Stage 3/3 Project Report

# Attitudes Towards Emerging Mobility Options and Technologies – Phase 3: Survey Data Compilation, and Analysis

Prepared for **Teaching Old Models New Tricks (TOMNET) Transportation Center**

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| **16. Abstract**<br>This report summarizes preliminary descriptive results of a large-scale survey-based research study to understand people's preferences and choices when it comes to future mobility options and technologies in the Tampa Bay metropolitan area. Survey results show that a majority of residents are familiar with ridesharing services and but only about one-third of respondents were familiar with autonomous vehicles. Use of ridesharing services was low with the sample and people were critical of shared ridehailing. Trust in autonomous vehicles was generally a more salient concern over the benefits to personal travel. | | | |
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## TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES

## SUMMARY

The Center for Teaching Old Models New Tricks (TOMNET), which is a Tier 1 University Transportation Center (UTC), aims to shed deep attitudinal and behavioral insights on the factors that affect a wide array of people's mobility choices in an era of new mobility options and technologies that will have a transformational impact on transportation. This report summarizes preliminary descriptive results of a large-scale survey-based research study to understand people's preferences and choices when it comes to future mobility options and technologies in the Tampa Bay metropolitan area. The T4 survey (TOMNET Transformative Transportation Technologies Survey) is intended to collect very detailed and in-depth data about people's mobility patterns, as well as attitudes towards and perceptions of emerging transportation options such as ridehailing services and autonomous vehicles.

TOMNET consortium members, Georgia Tech, University of Washington, and University of South Florida, as well as a sister University Transportation Center (called D-STOP) led by the University of Texas at Austin, are joining forces with Arizona State University (ASU) to collect the same survey data from a sample of residents in the four metropolitan regions of Tampa, Austin, and Atlanta in addition to Phoenix metro area. Data collection efforts yielded a respondent sample of 261 individuals from the Tampa Bay metropolitan area collected through an online platform. Similar respondent sample sizes are being obtained in the three other metro areas where consortium partners are engaged in data collection.

This report offers a descriptive weighted univariate illustration of the findings from the Tampa Bay metropolitan area survey sample. The T4 survey explicitly collected detailed individual attitudes, both general and transport-related attitudes, socioeconomic characteristics, current commute and travel behavior, residential and vehicle ownership preferences in addition to perceptions and behaviors toward mobility-on-demand services and autonomous vehicles. By collecting such a rich set of variables, the study offers a robust basis to construct scenarios critical to transportation demand forecasting and long-range planning.

Regarding usage and familiarity with new mobility services, most respondents are familiar with mobility-on-demand services including private and shared ridehailing services, carsharing, and micro-mobility services (bike and e-scooter sharing). However, a very small percent of the participants is using these services frequently. Micro-mobility services have been used by less than one percent of Tampa Bay metro area residents weekly with the majority of the trips happening during weekends and about half of trips are two miles or less.

With respect to automation technology in transportation, about 37% of the respondents stated to be very or somewhat familiar with AVs. Thirty-five percent stated that they will never ride in an AV and 42 percent stated that they are not willing to buy an AV. In general, safety and data security are among the top concerns for respondents rather than a benefit of AVs. In this respect, 82 percent want AVs to be allowed on the market only when they are at least as safe as human drivers. In addition to the stated concerns, 40 percent of respondents believe that they can tolerate congestion better in an AV and about 60 percent are willing to commute longer in an AV. With respect to sharing perception, more than half of the respondents are uncomfortable sharing

their ride with people they do not know and only 22 percent think that lower cost of shared ridehailing services worth the addition of travel time.

Overall it is important to consider that all the convenience and comfort that mobility-on-demand services and autonomous vehicles provide for the users of transportation systems are in combination with the additional costs they may produce not just out of the users' pocket but from the entire people and the built and natural environment. These new mobility services and technologies could potentially decrease transit and green modes usage, increase the trip frequency and travel distance, change travel schedule and pattern, impact the home, work, and destination choices, exacerbate congestion, and increase energy consumption, emission production and induced demand for travel. Policymaking and planning practices with respect to smart pricing and sharing could maximize the positive impacts and minimize the negative impacts of these new revolutions to guide them wisely in the direction of sustainability, productivity, wellbeing, health, efficiency, accessibility, mobility, and socio-economic growth to serve human beings.

In this report, a comprehensive description of all the steps taken to full deployment, data cleaning, and weighting is explained. Moreover, a complete series of descriptive univariate graphs with explanations, which summarize the survey results, is presented in weighted mode. Further work will go into an in-depth analysis of the survey results to respond to numerous research questions still unsolved about the usage pattern and perceptions around new transportation technologies. For further information on this project and accessing related project reports please visit the TOMNET UTC website at www.tomnet-utc.org.

## INTRODUCTION

Emerging mobility options and technologies including autonomous vehicles and mobility-on-demand services are bringing transformative changes in the transportation landscape. To enhance transportation forecasting models considering the increasing penetration of disruptive forces, people's attitudes towards and perceptions of these technologies and services need to be measured and understood. Armed with such an understanding, it will be possible to specify and develop behavioral models that account for attitudes and perceptions, adoption cycles, and adaptation patterns. This project proposes the design of a survey, two phases of respondents' recruitment, and data analysis for a sample of more than 250 individuals across the Tampa Bay metro area.

Autonomous vehicles (AV) (also referred to as driverless cars or self-driving cars) are capable of navigating without human input using an array of technologies such as radar, LIDAR, GPS, odometry, and computer vision. Most industry experts suggest that autonomous vehicles will be on the road within a few years (www.driverless-future.com). The Secretary of Transportation in the US stated at the 2015 Frankfurt Auto show that he expects driverless cars to be in use all over the world by 2025 (Frankfurter Allgemeine Zeitung). The Institute of Electrical and Electronics Engineers (IEEE) predicts that up to 75 percent of all vehicles will be autonomous by 2040. Virtual ridehailing companies such as Uber and Lyft are beginning to change the transportation landscape in significant ways as they provide door-to-door mobility-on-demand with the use of mobile apps. In general, information technology is making rideshare and transit travel options more convenient using location-aware services and real-time data analytics.

Ridehailing services including cars (such as Uber, Lyft, Didi,…) and micro-mobility services (bike and e-scooter renting services such as Lime, Bird, and others) are becoming the new mode of transport in recent years. People use their cell-phone app to request a car ride which can be private or shared with other passengers matched by the companies. It is envisioned that ridehailing services will operate in AV mode in the future. Thus, the two renovations of the transportation sector, automation and shared mobility, cannot be effectively evaluated separately.

With the emergence of new transportation technologies and services, it is critical for transportation forecasting models to be enhanced to account for market dynamics that will result from increased penetration of disruptive forces in the transportation domain. It is envisioned that the enhanced models will help decision-makers better plan for the transportation infrastructure systems and design marketing and policy strategies that maximize the benefits of these disruptive technologies. Attitudes and perceptions are likely to vary by socioeconomic characteristics, existing travel patterns and mobility experiences, land use, and built environment attributes.

The overall goal of this project is to collect a rich set of data that includes information about people's travel behavior and their attitudes towards and perceptions of advanced transportation technologies and mobility options to inform the development of robust behavioral models of technology adoption capable of reflecting impacts of these disruptive forces on traveler behavior and values. It is envisioned that the findings of this project can help in shaping future policies and business models around new transportation technologies trying to prevent potential problems and

promote the benefits that these new technologies are bringing.

The objectives of this project include the development of a harmonized survey instrument, survey administration protocol, and sampling plan that other jurisdictions can adopt to conduct similar studies in their areas. There is significant interest in understanding how people may adapt and respond to the introduction of transformative transportation technologies, but there is considerable uncertainty in how best to design a survey and set of questions that elicit the information needed to develop well-specified behavioral models. This project proposed a survey which is called T4 (TOMNET D-stop Transformative Technologies in Transportation) Survey to provide a data collection protocol and methodology that can be widely adopted.

The first phase of this project started in August 2017 and lasted for a year. Phase 1 included conducting a literature review, development of survey goals, objectives, detailed research questions, and survey questionnaire design. During the second phase of the project, data collection happened in two phases: pilot and full deployment. The pilot phase of data collection was conducted during fall 2018 and the full deployment conducted during summer and fall 2019.

The goals of the pilot T4 survey were to evaluate response rates across two survey methods, test the survey content and evaluate the sampling plan. Based on the outcomes of pilot deployment, the survey instrument content and method have been revised. While the pilot phase of data collection is conducted only in the Phoenix metro area with a sample size of 262 from both paper and online instruments, the full deployment was conducted in the Tampa Bay metro area with a sample size of 262 using a fully only online format. A separate report details the data collection and results obtained from the 262 complete responses received on the pilot phase of the study. The survey questionnaire for the full deployment has been revised from the pilot. Some ambiguities highlighted during pilot deployment were solved, and the AV section of the survey was expanded to include more in-depth questions about the potential impact of adopting AVs on users travel behavior, residential choice, vehicle ownership, and policy preferences. During phase 2, the research team compiled and cleaned the data, and will deeply analyze it using advanced statistical methods, estimate econometric models, as well as produce the required reports and documentation. The complete survey questionnaire is attached to this report as Appendix for further exploration. The pilot survey questionnaire was also available as the attached Appendix to the previous report of this project for the pilot phase.

The same data collection effort with the same questionnaire has been conducted across multiple jurisdictions. As part of a coordinated effort among TOMNET partners, Georgia Tech will collect the data for a similar sample size from Atlanta metro area, Georgia; and the University of South Florida will apply the survey in the Tampa metro area, Florida. Moreover, the University of Texas at Austin, who has been our close collaborator for many years, will also deploy the same data collection which is supported by the D-STOP University Transportation Center at the University of Texas at Austin. The data collected across multiple jurisdictions will soon be aggregated to produce a single dataset with a sample size of more than four thousand responses. This dataset will be unique in terms of sample size, contents, and spatial expansion across multiple

southern metro areas.

The remaining of this section will present a comprehensive description of all the steps taken to design and deploy the full survey during Summer 2019.

## Study Design

A comprehensive literature review concerning survey design and methodology was performed during phase 1 of this project. A comprehensive review of previous studies helped identify data needs and behavioral dimensions of interest to focus on this study. Previous studies showed that willingness to adopt autonomous vehicles (AVs) is higher among young men, living in dense urban areas (Becker and Axhausen, 2017). In terms of AV perceived benefits and concerns, safety was listed both as a concern and as a benefit of the AV technology (Becker and Axhausen, 2017). Providing mobility for those who can't drive was the most common benefit; while most common concerns were data security, privacy, reliability, and liability. Previous studies have shown that passion for driving and traffic conditions can influence the decision to adopt AVs (Schoettle and Sivak, 2014; Gurumurthy et al., 2018; Abraham et al., 2017; and Kyriakidis et al., 2015). Moreover, increased comfort and the opportunity to multitask could have substantial impacts on AV adaptation patterns (Becker and Axhausen, 2017).

**Table 1 Comparison of similar surveys presented at the 97th Annual Meeting of TRB**

| Reference | Autonomous vehicle | AV perception | AV adoption | AV willingness to pay | AV Residential location | AV ridesharing | AV+Ride hailing services | Ridehailing | RH perception | RH shared rides | Attitudes/ Lifestyle | Stated preference | Changes in travel behavior | Car ownership | Value of time/ time use | Multi-tasking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed Survey | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Asgari et al., 2018 | ✓ | ✓ | ⚠ | ✓ | ✗ | ✓ | ✓ | ✓ | ⚠ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✓ |
| Alemi et al., 2018 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ⚠ | ✓ | ✗ |
| Shabanpour et al., 2018 | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ⚠ | ✗ | ✗ | ✗ |
| Petrik et al., 2018 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ⚠ | ⚠ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✗ |
| Hao et al., 2018 | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ |
| Bailey et al., 2018 | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | ✓ | ✓ |
| Lahkar et al., 2018 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ⚠ | ✗ | ⚠ | ✗ | ✗ | ✗ |
| Wang et al., 2018 | ✓ | ⚠ | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ⚠ | ✗ | ✗ |
| Sener et al., 2018 | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ⚠ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ |
| Nazari et al., 2018 | ✓ | ✓ | ✓ | ✗ | ⚠ | ✓ | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ⚠ | ✓ | ✗ | ✗ |
| Wadud et al., 2018 | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Noblet et al., 2018 | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ⚠ | ✗ | ✗ | ✗ |
| Harb et al., 2018 | ✓ | ✗ | ✗ | ✗ | ✗ | ⚠ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ |
| NASEM, 2018 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ⚠ | ⚠ | ⚠ | ✗ | ✓ | ✗ | ✗ | ✗ |
| Circella et al., 2018 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ⚠ | ✓ | ✗ | ✓ | ⚠ | ✓ | ✓ |

Table 1 shows most of the recent survey-based studies related to AVs and ridehailing services that were presented in TRB 2018 (this portion of the study was conducted before the TRB 2019 and 2020), with the addition of other relevant publications. The complete list of references used in Table 1 is presented at the end of this report. The table columns are survey data elements that have been covered in each one of the reviewed studies, while each row represents one study. This review helped us identify data gaps that needed to be addressed. Our designed and ready to implement T4 survey includes all the stated data elements. Many of the previous surveys were missing data elements such as AV willingness to pay, AV residential location choice, AV ridehailing services, and inclusion of AV and ridehailing services. Moreover, the sample size of the proposed study will be significantly larger than previous studies, and this study will cover multiple metro areas across the United States.

A complete list of survey goals, objectives and detailed research questions was compiled. The goal of the T4 survey is to understand people's perceptions towards new transportation technologies, as well as to measure how general attitudes (e.g., technology savviness, environment friendliness, etc.) influence attitudes towards new transportation technologies. Furthermore, the study aims at understanding the role of current travel behavior and current use of mobility-on-demand services on perceptions of automated mobility, and willingness to adopt autonomous vehicles. The questionnaire was designed to identify how people's travel patterns, residential choices, vehicle ownership, and mode choice decisions will change in response to transformative changes in transportation. The goal is to obtain a database able to enlighten the study of long-term impacts on people's lifestyle and well-being, as well as the general impacts on energy consumption, emissions, congestion, and urban planning, and thus revise future demand models and activities forecasting models accounting for adaptation of these new transportation technologies.

The questionnaire and wording of the questions were carefully designed by a team with members from all four institutes where the T4 survey is deployed: Arizona State University, University of South Florida, the University of Texas at Austin, and Georgia Tech. With the collaboration of all, the survey was developed in five sections:

- *Section A – Attitudes and Preferences*: a set of attitudinal statements regarding privacy and willingness to share; environment-friendly lifestyle; technology-savviness; personal time use; general transportation perceptions; and residential location preferences. The goal of this section is to understand respondents' general attitudes to control for its effects on the analysis of travel behavior and the expected use of autonomous vehicles.
- *Section B – Household Vehicles and Residential Preferences*: description of vehicles available to the household, licensure status, tenure status, housing unit type, and detailed

residential location preferences.

- Section C – Current Travel Patterns: details about commute trips, mode frequency for commute and non-mandatory trips, average driven miles, and details about long-distance trips, as well as the frequency of online shopping and items delivered to the home.
- *Section D – Mobility-on-demand*: frequency and familiarity with mobility-on-demand services, detailed information on the last trip using bike-sharing or e-scooter sharing, as well as detailed information on the last trip using ridehailing services. This section includes a stated preference question where respondents were asked to choose between private a ridehailing trip or a shared ridehailing trip, given a specific (random) scenario.
- *Section E – Autonomous Vehicles*: familiarity with AVs, willingness to adopt, attitudinal statements, expected changes in travel behavior and vehicle ownership, as well as stated preference question regarding which form of adoption would be more desirable to the respondent. A stated preference ranking question was designed to understand respondents' mode choice in a scenario where autonomous vehicles are available through ridehailing services.
- *Section F – Background Information*: additional sociodemographic information, such as age, gender, race, place of birth, education attained, household location, size, and income. The goal of this survey section was to assess respondents' socioeconomic profile to better understand their travel-related decisions

## Data Collection

### *Sampling Plan, Deployment, and Rewards Strategy*

Based on the pilot deployment results that used both a paper survey instrument sent by mail and an online survey invited by email, the project leadership team decided to implement the full deployment only in the online form using the Qualtrics software. In addition to the savings in cost, the online survey method provided a higher quality of the responses with a smaller number of incomplete responses and the platform allows the implementation of logic conditions that increase the efficiency and provide a respondent-specific design of the survey.

Upon completion of the proofreading of the modified survey for the Tampa Bay region, and the supplemental invitation letter, the first wave of emails was sent out on Tuesday, the 29th of October 2019. The first set of responses started trickling in by the same date and the subsequent days of that week. During the initial few weeks of survey dissemination, we were only able to send 1000 emails per weekday (as there was a Qualtrics restriction of 5,000 emails per week). This was rectified after consultations with Qualtrics and the subsequent waves were sent at a rate of 10,000 emails a week. Out of the 50,000 total email invitations sent, 1,306 bounced back due to invalid addresses or other reasons. InfoGroup was chosen as the source of address information for the Tampa Bay study. Emails were sent on specific days, based on a recommendation of good and bad

days for marketing emails (Schwedelson, n.d). Figure below shows the daily number of responses received in addition to the cumulative numbers on the secondary axis.

Emails were typically sent on predefined time intervals – 9 AM and 4 pm on weekdays, and 1 PM on weekends when Two major hikes in respondent feedback were observed – one on December 11, 2019 (Wednesday), and the other on February 11, 2020 (Tuesday). After the first invitations of email distributions, first, and second email reminders were initiated for selected subsamples of survey respondents keeping a 10-14-day time interval from the previous sent-out email. As the Tampa Bay surveys were staggered over multiple months, respondents received reminders based on their corresponding invitation email dates. Table below describes the time periods for the email invitations and the subsequent reminders.

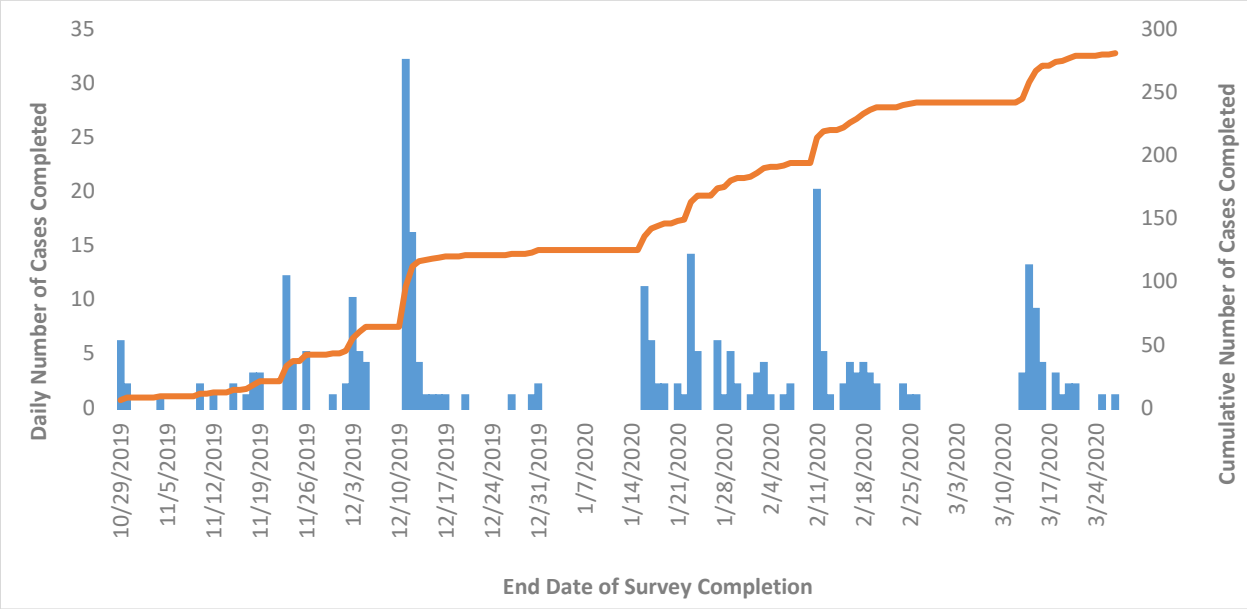



**Figure 1 Evolution of Response Rates, by Recruitment Method**

Invitations were staggered and delayed due primarily to three reasons:

1. The University of South Florida has a limited number of email invitations available per month for researchers to use due to its contract with Qualtrics. A request for increasing that limit for the research group took approximately two weeks to be approved by USF IT.
2. The University of South Florida Office of the President sent out a survey to all students and staff at USF during the month of October. Because this used up the university's allotment of email invitations, the research team was notified that it would have to wait to be allocated email invitations until the end of October or possibly November.
3. The holiday season limited the sending of reminders as the research team attempted to avoid the weeks of Thanksgiving, Christmas, and New Years' to avoid contacting people during times of travel.

All respondents who completed the survey before March 13, 2020 were provided with a

$10 Amazon gift card. Between the second and third reminders, discussions were held with Qualtrics to further increase the capacity of emails and we received approvals for 50,000 emails a week. The third reminders were sent with the intention of increasing the number of responses received and for this purpose, included an increased incentive of a $20 Amazon gift card. Surprisingly, this did not increase response rates (with only 39 responses from all the third reminders that were sent).

***Final Dataset***

The final data set considered uniquely submitted responses, with the home location in the Tampa Bay area. Responses with inconsistencies, such as the number of drivers in the household larger than household size, or respondents who marked the same answer on a large set of attitudinal questions were flagged as problematic on these particular questions but kept in the dataset to be used for other measured aspects. Table 2 details the response rates based on the final data set. Considering only the delivered messages, the response rate was 0.5 percent. The characteristics of the survey sample and their weighted responses to different survey questions will be explained in detail in the forthcoming sections of this report.

**Table 2 Sample Size and Response Rates**

| | Addresses Invited | Not Valid/ Bounced | Invitations Sent | Recorded Valid Responses | Response Rate |
|---|---|---|---|---|---|
| **Total Online** | 50,000 | 3,472 (6.94%) | 46,528 | 261 | 0.51% |

## Report Format

The remainder of this report will show distributions of the data collected on all questions of the survey. Section 0.1 describes the unweighted socioeconomic profile of respondents. Section 2.2 describes how the data were weighted, and the resulting weighted distributions for socioeconomic characteristics. Similarly, to other surveys, the socioeconomic characteristic distributions of the respondents are not exactly equal to the population. Weighting techniques have been applied to adjust the results to be more representative of the entire population; therefore, this report is presenting the weighted results in addition to explaining the applied weighting methodology. Thus, the results presented in all the following sections are weighted to better represent the population of Tampa Bay metro region. Section 3 presents the weighted data collected on the attitudes and preferences section of the survey. Section 4 of the report details vehicles owned by the household, and respondents' residential preferences (weighted). Section 5 details respondents weighted current travel patterns, including commuting characteristics, long-distance travel behavior, and online shopping usage. Section 6 of the report shows the weighted results obtained on the mobility-

on-demand section of the survey. Section 7 of the report details the weighted results regarding perceptions and expected use of autonomous vehicles. Lastly, section 8**Error! Reference source not found.** provides the final considerations of the results presented in the report. Appendix I shows the survey instrument with details about the survey logic implemented.

## DATA

### Unweighted Socioeconomic Profile

The respondents' basic socioeconomic attributes have been collected in the last section of the survey. The collected socioeconomic attributes include age, gender, place of birth, Hispanic origin, ethnicity, driver's license status, occupation, home location, work location, traveling limitations, household size, household structure, and income.

When analyzing respondents' age and gender, 59 percent of the sample is female, 40 percent is male, and 1 percent preferred not to answer the gender question. Figure 2 shows that the survey has covered a significant portion of people above 45 year, resulting in an underrepresentation of younger individuals when compared to the age distribution of ACS (American Community Survey) data for the Tampa Bay Metro area. Although we obtained the same proportion of males and females, males were more representative in the age categories over 60 years old, and women more representative in the younger age categories.

Regarding nationality and Hispanic/Latin origin, Figure 3 shows that 90 percent of respondents were born in the U.S., which is proportionally higher than the metro area's population born in the US (86 percent). As expected, the percentage of Hispanic/Latinos was also observed to be lower in our survey than in the tampa Bay region. In Figure 4, the race distribution of participants in the survey is illustrated; 78 percent of respondents identified themselves as white, 10 percent as black, and 5 percent preferred not to answer the question.

Figure 5 explores the educational background of the survey participants. With significantly higher proportions of highly educated people when compared to the population in the Tampa Bay metro area, most of the respondents (50 percent) held atleast a bachelor's degree. As the proportion of respondents with a higher level of education are greater than the ones observed in the county, the sample appears to be over-representative of the individuals with higher education. One possible explanation could be the internet accessibility requirement to fill the survey, as people with lower educational backgrounds tend to have lower income and less internet usage.

To capture more details about respondents' activity patterns, they were asked about their employment status. Figure 6 shows that most of them (63 percent) are part-time or full-time workers, 7 percent are both worker and student, and 27 percent are neither a worker nor a student.

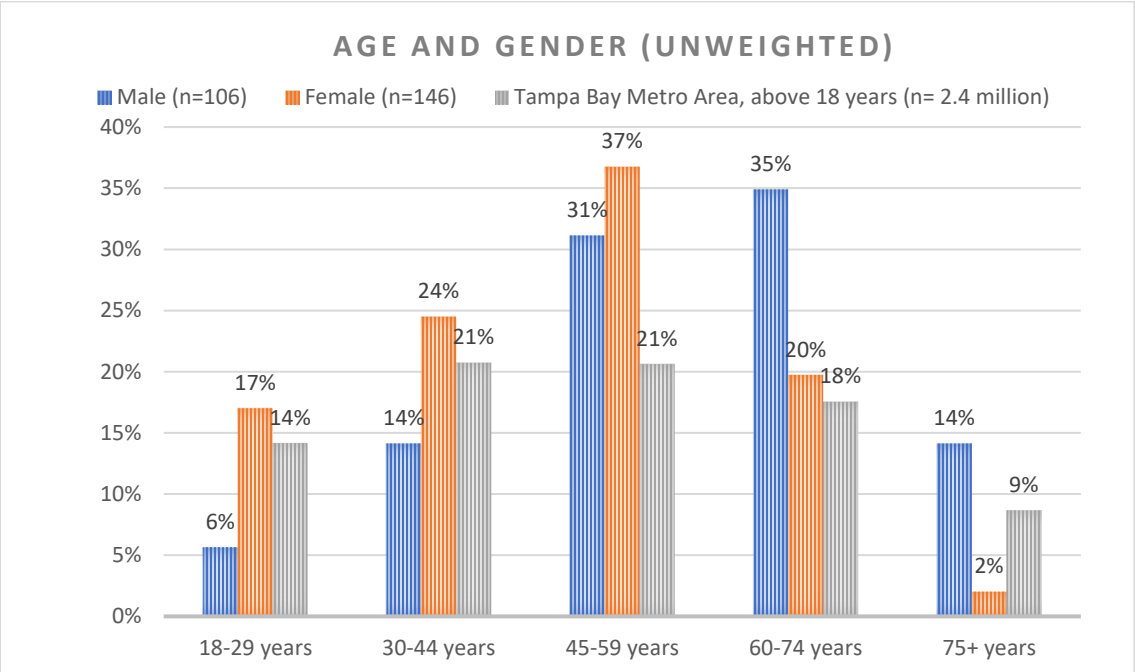



**Figure 2 Age and Gender Distributions (Unweighted)**

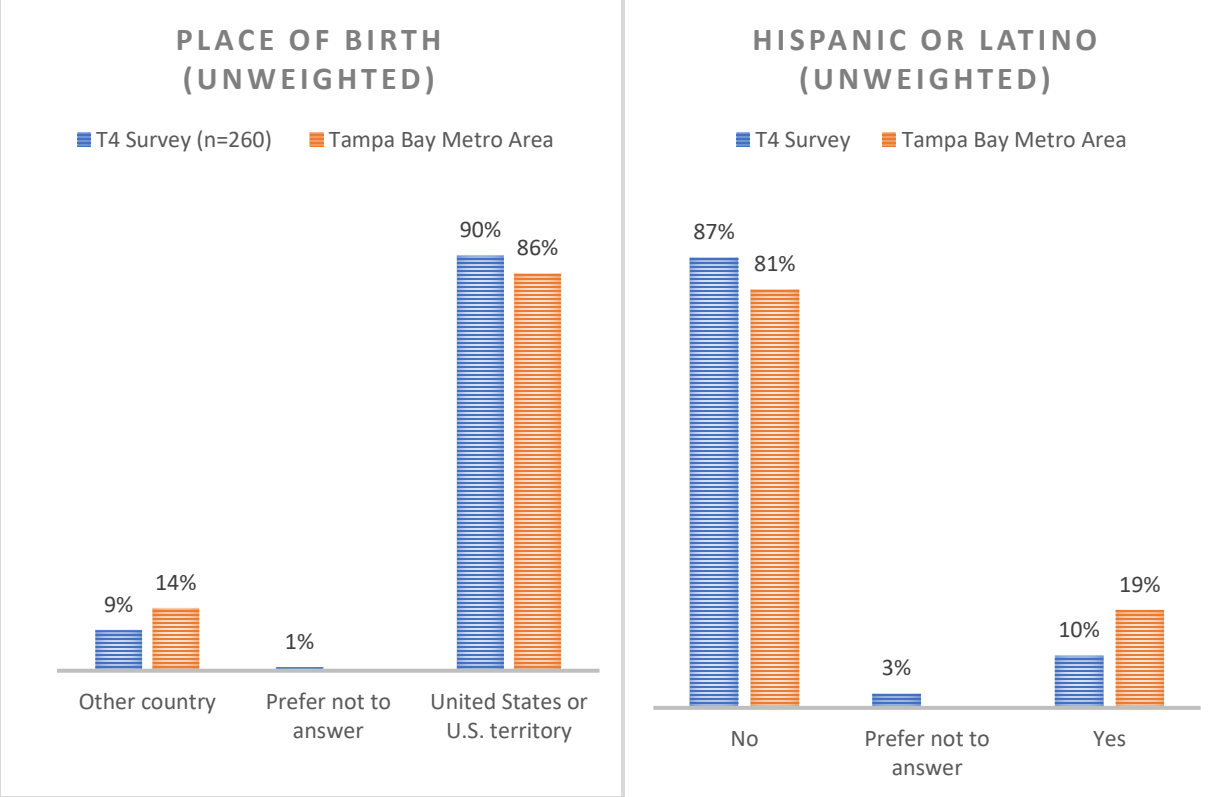



**Figure 3 Place of Birth and Hispanic/Latin Origin Distributions, Unweighted**

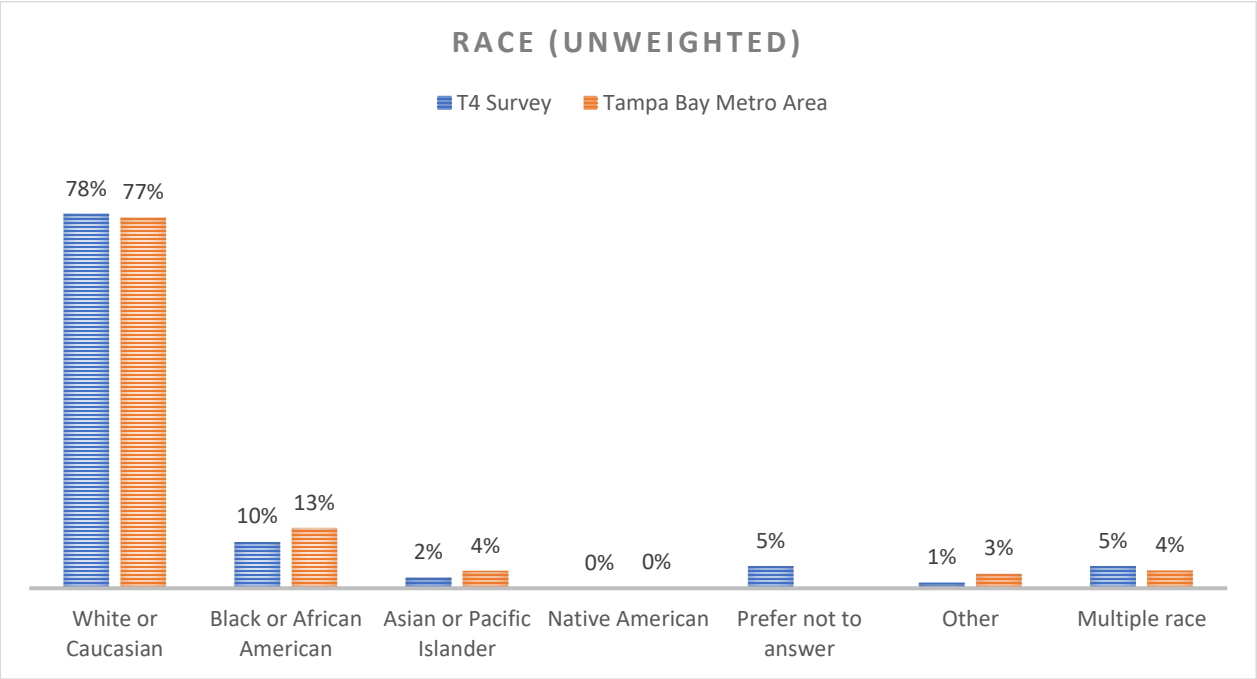



**Figure 4 Race Distribution, Unweighted**

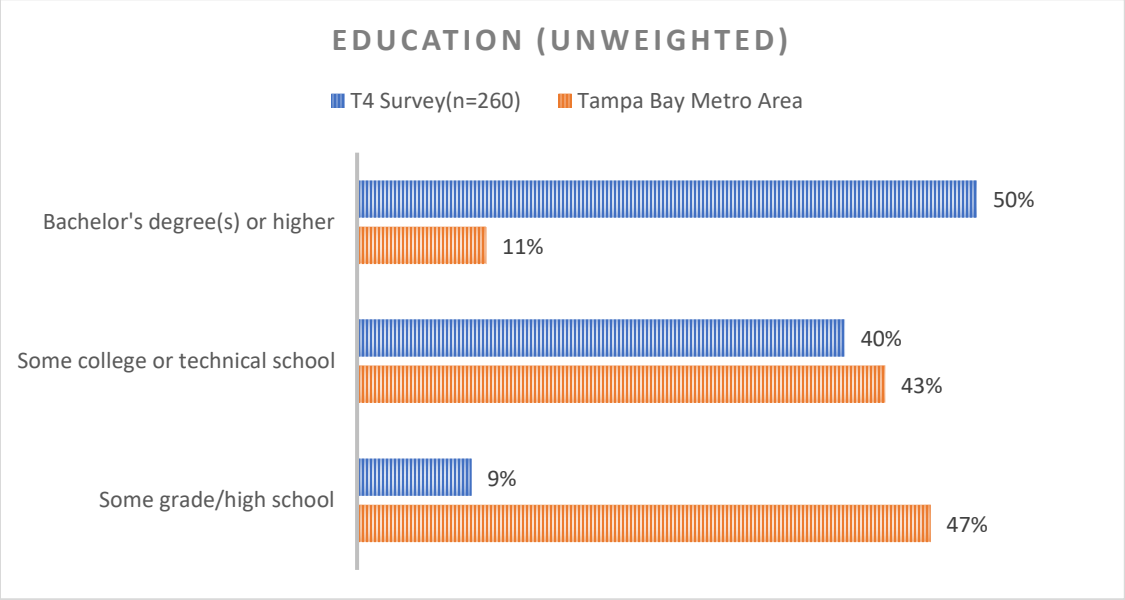



**Figure 5 Distribution of Highest Level of Education Attained, Unweighted**

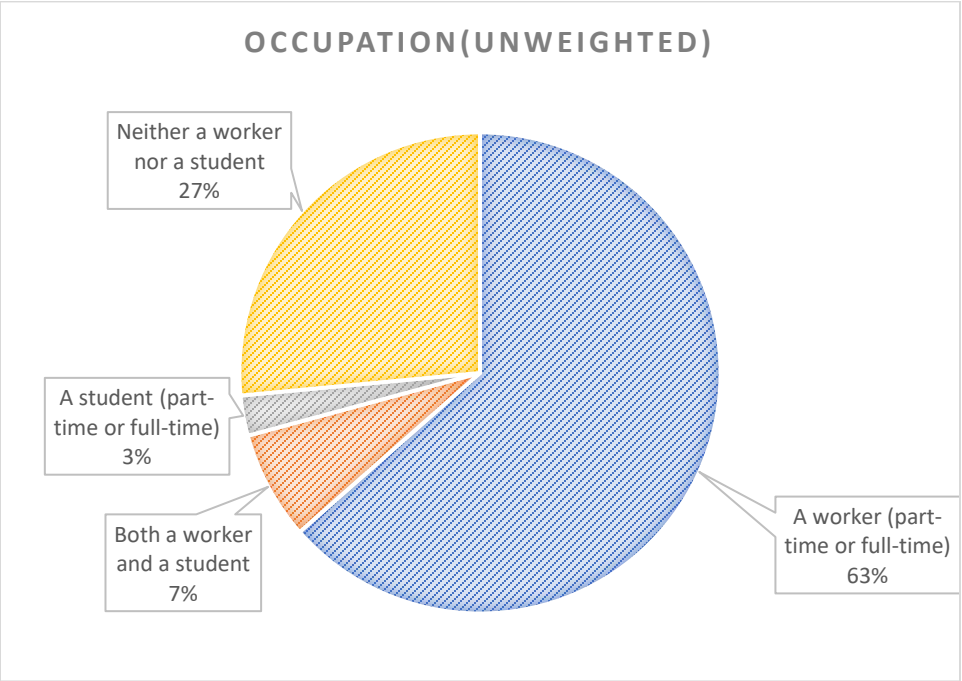



**Figure 6 Occupation Distribution, Unweighted**

Figure 7 shows that the overwhelming majority of respondents have no limiting conditions – 91 percent respondents say that they had no limiting conditions that prevented them from driving in general, 86 percent said the same about driving at night, and 88 percent felt the same about taking public transit. Additionally, 20 percent of the respondents had at least some limitations for walking while 25 percent revealed the presence of some limitations regarding biking.

