this trend occurs where travel moves more toward the mid-day period. It appears that currently, as Americans age, they tend to avoid the busy morning and afternoon periods associated with heavy congestion.

Trip time of day is essential to planners, with many assuming peak travel only occurring during the morning and evening hours. This spreading of travel to off peak periods could impact planning in two significant ways. First, understanding when seniors do the majority of traveling will allow for planners to identify the main times of day that may need special transportation solutions to provide for seniors' mobility needs. Second, if the peaks in the observed travel start time curves are related to the time of days that congestion occurs, and if the volumes of older Americans continue to increase and favor these off peak hours of travel, it could have implication to the temporal profile of the total population in the future.

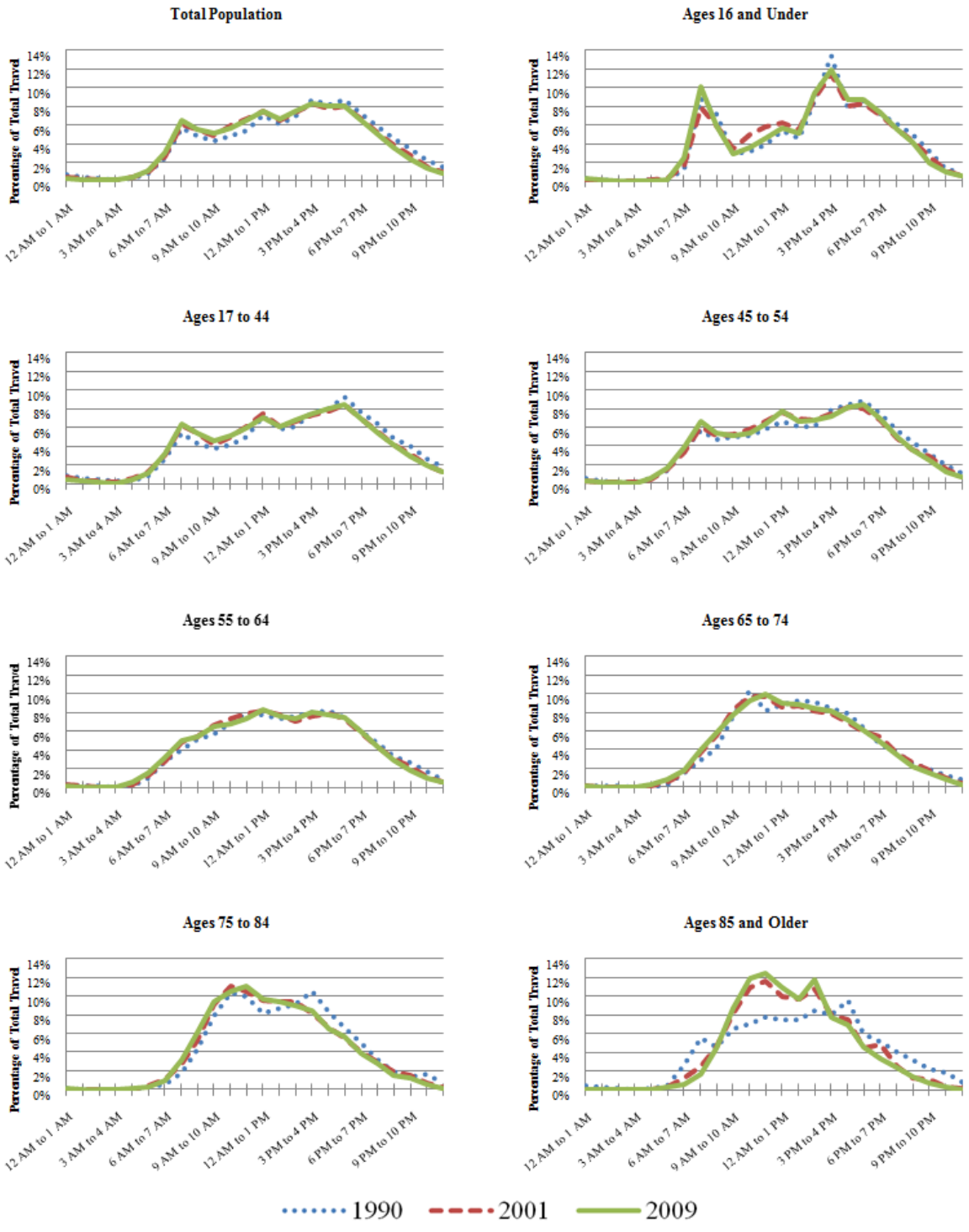


Figure 10: Temporal Distribution of Trip Share

To further examine the possibility of increased volumes during off peak hours, Figure 11 presents the volume of trips occurring at the various start times throughout the day. While the percentage of total trips in each survey period and age group occur during roughly the same time periods, the number of trips occurring during these travel times could be quite different. When observing the total population, this is immediately evident. The trips do occur during roughly the same start time period and consume about the same percent share of the total trips for each survey period, however the volume of trips occurring between the survey periods is quite different. According to the weighted totals, 293.4 billion total trips occurred during the 1990 survey period which increased to 400.8 billion total trips by 2001 and then decreased to 391.3 billion in 2009.

Figure 11 shows that while there was a significant increase between the 1990 and 2001 survey values, the 2001 and 2009 data are distributed very similarly over the travel day. The same can be said for those aged 17 to 44, but in the age groups 45 and greater, travel begins to vary between the survey periods (1990, 2001, and 2009). Among these increases, the largest gain between the survey periods was those nearest to retirement age, 55 to 64 year olds. The number of trips made by the 55 to 64 age group increased significantly from 1990 to 2001, with total trips increasing by roughly 12 billion trips, or 51.8 percent. Between 2001 and 2009, the 55 to 64 year olds again drastically increased their trip volumes by approximately 18 billion trips, or 50.2 percent.

