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OAK RIDGE National Laboratory

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Buildings and Transportation Science Division

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ACRONYMS

ACS	American Community Survey
AOA	Administration on Aging
JCHS	Joint Center for Housing Studies
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
NHTS	National Household Travel Survey
NHTSA	National Highway Traffic Safety Administration
NYC	New York City
NYS	New York State
PMT	Person Miles Traveled
POV	Privately Owned Vehicle/Privately Operated Vehicle
USDOT	US Department of Transportation
VMT	Vehicle Miles Traveled

ABSTRACT

According to US Census Bureau, the elderly population (individuals 65 years and older) has grown by over a third during the past decade (2010 to 2019), and by 3.2% from 2018 to 2019. It is essential for policymakers and planners to understand transportation issues associated with the elderly to meet their increasing travel demands. These issues include transportation and mobility of the elderly population, factors impacting their travel behavior, and transportation safety.

In this study, Oak Ridge National Laboratory was tasked by the New York State Department of Transportation (NYSDOT) to conduct a detailed examination of travel behaviors and identify patterns and trends of its elderly residents. The National Household Travel Survey (NHTS) was used as the primary data source to analyze subjects and address questions such as: Are there differences in traveler demographics between the elderly population and those of younger age groups who live in various New York State (NYS) regions, e.g., New York City (NYC), other urban areas of NYS, or other parts of the country? How do they compare with the population at large? Are there any regional differences (e.g., urban versus rural)? Do any unique travel characteristics or patterns exist within the elderly group? How did these patterns change over time?

In addition to the analysis of NHTS data, roadway travel safety concerns associated with elderly travelers were also investigated. Specifically, data on crashes involving the elderly (including drivers, passengers, and pedestrians) as captured in the Fatal Analysis Reporting System database was analyzed to examine elderly drivers and elderly pedestrian travel safety issues in NYS.

This study report provides a summary of travel behavior and socio-demographic characteristics of NYS elderly residents. These statistics could be used to examine equity issue concerning elderly New Yorkers, as well as to evaluate how well their mobility needs are being met. With a deeper understanding of issues and needs that this special population group is facing, policymakers and transportation planners would be able to make informed decisions on transportation investments and design services that could better address them.

EXECUTIVE SUMMARY

According to NHTS, the NYS elderly population increased over the past decades, accounting for 17% of the total population of age 5 years and older in 2017 versus 14% in 2009. The characteristics and travel behavior (e.g., trip length/frequency, trip purpose, and mode of transportation) of the elderly population are different from their non-elderly counterparts and thus examined in detail in this study based on the 2017 NHTS. The key characteristics of elderly households and populations in NYS, their travel patterns, trends, and factors that have impacts on these patterns/trends are identified.

Characteristics of Elderly Population in NYS

Elderly households are concentrated in NYS urban areas. In 2017, 89% of the NYS elderly households lived in NYC and other urban areas of NYS. The composition of elderly households is quite different from their non-elderly neighbors. The majority of elderly households (80%) are one or two-person dwellings versus 52% for non-elderly households.

Aging tends to decrease one's likelihood of being a driver, thus reducing the number of elderly populations who are drivers. 80% of the male population in NYS aged between 65 to 80 reported themselves as drivers in 2017. This share decreased to 65% for those aged 80 years and older. Elderly females, while their driving status shows a similar decreasing trend, are less likely to report themselves as drivers when compared to their male counterparts in the same age group in NYS.

Statistics from NHTS show that vehicle ownership varies in different regions. Elderly households living in more densely populated areas were less likely to own a vehicle than their counterparts from less populated regions. In 2017, nearly 49% of elderly households in NYC did not own any vehicles while only 5% to 20% of elderly households in other regions were without any vehicles in the same year.

Travel Patterns of Elderly Population

Overall, a typical elderly who lived in NYS took 3.2 trips per day, nearly the same as their non-elderly counterparts (3.3 trips per day). A gender gap among the elderly groups is evident—elderly females took 15% fewer daily trips compared to their male counterparts in NYS.

The 2017 average trip lengths in all regions and age groups increased from their corresponding 2001 and 2009 levels. The average trip length by an elderly resident of NYS increased from 6.65 miles in 2009 to 7.41 miles in 2017, an 11% increase in travel distance. Compared to their non-elderly counterparts, the elderly population generally took shorter trips regardless of where they lived. On average, the trip distance made by an elderly resident in NYS was 27% less than one made by his/her non-elderly counterpart.

The regional difference is evident when comparing NYC with the rest of NYS. Residents from NYC made noticeably fewer daily trips as well as shorter trip distances than those who lived in other NYS areas. In addition, residents from NYC, regardless of their elderly status, were more

likely to walk or take public transit while residents from other regions depend largely on privately owned vehicles.

Travel Challenges for Elderly with Medical Conditions

As expected, medical conditions were more common among the elderly population than the non-elderly population. On average, 6% of the non-elderly population in NYS had medical conditions that made it difficult to travel, versus 25% of the elderly population who had such conditions in 2017 in NYS. 47% of those who reported having medical conditions in NYS were elderly. NHTS data reveals that medical conditions have a noticeable impact on the travel behavior of elderly residents. In 2017, a typical elderly person without medical conditions took about 2-3 trips per day on average versus 0.5 trips per day for the person who had such an issue.

Travel Cost and Internet Accessibility

More than half of NYC residents considered travel costs as a financial burden in 2017, while only 19% held opposite views. Compared to the non-elderly population, elderly residents were slightly less concerned about travel costs within each region.

Elderlies are less likely to have access to the internet than their younger counterparts. This difference is more obvious for accessing the internet via smartphones, less than 10% of the non-elderly population claimed that they never accessed the internet using a smartphone vs. over 44% for the elderly group in all regions.

Traffic Safety of Elderly in NYS

Fatality Analysis Reporting System (FARS) data were used for traffic safety analysis associated with the elderly population in NYS. Overall, about 24% of all fatal crashes (2,716 out of a total of 11,257 accidents) that occurred in NYS during 2009-2019 involved at least one elderly person (age 65 years or older). About 95% of these elderly-involved fatal crashes were single-fatality crashes.

Normalized by population, the fatality rate based on crashes that occurred in NYS during 2009-2019 was estimated and examined. An overall decreasing trend in fatality rates for all age groups can be observed over the 11-year course. Among all age groups, those aged between 20 to 24 years old had the highest fatality rate from 2009 to 2019, followed by the elderly group.

Of all NYS crashes, motorist had the majority of fatalities in both elderly and non-elderly groups, accounting for 57-66% and 68-74% of the fatalities in the respective groups over the 11-year period. Among all non-elderly fatalities, the share of nonmotorists ranged from 26 to 32% between 2009 to 2019. This share ranged from 34 to 44% for elderly fatalities within the same period, indicating that an elderly person has a higher chance of being involved in fatal crashes as a nonmotorist.

1. INTRODUCTION

1.1 BACKGROUND

The American society continues to undergo an increasingly larger proportion of elderly population—defined as persons 65 years or older. As reported in the latest release of the 2020 *Profile of Older Americans* published by the Administration on Aging (AoA), more than two-fifths (41%) of the "baby boomers" was age 65 and older in 2019 (Administration on Aging, 2021). According to the report, the population of the elderly group in the US increased by 36% from 2009 to 2019, from 39.6 million in 2009 to 54.1 million in 2019. Based on US Census, the population of elderly is projected to reach about 80.8 million in 2040 and 94.7 million in 2060. Because of this significant growth, understanding and addressing issues associated with all aspects of the elderly population, including livability of the community, factors impacting travel behavior and mobility, and transportation safety, have become higher priorities for public policymakers and planners throughout the nation.

Studies on mobility limitations of older Americans have been conducted by many researchers and organizations over the last two decades. A recent study found that mobility limitations have seen "*increasingly prevalent in older persons affecting about 35% of persons aged 70 and the majority of persons over 85 years*" (Freiberger et al., 2020). Similarly, a report published by the Joint Center for Housing Studies of Harvard University in 2016 analyzed elderly population disabilities (Joint Center for Housing Studies, 2016). The report showed that around 40% of persons aged 70 and more than 60% of the persons aged 80+ have disabilities in conducting daily household activities including grocery shopping and driving.

Using 2001 and 2017 National Household Travel Survey (NHTS) data, Lidbe et al. analyzed changes in the long-distance travel patterns of older Americans with medical conditions (Lidbe et al., 2021). The study found that long-distance trips of older people with medical conditions decreased in 2017. More specifically, the long-distance trips made by elderly population with medical conditions decreased on weekdays but increased during weekends.

Hutchinson analyzed the travel patterns and mobility needs of older adults using 2017 NHTS data (Hutchinson, 2018). This research noted the importance of analyzing subgroups of older adults rather than treating all people over 65 years old as a single cohort. It is stated that the travel behavior of the elderly is affected significantly by an individual's medical condition and the need to use a medical device.

In this study, Oak Ridge National Laboratory was tasked by the New York State Department of Transportation (NYSDOT) to conduct a detailed examination of travel behaviors and identify patterns and trends of New York State (NYS) elderly (65 years old or older) populations. Unlike the abovementioned studies that concentrated on national-level statistics, this research is focused on examining issues associated with elderly NYS residents only.

1.2 OBJECTIVE

The purpose of this study is to use the 2017 National Household Travel Survey (NHTS) data as the primary data source to conduct a comprehensive evaluation of the NYS elderly population

socio-demographics. The focus is to examine their travel behaviors from various perspectives and to address questions that are important to NYS transportation planning needs. Specifically, this study is to:

- Analyze socio-demographic characteristics (e.g., demographic patterns, vehicle ownership, and worker status) of the elderly population in various NYS regions (e.g., New York City, other urban areas of NYS, or other regions of the state);
- Evaluate travel behaviors or patterns of the elderly group, in terms of daily trip rate and trip length;
- Assess travel behavior of the elderly population from different aspects, including transportation mode they took, their trip purposes, and travel frequencies during different times of the day;
- Identify regional differences in travel behaviors (e.g., urban versus rural);
- Investigate factors affecting travel behaviors of elderly, such as gender, household characteristics, and vehicle ownership;
- Characterize travel changes and trends over time from 2001 to 2017; and
- Explore the differences between elderly and non-elderly populations with regards to the items mentioned above.

1.3 A BRIEF DESCRIPTION OF DATA SOURCES

1.3.1 2017 NHTS Data

The NHTS is a Federal Highway Administration-sponsored national travel survey of U.S. households; it surveyed over 129,000 households in 2017 (National Household Travel Survey, 2022). According to the survey website "*the NHTS is the authoritative source of national data on the travel behavior of the American public*." The survey includes questions about traveler characteristics, their trip frequency, distance, travel time, and modes of transportation, including walking and bicycling. Survey data from previous years (i.e., 2001 and 2009) were also used, when necessary, in this study, specifically when trends or changes over time were concerned. Note that NHTS collected travel information from populations aged 5 years old and older at the survey time only.

To support planning and policymaking at the State and regional levels, since 1990 the NHTS has encouraged the participation of add-on partners who wish to purchase supplemental samples of the survey in their State or Metropolitan Planning Organization (MPO) area through a pooled-fund effort. With the more sample sizes provided in the add-on areas, States and MPOs are able to perform more in-depth analyses and to drill down to smaller geographic units, such as cities or counties. In 2017, thirteen States/MPOs including the state of New York participated in the add-on programs. The 2017 NHTS was conducted from March 2016 through May 2017, with the New York add-on covering April 2016 through April 2017. The 2017 NHTS was obtained from 129,696 households, which included a national sample of 26,000 households and 103,696 additional add-on partner samples purchased by the thirteen States or MPOs. For the state of New York, information was gathered for a total of 17,209 households including data from the add-on programs.

As in the previous series of the NHTS, the 2017 NHTS maintained a two-phase study, which included a household recruitment survey (phase 1) and a person-level retrieval survey (phase 2).

Older iterations of the NHTS refer to these phases as the short and long surveys. For the recruitment survey, only one adult from each participating household was asked to respond to questions whereas each member of the households was asked to respond to questions of the retrieval survey. In this study, Chapters 2, 3, and 4 are based on statistics retrieved from the person-level retrieval survey, and Chapter 5 is based on the recruitment survey.

In 2017 NHTS, sampling for St. Lawrence and Schenectady counties in NYS were different compared to the other counties. Therefore, to ensure data consistency, weighting adjustments at the county level for the entire NYS were performed based on ACS data.

1.3.2 American Community Survey Data

To further examine travel behavior and patterns associated with the NYS elderly population, data from the Census (i.e., 2020 American Community Survey or ACS) was also used. Specific subjects supplemented with ACS data include investigations on mobility of elderly population and their roadway travel safety issues.

The ACS is a survey conducted by the U.S. Census Bureau of over 3.5 million households each year (290 thousand per month) and are subject to the constraint that households should not be surveyed more than one time in any five-year period. Thus, the ACS is very intensive—about 27 times as big as the NHTS (3.5 million versus 129 thousand)—and it is repeated every year. The ACS is also geographically more uniform than the NHTS. Each year's ACS sample includes, on average, over 40 households per Census Tract and about 15 households per Block Group. Data on demographics, social, and economic characteristics of all ages of populations living in the U.S. is collected in the ACS. The ACS also collects data on commuting, i.e., Journey to Work, including mode of transportation and travel time to work.

1.3.3 Fatality Analysis Reporting System (FARS)

As mentioned above, roadway travel safety concerns associated with elderly travelers were examined in this study. Specifically, data on crashes involving elderly persons (including drivers, passengers, and pedestrians) and occurred in NYS, as captured in the Fatal Analysis Reporting System (FARS) database, was analyzed.

The FARS database is published and maintained by the National Highway Traffic Safety Administration (NHTSA) of the U.S. Department of Transportation (USDOT) on an annual basis. It covers all qualifying fatalities that occurred within the fifty States, the District of Columbia, and Puerto Rico since 1975. The FARS database contains information collected from a nationwide census of fatal motor vehicle crashes. To qualify as a FARS case, the crash has to involve "*a motor vehicle traveling on a trafficway customarily open to the public and must have resulted in the death of a motorist or a non-motorist within 30 days (720 hours) of the crash*" (National Center for Statistics and Analysis, 2022).

The latest available FARS data is for the calendar year of 2020, which was released by NHTSA in 2021. Under this study, FARS data from 2009 to 2019 were examined. When using it alongside the NHTS data, safety-related analyses are based on the 2009 and 2017 FARS data only.

1.4 GEOGRAPHICAL REGION CONSIDERATIONS IN DATA ANALYSIS

In this study, considering the possible variation of elderly population characteristics and travel behaviors in different geographical areas, data analysis was generally conducted separately at three major geographical regions in the NYS, i.e., NYC, other NYS urban areas, and non-urban NYS areas. In addition, analysis for the entire NYS as well as the rest of US was performed for comparison. The descriptions of these areas are presented in Table 1-1.

Table 1-1. Geographical regions in NYS and descriptions

Region	Description
New York City (NYC)	Five counties/boroughs: New York County, Kings County, Queens County, Richmond County, and Bronx County
Other NYS Urban Areas (excluding NYC)	All MPO areas in NYS other than NYC
Non-Urban NYS Areas	Areas in NYS but outside NYS MPOs
NYS Statewide	All areas in the NYS as a whole
Rest of US	A combined geographic region when comparing behaviors from those who lived elsewhere in the United States (i.e., outside the NYS)

1.5 ORGANIZATION OF REPORT

Chapter 2 of this report describes the characteristics of the elderly population in NYS, including the size of the population, their demographic profiles, elderly household living arrangements, their vehicle ownership and vehicle age. Travel patterns for the elderly population are discussed in Chapter 3 followed by the discussion of how medical conditions affect elderly travel behavior in NYS in Chapter 4. Additional analyses including views on travel cost of the elderly population and their internet access are presented in Chapter 5. Travel safety analysis for the NYS elderly population is presented in Chapter 6. This report is concluded with a summary of key findings in Chapter 7. A glossary of terms used in this report is provided in Appendix A.

2. CHARACTERISTICS OF THE ELDERLY POPULATION IN NEW YORK STATE

2.1 SIZE OF THE ELDERLY POPULATION

Based on ACS 2015-2019 data obtained from the US Census Bureau, the population density of the elderly, defined as the "number of persons aged 65 years and older per square mile," for New York State (NYS) is displayed in Figure 2-1. Clearly, higher elderly population densities are located in areas with higher populations, such as major urban areas of NYC, Albany, Buffalo, and so forth. A very different pattern can be seen when using population shares of the elderly (age 65+), as shown in Figure 2-2. In the figure, the population share is computed by dividing the number of elderly persons by the corresponding total population of all ages within the given region. Figures 2-1 and 2-2 used data from the ACS at the Census Tract level. The margin of error (MOE) and the coefficient of variation (CV) for population density and the share of the elderly population at each Census Tract were further examined. Overall, nearly 88% of the Census Tracts for both measures (elderly population density and share of the elderly population) have a coefficient of variation less than 20%. Less than 3% of Census Tracts have a coefficient of variation larger than 30%, most of which are in high population density areas such as NYC (Figures 2-3 and 2-4).

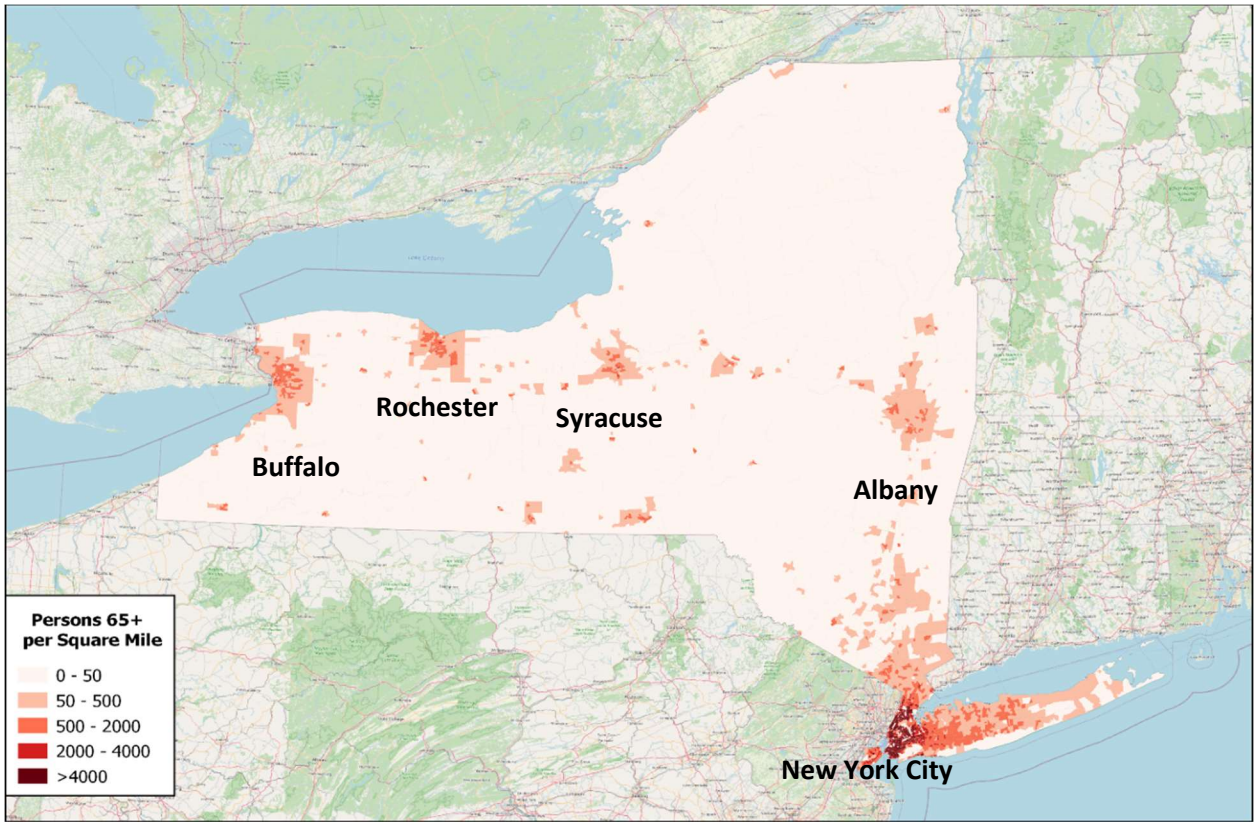


Figure 2-1. Elderly population density in NYS, based on ACS 2015-2019 data.

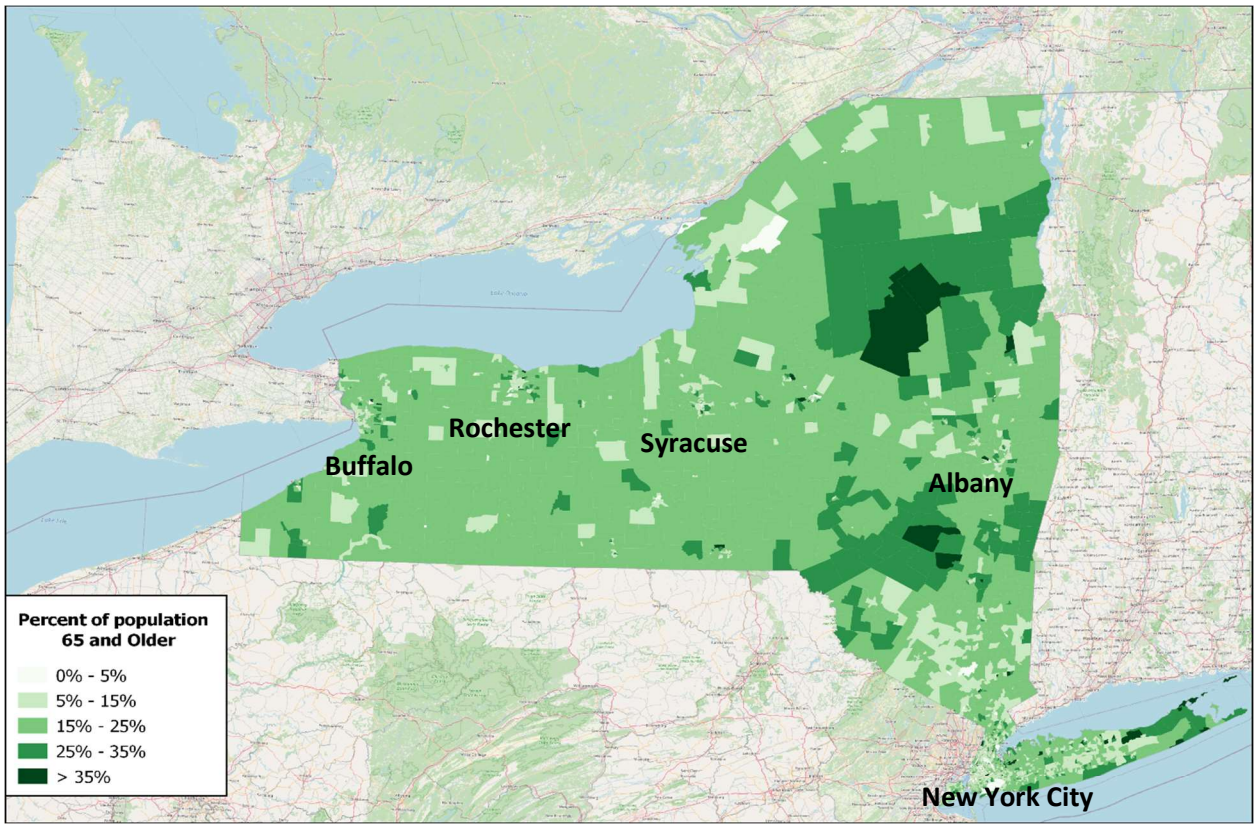


Figure 2-2. Percent of population aged 65 years or older in NYS, based on ACS 2015-2019 data.

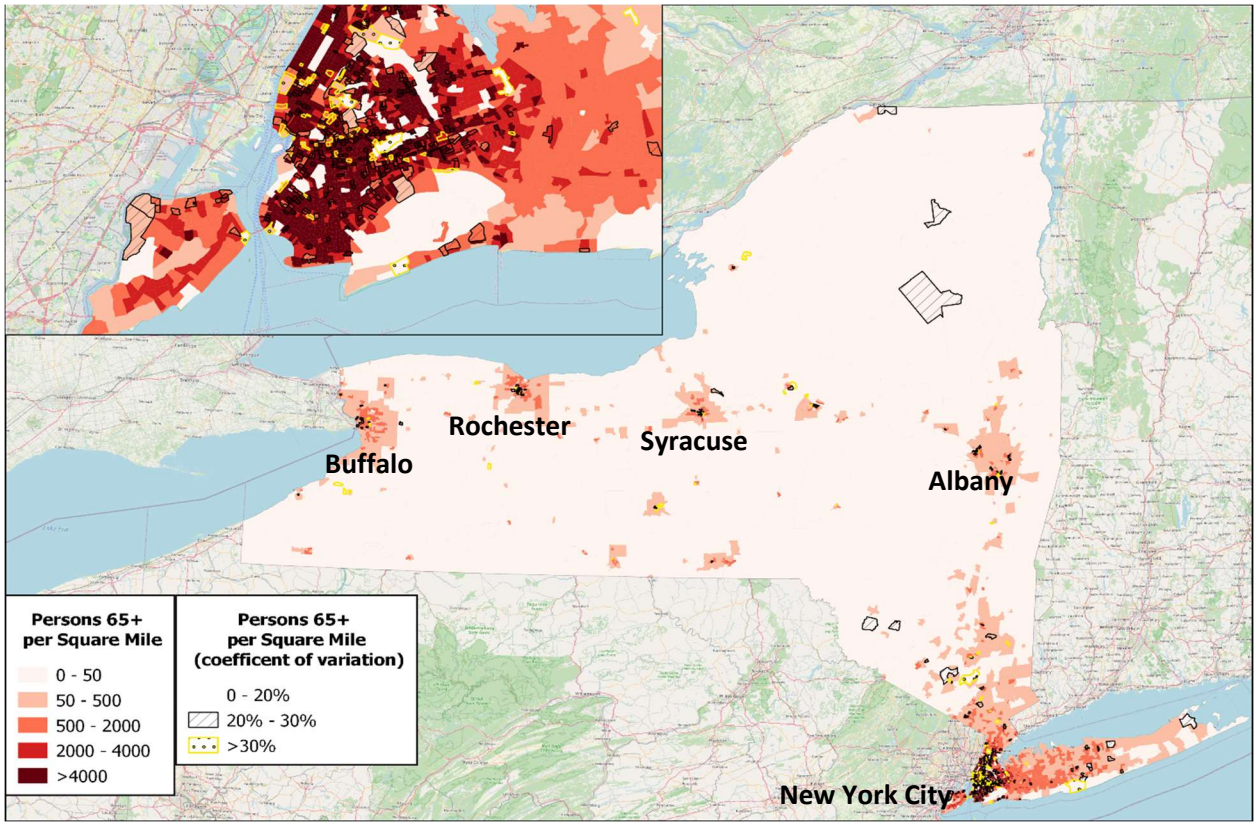


Figure 2-3. Coefficient of variation of the elderly population density in NYS, based on ACS 2015-2019 data.

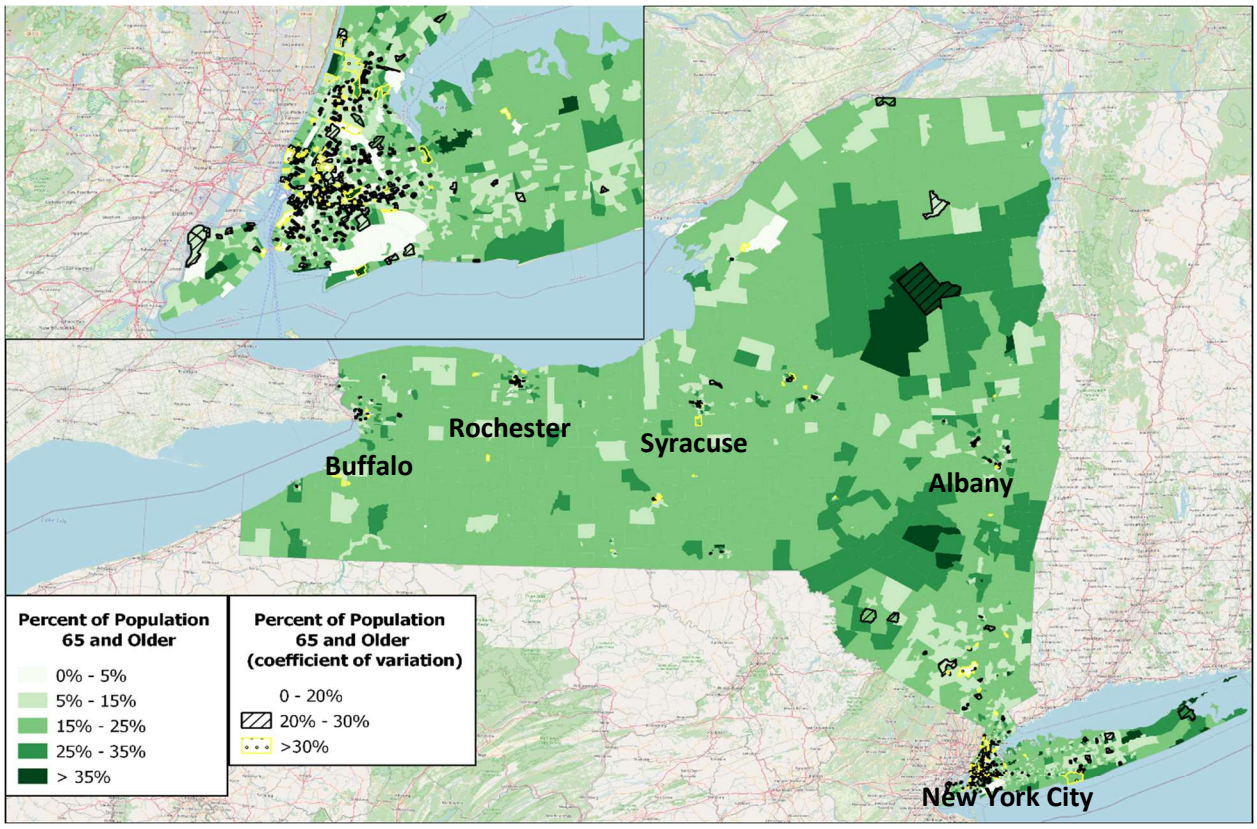


Figure 2-4. Coefficient of variation of the percent of population aged 65 years or older in NYS, based on ACS 2015-2019 data.

Based on the NHTS data, the NYS population (age 5 years and older only) increased from 18.3 million in 2009 to 18.6 million in 2017—a 1.8% increase from the 2009 level. As shown in Table 2-1, the elderly population (age 65+ years old) in NYS increased by over 17% during this 8-year period of time—from 2.6 million in 2009 to over 3.0 million in 2017. On the other hand, the share of the youngest group of NYS residents in the NHTS datasets (ages 5-15 years old) shows a declining trend since 2001—decreasing from 16.5% in 2001 to 14.3% in 2009, then dropping further to about 13.3% in 2017. Overall, the NYS elderly population accounted for about 16.5% of its total population of age 5 years old and older in 2017, an increase from 14.3% in 2009 and 13.6% in 2001.

Furthermore, Table 2-1 shows that the largest increases are in the age group of 65-69 years old, which increased from slightly about 4% of the total population in 2001 and 2009 to over 6% in 2017. This obvious increase in the age group 65-69 could be partially attributed to the baby boomers (those born between 1946 and 1965) starting to reach age 65 since 2011. With the youngest baby boomers (those born in 1965) reaching age 65 years old by 2030, as well as longer life expectancies in general, continuous increases in the elderly population (NYS included) are to be expected in the future years.

Table 2-1. NYS residents by age category using data from 2001, 2009, and 2017 NHTS

Age Category	2001	2009	2017
5-15 years old	16.5%	14.3%	13.3%
16-64 years old	69.9%	71.4%	70.2%
65-69 years old	4.0%	3.9%	6.6%
70-74 years old	3.7%	3.3%	3.9%
75-79 years old	2.9%	2.8%	2.8%
80-84 years old	1.9%	2.4%	1.6%
85+ years old	1.1%	1.8%	1.6%
All	16,991,235	18,281,802	18,610,703
Elderly (≥65 years)	**2,305,198**	**2,607,670**	**3,062,846**
Share of elderly	13.6%	14.3%	16.5%

Comparison of changes in population by age category, for NYS and the rest of US over the latest three NHTS years, are presented in Figure 2-5. The drop in the shares of 5-15 years old age group for NYS can be clearly observed. Outside NYS (i.e., rest of US), this population group remained at about the same level from 2001 to 2009 and grows about 2% from 2009 to 2017. Overall, the elderly population (those 65 years old and older) increased by significant percentages for both NYS and the rest of US during the periods of 2001 to 2009 and 2009 to 2017. Changes between 2009 and 2017 are clearly more substantial than those in the previous period (2001 to 2009)—true in both NYS and the rest of US regions.

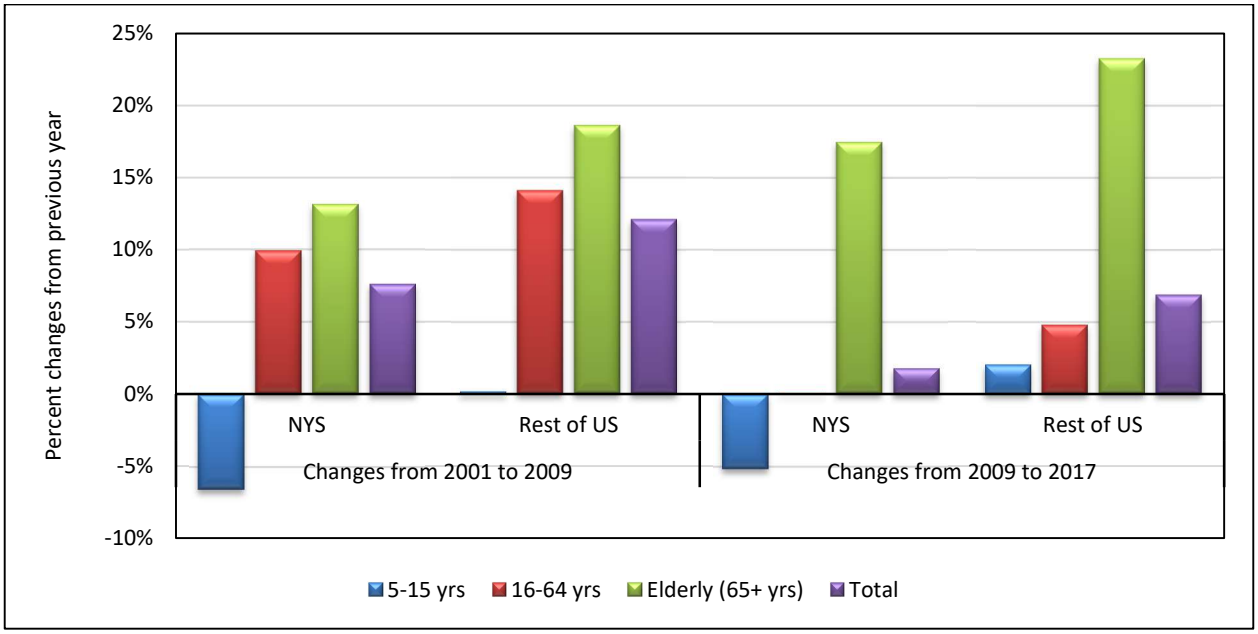


Figure 2-5. Percent change in population by age category in NYS and the rest of US (NHTS data).

Further disaggregated elderly age categories reemphasized the significant changes over time on 65-69 years old and 70-74 years old population groups seen in Table 2-1, between 2009 and 2017. As displayed in Figure 2-6, this increasing trend also exists among people who lived in the rest of US. On the other hand, the share of population group aged 80-84 years from NYS decreased significantly from 2009 to 2017. A similar but much smaller decrease can also be observed for people who lived in the rest of US.

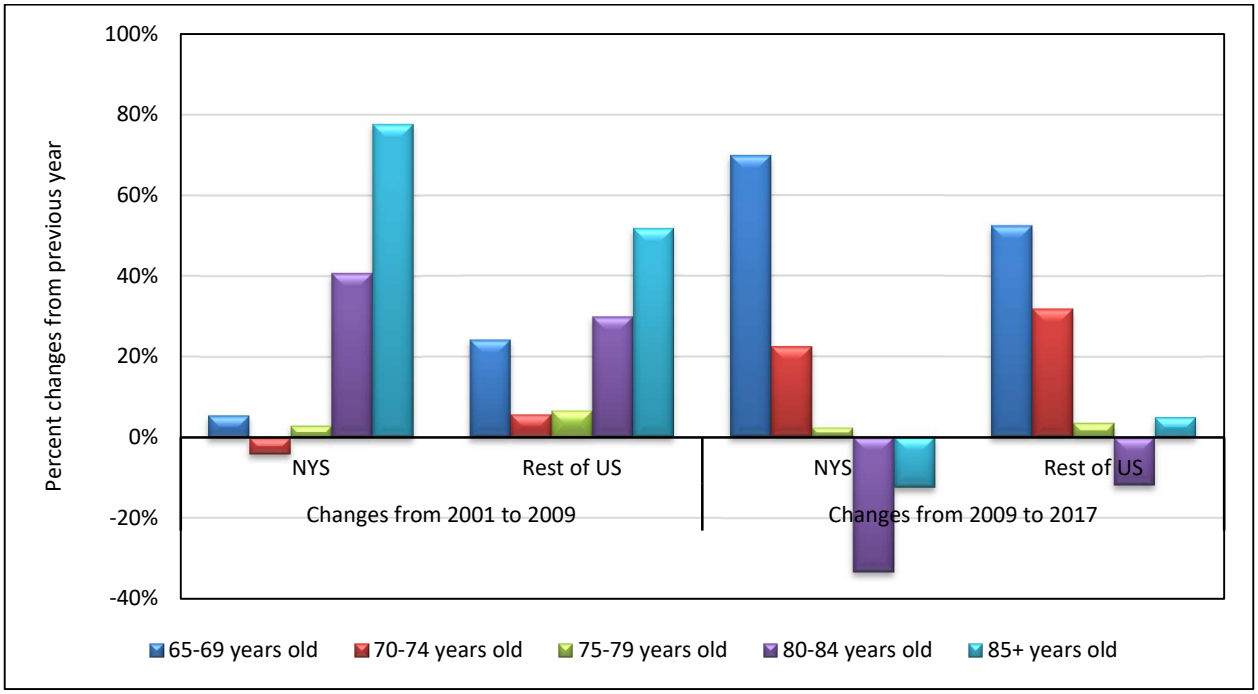


Figure 2-6. Percent change in elderly population age categories in NYS and the rest of US (NHTS data).

2.2 DEMOGRAPHIC PROFILE OF NYS ELDERLY POPULATION

2.2.1 Age and Gender

2.2.1.1 Statistics Based on US Census data

Using the ACS data, NYS population distributions by age group and gender for 2001, 2009, and 2017 are presented in Figure 2-7, Figure 2-8, and Figure 2-9, respectively. The upward shift seen in the shape of these pyramids, from 2001 to 2017, clearly demonstrates that the population in NYS is aging. Among the elderly age groups, the female population is undoubtedly larger than their male counterparts. Examination of the variance of the population distribution suggests that the CV of the population is generally well within 1% for all age groups and both genders.

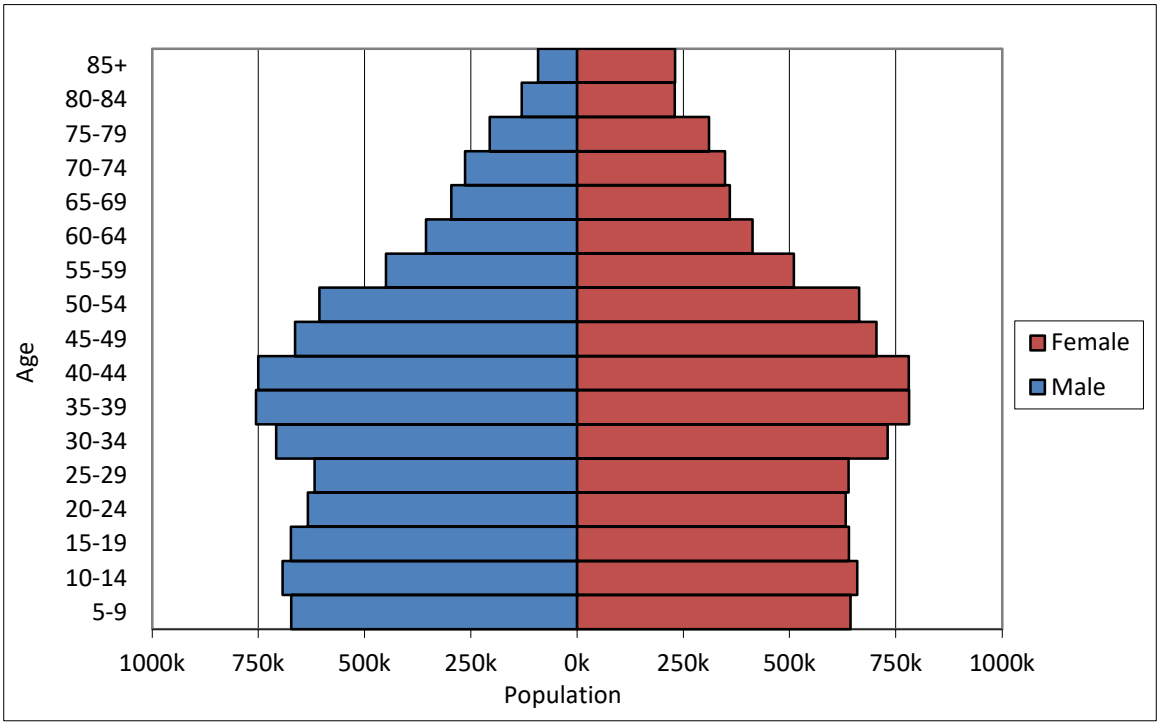


Figure 2-7. NYS population pyramid, by age and gender (2001 Census estimates).

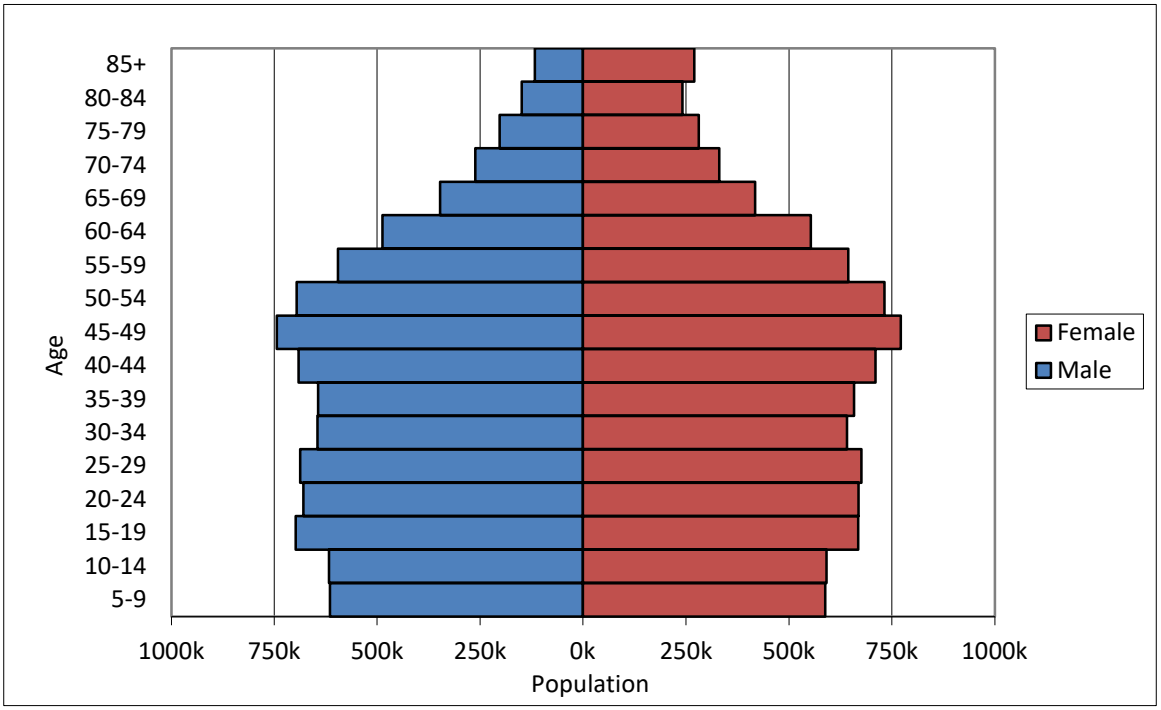


Figure 2-8. NYS population pyramid, by age and gender (2009 Census estimates).

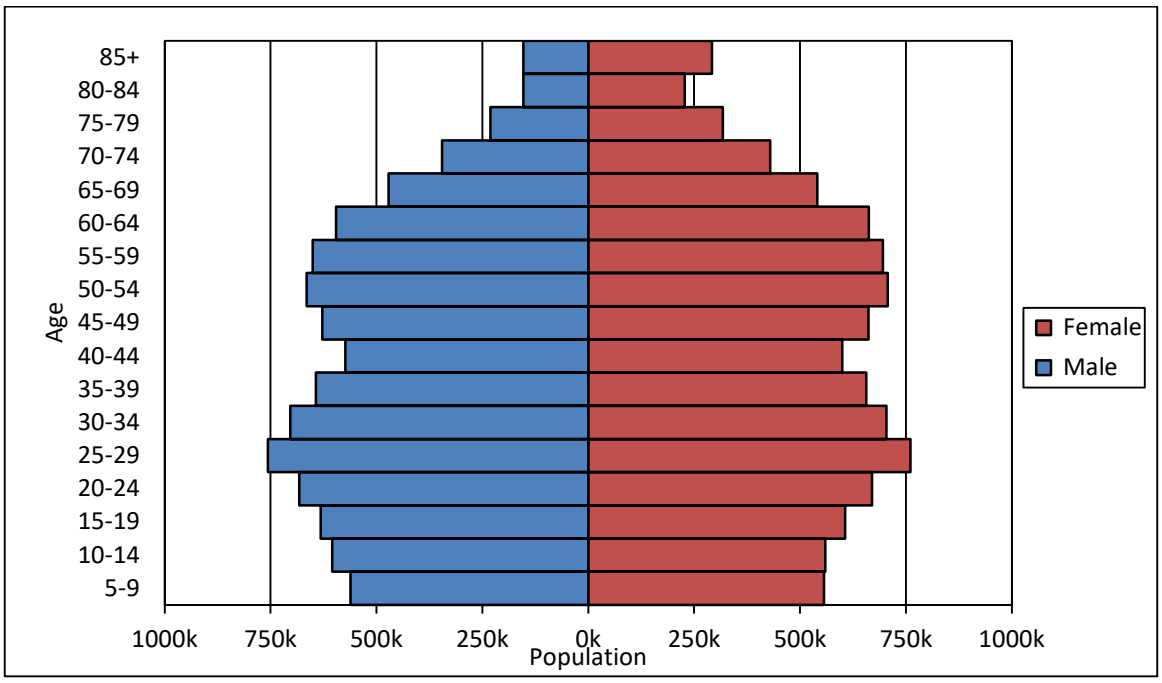
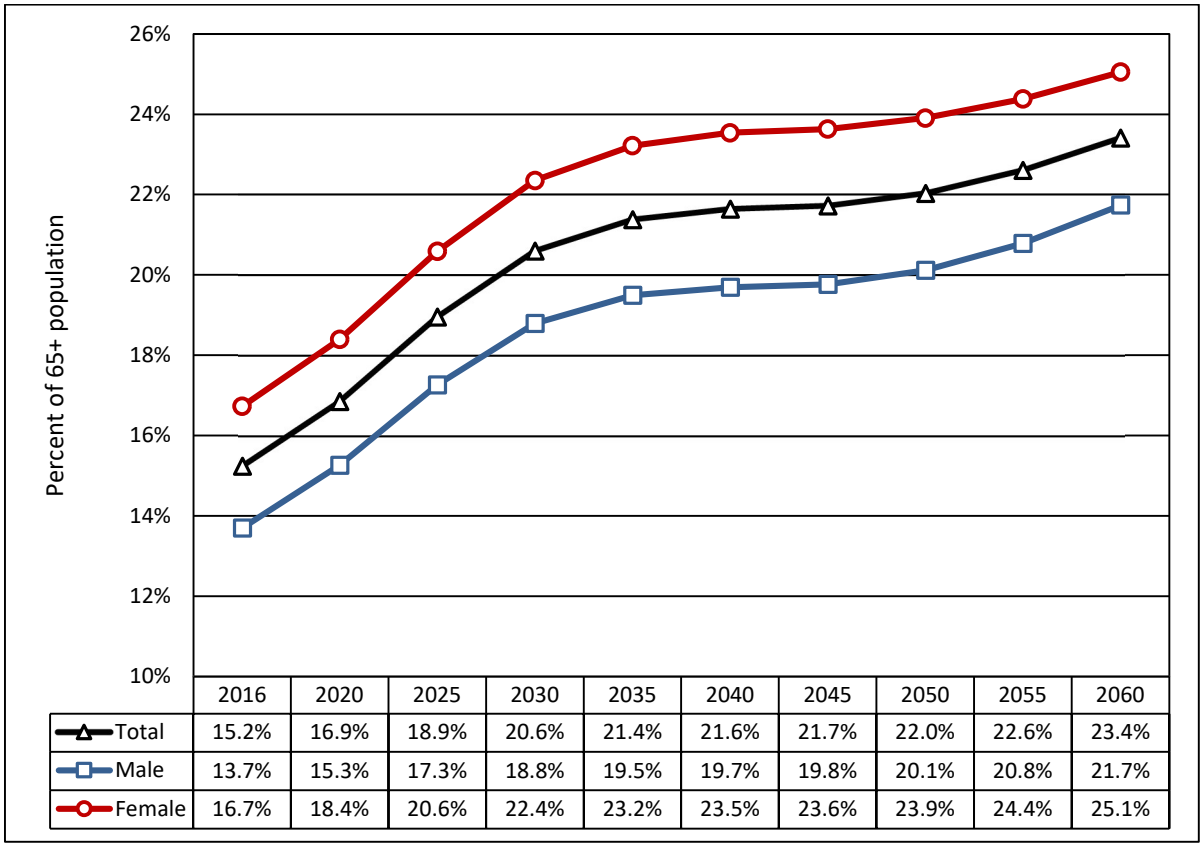


Figure 2-9. NYS population pyramid, by age and gender (2017 Census estimates).