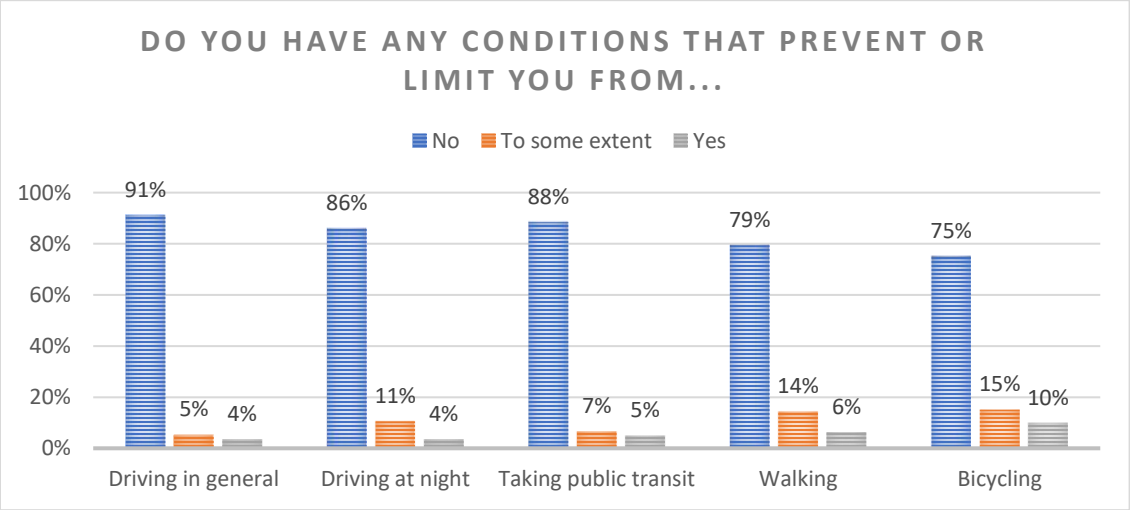



**Figure 7 Conditions Limiting Respondents' Mobility, Unweighted**

When asked about household size, results in Figure 8 show that almost half (44 percent) of

participants stated that they live in two-person households which is more than the the Tampa Bay region's proportion (37 percent). On the other hand, single households are underrepresented among survey respondents (with 20% surveyed vs 31% regional average).

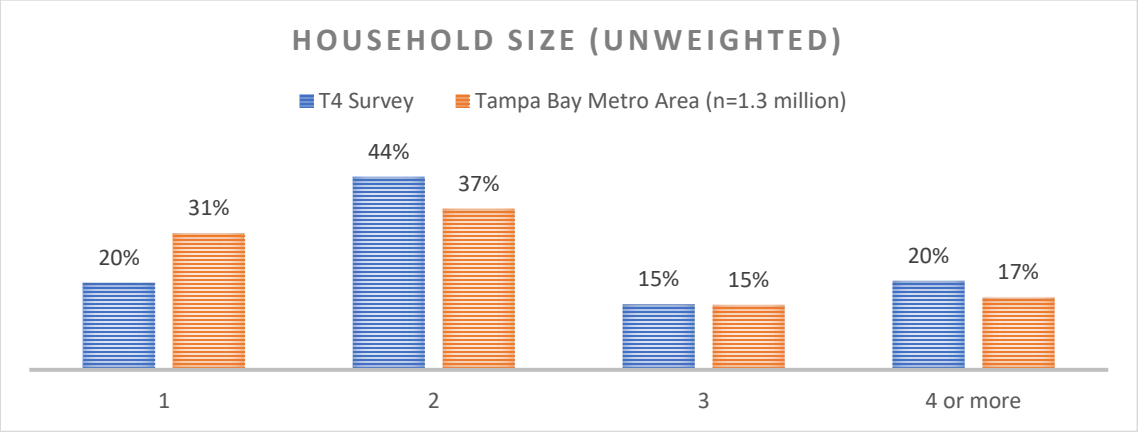



**Figure 8 Household Size Distribution, Unweighted**

Respondents' driver status was also included in the survey questionnaire. 99 percent of the respondents (18 years or older) have a driver's license. Regarding drivers in the household, Figure 9 shows that, there are two household members with a driver's license in the households of 50 percent of respondents. Based on our survey sample, almost all households have at least one member holding a driver's license (only one percent of respondents reported to live in a household with zero drivers). Figure 9 also reveals that the number of motorized vehicles available in the household. The largest group belongs to households with two vehicles (39 percent); and, 32 percent of respondents stated that they belong to one vehicle households. Additionally, 16 percent said there were three vehicles available in their households. Perhaps unsurprisingly, 3 percent of respondents reported having no vehicles available in their households.

According to the ACS, in the Tampa Bay metro region, 2.79 percent of households have no vehicles available, 25 percent have one vehicle, 47 percent have 2 vehicles, and 26 percent of the households have 3 vehicles or more available. Thus, the collected sample is almost consistent with the number of vehicles available in the households in the Tampa Bay metro area.

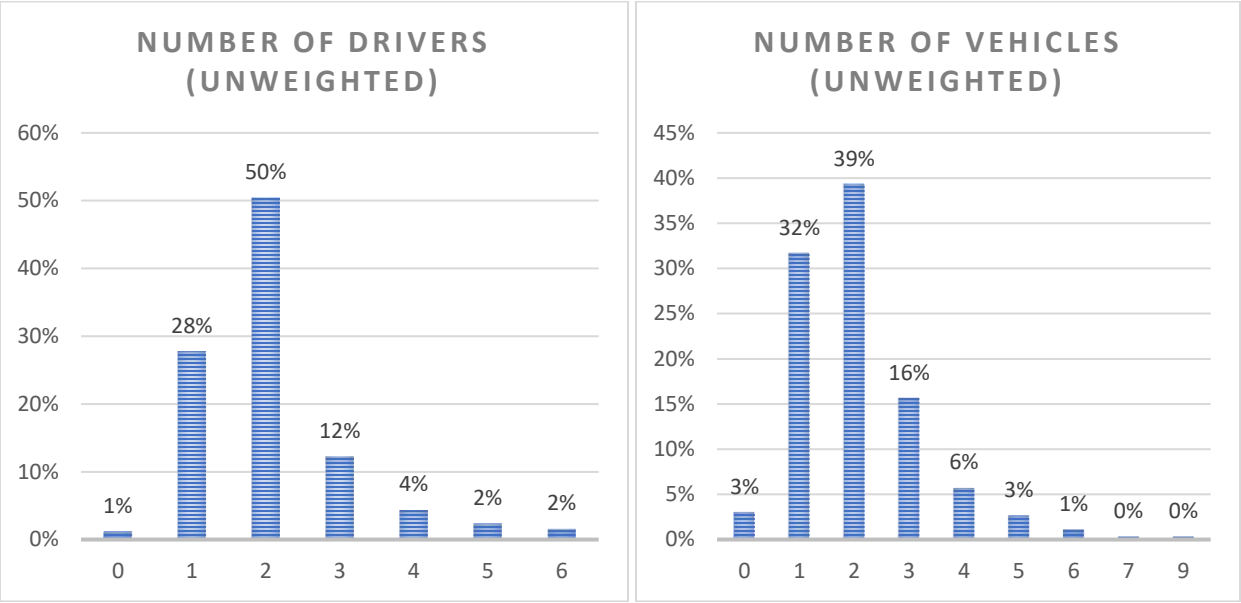



**Figure 9 Number of Motorized Vehicles and Drivers in the Household, Unweighted (N=257)**

In Figure 10, it can be seen that 69 percent of respondents own the place they live, while 25 percent rent their homes. In the Tampa Bay metro region, 64 percent of households are owner-occupied, and 36 percent are renter-occupied, thus the sample slightly overrepresents homeowners. The majority of the reported homes are stand-alone homes (69 percent), followed by condo/apartment (17 percent) and attached home/townhome (7 percent).

Concerning the household income distribution (Figure 11), the survey results show an underrepresentation of low-income categories (below $50,000), and overrepresentation of high-income households (above $75,000), when compared to the county ACS data. In our survey, only 9 percent of respondents said their annual income is lower than $25,000, compared to 22 percent of the households in the Tampa Bay metro area belonging to this low-income group. One possible explanation could be limited to internet access to low-income households.

In general, the survey shows a good representation of the population gender distribution, but the sample age distribution is skewed towards older groups. The sample provides a somewhat good representation of the county race distribution, however, it overrepresents the U.S. born residents, and underrepresents the Latino/Hispanic population. The data overrepresents high income, high vehicle ownership, and high education groups. Lastly, the collected sample has fewer single households and more two-person households compared to the survey population. To make the survey results be more representative of the population characteristics of the study, weighting schemes are adopted to compensate for the observed skews in the study sample. The next section explains the applied weighting procedure and the forthcoming sections represent the results for the weighted sample.

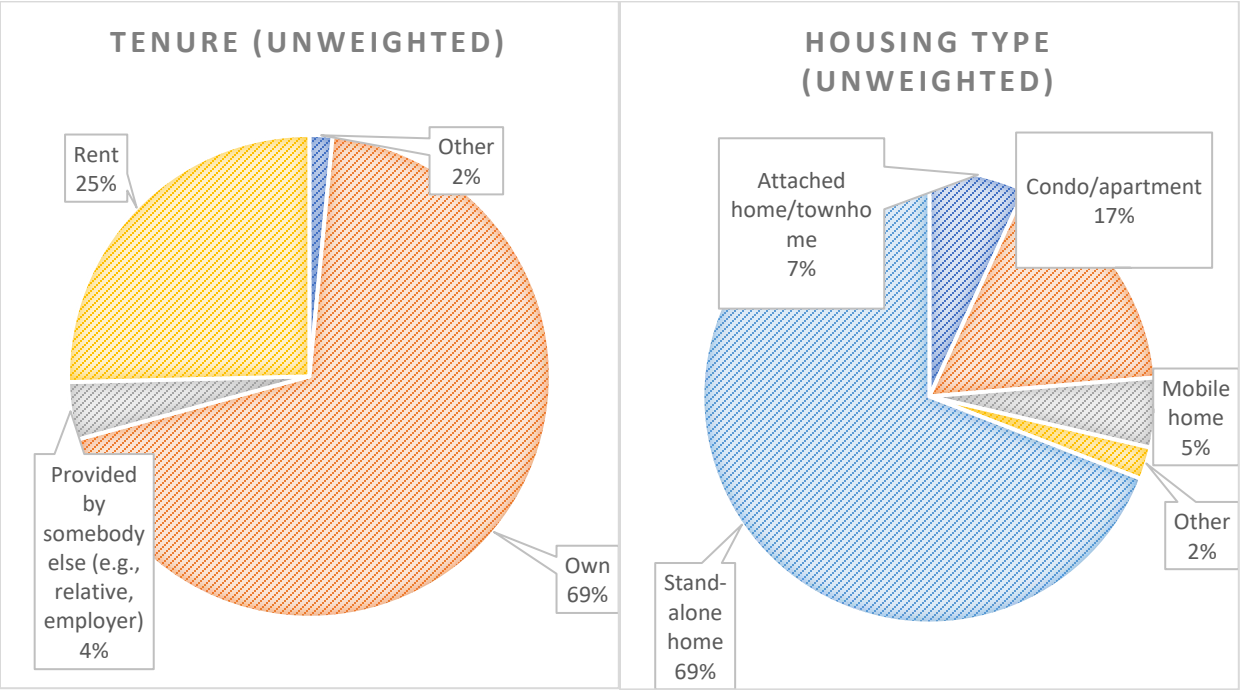



**Figure 10 Tenure Status and Housing Unit Type, Unweighted**

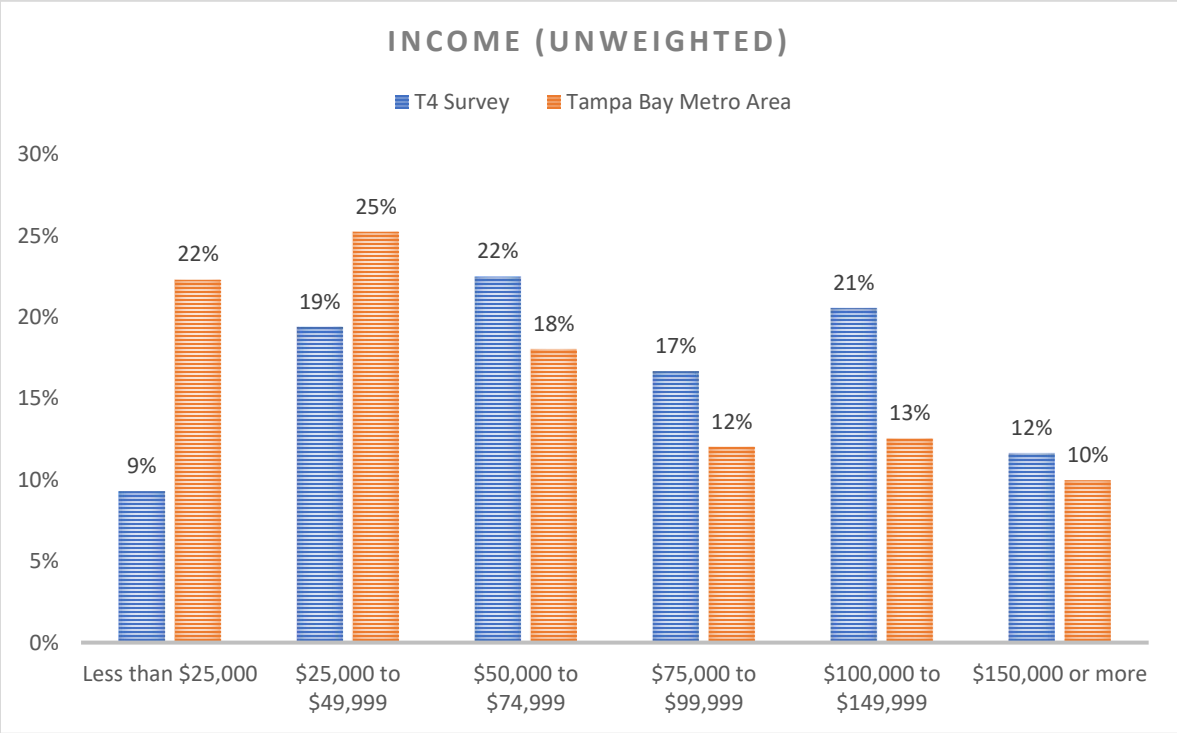



**Figure 11 Household Income Distribution, Unweighted**

## Data Weighting

Due to the discrepancy between the sample socioeconomic characteristics and the population, the survey results should be weighted to more accurately represent the public attitudes and perceptions toward new transportation technologies. This chapter explains the procedure to estimate the data weights for the full deployment survey data. The remainder of this chapter is organized as follows: section 2.2.1, illustrates the household income imputation using the Ordered Probit model and the Monte Carlo simulation to impute income for the records with missing data; section 2.2.2 explains the weighted variables adopted with brief description of the sample weighting algorithm (iterative proportional fitting - IPF - algorithm embedded in PopGen2.0 software); Lastly, section 2.2.3 presents the distribution of the weighted data compared to the marginal distribution obtained by the 2018 American Community Survey (ACS) 5-year estimates 2014-2018.

### *Income Imputation*

In most surveys, the household income variable often shows substantially more missing data than other variables. However, since household income plays an important role in the sample weighing process, replacing missing data with substituted values (i.e., imputed values) is necessary. The Ordered Probit model was utilized to impute household income. The observed number of individuals that responded to the survey questions with sufficient information to calculate weights is 260. Therefore, the Ordered Probit model was estimated using 260 responses.

The first step is to use the declared income levels of individuals (i.e., dependent variables) and the explanatory variables selected through a stepwise regression to calibrate the Ordered Probit model. Second, based on the estimated parameters, the replication is implemented. Third, a Monte Carlo simulation is used to validate the replicated results and imputing household income for the records with missing income. More detailed descriptions of the estimated results are addressed below.

The income is considered for the Ordered Probit model dependent variable in the following 6 categories: less than $25,000, $25,000 - $49,999, $50,000 - $99,999, $100,000 - $149,999, $150,000 - $249,999; and $250,000 or more. Table 3 illustrates the socioeconomic distributions of the unweighted sample per each income group. The first income category (i.e., less than $25,000) is selected as the baseline for the model estimation.

## Table 3 Income Imputation Model Estimation Data Characteristics

| **Gender** | **Less than $25,000 (n=24)** | **$25,000 to $49,999 (n=51)** | **$50,000 to $99,999 (n=101)** | **$100,000 to $149,999 (n=53)** | **$150,000 to $249,999 (n=17)** | **$250,000 or more (n=13)** | **All (n=260)** |
|---|---|---|---|---|---|---|---|
| Male | 29.2% | 39.22% | 35.64% | 54.72% | 35.29% | 57.14% | 40.76% |
| Female/other | 70.8% | 60.78% | 63.36% | 45.28% | 64.71% | 42.86% | 59.23% |
| | | | | | | | |
| **Employment Status** | **Less than $25,000 (n=24)** | **$25,000 to $49,999 (n=51)** | **$50,000 to $99,999 (n=101)** | **$100,000 to $149,999 (n=53)** | **$150,000 to $249,999 (n=17)** | **$250,000 or more (n=13)** | **All (n=260)** |
| Employed | 50.0% | 69.78% | 78.22% | 67.92% | 88.24% | 78.57% | 70.77% |
| Not employed | 50.0% | 39.22% | 22.78% | 32.08% | 11.76% | 21.43% | 29.23% |
| | | | | | | | |
| **Education** | **Less than $25,000 (n=24)** | **$25,000 to $49,999 (n=51)** | **$50,000 to $99,999 (n=101)** | **$100,000 to $149,999 (n=53)** | **$150,000 to $249,999 (n=17)** | **$250,000 or more (n=13)** | **All (n=260)** |
| High School or Less | 16.7% | 11.76% | 9.9% | 7.5% | 5.88% | 7.14% | 10% |
| Some College or Associate degree | 58.3% | 56.86% | 34.65% | 33.96% | 35.29% | 7.14% | 39.62% |
| Bachelor's degree or Higher | 25.0% | 31.37% | 54.45% | 58.94% | 58.82% | 85.72% | 50.38% |
| | | | | | | | |
| **Household Size** | **Less than $25,000 (n=24)** | **$25,000 to $49,999 (n=51)** | **$50,000 to $99,999 (n=101)** | **$100,000 to $149,999 (n=53)** | **$150,000 to $249,999 (n=17)** | **$250,000 or more (n=13)** | **All (n=260)** |
| HH Size 1 | 50.0% | 23.53% | 15.84% | 11.32% | 17.65% | 7.14% | 19.23% |
| HH Size 2 | 33.3% | 47.46% | 47.52% | 32.08% | 29.41% | 42.86% | 41.54% |
| HH Size 3+ | 16.7% | 29.41% | 36.34% | 56.6% | 52.94% | 50% | 39.23% |

Table 4 presents the Ordered Probit model estimation results for income imputation, predicting income for the households with missing income values. The estimated model used almost all the possible variables collected in the survey in addition to socioeconomic attributes. The estimating coefficients' signs and magnitude seem intuitive. Households with a higher number of members aged between 45-64, and workers are more likely to fall into higher income groups. On the other hand, if the number of children in the household increases, those groups are less likely to fall into higher income groups. The likelihood of falling into higher income levels may be highly associated with the number of people available for work. Besides, households defined as nuclear families and married couples with no children are more likely to belong to higher income groups, while households with multiple adults are less likely to fall into those groups. *A*s expected, those who are employed reported higher levels of household income. Also, highly educated respondents are likely to fall into higher income levels.

Moving over to residential characteristics, respondents who preferred to live in a spacious home, even if the public transit accessibility is low show a higher likelihood of falling into higher income categories. Usage of ride-hailing services on weeknights, weekend nights, and weekend days are positively correlated with higher income groups, compared to those who were not ridehailing users. Concerning AVs, individuals who stated, "early AV adopter" are likely to fall into the higher income categories while those stated "not AV adopter" are less likely to fall into the higher income categories. Interestingly, respondents with low sensitivity or concern about the safety of autonomous vehicles are associated with higher income levels. In Table 5, the goodness of fit is examined by log-likelihood values and the null model, which is only developed by constant values.

To validate the estimation results given by the Ordered Probit model, the replication and the observed responses are compared (Figure 12). The replication is conducted in two steps: first, the proposed model calculates the probability that individuals belong to 7 different income categories. Second, based on the probabilities, the Monte Carlo simulation is utilized to replicate and predict the income categories at the individual level. According to Figure 12, the replicated distribution follows the observed pattern relatively well except for the three income classes: $50,000 to $74,999, and $100,000 to $149,999 and $150,000 to $249,999.

## Table 4 Ordered Probit Model Results for Income Imputation

| Explanatory variables | Category or Continuous | Description | Coefficients | t - value |
|---|---|---|---|---|
| Number of members in HH | Continuous | Age between 45-64 | 0.028 | 0.28 |
| Number of workers in HH | Continuous | | 0.276 | 4.576 |
| Number of children in HH | Continuous | 17 years and below in HH | -0.142 | -1.203 |
| Agree with the tax policy | base: disagree | The government should raise the gas tax to help reduce the negative impacts of transportation on the environment. | 0.45 | 2.679 |
| Preference for home location | base: not prefer | I prefer to live in a spacious home, even if it is farther from public transportation or many places I go. | 0.193 | 1.35 |
| Preference for transit accessibility | base: not prefer | | -0.095 | -0.543 |
| Homeowner | base: rent or provided by others | Home ownership | 0.489 | 3.037 |
| Employed | base: unemployed | Employment status | 0.156 | 0.765 |
| Standalone home | base: other housing unit types (e.g., mobile home) | Housing type | 0.605 | 2.161 |
| Townhome | | | 0.54 | 1.459 |
| Condo/Apartment | | | 0.411 | 1.242 |
| Ridehailing service use on a weeknight | base: not a ridehailing user | Usage of ridehailing services | 0.044 | 0.16 |
| Ridehailing service use on a weekend night | | | 0.172 | 0.819 |
| Ridehailing service use on a weekend day | | | -0.02 | -0.08 |
| Early AV adopter | base: eventually adopt AV | Autonomous vehicle (AV) adoption scenario | 1.292 | 2.489 |
| Not AV adopter | | | -0.163 | -1.101 |
| Female | base: male | | -0.193 | -1.322 |
| Nuclear family | base: live alone | Household structure | 0.78 | 3.843 |
| Married couple with no children | | | 0.542 | 3.011 |
| Multiple adults' household | | | -0.042 | -0.182 |
| Impact on a long-distance trip by AV | base: disagree | I would make more long-distance trips when AVs are available because I wouldn't have to drive. | -0.177 | -2.145 |
| Safety concern by AV | base: disagree | AVs should prioritize the safety of pedestrians and bicyclists on the road over that of passengers in the vehicle. | -0.337 | -2.496 |
| Bachelor's degree | base: less than bachelor's degree | Education attainment | 0.422 | 2.758 |
| Graduate degree | | | 0.89 | 4.198 |

**Table 5 Income Imputation Model: Intercepts and Goodness of Fit**

| | 7: ($250,000 or more) – baseline) | Coefficients | t - value |
|---|---|---|---|
| 1\|2 | 1: (Less than $25,000) | -6.112 | -5.866 |
| 2\|3 | 2: ($25,000 to $49,999) | -5.16 | -5.01 |
| 3\|4 | 3: ($50,000 to $74,999) | -4.369 | -4.279 |
| 4\|5 | 4: ($75,000 to $99,999) | -3.802 | -3.738 |
| 5\|6 | 5: (100,000 to $149,999) | -2.874 | -2.843 |
| 6\|7 | 6: ($150,000 to $249,999) | -2.305 | -2.28 |
| | **Current fitted model (df=31)** | **Null model (df=6)** | **Ratio** |
| Log likelihood ratio | -426.964 | -479.196 | 0.891 |
| R-squared (McFadden) | 0.109 | | |

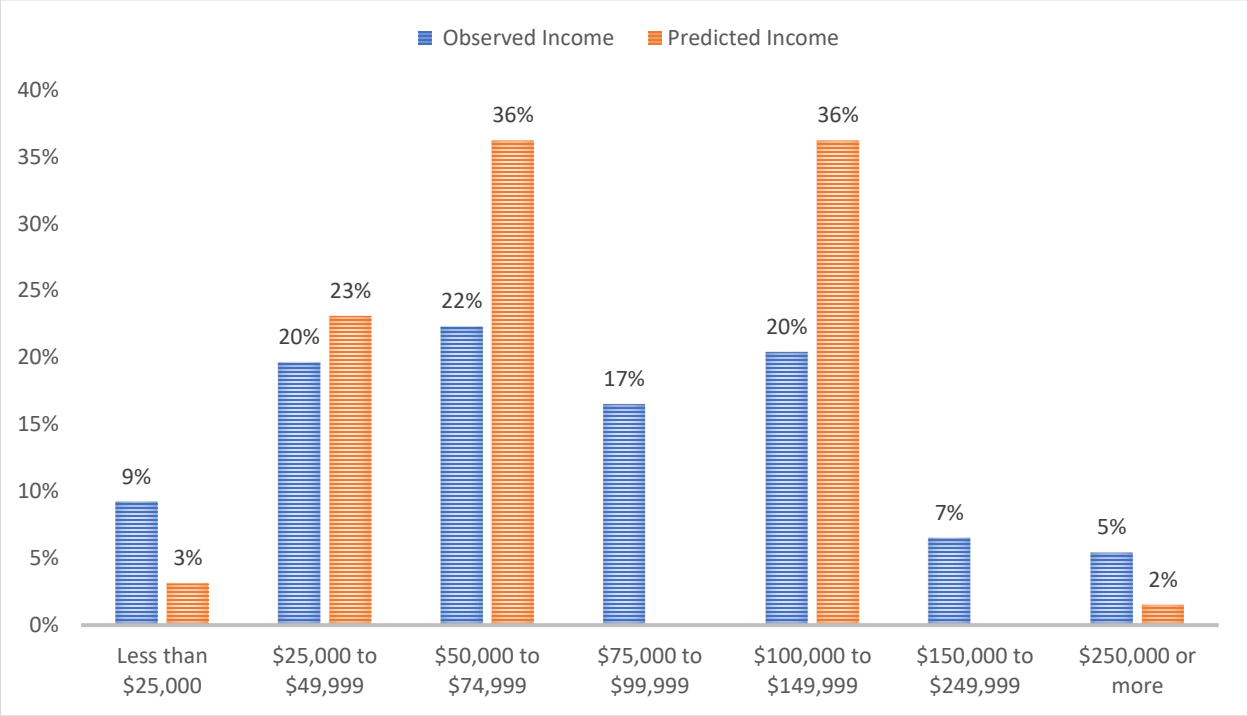



**Figure 12 Income Imputation Replication Results - Monte Carlo Simulation (N=260)**

***Weights Estimation***

After controlling for the missing income records, sample weights were calculated using the synthetic population generator, PopGen2.0 software. The process of computing weights for the survey data is associated with weighting the marginal distribution of the selected variables in the survey data, to match the characteristics of the true population marginal. The detailed description of the synthetic population generator and its algorithms can be found in Ye et al. (2009) and Konduri et al. (2016). This report presents a brief description of the data weighting process.

***Step 1 – Choosing the control variables*****:** sample size and software operation limit the number of variables that can be used as control variables. To ensure that the best set of variables were selected, an iterative process evaluated alternative combinations. As the original sample over-represents older individuals and under-represents low-income households, age, and income were always controlled for across all the weighting scenarios. Alternative variables were also tested in combination with income and age are the number of workers in the household, the number of vehicles in the household, household size, education, and employment status. The final set of variables was chosen based on its overall performance on replicating the distributions observed for the Tampa Bay metro region. Finally, the sample was weighted based on **age, education attained, employment status, household income, and the number of vehicles in the household.** Different variables categories were chosen in such a way to allow comparison with census data (see Table 6 and
Table *7*). Age was classified into four groups, namely 18-29 years, 30-44 years, 45-59 years, 60 years and above. Education attainment was categorized into three levels: high school, some college degree, and bachelor's degree or higher. Employment status was defined as worker or non-worker. Additionally, household income was categorized as low, middle, and high-income levels, and the number of vehicles was specified as 0, 1, 2, and 3 or more vehicles available to the household (
Table *7*).

***Step 2* – Compute marginal distributions for the Tampa Bay Metro Area:** To obtain the marginal distribution to explore the characteristics of the true population, the American Community Survey (ACS) 5-year estimates for 2014-2018 is utilized. As the total population, 18 years and above is around 3 million while the number of stated responses is 260. Therefore, instead of expanding the sample data to reach the marginal distribution of the true population, population-wide marginal control distributions are replicated to match the total number of the survey data responses. Thus, the data weighting aims to match the distribution pattern of the true population with the distribution pattern of the controlled variables, keeping the sample size equal to the actual collected data.

***Step 3 – Calculate weights*****:** The computation of the weights is executed in the following steps. First, a multi-dimensional matrix composed of the specified control variables (i.e., joint

distribution), is formed. Second, using the formed joint distribution as a seed matrix, an iterative proportional fitting algorithm (IPF) is executed to match the seed matrix with the univariate marginal control distributions of the ACS 5-year data. By implementing the IPF algorithm embedded in PopGen2.0 software, the distribution of each control variable at the person level and the household level is replicated to follow the true population characteristics. For instance, the distributions of the unweighted data in Table 6 and
Table *7* are formed to replicate the distributed characteristics shown in the Tampa Bay metro region. The estimation results for the weighted socioeconomic and demographic variables are discussed in the following subsections.

**Table 6 Person Level Control Variables Used for Weighting**

| **Age** | **Unweighted Data (n=260)** | **Tampa Bay Area (n=3030047)** |
|---|---|---|
| 18-29 years | 35 (11.85%) | 459217 (17.20%) |
| 30-44 years | 53 (19.24%) | 582152 (22.38%) |
| 45-59 years | 87 (35.31%) | 653059 (25.83%) |
| 60 years and above | 85 (33.60%) | 844178 (34.59%) |
| **Education** | **Unweighted Data (n=260)** | **Tampa Bay Area (n=3030047)** |
| High school graduate or less | 26 (10.37%) | 921804 (40.74%) |
| Some college or associate degree | 103 (42.27%) | 703760 (31.3%) |
| Bachelor's degree or higher | 131 (47.36%) | 663033 (27.95%) |
| **Employment** | **Unweighted Data (n=260)** | **Tampa Bay Area (n=3030047)** |
| Employed | 191 (71.08%) | 1324627 (71.08%) |
| Not employed/not in the labor force | 69 (29.92%) | 524563 (29.92%) |

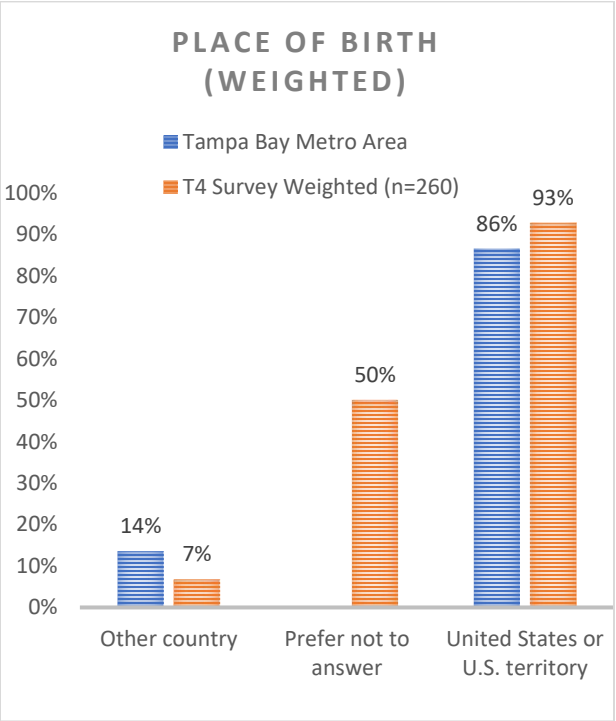
**Table 7 Household Level Control Variables Used for Weighting**

| **Household Income** | **Unweighted Data (N=260)** | **Tampa Bay Households (N=1310173)** |
|---|---|---|
| Less than $50,000 | 75 (32.9%) | 606157 (47.44%) |
| $50,000 to $99,999 | 101 (38.42%) | 426521 (31.63%) |
| $100,000 or more | 84 (28.68%) | 277495 (20.92%) |

***Weighted Socioeconomic Distributions***

This section addresses comparisons of the Tampa Bay metro region distributions with the weighted survey distributions. As mentioned in the previous section, the controlled socio-economic and demographic attributes were age, education, employment, gender, and household income. Based on the controlled variables, we compared the distribution pattern of the true population (Tampa Bay metro area Census data) with the weighted results, both for the variables that were controlled and not controlled.

Figure 13 and Figure 14 illustrate the weighted distributions of the place of birth, Hispanic origin, and race. After the weighting implementation, the weighted survey data are still more representative of Hispanicity, but less representative of race, and place of birth when compared to the unweighted sample. It should be noted that the place of birth, race Hispanic or Latino origin variable was not a control variable in the weighting process.