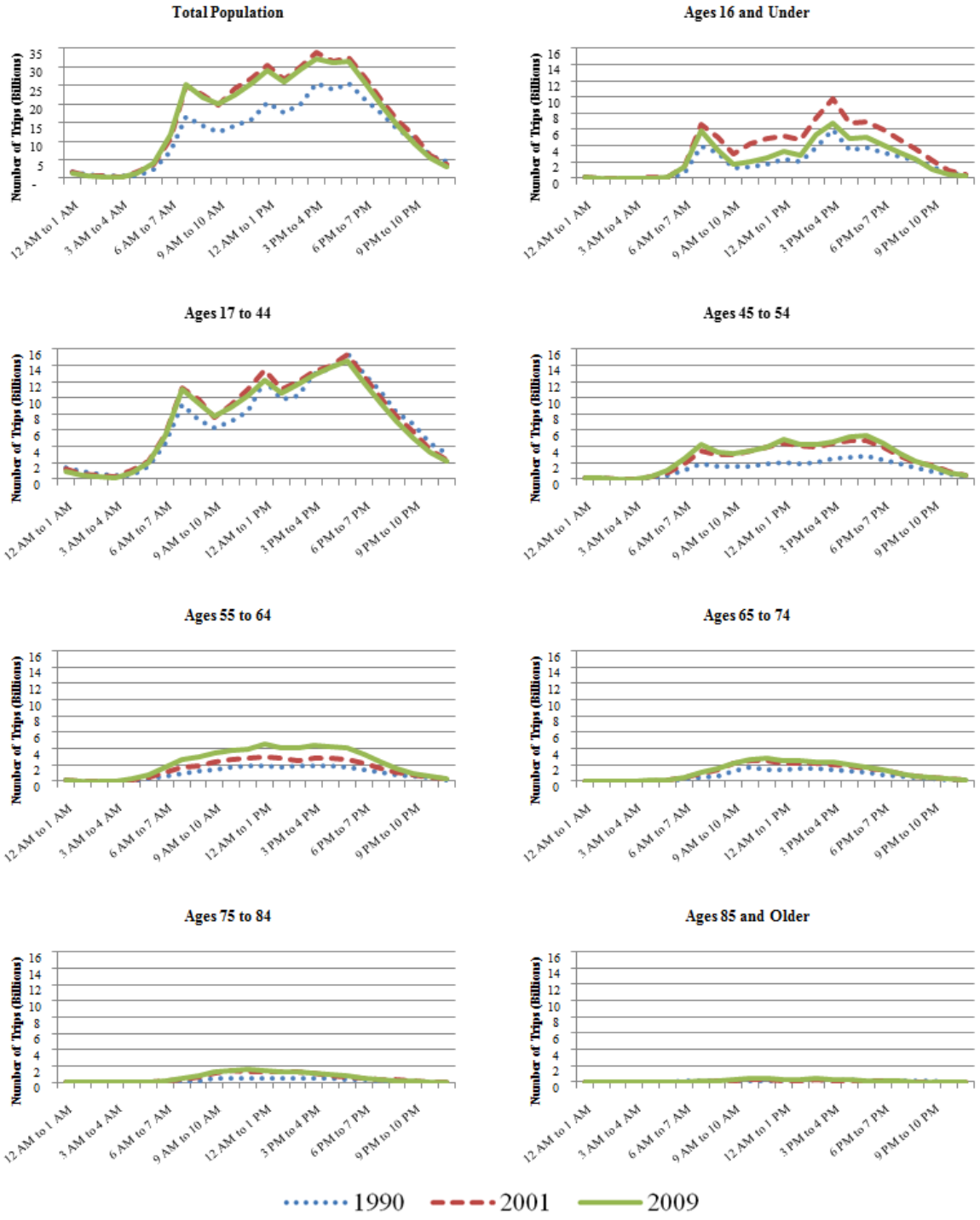


Figure 11: Temporal Distribution of Total Trips

4.4 Variations in Specific Trip Purpose Travel

Through the literature reviewed and data findings in the report, it has been established that seniors are indeed increasing their travel well past the age of 65. Research has shown that work force participation has changed significantly with more seniors holding jobs designated as full time well past the age of retirement. While most senior's increased travel will continue to contribute to off peak traffic volumes, seniors traveling to and from work will contribute directly to peak hour congestion.

With the importance of the ability to travel on vital activities such as medical appointments, and general well-being, understanding just how seniors make these trips is essential in developing plans to provide access to services in the future.

To understand the impact that work travel may have, analysis of trip start time and travel by mode share will be examined. Accessibility to medical facilities is essential to maintain health and activity later in life, and examining changes in how many, and by what means, medical trips are taken will prove valuable to policy makers. This section will examine in further detail work and medical trips due to their seemingly high importance to the increases already observed among seniors.

4.4.1 Work Trips

An examination of average number of work trips per person (Figure 12) reveals that among those between the ages of 55 and 85, the number of work trips is increasing. The economic down turn, high gas prices, and high unemployment rates have influenced seniors of retirement age and those near retirement age to reconsider leaving their career.

Remaining in a career beyond typical retirement age may also be due to people using their job as a means of self-definition and see retirement as a loss of identity.