The increase of the elderly population (65+ years old and older) over time is not a unique phenomenon for NYS. According to *Profile of Older Americans: 2020* (Administration on Aging, 2021), "the population age 65 and older numbered 54.1 million in 2019, …the number of older Americans has increased by 14.4 million since 2009" more than 36% increase over the 10-year period. Furthermore, Figure 2-10 presents statistics obtained from the most current Census population projections (U.S. Census Bureau, 2017), which estimated that the US elderly population share would reach 20% by 2030; and among females, the elderly population share would be over 20% by 2025.

2.2.1.2 Elderly Population Statistics Based on the NHTS data

The population shares of elderly residents, over the latest three NHTS survey years, were slightly higher for NYS than those who lived in the rest of the US (Figure 2-11). Their magnitude of increase over time, however, is very similar. Overall, shares of the elderly population in NYS increased by 0.7% from 2001 to 2009, and 2.2% from 2009 to 2017. Outside NYS, the shares of elderly population increased by 0.7% and 2.1%, respectively, during the same periods of time.



	2016	2020	2025	2030	2035	2040	2045	2050	2055	2060
Total	15.2%	16.9%	18.9%	20.6%	21.4%	21.6%	21.7%	22.0%	22.6%	23.4%
Male	13.7%	15.3%	17.3%	18.8%	19.5%	19.7%	19.8%	20.1%	20.8%	21.7%
Female	16.7%	18.4%	20.6%	22.4%	23.2%	23.5%	23.6%	23.9%	24.4%	25.1%

Figure 2-10. Annual share of the estimated and projected 65+population in the US. (Source: US Census Bureau, Population Division)

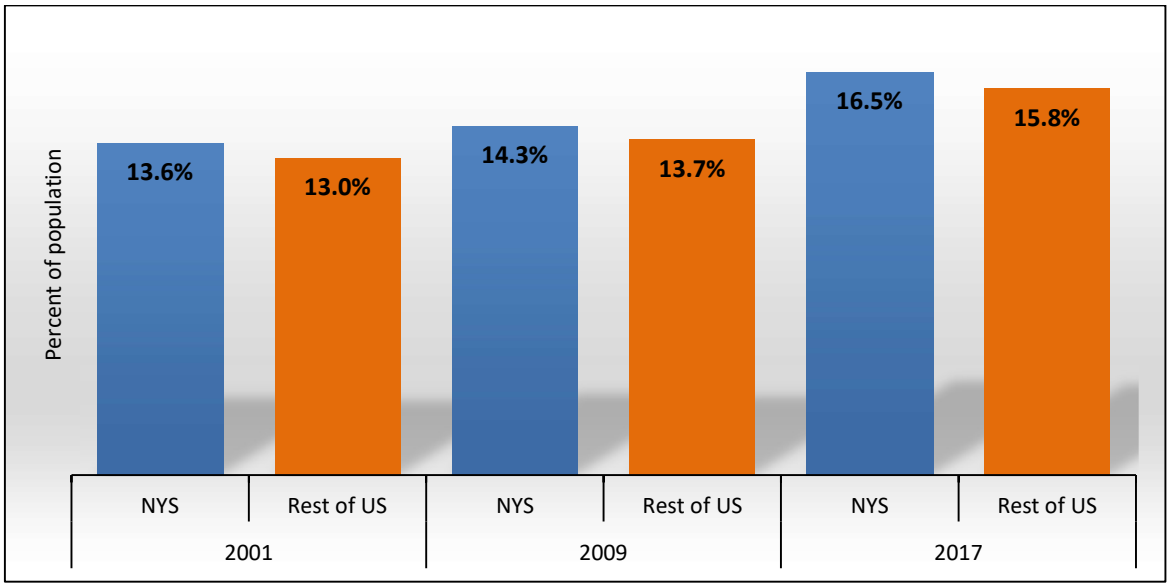


Figure 2-11. Percent population aged 65 and older in NYS and the rest of the US (2001, 2009, and 2017 NHTS data).

By gender (Table 2-2), the elderly male population in NYS increased about 20.6% from 2009 to 2017, nearly ten percentage points higher than the increase from 2001 to 2009 (11.3%). Table 2-2 also shows the share of each age group in the total population. It can be seen that the shares of elderly male population in 65-69 and 70-74 age groups in 2017 increased from their 2009 level, so does the population size. This pattern also exists for elderly females.

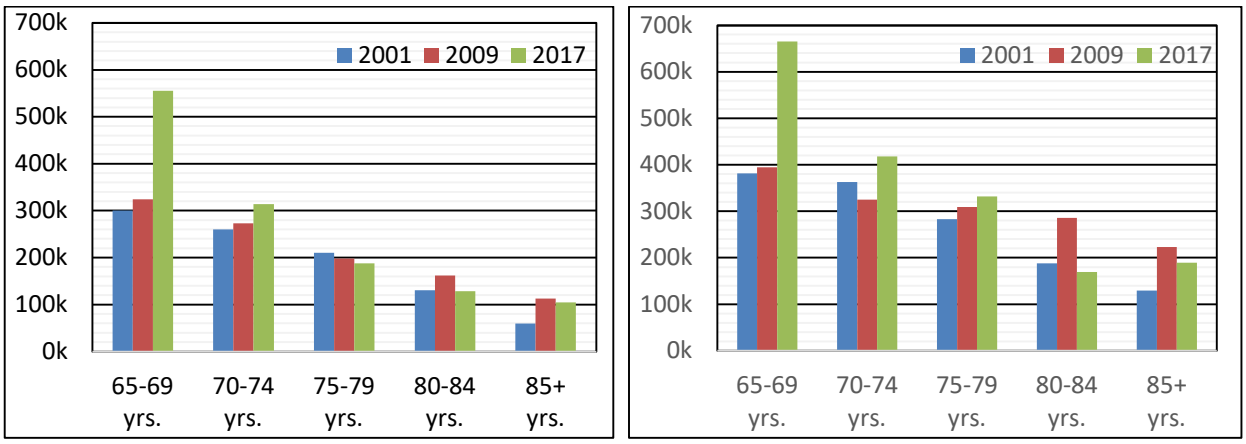
Similar to their counterpart, the total elderly female population also increased significantly in 2017, with a 15% increase from 2009. In addition, those who are in age groups "65-69 years" and "70-74 years" and "75-79 years" all increased from 2009.

Table 2-2. NYS population by age category, by gender, and changes over time (2001, 2009, and 2017 NHTS data)

Male			
Age group	**2001**	**2009**	**2017**
5-15 yrs.	17.0%	15.1%	14.2%
16-64 yrs.	71.2%	72.8%	71.5%
65-69 yrs.	3.7%	3.7%	6.2%
70-74 yrs.	3.2%	3.1%	3.5%
75-79 yrs.	2.6%	2.2%	2.1%
80-84 yrs.	1.6%	1.8%	1.4%
85+ yrs.	0.7%	1.3%	1.2%
All	8,133,178	8,845,089	9,003,816
Elderly (65+)	961,325	1,069,990	1,290,225

Female			
Age group	**2001**	**2009**	**2017**
5-15 yrs.	16.1%	13.6%	12.6%
16-64 yrs.	68.7%	70.1%	69.0%
65-69 yrs.	4.3%	4.2%	6.9%
70-74 yrs.	4.1%	3.4%	4.3%
75-79 yrs.	3.2%	3.3%	3.5%
80-84 yrs.	2.1%	3.0%	1.8%
85+ yrs.	1.5%	2.4%	2.0%
All	8,858,057	9,436,713	9,606,887
Elderly (65+)	1,343,874	1,537,681	1,772,621

A visual display of NYS elderly population by age category and gender is given in Figure 2-12. Gender difference in terms of population sizes is evident in this figure. There are more females than males in NYS among all elderly age groups over all three NHTS years.



(a) NYS elderly men **(b) NYS elderly women**

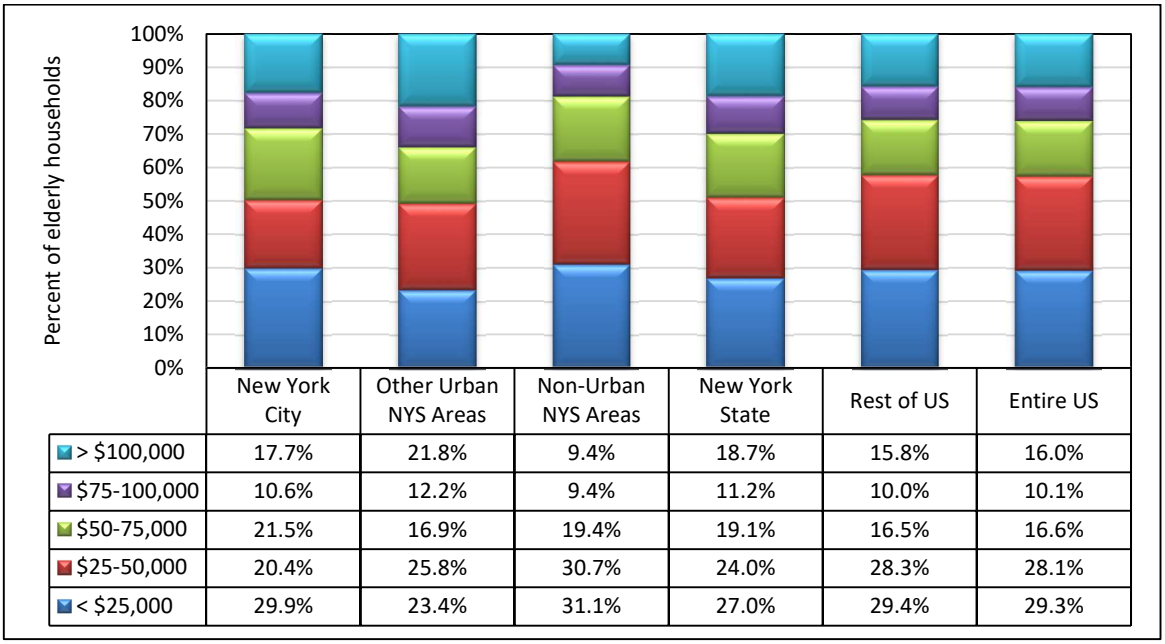
Figure 2-12. NYS elderly population by age and gender (2001, 2009, and 2017 NHTS data)[1].

2.2.2 Household Income

Considering households with one or more persons aged 65 years or older referred to as "elderly households" in this study, residents of NYC and other urban NYS areas had greater shares of higher income elderly households in their regions than those who lived in non-urban areas of NYS in 2017. As shown in Figure 2-13, elderly households with income of more than $100,000 accounted for about 22% in other urban NYS areas, followed by 18% in NYC, versus only 9% in the non-urban areas of NYS. Overall, nearly 19% of elderly households fall into the highest income category (>$100K) in NYS. For comparison, the share of higher income elderly households accounted for about 16% of total elderly households that lived outside NYS in 2017.

On the other hand, as illustrated in Figure 2-13, other urban NYS areas have the lowest percentage of under $25,000 income households, accounting for around 23% of its total number of households. About 30% of elderly households that lived in other regions (NYC, non-urban NYS areas, and the rest of US) are in the same lowest income group, however.

[1] Cautions need to be exercised to interpret the significant change in certain age groups in 2017 (e.g., the 65-69 age group) due to county-level weight adjustment in 2017 NYS NHTS data.

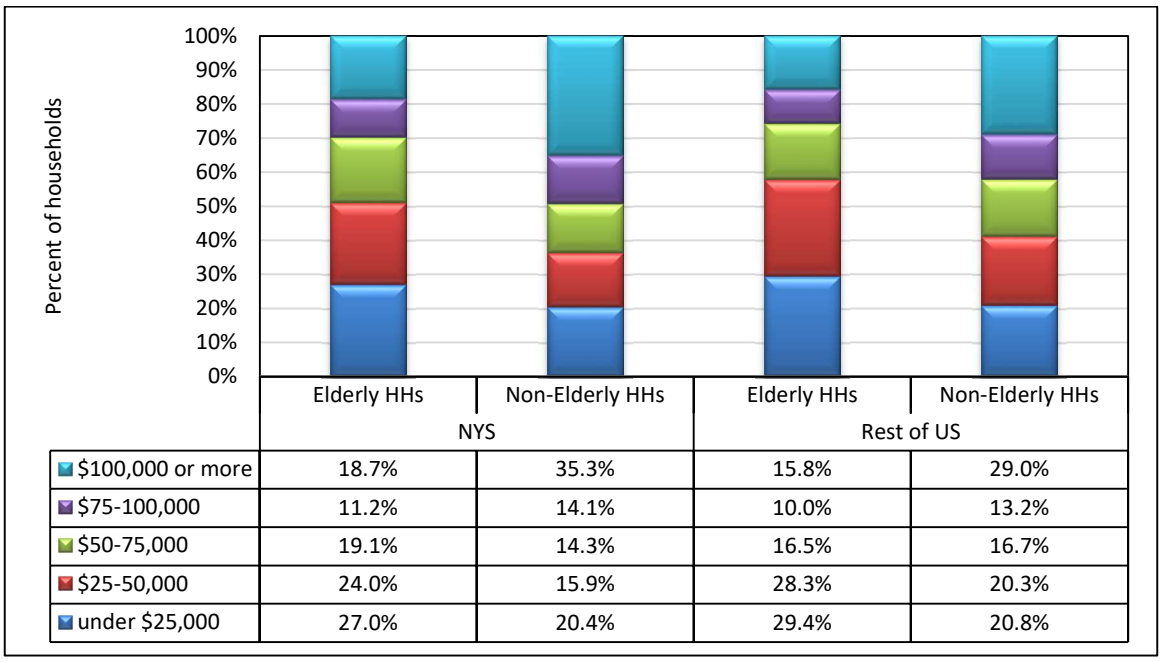


	New York City	Other Urban NYS Areas	Non-Urban NYS Areas	New York State	Rest of US	Entire US
> $100,000	17.7%	21.8%	9.4%	18.7%	15.8%	16.0%
$75-100,000	10.6%	12.2%	9.4%	11.2%	10.0%	10.1%
$50-75,000	21.5%	16.9%	19.4%	19.1%	16.5%	16.6%
$25-50,000	20.4%	25.8%	30.7%	24.0%	28.3%	28.1%
< $25,000	29.9%	23.4%	31.1%	27.0%	29.4%	29.3%

Figure 2-13. Distributions of elderly households by income and region (2017 NHTS).

When compared to non-elderly households (Figure 2-14), elderly households have a significantly higher likelihood of being in the lower two income groups (i.e., annual income under $50,000) regardless of where they lived. Furthermore, nearly 36% of non-elderly households in NYS were in the "$100,000 or more" income category, while less than 19% of elderly households in NYS were in the same income group. A similar pattern is also exhibited in elderly households located outside NYS (i.e., rest of US).

According to 2017 NHTS data, over 89% of the elderly households from NYS lived in urban areas—43% in NYC and 46% in other urban areas within the NYS. Similarly, as summarized in Table 2-3, over 86% of the NYS elderly households lived in urban areas during each of the prior survey years. The portion of elderly households that lived in NYC increased over the last 16 years, from 39% in 2001 to 43% in 2017 while the portion that lived in other NYS urban areas decreased slightly from 48% in 2001 to 46% in 2017.



	NYS		Rest of US	
	Elderly HHs	Non-Elderly HHs	Elderly HHs	Non-Elderly HHs
$100,000 or more	18.7%	35.3%	15.8%	29.0%
$75-100,000	11.2%	14.1%	10.0%	13.2%
$50-75,000	19.1%	14.3%	16.5%	16.7%
$25-50,000	24.0%	15.9%	28.3%	20.3%
under $25,000	27.0%	20.4%	29.4%	20.8%

Figure 2-14. Percent of households by income and household status (2017 NHTS).

Table 2-3. Number and share of elderly households by geographic location of residence

Year	Number of elderly households in NYS				Share of elderly households in NYS		
	New York City	Other Urban NYS Areas	Non-Urban NYS Areas	NYS	New York City	Other Urban NYS Areas	Non-Urban NYS Areas
2001	680,750	844,404	235,009	1,760,164	38.7%	48.0%	13.4%
2009	952,175	1,071,666	209,117	2,232,958	42.6%	48.0%	9.4%
2017	944,721	999,143	231,318	2,175,182	43.4%	45.9%	10.6%

2.2.3 Driver Status

It is not surprising that aging tends to decrease one's likelihood of being a driver, thus reducing the number of elderly populations who are drivers. The decreasing rates among aging women were higher than those in men, according to 2017 NHTS. The majority of men, especially those living outside NYC, continued to consider themselves as drivers well into their 80s. As displayed in Figure 2-15, a significant portion of the oldest men population group (aged 85+ years old) reported themselves as a driver in 2017, particularly among those who lived outside NYC area, where about 70% of men continued to hold on to their driving status. For elderly men living in NYC (Figure 2-15), there is a steady decline on the likelihood of being a driver for elderly men after they reach 70s. This trend turns upwards, however, for those aged 85 or older men living in NYC.

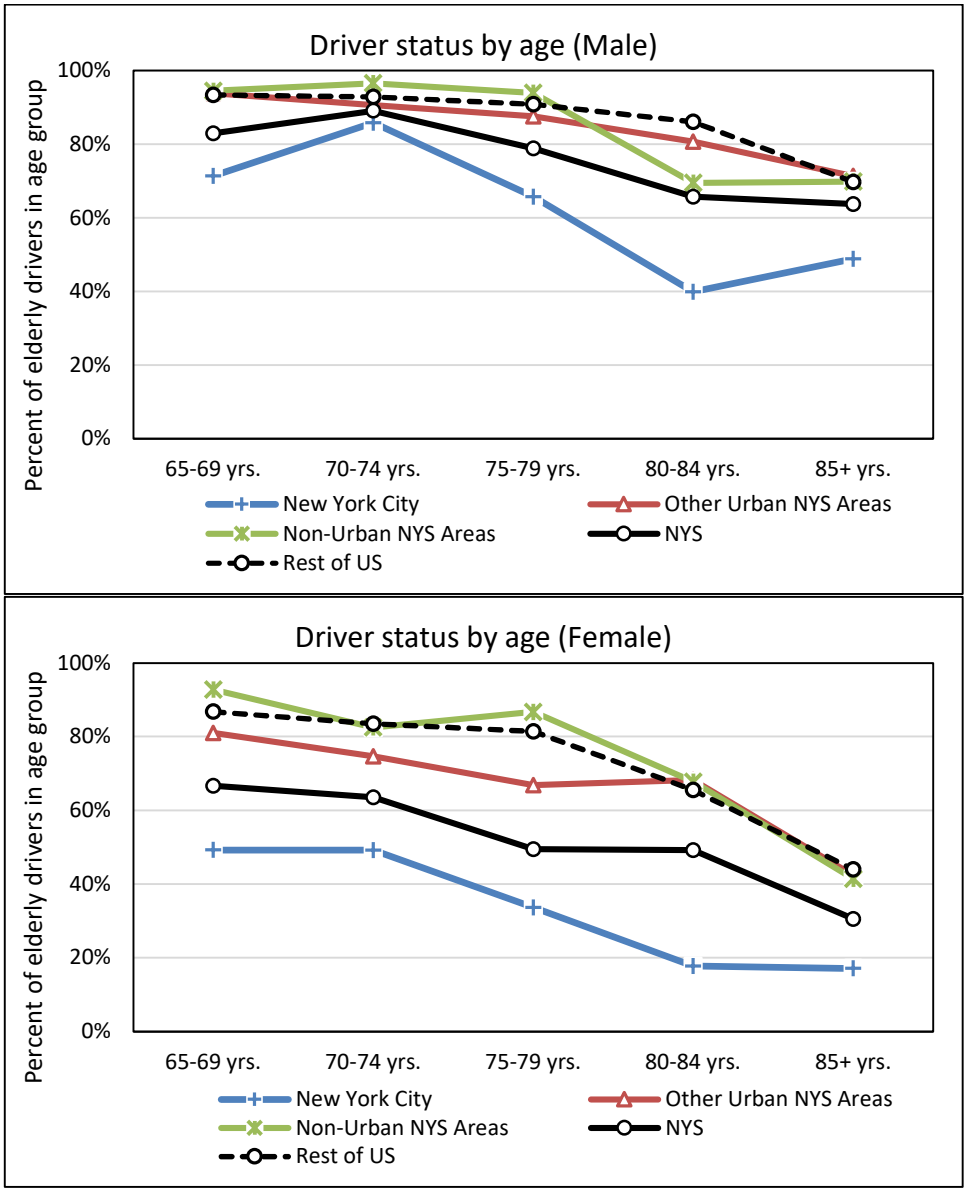


Figure 2-15. Percent of population in each age group reported as being a driver (2017 NHTS).

Overall, elderly females of all ages, regardless of where they lived, are less likely to report themselves as drivers when compared to their male counterparts (Figure 2-15). Like elderly men, age 85+ years old female residents of NYC were much less likely to identify themselves as drivers than those who lived elsewhere. Specifically, only about 17% of this oldest female age group in NYC did so versus over 40% of the same age group from all other regions in 2017.

Table 2-4 summarizes the percentages of the population that identified themselves as drivers, by age group and by region of residence across the three NHTS years (2001, 2009, and 2017). It is evident that there is a decreasing trend among elderly populations, shown in a general declining share of drivers as they aged regardless of gender or where they lived.

Table 2-4. Percentage of age groups that identified themselves as a driver (2001, 2009 and 2017 NHTS)

Age of driver	2001					2009					2017				
	New York City	NYS Other Urban	NYS Non-Urban	New York State	Rest of US	New York City	NYS Other Urban	NYS Non-Urban	New York State	Rest of US	New York City	NYS Other Urban	NYS Non-Urban	New York State	Rest of US
Men															
16-64 yrs.	73.0%	92.3%	94.5%	84.0%	93.8%	81.3%	92.7%	90.0%	87.6%	92.0%	70.3%	88.0%	84.7%	80.1%	89.2%
65-69 yrs.	71.3%	97.0%	99.6%	87.7%	95.3%	72.8%	99.1%	94.7%	88.9%	93.8%	71.3%	93.9%	94.5%	83.0%	93.4%
70-74 yrs.	75.7%	94.6%	96.1%	88.9%	92.7%	62.0%	92.6%	91.6%	79.7%	93.0%	85.9%	90.6%	96.5%	89.1%	92.9%
75-79 yrs.	44.9%	91.2%	90.8%	73.4%	88.9%	67.3%	81.5%	95.9%	79.1%	89.9%	65.7%	87.5%	93.9%	78.8%	90.8%
80-84 yrs.	47.5%	79.9%	82.3%	68.5%	86.3%	60.7%	89.3%	88.0%	77.8%	85.0%	39.9%	80.7%	69.5%	65.7%	86.1%
85+ yrs.	34.8%	68.1%	76.8%	57.8%	68.4%	42.8%	57.2%	79.9%	52.3%	68.9%	48.9%	71.3%	69.9%	63.7%	69.8%
Women															
16-64 yrs.	53.5%	90.3%	94.1%	74.3%	90.9%	69.4%	90.2%	88.8%	80.9%	89.7%	52.9%	84.5%	83.7%	70.3%	88.5%
65-69 yrs.	34.8%	87.9%	94.0%	67.1%	86.9%	62.1%	87.4%	85.4%	77.4%	87.7%	49.3%	81.0%	92.7%	66.7%	86.8%
70-74 yrs.	37.4%	84.7%	80.0%	65.7%	80.0%	64.6%	82.4%	83.2%	75.6%	80.8%	49.2%	74.7%	82.5%	63.5%	83.5%
75-79 yrs.	27.9%	73.5%	82.1%	57.9%	72.3%	45.2%	75.8%	77.6%	63.3%	73.5%	33.7%	66.8%	86.7%	49.4%	81.5%
80-84 yrs.	20.4%	56.9%	57.2%	39.9%	62.0%	28.3%	57.0%	74.3%	47.2%	64.8%	17.8%	68.2%	67.8%	49.2%	65.5%
85+ yrs.	15.9%	24.2%	18.6%	20.3%	32.8%	13.9%	36.2%	39.7%	25.8%	39.8%	17.1%	42.4%	41.4%	30.5%	44.0%

2.3 HOUSEHOLD CHARACTERISTICS

2.3.1 Household Size

Generally speaking, elderly households were more likely to be one-person or two-person households than households without any elderly persons. Clearly visible in Figure 2-16, approximately 38% of elderly households were 1-person households, while only around 26% of non-elderly households were single occupancy in NYS in 2017. Two-person households were also more common among elderly households than in non-elderly households, accounting for another 42% of the elderly households in NYS for the same year. Only slightly over half of the non-elderly households were one- or two-person households compared to 80% or more of elderly households living alone or with two persons in 2017. This pattern remained fairly consistent over the three NHTS years and across all regions, (i.e., for households of NYS as well as those from rest of the US).

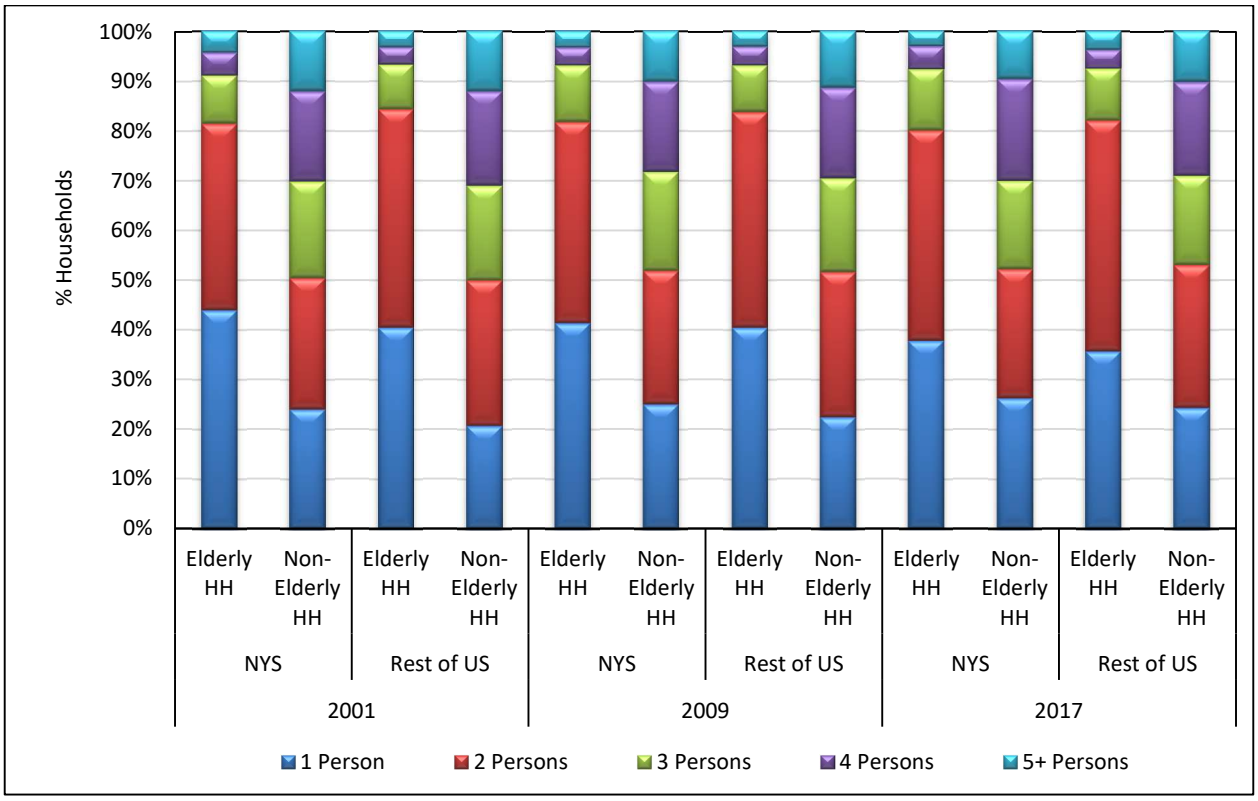


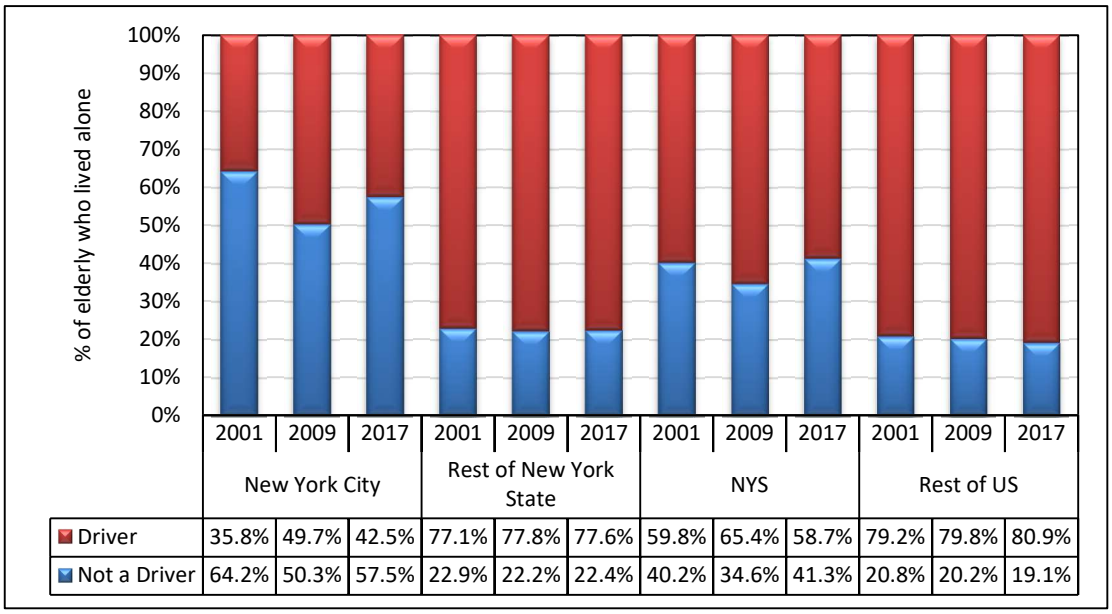
Figure 2-16. Household distributions by household size and household status (NHTS data).

The significant share of live-alone elderly households calls for a closer examination of their specific travel behaviors and characteristics—particularly on issues, such as: How did they travel (e.g., mode choice)? How were their mobility needs being met? Did gender and age make any differences?

2.3.2 Elderly Who Lived Alone

2.3.2.1 Driving Status

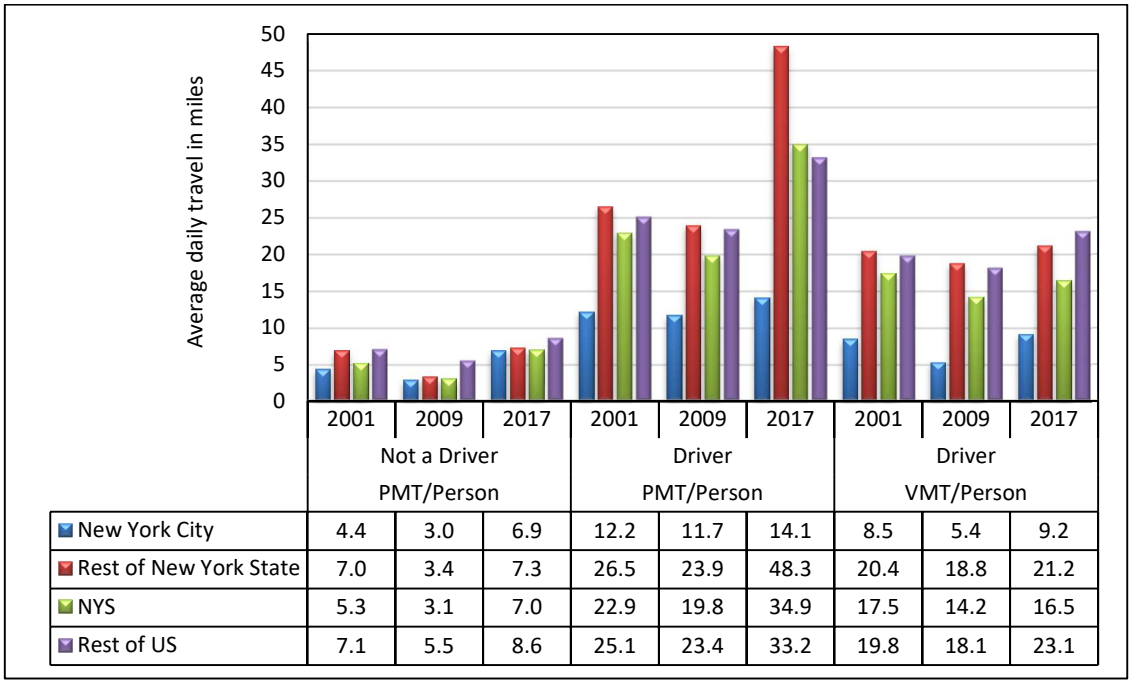
Based on NHTS data, elderly who lived alone in NYC had a significantly higher likelihood of not being a driver than those who lived in other parts of NYS (Figure 2-17). Nearly 58% of the elderly population who lived alone in NYC were not a driver, versus about 22% in the rest of NYS in 2017. The shares of non-driving elderly who lived alone outside NYS were roughly comparable to their counterpart New Yorkers that lived outside NYC. Overall, in 2017, 41% of the elderly population in NYS were not a driver.



	New York City			Rest of New York State			NYS			Rest of US		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
Driver	35.8%	49.7%	42.5%	77.1%	77.8%	77.6%	59.8%	65.4%	58.7%	79.2%	79.8%	80.9%
Not a Driver	64.2%	50.3%	57.5%	22.9%	22.2%	22.4%	40.2%	34.6%	41.3%	20.8%	20.2%	19.1%

Figure 2-17. A comparison of the share of elderly who lived alone by driver status in New York City, rest of New York State and rest of the US.

Figure 2-18 shows that elderly who lived alone and reported themselves as non-driver traveled significantly less—measured by person-miles traveled (PMT)—than those who identified themselves as driver regardless of where they lived. Although it might be argued that the lack of a driver status could severely impact one's mobility, it might also be possible that the need for driving was diminished when one significantly reduced his/her travel activities (e.g., no longer commuting due to health or other reasons).



	2001	2009	2017	2001	2009	2017	2001	2009	2017
	Not a Driver PMT/Person			Driver PMT/Person			Driver VMT/Person		
New York City	4.4	3.0	6.9	12.2	11.7	14.1	8.5	5.4	9.2
Rest of New York State	7.0	3.4	7.3	26.5	23.9	48.3	20.4	18.8	21.2
NYS	5.3	3.1	7.0	22.9	19.8	34.9	17.5	14.2	16.5
Rest of US	7.1	5.5	8.6	25.1	23.4	33.2	19.8	18.1	23.1

Figure 2-18. Average daily travel by driver status for elderly who lived alone in 2001, 2009, & 2017.

Statistics presented at the bottom of Figure 2-18 illustrate that, on average, elderly drivers who lived alone in NYC also had significantly less PMT and vehicle-miles traveled (VMT) than their counterparts that lived elsewhere. Such a difference is not obvious for the elderly non-drivers who lived alone in NYC. Overall, NYC elderly who lived alone made shorter trips, traveled less frequently, or both, than elderly who lived-alone in other regions. When comparing results across all NHTS years, all daily travel averages for 2017 are higher than their corresponding 2009 levels, regardless of where these lived-alone elderly are located or their driver statuses.

Note that, a further examination of the 2017 NHTS data identified two cases (trips) that were the main contributing factor for making the average travel length significantly longer than prior years in the rest of NYS (48.3 miles in Figure 2-18). Both cases were over 4,000-mile trips taken by persons reported as drivers. If these two extreme trips were excluded, the average trip length for lived-alone elderly drivers from the "Rest of NYS" and "NYS" region in 2017 would become 27.9 miles and 22.5 miles, respectively, which are more in line with other statistics presented in Figure 2-18.

2.3.2.2 Gender Difference

As discussed in section 2.2.1, women accounted for most of the elderly population in the US for all age categories (see Figure 2-12). The longevity of women's lifespan was also reflected in their high percentages of living alone as presented in Figure 2-19. Regardless of geographic regions of residence, females consistently accounted for 60% or higher of one-person households in all age groups. The only scenario out of sync is the 2009 statistics for those aged 70-74 years old. Compared to other age groups, the share of live-alone elderly is the smallest for those aged 65-69 years old in 2017.

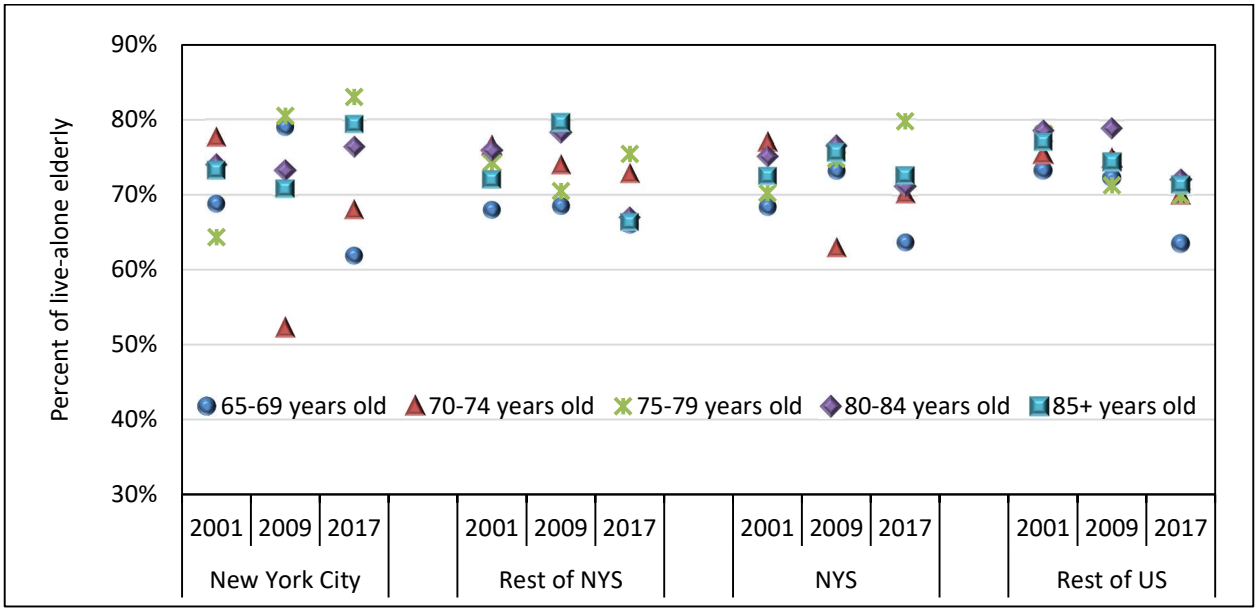
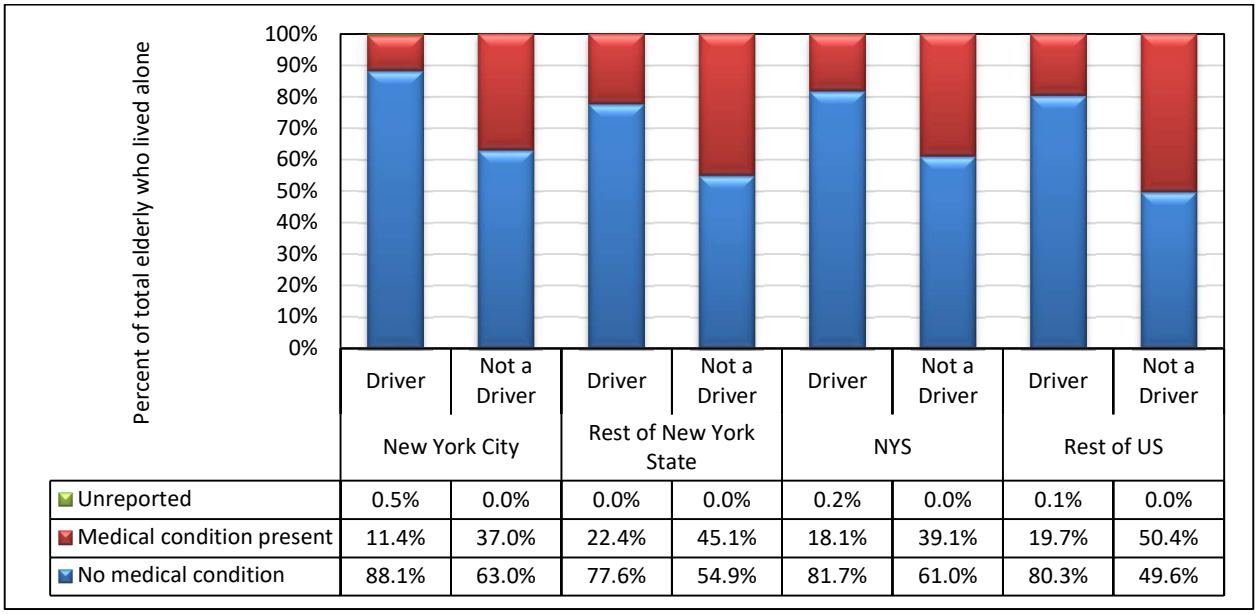


Figure 2-19. Female share of one-person elderly households by region in 2001, 2009, & 2017.

2.3.2.3 Medical Conditions

To examine whether medical conditions have any impact on the driving status of elderly who lived alone, responses from the 2017 NHTS survey question of "Do you have any medical conditions making travel difficult?" were analyzed. Results in Figure 2-20 show that one-person elderly non-driver households were more likely to report medical conditions that made travel difficult than those who lived alone but reported as a driver, regardless of where they lived. For instance, only 11% of lived-alone elderlies in NYC who are drivers reported having medical conditions that made travel difficult, while 37% of their non-driver counterparts indicated having the same issue. Outside NYS (rest of the US), more than half of lived-alone non-driver elderlies reported having travel limitations due to medical conditions, whereas only 20% of their driving counterparts have that limitation. Overall, both driver and non-driver elderly who lived alone in NYC had a lower share of reporting "medical condition present" than those who lived elsewhere in NYS or in the rest of the US in 2017.

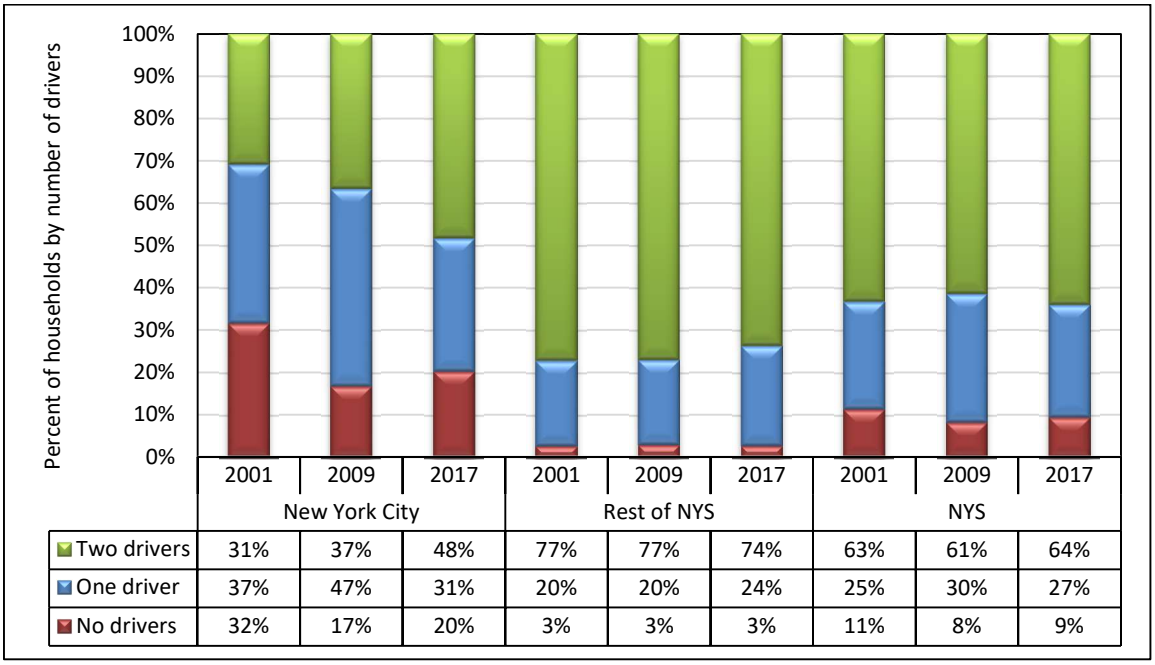


	New York City		Rest of New York State		NYS		Rest of US	
	Driver	Not a Driver	Driver	Not a Driver	Driver	Not a Driver	Driver	Not a Driver
Unreported	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	0.0%
Medical condition present	11.4%	37.0%	22.4%	45.1%	18.1%	39.1%	19.7%	50.4%
No medical condition	88.1%	63.0%	77.6%	54.9%	81.7%	61.0%	80.3%	49.6%

Figure 2-20. Percent of one-person household elderly who reported the presence of a medical condition by driver status (2017 NHTS).

2.3.3 Two-person Elderly Households

Based on statistics presented in Figure 2-21, NYC clearly has a much higher share of two-person elderly households without drivers than their counterpart households residing in other areas of NYS. This holds true for all three NHTS years where "no driver" two-person households accounted for 17 to 32% in NYC versus only 3% in the rest of NYS over the same period. In 2017, nearly half of the two-person elderly households in NYC reported having two drivers, an increasing trend from 31% in 2001 and 37% in 2009. Outside NYC, the majority of two-person elderly households in NYS were comprised of two drivers which accounted for 74% in 2017 and 77% in prior years.