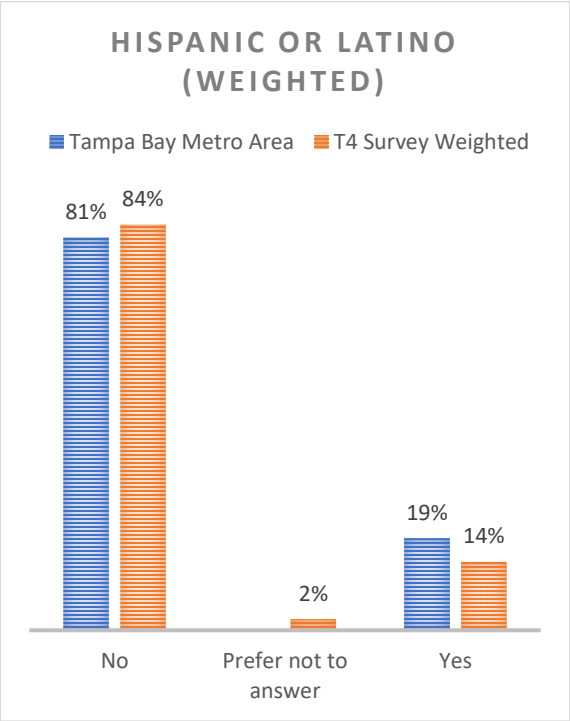




**Figure 13 Place of Birth and Hispanic/Latin Origin, Weighted**

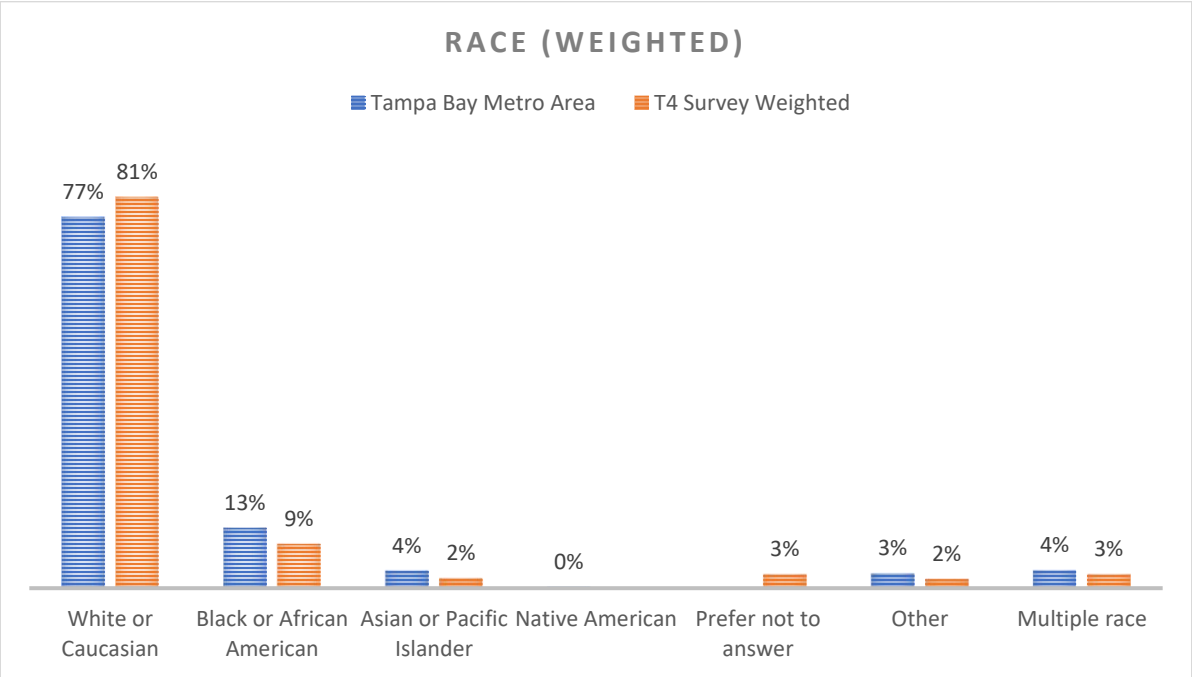



**Figure 14 Race Distribution, Weighted**

Figure 15 presents the distribution of household size between the weighted survey and the population in the Tampa Bay region. Household size was not among the control variables and so

the weighted sample does not exactly follow the population distribution.

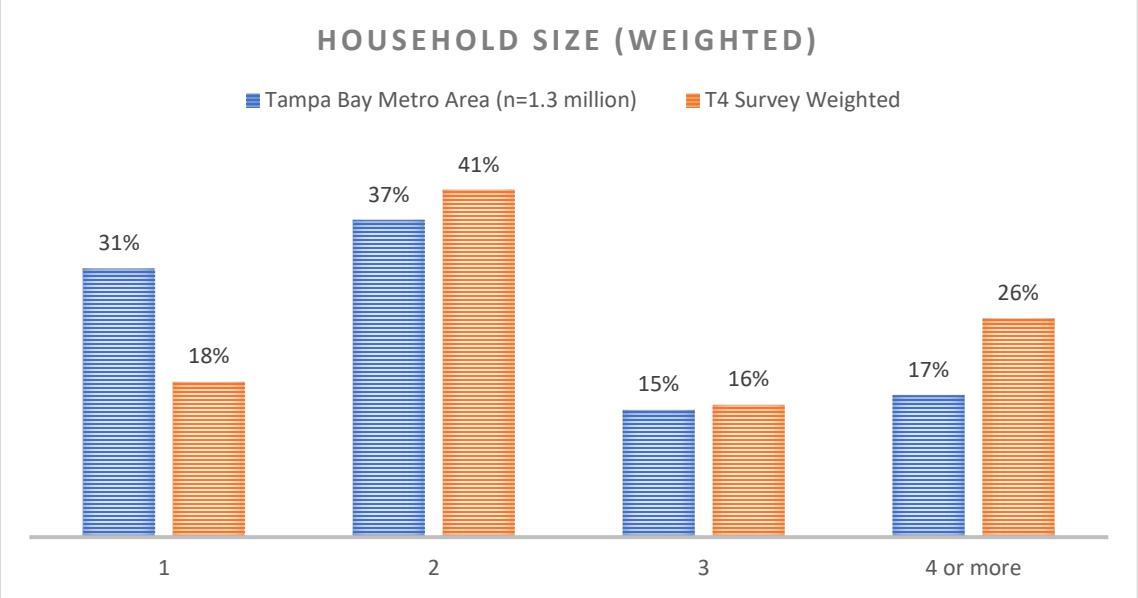



**Figure 15 Household Size Distribution, Weighted**

The proportion of the weighted results associated with tenure status and household unit type are as shown in Figure 16. Exploring the difference between unweighted and weighted sample distributions (Figure 10 and Figure 16) highlights no noticeable patterns other than some minor changes in the percentages under renure and housing type.

Figure 17 depicts the distribution of household income between the weighted sample and the population. There is a general improvement in the weighted sample, in comparison to the representation of the tampa Bay metro area. Household income was one of the control variables on the weighting process, and the weighted sample significantly performs better on representing the Tampa Bay metro region.

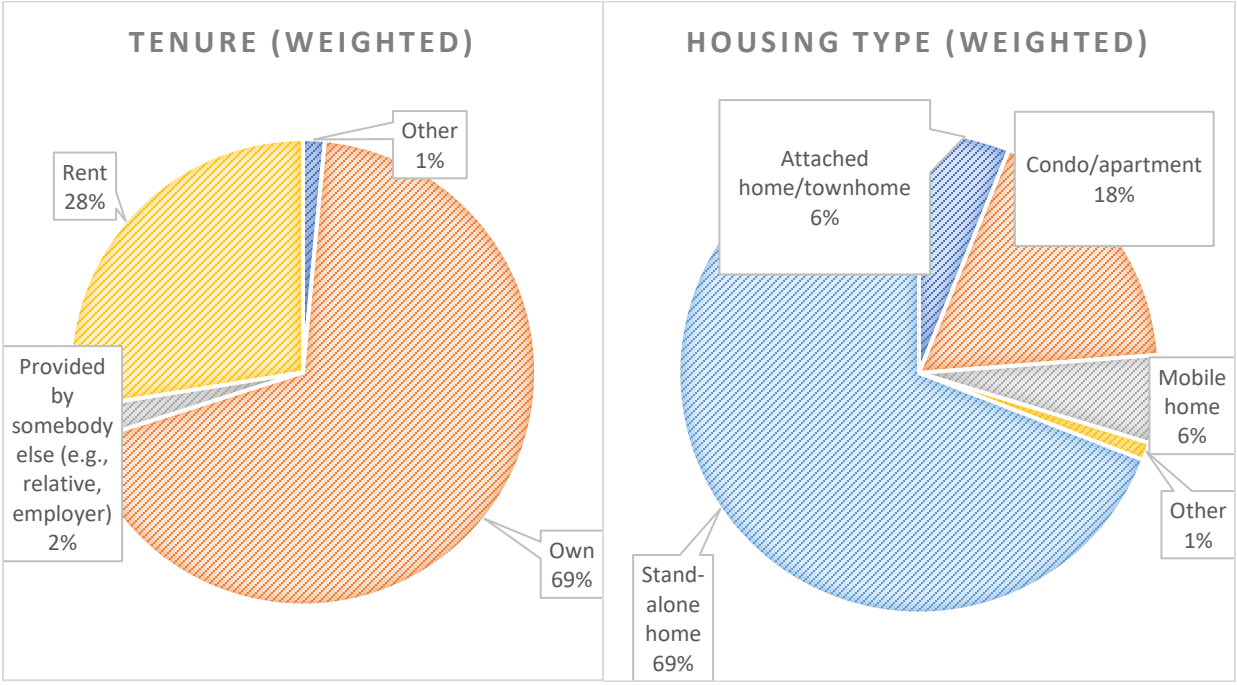



**Figure 16 Tenure Status and Housing Unit Type, Weighted**

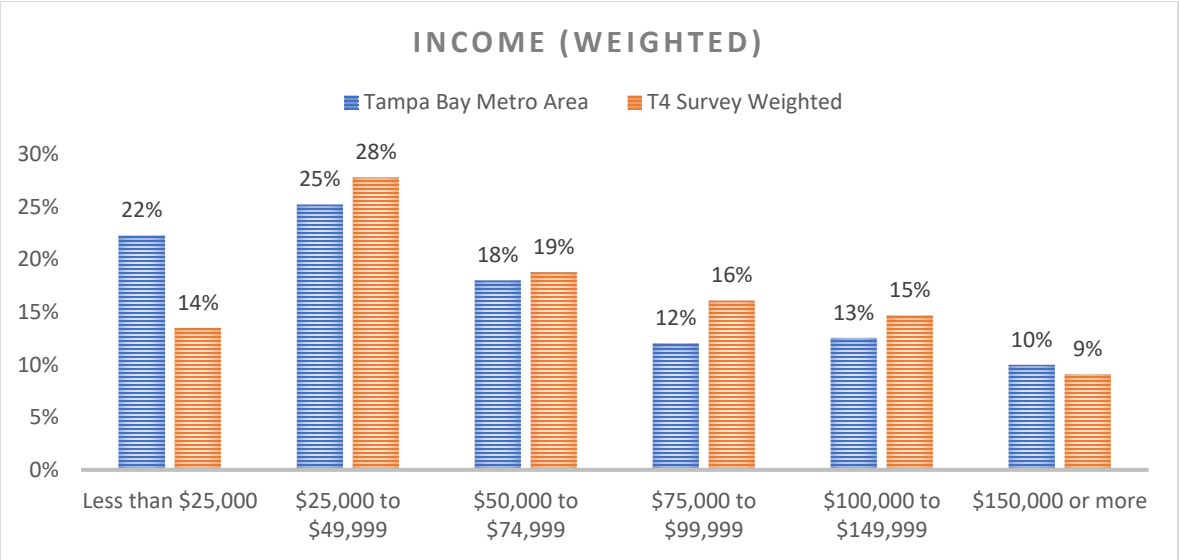



**Figure 17 Household Income Distribution, Weighted**

After successfully developing the weights, the remaining sections of the report present the collected responses of the **weighted sample data** regarding general attitudes, residential preferences, and vehicle ownership, current travel behavior, and perception and attitudes towards ridehailing services and autonomous vehicles.

It should be noted that a significant portion of the survey consists of Likert scale agree/disagree statements with five response options (strongly disagree, somewhat disagree,

neutral, somewhat agree, and strongly agree). It has been observed that quite numerous respondents chose the neutral option. Selecting a neutral option does not always mean that people are between agreeing and disagree; it can mean that the issue is not understandable or not important for the respondent. It can also imply that the respondent is unsure in some cases.

## Geocoding

Respondents were asked to provide their home location, and those who reported being commuters, reported they work or school address. Addresses were geocoded using the assistance of an online tool (Geocod.io). The procedure of geocoding the addresses involved a combination of manual classifications, software-assisted geocoding, and manual quality checks. The first step in the process was to individually read and classify the level of detail provided on the respondents' answers. Table 8 shows the result of that step for both home and work locations. Noticeably, the home location was provided with a higher level of detail. For the home location, respondents' provided information was used only when the data from the survey was provided as a complete address. All other responses had home locations geocoded based on the address provided by the marketing company. A flag was recorded indicating the level of detail provided, and how well that matched with the marketing company information.

For work addresses, as no information was available from the marketing company, the locations provide as cross-streets were geocoded at the intersection level. A total of 179 commute locations were recorded. After processing the address on The Geocodio (www.geocod.io), a manual quality check was performed by checking the location of the geocoded point with the provided information. Problematic cases were manually geocoded on Google Maps.

**Table 8 Level of Detail Provided by Respondent for Home and Work Location**

| Level of Detail Provided by Respondent | Home Location (n=260) | Work Location (N=179) |
|---|---|---|
| **Complete Address** | 61.8% | 42.5% |
| **Cross-Street** | 10.6% | 7.2% |
| **Incomplete Address/ Other** | 20.8% | 22.9% |
| **Seen but not Answered** | 7.3% | 26.8% |

## ATTITUDES AND PREFERENCES

Previous studies have shown the significance of the relationship between general and transport-related attitudes and travel behavior (Handy et al., 2005; Cao et al., 2009; Van de Covering et al., 2016). This section presents the descriptive data collected in the first section of the survey, regarding general and transport-related attitudes and preferences.

Figure 18 presents the survey results on respondent's opinions on privacy and sharing. The first statement depicts the respondent's comfort level when around people they do not know. The results indicate that 72 percent of the respondents do not feel uncomfortable while 15 percent feel uncomfortable and 14 percent feel neutral around people they do not know. The results for the second and third statements show a much clearer pattern. Most of the respondents do not favor the idea of renting out their cars to people they do not know (88 percent). Only 5 percent of the people agreed that renting out their cars to strangers would be fine. Similarly, when the respondents were asked if sharing their personal information or location via internet-enabled devices concerned them a lot, 68 percent of them either somewhat or strongly agreed with the statement, and an additional 18 percent were on the fence (neutral) about this.

These results demonstrate that not many people feel uncomfortable around people they do not know, indicating that the idea of riding in autonomous vehicles with strangers would not be so unrealistic in the future. However, the results also imply of potential barriers on people renting out their autonomous vehicles to other people when they are not using them (only 5 percent of the respondents favored the idea of renting out their cars to people they do not know). The results also show that people are highly sensitive to sharing their personal information or location via internet-enabled devices, suggesting another significant barrier that should be addressed in a potential autonomous vehicle future.

Figure 19 presents the survey results about the extent to which respondents agree or disagree with three statements on environmental friendliness. The first statement depicts the respondents' perception of the gas tax raise to help reduce the negative impacts of transportation on the environment. The results showed that more than three-fourths (77 percent) of the respondents disagreed with the statement while those strongly or somewhat agreed correspond to 12 percent, suggesting a clear opposition toward gas tax raise. The second statement aimed at exploring if respondents are committed to an environmentally friendly lifestyle. The results revealed that 69 percent of the respondents expressed agreement towards that commitment, although 45 percent of those participants only somewhat agree towards an environmentally-friendly lifestyle commitment. The third statement aimed to explore the respondents' commitment level to using less polluting means of transportation (e.g., walking, biking, and public transit). Results revealed that more than half (54 percent) of the respondents strongly or somewhat agreed with the statement while a further 20 percent strongly or somewhat disagreed. Overall, the results of these three statements suggest that although the majority of the respondents clearly express that they are committed to an environmentally friendly lifestyle, support the gas tax raise, and are

committed to using less polluting means of transportation.

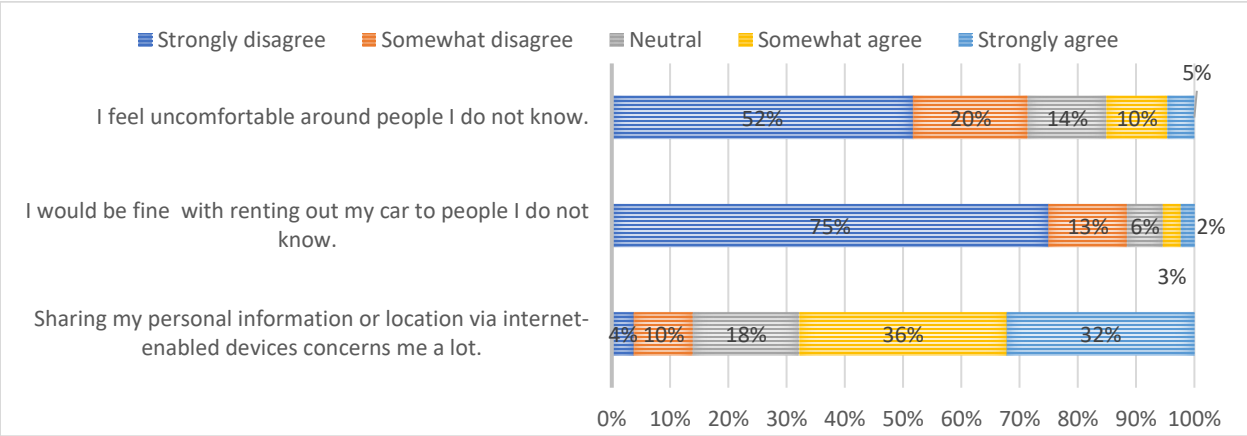



**Figure 18 Attitudinal Statements on Privacy and Sharing**

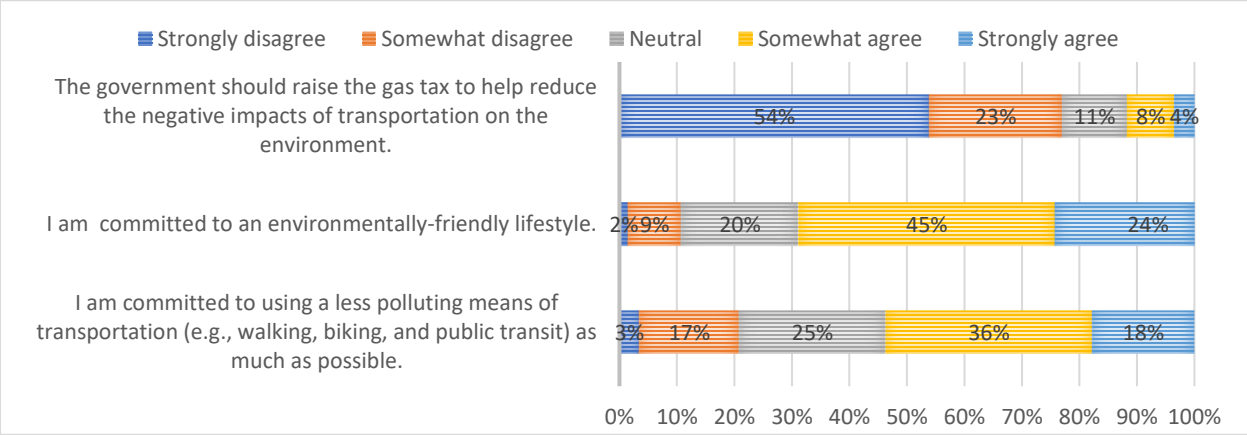



**Figure 19 Attitudinal Statements on Environment Friendliness**

Figure 20 presents the survey results about the extent to which respondents agree or disagree with the statements regarding tech-savviness. The first statement depicts the respondents' preference for online shopping over in-store shopping. The results show an interesting trend – out of all the respondents in the Tampa Bay region, more than half (59 percent) prefer the in-store option over the online option. In addition to that, only 18 percent of respondents prefer the online shopping option over the in-store option. While this was relevant in case of shopping behaviors, it does seem like the majority of the respondents (63 percent) face little problems in learning to use new technologies. Similarly, half the respondents (50 percent) suggested that they would like to tbe among the first users to use latest technologies in their life. When asked about the importance of internet connectoivity wherever they go, almost three fourths of the respondents (74 percent) felt that it was important to have internet conenctovity on-the-go. Finally, respondents were asked about their willingness to try out new and different things – an overwhelming majority (81 percent) agreed that they like trying new and different things. This large inclination towards using new technology, the importance of having internet

connectivity on-the-go, and the relative ease of using new technology and learning new technologies augurs well for the potential of a future with autonomous vehicles.

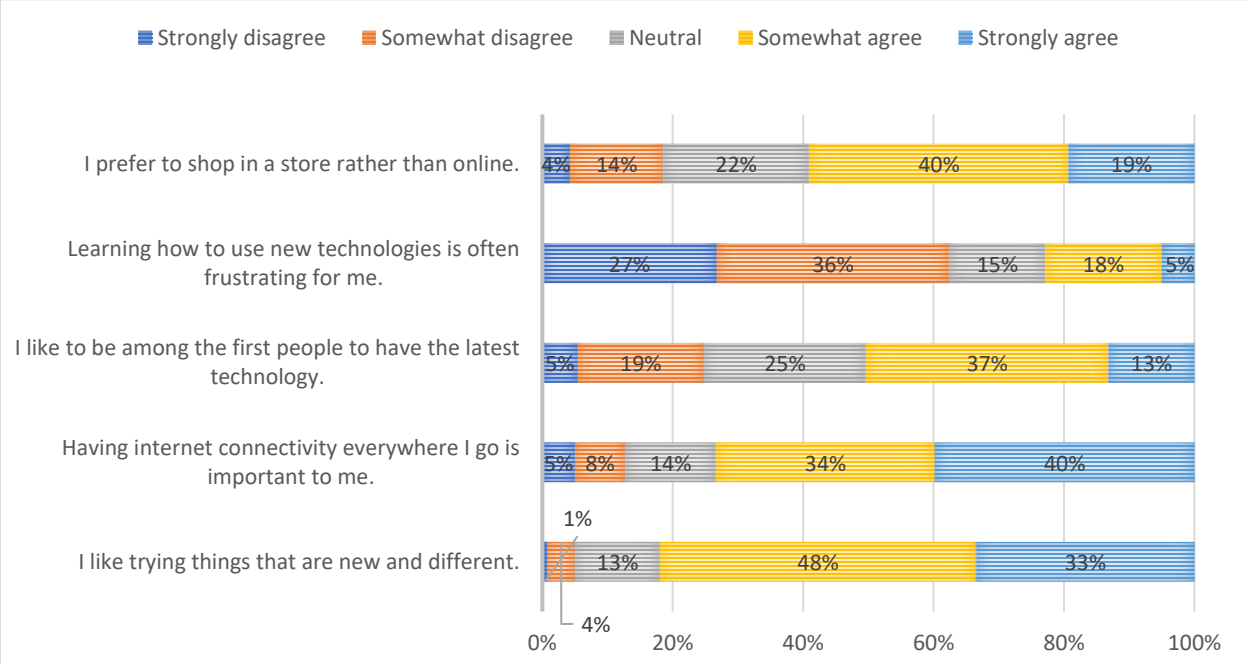



**Figure 20 Attitudinal Statements on Technology Savviness**

Figure 21 presents the survey results about the extent to which respondents agree or disagree with five different statements that intend to understand personal time use characteristics. The first statement depicts the respondents' preference for making good use of time during traveling. The results show a clear preference for making good use of time during traveling as 80 percent of the respondents agreed with the associated statement. Respondents were then asked if the time spent on traveling places provided a useful transition between activities. The results revealed that less than half of them (47 percent) strongly or somewhat agreed, and 31 percent stayed neutral. When asked about their preferences to multitask, results were more balanced with 38 percent strongly preferring to do one thing at a time and conytratsingly, about 42 percent respondents preferring to multitask; about 19 percent stayed neutral.

The fourth statement elicits information on time poverty – the degree to which respondents feel that the nonavailability of time inhibits them from doing many of the things they like to do. The results revealed that 45 percent of the respondents strongly or somewhat agreed that they are too busy to do many of the things they like to do while 38 percent disagreed with the statement. Lastly, when asked if waiting time was a useful pause in a busy day, more than half of the respondents (53 percent) agreed that it is a useful pause in a busy day while those who disagreed corresponded to 27 percent. In general, the majority of the sample wants to make good use of their travel time, and enjoy the time spent on traveling as a useful transition or pause between activities.

A significant majority of respondents favor multitasking and a similar proportion of people feel that they are time-poor.

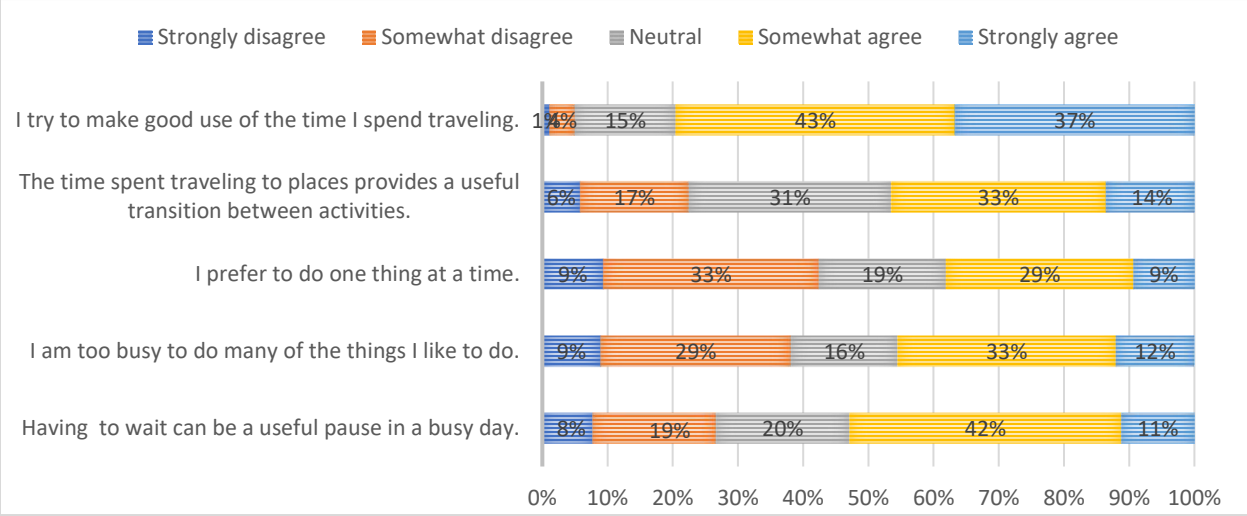



**Figure 21 Attitudinal Statements on Personal Time Use**

Figure 22 presents the survey results about the extent to which respondents agree or disagree with seven different statements about transportation. The result for the first statement suggests that 69 percent of the respondents agreed that their daily travel routine is generally satisfactory. On the contrary, 63 percent of the respondents felt that the level of congestion during their daily travel bothered them. In the Tampa Bay region, perhaps unsurprisingly so, only 12 percent of the respondents found public transit to be a reliable means of transportation for their daily travel needs. In similar vein, an overwhelmingly high 87 percent agreed that they definitely liked the idea of owning a car in Tampa, and a lot of these responsents (68 percent) also felt that they did not have reasonable alternatives to driving.

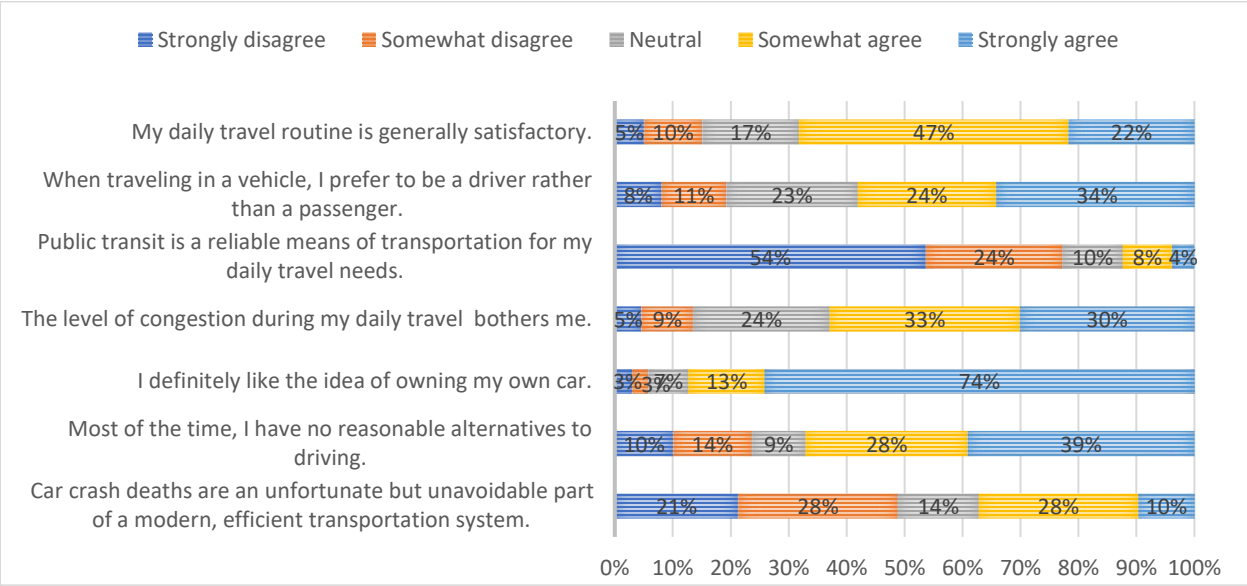



**Figure 22 Attitudinal Statements on Transportation Issues**

Figure 23 presents the survey results on respondents' preferences for residential location. More than two-thirds of respondents (67 percent) favored the mixed-use urban development with shops, restaurants, and offices mixed in their home neighborhood. Respondents also specified their preference for a spacious home, even if was further away from public transportation or their most frequented places (49 percent) as against 28 percent of the Tampa Bay respondents who indicated otherwise. This is further ecoed in their preferences for living close to public transit. Only 23 percent of Tampa Bay residents felt that they would prefer to live close to transit, even if it meant having a smaller home and living in a denser area. Results from this survey clearly show the preference for spacious homes though there seems to be a preference for mixed use neighborhoods. This finding should be considered in the context of the Tampa Bay area which majorly lacks accessible public transit and other alternative modes of transportation.

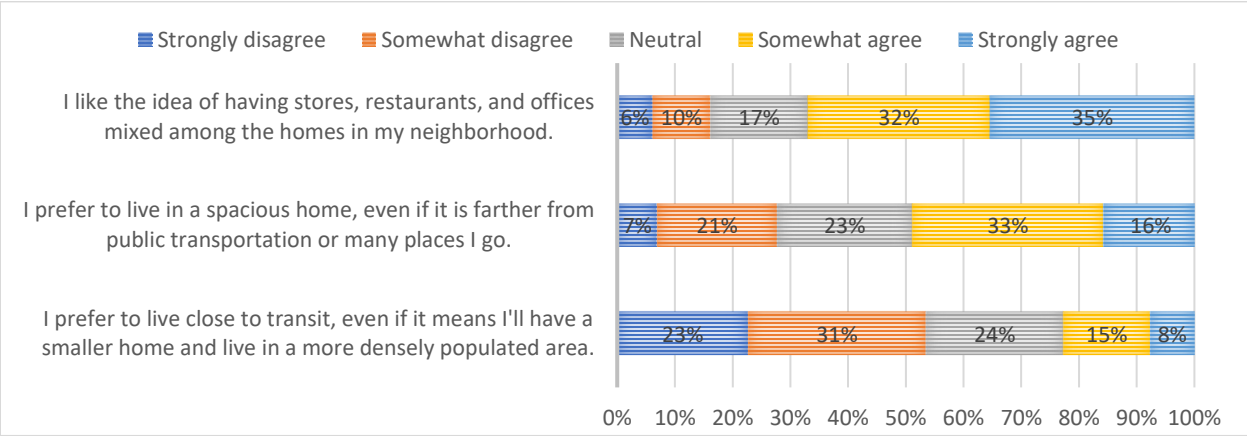



**Figure 23 Attitudinal Statements on Residential Location Preferences**

Figure 24 presents the last parts of the attitudes and preferences section from the survey. To sum up, majority of the respondents (87 percent) place emphasis on the reliability of their vehicles over their brand. The second statement deals with motion sickness in a moving vehicle and only a third (31 percent) suggested that they felt sick while reading in a moving vehicle.

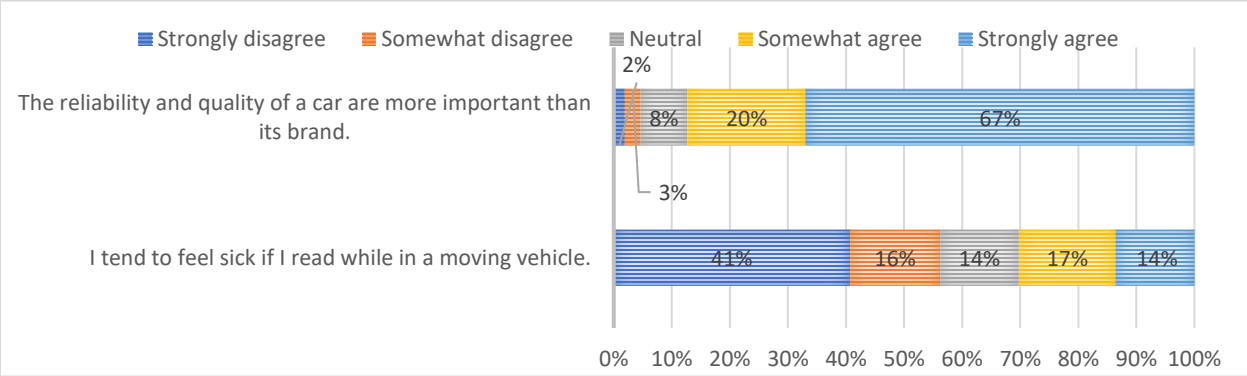



**Figure 24 Other Attitudinal Statements**

## VEHICLE OWNERSHIP AND RESIDENTIAL CHOICE

This section details the results from Section B of the survey, regarding respondents' vehicle ownership status and residential characteristics and preferences.

### Vehicle Ownership

This subsection presents the survey results on the characteristics of the respondents' reported household vehicles. Figure 25 presents the survey results on annual miles driven with vehicles the respondents used most often. The results show that just about 77 percent of the most often used vehicles were driven less than 15,000 miles annually. Figure 26 presents the distribution of vehicle model year for the most used vehicle per respondent. Results show that the majority of vehicles (76 percent) have been have a model year in the last 10 years (i.e., 2009 to 2019) with more than half of the total vehicles belongint to the last 5 years (i.e., 2014-2019) which was right after the recession, and corresponding to the improved economy.