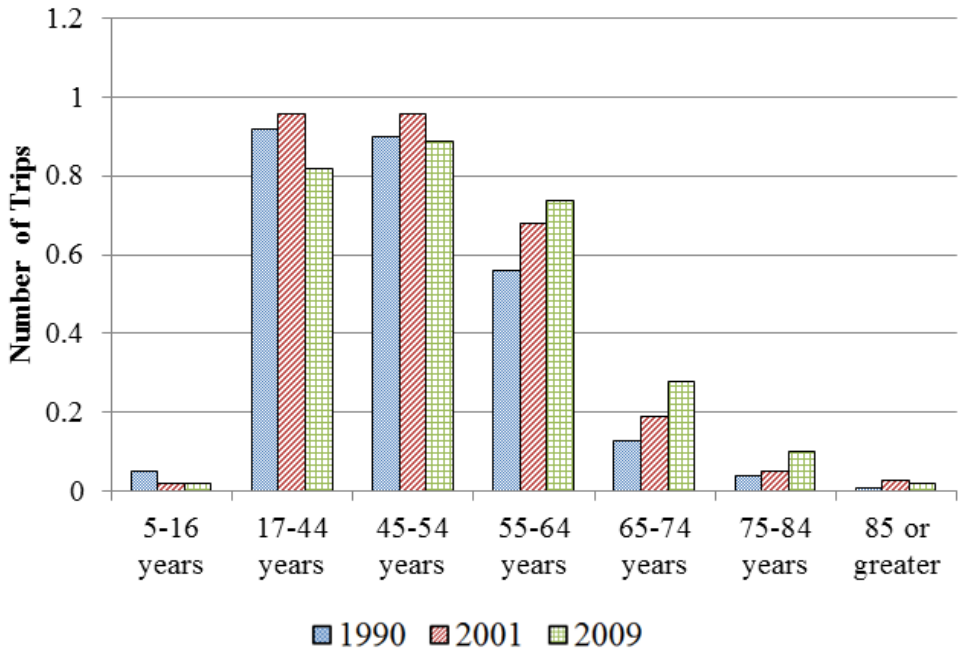


Figure 12: Daily Work Trip Rate per Person

When exploring the percentage share of work trips by age (Figure 13), an increasing amount of those trips were taken by those over the age of 45. While seniors take fewer total work trips than any other age group, it is important to note that between 2001 and 2009, the percent of senior work trips doubled. With the baby boomers being represented by the 45 to 64 age group, they also represent the largest percent share of total work trips that this age observed across the three surveys.

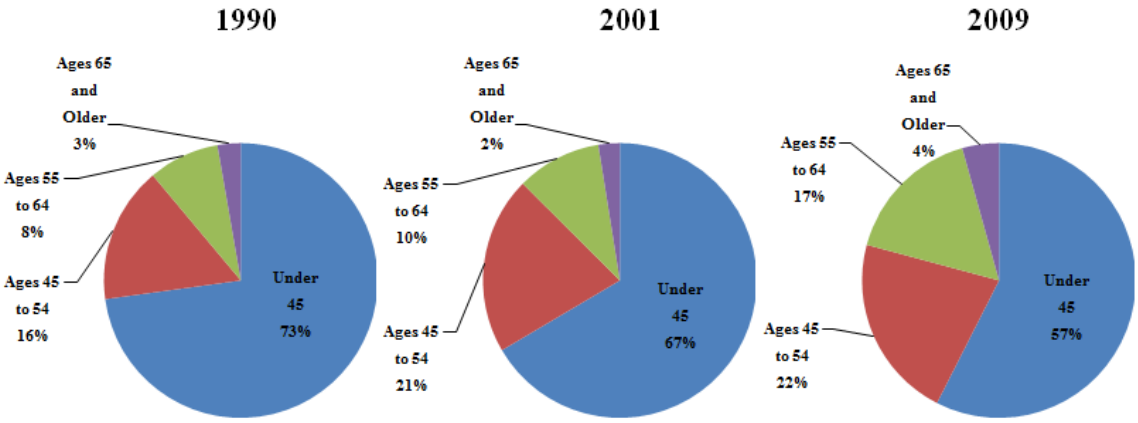


Figure 13: Percent Share of Total Work Trips by Age Group

Figure 14 examines average work trip distance and shows that people of working age (those under 65) typically travel 10 to 12 miles to and from work. This fact has remained relatively unchanged and shows that typical workers travel that average distance to their primary career over the course of their professional lives. Interestingly, senior average work travel distance has increased steadily over the three survey periods. This may be due to longer distances traveled to professional jobs rather than typical part time jobs seniors may take to supplement income during retirement.

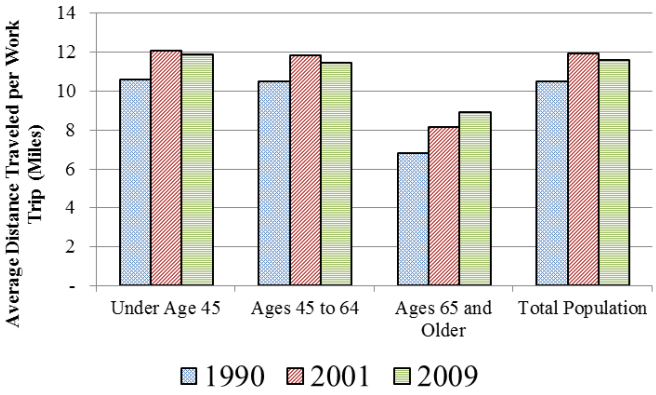


Figure 14: Average Miles Traveled per Work Trip

An analysis of average work trip start time (Figure 15) shows that the average percentage of trips has changed very little over the explored survey periods. These results support the idea of work trips still occurring during AM and PM peak periods. It also shows that seniors that are traveling for work are traveling during typical travel hours.