	New York City			Rest of NYS			NYS		
	2001	2009	2017	2001	2009	2017	2001	2009	2017
Two drivers	31%	37%	48%	77%	77%	74%	63%	61%	64%
One driver	37%	47%	31%	20%	20%	24%	25%	30%	27%
No drivers	32%	17%	20%	3%	3%	3%	11%	8%	9%

Figure 2-21. Distribution of two-person elderly households by number of drivers over time (2001, 2009, and 2017 NHTS).

2.4 VEHICLE OWNERSHIP

Based on the 2015-2019 5-year ACS data, the NYS population density for zero-vehicle elderly households at the Census Tract level was calculated and displayed in Figure 2-22. Examination of the zero-vehicle elderly household density suggests that this statistic has a relatively high variance—over 66% of the 4,907 Census Tracts have a coefficient of variation larger than 30%. Therefore, the upper bound and lower bound of the zero-vehicle elderly household density at each Census Tract are presented in the same figure as well to illustrate the possible variations. The upper bound of the population density was computed as the mean population density plus its margin of error, while the lower bound of the population density was computed as the mean population density minus the corresponding margin of error. Clearly visible from the state-level map, the highest density of zero-vehicle elderly households is concentrated around the NYC area. Clusters of zero-vehicle elderly households outside NYC were mainly located in other major urban areas such as Albany, Syracuse, Rochester, and Buffalo. A zoomed in view is further presented in Figure 2-23 to show the zero-vehicle elderly household density in NYC along with the upper bound and lower bound.

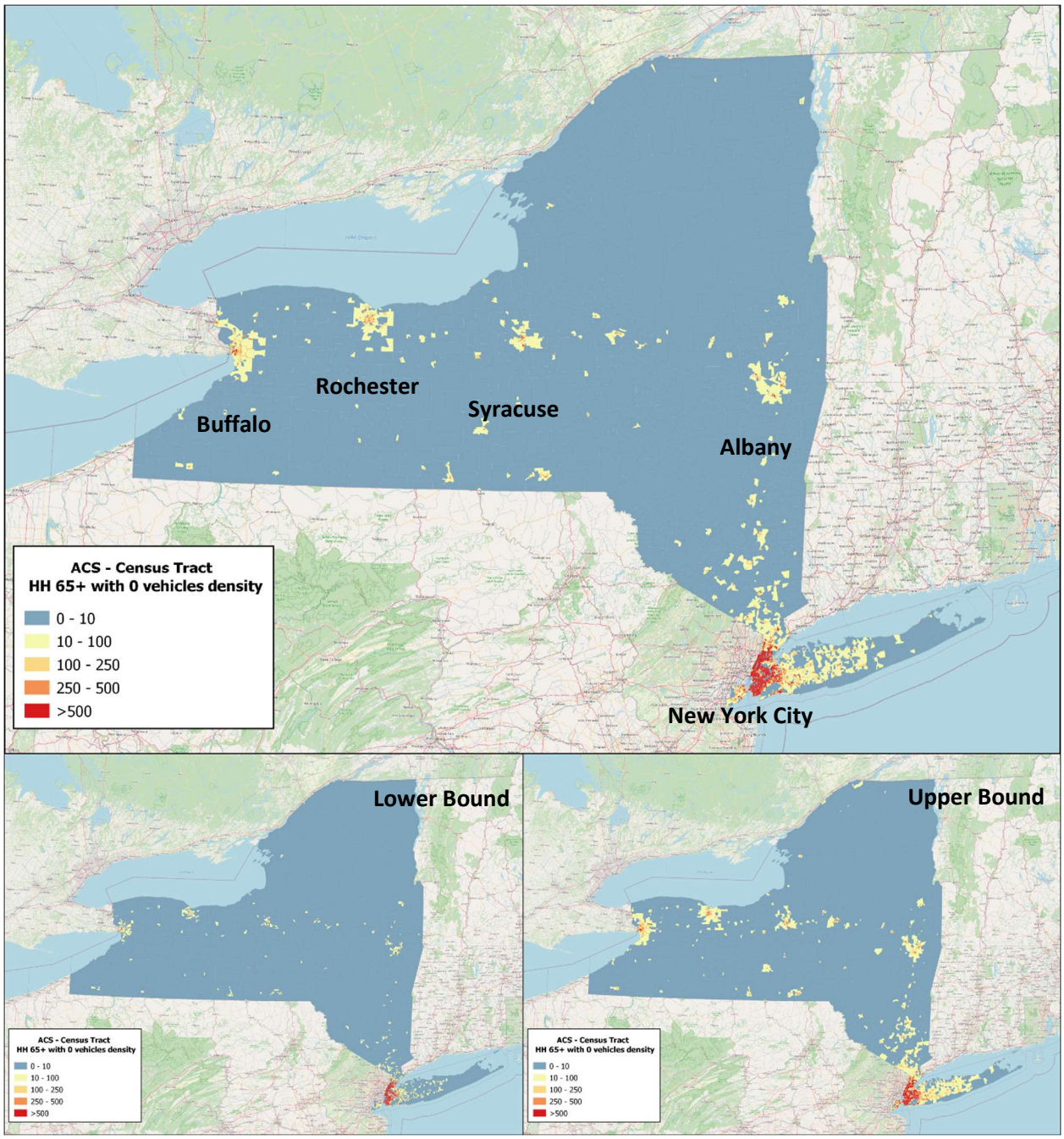


Figure 2-22. Density of elderly households with zero vehicles in NYS based on ACS 2015-2019 data (density measured as per square-mile in Census Tract).

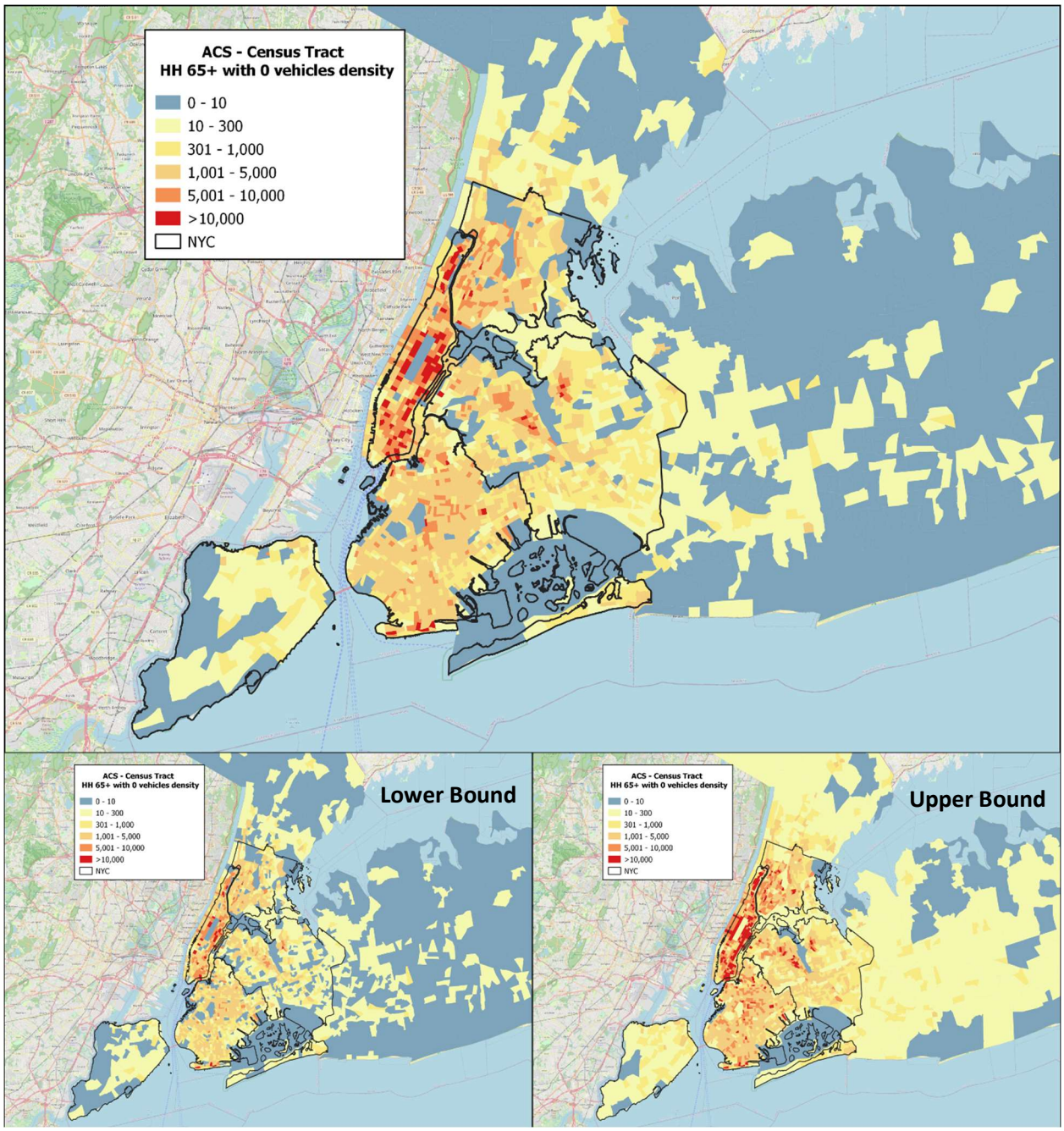


Figure 2-23. Density of elderly households with zero vehicles in NYC based on ACS 2015-2019 data (density measured as per square-mile in Census tract).

Statistics from NHTS show vehicle ownership in different regions. Clearly visible in Figure 2-24 (with numeric values shown in Table 2-5) is the remarkable difference in percentages of zero-vehicle households (shown in blue) between NYC and all other regions. For instance, in 2017, nearly 49% of elderly households in NYC did not own any vehicles while only 5 to 20% of elderly households in regions outside NYC were without any vehicles in the same year. Note that, this high proportion of zero-vehicle households was not unique for only elderly households in NYC. Based on NHTS data, approximately 52% of all NYC households did not own any

vehicles in 2017, while zero-vehicle households accounted for 55% and 52%, respectively, in 2009 and 2001.

Expectedly, elderly households living in more densely populated areas were less likely to own a vehicle than their counterparts from less populated regions. Except for NYC, the elderly population lived in urban areas with population density higher than 2000 per square mile has the highest share of zero-vehicle households in 2017—about 20% of the elderly households did not own any vehicles, as compared to less 10% of zero-vehicle elderly households in all other regions outside NYC.

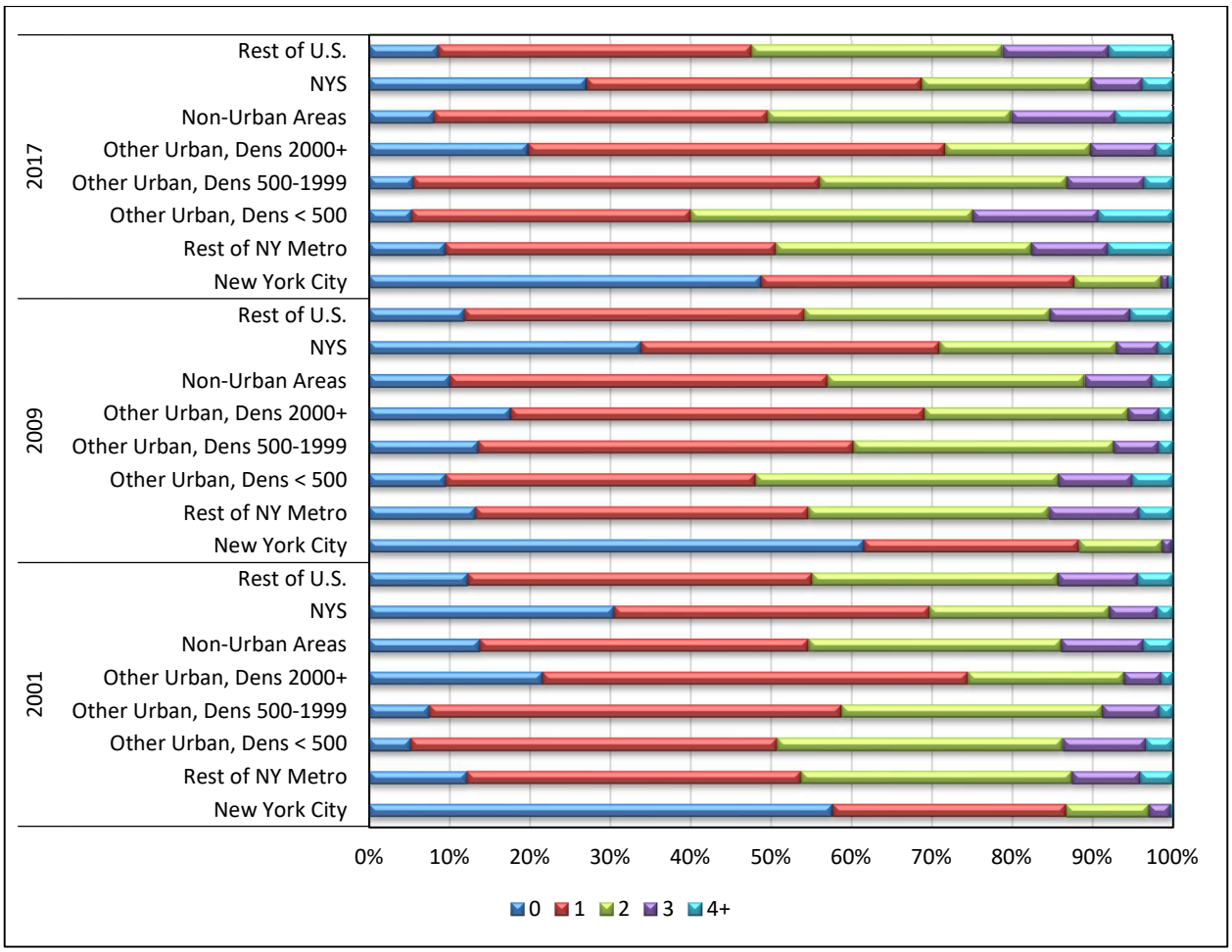


Figure 2-24. Distribution of elderly households by vehicle ownership and type of region (2001, 2009, and 2017 NHTS).

Notes: Rest of NY Metro are NYS metropolitan areas excluding NYC. "Dens" are population density per square mile. "Elderly households" are households with one or more persons aged 65 years or order.

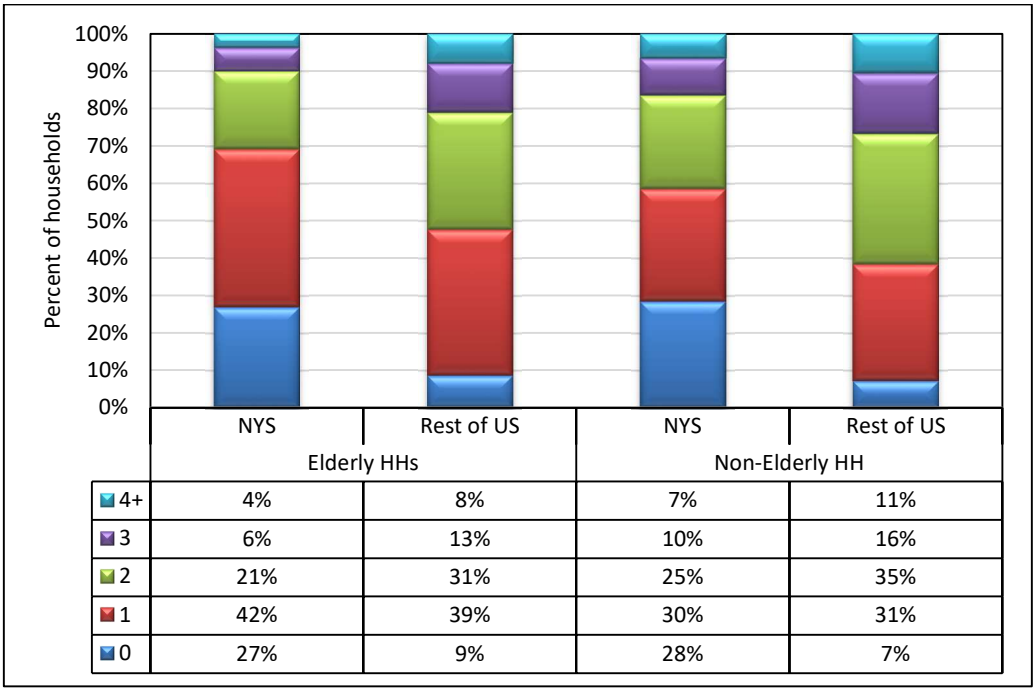
Table 2-5. Distribution of elderly households by vehicle ownership and geographic regions (2001, 2009, and 2017 NHTS)

Number of vehicles owned	Entire US	New York City	Rest of NY Metro	Other Urban, Dens < 500	Other Urban, Dens 500-1999	Other Urban, Dens 2000+	Non-Urban Areas	New York State	Rest of US
	2001								
0	13.50%	57.65%	12.15%	5.15%	7.49%	21.61%	13.83%	30.54%	12.30%
1	42.55%	29.02%	41.64%	45.62%	51.32%	53.01%	40.93%	39.17%	42.79%
2	30.04%	10.31%	33.66%	35.54%	32.36%	19.38%	31.36%	22.35%	30.58%
3	9.63%	2.71%	8.47%	10.25%	7.12%	4.55%	10.22%	5.94%	9.89%
4+	4.27%	0.31%	4.08%	3.44%	1.72%	1.45%	3.66%	1.99%	4.43%
All	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	2009								
0	13.28%	61.56%	13.22%	9.51%	13.58%	17.66%	10.09%	33.84%	11.87%
1	41.94%	26.78%	41.48%	38.57%	46.68%	51.41%	46.94%	37.17%	42.26%
2	30.02%	10.30%	29.90%	37.65%	32.36%	25.36%	32.01%	21.98%	30.58%
3	9.64%	1.22%	11.18%	9.18%	5.56%	3.81%	8.35%	5.13%	9.95%
4+	5.12%	0.14%	4.22%	5.08%	1.81%	1.76%	2.62%	1.88%	5.34%
All	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	2017								
0	9.76%	48.78%	9.53%	5.33%	5.45%	19.81%	8.11%	27.10%	8.64%
1	39.16%	38.94%	41.06%	34.70%	50.56%	51.84%	41.50%	41.68%	39.00%
2	30.61%	10.84%	31.83%	35.11%	30.74%	18.10%	30.32%	21.07%	31.22%
3	12.77%	0.86%	9.51%	15.61%	9.62%	8.08%	12.89%	6.33%	13.18%
4+	7.70%	0.58%	8.07%	9.25%	3.63%	2.17%	7.19%	3.81%	7.96%
All	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Notes: Cells highlighted in yellow are estimated based on a small sample (5 or fewer).

A comparison of vehicle ownership distributions by household status (elderly vs. non-elderly) and household locations (NYS vs. rest of the US), using 2017 NHTS data, is shown in Figure 2-25. There is no significant difference in shares of zero-vehicle households between NYS's elderly and non-elderly households. Specifically, 27% of elderly households versus 28% for non-elderly households that lived in NYS owned zero vehicles in 2017. Outside NYS, the share of zero-vehicle households for elderly HHs is statistically higher than for non-elderly HHs. Overall, 9% of elderly households did not own a vehicle with a margin of error of 0.7% versus 7% of non-elderly households in the same category with a margin of error of 0.3%.

On the other hand, only 31% of NYS elderly households owned 2 or more vehicles in 2017, while 42% of their counterpart non-elderly households owned 2+ vehicles during the same year. Outside NYS, the shares of households owning 2+ vehicles are 52% among elderly households, versus 62% for their non-elderly neighbors in the same year.

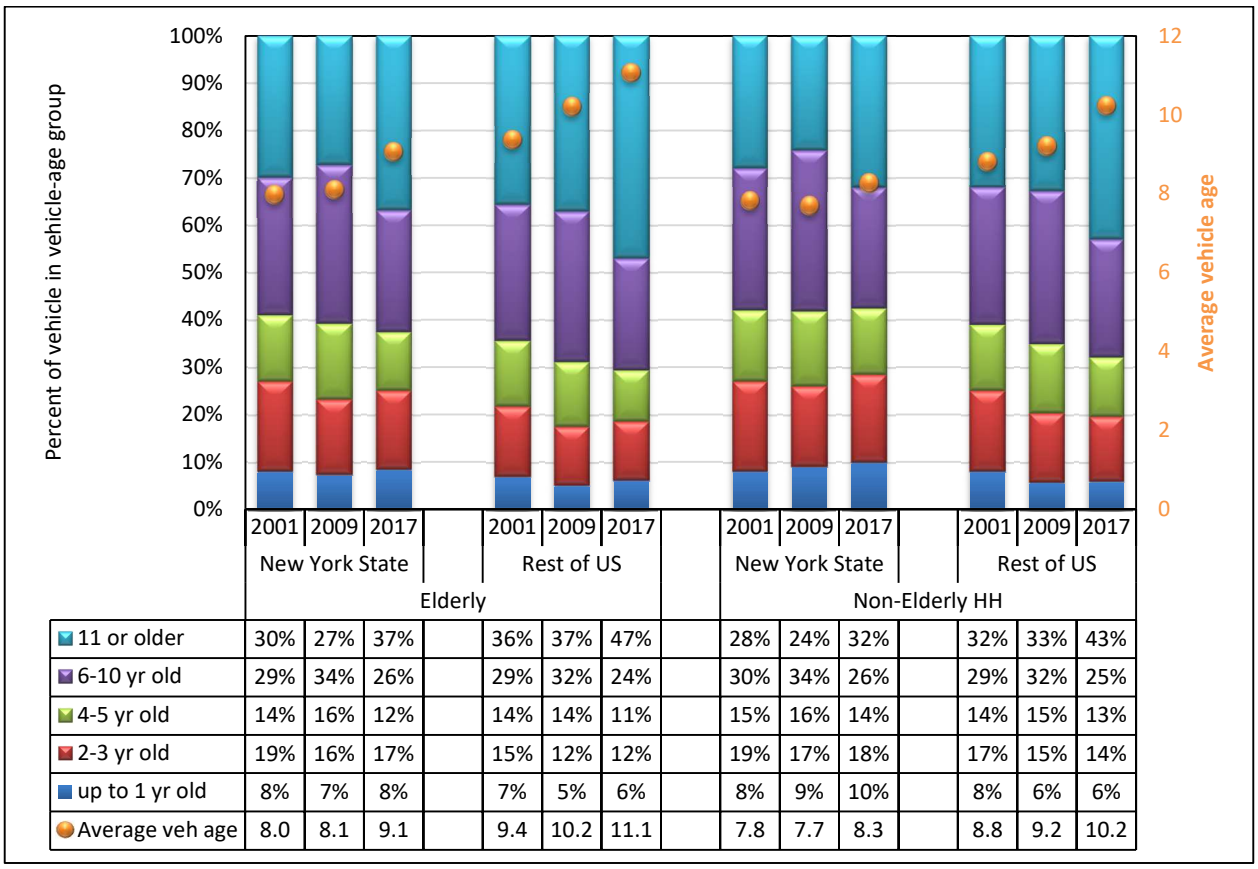


	Elderly HHs		Non-Elderly HH	
	NYS	Rest of US	NYS	Rest of US
4+	4%	8%	7%	11%
3	6%	13%	10%	16%
2	21%	31%	25%	35%
1	42%	39%	30%	31%
0	27%	9%	28%	7%

Figure 2-25. Distributions of elderly and non-elderly households by vehicle ownership (2017 NHTS).

2.5 VEHICLE AGE

The NHTS also collected information on household vehicle age although a small percent of the survey participants did not report this data—about 3 to 5% of them were missing (unreported) over the last three NHTS surveys. Using the available vehicle age data, Figure 2-26 shows the vehicle-age distributions by household status (elderly vs. non-elderly) and geographic region (NYS vs. Rest of US), over the three survey years. In 2017, about 37% of vehicles owned by NYS elderly households were eleven years or older, while over 47% of their counterparts from the rest of the US were the same. Among non-elderly households, the shares of "11 years or older" vehicles accounted for about 32% and 43% for NYS households and households that lived in the rest of the US, respectively.



	Elderly							Non-Elderly HH						
	New York State				Rest of US			New York State				Rest of US		
	2001	2009	2017		2001	2009	2017	2001	2009	2017		2001	2009	2017
11 or older	30%	27%	37%		36%	37%	47%	28%	24%	32%		32%	33%	43%
6-10 yr old	29%	34%	26%		29%	32%	24%	30%	34%	26%		29%	32%	25%
4-5 yr old	14%	16%	12%		14%	14%	11%	15%	16%	14%		14%	15%	13%
2-3 yr old	19%	16%	17%		15%	12%	12%	19%	17%	18%		17%	15%	14%
up to 1 yr old	8%	7%	8%		7%	5%	6%	8%	9%	10%		8%	6%	6%
Average veh age	8.0	8.1	9.1		9.4	10.2	11.1	7.8	7.7	8.3		8.8	9.2	10.2

Figure 2-26. Distribution of vehicle age by household elderly status and by region (2001, 2009, and 2017 NHTS).

The average age of vehicles owned by households within each group was also plotted in Figure 2-26. Vehicles owned by NYS households were about 1 to 2 years "newer" on average than those owned by households outside NYS. Vehicles owned by elderly households were slightly older than those owned by their non-elderly counterparts. The differences are slightly more visible among households living in the rest of US. Furthermore, an increasing trend in average vehicle age over the last 16-year period can also be observed in both regions, for both elderly and non-elderly households.

2.6 WORKER STATUS

The percent of population aged 16 years and older who worked during the three NHTS years was examined. As shown in Figure 2-27, shares of male workers were slightly lower among residents of NYC than those living in other parts of the country. Also, there is a gender difference in shares of worker from all regions. Worker shares among female across all regions are lower than their male counterparts from the same region. Furthermore, there is a declining trend in workforce levels over the three NHTS years among all regions and genders, except for NYC females in 2017.

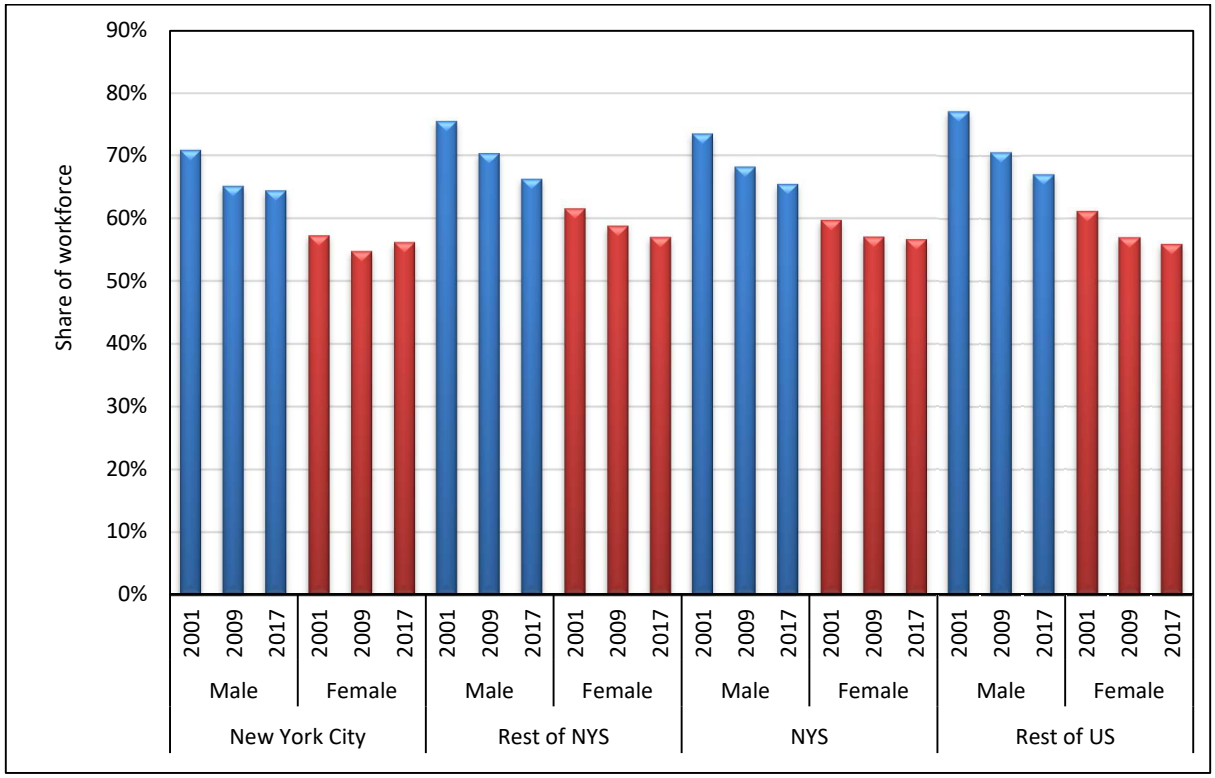
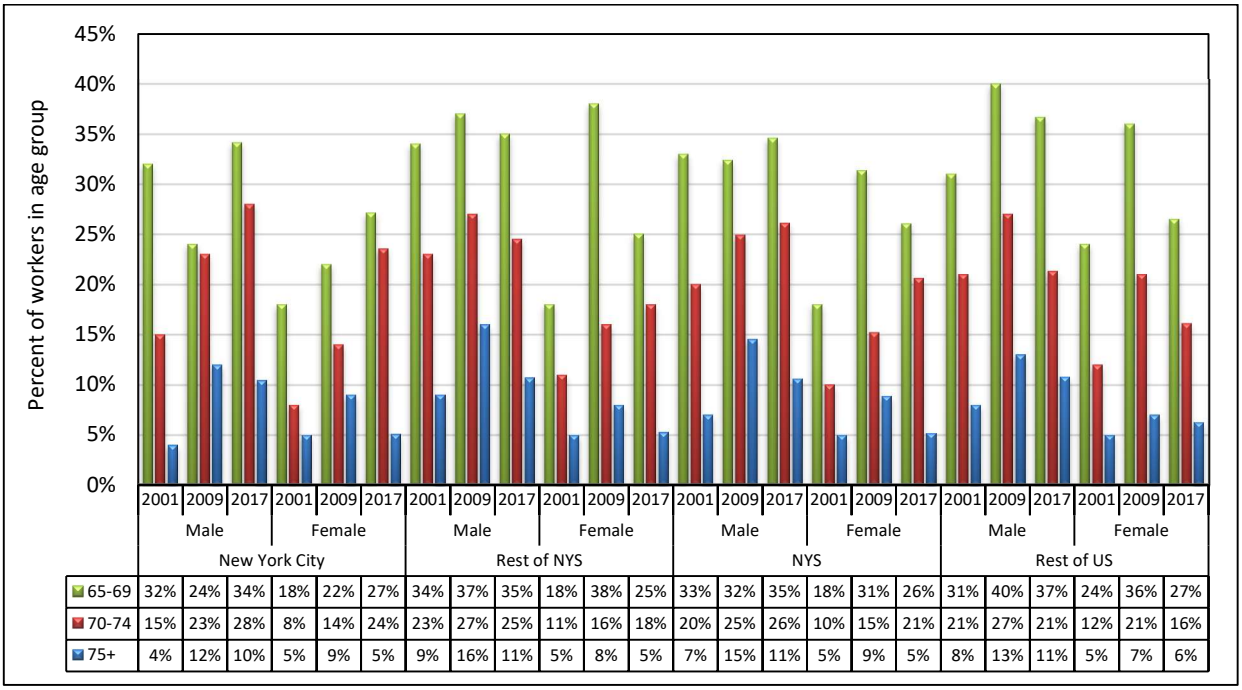


Figure 2-27. Percent of 16+ year old workers population over time by gender and region (2001, 2009, and 2017 NHTS).

When focused on the elderly, as illustrated in Figure 2-28, there were clearly increasing trends in worker shares over the last 16 years in NYC for both genders. Outside NYC, there was an increasing trend in worker shares within each age group from 2001 to 2009. The share, however, decreased from 2009 to 2017. Similar to the general worker population (as shown in Figure 2-27), elderly males have a significantly larger worker share than their female counterparts for all age groups and all regions. The 2001 statistics for the older males (75+ years old) that lived in NYC and the 2009 statistics for males aged 65-69 from the rest of NYS seemed to be the only two scenarios that were slightly out of sync.



	New York City						Rest of NYS						NYS						Rest of US					
	Male			Female			Male			Female			Male			Female			Male			Female		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
65-69	32%	24%	34%	18%	22%	27%	34%	37%	35%	18%	38%	25%	33%	32%	35%	18%	31%	26%	31%	40%	37%	24%	36%	27%
70-74	15%	23%	28%	8%	14%	24%	23%	27%	25%	11%	16%	18%	20%	25%	26%	10%	15%	21%	21%	27%	21%	12%	21%	16%
75+	4%	12%	10%	5%	9%	5%	9%	16%	11%	5%	8%	5%	7%	15%	11%	5%	9%	5%	8%	13%	11%	5%	7%	6%

Figure 2-28. Share of workers for elderly groups by gender and region in 2001, 2009, and 2017 NHTS.

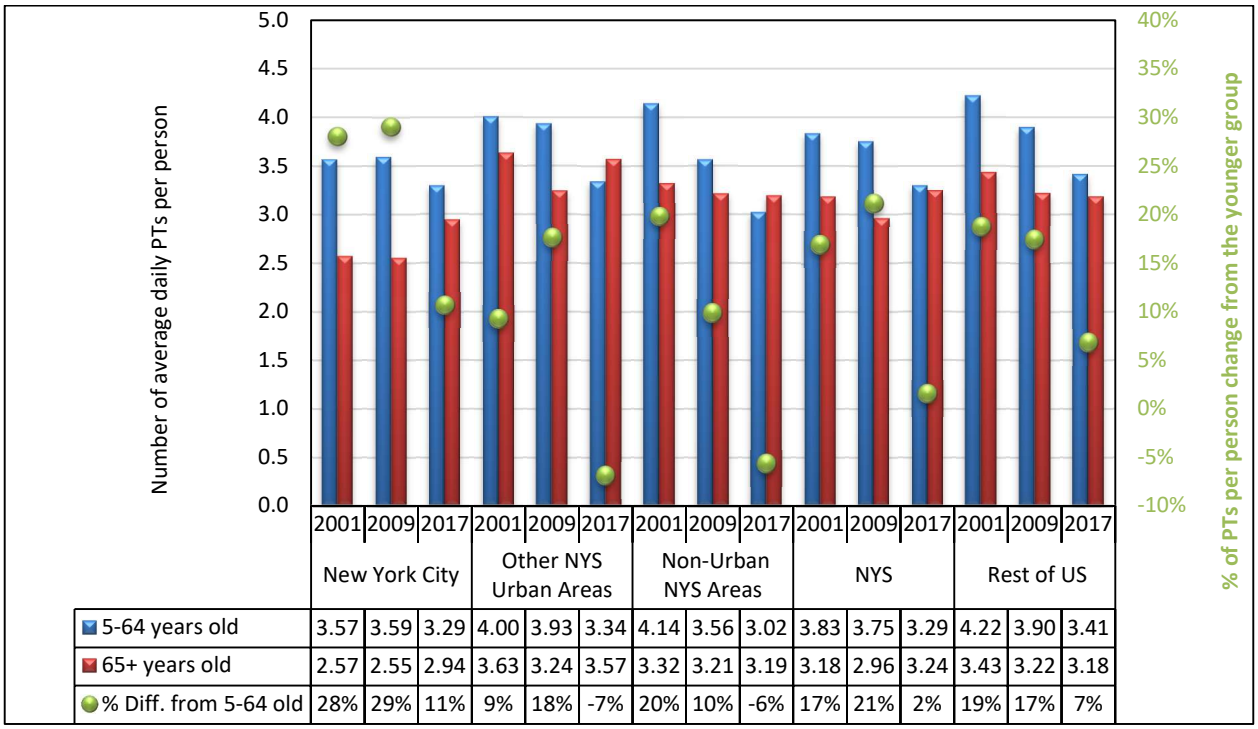
3. TRAVEL PATTERNS OF ELDERLY POPULATION

According to statistics published in the *Summary of Travel Trends: 2017 National Household Survey* report, Table 3b, on average, Americans are making fewer but longer trips in 2017, as compared to 2009 (McGuckin & Fucci, 2018). Although people aged 65 and older traveled a longer distance in 2017, unlike the general population, the daily average number of trips for elderlies in 2017 stayed at the same level as in 2009 (Table 31 of the same report). This chapter examines travel behaviors of NYS elderly residents, which include estimating the level of elderly travel, assessing any gender and regional differences, and determining their travel patterns and trends.

3.1 TRAVEL STATISTICS BY PERSON TRIPS

3.1.1 Average Daily Person-Trip Rate

Statistics presented in Figure 3-1 reveal that the younger people (aged 5-64) traveled less in 2017 than in previous years regardless of where they lived. Among elderly population, only those who lived in non-urban areas of NYS or from the rest of US show the same pattern. For elderlies living in urban areas of NYS (NYC and other urban areas), their 2017 daily average numbers of person trips were in fact higher than their 2009 levels. Overall, a typical elderly who lived in NYC took fewer daily trips than his/her counterpart from the other regions.



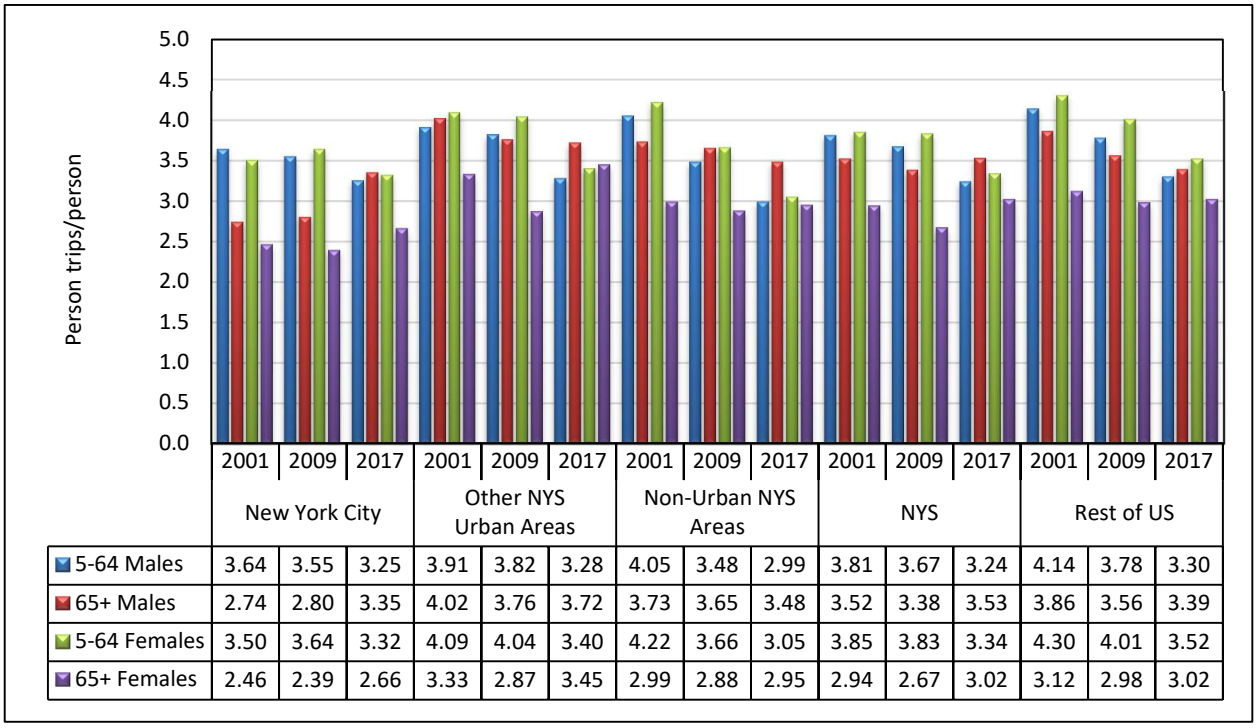
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			NYS			Rest of US		
5-64 years old	3.57	3.59	3.29	4.00	3.93	3.34	4.14	3.56	3.02	3.83	3.75	3.29	4.22	3.90	3.41
65+ years old	2.57	2.55	2.94	3.63	3.24	3.57	3.32	3.21	3.19	3.18	2.96	3.24	3.43	3.22	3.18
% Diff. from 5-64 old	28%	29%	11%	9%	18%	-7%	20%	10%	-6%	17%	21%	2%	19%	17%	7%

Figure 3-1. Average daily person-trips (PTs) per person by age and region over time (2001, 2009 and 2017 NHTS data).

The differences between trips made by non-elderlies and elderlies per day decreased obviously from 2001 to 2017 regardless of where they lived (Figure 3-1). In NYC area, an elderly person

took an average of nearly 30% fewer daily trips than their younger counterparts in 2001 & 2009, roughly about one trip less for the elderly on any given day. This difference reduced to 11% in 2017, representing about one-third of a trip fewer per day for a typical NYC elderly person. Outside NYC, elderly New Yorkers traveled slightly more per day on average than their younger counterparts in 2017, a different pattern from previous years. Overall, the elderlies in NYS made 2% fewer daily trips than their non-elderly counterparts in 2017, versus 21% fewer in 2009. In the rest of US, a typical non-elderly person traveled about 19% and 17% more than a typical elderly person in 2001 and 2009 respectively, while it is only 7% in 2017.

Furthermore, as illustrated in Figure 3-2, while no significant gender gap could be observed among the younger groups (shown in blue and green), a gender gap among the elderly groups (shown in red and purple) is evident. Elderly males made more trips per day than their female counterparts in all geographic areas and in all years. Such a gap, however, has shown a decreasing trend over time in all regions outside NYC. Unlike prior years (2001 and 2009), elderly males traveled slightly more frequently than their younger counterparts in 2017, regardless of the regions they lived. On the other hand, age differences in trip rates are more striking for females who lived in all regions. In the case of NYC, its elderly females traveled about 20% less as compared to their younger female counterparts. In addition, elderly females also made fewer daily trips than their male counterparts, regardless of regions and over all three NHTS years. Regardless of age or gender, in most cases, a resident of NYC made fewer daily trips on average than a typical person from other regions.



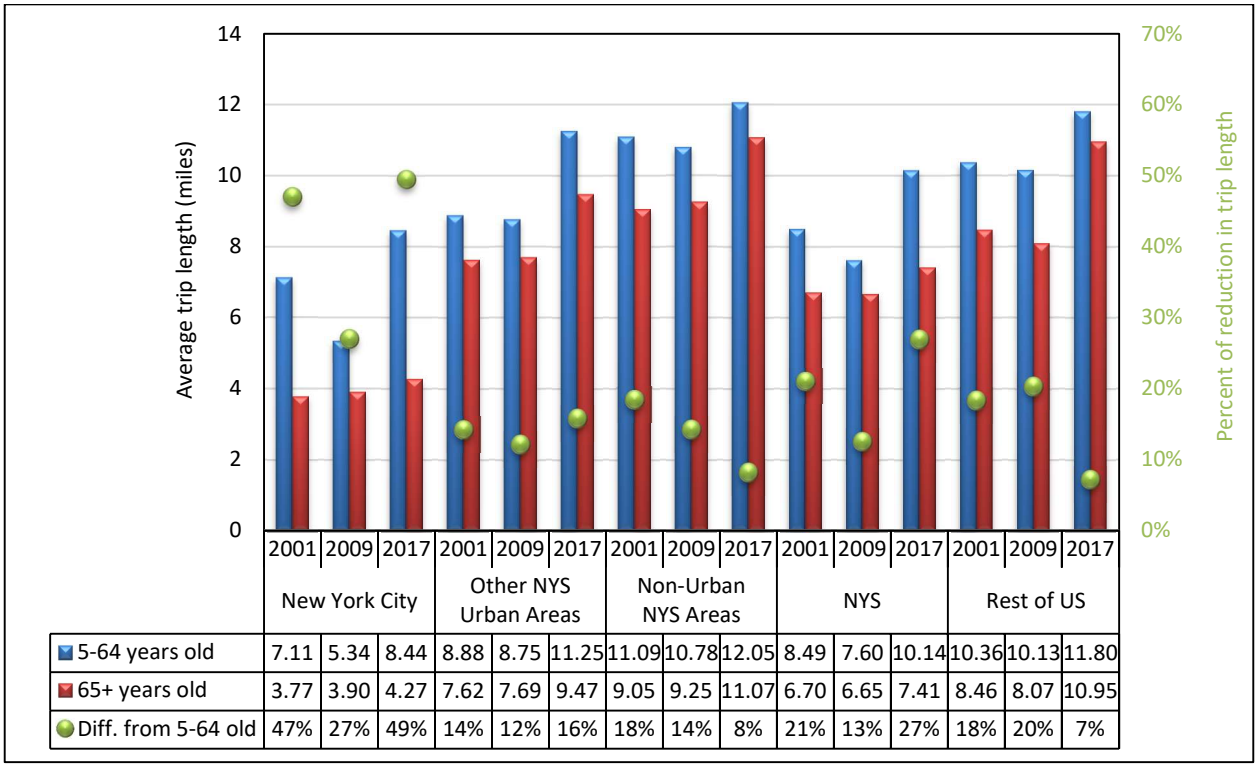
	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			NYS			Rest of US		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
5-64 Males	3.64	3.55	3.25	3.91	3.82	3.28	4.05	3.48	2.99	3.81	3.67	3.24	4.14	3.78	3.30
65+ Males	2.74	2.80	3.35	4.02	3.76	3.72	3.73	3.65	3.48	3.52	3.38	3.53	3.86	3.56	3.39
5-64 Females	3.50	3.64	3.32	4.09	4.04	3.40	4.22	3.66	3.05	3.85	3.83	3.34	4.30	4.01	3.52
65+ Females	2.46	2.39	2.66	3.33	2.87	3.45	2.99	2.88	2.95	2.94	2.67	3.02	3.12	2.98	3.02

Figure 3-2. Daily average person trips by age and gender over time (2001, 2009, and 2017 NHTS).

3.1.2 Average Person-Trip Length

Cautions need to be taken to interpret trip-length related statistic trends over the years. In 2017 NHTS, trip length was calculated using a Google API based on the shortest-path route between geocoded origin and destination of the trip, whereas previous NHTS used respondent's estimate of trip length for each trip. This change of methodology has both measurable and unknown impacts on the trip lengths. To account for different methods in trip length reporting, the 2017 estimates of vehicle trip length were adjusted to be more comparable to historical survey years. The changes in methodology and the adjustment of trip length estimates were documented in the *Summary of Travel Trends: 2017 National Household Survey* report. In this current study, all trip-length related measurements are adjusted according to the same method.

As observed in Figure 3-3, the 2017 average trip lengths in all regions and age groups increased from their corresponding 2001 & 2009 levels. Average trip length by a younger resident of NYS jumped from 7.60 miles in 2009 to 10.14 miles in 2017, a nearly 34% increase in travel distance. For younger people from the rest of US, the increase of average trip length during the same period is only about 12% (from 10.13 miles in 2009 to 11.80 miles in 2017). On the other hand, the increase in trip length was about 11% (from 6.65 miles to 7.41 miles) for a typical elderly person in NYS versus 36% (from 8.07 miles to 10.95 miles) for the elderly from outside of NYS (i.e., Rest of US) during the same period.