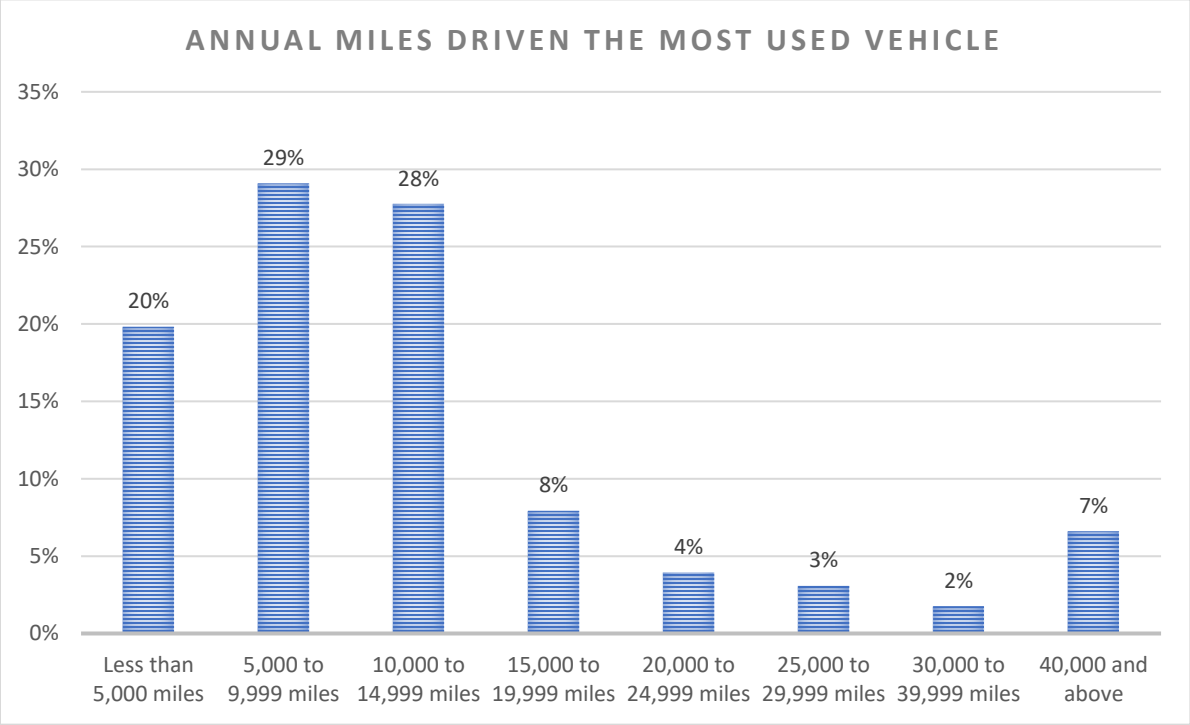



**Figure 25 Reported Estimated Annual Miles Driven for Vehicles Used Most Often by Respondent**

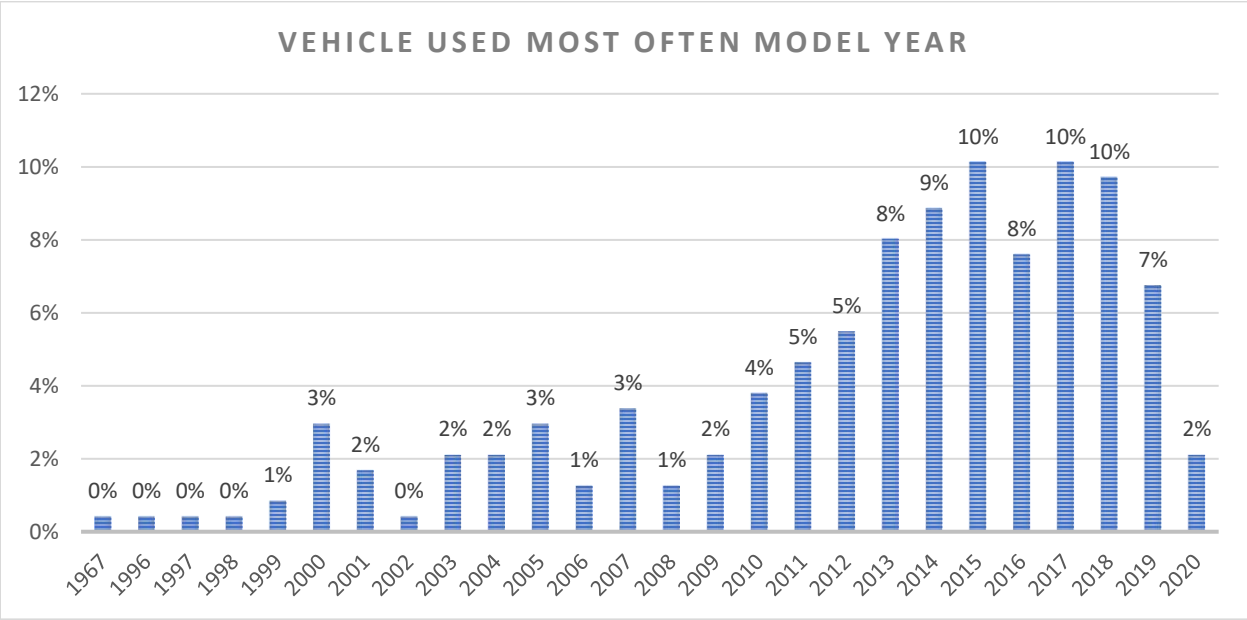



**Figure 26 Distribution of Vehicle Model Year for Vehicles Used Most Often by Respondent**

Figure 27 presents the results on the availability and type of driving assistance features of vehicles the respondents used most often. The results showed that the top three features available in the vehicles are the backup camera, adaptive cruise control, and automated braking system, respectively, while only a about a fifth of the respondents have blind-spot monitoring systems onboard their vehicles. Furthermore, 19 percent of the vehicles the respondents used most often are reported not having any of the given driving assistance features.

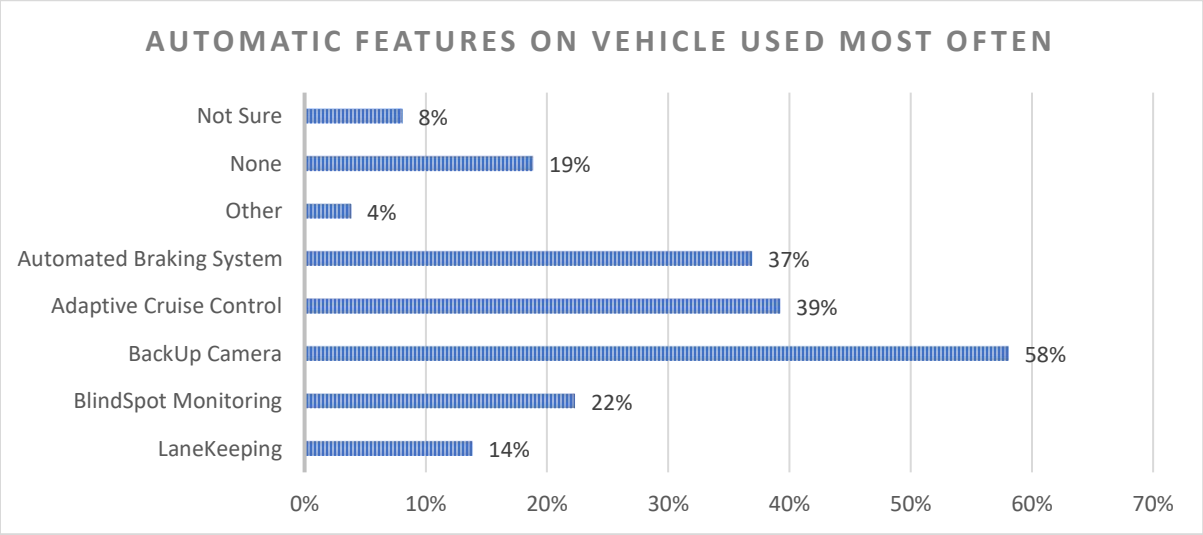



**Figure 27 Features Available on the Vehicle Respondent Uses Most Often (Multiple selections were allowed)**

**Residential Choice**

This subsection presents the survey results on the respondents' residential choice preferences. Figure 28 shows the distribution of years when respondents moved to their current home. It can be seen that the number of moves have increased in the past five years years, i.e., 2014 – 2019, a large majority of the respondents moved into their current homes in the past decade.

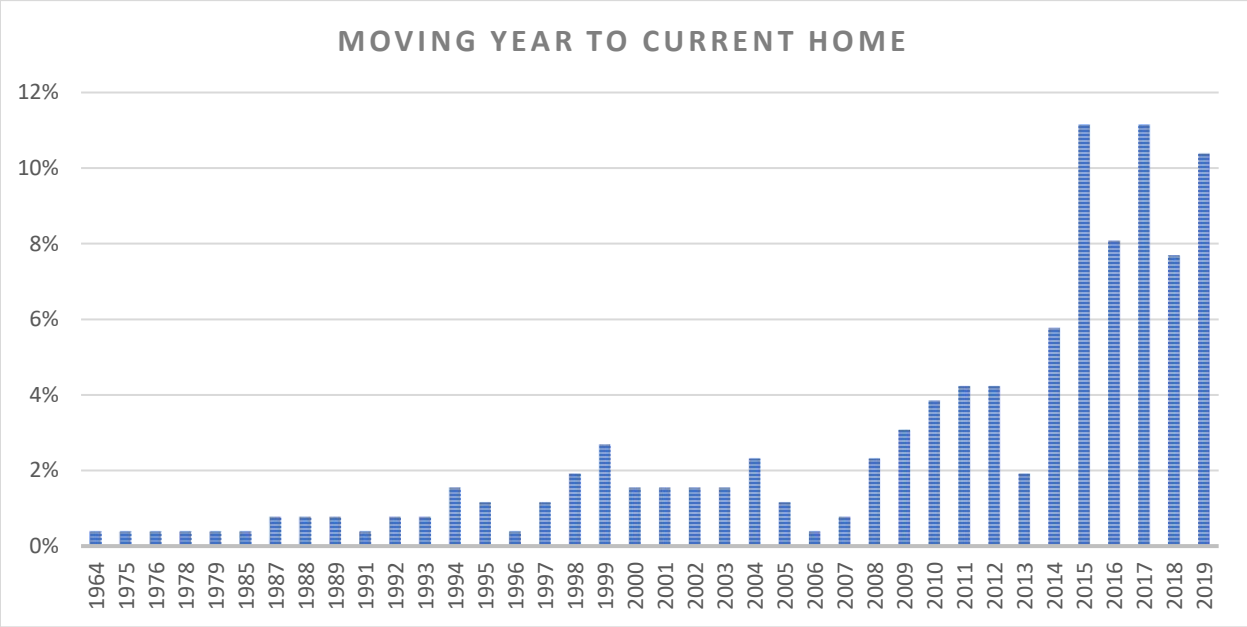



**Figure 28 Year Moved to Current Home**

Figure 29 presents the survey results on home choice preferences. Results revealed that top must-have features include low crime neighborhoods (57 percent), single-family homes (37 percent), backyards (31 percent), easy to walk or bike around neighborhood (24 percent), and close to good work/school location (20 percent). Respondents also desired features such as being close to shops and services (57 percent), close to park and nature (53 percent), and close to work/school location (47 percent).

On the contrary, respondents felt that features such as a large home (25 percent), a backyard (8 percent), and good access to public transit (6 percent) were not an absolute requirement. Respondents least cared about good access to public transit (62 percent), good public schools (49 percent), and a large home (32 percent). Overall, the results suggest that many people want to live in stand-alone homes in low crime neighborhoods. Backyards produice mixed feelings with equal share of respondents wanting and not wanting these features in their current/next home. It is also notable that not many people neither seek large homes nor good access to public transit when choosing their home.

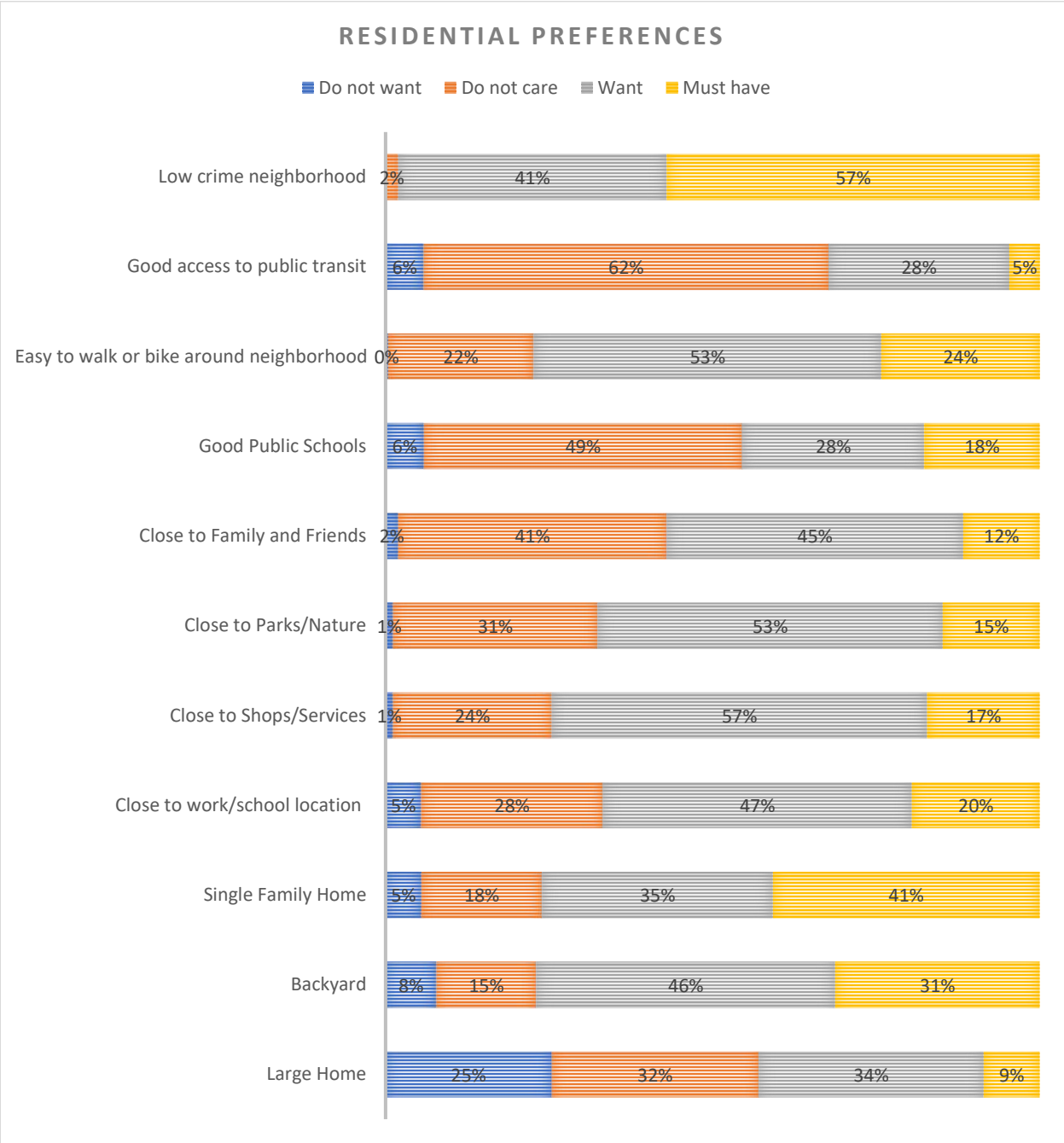



**Figure 29 Preferences for Home Location and Home Features**

## CURRENT TRAVEL PATTERNS

This section of the survey focuses on understanding the current travel patterns of the respondents. The survey asked about general travel behaviors, commute behaviors, and long-distance travel patterns, in addition to the frequency of online shopping, and the number of items delivered to the house. Collecting this information is important to understand how users' perceptions of new technology are related to their current travel patterns and needs.

Figure ***30*** shows that for non-commute trips, 83 percent of the respondents drive private vehicles alone for three or more days a week, while a further 12 percent drive private vehicles with passengers for three por more days a week, and another 5 percent ride in private vehicles with others for three or more days a week. 43 percent of tampa Bay respondents indicated that public transit by bus is not available for their trips. Even among the 57 percent for whom transit is available, an overhwleming majority (50 percent of the Tampa Bay sample) say they never use it for their non-commuting trips. Ridehailing services also do not have many frequent users with 69 percent indicating that the service is available, but they never use it. About 15 percent of the sample walk (at varying frequencies) for non-commuting trips weekly, and 11 percent bike (at varying frequencies) for their non-commuting trips. In summary, a private vehicle is the main mean of transportation for non-commute trips in single or higher occupancy forms.

Figure 31 indicates the responses from respondents about how many miles do they drive in a week, on average while they are not "on the clock" for work. About 58 percent of the respondents indicated that they drive more than 50 miles in a week, and about 35 percent respondents saying that they would travel a minimum of 100 miles a week. Lastly, 4 percent of the respondents who stated to have driver's license reported zero miles driven during the week.

### Commute Trips

The survey asked about the number of days respondents traveled, on average, to work and school trips, respectively, as indicated in Figure 32. For the work destination, 53 percent of respondents indicated that they travel five days a week to work. In case of school travel, only 19 percent of respondents traveled 5 days a week to school in the Tampa Bay region. While the large majority (67 percent) of the respondents indicated that they do not telecommute, around 10 percent of the Tampa Bay sample revealed that they did telecommute 5 days a week (refer to Figure 33).

The distance (in miles) and the time is taken to travel (in minutes) from home to the main workplace/school location are as shown in *Figure 34*. Almost half of the respondents (46 percent) live within 10 miles from the main workplace/school location, while about 29 percent of the respondents live at a distance greater than 20 miles from the workplace/school location. On the other hand, 58 percent of the respodnents live within a 30 minute drive time to their main commute location.

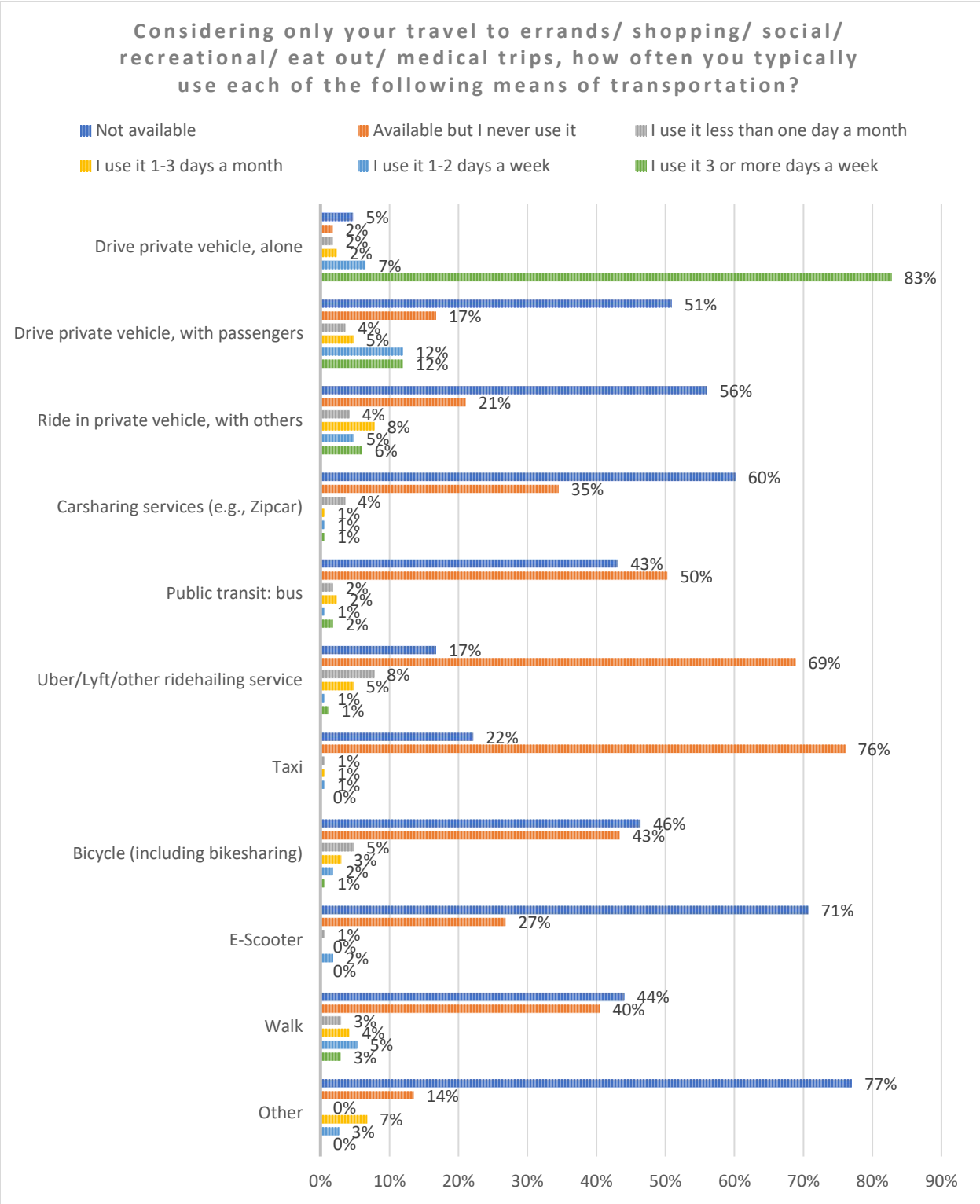



**Figure 30 Frequency of Mode Use on Non-Commute Trips**

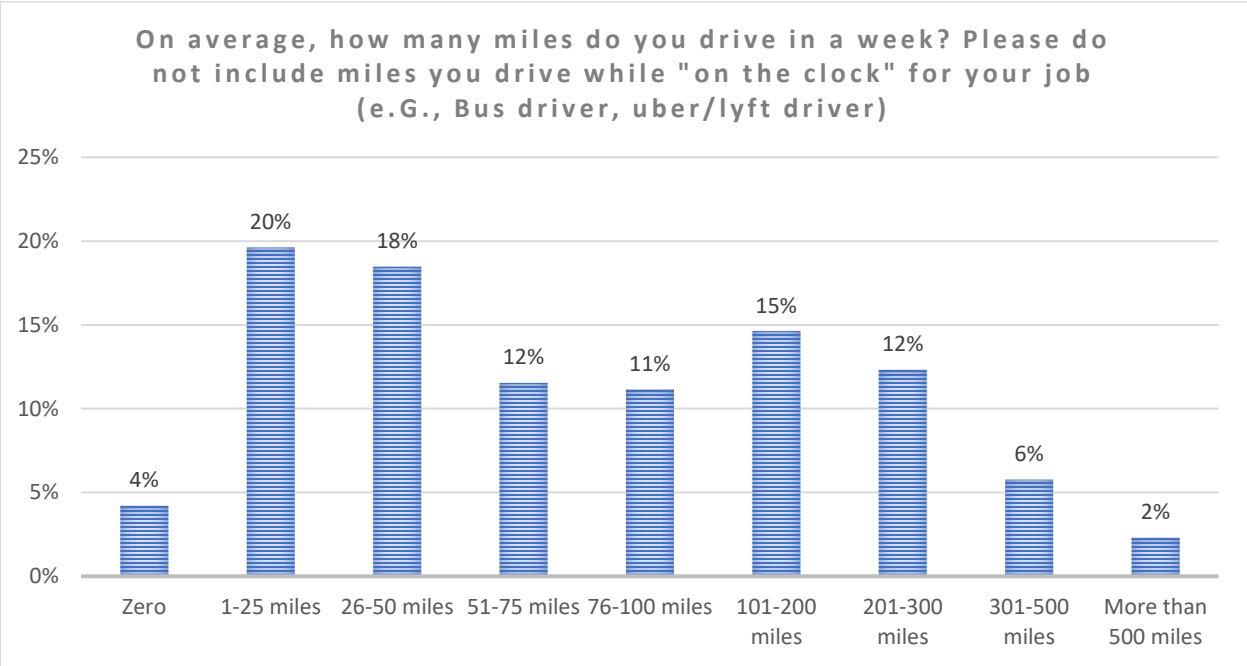



**Figure 31 Average Weekly Miles Driven**

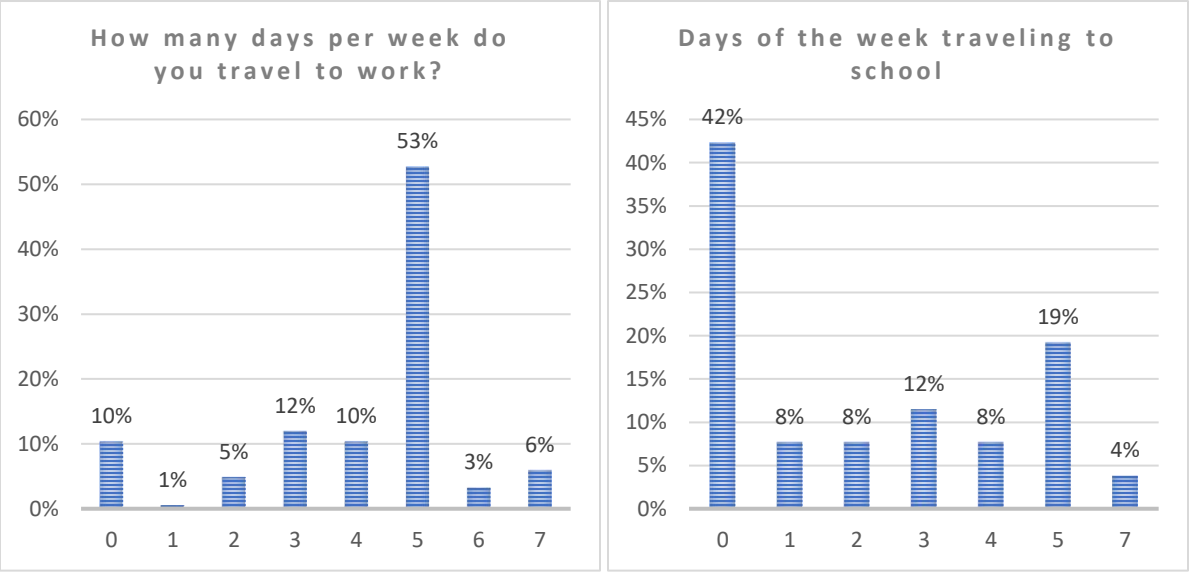



**Figure 32 Commute Frequency to Work and School**

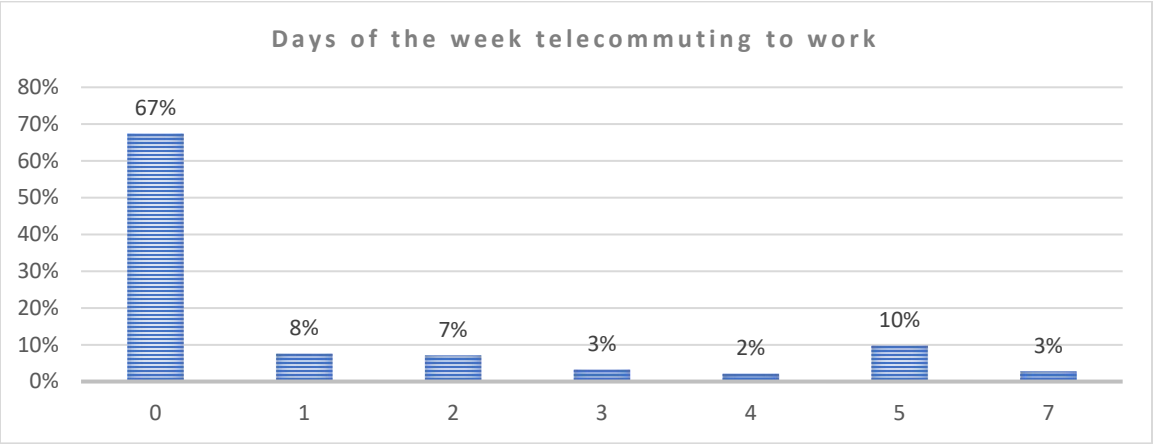



**Figure 33 Frequency of Telecommuting for Work**

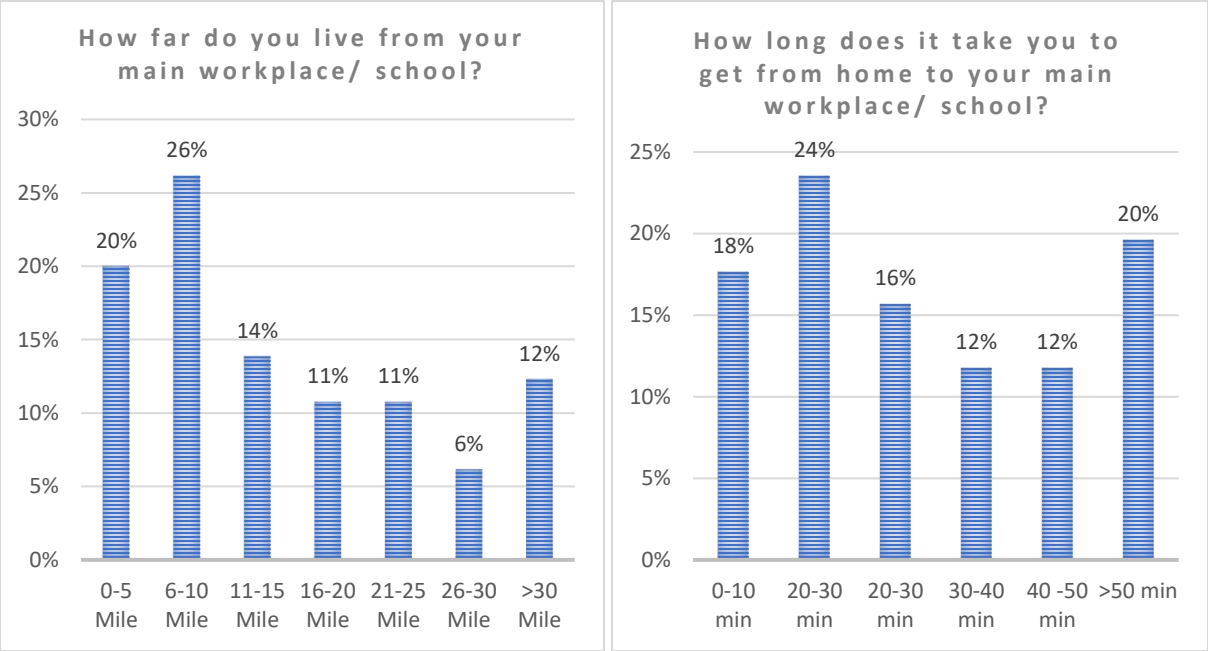



**Figure 34 Commute Average Distance and Duration**

Figure 35 indicates that 87 percent of the respondent selected driving alone in a private vehicle as the most often means of transportation for commuting in the Tampa Bay region. According to the American Community Survey (2018 5-year estimates), among workers 16 years and over in the tampa Bay metro region, 80 percent drive alone to work, 8 percent carpool, 1 percent uses public transit, 1 percent walk, 1 percent bike to work, and 2 percent uses other modes to get to work.

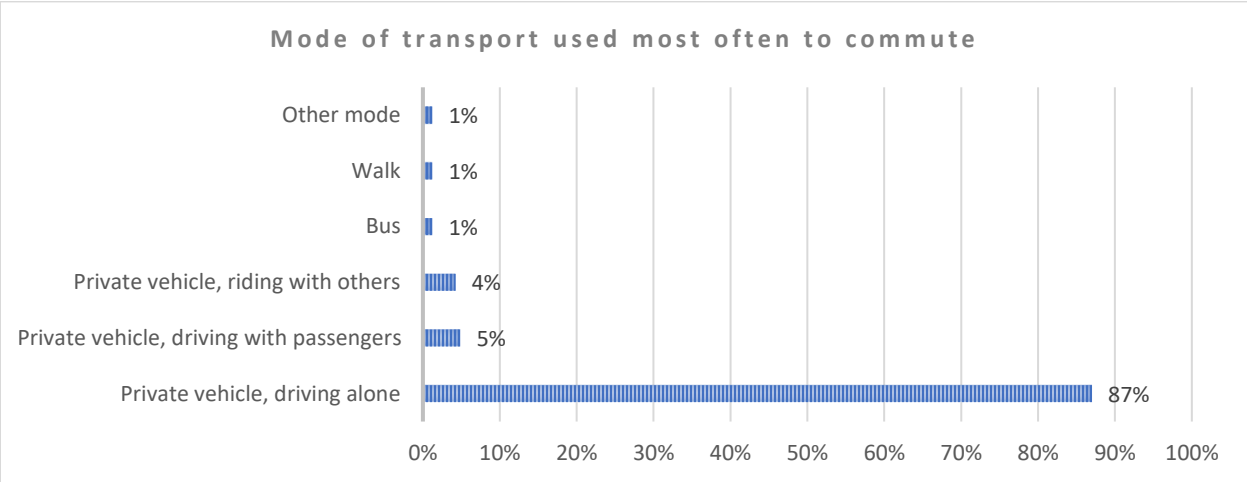



**Figure 35 Means of Transportation Used Most Often on Commute Trips (N=635)**

Figure 36 shows that for commute trips, three or more days a week, it is interesting to note that only 26 percent of the respondents drive private vehicles alone, while 65 percent drive private vehicles with passengers, and a further 12 percent ride in private vehicles with others. In comparison to non-commute trips, people use personal vehicles with passengers significantly more than other modes. 28 percent respondents indicated that public transit was not available for their trips. In addition, 67 percent indicated that public transit by bus was available, but they never use it for their commute – pointing to very low ptronage as far as transit usage is concerned. Ridehailing services also do not have many users with 62 percent indicating that the service is available, but they would never use it. About 36 percent of the Tampa Bay respondents stated that they would walk for their commuting trips at least once in a month (if not more) and around 19 percent do the same w.r.t biking. In summary, a private vehicle is the main mean of transportation for non-commute trips in single or higher occupancy forms.

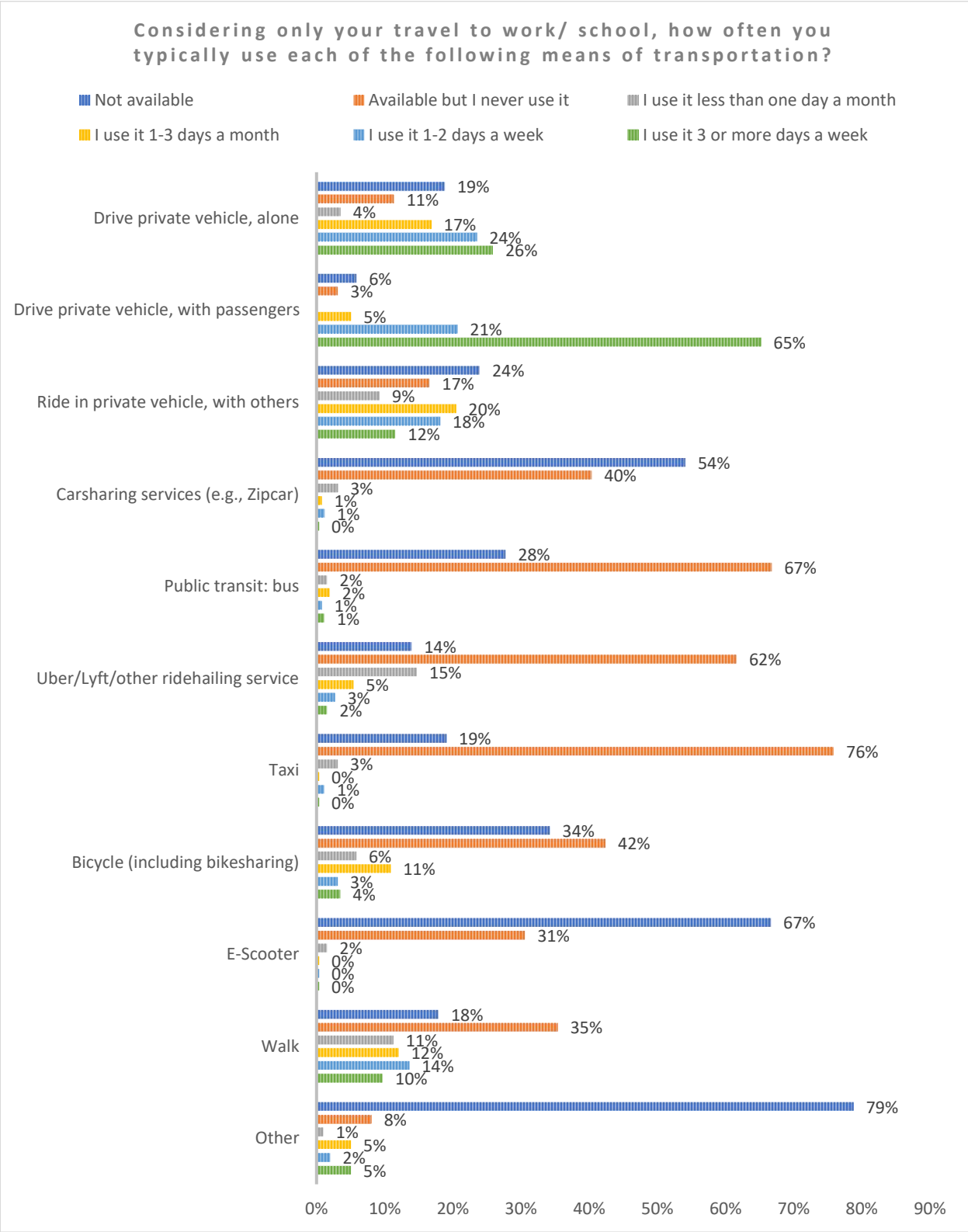



**Figure 36 Frequency of Mode Use on Commute Trips**

**Long-Distance Trips**

This sub-section of the survey tries to gauge the respondents' long-distance travel. Autonomous vehicles could make long-distance trips less burdensome by eliminating driving. To understand the extent that AV adoption might impact long-distance trips mode choice is one of the objectives of the T4 survey. In this study, long-distance travel was defined as trips that were at least 75 miles long (one-way), not including commute trips for about a half-year period (from the beginning of 2019 to the Jun-July 2019).