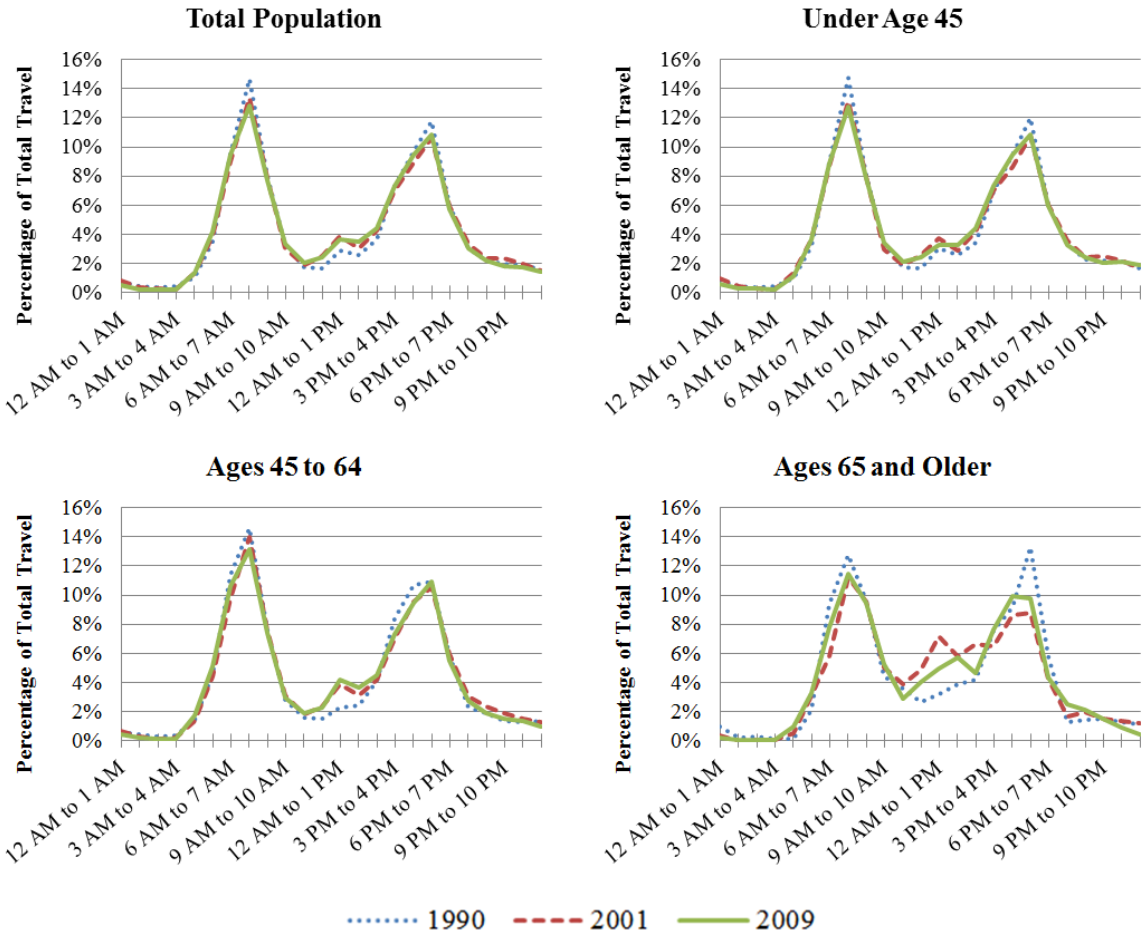


Figure 15: Share of Work Trip Time of Day Curve

The analysis of when work travel is occurring is important due to it being heavily intertwined with peak hour congestion. Figure 16 reveals that while the amount of travel among the total population and those under the age of 45 is changing very little, the travel among those over the age 45 has increased.

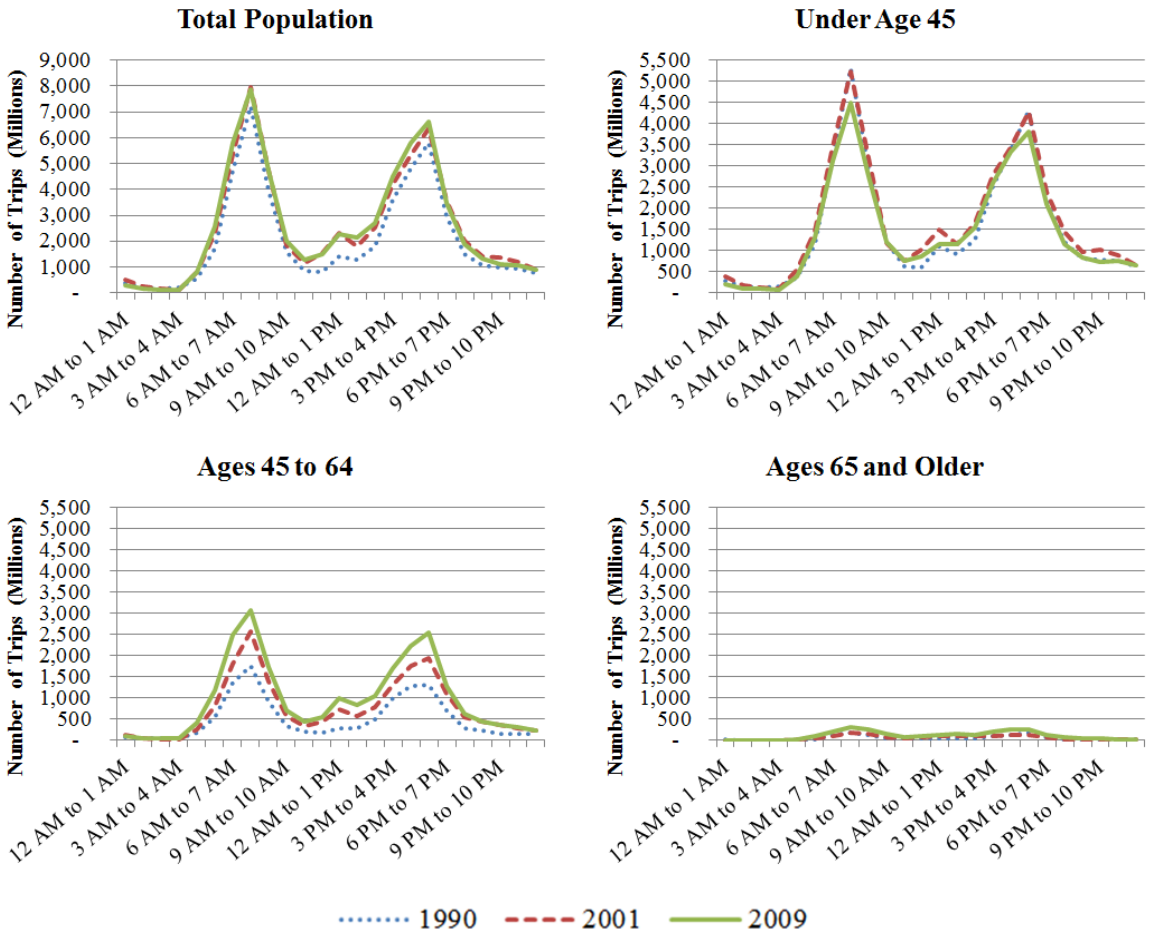


Figure 16: Number of Work Trips during Each Time Period

The mode choices (Figure 17) of those making work trips shows that, while still representing a small portion of work travel, public transportation is accounting for an increasing amount of work trips among those 45 and older. Due to the relatively small

sample size that represented the 1990 NHTS information, when segementing that sample by age group, trip type and then by a mode share that represents a relatively small percentage of total trips the results were not reliable and were omitted from mode comparison.