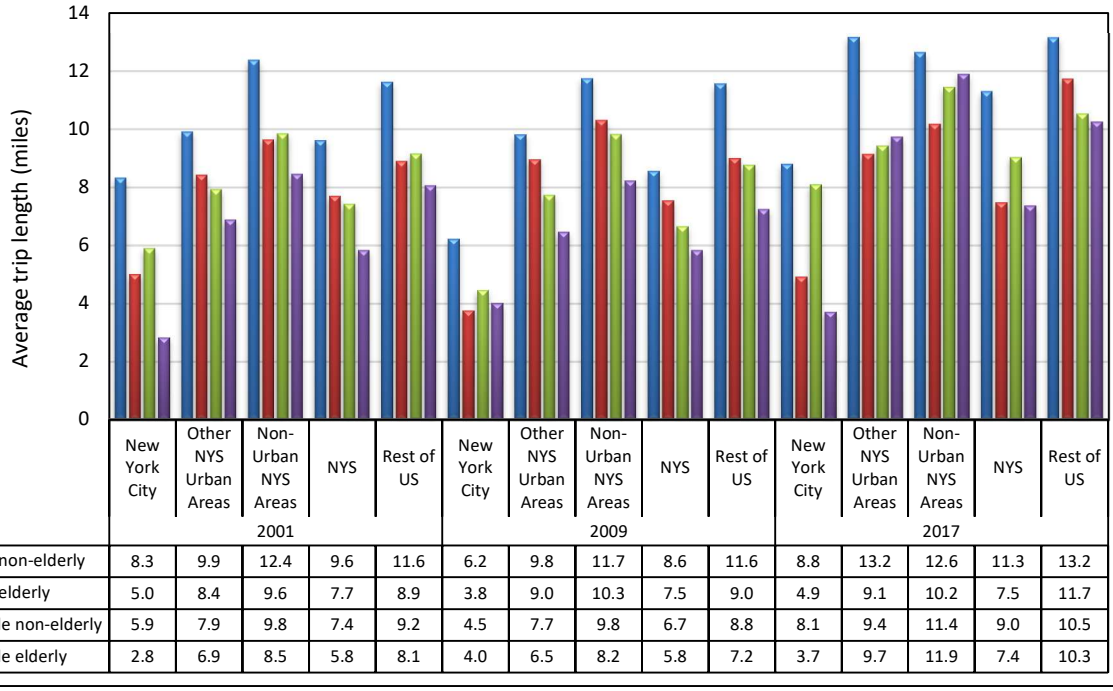
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			NYS			Rest of US		
5-64 years old	7.11	5.34	8.44	8.88	8.75	11.25	11.09	10.78	12.05	8.49	7.60	10.14	10.36	10.13	11.80
65+ years old	3.77	3.90	4.27	7.62	7.69	9.47	9.05	9.25	11.07	6.70	6.65	7.41	8.46	8.07	10.95
Diff. from 5-64 old	47%	27%	49%	14%	12%	16%	18%	14%	8%	21%	13%	27%	18%	20%	7%

Figure 3-3. Average person-trip length by age and region over time (2001, 2009, and 2017 NHTS).

Clearly, in all three years, NYC residents took significantly shorter trips than those who lived elsewhere in the country, and more so in the elderly population. Compared to their non-elderly counterparts, elderly population on average took shorter trips regardless of where they lived.

This pattern is most striking for residents living in NYC, where the elderlies traveled only about half of the distances as their younger counterparts did in 2017. Outside NYC, this trip-length difference was only about 7 to 8% for the two age groups in the same year. Furthermore, a decreasing trend in the trip-length differences between the two age groups can be observed from 2001 to 2017 in all regions, except for NYC.

Figure 3-4 revealed noticeable gender influences on average daily trip length by age groups. In general, men made longer trips on average than women within the same age group in most areas in 2001 and 2009, regardless of their age and where they lived. This remained the same in 2017 except for elderlies who lived outside NYC in NYS. In 2017, female elderlies from other NYS urban areas and non-urban NYS areas took slightly longer trips than their male counterparts from the same region.



	2001					2009					2017				
	New York City	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US	New York City	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US	New York City	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US
Male non-elderly	8.3	9.9	12.4	9.6	11.6	6.2	9.8	11.7	8.6	11.6	8.8	13.2	12.6	11.3	13.2
Male elderly	5.0	8.4	9.6	7.7	8.9	3.8	9.0	10.3	7.5	9.0	4.9	9.1	10.2	7.5	11.7
Female non-elderly	5.9	7.9	9.8	7.4	9.2	4.5	7.7	9.8	6.7	8.8	8.1	9.4	11.4	9.0	10.5
Female elderly	2.8	6.9	8.5	5.8	8.1	4.0	6.5	8.2	5.8	7.2	3.7	9.7	11.9	7.4	10.3

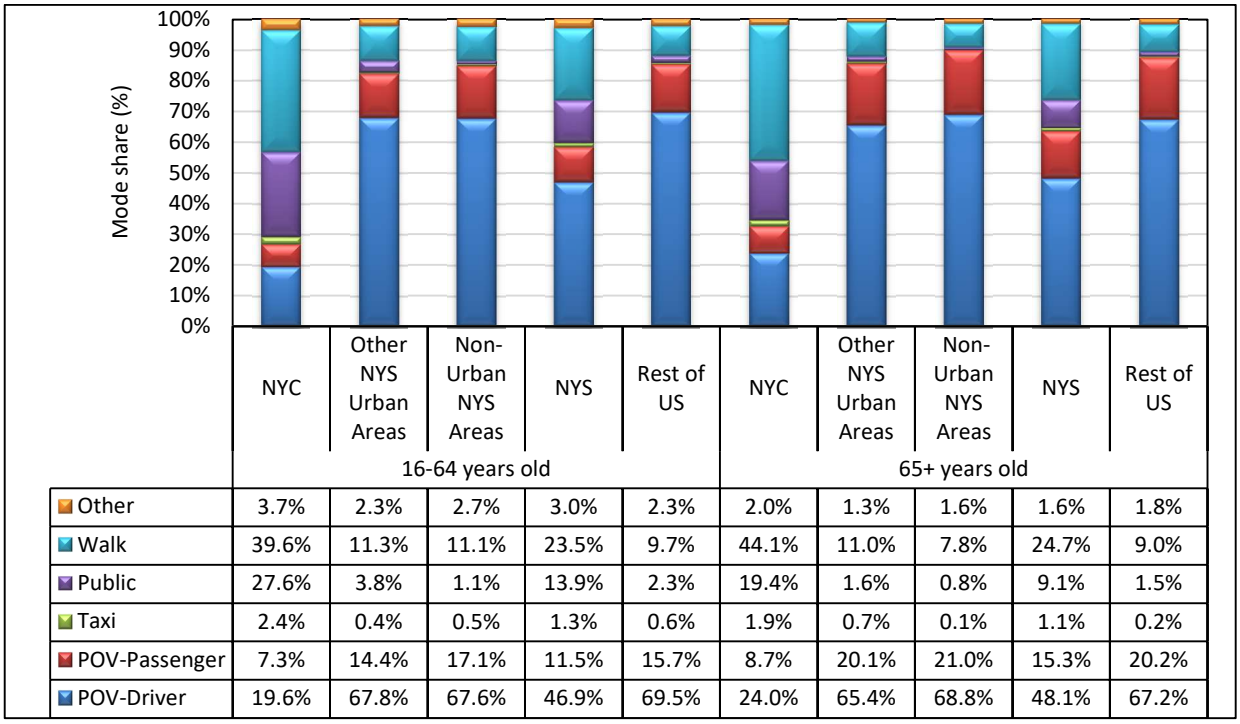
Figure 3-4. Average person-trip length by gender, age category, and region (2001, 2009, and 2017 NHTS).

3.1.3 Mode Shares

3.1.3.1 Differences in Age and Geographic Region

Except for people living in NYC, Americans depend on privately-owned vehicles (POV) for a considerably large portion of their daily travels (measured in person trips)—ranging from about 80% to over 90% depending on where they live. On the contrary, as seen in Figure 3-5, NYC residents above driving age (16-64 years age) used POV in less than one-third of their daily trips in 2017. Instead of POV, residents of NYC walked and used public transit to fulfill most of their daily travel needs which accounted for over 63% of their total daily trips. Walking and public transit were not as commonly used means of transportation by those who lived outside NYC, however. Although not as significant as the regional impacts (i.e., NYC versus other areas), age

also played a role in mode choice. In 2017, elderly population were slightly more likely to use POV (both driver and passenger) than the younger population. The POV-driver share, on the other hand, is about the same level. Among other modes, non-elderly population were more likely to use public transit than their elderly counterparts.

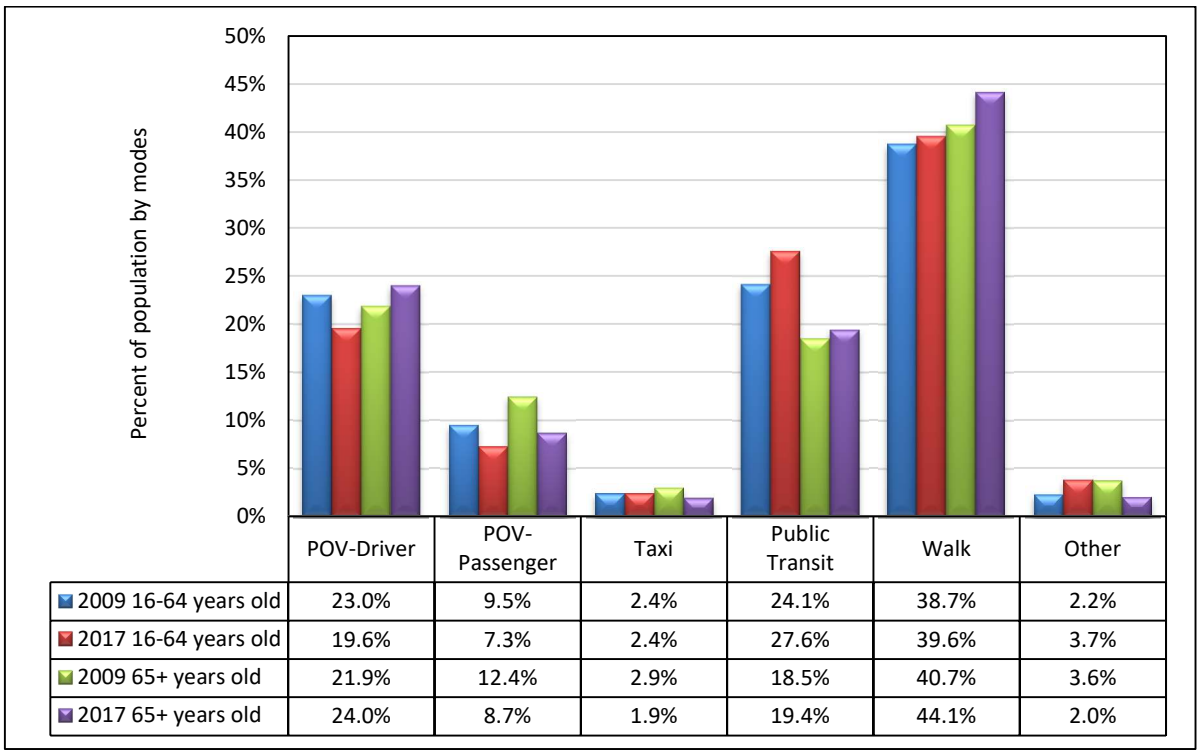


	16-64 years old					65+ years old				
	NYC	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US	NYC	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US
Other	3.7%	2.3%	2.7%	3.0%	2.3%	2.0%	1.3%	1.6%	1.6%	1.8%
Walk	39.6%	11.3%	11.1%	23.5%	9.7%	44.1%	11.0%	7.8%	24.7%	9.0%
Public	27.6%	3.8%	1.1%	13.9%	2.3%	19.4%	1.6%	0.8%	9.1%	1.5%
Taxi	2.4%	0.4%	0.5%	1.3%	0.6%	1.9%	0.7%	0.1%	1.1%	0.2%
POV-Passenger	7.3%	14.4%	17.1%	11.5%	15.7%	8.7%	20.1%	21.0%	15.3%	20.2%
POV-Driver	19.6%	67.8%	67.6%	46.9%	69.5%	24.0%	65.4%	68.8%	48.1%	67.2%

Figure 3-5. Mode share distributions by age and region, based on 2017 NHTS.

Elderly NYC residents utilized slightly more POV and walked a little more frequently in 2017 (Figure 3-6) when compared to the younger population (above driving age) who lived in NYC. POV shares (regardless of driver or passenger) remained about the same level from 2009 to 2017, as compared to a smaller decrease of 33% to 28% among its younger age group in the same period. Furthermore, elderly residents of NYC were more likely to take walking trips than their younger counterparts (44% vs 40%) in 2017.

The elderly residents of NYC were less likely to use public transit than younger NYC residents—true in both 2009 and 2017. Specifically, transit mode share was about 19% of total person trips made by NYC's elderly residents in 2017, while this was at 28% for the younger group. Within age groups, shares of transit use remain at about the same level between 2009 and 2017.



	POV-Driver	POV-Passenger	Taxi	Public Transit	Walk	Other
2009 16-64 years old	23.0%	9.5%	2.4%	24.1%	38.7%	2.2%
2017 16-64 years old	19.6%	7.3%	2.4%	27.6%	39.6%	3.7%
2009 65+ years old	21.9%	12.4%	2.9%	18.5%	40.7%	3.6%
2017 65+ years old	24.0%	8.7%	1.9%	19.4%	44.1%	2.0%

Figure 3-6. NYC mode shares by age group measured in person trips, 2009 and 2017 NHTS.

3.1.3.2 Gender and Age Impacts on Driving

In the case of POV trips made by the elderly, women were less likely to be the driver than men, more so among those 75+ female residents of NYC than the entire NYS and the other regions in the country. Figure 3-7 confirms the previous statement. Among the elderly female groups, age difference also impacted their driving decisions. Less than 50% of total POV person-trips taken by NYC women aged 75 years or older were driven by themselves, while age 65-74 years old women drove on over 75% of their POV person-trips. Although not as significant as in NYC, the age difference among women drivers who lived in NYS and the rest of US was also noticeable—61% to 65% of 75+ years old female drivers drove on their trips versus about 70% of those under 75 years old did. For men, the majority of their POV person-trips were reported as self-driving, regardless of where they lived or their age group.

Moreover, as seen in Figure 3-7, a significant portion of POV person-trips taken by females were driven by their spouses or people outside their households, regardless of their age or where they live. The figure also reveals a noticeable portion of trips (10%) made by females aged 75 or older, who lived in NYC, were driven by their children or other relatives. This pattern was not observed in the rest of US nor among elderly male travelers in all areas.

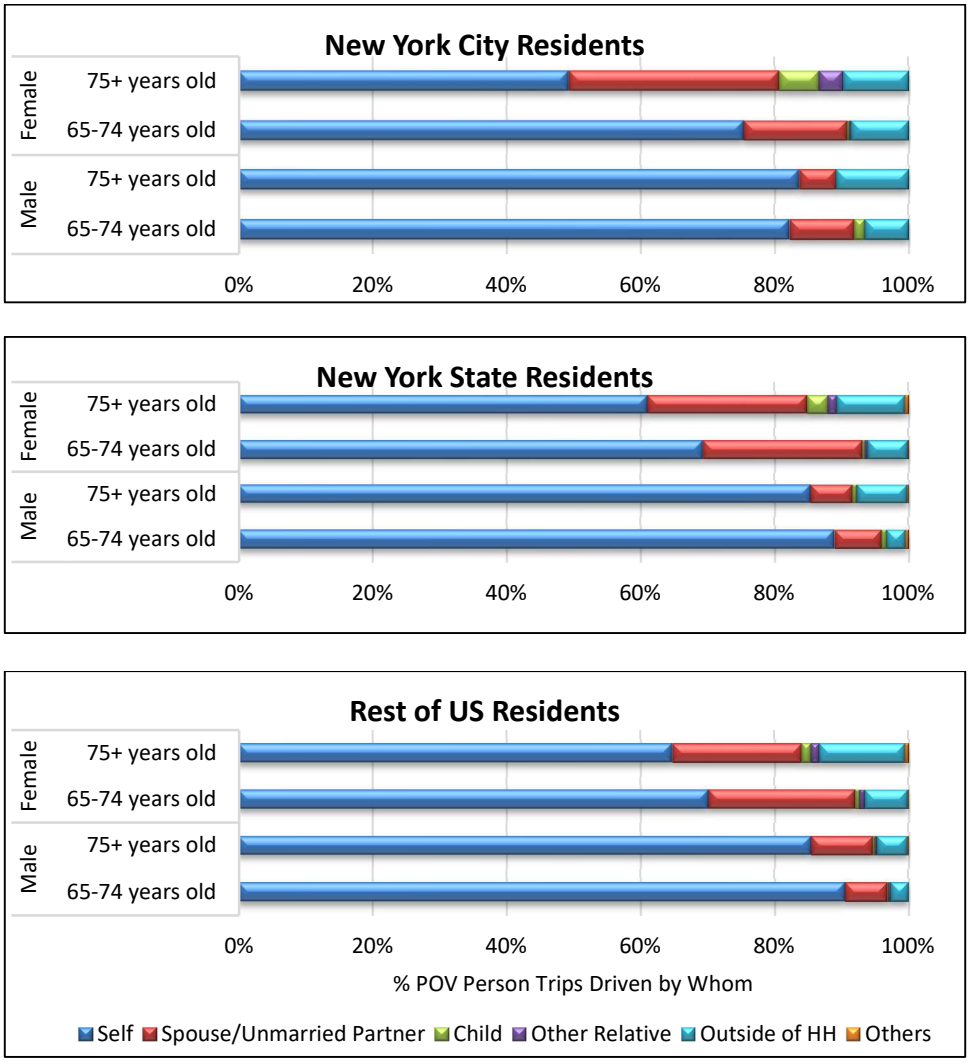


Figure 3-7. Percent person trips taken in a privately owned vehicle by driver type, age, and gender (2017 NHTS).

Within NYS but outside NYC, the percent of person trips taken in POV showed a pattern that was fairly similar to that in the rest of US. Figure 3-8 shows that the percent of POV person-trips driven by spouses was higher among residents in the non-urban area of NYS than those that lived in other urban regions for female groups. Urban or rural, the majority of men continued to drive themselves beyond age 75, resulting in only small reductions from shares of POV person-trips driven by the 65-74 years old age group that lived in the same region.

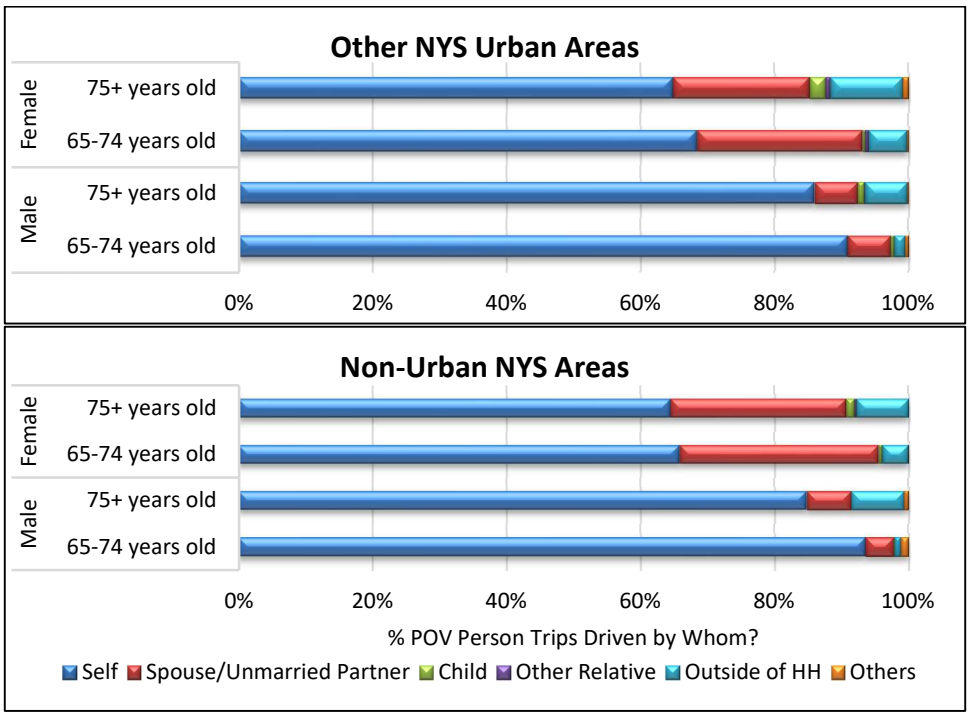
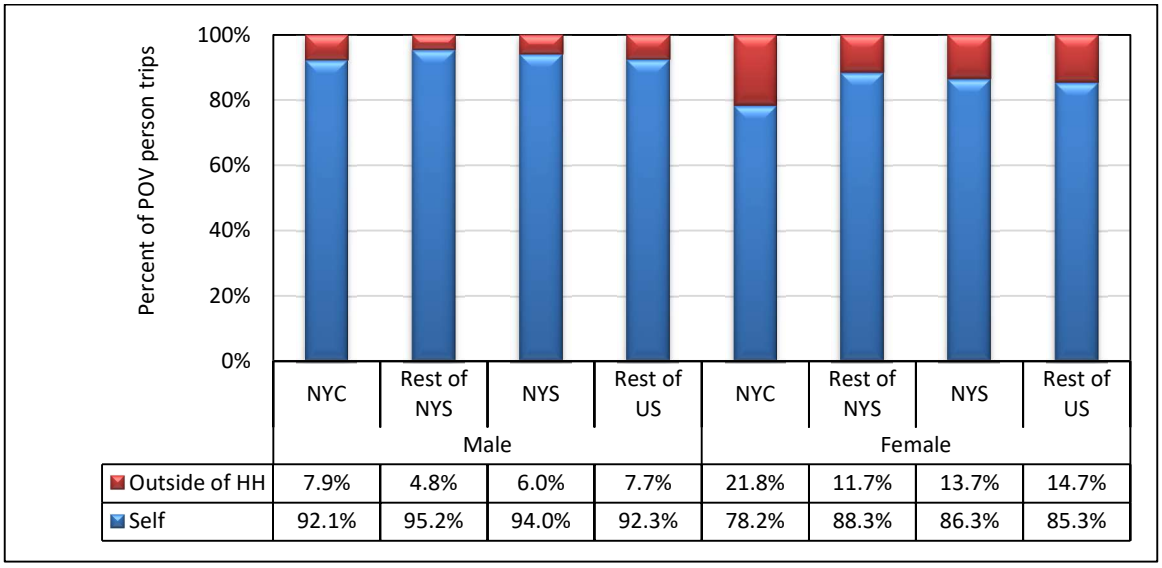


Figure 3-8. Percent person trips taken in POV by driver type, age, and gender for other urban and non-urban regions in NYS (NHTS 2017).

3.1.3.3 Lived-Alone Elderly Households

Person trips taken in POV by the elderly who lived alone, expectedly, relied mostly on their own driving. As seen in Figure 3-9, elderlies who lived alone in NYC were more likely to get outside help for transport than those that lived in the rest of NYS. A gender difference among lived-alone elderlies is clearly visible in all regions.



	Male				Female			
	NYC	Rest of NYS	NYS	Rest of US	NYC	Rest of NYS	NYS	Rest of US
Outside of HH	7.9%	4.8%	6.0%	7.7%	21.8%	11.7%	13.7%	14.7%
Self	92.1%	95.2%	94.0%	92.3%	78.2%	88.3%	86.3%	85.3%

Figure 3-9. Percent of person trips taken in POV by lived-alone elderly household by driver type, gender, and region (2017 NHTS).

3.1.4 Daily Person-Trips by Trip Purpose

Geographic regional differences did not result in any significant impacts on the shares of daily person-trips by trip purpose among the age groups (i.e., elderly or non-elderly). Regardless of age or region of residency, *family and personal business* was the most commonly cited reason for making a daily trip, followed by traveling for a *social and recreational* purpose. As statistics presented in Table 3-1, *family and personal business* trips accounted for over 34% of daily person-trips made by people in the younger age group for all regions, while over 51% of daily person-trips taken by age 65+ years old from those regions were for the exact same reason.

Not surprising, the share of trips made for *earn a living* was another major reason for the younger group, ranging from about 18% to 23% over the three NHTS years in all regions. Travel for work accounted for significantly less shares among the elderly groups in all regions, accounting for 8% or less in daily person-trip shares by region in the three NHTS years. Unlike other regions, share of work trips for elderlies who lived in NYC jumped from 5.5% in 2009 to 8.1% in 2017 (nearly a 48% increase), while the increase was from 17.8% to 22.5% (about 26% increase) for their younger counterparts.

Although age influence in travels for *social and recreational* reasons was not as significant as compared to *family and personal business* trips, higher shares of person-trips made by the elderly group for *social and recreational* reasons can be observed in Table 3-1. The increased shares of *family and personal business* and *social and recreational* trips among elderly groups in all regions could reflect a part of the lifestyle changes for elderly Americans, e.g., a shift away from traveling for work and more time for leisure activities.

Table 3-1. Distribution of daily average person-trips by trip purpose and region; based on 2001, 2009, and 2017 NHTS

Person Trips	New York City			Other Urban NYS Areas			Non-Urban NYS Areas			New York State			Rest of US		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
5-64 Years old															
Daily Trips/Person	**3.57**	**3.59**	**3.29**	**4.00**	**3.93**	**3.34**	**4.14**	**3.56**	**3.02**	**3.83**	**3.75**	**3.29**	**4.22**	**3.9**	**3.41**
Earn a Living	21.7%	17.8%	22.5%	21.0%	21.1%	20.7%	20.3%	22.5%	22.0%	21.2%	19.9%	21.6%	20.5%	20.1%	21.2%
Family & Personal Business	40.9%	42.9%	34.0%	41.5%	40.5%	35.9%	42.8%	41.6%	38.2%	41.4%	41.6%	35.3%	42.4%	40.8%	36.3%
Civic, Educational & Religious	11.6%	10.1%	9.8%	9.4%	10.3%	11.2%	8.9%	8.5%	10.4%	10.2%	10.1%	10.5%	10.2%	10.2%	11.6%
Social & Recreational	24.2%	26.8%	30.0%	26.6%	26.2%	28.1%	26.9%	25.6%	24.3%	25.6%	26.4%	28.6%	25.9%	27.1%	26.7%
Other	1.4%	1.4%	3.8%	1.2%	1.0%	4.0%	0.7%	0.8%	5.0%	1.2%	1.1%	4.0%	0.8%	0.8%	4.2%
Unreported	0.3%	1.0%	0.0%	0.3%	0.9%	0.1%	0.5%	1.1%	0.0%	0.3%	1.0%	0.0%	0.1%	1.0%	0.0%
65+ Years old															
Daily Trips/Person	**2.57**	**2.55**	**2.94**	**3.63**	**3.24**	**3.57**	**3.32**	**3.21**	**3.19**	**3.18**	**2.96**	**3.24**	**3.43**	**3.22**	**3.18**
Earn a Living	4.4%	5.5%	8.1%	4.4%	6.9%	6.6%	6.5%	7.3%	7.5%	4.7%	6.5%	7.3%	4.8%	8.2%	6.7%
Family & Personal Business	58.8%	54.9%	56.6%	57.2%	57.0%	54.3%	56.0%	53.9%	54.9%	57.5%	55.9%	55.3%	56.4%	54.9%	51.1%
Civic, Educational & Religious	7.7%	5.2%	5.4%	5.8%	4.2%	6.0%	5.7%	6.2%	5.0%	6.3%	4.8%	5.7%	6.2%	5.3%	7.0%
Social & Recreational	28.5%	32.3%	26.2%	31.6%	30.3%	30.1%	31.1%	32.1%	29.2%	30.6%	31.2%	28.4%	31.7%	30.4%	31.9%
Other	0.4%	0.9%	3.8%	0.9%	1.1%	3.0%	0.6%	0.0%	3.4%	0.7%	0.9%	3.3%	0.9%	0.5%	3.3%
Unreported	0.3%	1.2%		0.3%	0.6%	0.0%	0.1%	0.5%	0.0%	0.3%	0.8%	0.0%	0.1%	0.8%	0.1%

Note: Highlighted cells (yellow) are estimated on a small sample.

3.1.5 Daily Person-Trips by Time of Travel

Figure 3-10 indicates a strong relationship between the age of the traveler and the time the trip started. A significantly smaller percentage of the trips taken by the elderly started during 6-9 am, when compared with trips made by younger travelers in all regions. Nearly three-quarters of the elderly trips occurred between 9 am to 6 pm, with about 56% made in the time period from 9 am to 3 pm. There was no major regional difference in either age group, although NYC seemed to have slightly more travel activity during the evening and night hours than other regions within the same age group. Conversely, non-urban areas of NYS showed a slightly fewer share of trips during the late hours when compared with other regions within the same age category.

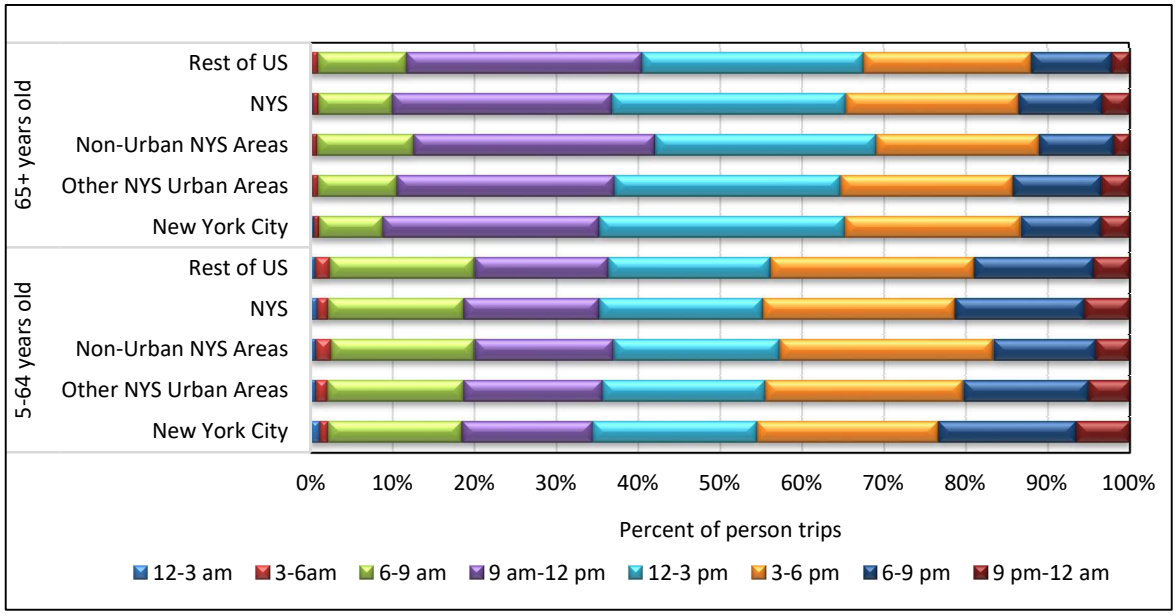


Figure 3-10. Temporal distribution of person trips by time of travel, age group, and region (2017 NHTS).

Regarding starting time of travel by trip purpose in 2017, traveler's age also played a role. This is evident in Figure 3-11. As seen in the distributions by time of the day by purpose, regardless of region, younger travelers generally have a wider spread of travel time than their elderly counterparts who traveled for the same purposes. Elderly travelers tend to start their trips evenly over the daytime hours.

Considering trips made for "earn a living", in NYC, most of the work trips taken by elderly travelers concentrated in two periods, 6-9 am and 3-6 pm, and accounted for about 47% of all commute trips made by the elderly in 2017. Over half of the commute trips made by the younger workers also occurred within the same two time periods. This seemed to be consistent with a typical working schedule for many working Americans. A similar pattern can also be observed in the entire NYS and the rest of NYS as well. Elderly commuters that lived in the rest of the NYS, made a slightly higher percent of work trips during the midday period from 9 am to 3 pm in 2017 and accounted for about 24% of their total commute trips versus 20% for the non-elderly group that lived in the same region. This might suggest elderly workers that lived in the rest of NYS had a more flexible working schedule than their younger counterparts from the same region.

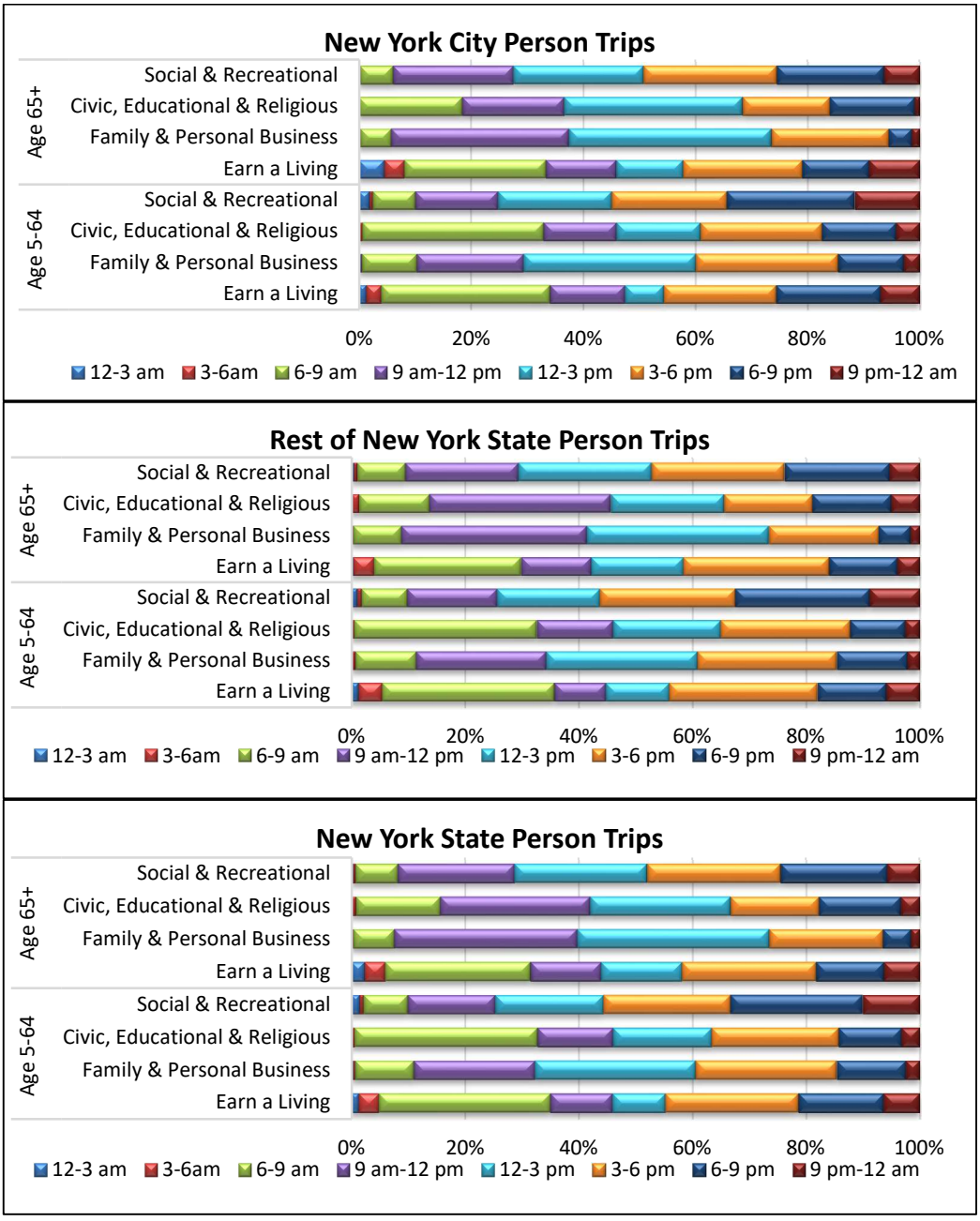


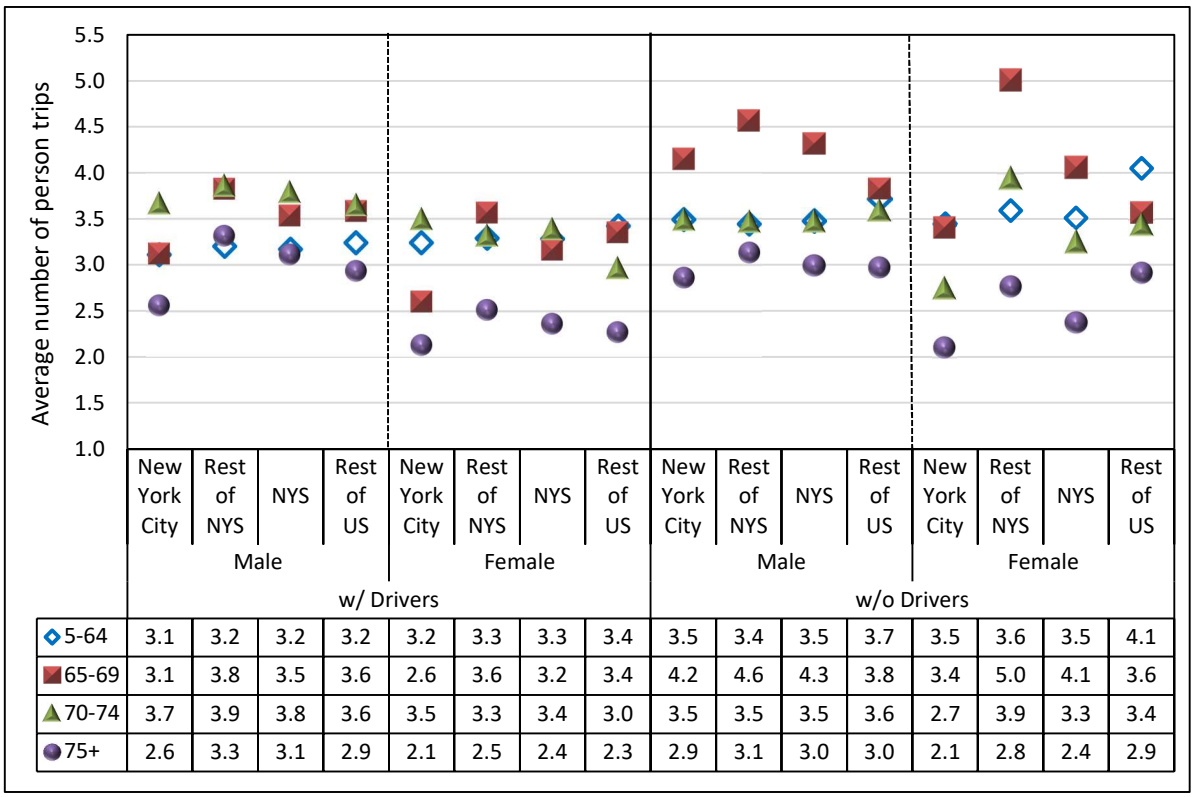
Figure 3-11. Temporal distribution of person-trips by trip purpose and traveler's age (2017 NHTS).

Furthermore, as seen in Figure 3-11, elderly travelers were more likely, than their younger counterparts, to begin their trips between 9 am and 3 pm when conducting *family and personal business* trips. About two-third of *family and personal business* trips were taken in this period by elderly travelers, while only about half of trips taken by the younger group for the same reason were made during this time period. There are no notable regional differences for trips made for this specific purpose, however.

On the other hand, nearly 56% of *social and recreational* trips made by younger travelers that lived in the rest of NYS were conducted after 3 pm, while the same only accounted for about 47% of the trips taken by the elderly living in the same region. This pattern was relatively consistent with statistics from *social and recreational* trips taken by residents of NYC. In general, elderly took *social and recreational* related trips throughout the day, spreading over all hours from 9 am to 9 pm.

3.1.6 Availability of Drivers

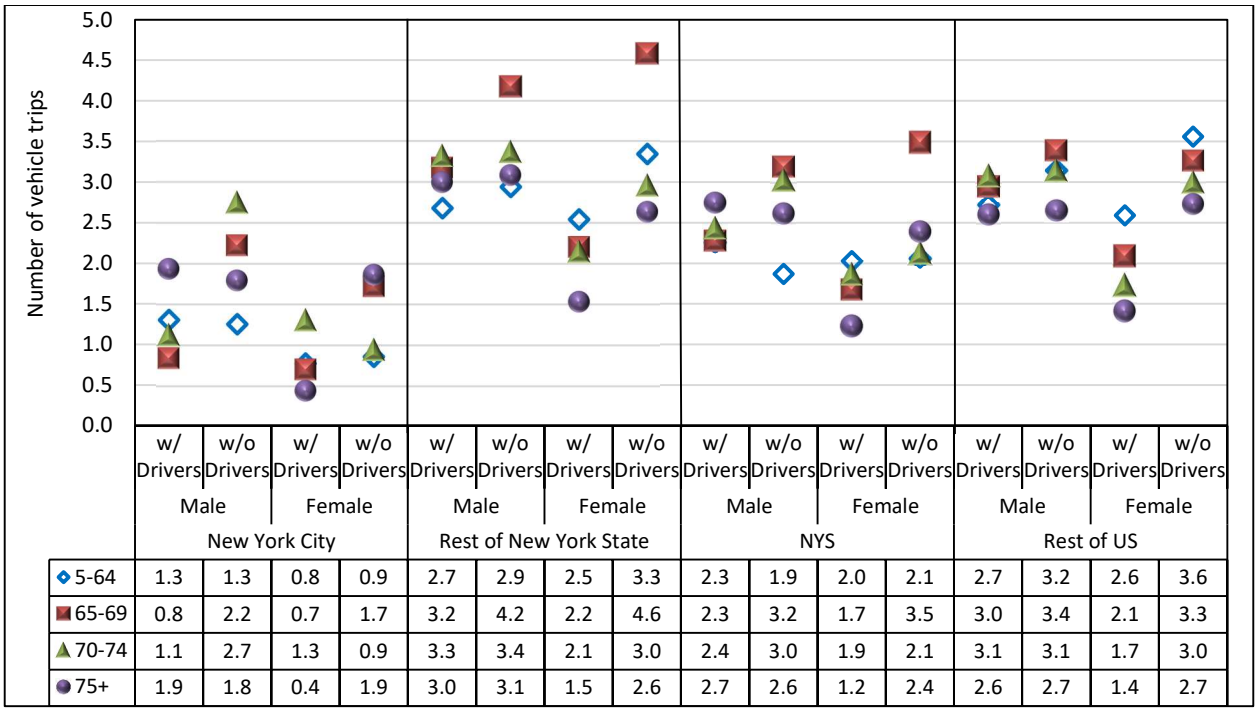
Considering the impact of having other drivers in the household on frequency of travel, Figure 3-12 shows that the daily person trips made by those without other drivers in their household were slightly higher, except for those aged 70-74 years old. In a recent study by Sadeghzaziri and Tawfik, a similar pattern was observed with respect to the presence of other person(s) in the household (not necessarily drivers) (Sadeghvaziri & Tawfik, 2020). The authors found that the number of trips made by elderly decreases with the presence of another person(s) in the household. Nonetheless, as Figure 3-12 shows, the differences among elderly's average trip rates based on the availability of other drivers are not significant in most cases. According to the 2017 NHTS data, New Yorkers who were 65-69 years old and without other drivers in their households made more trips than those have other drivers in their households (23% for males and 28% for females). Moreover, the average daily number of person trips made by people aged 75 and older is noticeably fewer than other age groups, regardless of region, gender, or availability of other drivers in the household.



	Male w/ Drivers				Female w/ Drivers				Male w/o Drivers				Female w/o Drivers			
	New York City	Rest of NYS	NYS	Rest of US	New York City	Rest of NYS	NYS	Rest of US	New York City	Rest of NYS	NYS	Rest of US	New York City	Rest of NYS	NYS	Rest of US
5-64	3.1	3.2	3.2	3.2	3.2	3.3	3.3	3.4	3.5	3.4	3.5	3.7	3.5	3.6	3.5	4.1
65-69	3.1	3.8	3.5	3.6	2.6	3.6	3.2	3.4	4.2	4.6	4.3	3.8	3.4	5.0	4.1	3.6
70-74	3.7	3.9	3.8	3.6	3.5	3.3	3.4	3.0	3.5	3.5	3.5	3.6	2.7	3.9	3.3	3.4
75+	2.6	3.3	3.1	2.9	2.1	2.5	2.4	2.3	2.9	3.1	3.0	3.0	2.1	2.8	2.4	2.9

Figure 3-12. Average daily person trips per person by age, gender, and availability of other drivers in the household (2017 NHTS).

When measured by average vehicle trips per driver, as presented in Figure 3-13, drivers from NYC clearly made fewer vehicle trips than drivers who lived outside NYC, signifying a regional difference. The change of average daily vehicle trips due to the availability of other drivers in the household is most visible among females who lived outside NYC, regardless of their ages. Specifically, based on 2017 NHTS data, the average daily vehicle trip rates for females who lived outside NYC and without other drivers in their households were higher than those having other drivers in the household. Unfortunately, as shown in Figure 3-14, due to wider margins of errors on vehicle trip rates estimated for NYC, the impact from availability of other drivers in the household is inconclusive for all NYC female age groups. For males, an effect on vehicle trip rates due to the availability of other drivers in the household also exhibited for those in the age groups of 65-69 and 70-74 years old drivers from NYC. Due to wider margin of errors (0.5 for without drivers in their household and 1.4 for with drivers in their household), the impact on 65-69 males was not significant, however. No other significant impacts from the availability of other drivers in the household were observed.



	New York City				Rest of New York State				NYS				Rest of US			
	Male		Female		Male		Female		Male		Female		Male		Female	
	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers	w/ Drivers	w/o Drivers
5-64	1.3	1.3	0.8	0.9	2.7	2.9	2.5	3.3	2.3	1.9	2.0	2.1	2.7	3.2	2.6	3.6
65-69	0.8	2.2	0.7	1.7	3.2	4.2	2.2	4.6	2.3	3.2	1.7	3.5	3.0	3.4	2.1	3.3
70-74	1.1	2.7	1.3	0.9	3.3	3.4	2.1	3.0	2.4	3.0	1.9	2.1	3.1	3.1	1.7	3.0
75+	1.9	1.8	0.4	1.9	3.0	3.1	1.5	2.6	2.7	2.6	1.2	2.4	2.6	2.7	1.4	2.7

Figure 3-13. Average daily vehicle trips by age, gender, and availability of other drivers in the household (2017 NHTS).

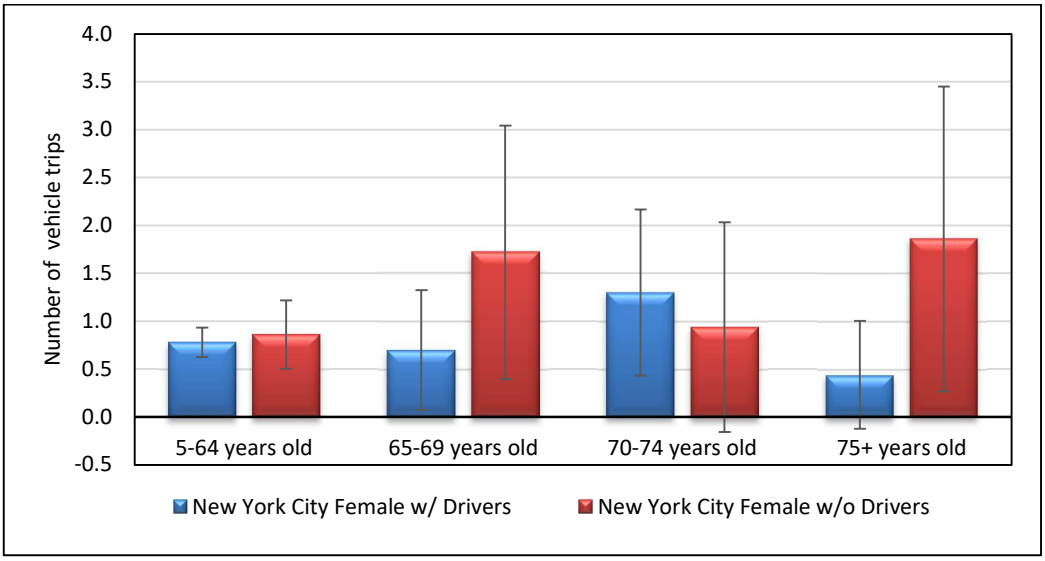


Figure 3-14. Average daily vehicle trips by age and availability of other drivers in the household for female population in NYC (2017 NHTS).