Figure 37 shows the frequency of the mode used to make personal long-distance trips. The car emerged as the most often used mode with about 22 percent of respondents indicated using car for 3 or more long-distance trips in the past year. During the same time, 8 percent of the respondents used airplanes for 3 or more long-distance trips. Close to 60 percent of the respondents had at least one long-distance trip by car and about 40 percent of the respondents had at least one long-distance trip by airplane.

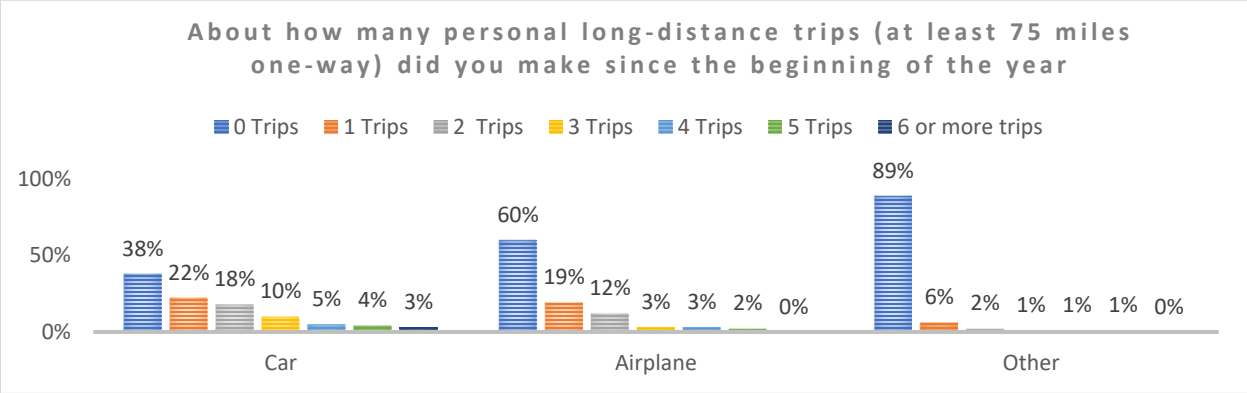



**Figure 37 Frequency of Long-Distance Trips for Personal Purposes Since the Beginning of the Year 2019**

In the case of frequency of long-distance trips made for business (Figure 38), 84 percent of the respondents stated that they did not make any long-distance trip by car, and 89 percent of the respondents stated that  did not make any long-distance trip by airplane.

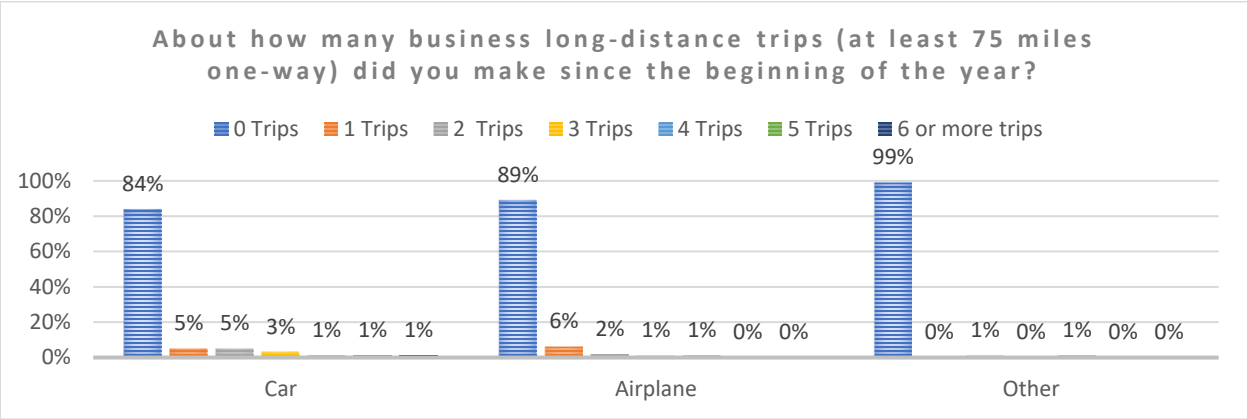



**Figure 38 Frequency of Long-Distance Trips for Business Purposes Since the Beginning of the Year 2019**

**Items Delivered to the House**

Because AV and mobility-on-demand services have the potential to serve freight deliveries, this section of the survey explores the current patterns of using online shopping in different categories of parcels, meals, and groceries. When asked about the item delivered to the house in the past 30 days, 25 percent of the respondents indicated that they purchased items online 2-3 times, while about 23 percent of the respondents indicated purchasing items online for more than 7 times in the past month. Results also revealed that most of the respondents (74 percent) did not have prepared meals delivered to the home, and about 88 percent did not have grocery items delivered in the past 30 days (Figure 39).

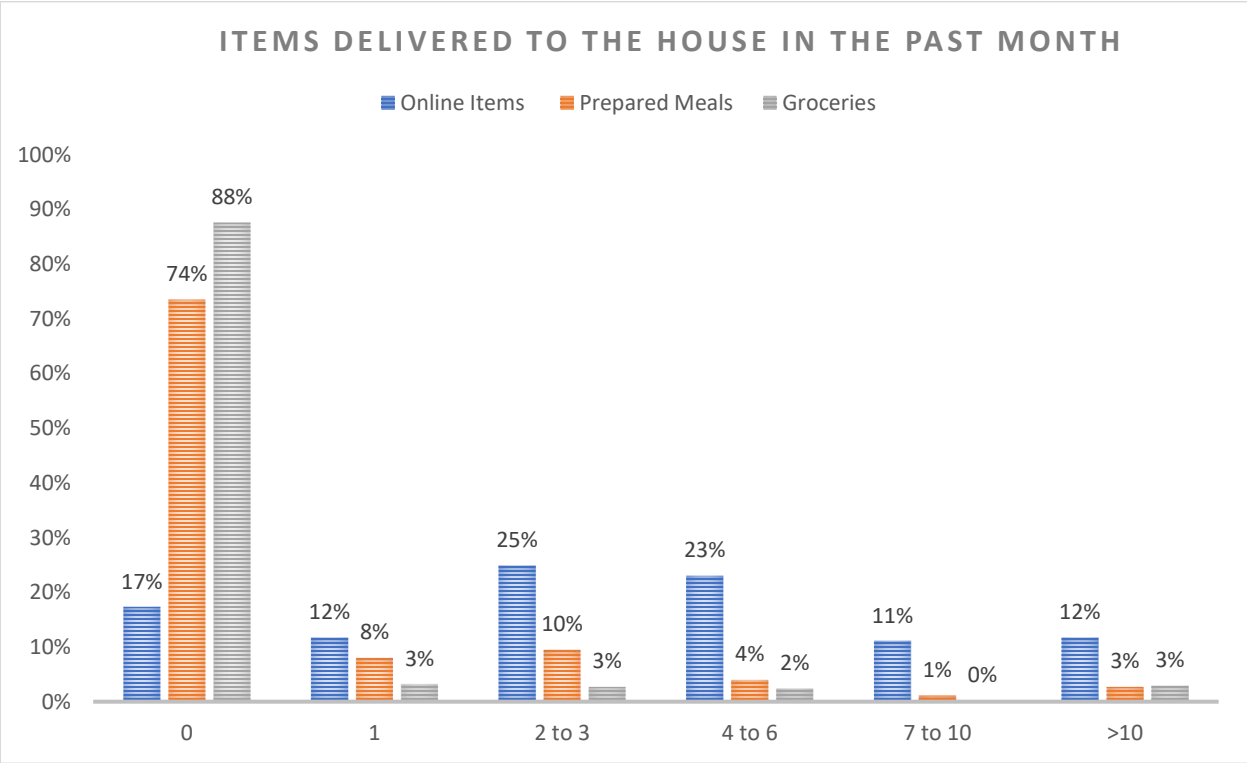



**Figure 39 Frequency of Items Delivered to the House in the Past 30 Days**

## MOBILITY-ON-DEMAND SERVICES

This section focuses on the mobility-on-demand services and asks respondents about familiarity, use, attitudes, and perceptions of these services. In this section, mobility-on-demand refer to private and shared ridehailing services, car sharing, bike sharing, and e-scooter sharing services. Respondents were asked to detail their last trips using ridehailing services, and bike-sharing/e-scooter sharing, when applicable. In the question of this section of the survey, respondents were asked about their willingness to share ridehailing services under specific scenarios (stated preference).

### Familiarity with Mobility-on-demand Services

Figure 40 illustrates how much respondents in the Tampa Bay area were familiar with, and use mobility-on-demand services. The mobility-on-demand services that were less familiar to respondents was bikesharing (50 percent) and carsharing (49 percent). Among all the asked mobility-on-demand services, private ridehailing services are the most common with 8 percent of the respondents using at least monthly (f not more), and only 12 percent of the respondents not familiar with them.

While bikesharing services are available in Tampa and St. Petersburg, they are mostly confined to multiple blocks in and around Downtown Tampa, and Downtown St. Petersburg. This could attribute to their relative unfamiliarity in the mind of the respondents from the Tampa Bay region. Carsharing services are also limited in Tampa Bay with only Enterprise providing services. Two percent of the respondents reported to ever using carsharing ,and two percent reported to using bike sharing on a monthly basis in the Tampa Bay metro area.

E-scooter sharing services had the joint highest share of individuals who were familiar with the service but have never used them (54 percent). Currently, there are several different e-scooter sharing companies operating in the area (e.g., Bird, Jump, Spin, and Lime). About four percent of the respondents are using E-scooter sharing services rarely.

### Bike-share and E-scooter-share Services

This section of the survey was proposed only to the respondents that reported having used either bike-sharing or e-scooter services. The attributes of the last trip with E-scooter or bike-sharing services were elicited from the riders. In terms of the time of day when these services were used, most of the trips (70 percent) occurred during the weekends (day time as well night time) (refer to Figure 41). Regarding trip lengths using E-scooter or bike-sharing services, half of the trips (50 percent) were 2 miles or under; and about 25 percent of the trips five miles or more (Figure 42).

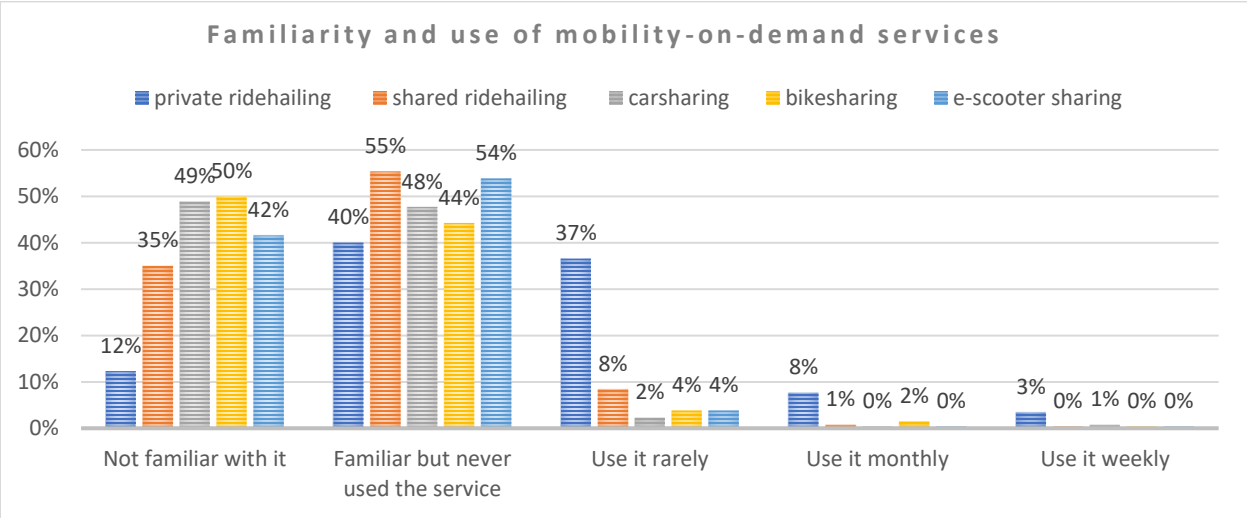



**Figure 40 Familiarity and Use of Mobility-on-demand Services**

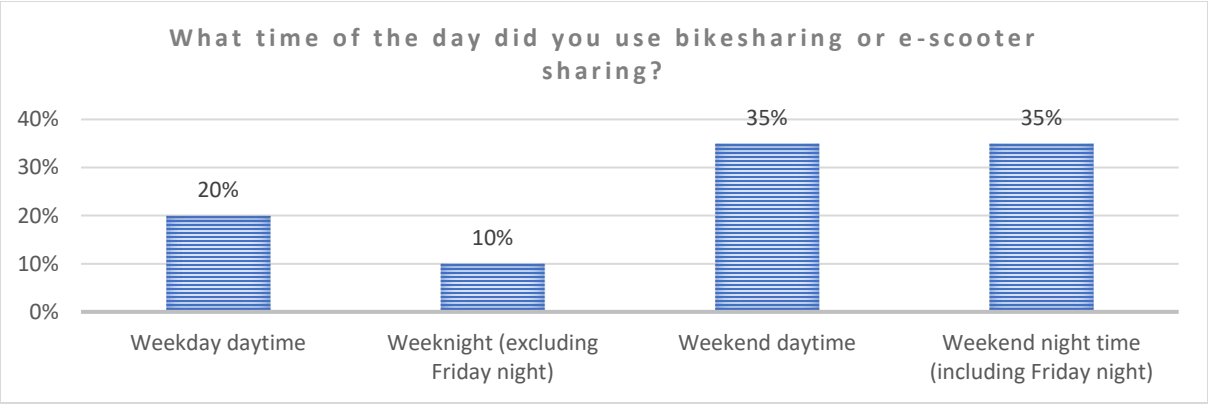



**Figure 41 Time of Day of Bikesharing or E-scooter Sharing Usage**

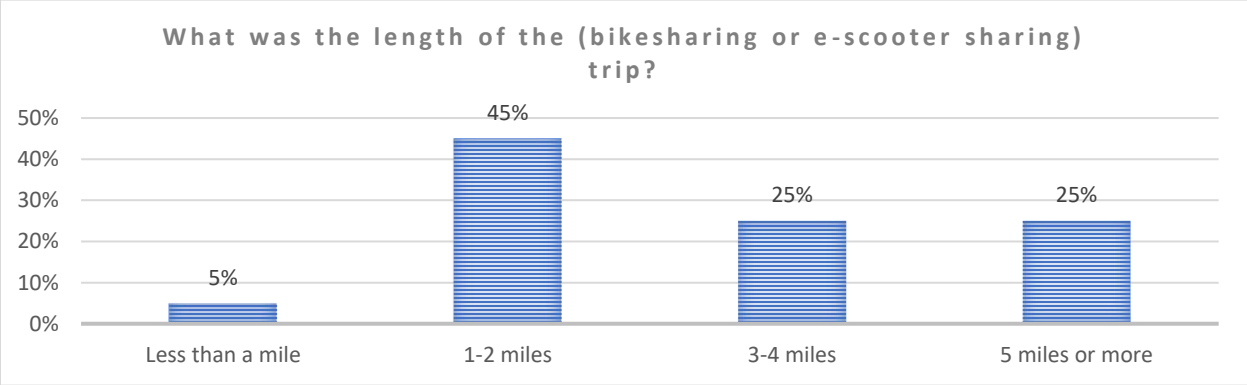



**Figure 42 Trip Length on Bikesharing or E-scooter Sharing Trips**

Regarding the primary purpose of the trip using either e-scooter or bike-sharing services (Figure 43), most respondents reported using the service for social/recreational trips (45 percent), followed by eating/drinking (15 percent), and joyrides enjoying/trying out the service (15 percent).

These services have been used for commuting only for 10 percent of the reported trips.

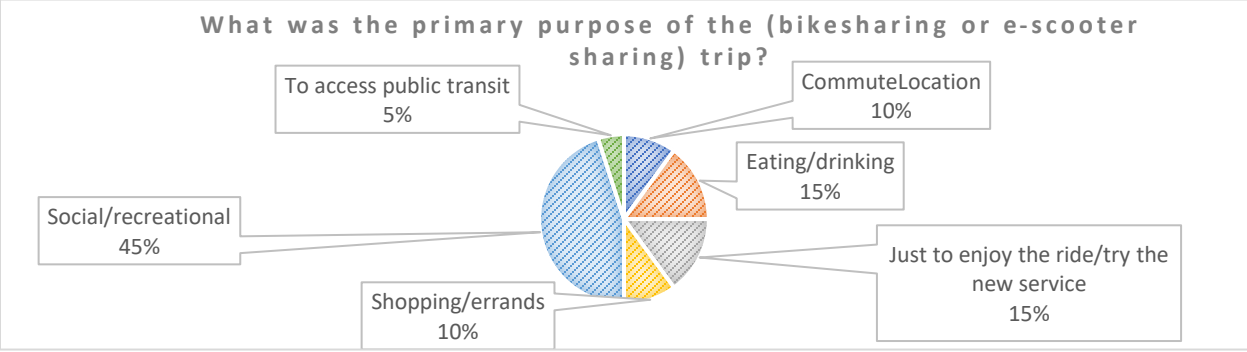



**Figure 43 Trip Purpose for Bikesharing or E-scooter Sharing Trips**

When asked about the reasons why bike-sharing or e-scooter sharing service was selected for the trip, the most common reason reported was "*Just to enjoy the ride/try a new service"* (34 percent) followed by "*No need to park/ parking was expensive or scarce", "To save time",* and "*public transit was not convenient*" (Figure 44). In this particular question, respondents were able to select up to three reasons for why they have selected the bike-sharing/e-scooter service for the trip.

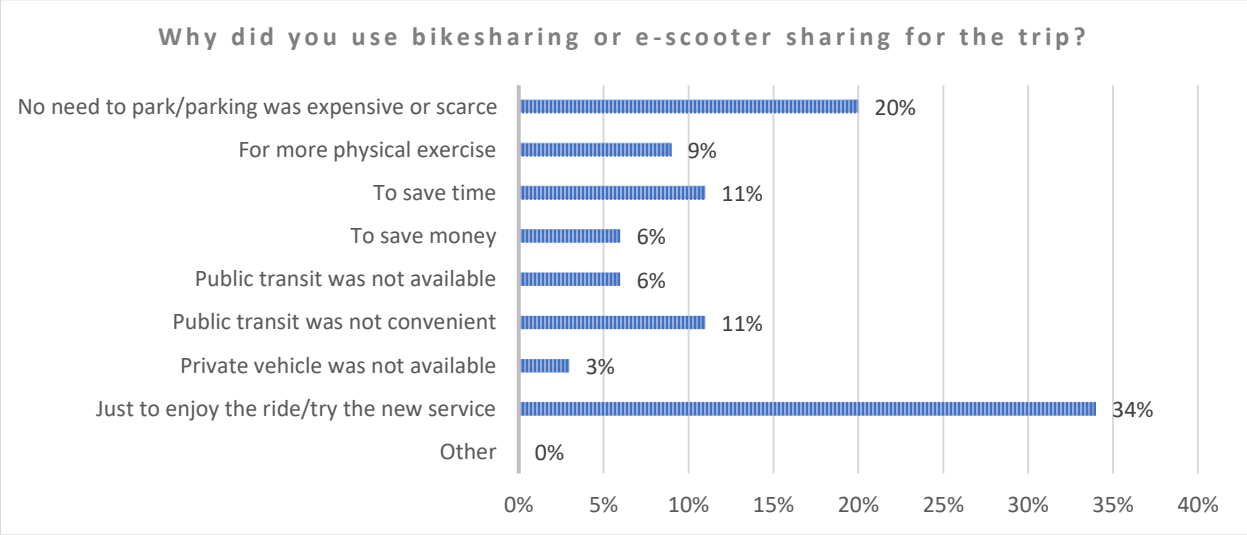



**Figure 44 Reasons Why Bikesharing or E-scooter Sharing Was Selected for the Trip**

Figure 45 shows the distributions of selected alternative modes for the respondents' last trip using bike-sharing or e-scooter sharing. About 55 percent of respondents reported they would have walked if the service was not available, 20 percent said they would have used Uber/Lyft for this trip, and 10 percent reported they would have ridden the bus. This finding suggests that bike-sharing and e-scooter sharing services are possibly replacing walking and ridehailing trips in the Tampa Bay region.

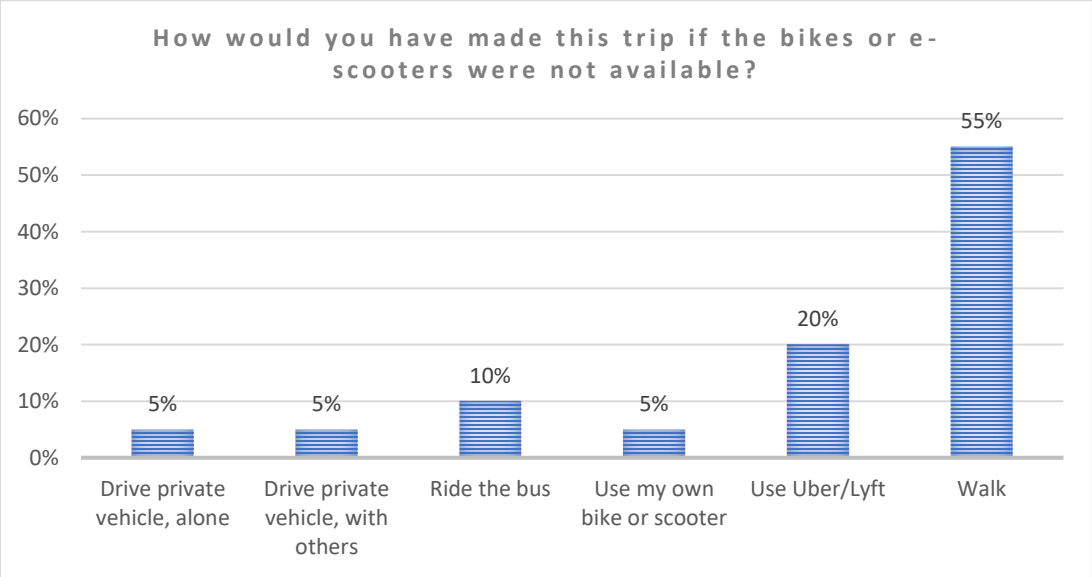



**Figure 45 Alternative Mode to Bikesharing or E-scooter Sharing Trips**

## Ridehailing Services

This section of the survey was proposed to those who have indicated that they have used ridehailing services. The detailed attributes of their last trip with ridehailing services in addition to their perceptions were elicited. Figure 46 shows that most ridehailing trips (60 percent) were done during the weekdays (day and night time). 24 percent of the trips happened during a weekenend night.

An important attribute of ridehailing trips is the wait time for the trip as well as the in-vehicle travel time, which adds to the total travel time. Figure 47 shows the distributions of both wait times and in-vehicle travel times reported by the survey respondents for the last ridehailing trip they recall. While a a significant chunk of respondents (44 percent) reported wait times of 5 minutes or less, 12 percent of the respondents reported waiting 15 mins or more for the trip. In-vehicle travel times were more evenly distributed with 60 percent of the trips taking less than 20 minutes in-vehicle travel time. 18 percent of the trips take more than 30 minutes in the Tampa Bay sample.

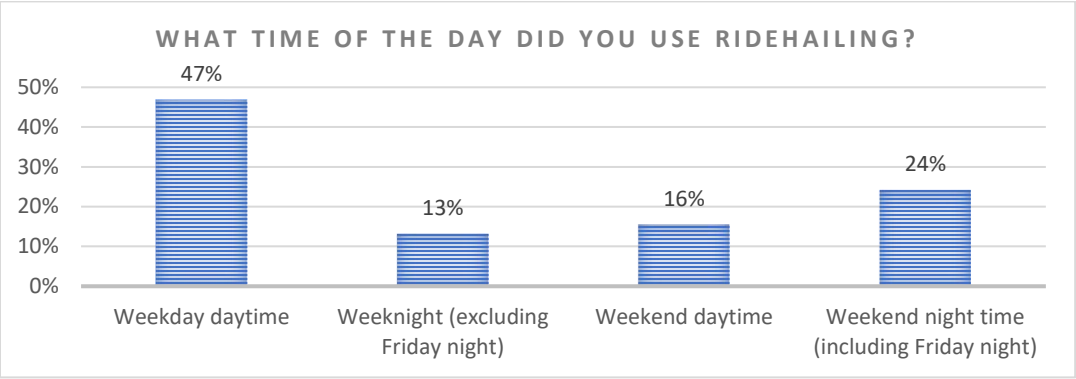



**Figure 46 Time of Day Distribution for Ridehailing Trips**

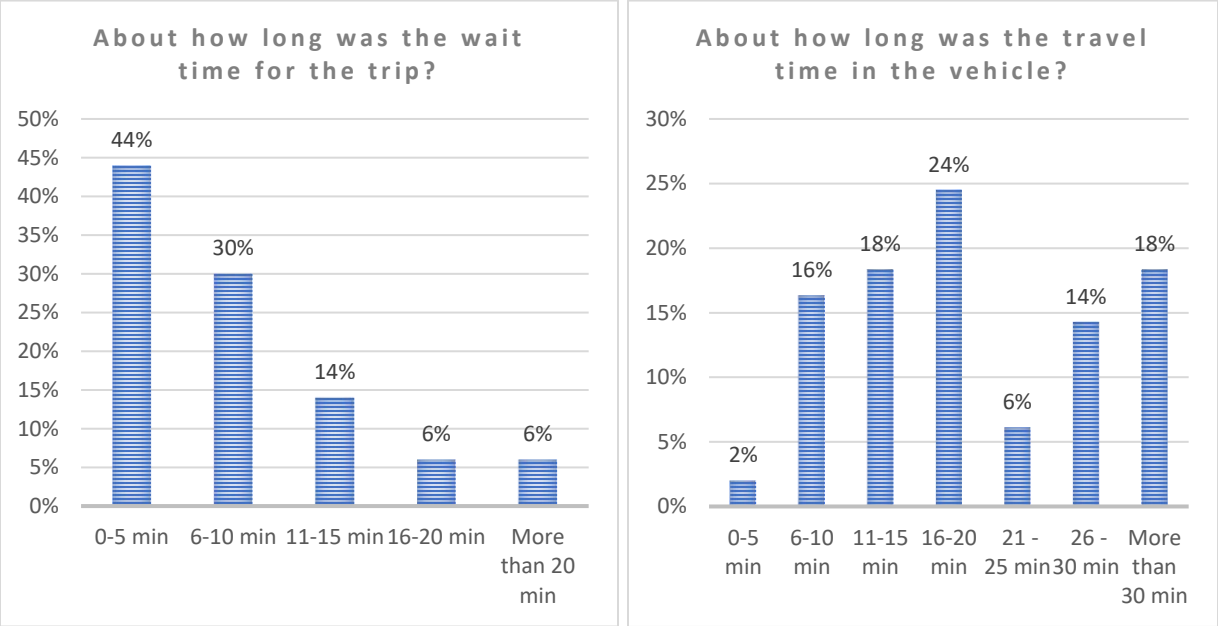



**Figure 47 Wait Time and In-vehicle Travel Time for Ridehailing Trips**

When asked about the alternative mode respondents would have chosen for this trip if ridehailing were not available (Figure 48), the most common alternative mode that respondetns would choose was found to be taxi (25 percent) followed by driving alone in private vehicle (21 percent), and driving with passengers in a private vehicle (20 percent). Interestingly, 7 percent of the users would have not made this trip if ridehailing services were not available. These findings illustrate the addition of induced demand (7 percent) that ridehailing services add to the transportation network and it is very important to consider them when planning for a future with autonomous vehicles.

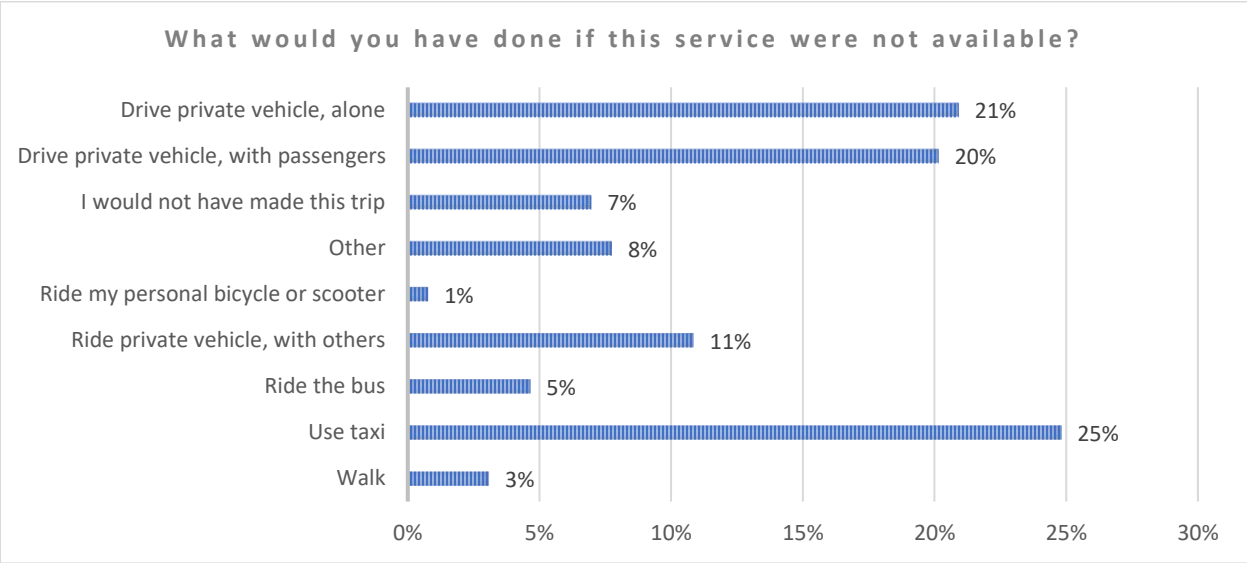



**Figure 48 Alternative Modes to Ridehailing Trips**

Figure 49 illustrated the distribution of the primary purpose of the ridehailing trips. Traveling to commute location represent only 15 percent of the trips, while traveling to social and recreational places represent 24 percent of the trip. Traveling to the airport (18 percent) and eating/drinking (14 percent) represented some other major trip purposes. Only 2 percent trips were done to access public transit. Respondents who reported they have used private ridehailing were asked the maximum additional travel time they would have accepted to use shared ridehailing if the service were available for half of the cost;

Figure 50 shows the distribution of responses. 31 percent of respondents reported they would not have accepted the shared ridehailing trip, even if the cost was half of what they paid for the private version of the same service. On the other hand, 10 percent of the respondents reported that they were willing to  accept an additiona;l travel time of 15 minutes or longer on shared ridehailing services for half of the price they have originally paid. These findings highlight that there is a willingness to share ridehailing services when the price justifies it. It should be noted that ridehailing services in private form are not helping much in reducing the load on the transportation network, energy consumption, and emission production. In other words, in the future, ridehailing services using autonomous vehicles are sustainable and will improve transport systems if the services are used mainly in sharing mode.

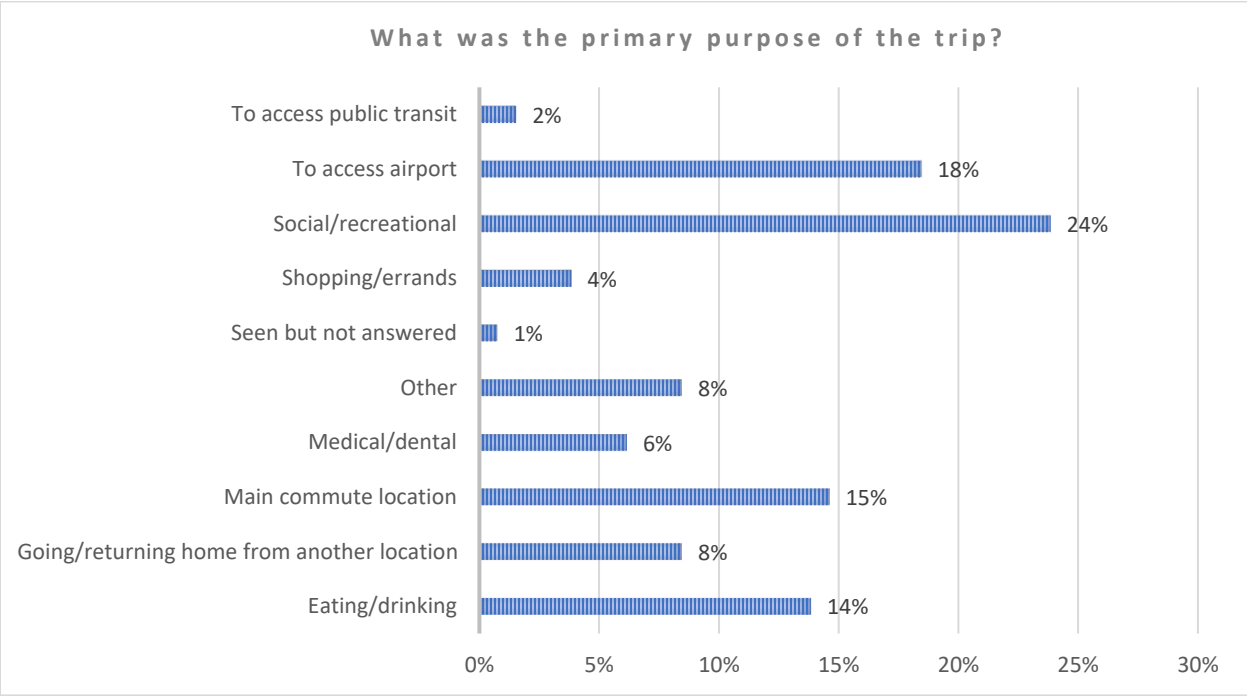



**Figure 49 Primary Purpose of Ridehailing Trips**

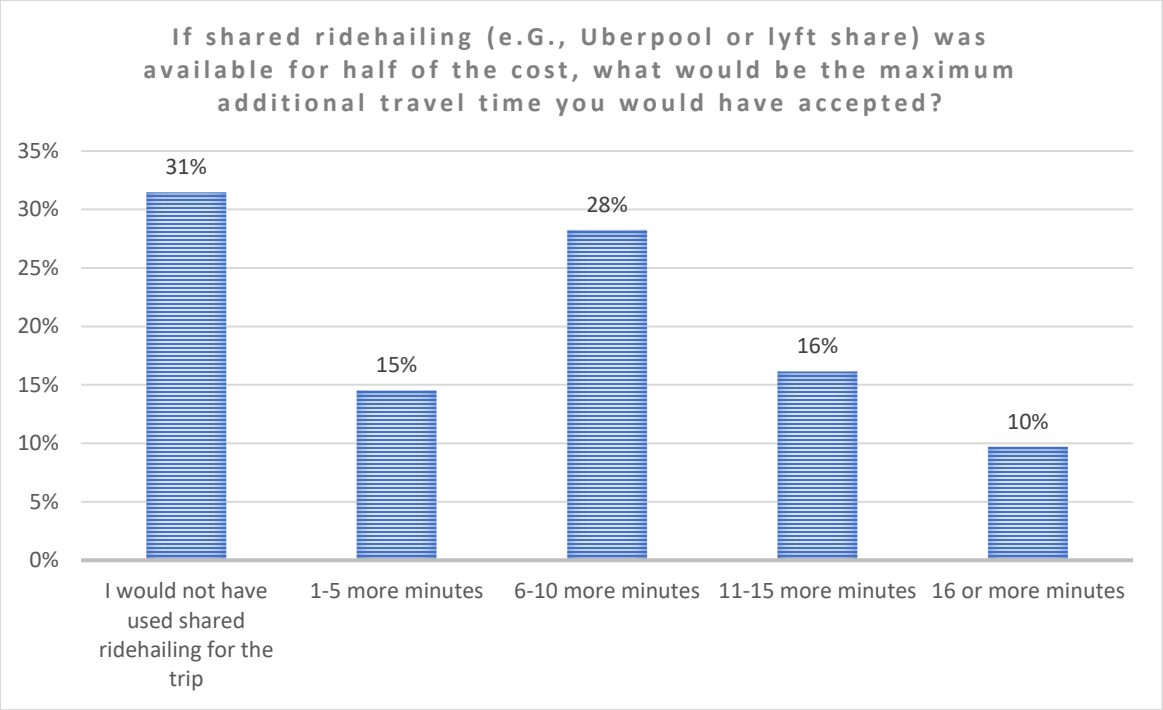



**Figure 50 Additional Travel Time Accepted for Ridehailing Trips**

In addition to the question about their last trip using ridehailing services, ridehailing users were asked general questions about their use of those services. Figure 51 shows the distribution of

monthly expenditures reported by ridehailing users in the month previous to the survey. 48 percent of respondents reported having spent zero dollars on ridehailing trips during the previous month, suggesting those respondents are sporadic users. 5 percent of respondents reported having spent more than $100 in the previous month on ridehailing trips, suggesting these are somewhat frequent ridehailing users.