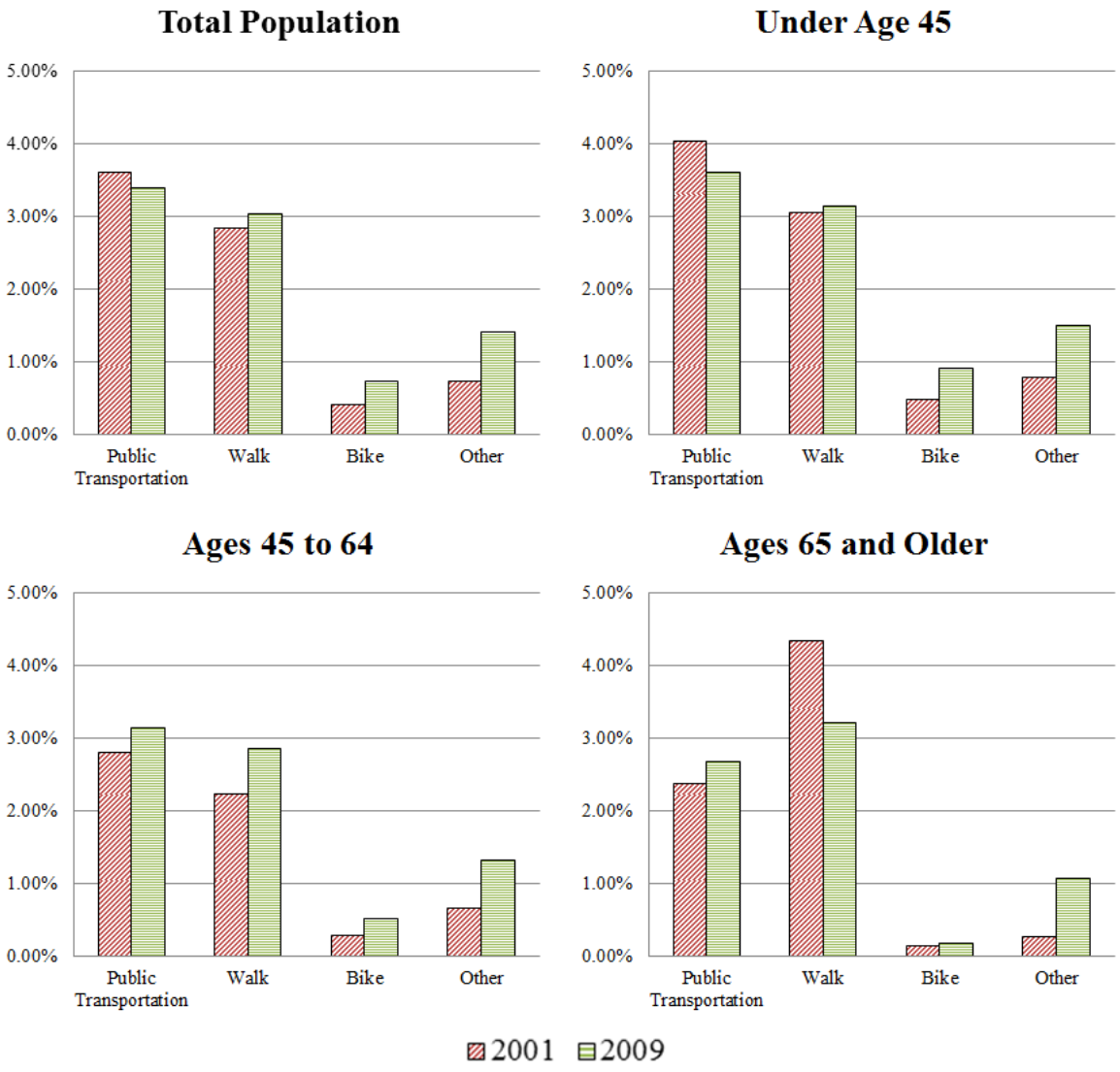


Figure 17: Percent Mode Share for Work Trips (Excludes POV)

The impact of the work mode choice on the number of work trips is shown in Figure 18. When examining those between the ages of 45 and 64, public transportation travel increased by roughly 200 million trips between 2001 and 2009. When compared to the percent increase in mode share, senior public transportation use may have only constituted a small amount of growth. The total amount of work trips made by seniors using public transportation increased by roughly 35 million trips nearly doubling between the two survey periods.