3.1.7 Zero-Vehicle Household Effect on Travel

Generally speaking, elderly households with zero-vehicles were more likely to fall into the low-income category. This is clearly demonstrated using reported 2017 NHTS data as shown in Figure 3-15. While nearly half of NYC's zero-vehicle elderly households were in the low-income category (defined as having an annual income of less than $25,000) in 2017, this share is much higher for zero-vehicle elderly households living elsewhere outside NYC. Specifically, the share of low-incomes among zero-vehicle elderly households lived in rural areas of NYS was nearly 90%, and about 70% for those lived in other NYS urban areas. In fact, many of the NYC elderly households did not own vehicles regardless of their income levels. Based on 2017 NHTS data, nearly 13% zero-vehicle elderly households in NYC were in the over $75,000 income group (6% for $75-100,000 and 7% for over $100,000), versus 2% in the rest of US. There is a general decreasing pattern in the shares of low-income (under $25,000 annually) zero-vehicle elderly households over time from 2001 to 2017.

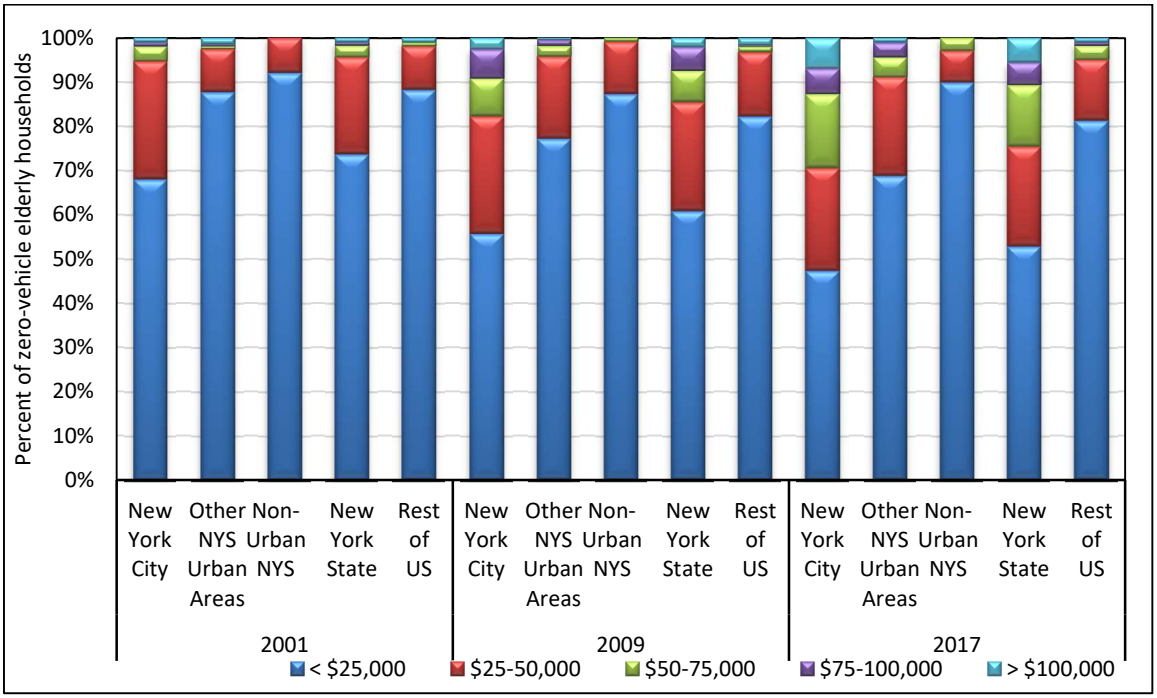


Figure 3-15. Distribution of zero-vehicle elderly households by income level and region (2001, 2009, & 2017 NHTS).

Figure 3-16 shows that when compared to non-elderly, zero-vehicle households, zero-vehicle elderly households have a higher share of lowest income group (under $25,000). This is more so for zero-vehicle households that resided in NYC. In the 2017 NHTS, for example, about 47% of NYC zero-vehicle elderly households that reported their household incomes were in the less than $25,000 group, while only about 29% of their non-elderly counterparts were in the same category. Correspondingly, zero-vehicle elderly households have a lower share of highest income groups (>$100,000) in NYC. Regardless of region or age groups, shares of zero-vehicle households in the lowest income groups declined over the last three NHTS surveys, except the relatively stable pattern for the non-elderly households lived in the rest of NYS.

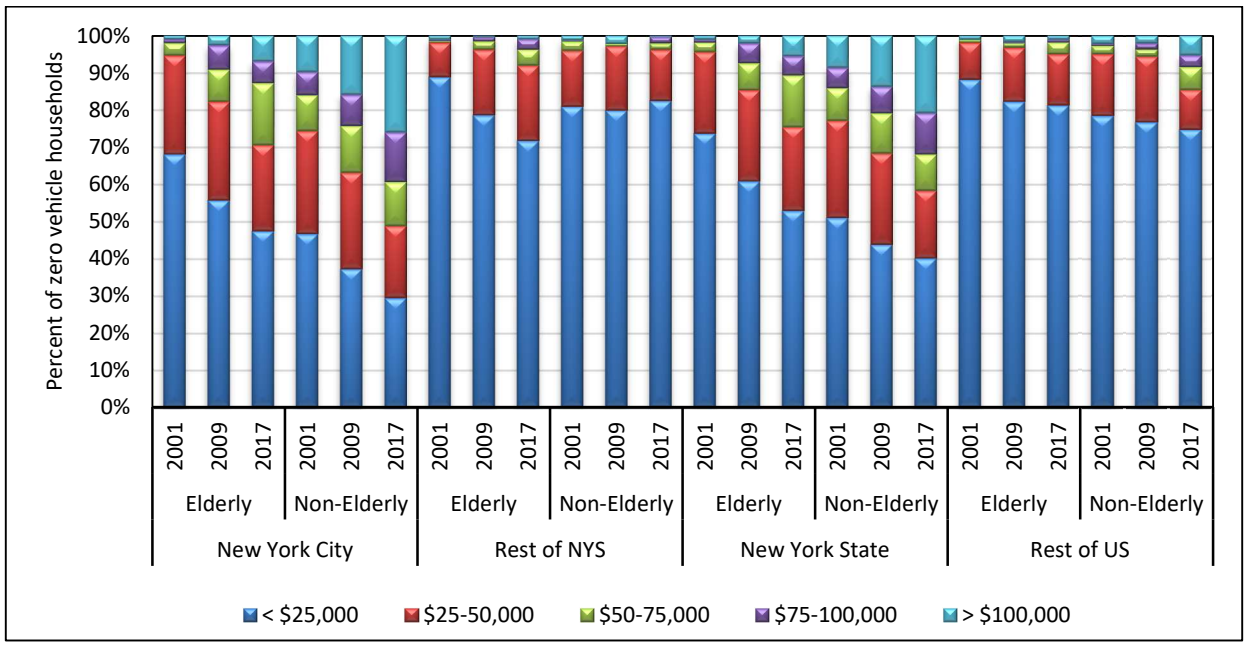


Figure 3-16. Distribution of household income for zero-vehicle households by age group and region.

Prior to 2017, there was a relatively high degree of missing data due to unreported responses to the household income survey questions. As summarized in Table 3-2, an improvement on this specific data element is clearly visible for the 2017 survey. The missing data rates in 2017 dropped significantly from prior surveys to about 5% or less among all regions. The statistics in Figure 3-16 were based on readjusted shares, assuming equally distributed unreported cases (i.e., respondents in all income levels have an equal chance of not reporting this data). However, this assumption might not necessarily be realistic. Users of this income data should bear this limitation in mind when interpreting associated statistics.

Table 3-2. Percent of unreported income for zero-vehicle households by region and year

Year	New York City	Other NYS Urban Areas	Non-Urban NYS Areas	NYS	Rest of US
2017	5.4%	4.5%	2.9%	5.2%	5.3%
2009	10.3%	12.6%	9.3%	10.6%	11.9%
2001	14.5%	16.3%	10.4%	14.6%	14.4%

In terms of person-trip rates, zero-vehicle elderly households made fewer trips than those who owned a vehicle regardless of where they lived. The difference between owning a vehicle and not owning one for elderly households was less substantial among those who lived in NYC, especially in 2017. As summarized in Figure 3-17, of those that owned a vehicle, elderly households in NYC made slightly fewer numbers of trips on average than those that lived in other regions. In 2017, for instance, NYC elderly households that owned a vehicle took an average of 3.1 person-trips while those that lived in other regions made an average of 3.3 or more person-trips in a day. On the contrary, zero-vehicle elderly households in NYC made more daily person-trips than those that lived outside the NYC—at an average of 2.7 person-trips per day for NYC in 2017 compared to about 2.4 or fewer trips per day for those that lived elsewhere during the same year. This pattern holds for 2001 and 2009. Overall, the person-trip rates by

zero-vehicle elderly households increased from 2001 to 2017 for all regions, while the person-trip rates made by those who owned a vehicle stayed about the same.

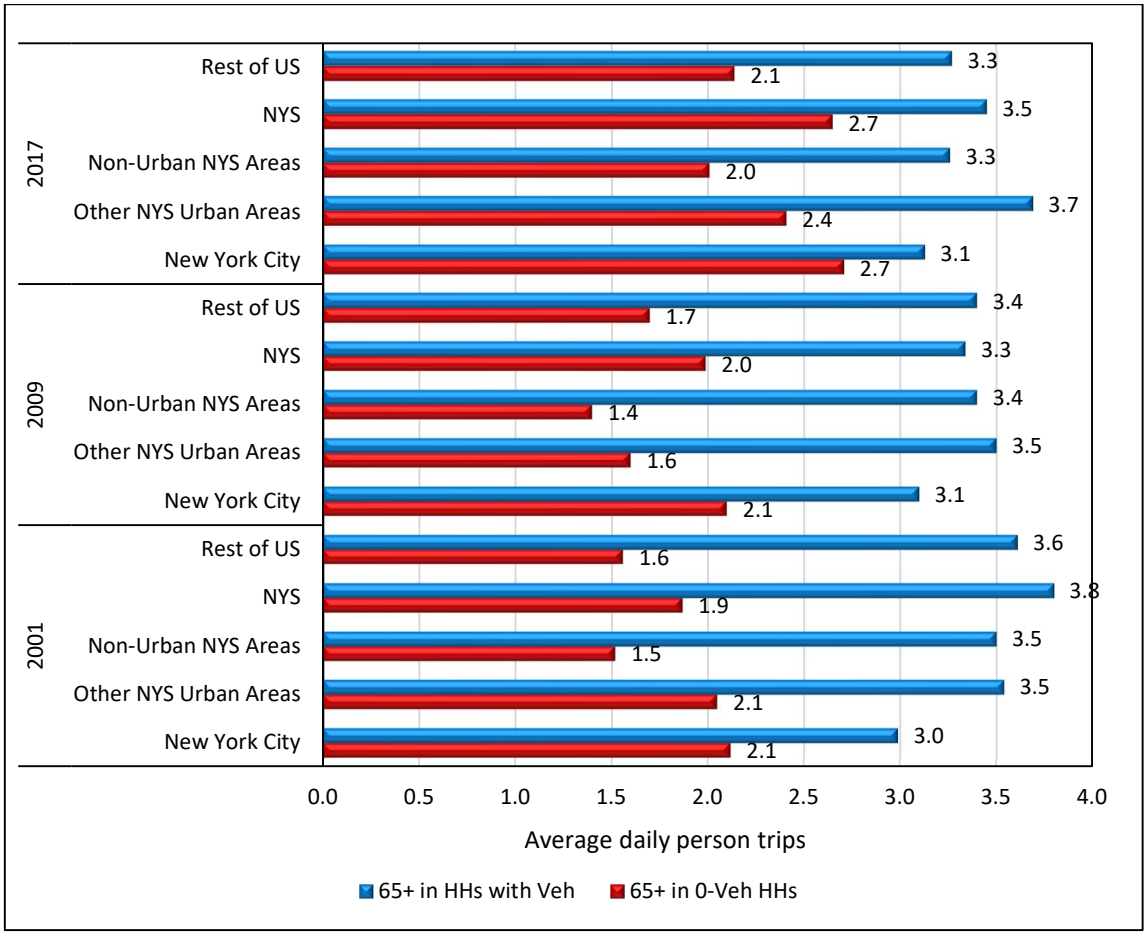
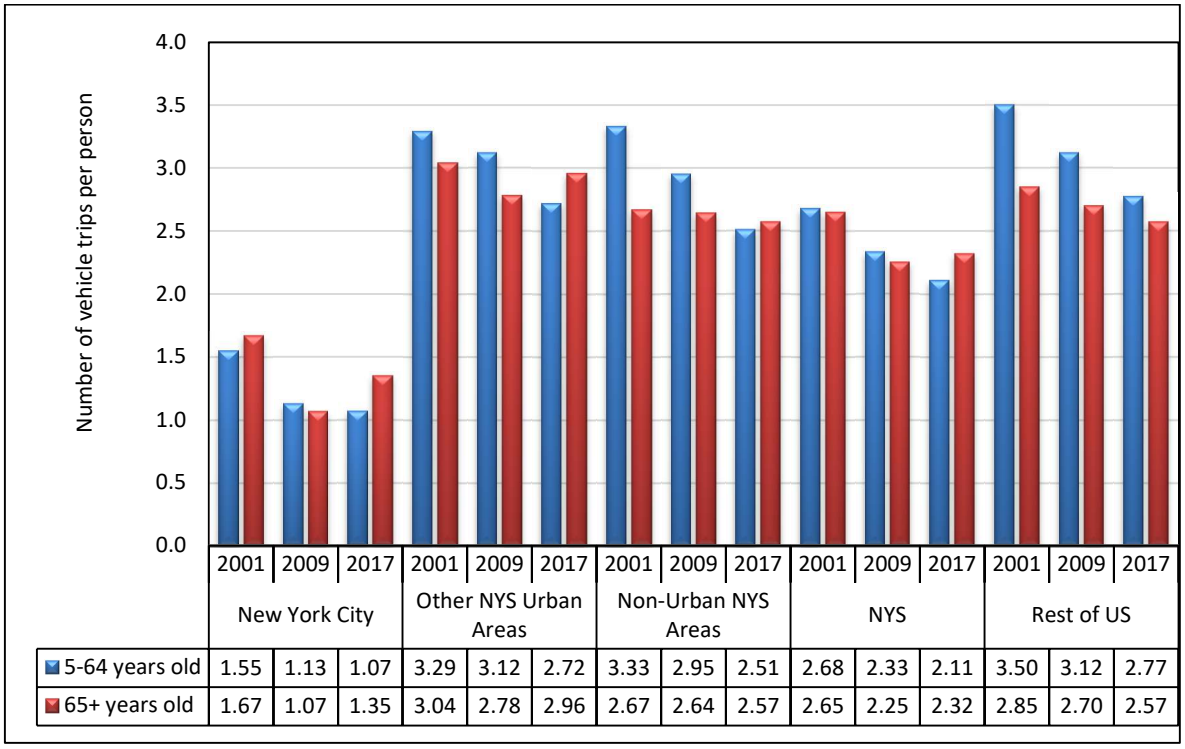


Figure 3-17. Impact of owning a vehicle on the average trip rates of elderly households, by region and over time (2001, 2009, and 2017 NHTS).

3.2 VEHICLE TRAVEL

3.2.1 Average Daily Vehicle-Trip Rate

When limited to vehicle travel only (i.e., trips made by POV), again, NYC residents made significantly fewer trips than those that lived elsewhere. Figure 3-18 shows that on average an NYC elderly person made about 1.4 daily vehicle trips in 2017, while elderly residents elsewhere made over 2.5 vehicle trips per day in the same year. In 2017, the NYS elderly took a slightly higher number of vehicle trips per day than their younger counterparts from the same region. Outside NYS, however, a typical elderly person took slightly fewer vehicle trips per day in 2017 than a younger person from that same region. Regardless of the region, a declining trend in the average number of daily vehicle trips from 2001 to 2017 can be observed in Figure 3-18 among non-elderly residents. A similar trend can also be seen among elderly groups who lived in non-urban NYS or outside NYS over three NHTS years. Average vehicle trips made by the elderly population in NYC, as well as those from the NYS urban areas, increased slightly from their 2009 levels.

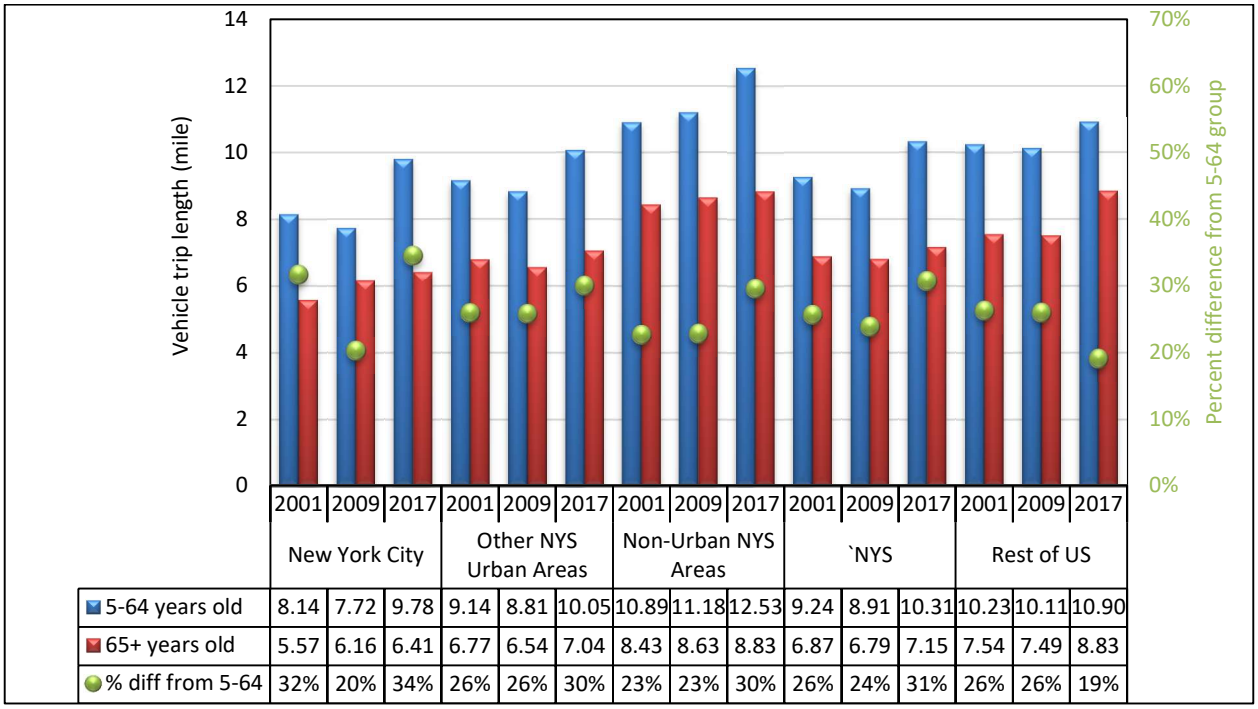


	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			NYS			Rest of US		
5-64 years old	1.55	1.13	1.07	3.29	3.12	2.72	3.33	2.95	2.51	2.68	2.33	2.11	3.50	3.12	2.77
65+ years old	1.67	1.07	1.35	3.04	2.78	2.96	2.67	2.64	2.57	2.65	2.25	2.32	2.85	2.70	2.57

Figure 3-18. Average daily vehicle trips by age group and region (2001, 2009, 2017 NHTS data).

3.2.2 Average Vehicle-Trip Length

Similarly, when examining average daily travel distances for trips made in POV (in terms of vehicle trips), Figure 3-19 revealed that the elderly in all regions typically made shorter vehicle trips than their younger counterparts. Average daily travel distances in a vehicle were longer for residents that lived in rural regions of NYS, particularly on trips taken by the younger population. Given a generally wider spread of activity centers (e.g., shopping locations, schools, or churches) for residents in non-urban areas (i.e., rural), driving farther distance to conduct their daily business was expected. The percent reduction in trip length due to age difference was also included in Figure 3-19. Elderly generally traveled shorter distances, by vehicle, than their younger neighbors. On average, the trip made by a non-elderly person is 31% shorter than those made by an elderly person in NYS. The difference is about 19% in the rest US. Overall, the average travel distances by vehicle in 2017 increased from their 2009 level, regardless of the region.



	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			`NYS			Rest of US		
5-64 years old	8.14	7.72	9.78	9.14	8.81	10.05	10.89	11.18	12.53	9.24	8.91	10.31	10.23	10.11	10.90
65+ years old	5.57	6.16	6.41	6.77	6.54	7.04	8.43	8.63	8.83	6.87	6.79	7.15	7.54	7.49	8.83
% diff from 5-64	32%	20%	34%	26%	26%	30%	23%	23%	30%	26%	24%	31%	26%	26%	19%

Figure 3-19. Average daily vehicle trip length by age and region (2001, 2009 and 2017 NHTS).

3.2.3 Vehicle-Trips by Time of Travel

As in the temporal analysis on patterns of person-trips discussed under section 3.1.5, distributions of vehicle trips by time of the day for elderly drivers in NYS were compared to those of their corresponding younger driver group. Figure 3-20 shows that, no matter where they lived, elderly drivers were more likely to make vehicle trips during the period from 9 am to 6 pm. Vehicle travel by the younger drivers, on the other hand, is spread more evenly across the day from 6 am to 9 pm. Furthermore, younger drivers in all regions consistently took more vehicle trips during the evening hours (6 pm to midnight) than their elderly counterparts in all three NHTS years. There was no noticeable difference in the temporal patterns presented in Figure 3-20 over the three NHTS years.

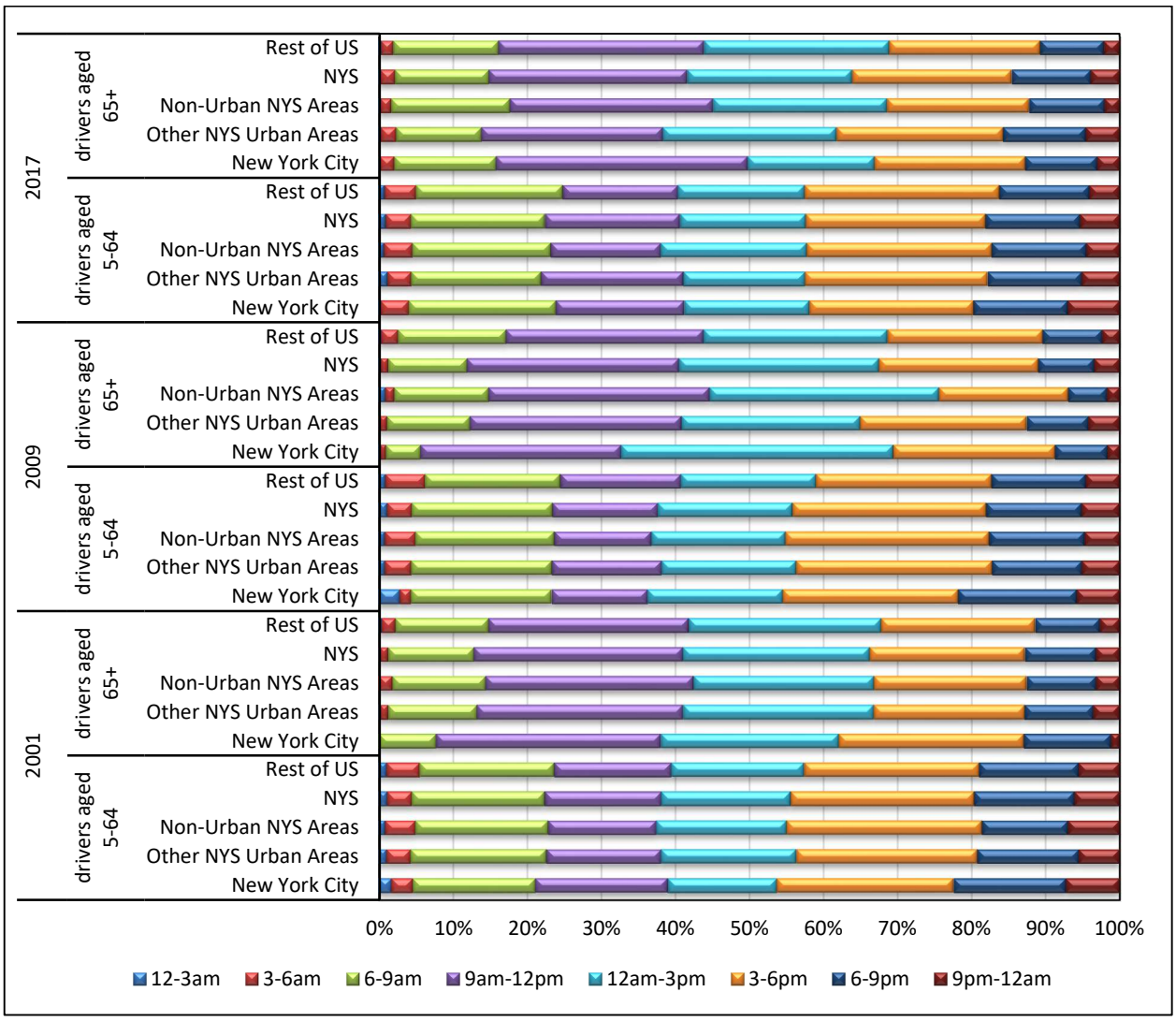


Figure 3-20. Temporal distribution of vehicle trips by driver age and region (2001, 2009, & 2017 NHTS).

3.2.4 Average Vehicle-Trips per Driver by Purpose

Table 3-3 shows the distributions of daily average vehicle trips per driver by trip purpose and age groups. The most commonly cited reason for drivers making a daily vehicle trip was to conduct *family and personal business* activities. This is true regardless of the drivers ages or where they lived. Expectedly, *earn a living* among younger drivers accounted for higher shares of vehicle trips than those of the elderly drivers in the same regions. Work-related vehicle trips accounted for less than 10% of daily vehicle trips made by elderly drivers in 2017 in all regions, which is significantly lower than the 27 to 30% shares among younger drivers. On the other hand, elderly drivers made over 25% of their daily vehicle trips for *social and recreational* activities.

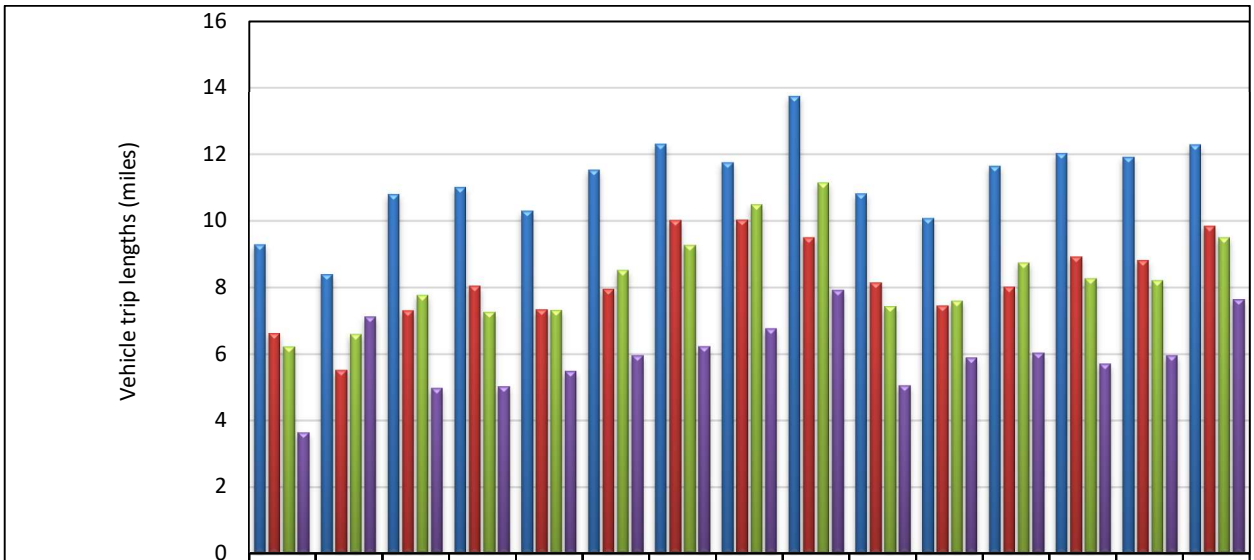
Table 3-3. Distribution of daily average vehicle-trips by trip purpose and region (2001, 2009, and 2017 NHTS)

Vehicle Trips	New York City			Other Urban NYS Areas			Non-Urban NYS Areas			New York State			Rest of US		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
5-64 Years old															
Daily VT/Driver	**1.55**	**1.13**	**1.07**	**3.29**	**3.12**	**2.72**	**3.33**	**2.95**	**2.51**	**2.68**	**2.33**	**2.11**	**3.50**	**3.12**	**2.77**
Earn a Living	27.6%	19.6%	26.8%	28.7%	28.7%	28.6%	29.5%	31.0%	31.5%	28.6%	27.3%	28.6%	28.8%	28.3%	29.6%
Family & Personal Business	48.9%	55.0%	42.6%	46.5%	45.7%	41.0%	47.3%	44.9%	41.4%	47.1%	47.4%	41.4%	46.4%	45.1%	40.7%
Civic, Educational & Religious	3.8%	3.3%	2.9%	4.1%	4.9%	4.1%	3.2%	3.8%	3.2%	3.9%	4.4%	3.8%	4.8%	4.9%	5.0%
Social & Recreational	18.4%	20.3%	23.4%	20.1%	19.6%	22.8%	19.4%	19.3%	19.6%	19.6%	19.7%	22.5%	19.5%	20.5%	21.0%
Other/ unreported	1.3%	1.8%	4.3%	0.7%	1.1%	3.5%	0.6%	1.1%	4.3%	0.9%	1.2%	3.7%	0.6%	1.2%	3.6%
65+ Years old															
Daily VT/Driver	**1.67**	**1.07**	**1.35**	**3.04**	**2.78**	**2.96**	**2.67**	**2.64**	**2.57**	**2.65**	**2.25**	**2.32**	**2.85**	**2.70**	**2.57**
Earn a Living	5.4%	6.2%	8.2%	5.5%	7.8%	8.3%	9.0%	10.0%	9.3%	6.1%	7.9%	8.4%	6.2%	10.7%	8.7%
Family & Personal Business	66.6%	59.0%	54.9%	61.4%	59.8%	58.9%	58.6%	56.3%	58.2%	61.7%	59.2%	58.0%	60.5%	57.8%	55.4%
Civic, Educational & Religious	4.2%	4.5%	5.5%	5.6%	4.4%	5.6%	6.1%	5.8%	5.4%	5.5%	4.6%	5.6%	6.1%	5.1%	6.6%
Social & Recreational	23.8%	29.1%	28.6%	26.7%	27.2%	25.1%	25.9%	27.6%	24.9%	26.1%	27.5%	25.8%	26.6%	25.6%	26.7%
Other/ unreported		1.2%	2.8%	0.8%	0.8%	2.1%	0.5%	0.2%	2.2%	0.6%	0.8%	2.3%	0.6%	0.8%	2.7%

Note: Highlighted cells (yellow) are estimated on a small sample.

3.2.5 Age and Gender Effects on Average Vehicle-Trip Length

Similar to average person-trip length, NYC residents on average traveled fewer miles by vehicle than those from other regions. Not surprisingly, those who lived in rural areas typically drove a little farther than others. As shown in Figure 3-21, there were also gender and age influences on the average vehicle-trip length. Elderly male residents traveled shorter distances by vehicle than their younger counterparts did—typically about 2 to 3 fewer miles per trip on average. Comparing between genders, in most cases, vehicle trips taken by males tend to be 1 to 4 miles longer on average per trip than females in the same age group, regardless of the regions and survey years. Elderly women traveled the least in terms of miles, on average, in all regions during 2017.



	New York City			Other NYS Urban Areas			Non-Urban NYS Areas			NYS			Rest of US		
	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017	2001	2009	2017
Male 5-64 years	9.3	8.4	10.8	11.0	10.3	11.5	12.3	11.8	13.7	10.8	10.1	11.6	12.0	11.9	12.3
Male 65+ years	6.6	5.5	7.3	8.0	7.3	8.0	10.0	10.0	9.5	8.1	7.5	8.0	8.9	8.8	9.8
Female 5-64 years	6.2	6.6	7.8	7.3	7.3	8.5	9.3	10.5	11.1	7.4	7.6	8.7	8.3	8.2	9.5
Female 65+ years	3.6	7.1	5.0	5.0	5.5	6.0	6.2	6.8	7.9	5.1	5.9	6.0	5.7	6.0	7.6

Figure 3-21. Average length of vehicle trips by age, gender, and region (2001, 2009 & 2017 NHTS).

3.3 SIZE OF TRAVEL PARTY ON TRIPS INVOLVING ELDERLY

To address the question of whether elderly traveled alone, in pairs, or in larger groups when they made trips in 2017, information associated with travel party size (i.e., the number of people traveling on the same trip) collected in the NHTS was analyzed. As shown in Figure 3-22, about 90% or more of person trips made by elderly travelers in all regions, and in the past 14 years, were made by travel party of one or two. Specifically, single-travelers accounted for over half of elderly person-trips in all regions during 2017, especially in NYC where over 70% of elderly female person trips were made by those who traveled alone and 60% for their male counterparts. Outside NYC, the shares of elderly person-trips by travel party size in the 2017 NHTS were

similar among all regions, with about half of person-trips made by elderly traveling alone and another 35 to 40% were accompanied by another person.

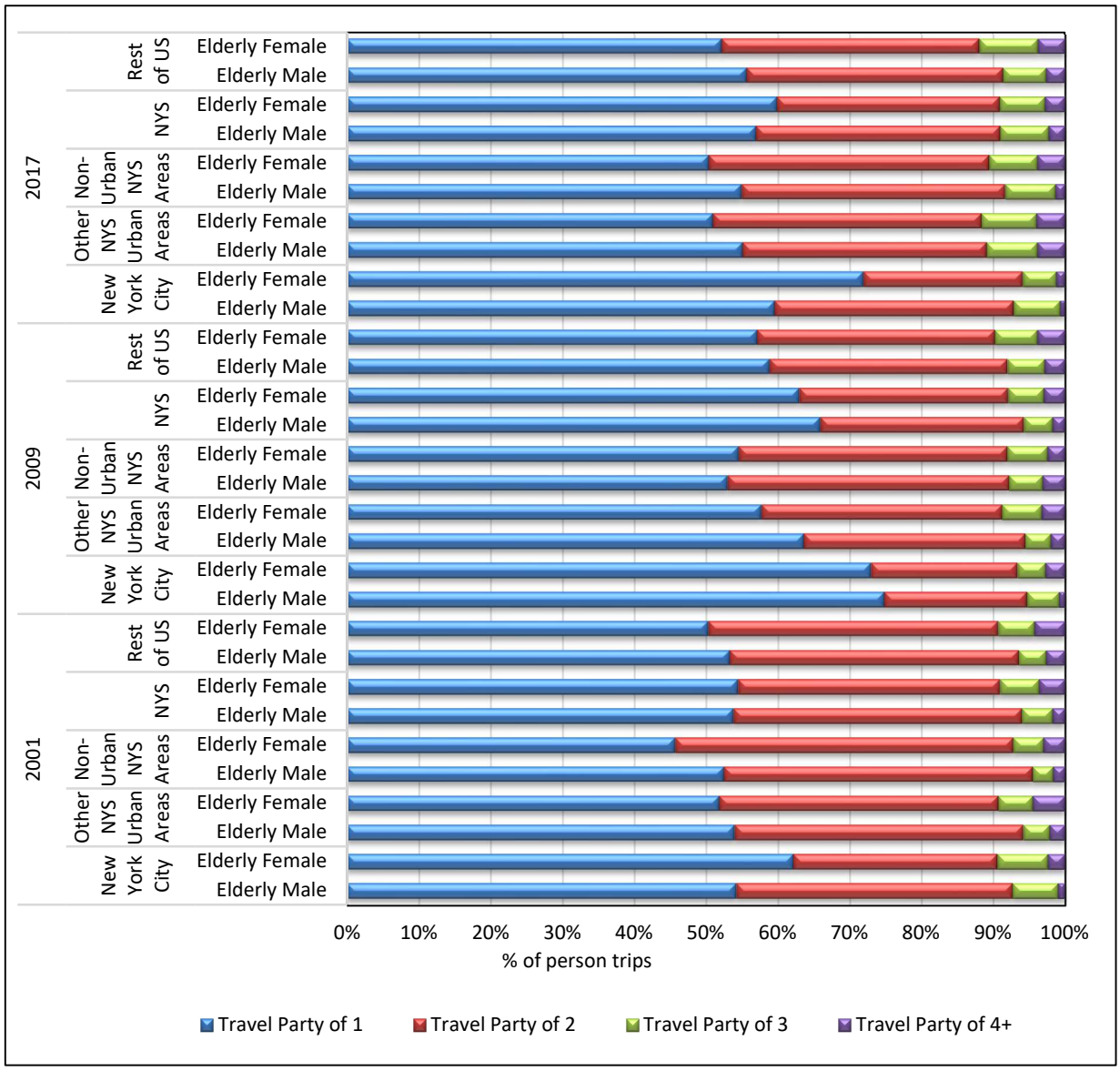


Figure 3-22. Percent of elderly person trips by gender and travel party size (2001, 2009, 2017 NHTS).

In terms of person-miles traveled (PMT) shown in Figure 3-23, it is visible that the shares of single elderly traveler were not as high as those shown in Figure 3-22. This reflects that elderly person took shorter distance trips when traveling alone. In 2017, the shares of PMT made by elderly females from NYS and traveled alone are slightly higher compared to their elderly male counterparts from the same residents. Elderly residents of NYS also have noticeable higher shares of PMT for traveling alone, as compared to their counterparts living elsewhere in the country.

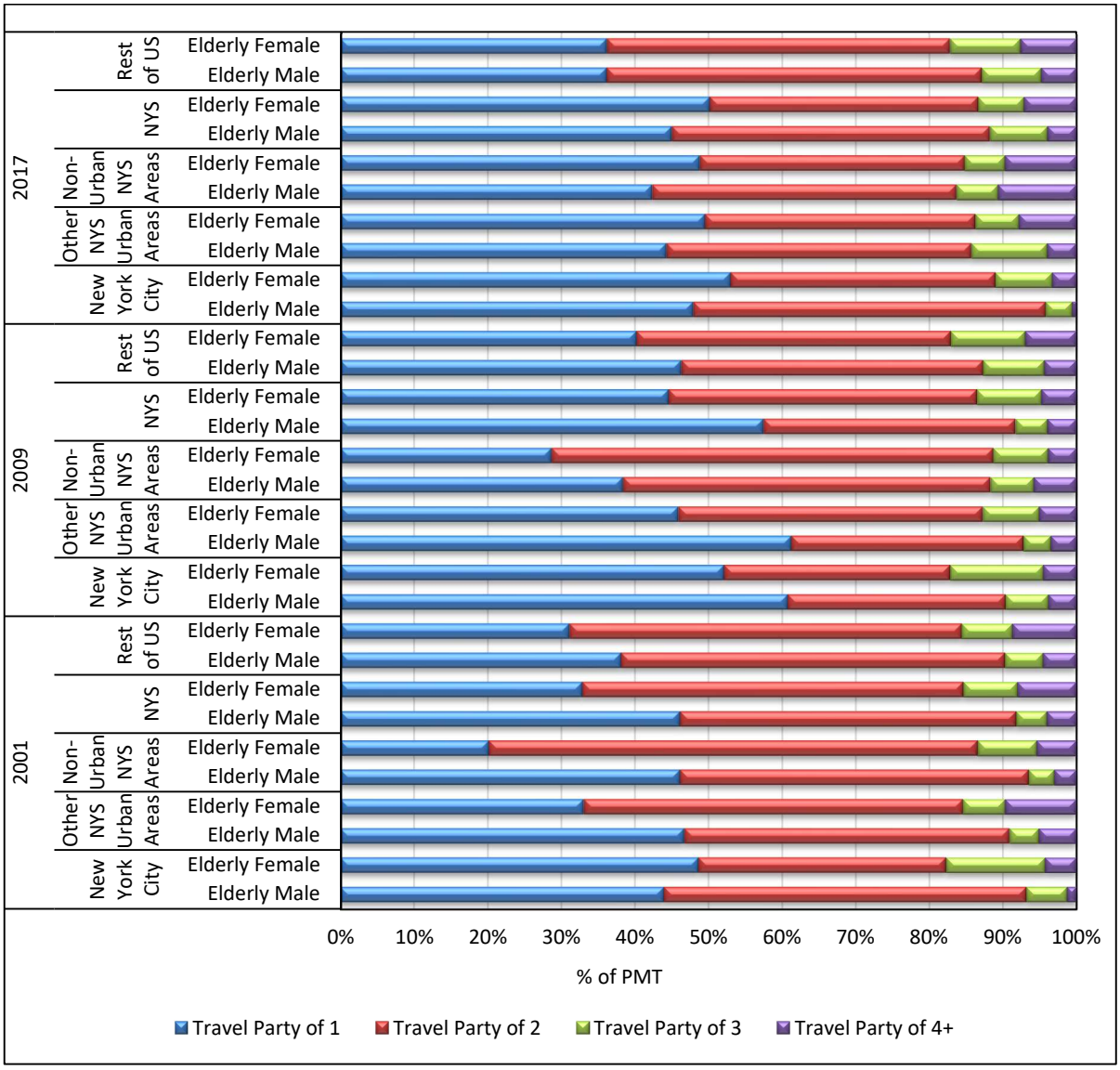


Figure 3-23. Percent of elderly person-mile traveled by gender and travel party size (2001, 2009, 2017 NHTS).

When looking at shares of vehicle trips, elderly females were more likely to drive alone than elderly males from the same region (Figure 3-24) regardless of where they lived over the three NHTS years. Correspondingly, elderly males were more likely to travel in parties of two, as measured by vehicle trips, than elderly females. The NYC elderly males, specifically, were noticeably less likely to make vehicle trips on their own than those who lived elsewhere.

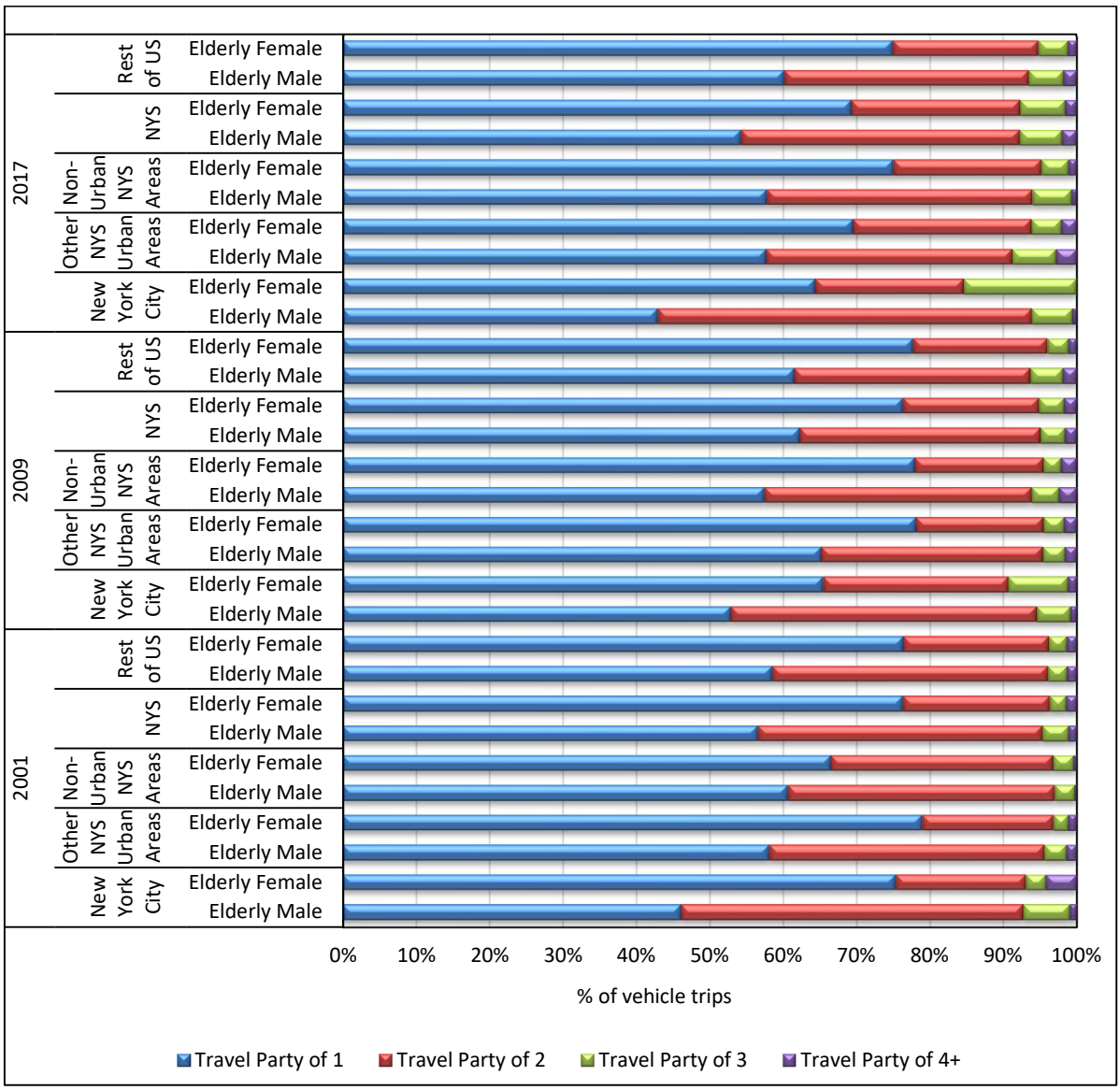


Figure 3-24. Percent of elderly vehicle trips by gender and travel party size (2001, 2009, & 2017 NHTS).

In most cases, the vehicle miles traveled (VMT) share pattern was more similar to the vehicle trips compared to those observed between the PMT and person trips discussed above. Figure 3-25 shows that, elderly females were more likely to have higher VMT shares of traveling alone than their male counterparts did during 2017, in all regions except for those lived in other NYS urban areas. Results displayed in Figure 3-25 indicate that traveling alone or with another person among elderly populations accounted for 90% or more of their respective total VMT in nearly all regions.

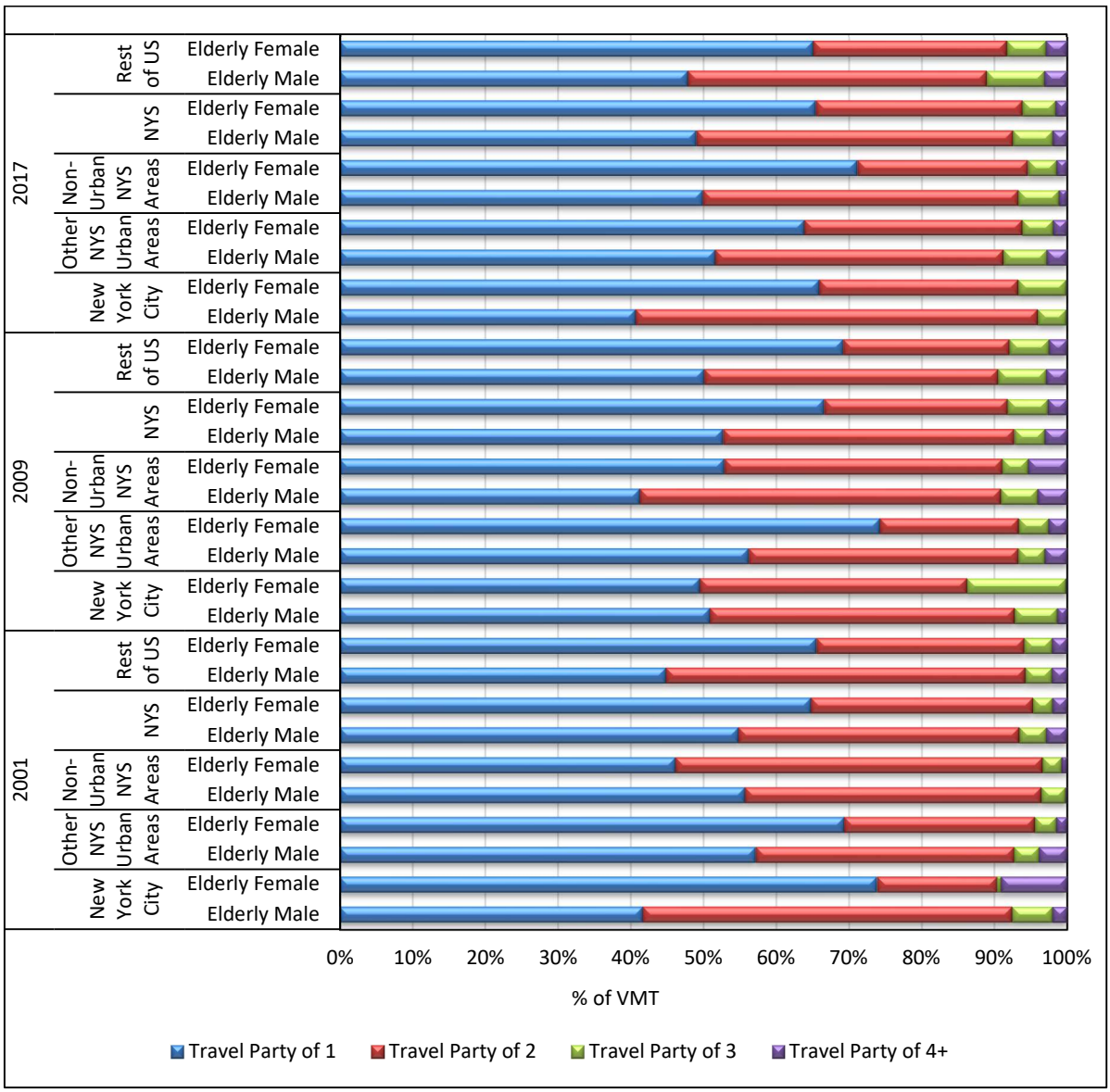


Figure 3-25. Percent of elderly VMT by gender and travel party size (2001, 2009, & 2017 NHTS).