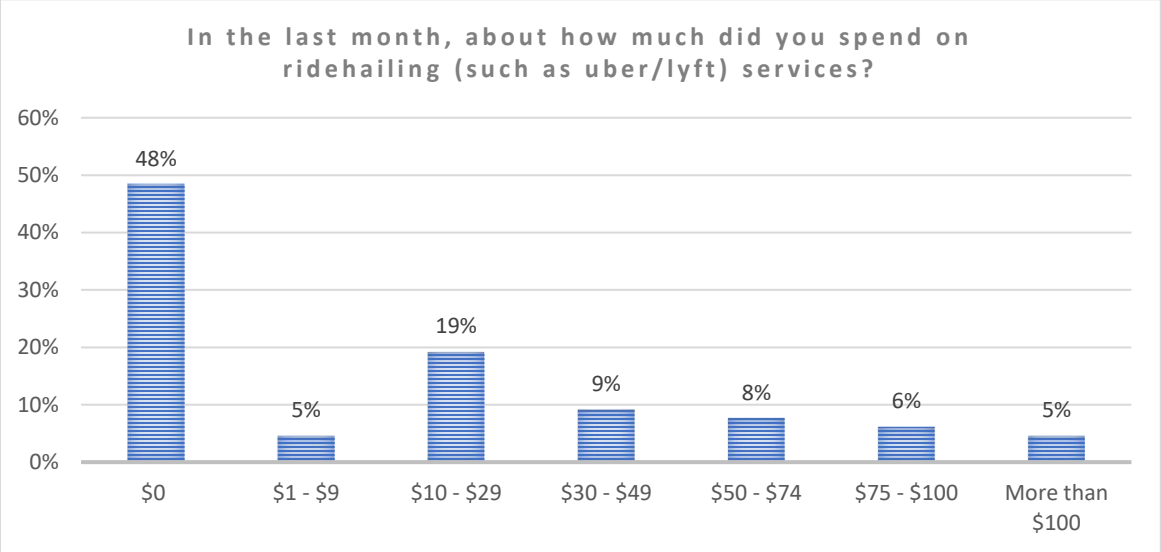



**Figure 51 Monthly Expenditures on Ridehailing Trips**

Ridehailing users were asked about how their use of different transportation modes have changed after they began using Uber or Lyft (Figure 52). Six percent of respondents reported driving alone less often, seven percent reported to drive with passengers less often, and another seven percent reported to take rides less often because of ridehailing services, indicating that these services are contributing to reduced use of private vehicles. However, 9 percent of respondents reported using buses less often suggesting that ridehailing services might have a negative impact on transit ridership in the Tampa Bay area. Regarding non-motorized modes, 8 percent of respondents reported to have decreased their bicycle or e-scooter use, and 5 percent of the Tampa Bay respondents stated that they walk less often due to usage of ridehailing services.

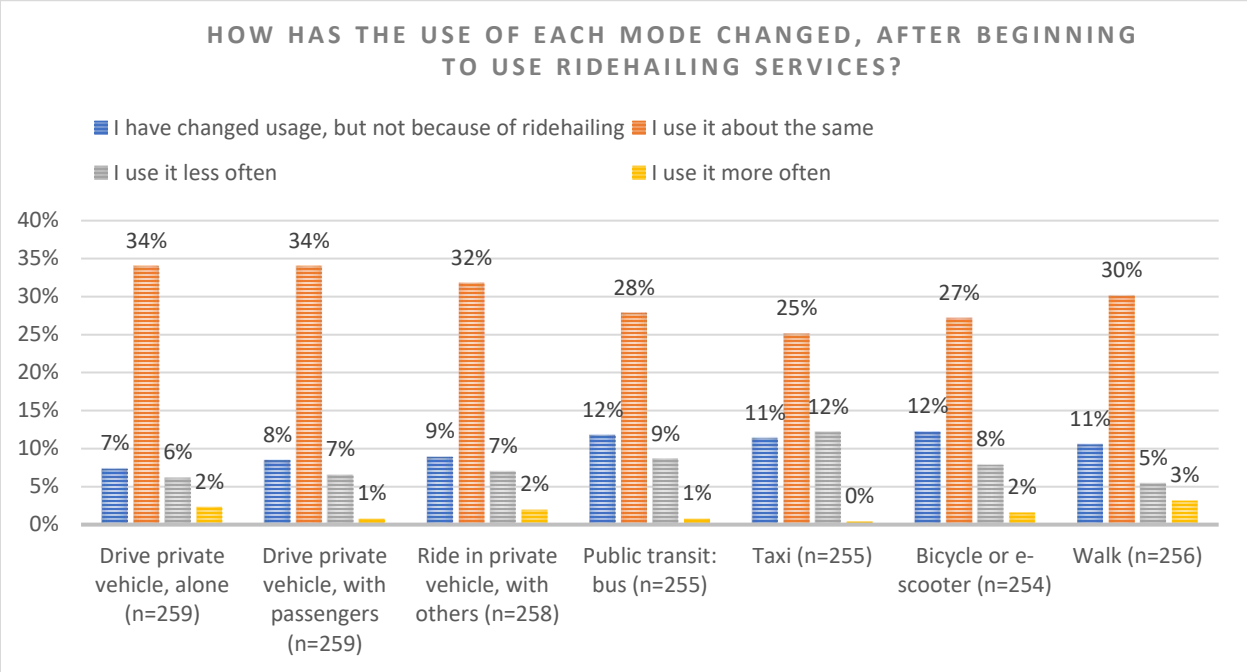



**Figure 52 Impact of Ridehailing on Usage of Other Modes**

### Attitudes Towards Ridehailing Services

This subsection will detail the answers obtained regarding respondents' attitudes towards ridehailing services. It is important to note that all respondents were asked to answer those questions, regardless of their reported use of ridehailing services. Figure 53 details general perceptions towards ridehailing; Figure 54 describes attitudes that relate to the interaction of ridehailing services and other transportation modes; and Figure 55 shows attitudes towards shared ridehailing services and privacy.

Regarding the relationship between ridehailing services and home, work, and school location, 60 percent of respondents strongly or somewhat disagree with the fact that ridehailing availability affects where they choose to live, work, and/or go to school. Only 4 percent of respondents identified that service availability influences their home and work location preferences. Around 11 percent of respondents stated that the lack of equipment to accommodate disabilities prevents them from using ridehailing. The lack of a child safety seat was identified as a barrier to adopting ridehailing services for 17 percent of the respondents. About 61 percent of the respondents identified ridehailing services as a good travel option when they are away from home. Reliability was seen as a concern for ridehailing services – almost one-fifths (18 percent) of the respondents felt this way, and close to half of the respondents in the Tampa Bay region (47 percent) were neutral/unsure about the prospect of using these servuces when they were more reliable. Regarding the cost of ridehailing, close to 50 percent of respondents strongly or somewhat agreed that ridehailing services are too expensive to be used on a daily or weekly basis; only 16 percent

think otherwise.

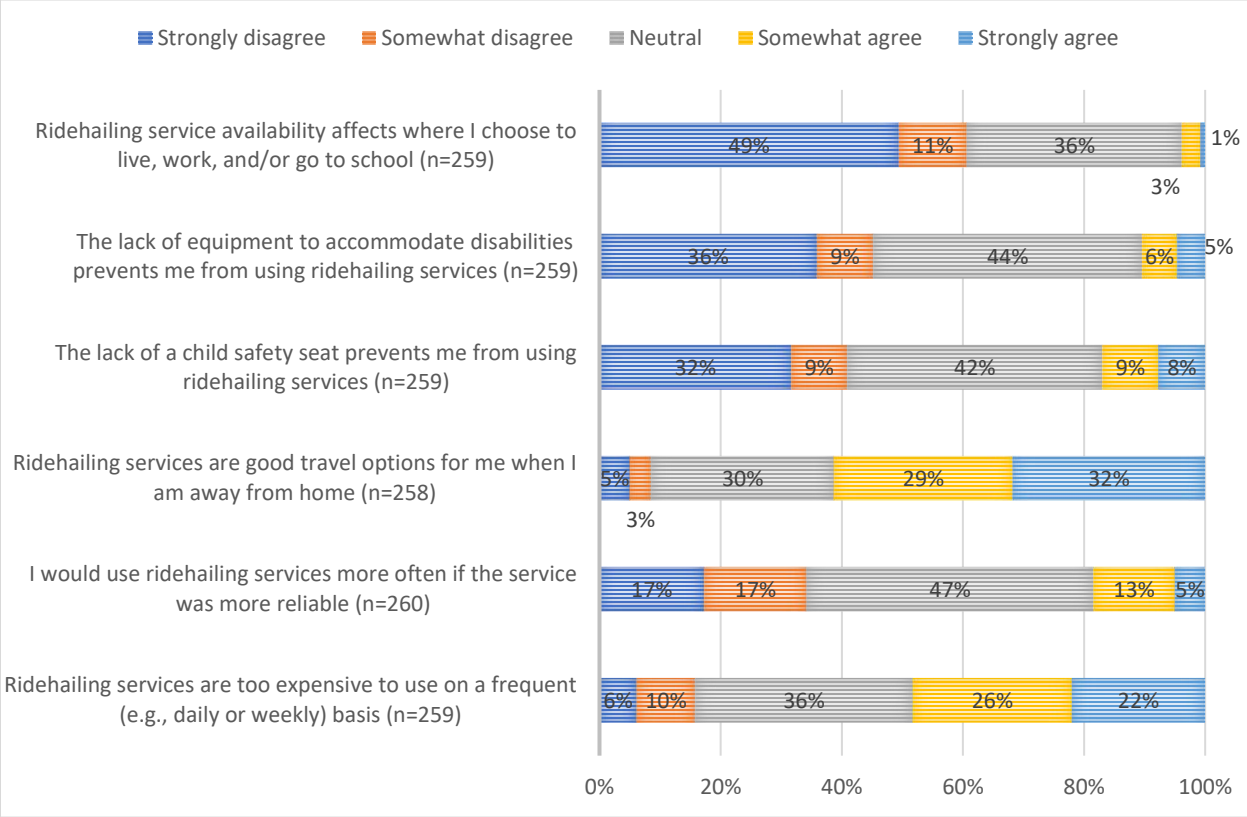



**Figure 53 Attitudes Towards Ridehailing Services – General Perceptions**

Figure 54 shows the respondents' agreement with the statements that explores the relationship between ridehailing and other modes of transportation. This relationship is very important in assessing the impacts of ridehailing services on the transport network. Regarding vehicle ownership, 20 percent of respondents reported that ridehailing services help them to live with fewer or no cars, while 41 percent disagree with the impact of ridehailing on car ownership. 53 percent of respondents strongly or somewhat agree that ridehailing services are good options when or where public transit is not available, however only 20 percent strongly or somewhat agree that ridehailing services help them get to or from public transit stops. This finding suggests that ridehailing services might complement public transit when or where it is not available and to some extent assist in the public transit accessibility when it is available. The majority (59 percent) of respondents strongly or somewhat agree that ridehailing services are good alternatives when their cars are temporarily unavailable, such as when it is being repaired. For close to half (46 percent) of respondents, ridehailing services help them avoid impaired driving. And finally, around 36 percent of respondents strongly or somewhat agree that ridehailing services help them save time and money on parking.

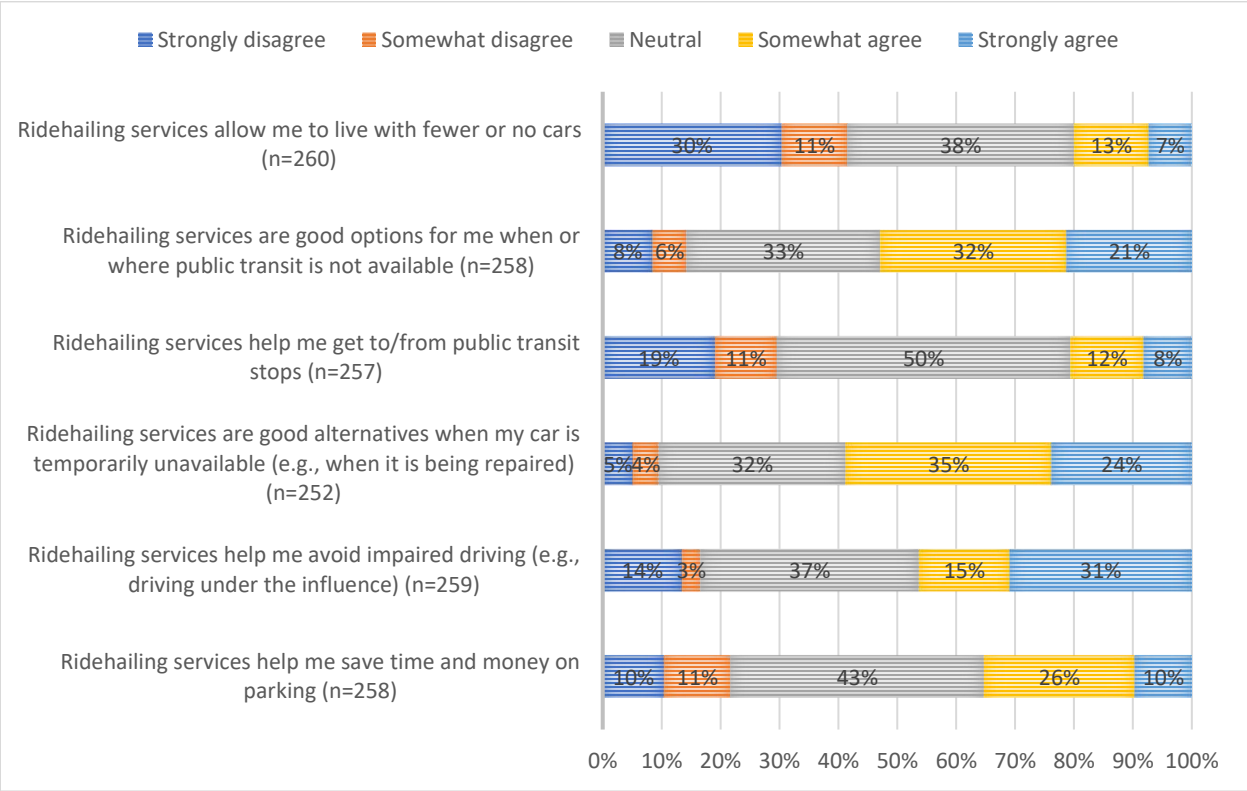



**Figure 54 Attitudes Towards Ridehailing Services and Other Transportation Modes**

Figure 55 shows respondents' preferences towards privacy and sharing rides on ridehailing trips. Only 22 percent of respondents somewhat or strongly agree that the lower cost of shared ridehailing is worth the additional time picking up and dropping off other passengers, while 32 percent of respondents somewhat or strongly disagree with the same statement. For more than half of the respondents (56 percent), traveling with unfamiliar passengers on shared ridehailing trips makes them uncomfortable. Additionally, 52 percent stated that traveling with a driver they do not know makes them uncomfortable as well. This finding suggests that respondents in the Tampa Bay sample have concerns regarding being around unfamiliar people and sharing rides with unknown travelers. This privacy concern is very important to consider when transport policies want to promote shared ridehailing rides. Strategies liked writing reviews for drivers or passengers, matching women with only female passengers or any other strategy that can increase the perceived risk/comfort, as well as the real safety and privacy of the ridehailing trips, could increase the portion of shared ridehailing trips and consequently enhance sustainability and consumers satisfaction.

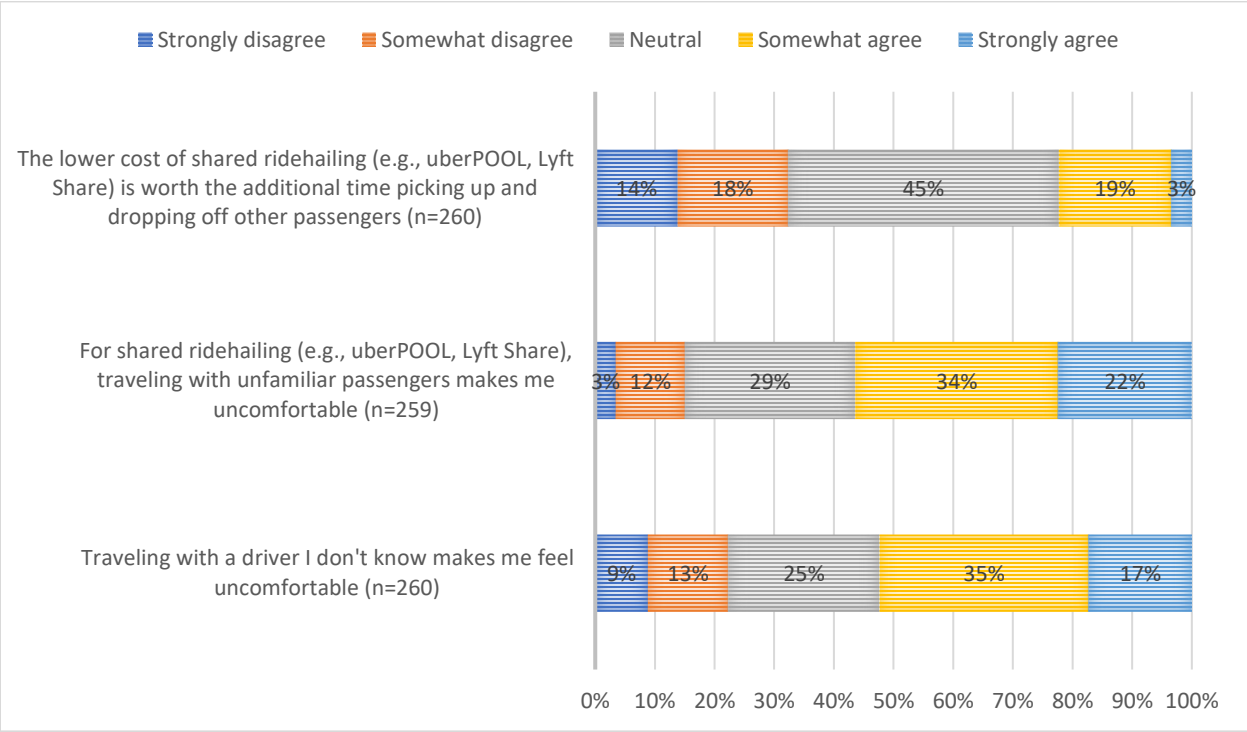



**Figure 55 Sharing and Privacy Attitudes Towards Ridehailing Services**

**Stated Preference: Shared versus Private Ridehailing**

At the end of the mobility-on-demand section, respondents were given different scenarios where they have to decide between share and private ridehailing services based on cost, travel time, and the presence of additional passengers for three different trip purposes: going to work or school, going on a shopping trip, and going on a social/recreation trip. The combination of the different trip attributes in block design produced 16 different scenarios presented to the respondents. For the sake of this report, only two scenarios are presented in the illustration. Future publications based on this data will shed light on the actual sharing preferences of the respondents as a function of the cost, travel time, and the number of additional passengers on the trip.

Figure 56 shows one scenario in which private trip costs $18 and takes 20 minutes; while the shared ridehailing trip costs $1.75 less and takes 5 minutes more with an additional passenger matched by the service app. The trip purpose with the highest acceptance of the shared service was social/leisure trips (39 percent). Shopping trips had the lowest share of respondents choosing the shared version of the trip (20 percent), possibly due to the constraint imposed by carrying the purchased items. Only 25 percent of respondents chose the shared service for their commute trip, given the described conditions.

Similarly, Figure 57 illustrates the same question with different values in another stated preference scenario. In this scenario, the distinction between the costs of the two options is larger. While the private ride costs $13 and takes 10 minutes, the shared ride costs $3.25 less and only 3 minutes more with two additional passengers. With a larger distinction in cost in Scenario 2

compare to the first scenario, a significantly larger proportion of respondents chose the shared option. In scenario 2, 65 percent chose the shared option for shopping; 48 percent chose the shared ride for social/leisure trips; and, 24 percent chose the shared ride for commute trips. These findings suggest that increasing the discount on the shared option significantly impacts the users' choice toward the shared option, especially for trip purposes such as shopping and social/leisure trips which do not have a strict time commitment. However, the choice between the shared and private options did not significantly change for commute trips, which have more seriousness in terms of schedule and time commitment, even with a lower price for the shared option. Perhaps, commuters would have chosen the share option more frequently if they were offered similar travel time reliability.

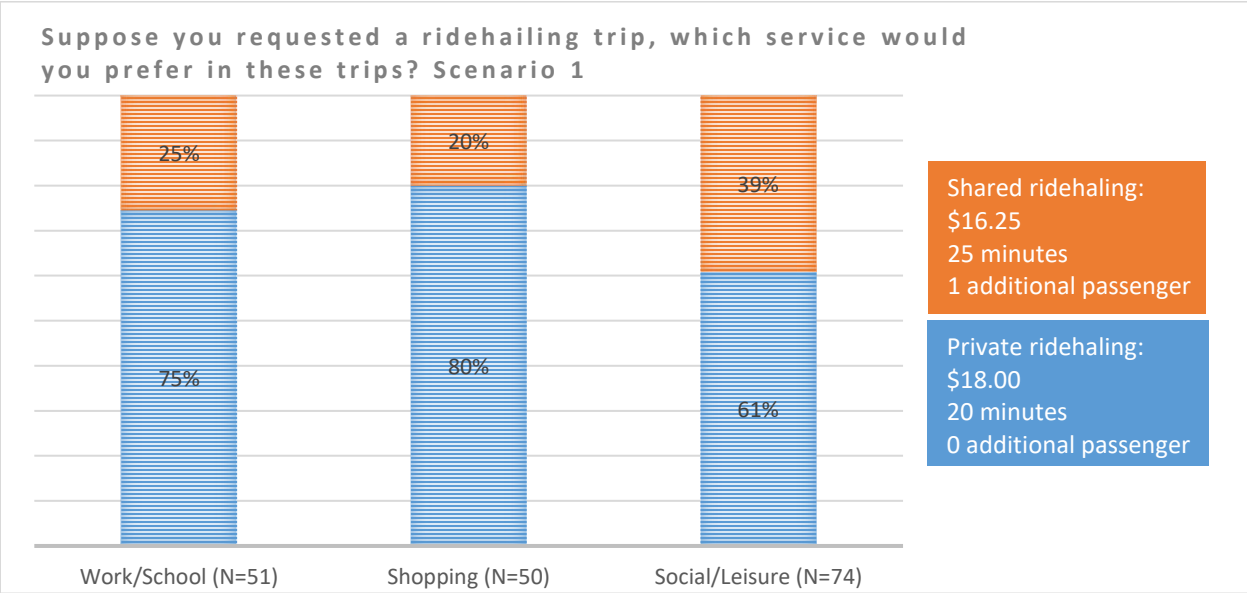



**Figure 56 Stated Preference: Shared versus Private Ridehailing, Scenario 1**

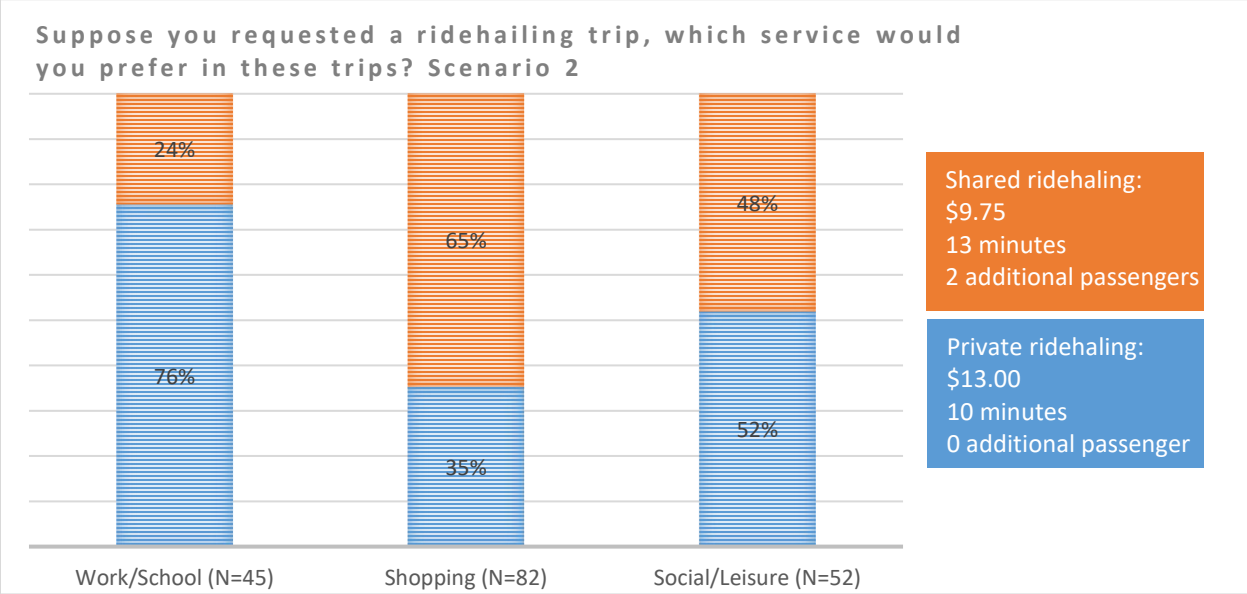


**Figure 57 Stated Preference: Shared versus Private Ridehailing, Scenario 2**

## AUTONOMOUS VEHICLES

This section explains the results of the Autonomous Vehicle (AV) section of the survey. At the beginning of the section the survey participants were introduced with AV with the following quote:

> *"An **Autonomous Vehicle (AV)** is a vehicle that drives itself without human supervision or control. It picks up and drops off passengers including those who do not drive (e.g., children, elderly), goes and parks itself, and picks up and delivers laundry, groceries, or food orders on its own. When AVs become available, ridehailing companies (e.g., Uber and Lyft) will use them to provide rides without a human driver in the vehicle. When answering the questions in this section, please assume a future in which **autonomous vehicles (AVs) are widely adopted, but human-driven vehicles are still present."***

The first subsection describes respondents' familiarity with AVs, and the second subsection illustrates respondents' attitudes towards AVs; the third subsection explains other aspects covered by the survey that are not in the previous sections such as impacts on other modes due to automated mobility use. The last subsection shows the brief results of the random scenario stated preference questions.

### Familiarity with Autonomous Vehicles

Figure 58 shows that most respondents (27 percent) are somewhat familiar with the autonomous vehicles' technology. While 15 percent of respondents had never heard of autonomous vehicles prior to taking the survey, 48 percent of the respondents declared they have heard of AVs, but do not know much about them. Only 1 percent of the respondents have actually ridden in an AV. This makes iniutitive sense as the Tampa Bay region has been the host for a few autonomous vehicle demonstrations in the past three years but has not had any scaled up operations of AVs yet.

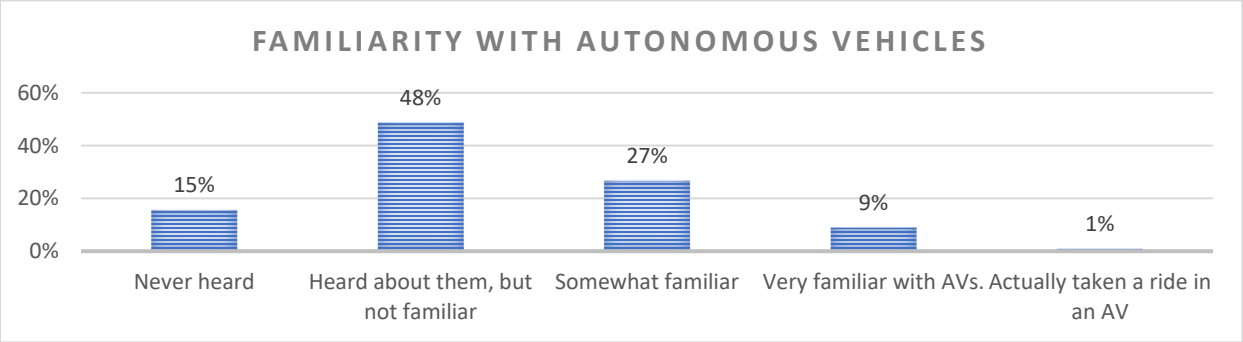



**Figure 58 Familiarity with Autonomous Vehicles**

**Attitudes Towards Autonomous Vehicles**

This section presents the survey results on respondents' attitudes toward potential benefits and concerns of AVs. Figure 59 shows the distribution of respondents' answers to attitudinal statements that capture their perceptions toward the potential benefits of AV. Most respondents (48 percent) expect that autonomous vehicles will help them save time and money on parking by dropping them off and parking themselves, while 19 percent think otherwise. With respect to the convenience of sharing an AV across household members, 40 percent expect that autonomous vehicles will make it easier to share vehicles within their households since those vehicles would be able to pick-up and drop-off household members on their own. Another significant share of respondents (40 percent) are unsure of these possibilities.

Respondents had mixed opinions about the potential benefit of AV to make car trips less stressful. While 31 percent of the respondents expect their car trips to be less stressful in the AV world, almost the same amount (30 percent) were unsure about this possibility. Similarly, on the safety aspect of AVs, the majority of the respondents (46 percent) stated that they strongly or somewhat disagrees with the statement that "AVs would make me feel safer on the street as a pedestrian or cyclist". A significant chunk (36 percent) were unsure about the safety benefits with AVs. The responses to these two attitudinal statements suggest that safety might not be seen by all as a potential benefit of autonomous vehicles yet, although one of the main stated goals of the AV industry is to improve safety by eliminating human errors. Regarding the potential to avoid impaired driving, 54 percent of respondents reported they somewhat or strongly agree that AVs would help them avoid impaired driving.

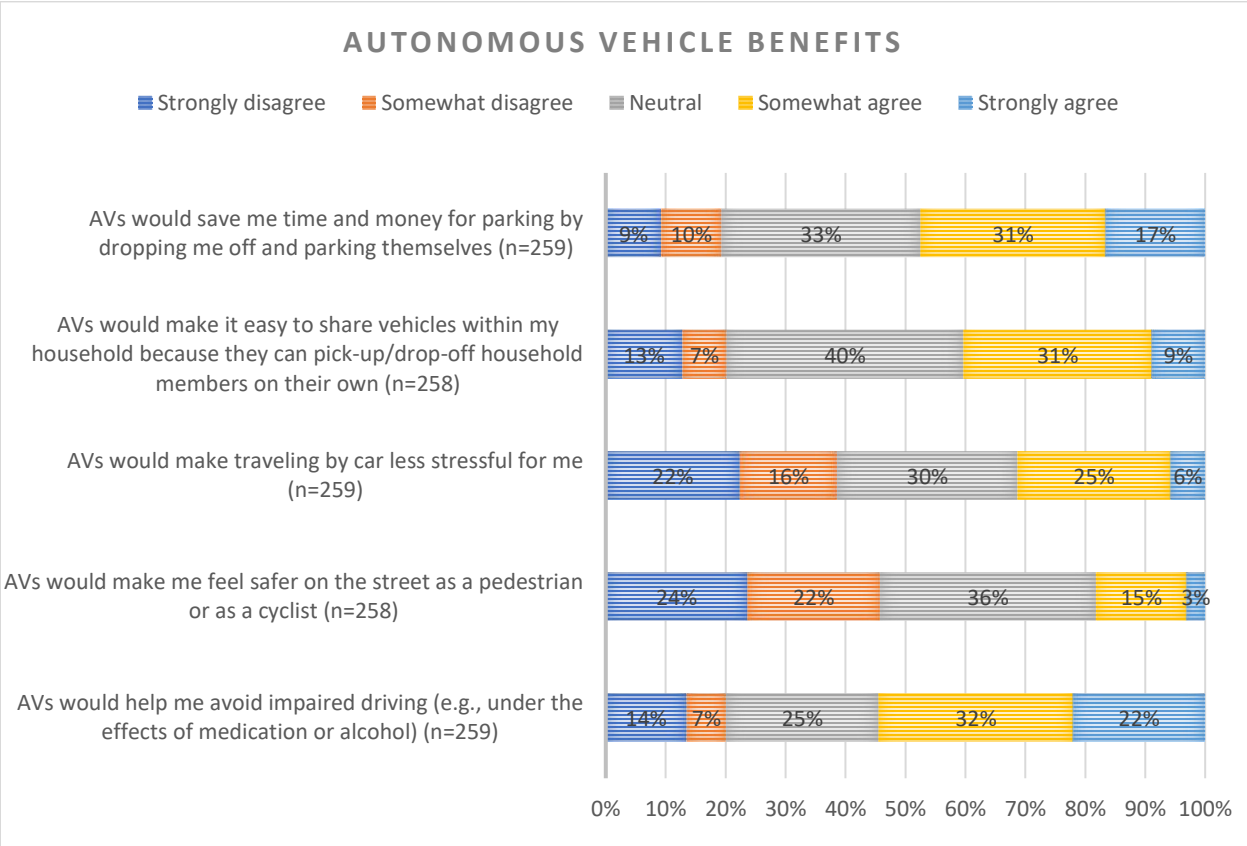



**Figure 59 Attitudes Towards Potential Benefits of Autonomous Vehicles**

Respondents were asked to rate their agreement with statements capturing potential concerns (Figure 60) with the implementation of autonomous vehicles. These statements were mixed with the potential benefits statements (Figure 59) and statements about the expected use of autonomous vehicles (Figure 61). For more details on the order in which the statements were presented to respondents, please refer to APPENDIX I - SURVEY INSTRUMENT.

With respect to safety perception of respondents, 78 percent of respondents strongly or somewhat agree that they want the ability to take control of the autonomous vehicle any time during the ride, suggesting a potential barrier to autonomous vehicles that do not have steering wheels. Regarding data security, 47 percent of respondents said to be concerned that their travel logs and personal information could be leaked (29 percent are unsure of this possibility). On technological reliability, 72 percent of the respondents strongly or somewhat agree that they are concerned with the potential failure of AV sensors, equipment, technology, or programs. AVs transporting children unsupervised has been a topic of intense debate, and 70 percent of respondents reported they would not feel comfortable about this phenomenon. Repeatedly, this finding along with previous statements related to safety implies that people are not yet generally convinced that AVs are reliable and they could improve safety. Lastly, about 37 percent of respondents felt that AVs would eliminate their joy of driving.