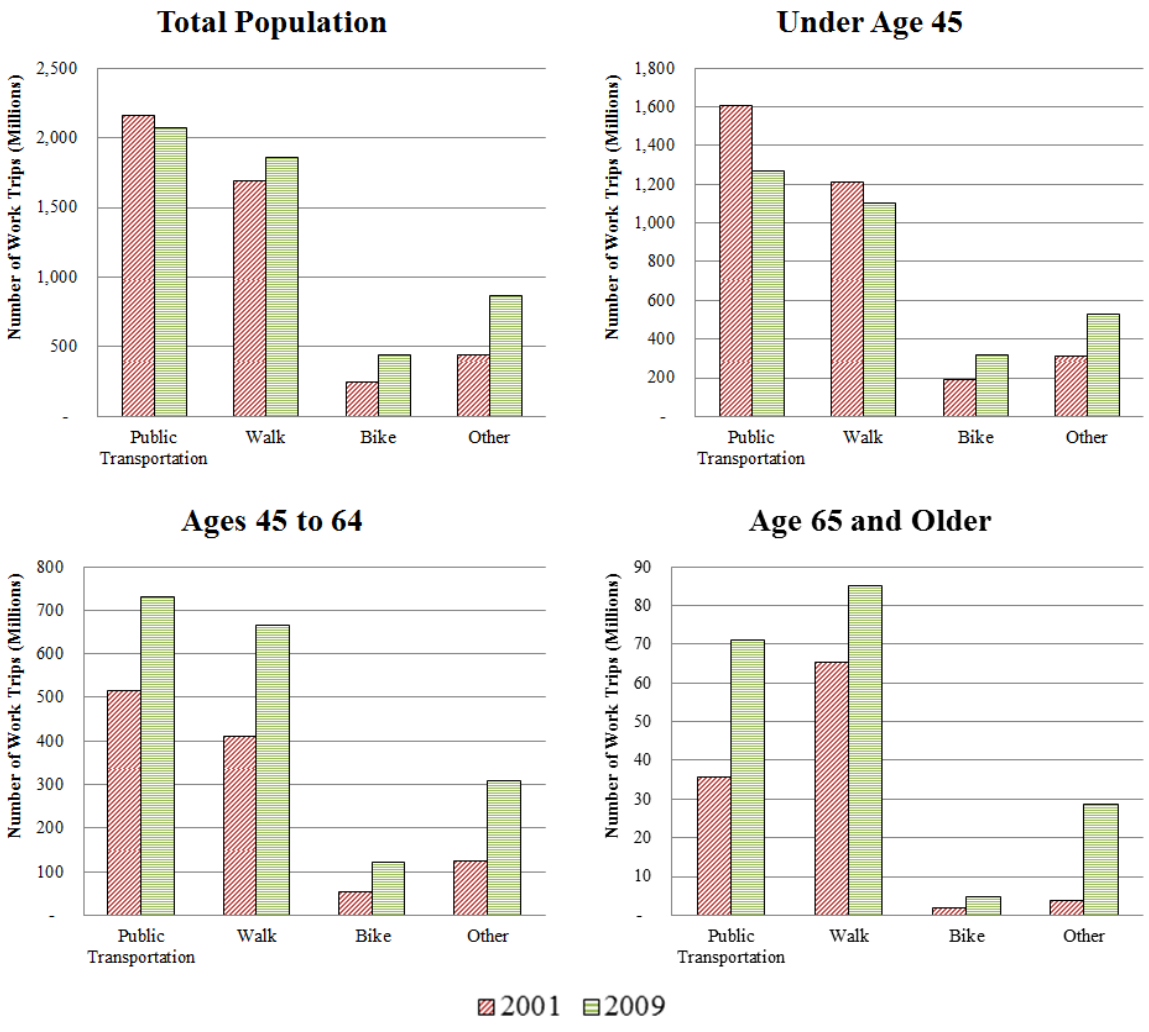


Figure 18: Total Number of Work Trips per Mode (Excludes POV)

4.4.2 Medical Trips

In a 2011 paper discussing the impact of baby boomers on future U.S. Travel, Nancy McGuckin and Lana Lynott explored NHTS data from 1969 to 2009 and found that medical travel is growing at astounding rates and can be expected to continue growing as the baby boom generation moves into retirement (McGuckin & Lynott, 2011).

An examination of the average number of daily trips per person (Figure 19) reveals significant increases in the number of medical trips per person. With the specialization of several medical professions and many alternatives available to the population that did not exist in the past, increased medical travel could be explained by seeing several doctors as opposed to just one. Increases in medical travel may also simply be an effect of the general aging of the population.

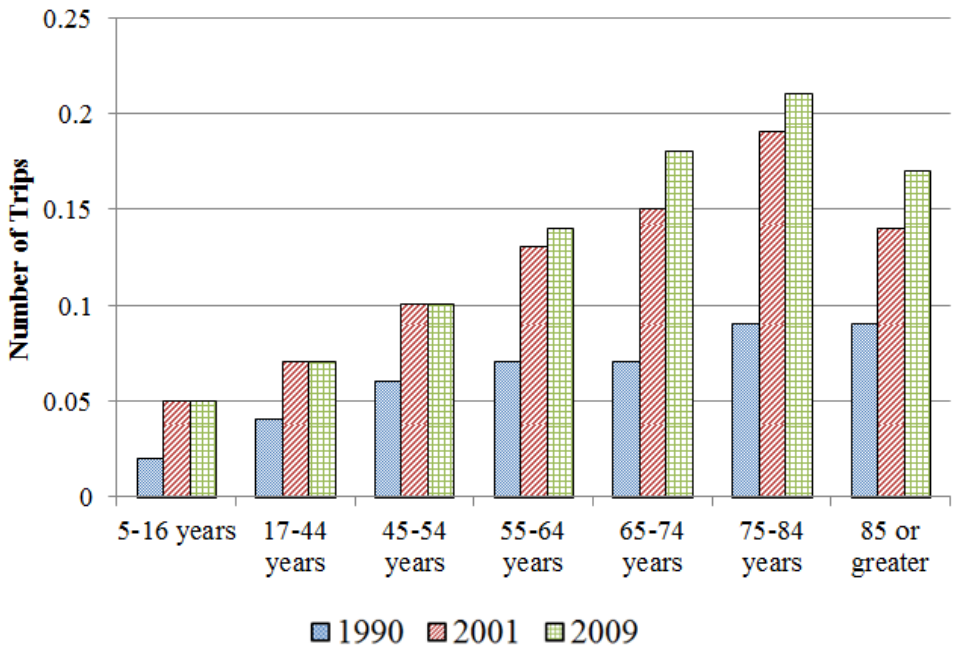


Figure 19: Average Number of Daily Medical Trips

The amount of medical travel that occurs by mode is presented in Figure 20. Personal vehicle remains the main means of transportation to and from medical appointments. The figure shows that seniors are relying more on public transportation to fulfill these medical trip needs.