4. TRAVEL CHALLENGES FOR ELDERLY WITH MEDICAL CONDITIONS

4.1 NHTS DATA ASSOCIATED WITH MEDICAL CONDITIONS

Under the 2017 NHTS, survey respondents were asked the question of "*Do you have a condition or handicap that makes it difficult to travel outside of the home?*" If one answers "yes" to that question, two follow-up questions: "*How long have you had this condition?*" and "*Do you use any of the following (medical devices)?*" were then asked. Specifically, survey respondents can choose one of the 3 choices for the "how long" question: 6 months or less, more than 6 months, and all your life. The medical devices listed for selections (multiple choices) include cane, walker, white cane, seeing-eye dogs, crutches, motorized scooter, manual wheelchair, motorized wheelchair, something else, and none of above.

In addition to the above questions, participants who answered "yes" to the initial question were also asked to select from a list of travel limitations caused by having such a medical condition. This multiple-choice question includes the following options:

- Reduced day-to-day travel
- Given up driving altogether
- Limited driving to daytime
- Asked others for rides
- Used the bus or subway less frequently
- Used special transportation services such as Dial-A-Ride
- Used a reduced fare taxi
- None of the above

Note that survey respondents who are 80+ years old were all received this last question (i.e., travel limitations), regardless of whether they have a medical condition or not.

4.2 TRAVEL ISSUES FOR ELDERLY WITH MEDICAL CONDITIONS

Using 2017 NHTS data collected from those health-related questions, travel behaviors of elderly New Yorkers with medical conditions are further examined. This section examines to understand the demographics of these elderly population and how medical conditions affect their travel behaviors.

According to 2017 NHTS, 25% of the NYS elderly population reported having health issues that affect their travel decisions (Figure 4-1). Figure 4-1 shows a noticeable difference in the percent of persons with medical conditions between elderly & non-elderly (person aged 5-64) populations in NYS. Depending on geographic regions, about 5-10% of the non-elderly population reported having medical conditions, versus 21-29% among the elderly population, in 2017. Compared to elderly residents of other regions, a slightly higher proportion of NYC elderly residents reported having health issues. Furthermore, Figure 4-2 shows that 56% of those who reported having medical conditions in NYC were elderly population. The percentages were much lower in regions outside NYC, especially in the non-urban NYS areas, where 30% of those reported as having medical conditions were elderlies.

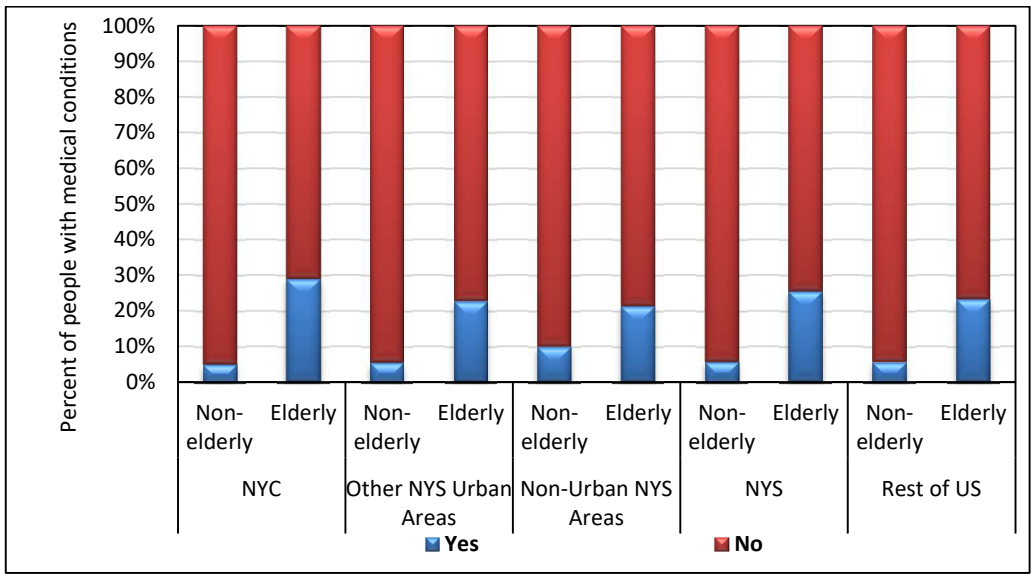


Figure 4-1. Distributions of the population with medication conditions (2017 NHTS).

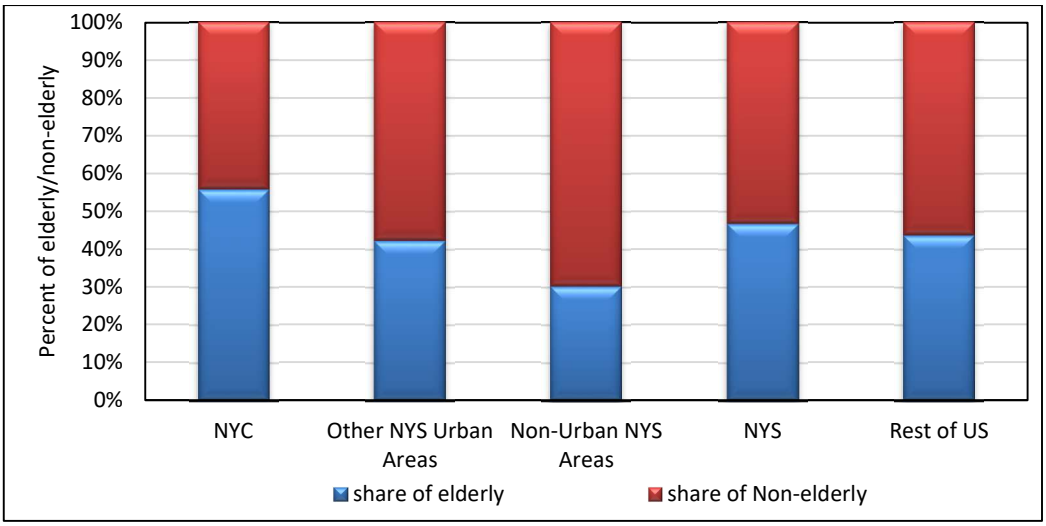


Figure 4-2. Distributions of elderly and non-elderly population among those with medication conditions (2017 NHTS).

As illustrated in Figure 4-3, among those who reported having medical conditions in all ages, the majority of them indicated having the condition for more than 6 months. The non-elderly population has a higher likelihood of having a life-long health issues than their elderly counterparts.

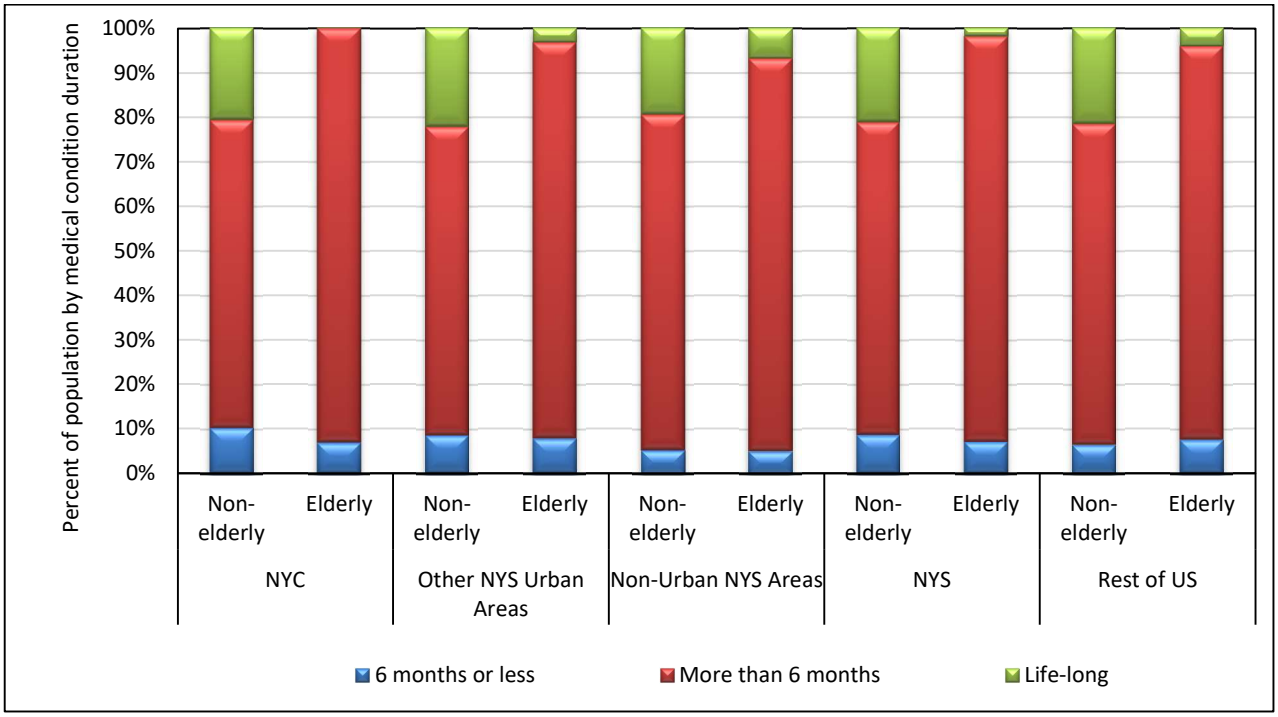


Figure 4-3. Distribution of medical condition duration, 2017 NHTS.

4.3 HEALTH EFFECTS ON TRAVEL

It is of particular interest to examine how health conditions impact travel behavior among the elderly population. Figure 4-4 summarizes geographic region and age differences in reduced-day to-day travel based on NHTS collected information. Not surprisingly, persons with medical conditions are less mobile—over 55% of those with medical conditions reported to have reduced their day-to-day travel due to such conditions. A slightly higher percentage of elderly who live in NYC reduced their day-to-day travel due to medical conditions in 2017 than their counterparts who live in other NYS regions.

In addition, based on Figure 4-5, 20-27% of those with medical conditions gave up their driving in 2017, regardless of age or where they lived. The elderly population was slightly more likely to give up driving compared to their non-elderly counterparts, except for those who lived in non-urban NYS areas. This age difference is not obvious however.

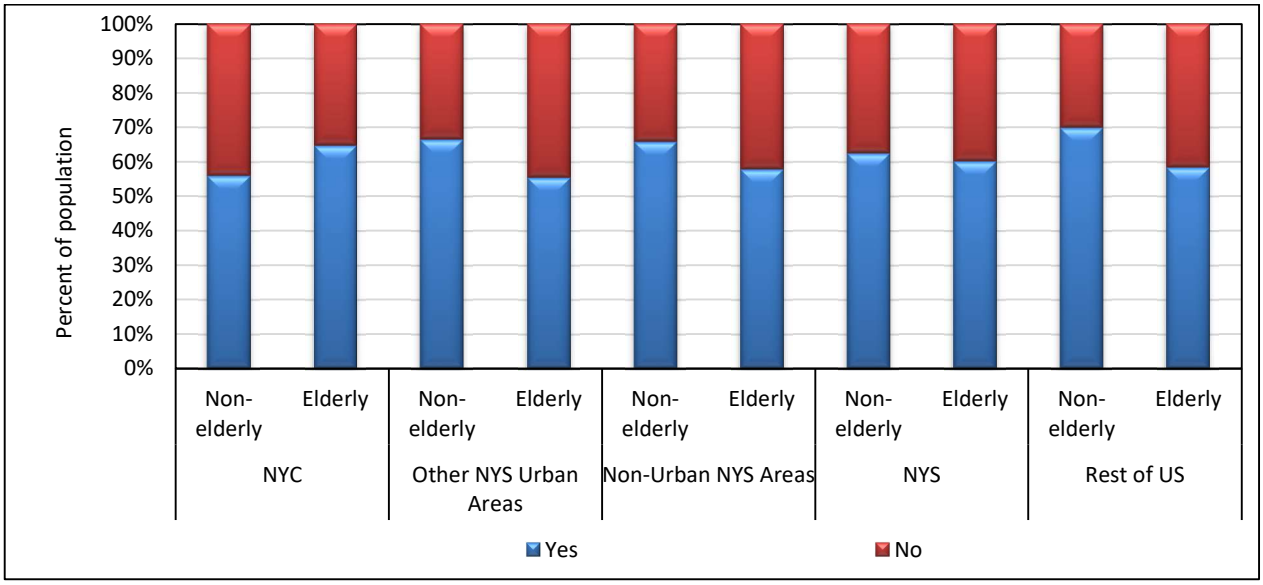


Figure 4-4. Distributions of 'reduced day-to-day travel' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

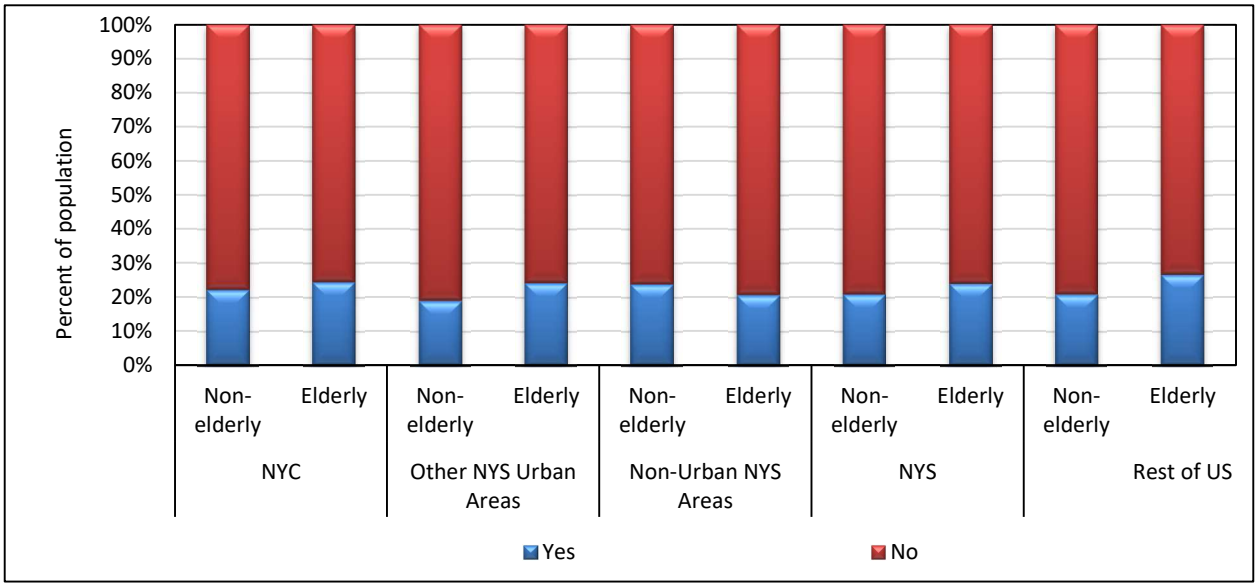


Figure 4-5. Distributions of 'giving up driving' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

Due to their medical conditions, some NYS residents had to limit their driving to daytime. As demonstrated in Figure 4-6, a larger percentage of the elderly population limit their driving to daytime compared to their non-elderly counterparts, regardless of where they lived. For people lived outside NYC, about 30% of the elderly population choose to drive during the daytime while 17% of the non-elderly population made the same choice. In addition, regional differences can be observed from this figure—an NYC resident was less likely to reduce their driving to daytime compared to a person who lived outside NYC. This holds true for both the elderly and non-elderly populations.

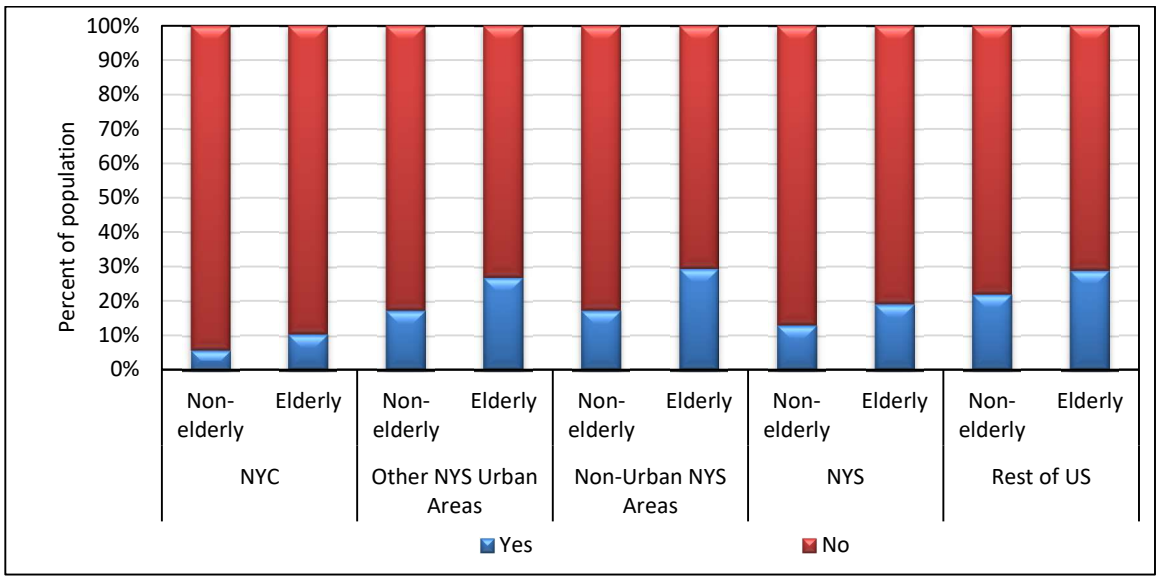


Figure 4-6. Distributions of 'limited driving to daytime' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

Medical conditions impact people's use of public transit. As displayed in Figure 4-7, around 30% of NYC residents with such conditions reported using the bus or subway less frequently, regardless of their age. This percentage is smaller for those who lived outside NYC. Among those lived outside NYC, 10-20% of the non-elderly population and less than 10% of the elderly population reduced their usage of public transit due to medical conditions.

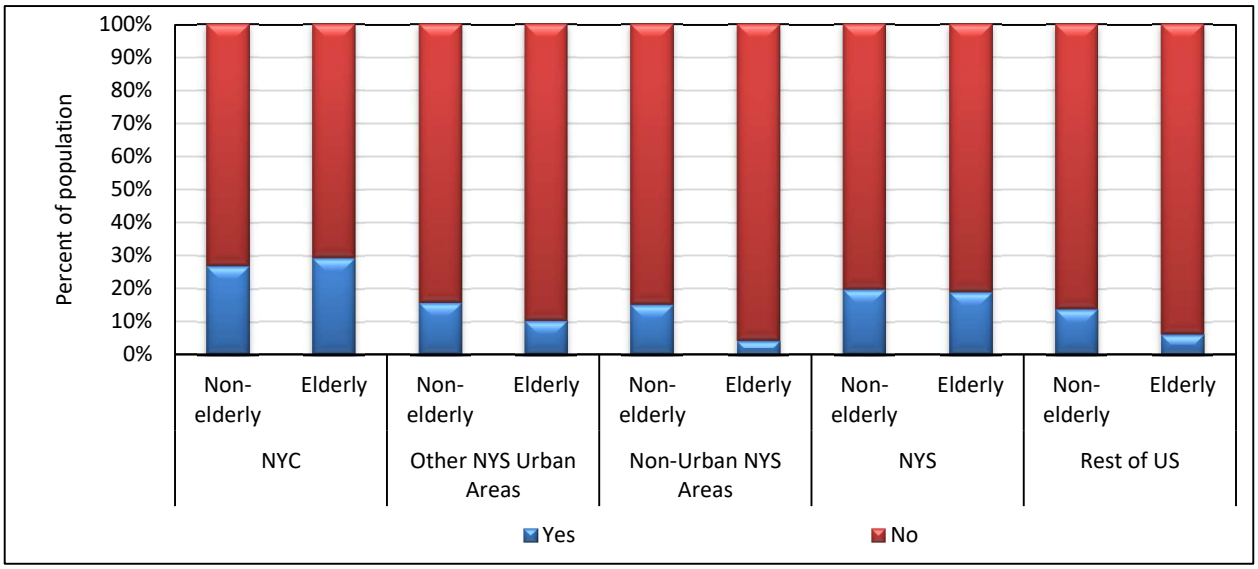


Figure 4-7. Distributions of 'used the bus or subway less frequently' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

A large percentage of the population with medical conditions relied on rides from others. Figure 4-8 shows that over 29% of residents with medical conditions would ask others for rides. Non-elderly residents in both NYS and the rest of US were more likely to ask others for a ride compared to their elderly counterparts, except for those who lived in NYC. Regional differences

can be observed as well—compared to residents who lived in the other regions, NYC residents were slightly less likely to ask others for a ride. This is expected because a higher share of NYC residents with medical conditions choosing other options such as bus, subway, special transportation services and reduced fare taxi can be observed (Figure 4-7, Figure 4-9, and Figure 4-11).

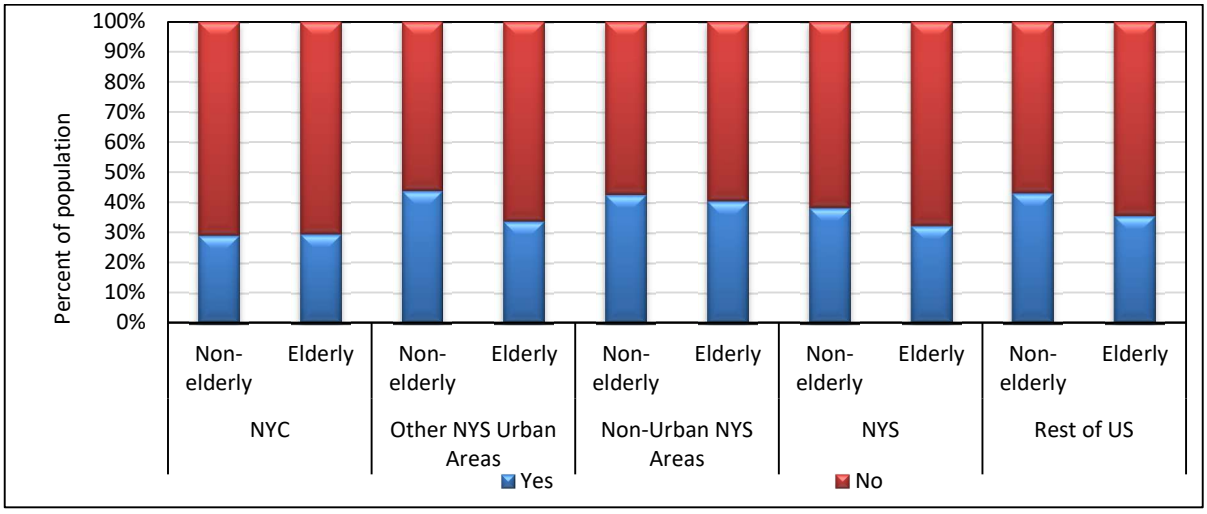


Figure 4-8. Distributions of 'asked others for rides' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

Special transportation services such as Dial-A-Ride serve as possible travel options for those with medical conditions. As shown in Figure 4-9, except for those who lived in NYC, a slightly higher percentage of the non-elderly population with medical conditions chose to use special transportation services than their elderly counterparts. Over 10% of the non-elderly residents used these special services in areas outside NYC and the rest of US while about 7% of the elderly residents made the same choice from the same region. A relatively higher percentage of the NYC residents with medical conditions chose to use special transportation services, compared to those of the other NYS areas. In NYC, 15% of non-elderly residents and 24% of the elderly residents used special transportation services due to their medical conditions. Additionally, among those who lived in NYC reporting using special transportation services, over 70% were elderly residents (Figure 4-10).

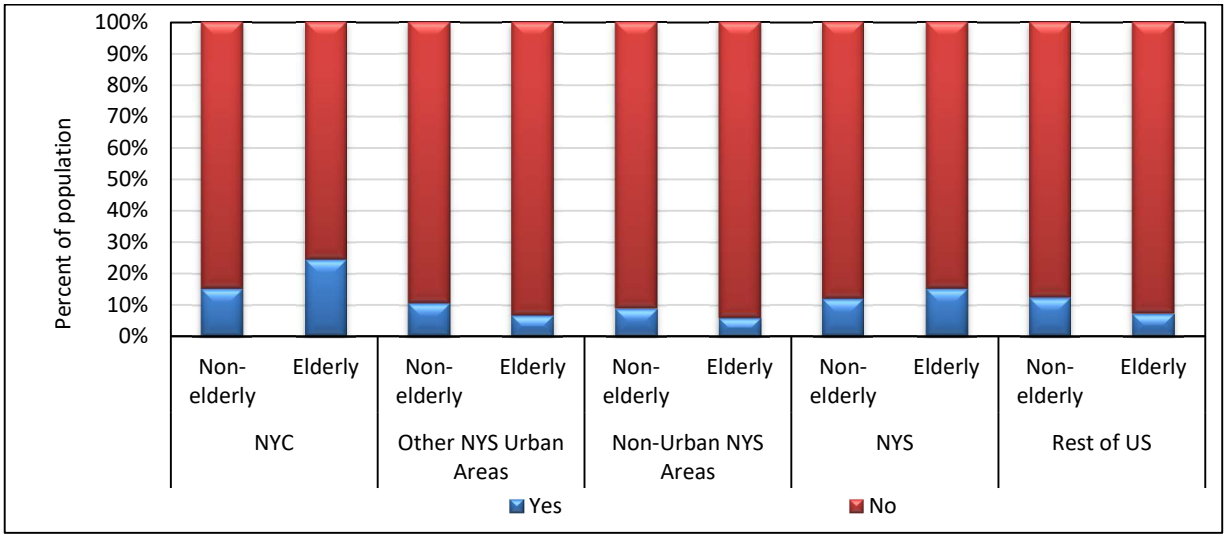


Figure 4-9. Distributions of 'used special transportation services such as Dial-A-Ride' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

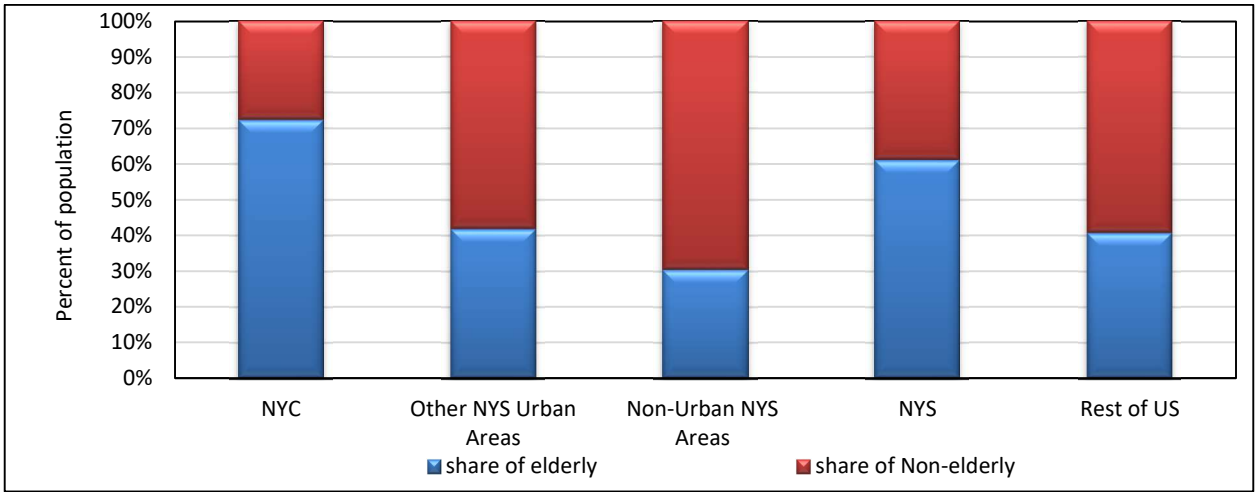


Figure 4-10. Elderly and non-elderly population distributions among those who used special transportation services such as Dial-A-Ride due to medical conditions, 2017 NHTS.

Figure 4-11 summarizes the distribution of population using a reduced fare taxi due to medical conditions. Overall, a reduced fare taxi was not a popular option. Around 11% of NYC residents reported using a reduced fare taxi regardless of their age, while less than 7% of residents who lived outside NYC reported choosing this option.

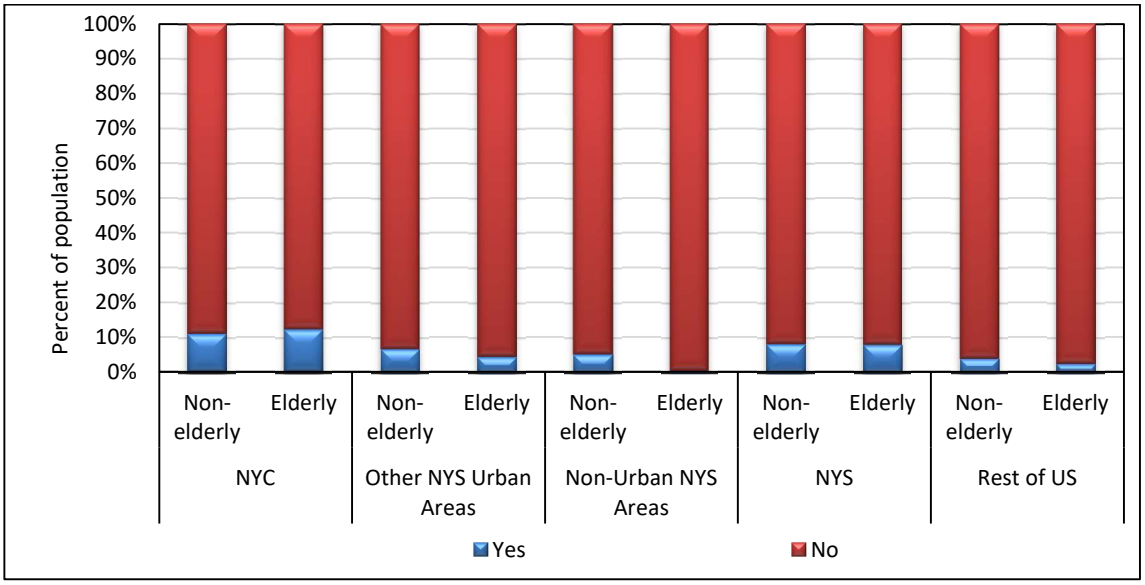


Figure 4-11. Distributions of 'used a reduced fare taxi' due to medical conditions as reported by elderly and non-elderly population, 2017 NHTS.

The impact of medical conditions on trip frequencies of the elderly population is further examined. As presented in Figure 4-12, on average, trip rates for elderlies with medical conditions are significantly lower than those without such conditions in 2017, regardless of where they lived or their genders. Specifically, a typical elderly person without medical conditions took about 2 to 3 trips per day versus 0.5 trips per day for the elderly who had such issues. Gender differences among elderlies without medical conditions can be observed in Figure 4-12, where elderly male on average took more daily trips than their female counterparts. This pattern does not exist among elderlies with medical conditions, however.

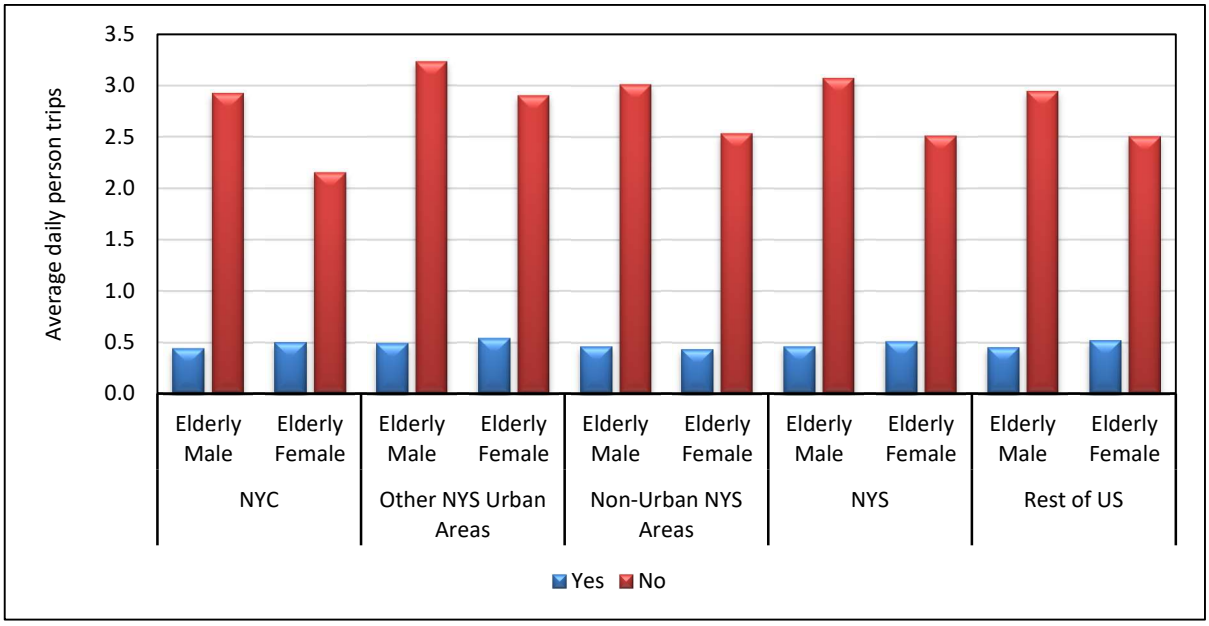


Figure 4-12. Average daily person trips by medical conditions and gender for elderly, 2017 NHTS.

Similarly, when examining average daily trip length made by elderlies by their status of medical conditions, Figure 4-13 revealed that the elderlies with medical conditions typically made shorter trips than those without medical conditions. The only exception is elderly females who lived in NYC, where similar trip distances was made regardless of their status of medical conditions. Among those with medical conditions, elderly males generally traveled longer distances compared to their female counterparts in all regions except for non-urban areas of NYS.

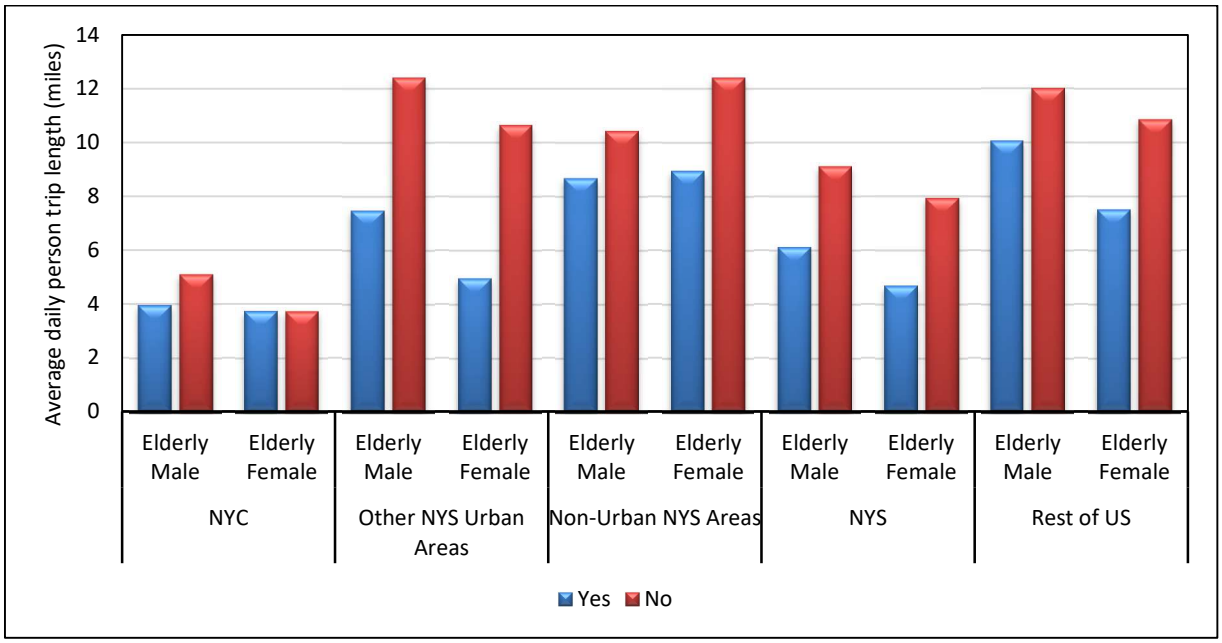


Figure 4-13. Average daily person trip length by medical conditions and gender for elderly, 2017 NHTS.

5. TRAVEL COST AND INTERNET ACCESSIBILITY OF ELDERLY POPULATION

Under the 2017 NHTS recruitment survey, one adult from each participating household was asked to respond to questions about their travel experience on mode use and travel cost, as well as their frequency of internet access. Using information gathered from that recruitment survey, this chapter specifically examines elderly survey respondents' view on travel cost and their frequency of internet access.

5.1 VIEWS OF TRAVEL COST IMPACTS ON TRAVEL BEHAVIOR BY ELDERLY

Specifically, the survey asked the respondent from each surveyed household to answer the question of "*How much do you agree or disagree with each of the following?*" This includes five parts as listed below:

- *The price of gas affects the number of places I go*.
- *Getting from place to place costs too much*.
- *I walk to places to save money*.
- *I bike to places to save money*.
- *I use public transportation to save money*.

For each part listed under this question, the survey respondent would select one option from the provided list of strongly agree, agree, neutral (neither agree or disagree), disagree, and strongly disagree. Note that the statistics presented in the following sections are person-based.

5.1.1 Price of Gas Affects Amount of Travel

The results shown in Figure 5-1 reflects that the respondents from NYC have significantly lesser concerns on gas prices than those from other regions. Only around 30% of NYC residents, regardless of age, strongly agreed or agreed that gas price affected their travel decision, while 40% to 61% of their counterparts from other three regions have the same opinion. There are no visible differences between elderlies and non-elderlies regarding their opinions on this issue. Although non-elderly New Yorkers who participated in the survey and lived outside the NYC area have slightly higher concerns on gas prices than their elderly counterparts. Note that respondents from NYC have a relatively high percentage (27 to 37%) of holding a neutral view on this issue, especially for the elderly group.

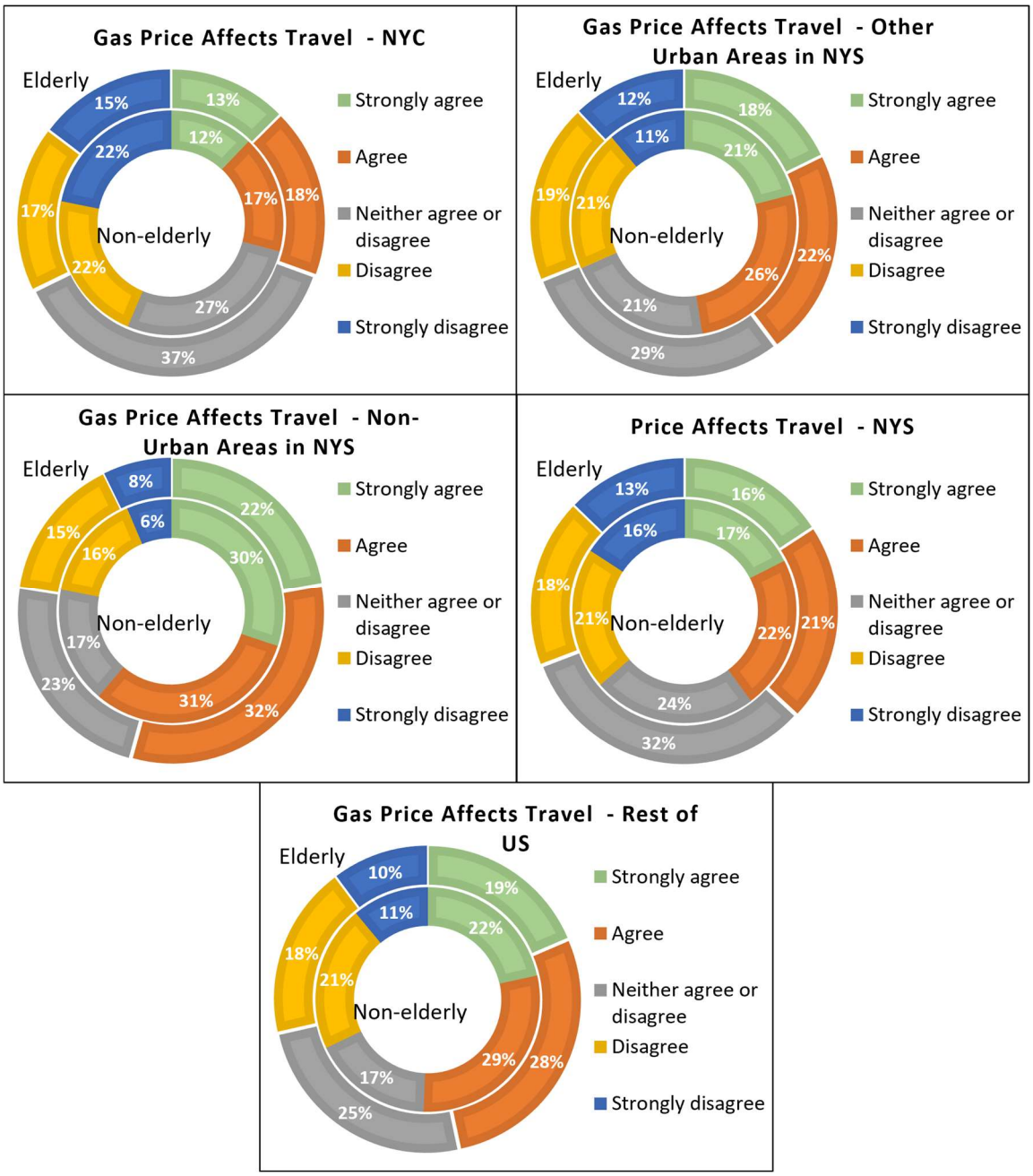


Figure 5-1 Distributions of gas price affect travel issue as reported by elderly vs non-elderly person, 2017 NHTS.

5.1.2 Travel Costs Too Much

The result seen in Figure 5-2 reflects that, regardless of the regions, over 40% of adult New Yorkers who responded to this question either strongly agreed or agreed that travel costs too much. Except for those who lived in NYC, about one in three of the adults from all regions has no opinion on this specific subject, while about one in four of the adults from NYC is neutral on the same issue. Compared to the rest of US, a higher share of respondents from New York State

considered travel cost too much. About 50% of adult New Yorkers held this opinion while 40% of adults from the rest of US agreed on the same subject.

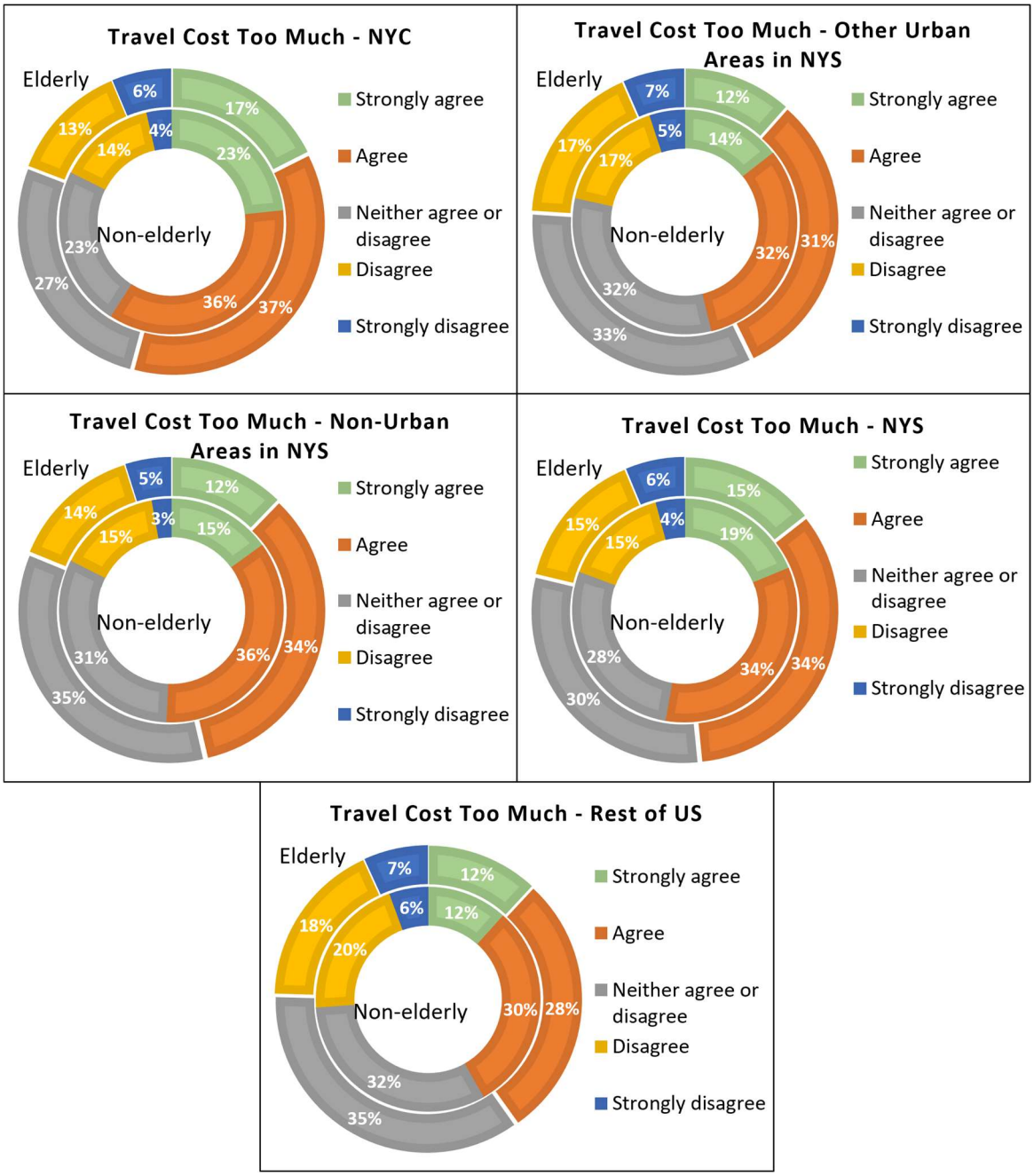


Figure 5-2. Distributions of travel cost issue as reported by elderly vs non-elderly person, 2017 NHTS.