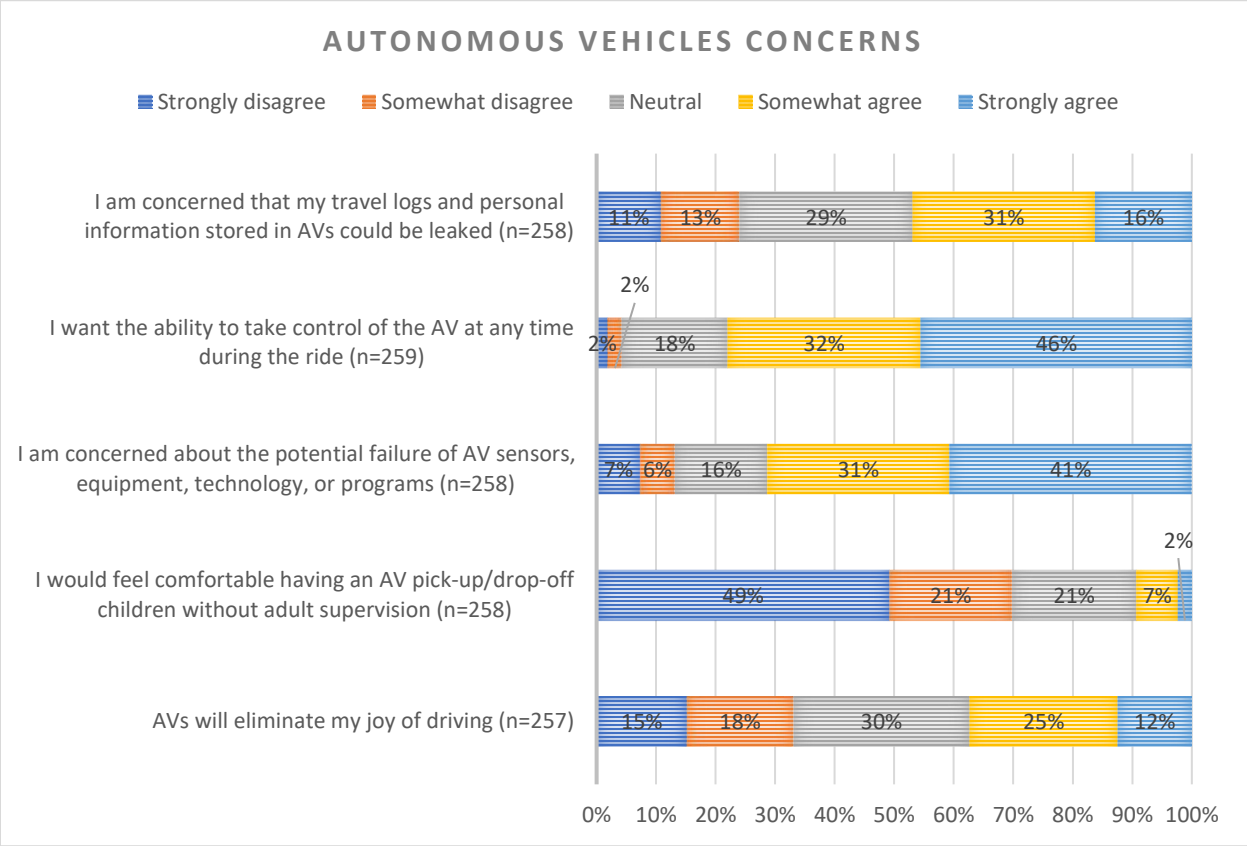



**Figure 60 Concerns about Automated Mobility**

Figure 61 shows the distributions of respondents' answers to statements measuring autonomous vehicle adoption and potential stated use. Regarding AV adoption, only 23 percent of respondents strongly or somewhat agreed that they would never ride in an AV, while 45 percent of respondents disagreed with that, leaving a significant chunk of respondents (32 percent) to be on the fence about this. Regarding potential uses of AVs, 45 percent revealed they would send an AV to pick-up groceries/laundry/food orders by itself. When asked about long-distance trips, only 31 percent of respondents expected an increase in the frequency of such trips when AVs are available. 63 percent of respondents stated that they would feel uncomfortable sleeping while traveling in AV. These results indicate that respondents still have concerns about how the technology will perform, which is consistent with the results observed before.

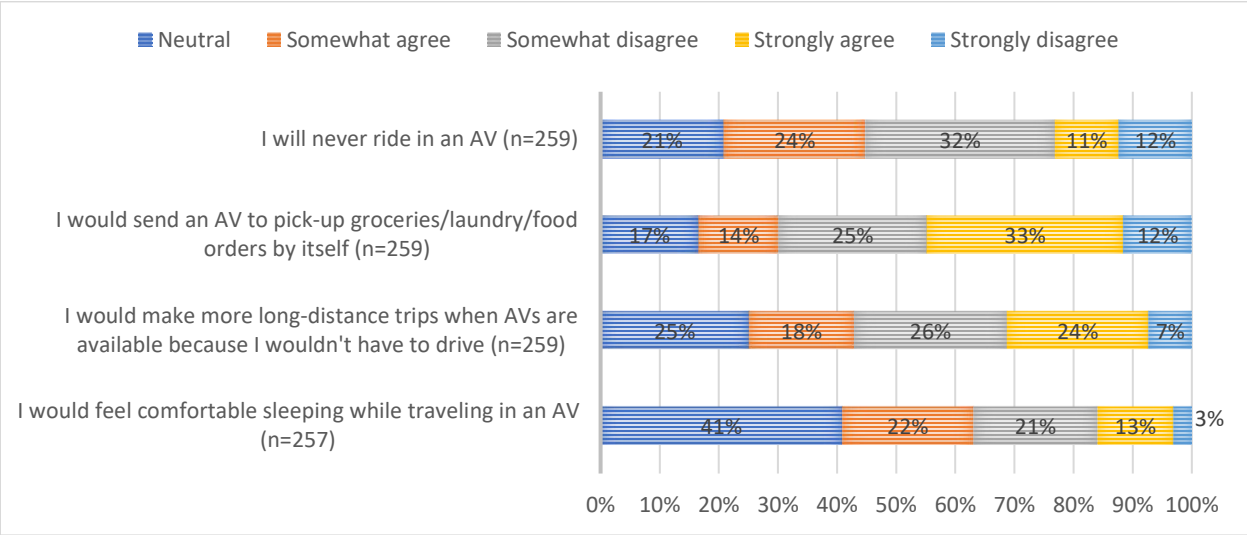



**Figure 61 stated Use of Autonomous Vehicles**

Exploring the perceptions toward AVs further, respondents were asked about their attitudes towards ridehailing services using autonomous vehicles. It is expected that in the future such mobility-on-demand services will use AVs to provide rides to the public. Figure 62 shows the distributions of respondents' answers to attitudinal statements exploring the relationship between automated mobility and ridehailing services. Around 38 percent of the respondents agree that they would use AV ridehailing services alone or with coworkers, friends or family (along with a further 30 percent who are unsure of their potential future behavior). Interestingly though unsurprisingly, only 15 percent of respondents would be willing to use AVs on ridehailing services with passengers that are unfamiliar to them (along with a large chunk of respondents who wouldn't indulge in this behavior). These results show that there are more barriers to the adoption of shared ridehailing services, in comparison to private ridehailing services in terms of privacy and safety concerns of riding with strangers.

Regarding leasing their personal AV to ridehailing companies to earn money, more than half (59 percent) of the respondents reported they would not feel comfortable doing that when they are not using their vehicle. Around 40 percent of respondents stated that they would be willing to pay extra to have a backup human operator inside the AV during their ride, reinforcing the idea that many respondents have concerns regarding the AV performance.

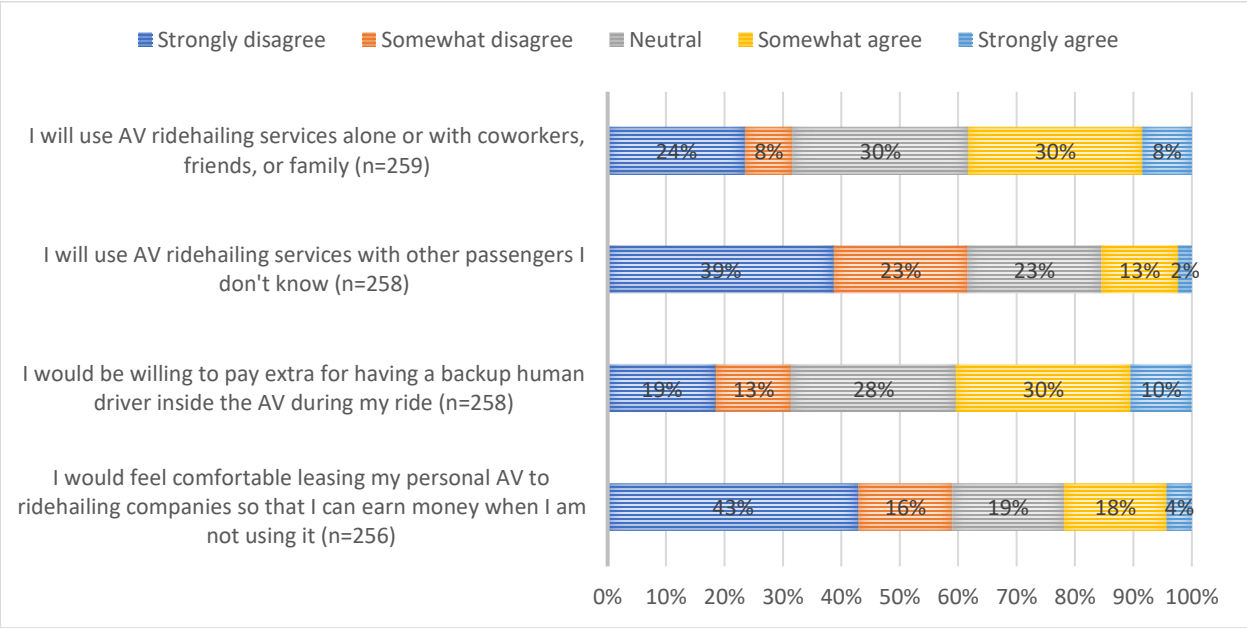



**Figure 62 Perceptions of Autonomous Vehicles on Ridehailing Services**

The results regarding respondents' perceptions toward AVs related policies are shown in Figure 63. A significant share of respondents generally agree or feel neutral about the suggested AV policies in the survey. Concerning AV-only lanes/areas, 62 percent of respondents strongly or somewhat agree that the government should establish such dedicated facilities for AV operations. On liability in the event of a crash, the majority of respondents (58 percent) agree that in an AV crash, vehicle manufacturers and their insurance companies should be held responsible, instead of the AV owner, passenger or operator (28 percent were unsure about this).

Concerning legal aspects of AVs, respondents were not as favorable to have laws limiting the speed of AVs to 25mph or less on city streets; 39 percent of respondents said to strongly or somewhat agree with such policy and a significant portion (34 percent) stated that they were unsure about this. Safety settings are an important feature of an autonomous vehicle; however, the choice of whose safety should be prioritized in the event of a crash is not as straightforward. When asked if AV owners should be able to program how their AVs prioritize the safety of different groups in the event of a crash (e.g., pedestrians, bicyclists, other vehicles, or AV passengers), 39 percent of respondents strongly or somewhat disagree with it and almost equal share (38 percent) strongly or somewhat agreed with this policy.

In a similar context, 46 percent of respondents strongly or somewhat agree that AVs should prioritize the safety of pedestrians and bicyclists over that of passengers in the vehicle (31 percent were unsure about this aspect). Lastly, the vast majority of the respondents (82 percent) felt very strongly that AVs should only be allowed on the market when they prove to be at least as safe as human drivers. Once again, respondents reported having strong feelings regarding the expected safety of AVs. This finding motivates the initiatives that are trying to systematically test different

AV technologies outside public roads before permitting them to be on public roads for testing or on the market for sales.

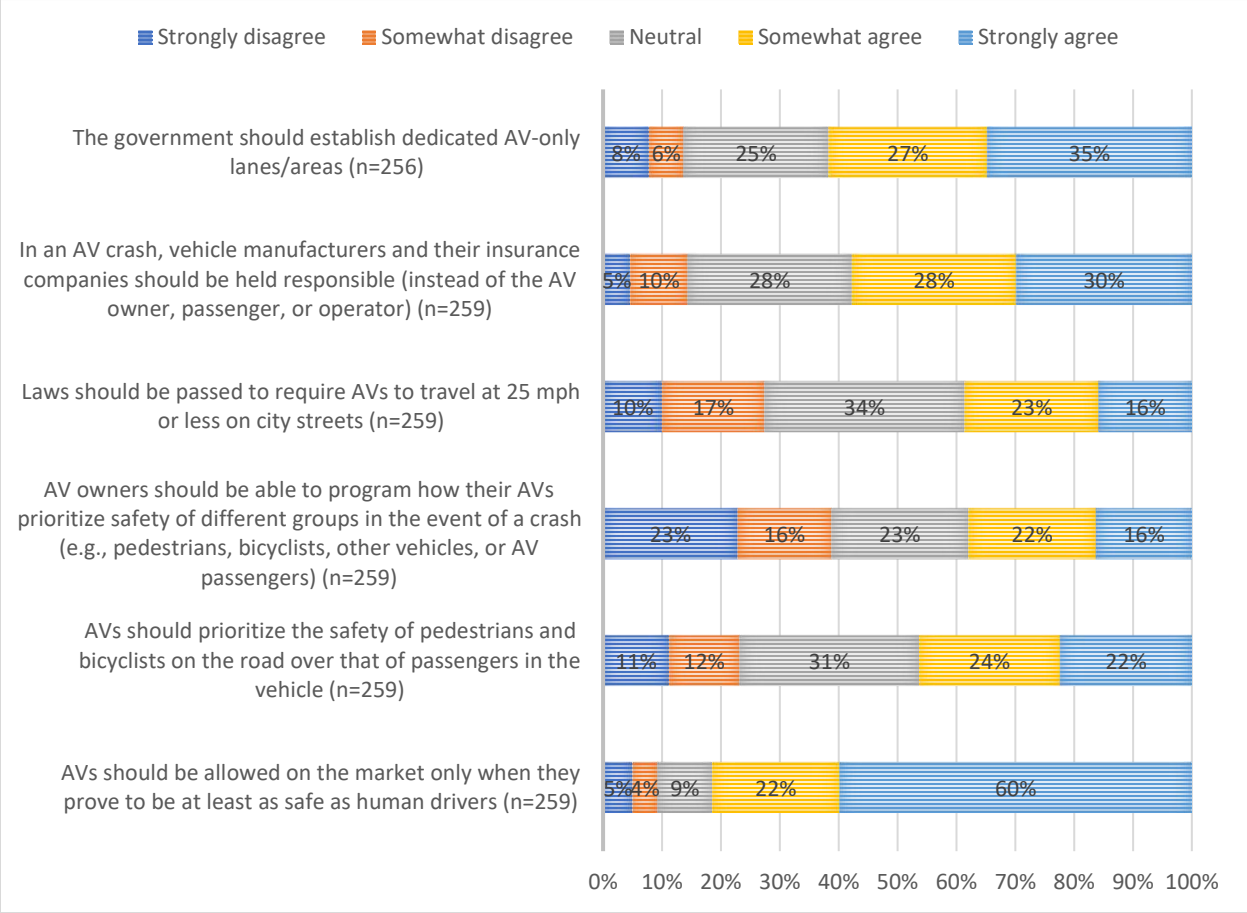



**Figure 63 Attitudes Towards Autonomous Vehicles Policies**

### Other Aspects of Autonomous Vehicles Use

This section will show the results obtained in other aspects of autonomous vehicles focusing on the impact of using AV on travel behavior, mode choice, vehicle availability, and residential choice. Figure 64 shows the distribution of the additional time commuters are willing to accept in their current trips, once they have access to AVs. While 36 percent of commuters stated that they would not accept any additional time on their one-way travel to work or school, 5 percent stated that they would acvcept an additional travel time in excess of 30 minutes. This findings present interesting challenges for policy/planning agencies that are championing the cause of sustainable travel in urban areas.

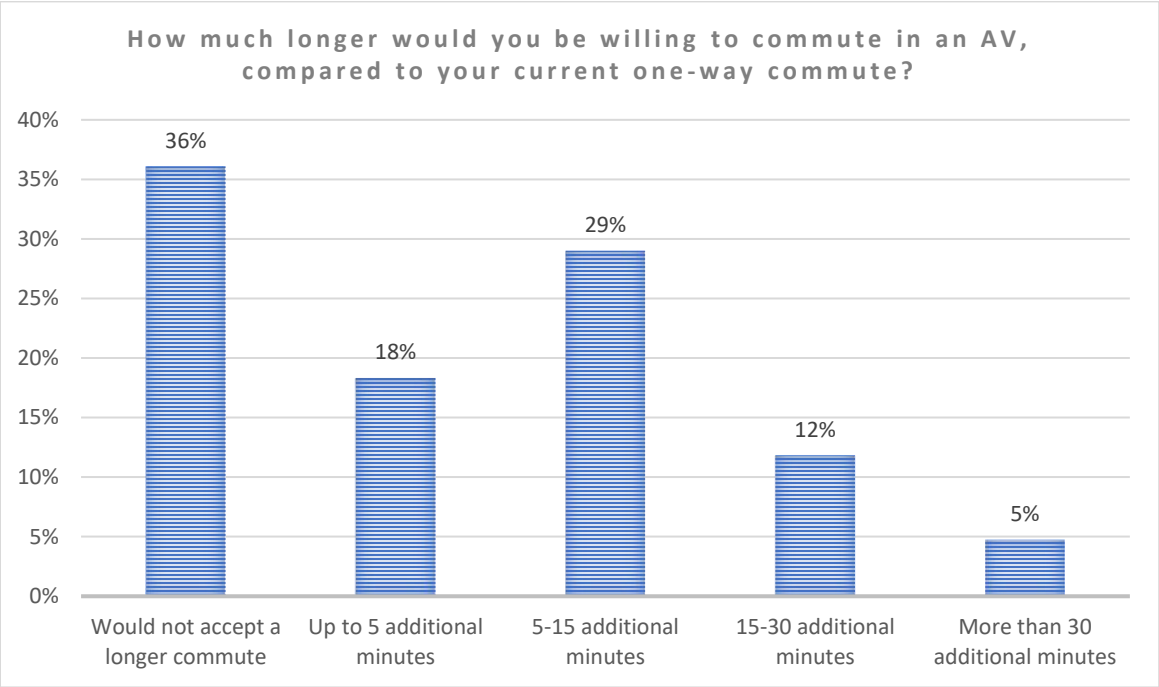



**Figure 64 Accepted Additional Time on Commute Assuming AVs are Available**

Figure 65 shows the distribution of respondents' opinions on how likely they would change in other ways with the availability of AVs. Better tolerating congestion is one of the ways most respondents expect to change (38 percent), followed by making more long distance road trips (37 percent), and travel for more activities, and after dark (35 percent). On the other hand, most respondents felt that it would be unlikely for them to move to a better location or home with the availability of AVs (59 percent). Additionally, making additional trips that are not being made now (56 percent), and traveling further to go shopping or eat out (55 percent) were unlikely to happen even with the introduction of AVs.

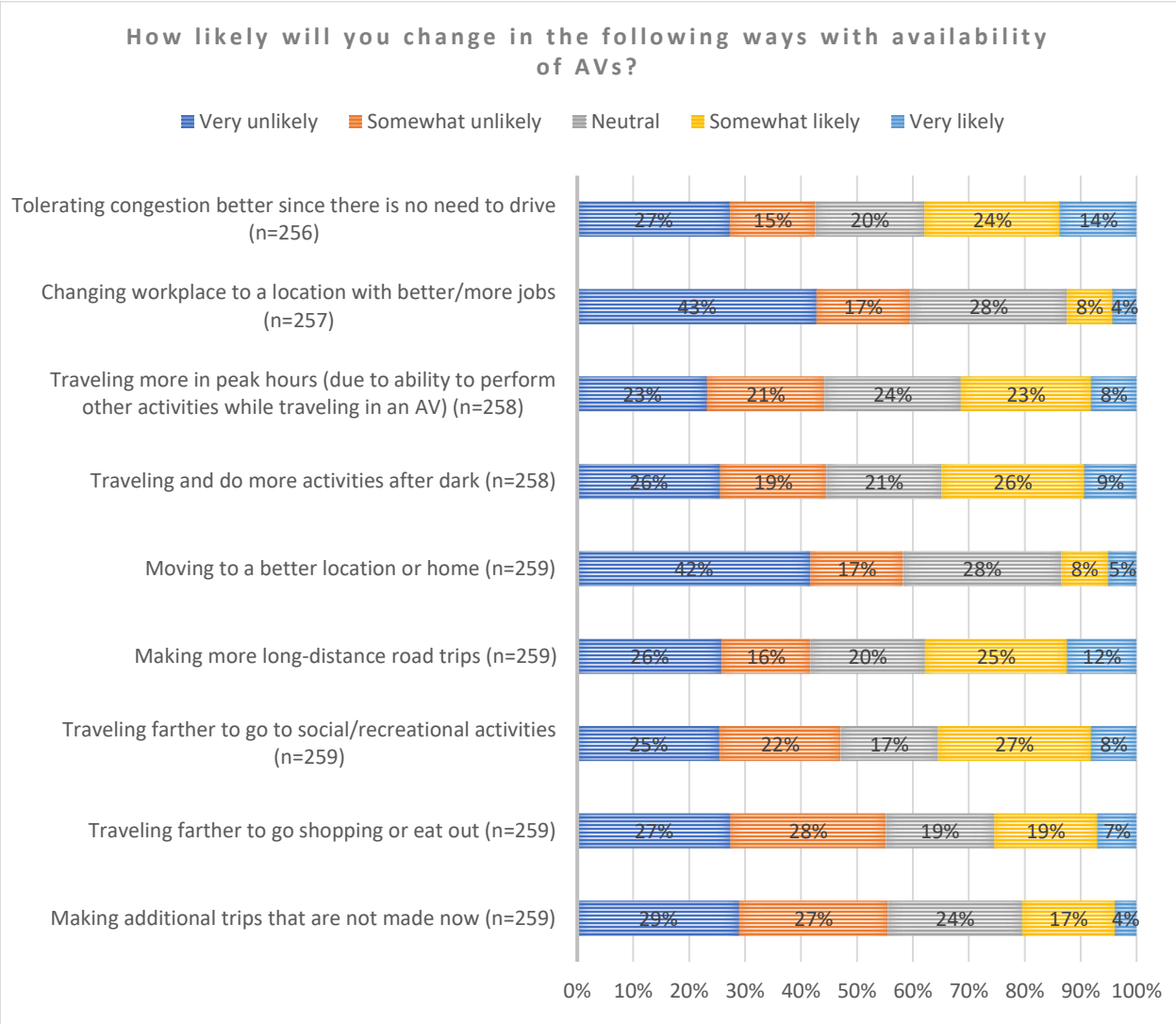



**Figure 65 Expected Changes in an Automated Future**

Figure 66 shows expected changes in the use of different modes, given the respondents had access to autonomous vehicles. The respondents expect the least change in their usage of the airplane, with 83 percent of respondents expecting to use them same once AVs become available. However, 13 percent of respondents are decreasing their airplane usage implying that they may switch to AV for their long-distance travel. Human-driven ridehailing services and public transit (bus) were the modes where respondents were most willing to decrease their use (37, and 40 percent, respectively). Also, 34 percent of respondents expect a decrease in the usage of human driving personal vehicles. When asked about walking, 74 percent of respondents expect no change in the frequency of their walking trips, while 19 percent are expecting to walk less. Lastly, 67 percent of respondents expect no change in the frequency of bicycle or scooter usage, while 28 percent are expecting to decrease their bike use. The quite significant potential decrease in public transit, bike, and walk trips can become one of the negative impacts of the deployment of

autonomous vehicles and should be considered ahead of time. Again, reasonable pricing and sharing policies could facilitate the impact of AV use of more environment-friendly modes. For instance, AVs can work with public transit to increase its accessibility. Another potential policy recommendation could be increased cost of AVs for short trips so people who are trying to replace their walk or bike trips using AVs would encounter barriers to do so.

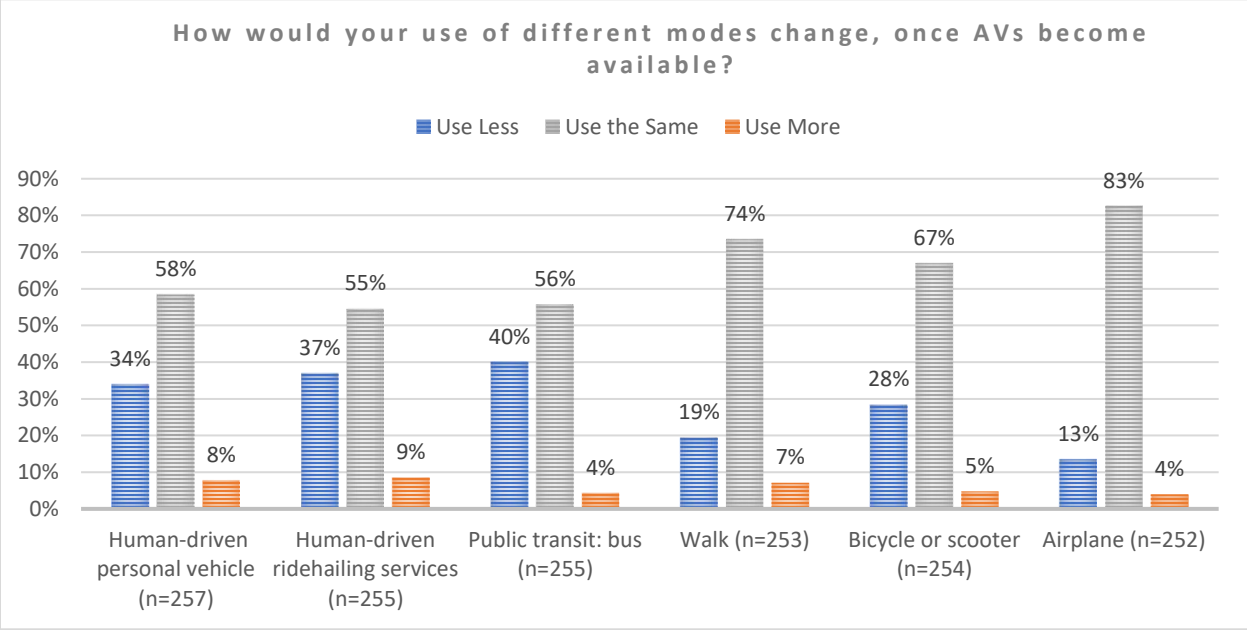
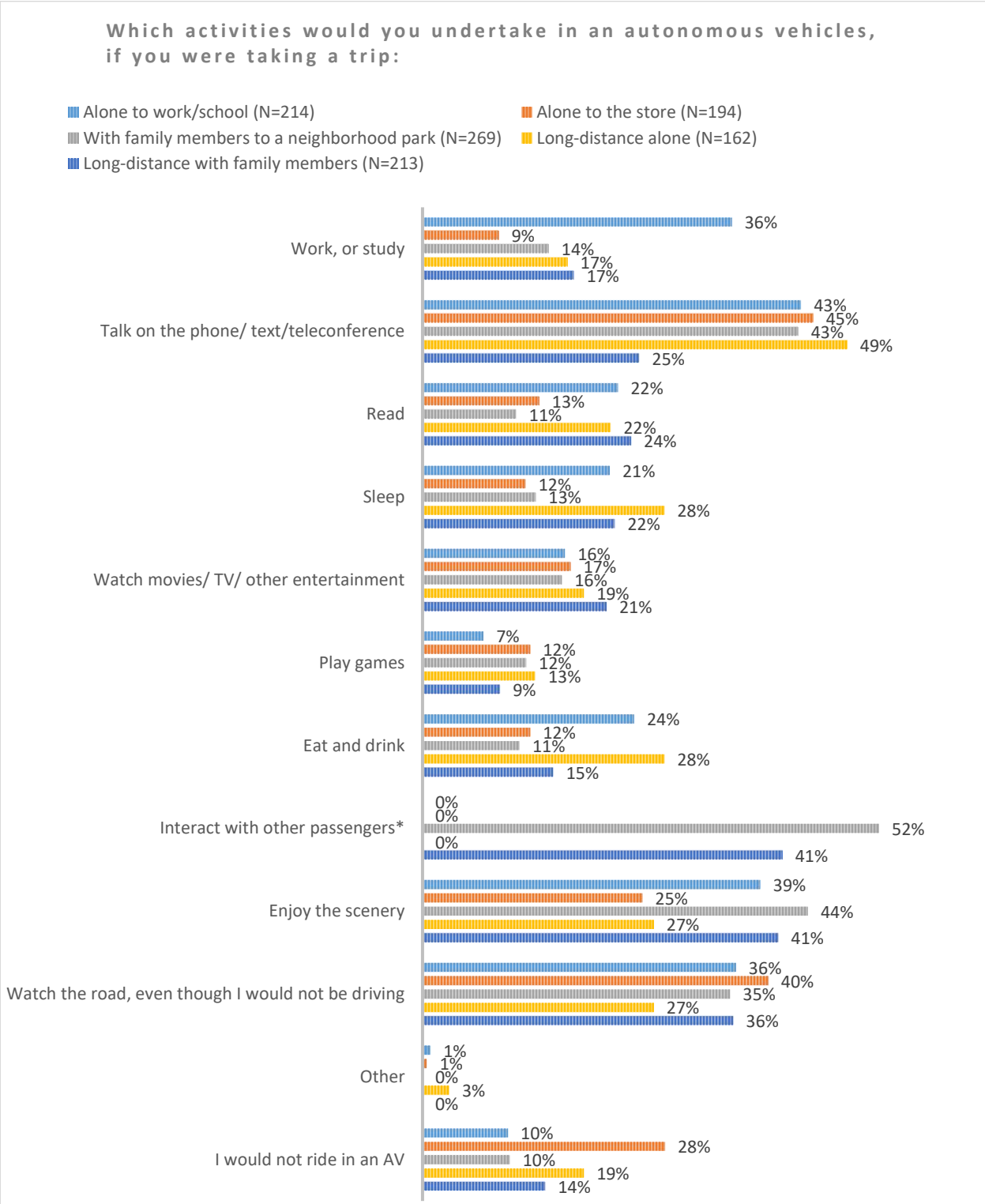



**Figure 66 Expected Changes in Usage of Other Modes Due to Automated Mobility**

Respondents were asked to choose up to three activities they would engage when inside an autonomous vehicle for five different trip purposes: alone to work or school; alone to the store; with family members to a neighborhood park; long-distance alone; and long-distance with family members. Figure 67 shows the distribution of the selected choices in all scenarios. The activities chosen most often across all trip purposes were talking on the phone/texting/teleconferencing (chosen, on average, by 41 percent of respondents), enjoying the scenery (chosen, on average, by 35 percent of respondents), and watching the road (chosen, on average, by 35 percent of respondents).

Considering only work or school trips, the same activities mentioned before were the most frequent followed by work or study chosen by 36 percent of respondents. When asking the same question only for trips alone to the store, the same three activities were the most frequent (9 percent). However, 28 percent of the respondents would not ride alone to store with AV. When considering a trip with family members to a neighborhood park, in addition to the top three activities, the majority (52 percent) of respondents chose to interact with other passengers as one of their chosen activities. For long-distance trips, the activities selected are more distributed across different types. While 49 percent chose to talk on the phone, texting, and teleconferencing as their

top activity during long-distance trip alone, between 19 to 30 percent of the respondents chose to sleep, enjoying the scenery, watching the road, eating and drinking, reading, watching movies/ TV/ other entertainments, and reading among their top three activities. If the long-distance trip was with family members, interacting with other passengers and enjoying the scenery have been chosen the most (41 percent of respondents), followed by watching the road (36 percent), talk on the phone/ text teleconferencing (25 percent), reading (24 percent), sleeping (22 percent), and watching movies/ TV/ other entertainments (21 percent).




*Option available only on scenatios with other passengers present

**Figure 67 Activities Respondents Expect to Engage When Traveling in an Autonomous**

**Vehicle**
**Stated Preference for Purchasing AV**

This subsection briefly describes the stated preference responses when it comes to making a decision about buying AVs. In general, 42 percent of the Tampa Bay respondents reported they would never purchase an AV. 52 Figure 68 also shows that 12 percent of respondents would not be willing to pay any additional amount for the AV version of a regular vehicle that costs $25,000. 14 percent of the respondents were willing to pay at least $5,000 or more for the autonomous version of the vehicle.

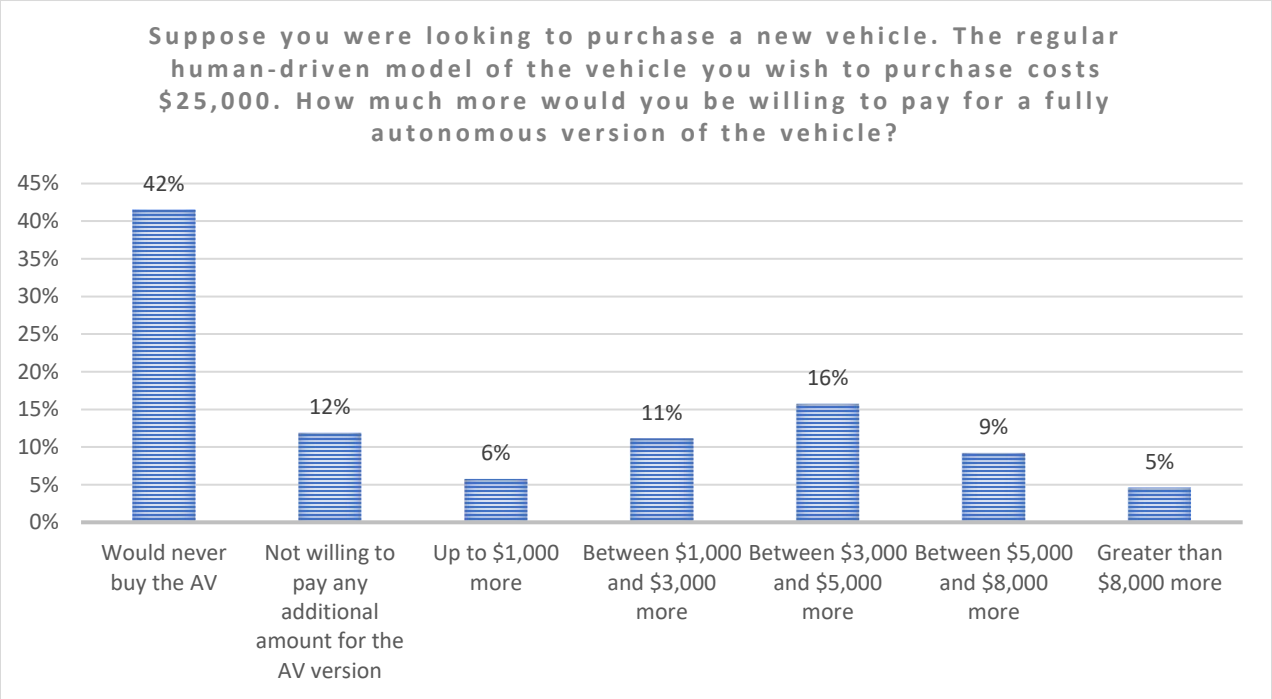



**Figure 68 Willingness to Purchase and Pay for an Autonomous Vehicle**

The stated preference questions measured willingness to pay for AVs as a function of the cost compared to buying regular vehicles and relying only on AV-based ridehailing services. The question was presented to respondents twice, randomly selecting from 18 pre-specified scenarios. Each scenario had a unique combination of fixed costs, variable costs, and average wait time for each alternative. Respondents were asked to rank their preferences of three alternatives for two different scenarios that were randomly selected.

Figure 69 illustrates the first scenario of the random experiment (out of 18 possible scenarios). In this case, all respondents saw the same values for fixed costs and variable costs of AV, regular vehicle, and AV-based ridehailing only. About 22 percent of respondents didn't answer the question. Among the remaining complete responses, 39 percent chose regular vehicles as their first option and 25 chose AV as their first option. Only 13 percent chose AV-based ridehailing as

their first option.