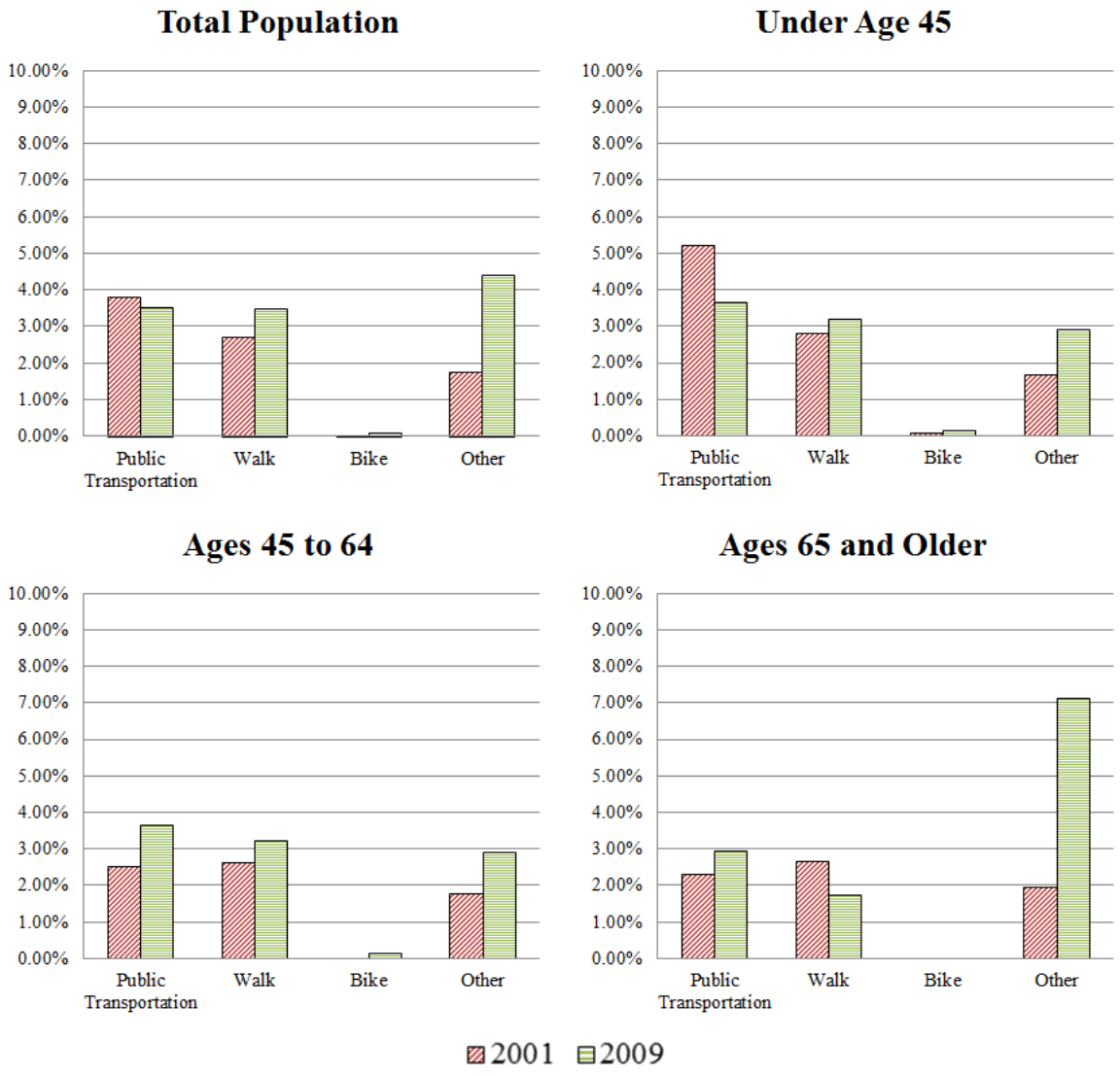


Figure 20: Percent Mode Share for Medical Trips (Excludes POV)

CHAPTER 5: DEMOGRAPHIC AND TRAVEL TREND SUMMARIES

5.1 Seniors (Ages 65 and Older)

Demographic analysis revealed that the number of households with at least one senior present increased across each survey period to represent roughly one out of every seven U.S. citizens in 2009. While the majority of senior households consist of two-person or single-person households, the number of seniors living alone has increased. A small portion of senior households seemed to change from second cities to urban areas, and suburban areas represented roughly a quarter of all senior households in each survey period.

The education level of seniors has increased over the survey periods. The percentage of seniors with at least some college education increased from roughly 26 percent in 1990 to 48 percent by 2009. Increases in education levels better equips seniors to obtain more specialized and less physically demanding jobs, which may lead to the ability to continue to work past the traditional retirement age. Supporting the concept of increases in education allowing for longevity in workforce participation, the percentage of employed seniors increased from 11 percent in 1990 to 21 percent by 2009. The amount of seniors classifying their work status as full time also increased from 40 percent in 2001 to 45 percent in 2009.

While total travel decreased between the 2001 and 2009 NHTS survey periods, senior share of total travel increased between each survey period. As seniors age, their

travel continues to shift to more mid-day or off peak times. This trend shows little, if any, shift in the temporal distribution of travel between the survey periods.

The personal vehicle mode share of total trips has decreased over the survey periods (1990, 2001, and 2009) but remains the most commonly used means of travel. The average vehicle occupancy has decreased among seniors, suggesting that they are increasingly driving alone. While there was a slight increase in public transportation mode share of trips among seniors, total public transportation trips increased only slightly and still represents a small portion of total travel.

Additional work trips were noted amongst seniors. While still representing a small portion, seniors continue to represent a growing share of total work travel. To complete work trips, seniors travel during traditional peak travel times, and the total number of work trips in both morning and afternoon peak periods doubled between 2001 and 2009.

Senior travel distance to and from medical appointments has remained relatively unchanged, whereas the total number of trips for medical appointments has increased noticeably. While personal vehicle continues to be the main means of travel for seniors to and from medical appointments, public transportation is increasingly being used to travel for this purpose.

5.2 Middle Aged (Ages 45 to 64)

The majority of middle aged households tend to consist of two or more persons. While representing the minority of these households, the amount of single occupancy households among this age group has increased. Those of middle age have increased

from representing approximately one in five U.S. citizens in 1990 to roughly one in three by 2009. Small portions of middle age households transitioned from second cities and rural areas to urban environments, but approximately a quarter of all middle age households lived in suburban areas across all survey periods.

Education among the middle age has increased significantly as the baby boom generation transitioned into this age group. The percentage of middle age persons with some form of college education increased from 38 percent in 1990 to 65 percent in 2009.

Employment fell among the age group between 2001 and 2009, most likely due to the economic recession that the United States experienced during the 2009 survey period. As traditional full time employment decreased, part time work increased between 2001 and 2009.

As the baby boom generation transitioned into the middle age group, the middle age percent share of total travel showed noticeable increases. While share of travel increased, middle age average daily trip rates decreased between 2001 and 2009. This may have been caused by non-essential trips being reduced among the age group due the aforementioned economic conditions.

Personal vehicle usage among the middle age, while remaining the prominent means of transportation, decreased over the survey periods (1990, 2001, and 2009). The share of total travel represented by public transportation remained small but increased noticeably in number of trips per day and increased by roughly 750 million total trips between the 2001 and 2009 survey periods.

The middle age group represented an increasing number of total work trips. Those ages 55 to 64 showed the largest increases in share of total work travel and made

an increasing number of daily work trips. While personal vehicles still provide the main means of transportation to and from work for the middle age group, the baby boom generation (i.e., middle age group in 2009) showed an increased usage of public transportation for work trips.

5.3 A Comparison of Middle and Senior Age Trends

Comparing factors that may contribute to changes in senior travel behavior and trends exhibited by the middle age group may allow for inferences concerning baby boomers' travel as they transition into the senior age group. Several trends shared between the two age groups include changes in education levels, number of single occupancy households, number of work and medical trips, and total trip share.