5.1.3 Walk to Save Money

The result seen in Figure 5-3 reflects that majority of adult respondents who lived outside the NYC disagreed or strongly disagreed that walking is an option to save money. In NYC, however, over 40% of elderly respondents and about 60% of younger adult respondents agreed or strongly agreed on using walk to save money. This pattern, where the share of elderlies who disagreed or

strongly disagreed on travel by walking to save money is much higher than their younger counterparts, can also be observed in the other regions.

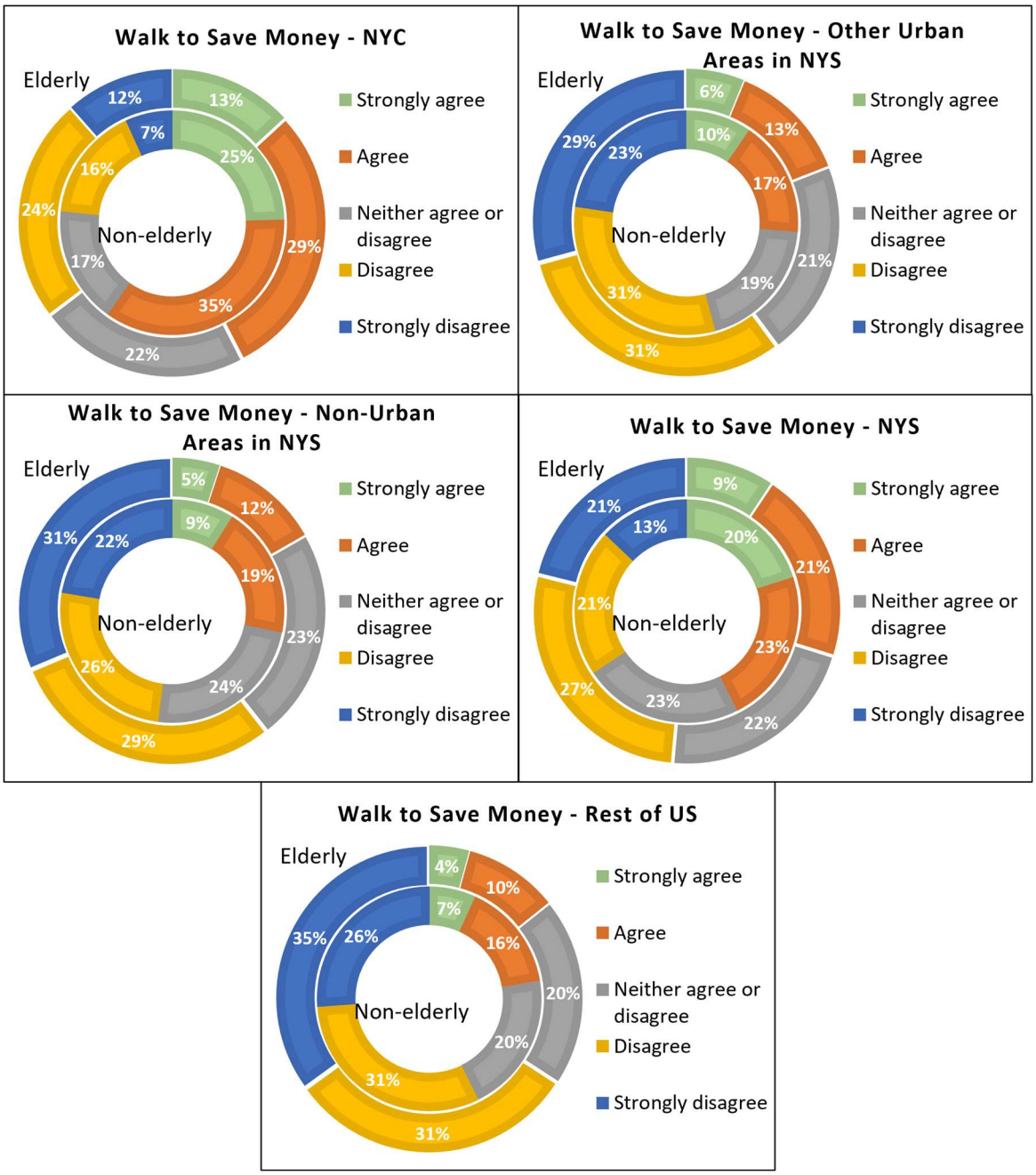


Figure 5-3. Distributions of walk to save money issue as reported by elderly vs non-elderly person, 2017 NHTS.

5.1.4 Bike to Save Money

Figure 5-4 reflects that the majority of the adult respondents strongly disagreed or disagreed on traveling by bike to save money, regardless of where they lived. It is worth noticing that the shares of respondents choosing strongly disagree are higher than those who disagreed in both age groups, which could indicate a strong opinion on this question. Overall, elderly respondents are

more likely to express disagreement than their non-elderly counterparts on this issue, reglardless of the location they live. For those who agreed or strongly agreed, non-elderlies are more likely to indicate using bike to save money, especially those who lived in NYC. About 19% of NYC non-elderly respondents strongly agreed/agreed that biking is an option to reduce travel expenses, while only 8% of elderly respondents from the same region indicated so.

Figure 5-4. Distributions of bike to save money as reported by elderly vs non-elderly person, 2017 NHTS.

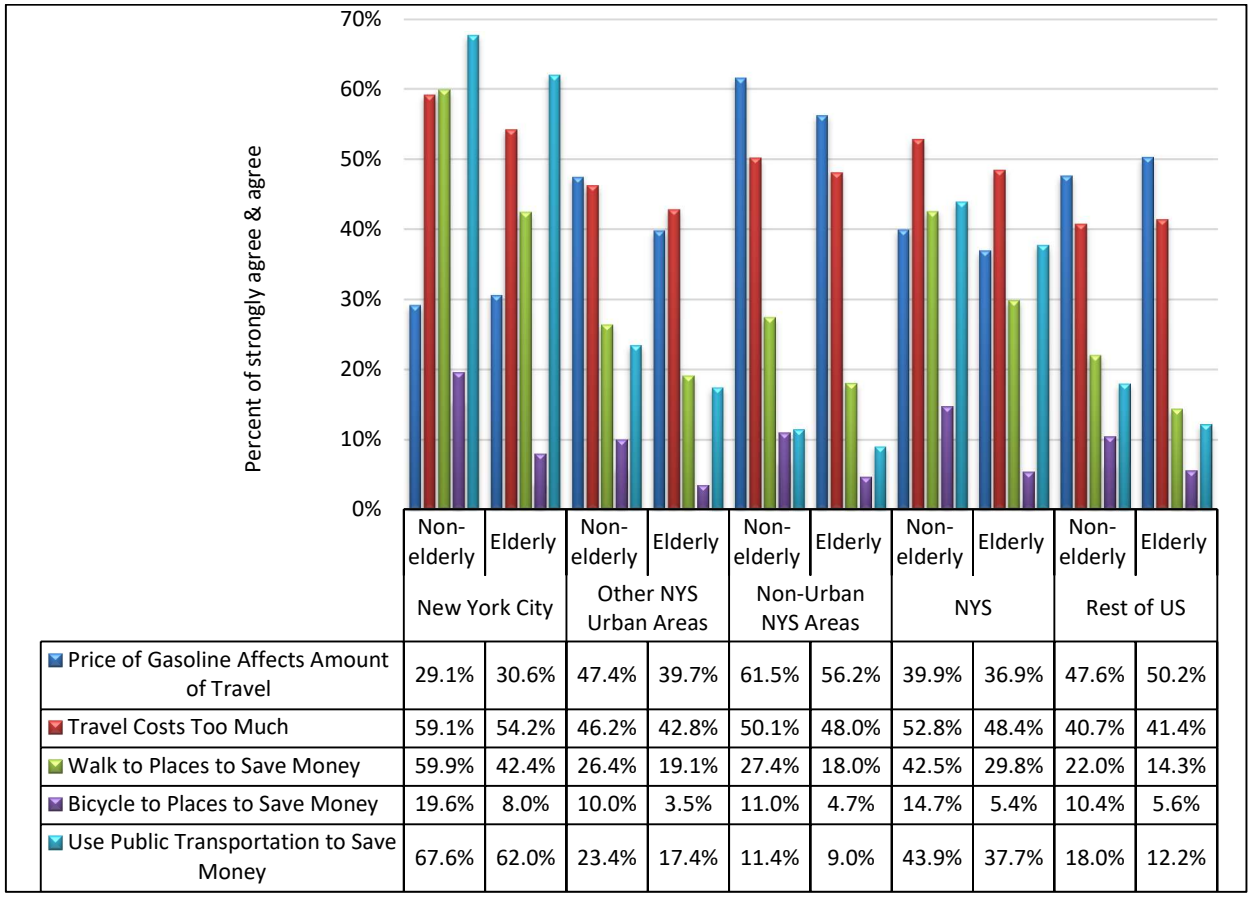
5.1.5 Use Public Transportation to Save Money

Given the much wider availability of public transit in NYC, it is not a surprise that Figure 5-5 shows a significantly different pattern on the views of using public transit to save money between respondents from NYC and those from the other regions. Majority of NYC respondents strongly agreed or agreed that public transit is a cost-saving option. About 68% of the non-elderly survey respondents and 62% of the elderly respondents held this view. Expectedly, most respondents from the rest of NYS and outside NYS had the opposite opinions. This is more so for respondents from the non-urban NYS areas, only about 10% of residents agreed or strongly agreed on using public transit to reduce travel costs.

Figure 5-5. Distributions of use public transit to save money issue as reported by elderly vs non-elderly person, 2017 NHTS.

5.1.6 Overall Travel Costs Concerns

The share of respondents who indicated "strongly agree" or "agree" with each of the five statements was further summarized by respondent age and region. The results are presented in Figure 5-6 so that overall price concerns and different alternative modes to save travel expenditure could be compared.



	New York City		Other NYS Urban Areas		Non-Urban NYS Areas		NYS		Rest of US	
	Non-elderly	Elderly	Non-elderly	Elderly	Non-elderly	Elderly	Non-elderly	Elderly	Non-elderly	Elderly
Price of Gasoline Affects Amount of Travel	29.1%	30.6%	47.4%	39.7%	61.5%	56.2%	39.9%	36.9%	47.6%	50.2%
Travel Costs Too Much	59.1%	54.2%	46.2%	42.8%	50.1%	48.0%	52.8%	48.4%	40.7%	41.4%
Walk to Places to Save Money	59.9%	42.4%	26.4%	19.1%	27.4%	18.0%	42.5%	29.8%	22.0%	14.3%
Bicycle to Places to Save Money	19.6%	8.0%	10.0%	3.5%	11.0%	4.7%	14.7%	5.4%	10.4%	5.6%
Use Public Transportation to Save Money	67.6%	62.0%	23.4%	17.4%	11.4%	9.0%	43.9%	37.7%	18.0%	12.2%

Figure 5-6. Summary on views of travel cost by respondent age and region, 2017 NHTS.

As shown in Figure 5-6 and discussed in Section 5.1.2, more than 40% of respondents strongly agreed or agreed that travel costs too much (red bar). Interestingly, compared to the younger adults, elderly persons of the same region generally were less concerned about travel costs. A smaller share of elderly persons considered travel costs too much, although the differences in shares are not significant, ranges from 1.5% to 5% by region. Among the three transportation modes being considered, walk and public transit were more likely to be used than bike, according to the responses, as an alternative mode to save travel costs regardless of where they lived. Walk was cited as the most popular alternative mode to save money in the non-NYC areas in 2017, possibility due to limited availability on public transits outside the NYC. Compared to non-elderly respondents, elderly adults were less likely to agree to use alternative modes (walk, bike, or public transit) to save money. This difference of opinions on mode choice behavior, between elderly and non-elderly adults in each region, was most noticeable for walk, about 7%

to 17% more non-elderly persons agreed or strongly agreed that they walked to reduce travel costs.

5.2 ACCESS TO THE INTERNET BY TECHNOLOGY

According to a study conducted by the American Association of Retired Persons, nearly 22 million US seniors (aged 65 and older), accounted for about 40% of total elderly population in 2020, do not have wireline broadband access at home (Older Adults Technology Services, 2021). In the 2017 NHTS, a set of questions were asked to obtain survey participants' frequency of access to internet using different devices. Specifically, the survey asked the main respondent from each participating household to answer the question of "How often do you use the following devices to access the internet?" This includes three items as listed below:

- Desktop or laptop computer
- Smartphone
- Tablet

Note that, the above question did not request such an access (to internet) must be from any specific locations.

Figure 5-7 summarizes the distribution of using different technologies to access internet by usage frequency. Notice that the statistics in the figure are based on an adult member of the surveyed household who responded the question. An obvious difference between the two age groups in using desktop/laptop computers to access internet can be seen in this figure. Expectedly, younger adults have more access to desktop/laptop computers, regardless of the region. The share of not having access to desktop/laptop among elderlies is about 23% to 34%, as compared to 6% to 10% for the younger group, varying by region. For elderlies who use computers to access the internet, 40% to 66% of them have daily access, while 20% of them said they access the internet not on a daily basis (a few times a week, a few times a month, or a few times a year). Overall, daily access to internet using computers is the most common mean among adults in the US, regardless of regions. Among all four regions, NYC elderly residents have the lowest share of using desktop/laptop computers to access internet.

Figure 5-7 also shows a significant gap between the two age groups on using smartphones to access internet. While about 83% to 94% of non-elderly persons, depending on regions, use smartphones to access internet in any frequencies, only about 42% to 56% of their elderly counterparts do so. For those elderlies who use smartphone to access internet, majority of them access the internet on a daily basis. No obvious regional differences could be seen, except for people who lived in non-urban NYS areas, where they are less likely to use smartphones to access internet as compared to other regions.

Among all three types of devices, smartphone is the most commonly used device among non-elderlies. Although the total share of non-elderlies having access to internet via smartphone is similar as compared to desktop/laptop computers, their share of daily use of smartphone to access internet is noticeably higher. Elderlies, on the other hand, are more likely to use desktops/laptops than smartphones or tablets when access to internet. Tablet is the least popular device for both elderly and non-elderly persons. Overall, 60 to 70% of non-elderlies use tablet to access to internet. Among them, 30 to 40% use it daily. The share of elderlies who use tablet

devices to access internet is about 37 to 47%, depending on region. Among them, 17 to 26% of them use it on a daily basis.

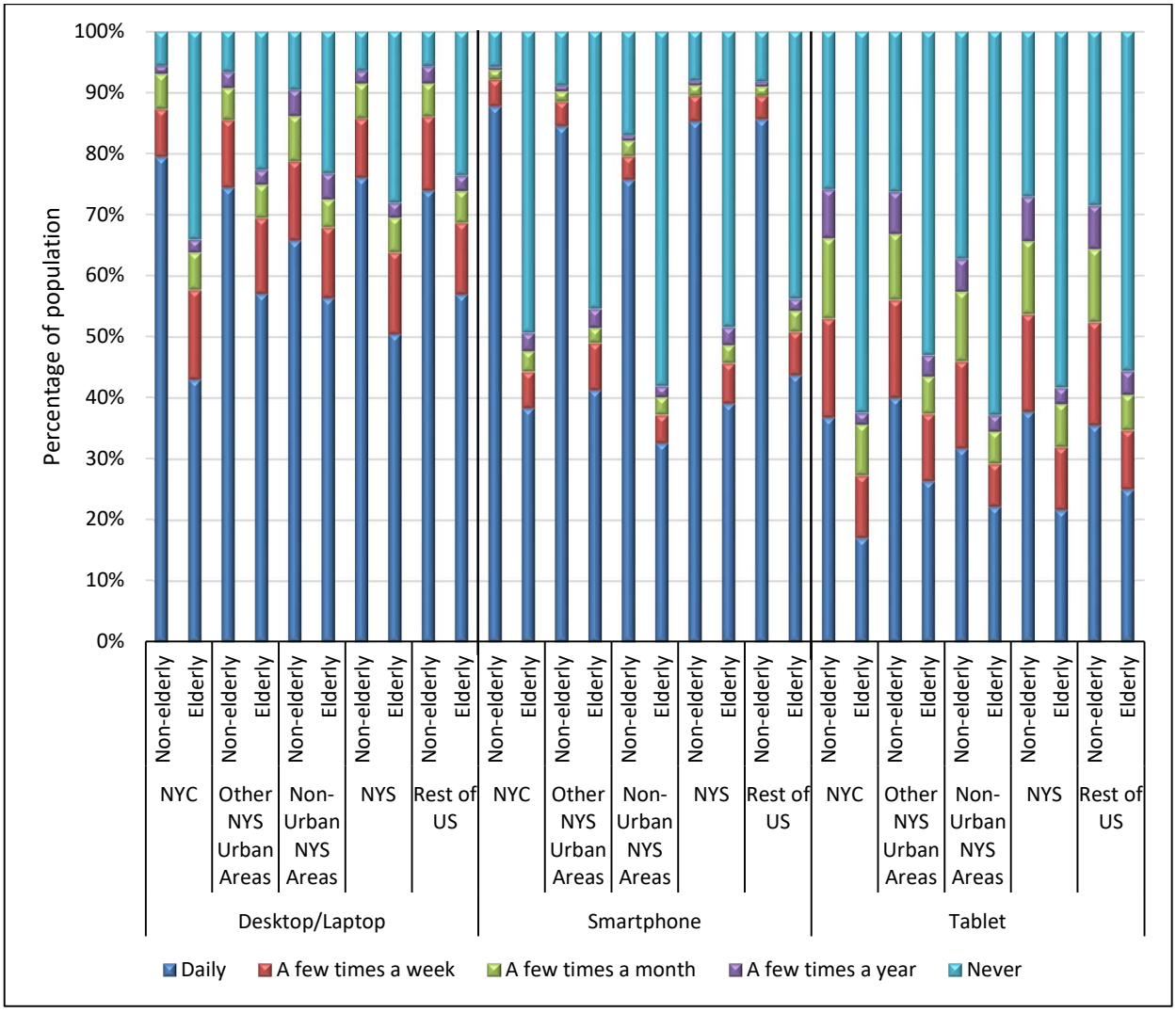


Figure 5-7. Distributions of using desktop/laptop, smartphone, or tablet to access the internet by person, 2017 NHTS.

6. TRAFFIC SAFETY OF ELDERLY IN NYS

6.1 FARS OVERVIEW

Fatality Analysis Reporting System (FARS) data were used for traffic safety analysis associated with elderly population in NYS. The FARS data contain information collected from a nationwide census of fatal motor vehicle crashes in the US. It is published and maintained by the National Highway Traffic Safety Administration (NHTSA) of the US Department of Transportation (USDOT) on an annual basis. Data elements contained in FARS databases are organized and provided in four dataset levels, including *Crash, Vehicle, Person*, and *Event.* Except for the Crash level which contains only the *Accident* file, all other data levels contain multiple files (see Figure 6-1). For the examination of elderly traffic safety analysis, information (data elements) obtained specifically from the *Accident* and *Person* files in FARS were utilized. Explicitly, the *Accident* file contains data elements associated with crash characteristics and environmental conditions at the time of the crash, which has one record per fatal crash. Crash locations contained in the *Accident* file were used to identify cases that occurred within NYC and elsewhere in NYS. The *Person* file contains information on all persons involved in the FARS-qualifying crash, which includes motorists (drivers and passengers of the involved vehicles) as well as non-motorist (pedestrians and pedal-cyclists). Specifically, information on age, gender, and person type (e.g., driver and pedestrian) were used in this study.

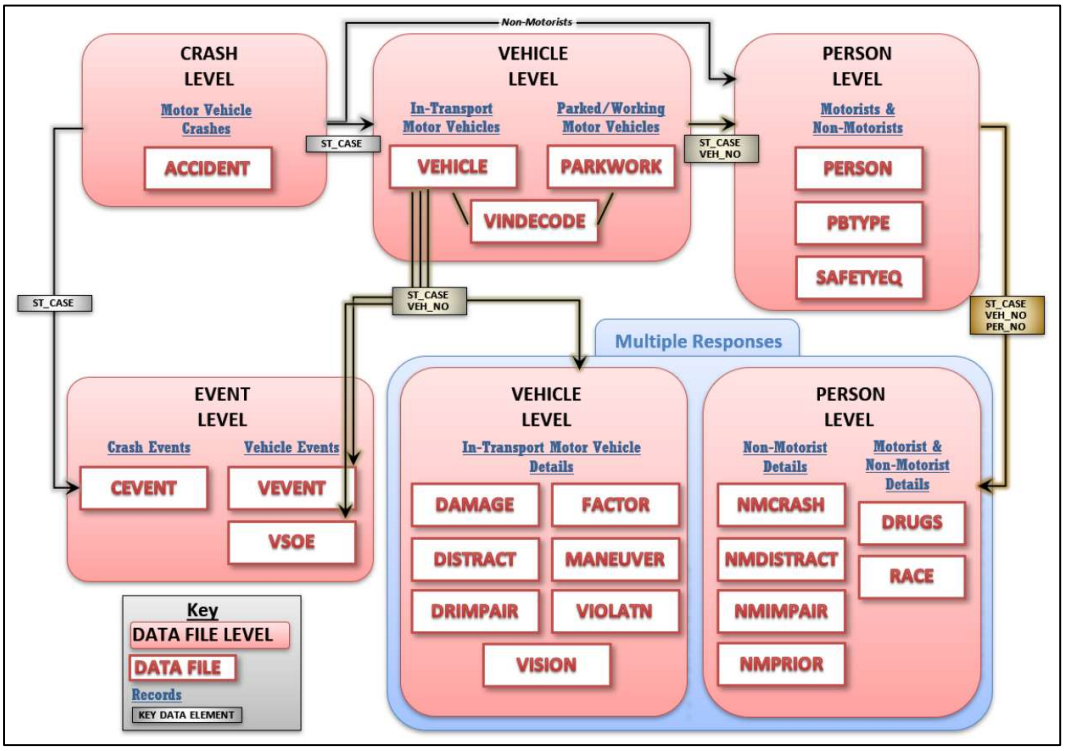
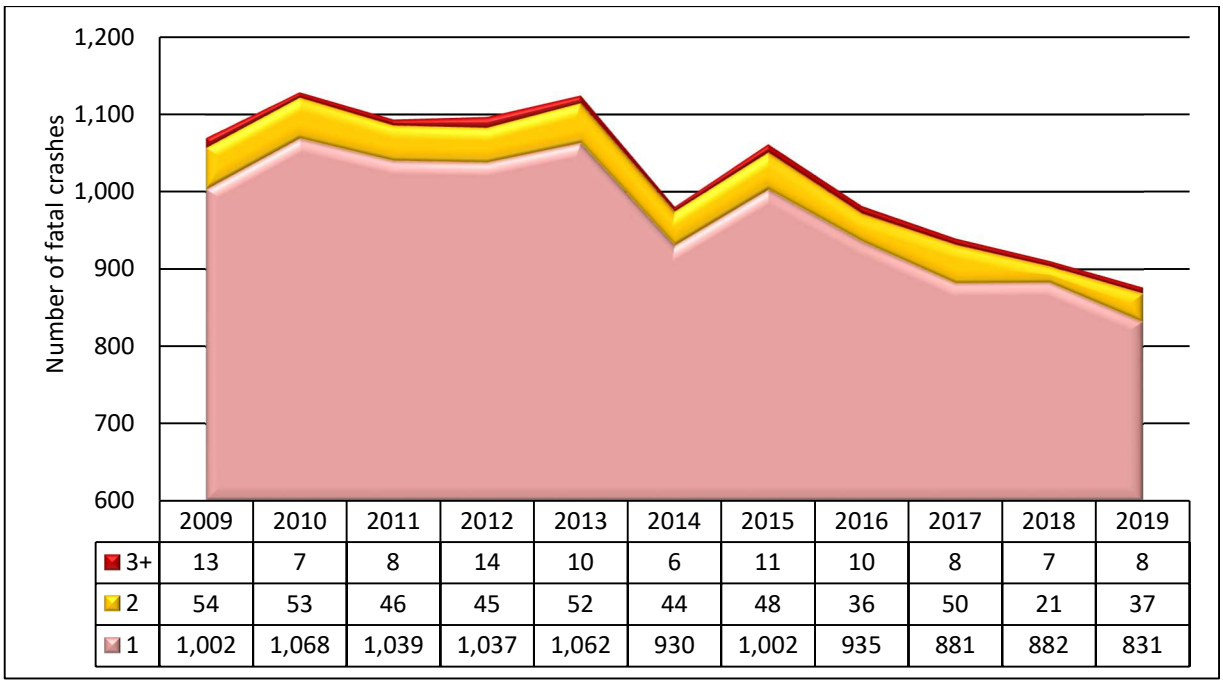


Figure 6-1. FARS dataset levels and files (Source: FARS Analytical User's Manual, February 2021, Revised).

In general, the number of fatal crashes in NYS had an overall declining trend during the period from 2009 to 2019 (see Figure 6-2). Clearly, the majority of fatal crashes that occurred in NYS involved a single-fatality, which accounted for over 94% of all fatal crashes in NYS during this

eleven-year period. Only about 1% of fatal crashes that occurred in NYS resulted in 3 or more fatalities.

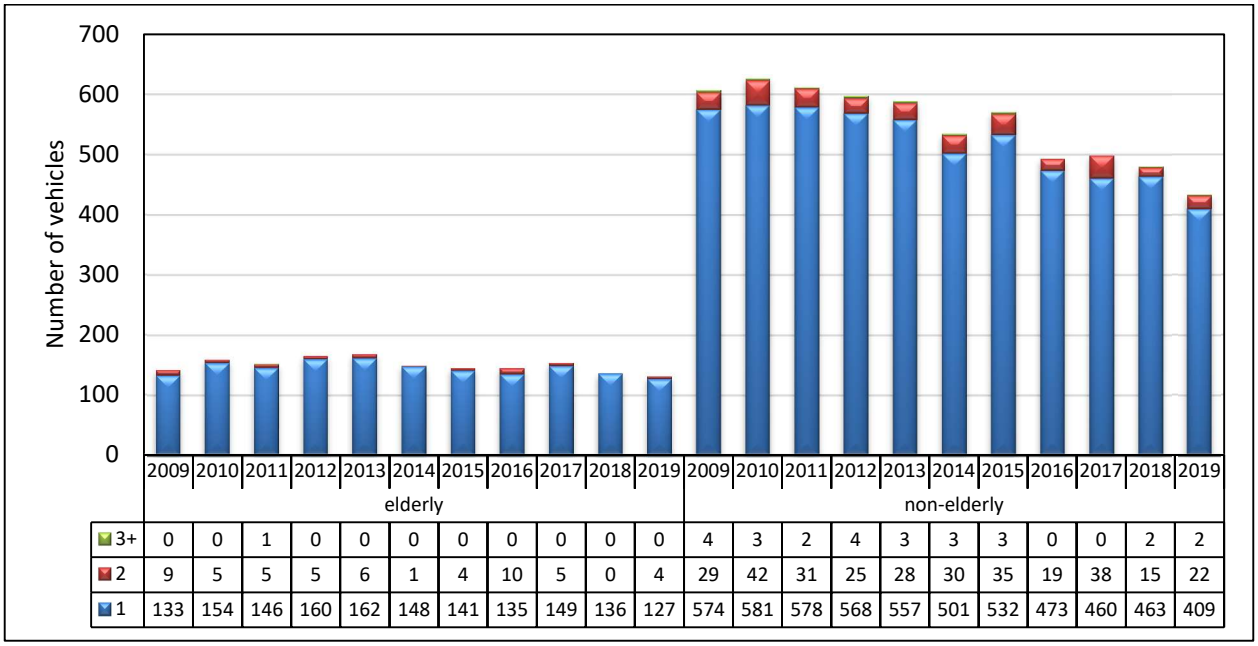
Overall, about 24% of all fatal crashes (2,716 out of a total of 11,257 crashes) that occurred in NYS during 2009-2019 involved at least one elderly person (age 65 years or older). Note that the elderly who were involved could be an occupant of the impacted vehicle (driver or passenger), pedestrian, or others (e.g., cyclist). About 95% of these elderly-involved fatal crashes were single-fatality crashes. No significant differences in the fatal crash count patterns could be seen between fatal crashes of the general population and those involving elderly persons.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
3+	13	7	8	14	10	6	11	10	8	7	8
2	54	53	46	45	52	44	48	36	50	21	37
1	1,002	1,068	1,039	1,037	1,062	930	1,002	935	881	882	831

Figure 6-2. Total number of fatal crashes by number of fatalities per crash, 2009-2019 in NYS.

Particularly, the number of occupants in the vehicle that had a fatality in NYS from 2009 to 2019 is examined and summarized in Figure 6-3. Note that elderly/non-elderly in the figure refers to the elderly status of the occupants that had a fatal injury in the vehicle in the crash. As shown in the figure, over 92% of the vehicles that had the fatality had one occupant, regardless of the occupants' elderly status.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
3+	0	0	1	0	0	0	0	0	0	0	0	4	3	2	4	3	3	3	0	0	2	2
2	9	5	5	5	6	1	4	10	5	0	4	29	42	31	25	28	30	35	19	38	15	22
1	133	154	146	160	162	148	141	135	149	136	127	574	581	578	568	557	501	532	473	460	463	409

Figure 6-3. Number of vehicles by elderly status of the occupants that had the fatal injury and total number of occupants in the vehicle, 2009-2019 in NYS.

A total of 12,031 fatalities were a result of 11,257 fatal crashes that occurred on NYS roadways during 2009-2019. Figure 6-4 shows a summary of fatalities, taking into account the age and gender of those killed in crashes over this 11-year time period. Consistently over time, the number of male fatalities was more than twice as many as female fatalities. Normalized by NYS population data obtained from US Census, Figure 6-5 further presents the fatalities per 1,000 population by age and gender. Obviously, males have a significantly higher risk, than their female counterparts, of being killed in fatal crashes in NYS. This is true for all age groups, except the youngest age group of under 15 years. Considering the annual distribution of fatalities by age and gender, over a third (36%) of females who were killed in NYS fatal accidents in 2017 (the latest NHTS year) were from the 65+ age group, as compared to 23% of their elderly male counterparts. As shown in Figure 6-4, there is a general reduction in the total number of fatalities in NYS since 2015 for both male and female groups. However, the share of elderly fatalities shows an increase over the 11 years for both genders, from 29% in 2009 to 35% in 2019 for the female group and 17% to 22% for the male group. As a reminder, FARS data presented here captured all people involved in crashes on NYS roadways, who may not necessarily be residents of NYS.

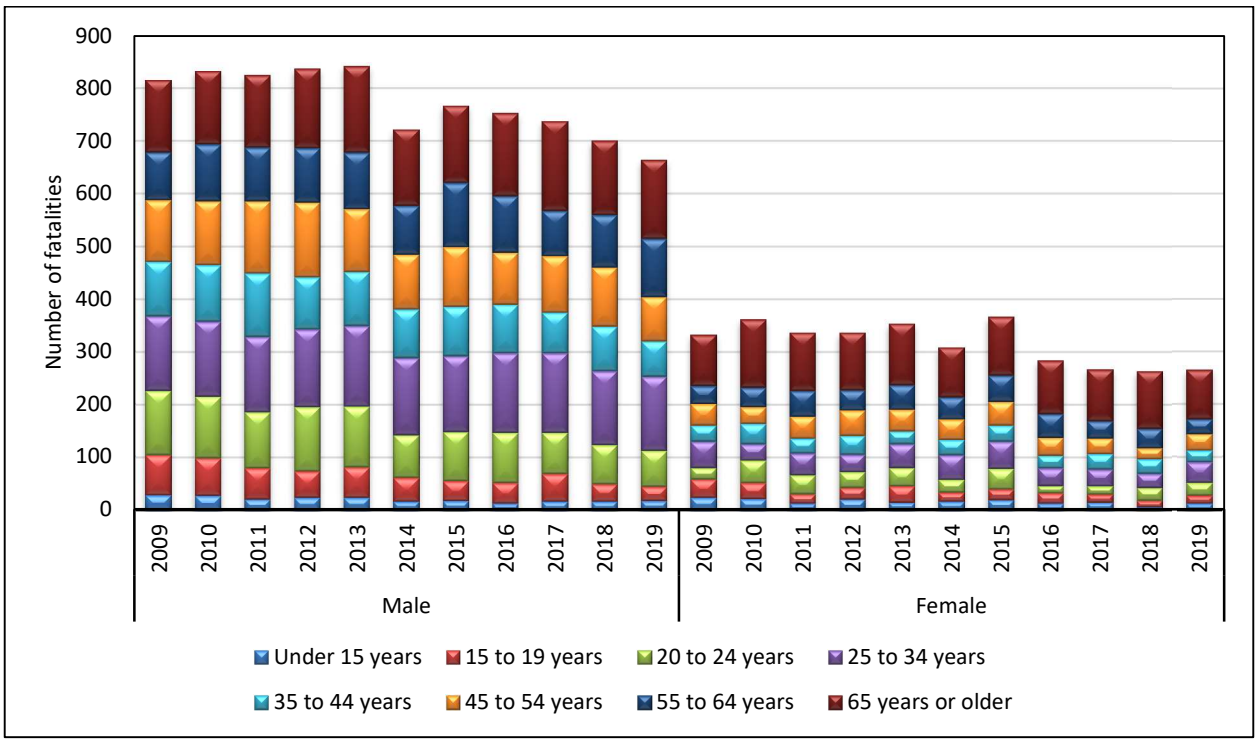


Figure 6-4. Number of NYS fatalities by gender and age of person involved, FARS data 2009-2019.

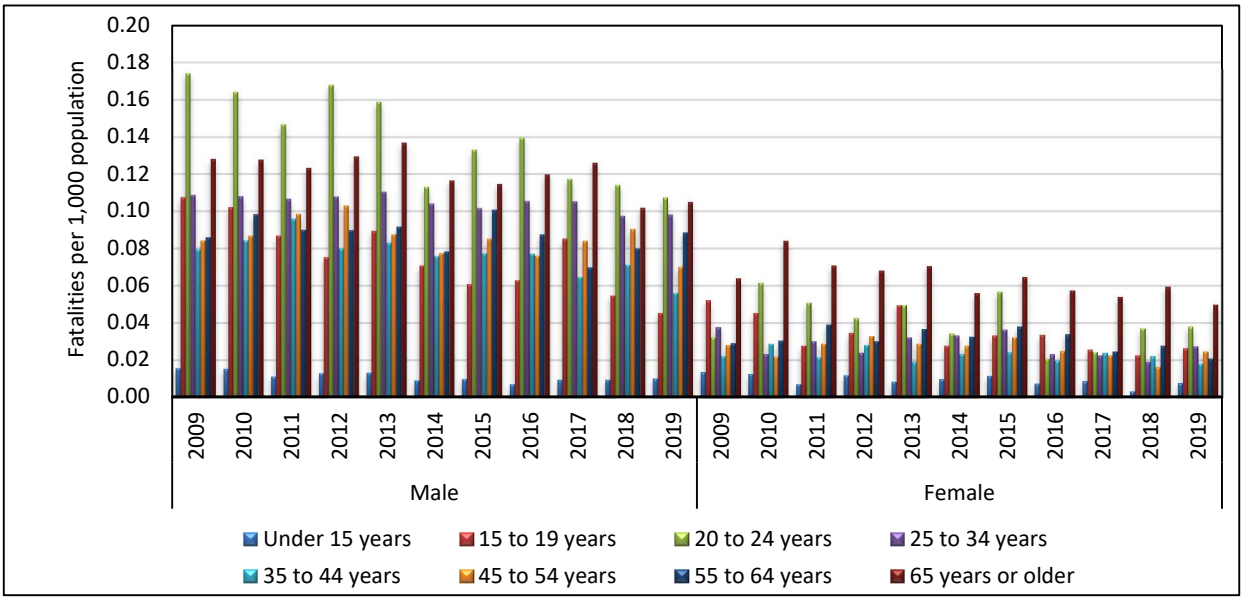


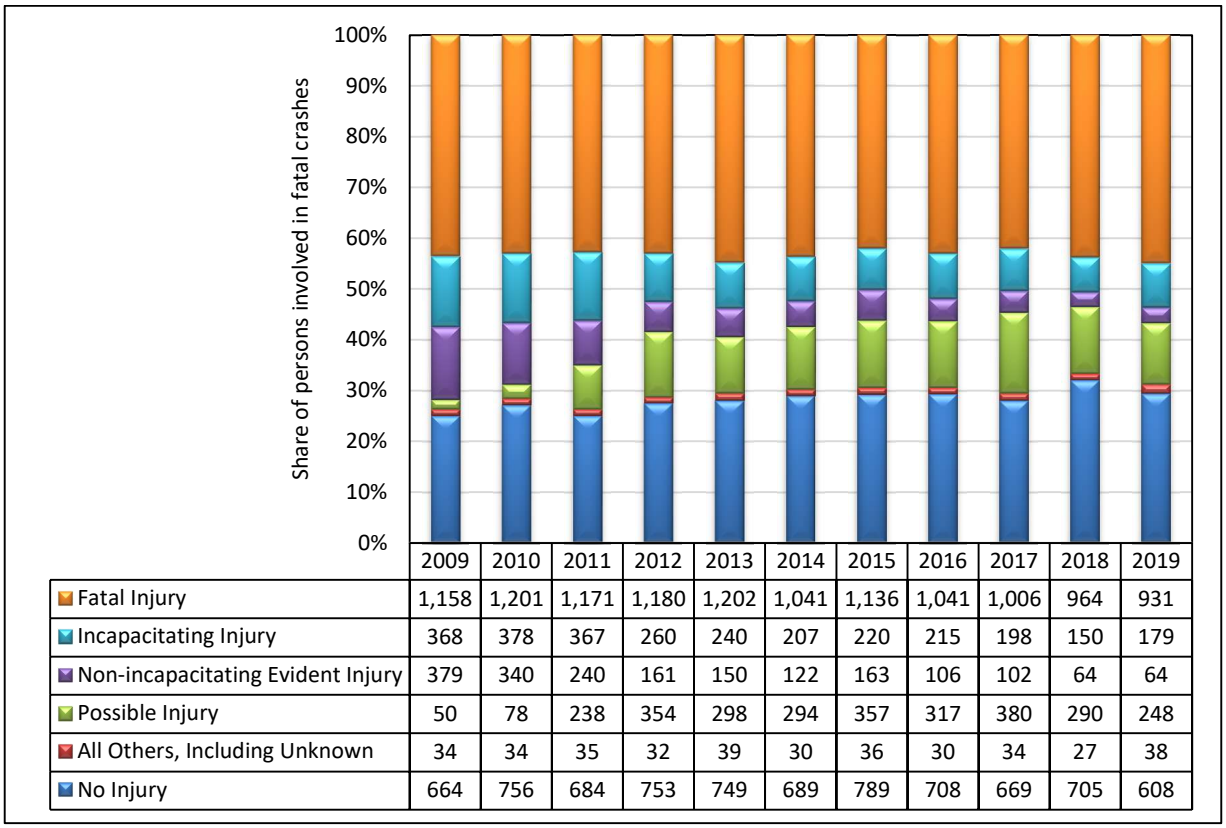
Figure 6-5. NYS fatalities per 1,000 NYS residents by gender and age of person involved, FARS data 2009-2019.

Furthermore, 11,257 fatal accidents that occurred on NYS roadways involved 19,977 persons who experienced varying degrees of injury severity. On average, over 28% of those involved persons did not suffer any injuries in these accidents. As shown in Figure 6-6, the share of "No Injury" persons (colored in blue) increased slightly over time from about 25% in 2009 to over

29% in 2019, while the share of persons killed (colored in orange) stayed around the same level (at about 44%) during the same period of time.

A summary of fatalities by region and age groups (elderly versus non-elderly) was also obtained. Table 6-1 presents these results for the NHTS years 2009 and 2017. The non-elderly fatalities decreased from 2009 to 2017, while the elderly fatalities increased.

With the geocoded crash location information provided in the FARS database, a heat map of all fatal crashes from 2009 to 2019 (combined) is displayed in Figure 6-7. This heat map follows a "spectrum" theme where locations with the most accidents were shown in red and the least are in blue. Not surprisingly, highly populated urban areas with more people and more traffic are more likely to have crashes occurring in those regions.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fatal Injury	1,158	1,201	1,171	1,180	1,202	1,041	1,136	1,041	1,006	964	931
Incapacitating Injury	368	378	367	260	240	207	220	215	198	150	179
Non-incapacitating Evident Injury	379	340	240	161	150	122	163	106	102	64	64
Possible Injury	50	78	238	354	298	294	357	317	380	290	248
All Others, Including Unknown	34	34	35	32	39	30	36	30	34	27	38
No Injury	664	756	684	753	749	689	789	708	669	705	608

Figure 6-6. Distribution of injury severity of persons involved in FARS crashes in NYS 2009-2019.

Table 6-1. Number of fatalities by NYS region and elderly status of impacted person, 2009 versus 2017

Region	Age Group	2009	2017
NYC	Non-elderly	207	141
	Elderly	**57**	**65**
Rest of NYS	Non-elderly	706	595
	Elderly	**177**	**202**
NYS	Non-elderly	913	736
	Elderly	**234**	**267**

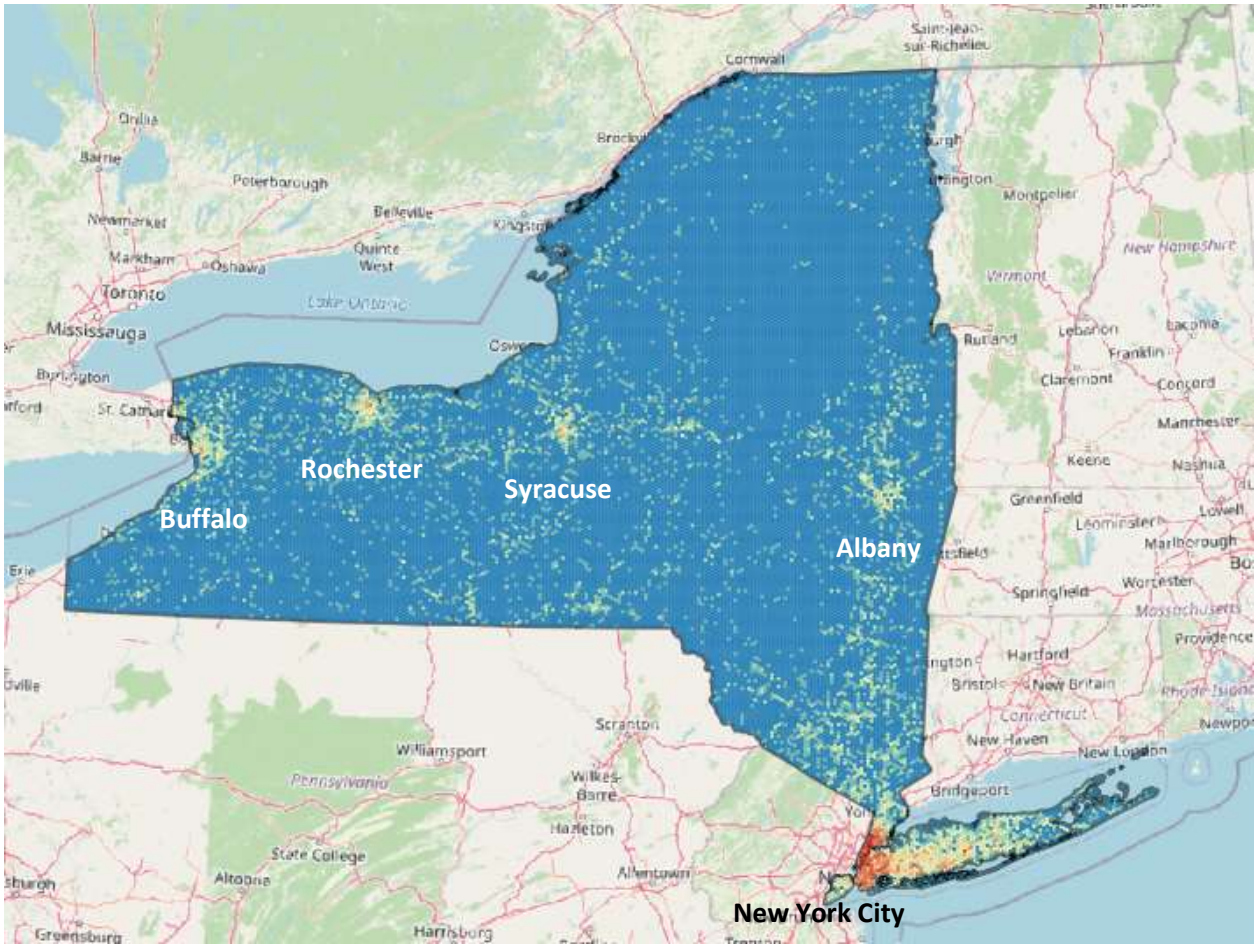


Figure 6-7. Heat map of all FARS crashes in NYS 2009-2019.

6.2 MEASURE OF EXPOSURES

The number of traffic fatalities would likely be influenced by many factors, including the size of the population, the amount of travel that occurred, and the volume of vehicles using the roadways in any given time (month, year, etc.). Because of this, assessments based on the sheer numbers of fatal crash counts, across regions or over time, might not necessarily provide an accurate measure of traffic safety on the roadways when comparing between different time periods or among various geographic regions. Commonly used measures of exposure applied in this study that provide normalized accident/crash numbers for comparison purposes include (1) population-based measures, such as rate per person (over all impacted population) or rate per driver (targeted population), and (2) vehicle-based measures such as rate per vehicle or rate per VMT. As shown in Table 6-2, based on Census ACS data, the NYS population has seen a general increasing trend over the 9 years from 2009 to 2017 but decreased since 2017. Those ages 55 years and older (55-64 and 65+) showed a clear increase among all NYS residents from 2009 to 2019, especially those ages 65 and older. On the other hand, population sizes for those ages under 54 showed a declining trend over the same 11-year period, except for the 25 to 34 age group population. These trends are clearly visible from Figure 6-8; which displays changes in NYS population distributions by age during the time period from 2009 to 2019.

Table 6-2. NYS 2009-2019 population by age group (thousands)

Age group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<15	3,541	3,533	3,484	3,490	3,514	3,495	3,484	3,455	3,439	3,374	3,336
15-19	1,381	1,359	1,343	1,314	1,296	1,264	1,247	1,244	1,237	1,202	1,187
20-24	1,389	1,417	1,421	1,451	1,433	1,441	1,406	1,382	1,352	1,294	1,265
25-34	2,636	2,659	2,706	2,765	2,788	2,843	2,870	2,883	2,923	2,873	2,865
35-44	2,654	2,621	2,569	2,530	2,513	2,508	2,514	2,468	2,472	2,434	2,430
45-54	2,870	2,873	2,881	2,843	2,807	2,784	2,771	2,725	2,661	2,557	2,472
55-64	2,244	2,310	2,394	2,432	2,454	2,508	2,534	2,567	2,604	2,596	2,602
65+	2,592	2,621	2,667	2,745	2,847	2,903	2,969	3,021	3,161	3,212	3,296
Total	**19,307**	**19,392**	**19,465**	**19,570**	**19,651**	**19,746**	**19,796**	**19,745**	**19,849**	**19,542**	**19,454**

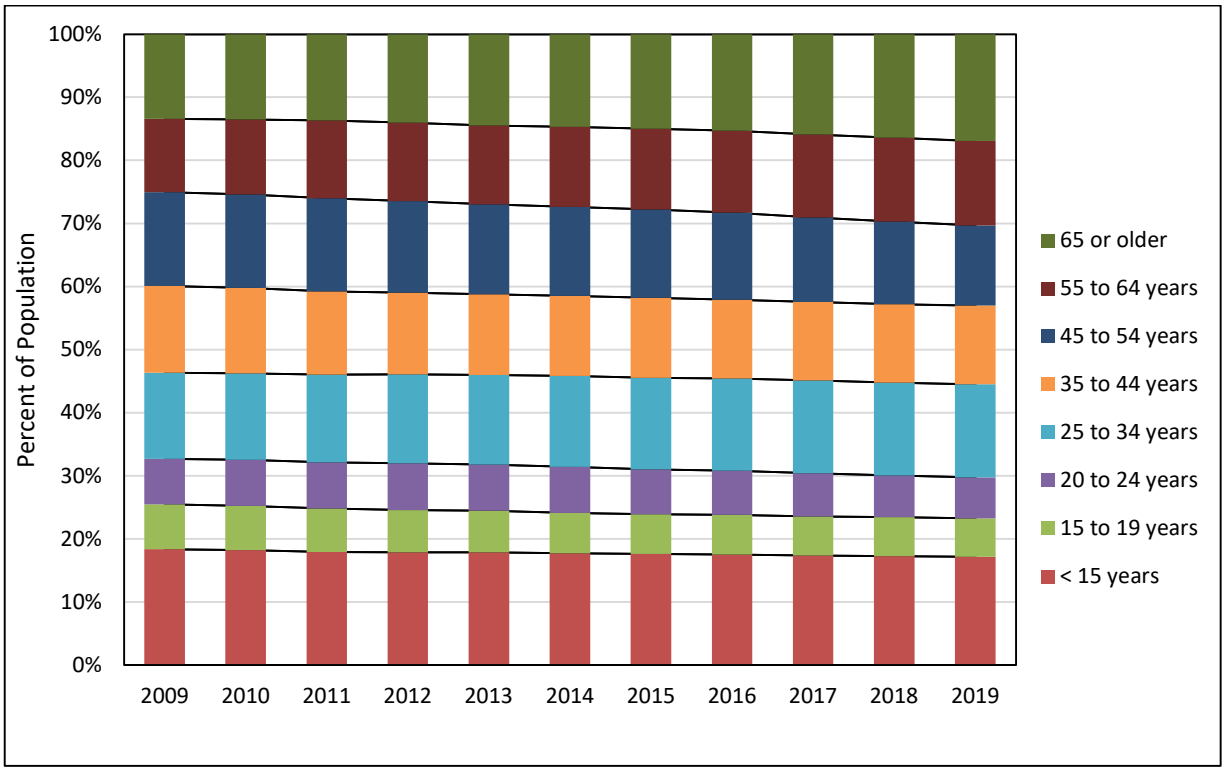


Figure 6-8. Distribution of NYS resident population by age group, 2009-2019.

Using information obtained from the *Highway Statistics Series* published by the Federal Highway Administration (FHWA), annual VMT and its corresponding number of registered number of vehicles in NYS for the period of 2009 to 2019 are summarized and presented in Figure 6-9 (Federal Highway Administration, 2019). Specifically, state-level VMT was taken from *Table VM-2* and vehicle registration information was found in *Table MV-1* of each annual *Highway Statistics* report. As seen in Figure 6-9, the registered number of vehicles increased slightly from 2011 to 2019, while VMT remain relatively stable in this period.

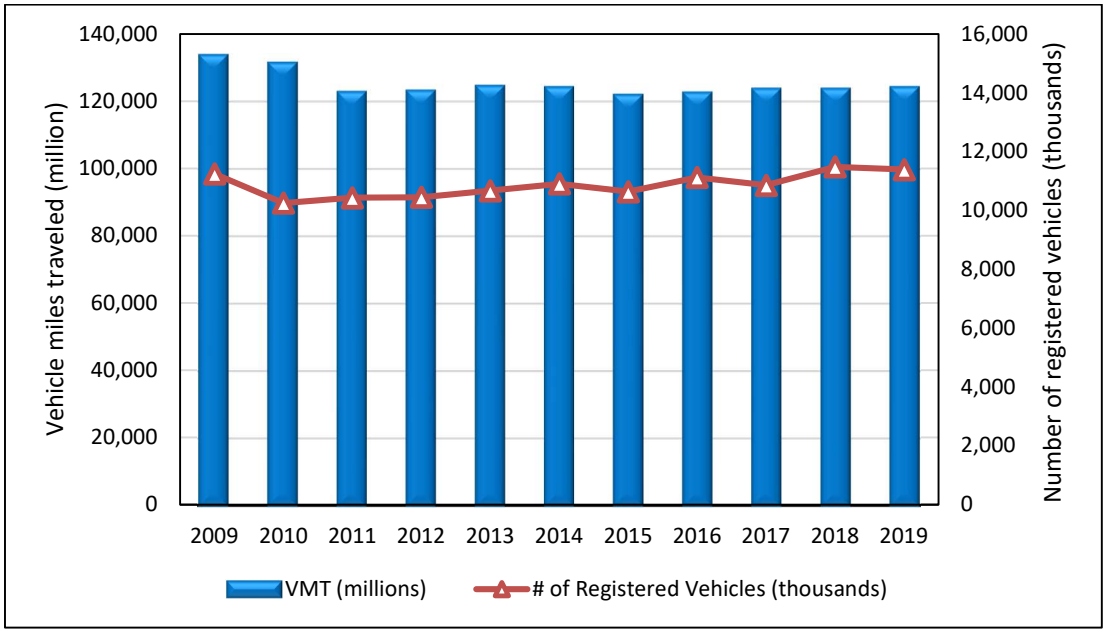


Figure 6-9. Annual VMT and number of registered vehicles in NYS, 2009-2019.

The *Highway Statistics* information is only available as totals for national and state-levels, i.e., no further geographic or demographic breakdowns are given. Thus, to examine whether travelers' age or geographic region (where they lived) influences the degree of fatality (based on FARS data), NHTS data had to be used. To maintain consistency, when NHTS demographic information was used, VMT estimated from NHTS data was also used as the measure of exposure for this specific discussion instead of the state-level VMT from the *Highway Statistics*. As in previous chapters of this report, NYS residents aged 65 years or older were classified in the elderly group, while all others (aged 5 to 64) were included under the "non-elderly" group. The main geographic concern was focused on the uniqueness of NYC versus those who lived elsewhere in NYS (i.e., Rest of NYS).

Table 6-3 presents a summary of the VMT totals (in million miles) by elderly and non-elderly residents that lived in NYC and elsewhere in NYS based on the 2009 and 2017 NHTS datasets. The total VMT made by elderly population increased significantly from 2009 to 2017 in both regions, while those made by non-elderly group remain stable or reduced slightly between the two years. As discussed in Chapter 3 of this report, based on NHTS data, both the elderly population trip rate and trip length in NYS increased from 2009 to 2017, which leads to the increased VMT. Expectedly as shown in Figure 6-10, elderly residents contributed to around 10% of total VMT within each region in 2009, whereas their VMT shares grew to over 15% in 2017.

Table 6-3. VMT (in million miles) by elderly status for NYS residents, 2009 and 2017 NHTS

Region	Group	2009	2017
NYS	Non-elderly	82,358	77,959
	Elderly	9,813	14,519
	Total	**92,171**	**92,478**
NYC	Non-elderly	13,085	13,312
	Elderly	1,272	2,359
	Total	**14,357**	**15,671**
Rest of NYS	Non-elderly	69,272	64,647
	Elderly	8,542	12,160
	Total	**77,814**	**76,807**

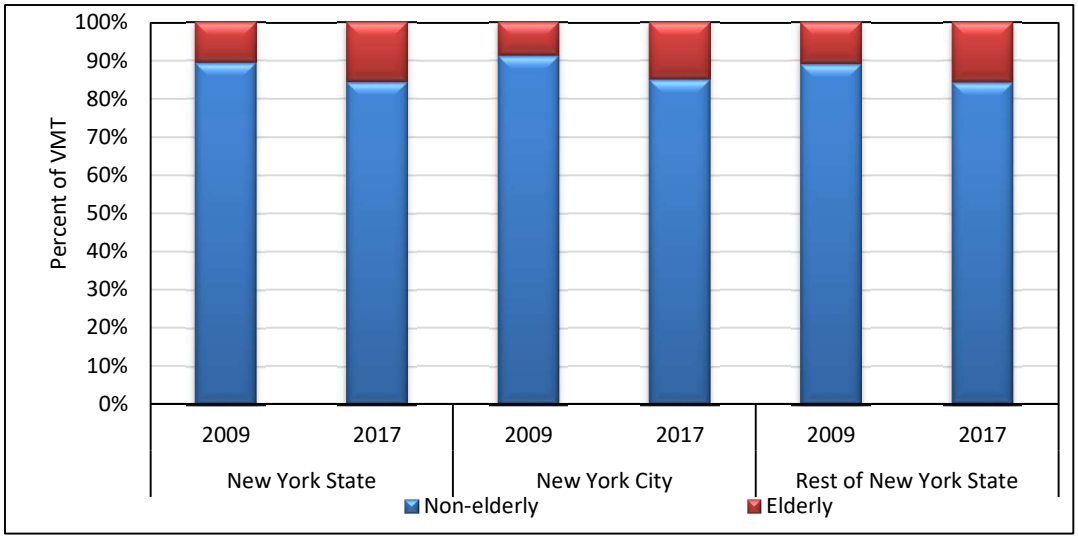


Figure 6-10. Distributions of VMT by age group and location in NYS, 2009 and 2017 NHTS data.

6.3 FATALITY RATES

Annual fatality rates based on crashes that occurred in NYS during 2009-2019 were estimated by different measures and are presented in Figure 6-11. The FARS fatality counts (totals) in these years are also presented in the same figure for reference. Basically, all fatality rates agreed with the overall declining trend as shown in the measures of fatality numbers over the 11-year period. The population-based measure of fatality rate (i.e., the fatality rate per 100,000 persons) was flatter (a smaller slope meaning less changes over time) than those of other more "targeted group" measures (i.e., per driver, per vehicle, or per VMT). These "targeted" measures have direct and indirect associations with vehicle, so it seems reasonable to have a slightly higher association with fatalities—mainly because FARS captures crashes that occur on public roadways and majority of these crashes are associated with vehicles. All measures showed a continuous decline from 2015 and 2019, which is consistent with the fatality counts trend within the same period.

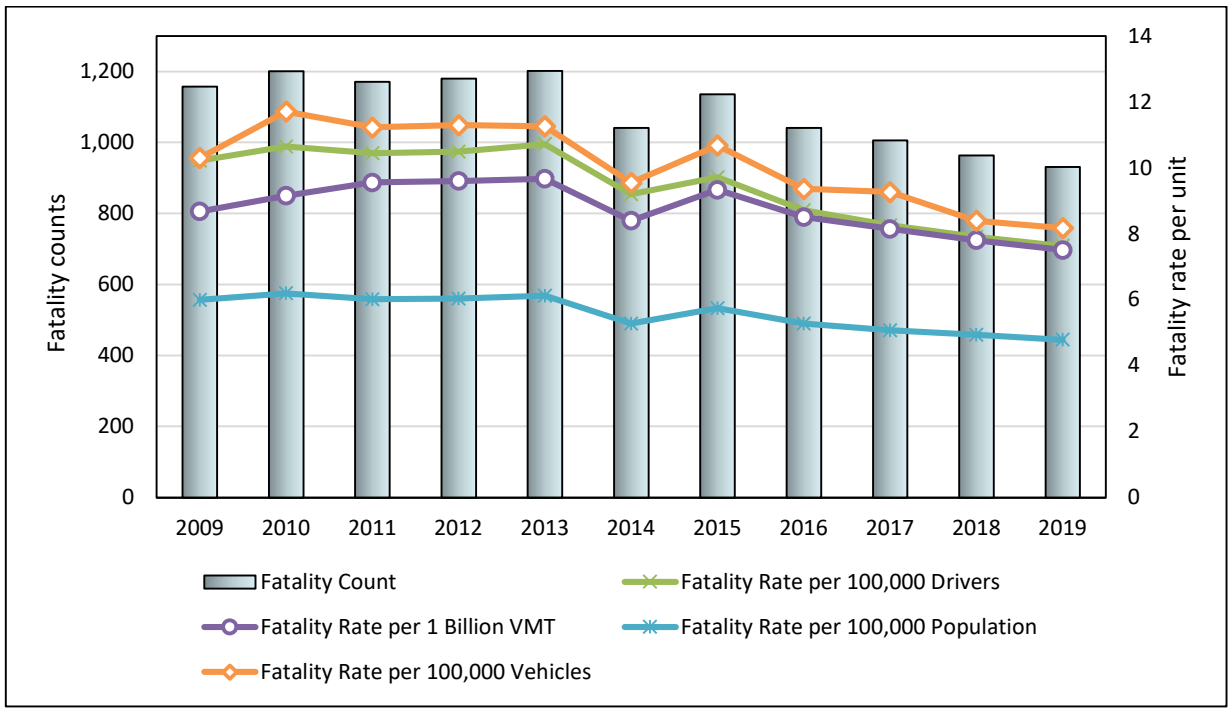


Figure 6-11. Fatality counts and measures of fatality rates for FARS crashes in NYS, 2009-2019.

Fatality rates, measured in fatalities per 100,000 populations within the age group, were also examined and the results are summarized in Table 6-4. Higher fatality rates associated with the younger driver age groups (15-24 years old) are clearly noticeable, especially from 2009 to 2013. Furthermore, fatality rates for the elderly (aged 65+ years old) are nearly as bad as those ages 20-24 years old. Overall, fatality rates were in decreasing trends for all age groups over the 11-year course.

Table 6-4. Fatality rates by age group in NYS during 2009-2019
(Unit of measure: person per 100,000 population)

Age Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<15 years	1.4	1.4	0.9	1.2	1.1	0.9	1.0	0.7	0.9	0.6	0.9
15 to 19 years	8.0	7.4	5.7	5.5	6.9	4.9	4.7	4.7	5.4	3.8	3.5
20 to 24 years	10.4	11.3	10.0	10.5	10.5	7.4	9.4	7.9	7.0	7.6	7.3
25 to 34 years	7.2	6.5	6.8	6.5	7.1	6.8	6.8	6.4	6.3	5.8	6.3
35 to 44 years	5.0	5.5	5.8	5.3	5.0	4.8	4.9	4.7	4.3	4.6	3.7
45 to 54 years	5.5	5.3	6.2	6.7	5.7	5.1	5.7	4.9	5.1	5.2	4.7
55 to 64 years	5.6	6.3	6.3	5.8	6.3	5.4	6.8	5.9	4.6	5.2	5.3
65+ years	9.0	10.2	9.3	9.4	9.8	8.2	8.7	8.5	8.4	7.8	7.3
All ages	**6.0**	**6.2**	**6.0**	**6.0**	**6.1**	**5.3**	**5.7**	**5.3**	**5.1**	**4.9**	**4.8**

Unfortunately, statistics on the number of drivers or VMT by age group for the 11-year time period were not readily available, thus other fatality rate measures (as seen in Figure 6-11) could not be examined. Nonetheless, the statistics shown in Table 6-1 and Table 6-3 were utilized to compare VMT-based fatality rates for the two NHTS years (2009 and 2017) by elderly status of

the persons that were killed and by regions where such accidents occurred (NYC versus elsewhere in NYS). These fatality rates are shown in Table 6-5 below.

Table 6-5. Fatality rate by elderly status in NYS for NHTS years 2009 and 2017
(Unit of measure: person per 100-million VMT)

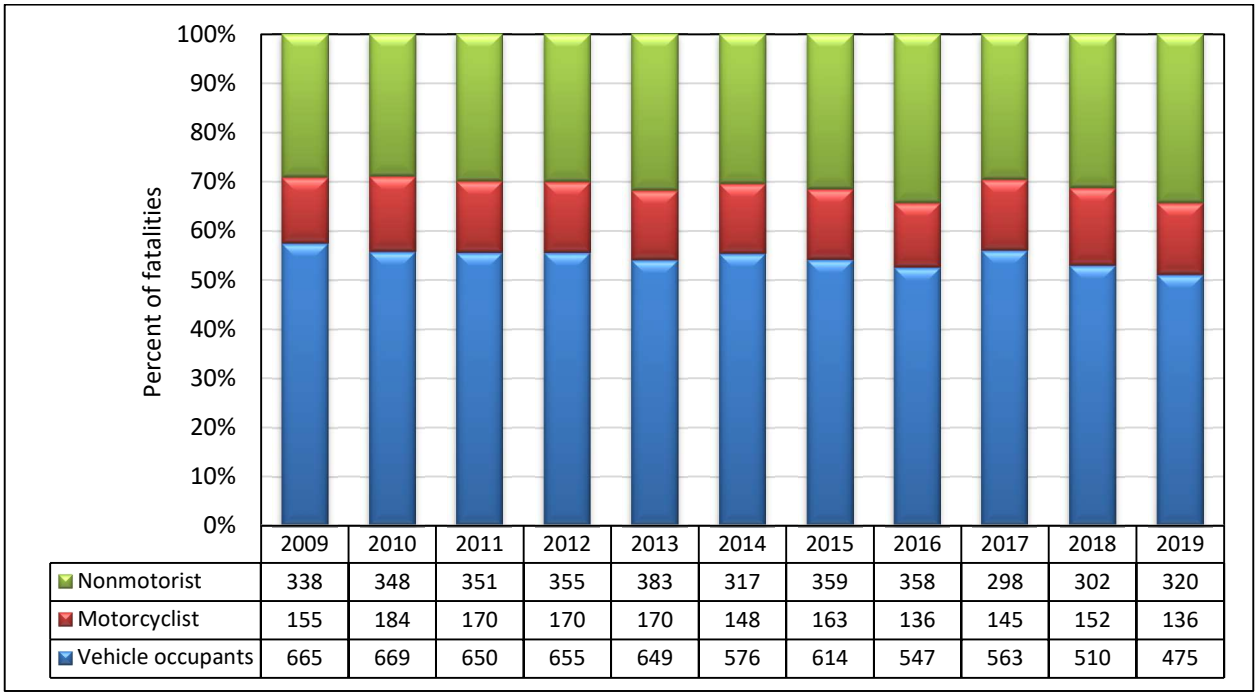
Region	Age Group	2009	2017
NYC	Non-elderly	1.6	1.1
	Elderly	**4.5**	**2.8**
Rest of NYS	Non-elderly	1.0	0.9
	Elderly	**2.1**	**1.7**
NYS	Non-elderly	1.1	0.9
	Elderly	**2.4**	**1.8**
	All	1.3	1.1

The above per-VMT based fatality rate also indicated that elderlies were subjected to a higher risk than their younger counterparts, especially in NYC. Additionally, fatality rates in NYC were higher compared to their counterparts elsewhere in the NYS. Clearly, from the point of view of VMT, 2017 was a safer year for all when compared with 2009 fatality rates. Overall, the average fatality rate dropped from 1.3 "person per 100-million VMT" in 2009 to 1.1 "person per 100-million VMT" in 2017 in NYS.

6.4 FATALITY BY PERSON TYPE

Of all NYS fatalities during the 11-year period of 2009-2019, the majority were occupants of vehicles that were involved in the crashes (either as a driver or a passenger), accounting for 50-60% of NYS fatalities annually (see Figure 6-12). Most of the remaining fatalities were non-motorized bystanders (e.g., people who were walking and biking). As seen in Figure 6-12, there is a slightly increasing trend in share of fatalities involving persons with non-motorized transportation modes—growing from about 29% in the 2009 to about 34% in 2019. The share of fatalities involving motorcyclists[2] in recent years remain steady. On the other hand, the share as well as the number of vehicle-occupant fatalities in NYS has seen a reduction over the 11-year period, dropping from 665 in 2009 to 475 in 2019 in fatality counts and from 57% to 51% in terms of fatality shares between the two years.

[2] Motorcycle includes two/three wheel motorcycle, motor scooter, moped or motorized bicycle and other unknown motorcycle types. Specifically, in the FARS *Person* file, all vehicles that have "BODY_TYPE" value 80 to 89 are considered motorcycle in this study. Both passengers and drivers of the motorcycle are referred to as motorcyclists.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Nonmotorist	338	348	351	355	383	317	359	358	298	302	320
Motorcyclist	155	184	170	170	170	148	163	136	145	152	136
Vehicle occupants	665	669	650	655	649	576	614	547	563	510	475

Figure 6-12. Distribution of NYS fatalities by person type, 2009-2019.

The characteristics of fatalities from NYS crashes were further examined, specifically by elderly status of those involved. These results are presented in Figure 6-13. Note that motorist group includes vehicle occupants (driver and passenger) and motorcyclist. Expectedly, motorist had the majority of fatalities in both elderly and non-elderly groups, accounting for 57-66% and 68-74% of the fatalities in the respective groups over the 11-year period. Among all non-elderly fatalities, the share of nonmotorists ranged from 26 to 32% between 2009 to 2019. This share ranged from 34 to 44% for elderly fatalities within the same period, indicating that an elderly person has a higher chance of being involved in fatal crashes as a nonmotorist. Furthermore, the share of fatalities involving elderly nonmotorists increased from 2009 to 2019 (from 38% in 2009 to 43% in 2019).

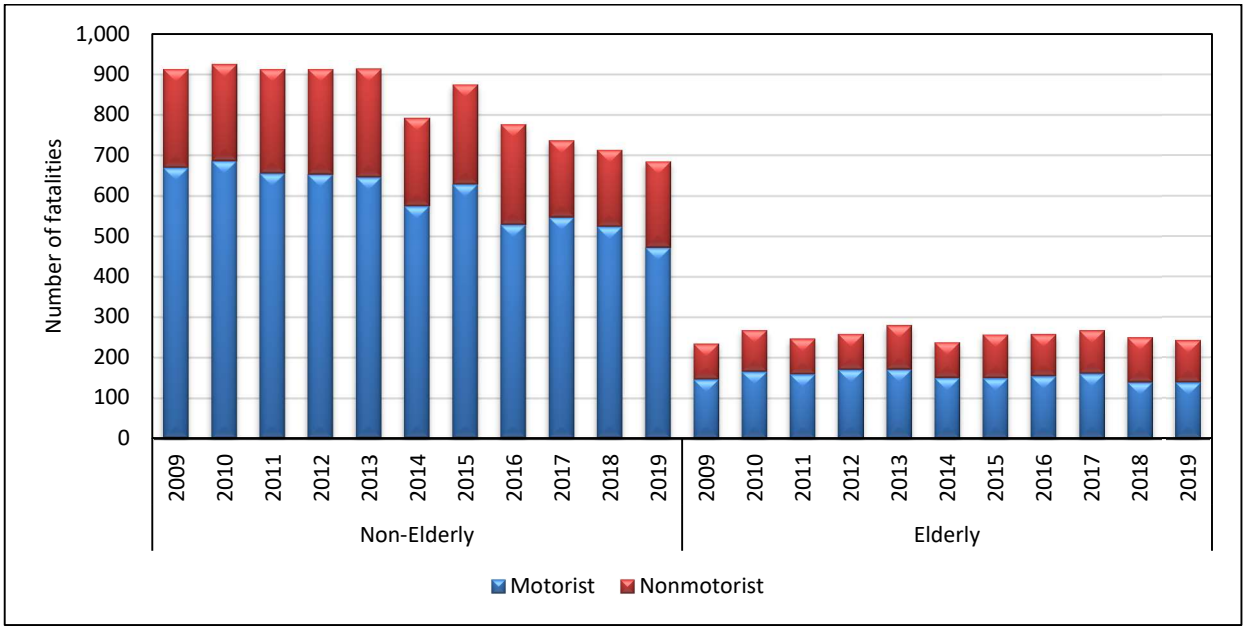


Figure 6-13. Number of fatalities by elderly status in NYS crashes based on 2009-2019 FARS.

A further breakdown of NYS fatalities by person type and elderly status in different regions in NYS is presented in

Table **6-6**. Compared to the rest of NYS, the shares of people being involved in a crash as nonmotorists in NYC are much higher for both elderly and non-elderly groups (58% of fatalities in NYC versus 22% in Rest of NYS in 2017). A significant difference between elderly and non-elderly groups were also observed for fatal crashes in NYC. For example, in 2017, 45% of non-elderly fatalities in NYC were nonmotorists while 86% of elderly fatalities were nonmotorists.

Table 6-6. Fatalities by person type, region and elderly status, for NHTS years 2009 and 2017

Regions	Person type	Non-Elderly		Elderly		All	
		2009	2017	2009	2017	2009	2017
NYC	Motorist	89	77	7	9	98	87
	Nonmotorist	118	64	50	56	173	120
Rest of NYS	Motorist	580	469	139	151	722	621
	Nonmotorist	126	126	38	51	165	178
NYS	Motorist	669	546	146	160	820	708
	Nonmotorist	244	190	88	107	338	298

The number of elderly fatalities by gender and person type from 2009 to 2019 is presented in Figure 6-14. Generally, around 40% of fatal crashes involve elderly as nonmotorists from 2009 to 2019. No obvious gender differences were observed from the figure except in 2018 and 2019. The share of elderly female fatalities increased compared to previous years—over 50% of the fatalities were nonmotorists in these two years.

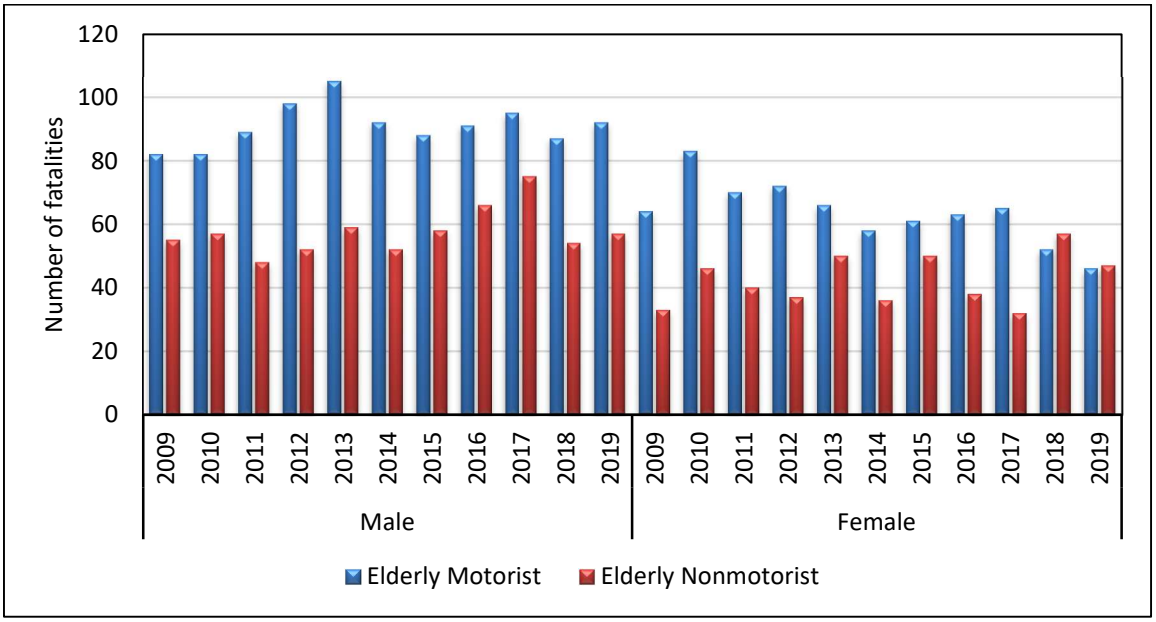


Figure 6-14. Number of elderly fatalities by gender and person type in NYS crashes based on 2009-2019 FARS.

The elderly fatalities involving motorists by occupant type and gender are presented in Figure 6-15. Males clearly have a much higher likelihood of being involved in fatal crashes as motorcyclist compared to their female counterparts. Around 26% of elderly male fatalities were motorcyclists over the 11 years from 2009 to 2019 whereas it was less than 10% for females. Conversely, females were more likely to be involved in fatal crashes as passengers compared to males. In 2017, 37% of female fatalities as motorists were passengers versus 13% for males.

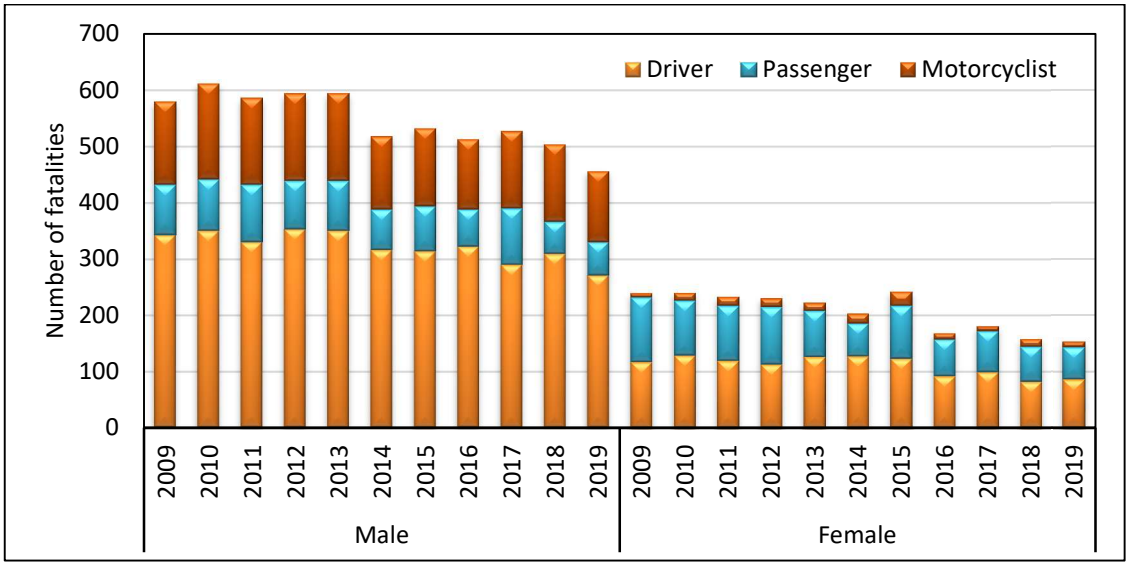


Figure 6-15. Number of elderly fatalities by gender and occupant type in NYS crashes based on 2009-2019 FARS.

Note that, in order to examine traffic safety issues concerning the elderly, information from the FARS data series were analyzed to the extent possible for NYS. A major limitation of using FARS in this context was that FARS considered all persons involved in its qualifying accidents regardless of where these people lived. By using data from all FARS accidents that occurred in NYS for the analysis, this study unescapably inherited a somewhat nonrealistic assumption of treating all those involved in fatal accidents in NYS as if they were residents of NYS. Readers of this report are reminded to keep this in mind when interpreting FARS results presented in this chapter.

7. SUMMARY OF KEY FINDINGS

This report details findings from an examination of travel behavior and patterns (or trends) associated with the elderly population in NYS. The main data source used was the 2017 NHTS. Due to the uniqueness of NYC, regional analyses were conducted by comparing statistics from NYC to other regions in NYS in many cases. Below are key findings from this study:

Population Size of Elderly in NYS

- Based on the 2017 NHTS, the NYS elderly population accounted for 17% of its total population of age 5 years and older—an increase from the 14% in 2009.
- Although the male population in NYS as a whole increased nearly 2% from 2009 to 2017, the elderly male population in NYS increased over 20% during the same period of time. Similarly, NYS females as a whole had a population growth of about 2% between 2009 and 2017, while the increase in the elderly female population was over 15% during this time period.

Characteristics of the Elderly Households

- When compared to non-elderly households, elderly households (a household with at least one person who is 65 or older) had a significantly higher likelihood of being in the lower income groups (with annual household income under $50,000) regardless of where they lived in NYS.
- About 89% of the NYS elderly households lived in urban areas, including 43% in NYC and 46% in other urban areas of NYS in 2017.
- In 2017, approximately 38% of elderly households lived alone, while only about 26% of non-elderly households were lived alone. Another 42% or so of the elderly households were two-person households, compared to about 26% in non-elderly households.
- In 2017, nearly 49% of elderly households in NYC did not own any vehicles, while only 5% to 20% of elderly households had zero-vehicles in all other NYS regions. As a whole, about 52% all NYC households did not own any vehicles.

Driving Status of Elderly

- The elderly who lived alone in NYC had a significantly higher likelihood of not being a driver than their counterparts who lived elsewhere in NYS. According to the 2017 NHTS, the share of lived-alone elderly who is not a driver is 58% in NYC versus 22% in other NYS regions.
- Approximately 70% of elderly males aged 85+ continue to consider themselves a driver. Elderly females are less likely to report themselves as drivers when compared to their male counterparts. About 40% of old female residents identified themselves as drivers in their late 80s (85+).
- A "non-driver" lived-alone elderly traveled significantly less PMT than those who identified themselves as "a driver" regardless of where they lived. The elderly who lived alone in NYC also had significantly less daily PMT and VMT than their counterparts who lived elsewhere—regardless of their driver status.
- NYC also had a much higher share of two-person elderly households without any drivers as compared to their counterparts from other areas of NYS. Based on 2017 NHTS data,

about 20% of the all two-person elderly households in NYC had no drivers in their households, versus only 3% in the rest of the NYS.

Travel Patterns

- On average, NYC residents took fewer daily trips per person than those from other regions. A typical elderly person from NYC took 11% fewer daily person trips in 2017 than their younger neighbors from the same region. Outside NYC, an elderly New Yorker took about 6-7% more daily trips than their non-elderly counterparts.
- Elderly travelers on average took shorter trips than younger travelers regardless of where they lived. For those who lived in NYC, a typical elderly person traveled an average of 50% shorter distance than a typical non-elderly person in 2017; this difference was about 16% for people who lived in other urban areas of NYS and 8% for those from non-urban regions of NYS.
- Instead of POV, NYC residents walked and used public transit to fulfill most of their daily travel needs. These two modes of transportation accounted for over 60% of NYC residents' total daily trips.
- Majority of POV trips taken by elderly men relied on their own driving, regardless of where they lived. On the other hand, a significant portion of POV trips taken by elderly women were driven by their spouses or other people outside their households.
- Over 55% of daily person trips taken by a NYS elderly were made for the purpose of family and personal business in 2017, while less than 40% of their younger counterparts traveled for the same reason.
- Over three-quarters of elderly person-trips taken in 2017 occurred during the period from 9 am to 6 pm. Over half of those trips were made during the period from 9 am to 3 pm.
- NYC residents made significantly fewer vehicle trips than those who lived elsewhere. On average, an NYC elderly person made about 1.4 daily vehicle-trip in 2017, while his/her counterpart from outside NYC made 2.5 to 3 vehicle trips per day in the same year.
- Elderly drivers were more likely to make vehicle trips during the period from 9 am to 6 pm, regardless of where they lived. On the other hand, vehicle trips made by younger drivers were spread more evenly across the day from 6 am to 9 pm.
- Over 50% of person-trips taken by elderlies in all NYS regions were made by traveling alone.
- In 2017, elderly females were more likely to drive alone than elderly males from the same region. Elderly males however were more likely to travel in parties of two on their vehicle trips than elderly females.

Medical Condition

- On average, 5-10% of the non-elderly population had medical conditions that made it difficult to travel, versus 21-29% of the elderly population who had such conditions in 2017.
- In NYC, 56% of those who reported having medical conditions were elderly residents.
- In 2017, a typical elderly person without health issues took about 2 to 3 trips per day on average versus 0.5 trips per day for the person who had such an issue.

Travel Cost and Internet Accessibility

- More than half of NYC elderly residents considered travel costs as a financial burden in 2017, while only 19% thought travel cost is not a concern.
- Compared to the non-elderly population, elderly residents were less concerned about travel costs within each region.
- Elderlies are less likely to have access to the internet than their younger counterparts. This difference is more obvious for accessing the internet via smartphones, under 10% of non-elderly population claimed that they never accessed the internet using a smartphone vs. over 44% for the elderly group in all regions.
- Desktop/laptop is a more popular device than smartphones among the elderly. About 56% of elderly residents lived outside NYS access the internet by desktops/laptops.

Traffic Safety

- Based on FARS data, about 24% of all fatal accidents occurred in NYS during the period from 2009 to 2019 involved at least one elderly person. About 95% of elderly-involved fatal crashes were single-fatality.
- The share of elderly fatalities increased from 2009 to 2017 in both NYC and the rest of NYS.
- When measured in fatalities per 100,000 populations by age group during 2009-2019, the annual fatality rates reflected that elderly group was one of the highest among all age groups, nearly as high as those aged 20-24 years old.
- An elderly person has a higher chance of being involved in fatal crashes that occurred in NYC as a non-motorist.

REFERENCES

Administration on Aging. (2021). *2020 Profile of Older Americans*. Administration for Community Living. https://acl.gov/sites/default/files/Profile%20of%20OA/2020ProfileOlderAmericans_RevisedFinal.pdf

Federal Highway Administration. (2019). *Highway Staistics*. https://www.fhwa.dot.gov/policyinformation/statistics.cfm

Freiberger, E., Sieber, C. C., & Kob, R. (2020). Mobility in older community-dwelling persons: a narrative review. *Frontiers in Physiology*, *11*, 881.

Hutchinson, J. W. (2018). *Exploring patterns of heterogeneity in activity–travel behaviors of older people* [master's thesis, The University of Texas at Austin].

Joint Center for Housing Studies. (2016). *Projections & Implications for Housing a Growing Population: Older Households 2015-2035*. Joint Center for Housing Studies (JCHS) of Harvard University. https://www.jchs.harvard.edu/sites/default/files/media/imp/harvard_jchs_housing_growing_population_2016_1.pdf

Lidbe, A., Adanu, E. K., Penmetsa, P., & Jones, S. (2021). Changes in the travel patterns of older Americans with medical conditions: a comparison of 2001 and 2017 NHTS data. *Transportation Research Interdisciplinary Perspectives*, *11*, 100463.

McGuckin, N., & Fucci, A. (2018). *Summary of Travel Trends: 2017 National Household Survey* (FHWA-PL-18-019). https://nhts.ornl.gov/assets/2017_nhts_summary_travel_trends.pdf

National Center for Statistics and Analysis. (2022). *Fatality Analysis Reporting System Analytical User's Manual, 1975-2020* (DOT HS 813 254). National Highway Traffic Safety Adiministation. https://www.nhtsa.gov/crash-data-systems/fatality-analysis-reporting-system

National Household Travel Survey. (2022). *NHTS Website*. https://nhts.ornl.gov/

Older Adults Technology Services. (2021). *Aging Connected: Exposing the Hidden Connectivity Crisis for Older Adults*. Older Adults Technology Services. https://oats.org/wp-content/uploads/2021/01/Aging-Connected-Exposing-the-Hidden-Connectivity-Crisis-for-Older-Adults.pdf

Sadeghvaziri, E., & Tawfik, A. (2020, May 26–29). Using the 2017 National Household Travel Survey Data to Explore the Elderly's Travel Patterns. International Conference on Transportation and Development 2020, Seattle, Washington.

U.S. Census Bureau. (2017). *2017 Population Projections Datasets*. https://www.census.gov/programs-surveys/popproj/data/datasets.html

APPENDIX A. GLOSSARY OF NHTS TERMS

APPENDIX A. GLOSSARY OF NHTS TERMS

This glossary provides the most commonly used terms in the NHTS as well as terms used in this report along with definitions of those terms. These definitions are provided to assist the user in the interpretation of the NHTS data.

Adult	For NHTS, this is defined as a person 18 years or older.
Block Group	A subdivision of a Census Tract that contain 600 to 3,000 people. The source used for the 2017 NHTS was the United States Census Bureau 2014 TIGER/Line Shapefiles (derived from Census 2010 definition).
Census Tract	A small subdivision of a county, generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people. The geographic size of the tract may vary considerably, depending on population density. Tracts were designed to be homogeneous in regard to population characteristics, economic status and living conditions when they were first delineated. Since the first tracts were delineated for the 1890 Census, today's tracts may be far from homogeneous. The source used for the 2017 NHTS was the United States Census Bureau 2014 TIGER/Line Shapefiles (derived from Census 2010 definition).
Destination	For travel day trips, the destination is the point at which there is a break in travel, except if the break is only to change vehicles or means of transport.
Driver	A driver is a person who operates a motorized vehicle. If more than one person drives on a single trip, the person who drives the most miles is classified as the principal driver.
Elderly	A person 65 years or older.
Elderly Household	Households with one or more persons aged 65 years or older.
Employed	A person is considered employed if (s)he worked for pay, either full time or part time, during the week before the interview. This includes persons who work at home or persons who have more than one job.
Household	A group of persons whose usual place of residence is a specific housing unit; these persons may or may not be related to each other. The total of all US households represents the total civilian non-institutionalized population. A household does not include group quarters (i.e., 10 or more persons living together, none of whom are related).

Household Income	Household income is the money earned by all family members in a household, including those temporarily absent. Annual income consisted of the income earned 12 months preceding the interview. Household income includes monies from all sources, such as wages and salary, commissions, tips, cash bonuses, income from a business or farm, pensions, dividends, interest, unemployment or workmen's compensation, social security, veterans' payments, rent received from owned property (minus the operating costs), public assistance payments, regular gifts of money from friends or relatives not living in the household, alimony, child support, and other kinds of periodic money income other than earnings. Household income excludes in-kind income such as room and board, insurance payments, lump-sum inheritances, occasional gifts of money from persons not living in the same household, withdrawal of savings from banks, tax refunds, and the proceeds of the sale of one's house, car, or other personal property.
Household Members	Household members include all people, whether present or temporarily absent, whose usual place of residence is in the sample unit. Household members also include people staying in the sample unit who have no other usual place of residence elsewhere.
Household Vehicle	A household vehicle is a motorized vehicle that is owned, leased, rented or company-owned and available to be used regularly by household members during the two-week travel period. Household vehicles include vehicles used solely for business purposes or business-owned vehicles, as long as they are driven home and can be used for the home to work trip (e.g., taxicabs and police cars). Household vehicles include all vehicles that were owned or available for use by members of the household during the travel period, even though a vehicle may have been sold before the interview. Vehicles excluded from household vehicles are those which were not working and were not expected to be working within 60 days, and vehicles that were purchased or received after the designated travel day.
Journey-to-Work Trips (Commute Trips)	Includes travel to and from a place where one reports for work. Does not include any other work-related travel. Does not include any trips for persons who work at home.
Means of Transportation	A mode of travel used for going from one place (origin) to another (destination). A means of transportation includes private and public transit modes, as well as walking. The following transportation modes, grouped by major mode, are included in the NHTS data. **Active Modes** – include modes where a person must actively move from one place to the next.

1. Walk: This category includes walking and jogging.

2. Bicycle: This category includes bicycles of all speeds and sizes that do not have a motor.

Private Vehicle – a stipulation for being a private vehicle is that the vehicle is privately operated, including rental cars.

3. Car. Includes cars and station wagons. Leased and rented cars are included if they are privately operated and not used for picking up passengers in return for fare.

4. Sport Utility Vehicle. Includes vehicles that are a hybrid of design elements from a van, a pickup truck and a station wagon. Examples include a Ford Explorer, Jeep Cherokee, or Nissan Pathfinder.

5. Van. Includes vans or minivans designed to carry 5 to 13 passengers, or to haul cargo.

6. Pickup Truck. Includes vehicles with an enclosed cab that usually accommodates 2-3 passengers and has an open cargo area in the rear. Late model pickups often have a back seat that allows for total seating of 4-6 passengers. Pickup trucks usually have the same size of wheel-base as a full-size station wagon. This category also includes pickups with campers.

8. Motorcycle/Moped: This category includes large, medium, and small motorcycles and mopeds.

9. RV (Motor Home, ATV, snowmobile): An RV or motor home includes a self-powered recreational vehicle that is operated as a unit without being towed by another vehicle (e.g., a Winnebago motor home). This category also includes ATVs and snowmobiles.

18. Rental Car: Includes Zipcar and Car2Go, in addition to commercially rented cars for private use.

7. Golf Cart/Segway: This includes all electric or gas operated vehicles designed for use on a golf course, but whose use has recently extended to use within smaller, often gated, communities. NOTE: Travel taken via golf cart is NOT included in vehicle trips and vehicle miles of travel.

Public Transportation, as used in FHWA publications and analysis of NHTS data, typically includes the following, that are indicated in bold below, public or commuter bus, commuter rail, and subway/elevated rail/light rail/streetcar.

Bus: This category includes:

11. **Public or Commuter Buses**, these are local public transit buses that are available to the general public and buses used for short-distance public transport purposes (e.g., city bus or public bus), school buses,

13. Private/Charter/Tour/Shuttle Buses, these are private buses operating on a fixed schedule between population centers, and are buses that shuttle passengers from one fixed place to another (e.g., airport shuttles), and

14. City-to-City Buses, these are buses that run from one urban center to the other (e.g., Greyhound).

Train: This category includes:

15. **Amtrak/Commuter Rail** that run from one urban center to another,

16. **Subway/Elevated Rail/Light Rail/Street Car** (also known as rail rapid transit) is a high capacity system operated on a fixed rail or guide way system on a private right of way, and vehicles that run on a fixed rail system powered by electricity obtained from an overhead power distribution system.

Other Modes

10. School Buses.

12. Paratransit /Dial-A-Ride.

17. Taxi/limo. Taxis include the use of a taxicab by a passenger for fare, including limousines. In 2017, this category also includes ridesharing such as Uber and Lyft.

19. Airplane. Airplanes include commercial airplanes and smaller planes that are available for use by the general public in exchange for a fare. Private and corporate planes and helicopters are also included.

20. Boat/Ferry/Water Taxi. This includes travel by passenger line ferries.

97. Something else. Includes any type of transportation not previously listed (skate boards, roller blades, sailboats, cruise ships, etc.).

Metropolitan Statistical Area (MSA)

Except in the New England states, a metropolitan statistical area is a county or group of contiguous counties which contains at least one city of 50,000 inhabitants or more, or “twin cities” with a combined population of at least 50,000. In addition, contiguous counties are included in an MSA if, according to certain criteria, they are socially and economically integrated with the central city. In the New England states, MSA’s consist of towns and cities

	instead of counties. The source used for the 2017 NHTS was the United States Census Bureau 2014 TIGER/Line Shapefiles (derived from Census 2010 definition).
Motorized Vehicle	Motorized vehicles are all vehicles that are licensed for highway driving. Snow mobiles and minibikes are specifically excluded.
New York City (NYC)	New York City is defined in this report as the five county area: Bronx, Kings, Queens, New York (Manhattan), and Richmond.
Occupancy	Occupancy is the number of persons, including driver and passenger(s) in a vehicle.
Occupancy Rate	NHTS occupancy rates are generally defined as the mileage-weighted averages of the number of persons on a vehicle trip.
Origin	Origin is the starting point of a trip.
Passenger	For a specific trip, a passenger is any occupant of a motorized vehicle, other than the driver.
Person Miles of Travel (PMT)	PMT is a primary measure of person travel. When one person travels one mile, one person mile of travel results. Where 2 or more persons travel together in the same vehicle, each person makes the same number of person miles as the vehicle miles. Therefore, four persons traveling 5 miles in the same vehicle results in 20 person miles (4 x 5 = 20).
Person Trip	A person trip is a trip by one or more persons in any mode of transportation. Each person is considered as making one person trip. For example, four persons traveling together in one auto are counted as four person trips.
Privately Owned Vehicle (POV)	A privately-owned vehicle or privately-operated vehicle. Either way, the intent here is that this is not a vehicle available to the public for a fee, such as a bus, subway, and taxi.
Travel Day	A travel day is a 24-hour period from 4:00 a.m. to 3:59 a.m. designated as the reference period for studying trips and travel by members of a sampled household.
Travel Day Trip	A travel day trip is defined as any time the respondent went from one location to another by private motor vehicle, public transportation, bicycle, walking, or other means during the NHTS assigned reporting travel day. However, a separate trip is not counted in two instances: 1. When the sole purpose for the trip is to get to another vehicle or mode of transportation in order to continue to the destination.

2. Travel within a shopping center, mall or shopping areas of 4-5 blocks is to be considered as travel to one destination.

Vehicle	In the 2017 NHTS, the term vehicle includes autos, passenger vans, sport utility vehicles, pickups and other light trucks, RVs, motorcycles and mopeds owned or available to the household.
Vehicle Miles of Travel (VMT)	VMT is a unit to measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.
Vehicle Occupancy	Vehicle occupancy is the number of persons, including driver and passenger(s) in a vehicle; also includes persons who did not complete a whole trip.
Vehicle Occupancy Rate	NHTS occupancy rates are generally calculated as person miles divided by vehicle miles.
Vehicle Trip	A trip by a single POV regardless of the number of persons in the vehicle.
Work-Related Travel	These are trips related to business activities except travel to the place of work: for example, a plumber drives to a wholesale dealer to purchase supplies for his business or a company executive travels from his office to another firm to attend a business meeting. Business, out-of-town trips, and professional conventions are also included.
Worker	See “Employed.”