Increases in education levels may give seniors the ability to obtain jobs that are more specialized and less physically demanding, providing the ability to working past retirement age. This concept was supported by the increase in employment and full time job classification among seniors between the survey periods (1990, 2001, and 2009). The baby boomers (i.e., middle age group in 2009) exhibit higher levels of education than 2009 seniors, suggesting that they may be even better equipped to continue working into older age. Those in the upper portion of the baby boom generation (i.e., ages 55 to 64 in 2009) have already shown increases in the number of daily work trips per person and the share of total travel.

The concept that baby boomers will be more willing to remain employed past traditional retirement age is strengthened by the presence of the economic recession in the 2009 NHTS data. Total employment and jobs classified as full time decreased

between 2001 and 2009, which may leave many baby boomers financially burdened if they were to retire at 64.

Both seniors and the baby boomers are increasingly living in single occupancy households. As baby boomers transition into the senior population, this may lead them to remain active members of society by increasing social or recreational travel. Given that the number of suburban households continues to represent approximately a quarter of all households, and an increasing amount of seniors and baby boomers driving alone (as evident by decreasing average vehicle occupancy rates), those living alone could be at a significant disadvantage if the ability to drive is suddenly lost.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions and Recommendations

This thesis made use of the 1990 NPTS, and the 2001 and 2009 NHTS data to analyze the travel patterns and characteristic changes in middle aged, senior, and total population in the U.S. Socio-demographic information and trip characteristics were used to identify changes in travel behavior, paying specific attention to changes in the travel behavior of those who are of or close to retirement age. Data were also examined to see how work travel has changed to identify whether seniors are indeed working into older age as opposed to retiring.

A detailed analysis of socio-demographic information and trip characteristics revealed changes among all age groups. There were significant increases in the number of homes with one person of middle age or senior age status. With increases in the licensure and high number of vehicles available to seniors, seniors may increase travel for social and recreational purposes to remain active well into older age.

Upon first examination of total trips made between the three survey periods, there is a general decrease in total travel and personal vehicle use between the 2001 and 2009 survey periods. Transit and other travel alternatives, while still representing small portions of total trips, realized gains in mode share between the survey periods. Increases in travel could be important in the development of future public transportation policies. Thus, it should be noted that, due to the record high gas prices and economic recession

occurring during the 2009 NHTS data collection, the permanence of these results is still highly speculative and should be interpreted with caution.

While overall travel may be decreasing, travel generally still occurs during the same times and exhibits the same peak hours for each survey period. Examination of time of day curves indicate that senior travel is occurring mostly during off-peak periods. However, senior travel volumes are increasing at significant rates, whereas younger age groups' peak hour travel totals are remaining relatively the same.

Seniors of today are very different from those of previous decades. The results from demographic analysis indicate that a large majority of them are not retiring or simply working part time jobs, but many are remaining in careers well past the age of retirement. While many jobs now offer employees options for flexible hours or remote access to work, seniors continue to travel during peak hours and at increasing rates.

The increase in senior workforce participation can have implications for traffic forecasting. Currently, trip rates are applied to age groups after socio-economic data and population are projected to the designated year, assuming that seniors continue to exhibit the same travel patterns. The results indicate that this assumption may be significantly underestimating the total trips that the future senior population will be generating.

Senior's mode choice is also changing. While the percent share of modes other than personal vehicle are small in comparison, seniors are also increasingly making use of public transportation to complete everyday activities. Increases in public transportation usage for work and to travel for medical appointments were also observed to be increasing. The increasing use of public transportation by seniors could have significant value as the baby boom generation continues to transition into that age group.

Again, care should be taken when looking at these mode shift results due the possible impacts of the economic recession on the results. If well implemented, seniors of the future may be willing to replace their personal vehicles with public transportation.

6.2 Future Research

This thesis analyzed age groups and only observed changes in travel over time using the 1990 NPTS, and 2001 and 2009 NHTS datasets. This research did not consider the proximity to public transportation, which could provide insight as to whether a public transportation system would be utilized even if it was provided. Additional research into the travel behaviors of the baby boomers as they age into retirement will also provide greater understanding, as this group marks a generation defined by the personal automobile and may provide a model for future senior travel behaviors.

The timing of the 2009 NHTS data collection allows for a unique opportunity to observe the effects of an economic recession on travel behaviors. The observed decreases in total travel, personal vehicle usage, and increases in public transportation from this report are valuable finding for policy makers and planners. However, the impacts of the economic climate could be responsible for these results. An examination of future travel surveys in comparison to the 2001 and 2009 NHTS data sets could provide valuable insight into whether the observed mode and travel changes are actual consistent trends or effects of the economic climate.

With increases in workforce participation by seniors, changes in travel by job classification could provide additional information about how travel has changed among seniors over time. Understanding how the presence of a job and type of job effects

average trips per day, mileage, and mode choice may give more perspectives into how senior travel is evolving.

There were also indications that some senior and middle aged households are shifting from rural, town, and second city areas to urban centers. An examination of whether these changes are due to an increased need to reside in urban areas could be beneficial for planners and policy makers. The results may also help determine if a change toward urban living is occurring or determine if shift is the result of changes in the population density of residential areas leading to the reclassification of these areas to urban.

The increasing role of technology may also be affecting travel purpose and behaviors. While travel was needed in the past to be able to work, socialize, and interact with friends and family, opportunities such as remote access and social media have provided ways for seniors to accomplish these tasks without relying on transportation. Seniors working in even full time roles can now work from home (i.e., telecommuting), completing job tasks, conducting meetings, and providing for themselves without leaving their homes. People are also able to communicate and express themselves through the internet via various social media outlets which is incomparable to anything in the past. There is a significant lack of research into the effects of how this technology relates to the concept of mobility and could provide valuable information about alternatives to transportation where mass transit may not be feasible.

In summary, the current study increased understanding of senior and middle age travel behaviors, and provides several meaningful implications for research and practice. As the baby boom generation continues to travel more than each previous generation,

there is no evidence to suggest that the trend will end as they reach retirement age. Seniors today are remaining active and working well into their older age and the age group has continued to increasingly contribute to total travel. These increases may be echoed by the baby boom generation and must be considered in traffic forecasting, and policy making.

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