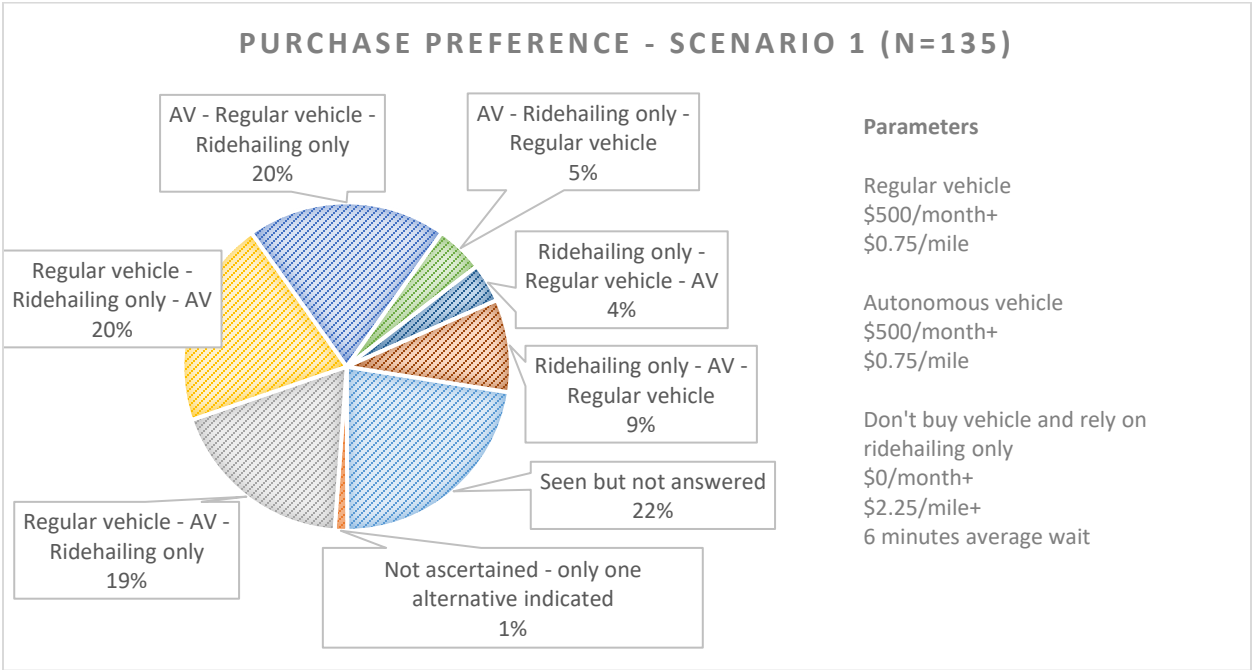



**Figure 69 Ranking Stated Preference Question Measuring Willingness to Purchase Autonomous Vehicles, Scenario 1**

Figure 70 illustrates the second scenario of the random experiment. In this case, all respondents saw the same values for fixed costs and variable costs of AV, regular vehicle, and AV-based ridehailing only (which were different from the scenario presented in Figure 68). AV costs more compared to the regular vehicle, and AV-based ridehailing costs three times more per mile than AV with an average wait time of 6 minutes. With an increase in the cost of AV, 69 percent chose to purchase a regular vehicle as their first choice, and only 9 percent chose AV as their first choice. Similarly, 9 percent chose ridehailing as their first choice. About 11 percent of the respondents did not answer the question.

In summary, at the time of the survey, people in the Tampa Bay metro area are less willing to buy AV compared to regular vehicles and their preference is very sensitive to cost. Ridehailing services have mostly been the respondent last option to choose them as their only transport mode. This finding raises concerns about the potential low use of shared ridehailing services in an AV world with the existence of an attitude of having a personal vehicle. Again, pricing and taxation mechanism should work around these issues if the right policies can be placed with thoughtful timelines to motivate shared AV use and prevent the increase in induced demand for AV.

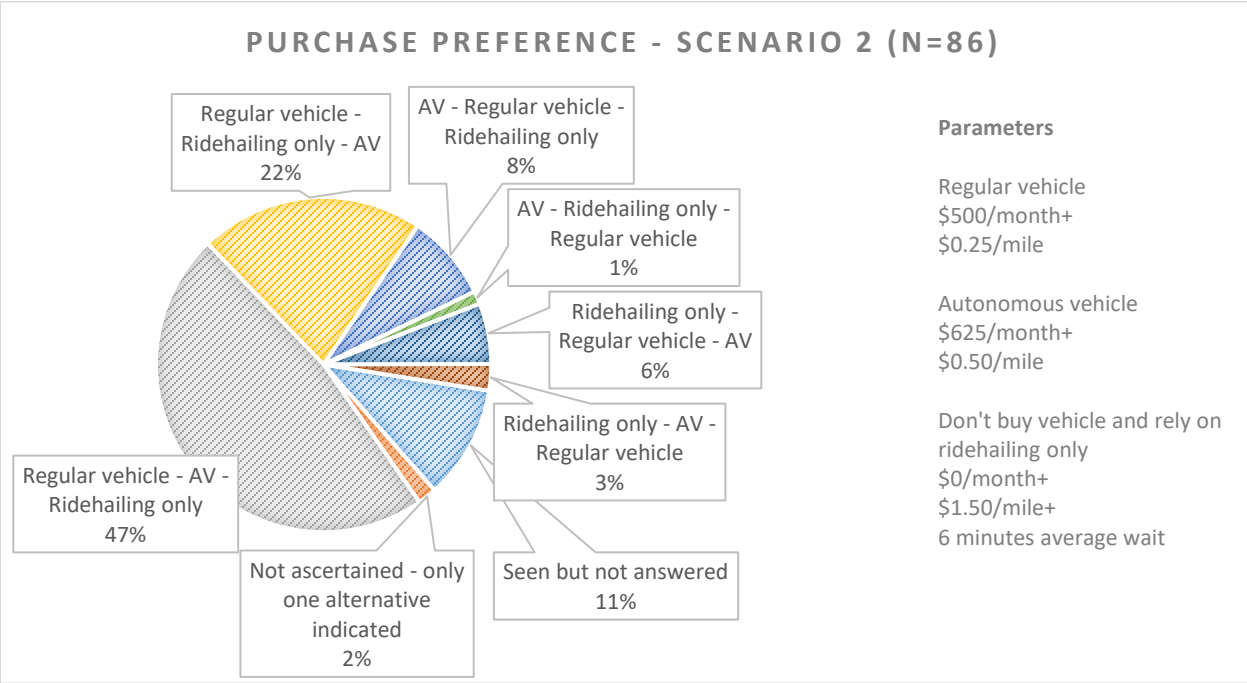



**Figure 70 Ranking Stated Preference Question Measuring Willingness to Purchase Autonomous Vehicles, Scenario 2**

## CONCLUSION

Disruptive transportation technologies such as autonomous vehicles and mobility-on-demand services are bringing transformative changes in the urban area. To enhance our understanding of various impacts of these new mobility options on travel behavior and relative consequences, people's attitudes towards and perceptions of these technologies and services need to be measured and understood. This project's goal was to collect such information in multiple jurisdictions through a comprehensive attitudinal and behavioral survey. This report particularly covers the full deployment of data collection in the Tampa Bay metro area and presents the univariate weighted distribution of responses to all the survey questions. An earlier report covers the pilot phase of data collection which included a literature review, development of survey goals, objectives, detailed research questions, survey questionnaire design, and pilot deployment. The pilot phase of data collection was conducted during fall 2018 (in the Phoenix metro area) and the full deployment was conducted in Fall 2019-Spring 2020 in the the Tampa Bay metro area metro area. This project provides a data collection protocol and methodology that can be widely adopted in addition to survey results output and econometric modeling and travel behavior analysis that is forthcoming.

The T4 survey explicitly collected detailed general and transport-related attitudes, socioeconomic characteristics, current commute and travel behavior, residential and vehicle ownership preferences in addition to perceptions and behaviors toward mobility-on-demand services and autonomous vehicles. With respect to people's attitudes, a battery of attitudinal statements measures various general and transport preferences of the survey participants. Previous studies have shown that the application of attitudes can significantly improve travel demand modeling and forecasting accuracy (Golob et al., 1977; Cao et al., 2008; Tardiff, 1977; and Paulseen et al., 2014). For example, a significant portion of respondents (54 percent) expressed willingness to use less polluting means of transportation; internet connectivity was important for the majority (74 percent) of respondents; 80 percent want to make good use of their travel time; And, 87 percent like the idea of owning a personal car.

Regarding usage and familiarity with new mobility services, almost half of the respondents are familiar with the mobility-on-demand services including private and shared ridehailing services, carsharing, and micro-mobility services (bike and e-scooter sharing). However, only a small percent of the participants are using these services frequently. The ridehailing users believe that their usage of these services decreased their walk, bike, e-scooter, and transit trips between 6 to 10 percent. A little over half of the respondents found ridehailing services to be a good alternative mode during traveling, and/or when transit is not available, and/or when their car is temporarily not available, and/or in assisting them avoiding impaired driving. About half of the respondents believe that ridehailing services are too expensive to be used on a regular basis.

Micro-mobility services have been used by one percent of the Tampa Bay metro area residents weekly with the majority (70 percent) of the trips happening during the weekends and 50 percent of the trips being less than two miles. Close to half of the micro-mobility users stated that

they would walk or not make this trip if this service was not available and a significant chunk of the respondents (34 percent) mentioned using of the service just to enjoy and give it a try as one the three reasons for using these services.

A little over a third (36 percent) of the respondents stated to be very or somewhat familiar with AVs and one percent have actually taken a ride. With this rate of familiarity, 23 percent stated that they will never ride in an AV, 42 percent stated that they would never by an AV, and 37 percent stated that AVs would eliminate their joy of driving. Respondents' perceptions about various benefits and concerns around AVs have been asked. In general, safety is among the top concerns for respondents rather than a benefit. Only a fifth of the respondents think AVs would make it safer for pedestrians and bicycles, and about three quarters have concerns about the technical failures and are willing to take control of the AV at any time. In this respect, 82 percent want AVs to be allowed on the market only when they are at least as safe as human drivers. In addition to safety, close to half of the respondents have concerns about data security.

In addition to the stated concerns, respondents think the convenience brought by AV can impact their choices. Results also show how the majority (64 percent) are willing to commute longer in an AV. About 12 percent of respondents would change their home or work locations in the presence of AVs; one fifth would make additional trips; and, 31 to 35 percent would travel more often during peak hours and/or after dark and/or to farther destinations. All of these findings, in addition to stated 40 percent decrease in transit use and 19 to 28 percent decrease in active transportation modes use, highlights a significant potential negative impact of automation on sustainability and eventually wellbeing goals of our transportation system and calls for thoughtful and timely planning and policymaking efforts.

With respect to sharing perception, more than half of the respondents are uncomfortable sharing their ride with people they do not know. With respect to sharing the AV ride, only 15 percent are willing to share their ride with people whom they do not know, and 22 percent are willing to share their AV by leasing it to ridehailing companies while they are not using it.

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## APPENDIX I - SURVEY INSTRUMENT

### Section A: Attitudes and Preferences

To begin, we would like to learn about your attitudes and opinions on transportation and life in general. For each of the following statements, please choose the response that most closely matches your feelings. We want your honest opinion on each topic (or your *best guess*, for topics you are not very familiar with) – *remember, there are no "right" or "wrong" answers!*

| | *Strongly disagree* | *Somewhat disagree* | *Neutral* | *Somewhat agree* | *Strongly agree* |
|---|---|---|---|---|---|
| I like to be among the first to have the latest technology. | ○ | ○ | ○ | ○ | ○ |
| The government should raise the gas tax to help reduce the negative impacts of transportation on the environment. | ○ | ○ | ○ | ○ | ○ |
| I feel uncomfortable around people I do not know. | ○ | ○ | ○ | ○ | ○ |
| I prefer to do one thing at a time. | ○ | ○ | ○ | ○ | ○ |
| Most of the time, I have no reasonable alternatives to driving. | ○ | ○ | ○ | ○ | ○ |
| I am too busy to do many of the things I like to do. | ○ | ○ | ○ | ○ | ○ |
| Car crash deaths are an unfortunate but unavoidable part of a modern, efficient transportation system. | ○ | ○ | ○ | ○ | ○ |
| I am committed to an environmentally-friendly lifestyle. | ○ | ○ | ○ | ○ | ○ |
| Having to wait can be a useful pause in a busy day. | ○ | ○ | ○ | ○ | ○ |
| I prefer to shop in a store rather than online. | ○ | ○ | ○ | ○ | ○ |
| Learning how to use new technologies is often frustrating for me. | ○ | ○ | ○ | ○ | ○ |
| I would be fine with renting out my car to people I do not know. | ○ | ○ | ○ | ○ | ○ |
| Having internet connectivity everywhere I go is important to me. | ○ | ○ | ○ | ○ | ○ |
| I prefer to live close to transit, even if it means I'll have a smaller home and live in a more densely populated area. | ○ | ○ | ○ | ○ | ○ |
| Sharing my personal information or location via internet-enabled devices concerns me a lot. | ○ | ○ | ○ | ○ | ○ |
| My daily travel routine is generally | ○ | ○ | ○ | ○ | ○ |

satisfactory.

| | | | | | |
|---|---|---|---|---|---|
| When traveling in a vehicle, I prefer to be a driver rather than a passenger. | ○ | ○ | ○ | ○ | ○ |
| I prefer to live in a spacious home, even if it is farther from public transportation or many places I go. | ○ | ○ | ○ | ○ | ○ |
| I am committed to using a less polluting means of transportation (*e.g.*, walking, biking, and public transit) as much as possible. | ○ | ○ | ○ | ○ | ○ |
| Public transit is a reliable means of transportation for my daily travel needs. | ○ | ○ | ○ | ○ | ○ |
| I tend to feel sick if I read while in a moving vehicle. | ○ | ○ | ○ | ○ | ○ |
| I like trying things that are new and different. | ○ | ○ | ○ | ○ | ○ |
| I try to make good use of the time I spend traveling. | ○ | ○ | ○ | ○ | ○ |
| The level of congestion during my daily travel bothers me. | ○ | ○ | ○ | ○ | ○ |
| I definitely like the idea of owning my own car. | ○ | ○ | ○ | ○ | ○ |
| The time spent traveling to places provides a useful transition between activities. | ○ | ○ | ○ | ○ | ○ |
| The reliability and quality of a car are more important than its brand. | ○ | ○ | ○ | ○ | ○ |
| I like the idea of having stores, restaurants, and offices mixed among the homes in my neighborhood. | ○ | ○ | ○ | ○ | ○ |

## Section B: Household Vehicles and Residential Preferences

Learning about your household vehicles and residential preferences will help us better understand your transportation and lifestyle choices.

1. Do you have a driver's license? ○ No ○ Yes

2. How many people in your household have a driver's license (including you)? _____
   *By "household" we mean "people who live together and share at least some financial resources". Unrelated housemates/roommates are usually* ***not*** *considered members of the same household even if they live in the same housing unit.*

3. How many *motorized* vehicles (including four-wheelers and two-wheelers) are available in your household? _____
   *If you have* ***zero motorized vehicles*** *in your household, please enter "0" and proceed to Question 6.*

4. Please provide details of all motorized vehicles (including four-wheelers and two-wheelers) available to your household. If your household has more than four vehicles, consider the four vehicles used the most. **Please report the vehicle you use most often as Vehicle 1.**

| *Vehicle* | *Make* | *Model* | *Model Year* | *Year Acquired* | *Fuel Type* | *Annual Miles Driven (Estimate)* |
|---|---|---|---|---|---|---|
| *Example* | *Toyota* | *Camry* | *2004* | *2008* | ●Gasoline ○Electric<br>○Hybrid ○Other | ○*Less than 5,000 miles*<br>○*5,000 to 9,999 miles*<br>● *10,000 to 14,999 miles*<br>○*15,000 to 19,999 miles*<br>○*20,000 to 24,999 miles*<br>○*25,000 to 29,999 miles*<br>○*30,000 to 39,999 miles*<br>○*40,000 and above* |
| 1 | _____ | _____ | _____ | _____ | ○Gasoline ○Electric<br>○Hybrid ○Other | ○*Less than 5,000 miles*<br>○*5,000 to 9,999 miles*<br>○ *10,000 to 14,999 miles* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | ○*15,000 to 19,999 miles*<br>○*20,000 to 24,999 miles*<br>○*25,000 to 29,999 miles*<br>○*30,000 to 39,999 miles*○*40,000 and above* |
| 2 | _____ | _____ | _____ | _____ | ○Gasoline ○ Electric<br>○Hybrid ○ Other | ○*Less than 5,000 miles*<br>○*5,000 to 9,999 miles*<br>○ *10,000 to 14,999 miles*<br>○*15,000 to 19,999 miles*<br>○*20,000 to 24,999 miles*<br>○*25,000 to 29,999 miles*<br>○*30,000 to 39,999 miles*○*40,000 and above* |
| 3 | | | | | ○Gasoline ○ Electric<br>○Hybrid ○ Other | ○*Less than 5,000 miles*<br>○*5,000 to 9,999 miles*<br>○ *10,000 to 14,999 miles*<br>○*15,000 to 19,999 miles*<br>○*20,000 to 24,999 miles*<br>○*25,000 to 29,999 miles*<br>○*30,000 to 39,999 miles*○*40,000 and above* |
| 4 | _____ | _____ | _____ | _____ | ○Gasoline ○ Electric<br>○Hybrid ○ Other | ○*Less than 5,000 miles*<br>○*5,000 to 9,999 miles*<br>○ *10,000 to 14,999 miles* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | ○ *15,000 to 19,999 miles*<br>○ *20,000 to 24,999 miles*<br>○ *25,000 to 29,999 miles*<br>○ *30,000 to 39,999 miles*○ *40,000 and above* |

5. Which of the following driving assistance features does **Vehicle 1** have? *Please check all that apply.*

   ☐ Lane keeping system
   ☐ Backup camera
   ☐ Adaptive Cruise Control (ACC)
   ☐ Automated braking system
   ☐ Blind spot monitoring
   ☐ Other (please specify): _____
   ☐ None
   ☐ Not sure

In the following questions, we are interested in the location where you currently live most of the time. For example, if you are a college student, please consider your local address when answering all questions, not your parents' home address.

6. What best describes the home you **currently** live in?

   ○ Stand-alone home
   ○ Attached home/townhome
   ○ Condo/apartment
   ○ Mobile home
   ○ Other (please specify): _____

7. Do you rent or own your home?

   ○ Rent
   ○ Own
   ○ Provided by somebody else (*e.g.*, relative, employer)
   ○ Other (please specify): _____

8. What year did you move to your current address (*e.g.,* 2010)? _____

9. Did you choose your current home **location**?

○ No, my home location was chosen by others (*e.g.*, spouse/partner)
○ Yes, I chose or helped choose my current home location

10. This question focuses on your preferences about homes and neighborhoods. If you participated in choosing your current home, please tell us what features led you to choose your current residence. If not, imagine that you are planning a move now: which of the following features would you seek for your future home?

| | *Do not want* | *Do not care* | *Want* | *Must have* |
|---|---|---|---|---|
| Large home | ○ | ○ | ○ | ○ |
| Backyard | ○ | ○ | ○ | ○ |
| Single family home (stand-alone home) | ○ | ○ | ○ | ○ |
| Close to work/school location (for one or more household members) | ○ | ○ | ○ | ○ |
| Close to shops/services | ○ | ○ | ○ | ○ |
| Close to parks/nature | ○ | ○ | ○ | ○ |
| Close to family/friends | ○ | ○ | ○ | ○ |
| Good public schools | ○ | ○ | ○ | ○ |
| Easy to walk or bike around neighborhood | ○ | ○ | ○ | ○ |
| Good access to public transit | ○ | ○ | ○ | ○ |
| Low crime neighborhood | ○ | ○ | ○ | ○ |

## Section C: Current Travel Patterns

1. At this time, you are:

   ○ Both a worker and a student
   ○ A worker (part-time or full-time)
   ○ A student (part-time or full-time)
   ○ Neither a worker nor a student: *Please go to Question 6.*

2. On average, how many **days per week** do you…

   a. Travel to work: _____
   b. Travel to school: _____
   c. Telecommute for work: _____

   *"Telecommute" refers to working from home or a location close to home, without the need to travel to the regular workplace at all.*
   *If you do not commute to work or school, please go to Question 6.*

3. How far do you live from your main work/school location? _____ miles (estimate one-way trip distance)

4. On a typical day, how long does it take you to get from home to your main work/school location (one-way) by the **means of transportation you use most often**?

   My trip typically takes _____ minutes by:

   *Please choose the means of transportation used most often:*
   ○ private vehicle, driving alone.
   ○ private vehicle, driving with passengers.
   ○ private vehicle, riding with others.
   ○ carsharing services (*e.g.*, Zipcar).
   ○ bus.
   ○ Uber/Lyft/other ridehailing services.
   ○ taxi.
   ○ bicycle (including bikesharing).
   ○ e-scooter sharing service (*e.g.*, Bird, Lime).
   ○ walk.
   ○ other mode not listed above.

5. Considering only your **travel to work/school**, please indicate how often you typically use ***each*** of the following means of transportation.

| | | | *I use it…* | | | |
|---|---|---|---|---|---|---|
| | *Not available* | *Available but I never use it* | *Less than one day a month* | *1-3 days a month* | *1-2 days a week* | *3 or more days a week* |
| **Drive** private vehicle, alone | ○ | ○ | ○ | ○ | ○ | ○ |
| **Drive** private vehicle, with passengers | ○ | ○ | ○ | ○ | ○ | ○ |
| **Ride** in private vehicle, with others | ○ | ○ | ○ | ○ | ○ | ○ |
| Carsharing services (*e.g.*, Zipcar) | ○ | ○ | ○ | ○ | ○ | ○ |
| Public transit: bus | ○ | ○ | ○ | ○ | ○ | ○ |
| Uber/Lyft/other ridehailing service | ○ | ○ | ○ | ○ | ○ | ○ |
| Taxi | ○ | ○ | ○ | ○ | ○ | ○ |
| Bicycle (including bikesharing) | ○ | ○ | ○ | ○ | ○ | ○ |
| E-scooter (*e.g.*, Bird, Lime) | ○ | ○ | ○ | ○ | ○ | ○ |
| Walk | ○ | ○ | ○ | ○ | ○ | ○ |
| Other (please, specify): _____ | ○ | ○ | ○ | ○ | ○ | ○ |

*If you do not commute to work or school, please resume here.*

6. Considering only your **errands/shopping/social/recreational** trips, please indicate how often you typically use ***each*** of the following means of transportation.
*Note: The last question was about travel to work/school, while this question is about other trip purposes.*

| | | | *I use it…* | | | |
|---|---|---|---|---|---|---|
| | *Not available* | *Available but I never use it* | *Less than one day a month* | *1-3 days a month* | *1-2 days a week* | *3 or more days a week* |
| **Drive** private vehicle, alone | ○ | ○ | ○ | ○ | ○ | ○ |
| **Drive** private vehicle, with passengers | ○ | ○ | ○ | ○ | ○ | ○ |
| **Ride** in private vehicle, with | ○ | ○ | ○ | ○ | ○ | ○ |

| | | | | | | |
|---|---|---|---|---|---|---|
| others | | | | | | |
| Carsharing services (*e.g.*, Zipcar) | ○ | ○ | ○ | ○ | ○ | ○ |
| Public transit: bus | ○ | ○ | ○ | ○ | ○ | ○ |
| Uber/Lyft/other ridehailing service | ○ | ○ | ○ | ○ | ○ | ○ |
| Taxi | ○ | ○ | ○ | ○ | ○ | ○ |
| Bicycle (including bikesharing) | ○ | ○ | ○ | ○ | ○ | ○ |
| E-scooter (*e.g.*, Bird, Lime) | ○ | ○ | ○ | ○ | ○ | ○ |
| Walk | ○ | ○ | ○ | ○ | ○ | ○ |
| Other (please, specify): _____ | ○ | ○ | ○ | ○ | ○ | ○ |

7. Do you have any conditions that prevent or limit you from …

| | *No* | *To some extent* | *Yes* |
|---|---|---|---|
| Driving in general | ○ | ○ | ○ |
| Driving at night | ○ | ○ | ○ |
| Taking public transit | ○ | ○ | ○ |
| Bicycling | ○ | ○ | ○ |
| Walking | ○ | ○ | ○ |

8. Are there any adults (*i.e.*, 18 years old or older) in your household, other than yourself, with conditions that either partially or fully limit their ability to drive? ○ No ○ Yes

9. On average, how many miles **do you drive** in a week? *Please **do not include** miles you drive while "on the clock" for your job (e.g., bus driver, Uber/Lyft driver).*

○ Zero
○ 1-25 miles ○ 26-50 miles ○ 51-75 miles ○ 76-100 miles
○ 101-200 miles ○ 201-300 miles ○ 301-500 miles ○ More than 500 miles

10. In the past 30 days, about how many times did you have each of the following delivered to your home?

| | *Zero* | *1* | *2-3* | *4-6* | *7-10* | *More than 10* |
|---|---|---|---|---|---|---|
| a.Items purchased online | ○ | ○ | ○ | ○ | ○ | ○ |
| b.Prepared meals | ○ | ○ | ○ | ○ | ○ | ○ |
| c.Groceries | ○ | ○ | ○ | ○ | ○ | ○ |

We would now like to obtain some information about your **long-distance travel** (for vacation, business, visiting friends/relatives, etc.).

11. About how many long-distance trips (at least 75 miles one-way) did you make **since the beginning of the year?** Do **not** include trips to and from work/school. Please count each complete **round-trip** as ONE trip, and classify it based on the primary destination, the main trip purpose, and the means of transportation that was used for the longest portion of the journey. *If you made no long distance trips for a specific category, then please enter 0.*

    a. Number of long-distance trips for **leisure/personal** purposes since the beginning of the year:
    _____Trips by car _____Trips by airplane _____Trips by other means

    b. Number of long-distance trips for **business** purposes since the beginning of the year:
    _____Trips by car _____Trips by airplane _____Trips by other means

12. Have you been to the Tampa International or St. Petersburg-Clearwater or Sarasota-Bradenton airports since the beginning of the year to either travel yourself or to pick-up/drop-off someone else who was traveling? ○ No ○ Yes

## Section D: Mobility-on-demand

This section asks questions about the use of mobility-on-demand (also called **ridehailing or ridesharing)** such as Uber and Lyft, which provide door-to-door transportation via a smartphone app, as well as other new mobility services such as carsharing and bike/scooter sharing. Ridehailing can be either **private** (involving only you and your own travel companions) or **shared** (involving pick-up/drop-off of other people you don't know). Even if you have never used these services, please answer all questions to the best of your ability.

1. How often do you generally use the following transportation services?

| | *I am not familiar with it* | *I am familiar but never used the service* | *I use it rarely (e.g., less than once a month)* | *I use it monthly* | *I use it weekly* |
|---|---|---|---|---|---|
| **Private ridehailing** (*e.g.,* Uber, Lyft) | ○ | ○ | ○ | ○ | ○ |
| **Shared ridehailing**[a] (*e.g.*, uberPOOL, Lyft Share) | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| **Carsharing** (*e.g.*, Zipcar, Share Now) | ○ | ○ | ○ | ○ | ○ |
| **Bikesharing** (*e.g.*, Jump, Grid) | ○ | ○ | ○ | ○ | ○ |
| **E-scooter sharing** (*e.g.*, Lime, Bird) | ○ | ○ | ○ | ○ | ○ |

[a] Shared ridehailing is an Uber/Lyft ride which you are sharing with other passengers not in your party.

*If you have never used bikesharing or e-scooter sharing, please go to Question 3 on page 9.*

2. Considering the **last trip** you made using **bikesharing** or **e-scooter sharing**, please answer the following questions:

   a. What type of service did you use for this trip?

      ○ Bikesharing
      ○ E-scooter sharing

   b. When did you use it?

      ○ Weekday daytime
      ○ Weeknight (**excluding** Friday night)
      ○ Weekend daytime
      ○ Weekend night time (**including** Friday night)

   c. What was the length of the trip?

      ○ Less than a mile
      ○ 1 – 2 miles
      ○ 3 – 4 miles
      ○ 5 miles or more

   d. What was the primary purpose of the trip? *Please check the **best answer.***

      ○ Work/school
      ○ Shopping/errands
      ○ Eating/drinking
      ○ Social/recreational
      ○ To access airport
      ○ To access public transit
      ○ Medical/dental
      ○ Going/returning home from another location
      ○ Just to enjoy the ride/try the new service
      ○ Other (please, specify): _____

   e. Why did you use this service for the trip? *Please check ALL that apply.*

☐ No need to park/parking was expensive or scarce
☐ For more physical exercise
☐ To save time
☐ To save money
☐ Public transit was not available
☐ Public transit was not convenient
☐ Private vehicle was not available
☐ Just to enjoy the ride/try the new service
☐ Other (please, specify): _____

f. How would you have made this trip if the shared bikes or e-scooters were not available? *Choose the most likely option.*

○ **Drive** private vehicle, alone
○ **Drive** private vehicle, with passengers
○ **Ride** in private vehicle, with others
○ Ride the bus
○ Use taxi
○ Use Uber/Lyft
○ Use my own bike or scooter
○ Walk
○ I would not have made this trip
○ Other (please, specify): _____

*If you have never used ridehailing services, please go to Question 6 on page 10.*

3. Considering the **last trip** you recall using ridehailing services, please answer the following questions. If you don't remember all of the information precisely, your best guess is fine. You can also refer to your app to see trip details.

| | |
|---|---|
| What type of ridehailing service did you use? | ○ Private ridehailing (*e.g.,* Uber, Lyft)<br>○ Shared ridehailing (*e.g.,* UberPOOL, Lyft Share) |
| **Where** did you travel using this service? *Provide address or major cross-streets and city name.* | From: _____<br>To: _____ |
| **When** did you use it? | ○ Weekday daytime<br>○ Weeknight (**excluding** Friday night)<br>○ Weekend daytime<br>○ Weekend night time (**including** Friday night) |
| About how long was the **wait time** for this trip? | _____ minutes |
| About how long was the **travel time** in the vehicle? | _____ minutes |
| About how much did the **trip cost**? | $_____ *OR* ☐ I don't know because someone else alled the ride. |
| What was the primary **purpose** of the trip? *Please check the **best answer.*** | ○ Work/school<br>○ Shopping/errands<br>○ Eating/drinking<br>○ Social/recreational<br>○ To access airport<br>○ To access public transit<br>○ Medical/dental<br>○ Going/returning home from another location<br>○ Other (please, specify): _____ |
| How many other passengers traveled with you? | ○ I was the only passenger *OR*<br>___ Family members, friends or colleagues<br>___ Other passengers matched via the app (for ridehailing) |
| What would you have done if this service were **not** available? *Choose the most likely option.* | ○ **Drive** private vehicle, alone<br>○ **Drive** private vehicle, with passengers<br>○ **Ride** in private vehicle, with others<br>○ Ride the bus<br>○ Use taxi<br>○ Use a bikesharing or e-scooter sharing service<br>○ Walk |

| | |
|---|---|
| | ○ Ride my personal bicycle or scooter<br>○ I would not have made this trip<br>○ Other (please, specify): _____ |
| Assume that **shared ridehailing** (*e.g.*, uberPOOL or Lyft Share) was available for this trip, allowing for cheaper fares but longer travel times to reach your destination. What is the maximum **additional** travel time you would have accepted if you had received a 50% discount? | ○ I already made this trip using shared ridehailing<br>○ I would not have used shared ridehailing for the trip<br>○ 1-5 more minutes<br>○ 6-10 more minutes<br>○ 11-15 more minutes<br>○ 16 or more minutes |

4. In the **last month**, about how much did you spend on ridehailing (such as Uber/Lyft) services?

   ○ $0
   ○ $1 - $9
   ○ $10 – $29
   ○ $30 - $ 49
   ○ $50 - $74
   ○ $75 - $100
   ○ More than $100

5. After beginning to use ridehailing services, how has your use of each of the following means of transportation changed?

| | *I have changed usage, but **not** because of ridehailing* | *I use it less often* | *I use it about the same* | *I use it more often* |
|---|---|---|---|---|
| **Drive** private vehicle, alone | ○ | ○ | ○ | ○ |
| **Drive** private vehicle, with passengers | ○ | ○ | ○ | ○ |
| **Ride** in private vehicle, with others | ○ | ○ | ○ | ○ |
| Public transit: bus | ○ | ○ | ○ | ○ |
| Taxi | ○ | ○ | ○ | ○ |
| Bicycle or e-scooter | ○ | ○ | ○ | ○ |
| Walk | ○ | ○ | ○ | ○ |

*If you have never used ridehailing services, please resume here.*

6. Please rate your level of agreement with each of the following statements about ridehailing services (e.g., Uber/ Lyft). Even if you do not currently use these services, your opinions about them are important to us.

| | *Strongly disagree* | *Somewhat disagree* | *Neutral* | *Somewhat agree* | *Strongly agree* |
|---|---|---|---|---|---|
| Ridehailing services are too expensive to use on a frequent (*e.g.*, daily or weekly) basis. | ○ | ○ | ○ | ○ | ○ |
| I would use ridehailing services more often if the service was more reliable. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services help me save time and money on parking. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services help me avoid impaired driving (*e.g.*, driving under the influence). | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services are good alternatives when my car is temporarily unavailable (*e.g.*, when it is being repaired). | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services are good travel options for me when I am away from home. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services help me get to/from public transit stops. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services are good options for me when or where public transit is not available. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing services allow me to live with fewer or no cars. | ○ | ○ | ○ | ○ | ○ |
| Traveling with a driver I don't know makes me feel uncomfortable. | ○ | ○ | ○ | ○ | ○ |
| For shared ridehailing (*e.g.*, uberPOOL, Lyft Share), traveling with unfamiliar passengers makes me uncomfortable. | ○ | ○ | ○ | ○ | ○ |
| The lower cost of shared ridehailing (*e.g.*, uberPOOL, Lyft Share) is worth the additional time picking up and dropping off other passengers. | ○ | ○ | ○ | ○ | ○ |
| The lack of a child safety seat prevents me | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| from using ridehailing services. | | | | | |
| The lack of equipment to accommodate disabilities prevents me from using ridehailing services. | ○ | ○ | ○ | ○ | ○ |
| Ridehailing service availability affects where I choose to live, work, and/or go to school. | ○ | ○ | ○ | ○ | ○ |

7. Imagine that you call a ride through a smartphone app. For each of **the trip purposes** below, check whether you would choose the **private** (Option 1) or **shared** (Option 2) ridehailing options based on the trip features presented (trip cost, travel time, and the presence of additional passengers). *Select only one option* ***in each row****. Note that the travel times for shared ridehailing include both your waiting time and the extra time picking up/dropping off other passengers.*

| | **Option 1:**<br>**Private ridehailing**<br>(*e.g.,* Uber and Lyft) | **Option 2:**<br>**Shared ridehailing**<br>(*e.g.*, uberPOOL and Lyft Share) |
|---|---|---|
| **Social/Leisure** | ○ $ 18.00/ 20 minutes | ○ $ 16.25/ 25 minutes/ 1 additional passengers |
| **Shopping** | ○ $ 13.00/ 10 minutes | ○ $ 9.75/ 13 minutes/ 2 additional passengers |
| **Work/School** | ○ $ 8.00/ 20 minutes | ○ $ 6.00/ 25 minutes/ 3 additional passenger |

## Section E: Your Thoughts on Autonomous Vehicles

**PLEASE READ THIS DESCRIPTION CAREFULLY:**

An **Autonomous Vehicle (AV)** is a vehicle that drives itself without human supervision or control. It picks up and drops off passengers including those who do not drive (*e.g.*, children, elderly), goes and parks itself, and picks up and delivers laundry, groceries, or food orders on its own. When AVs become available, ridehailing companies (*e.g.*, Uber and Lyft) will use them to provide rides without a human driver in the vehicle. When answering the questions in this section, please assume a future in which **autonomous vehicles (AVs) are widely adopted, but human-driven vehicles are still present.**

1. Which of the following statements best describes your **familiarity with AVs**?

○ I had never heard of AVs before taking this survey.
○ I have heard of AVs, but don't know much about them.
○ I am somewhat familiar with AVs.
○ I am very familiar with AVs.
○ I have actually taken a ride in an AV.

2. Please rate your level of agreement with each of the following statements about AVs. We want your opinion even if you are not familiar with AVs.

| | *Strongly disagree* | *Somewhat disagree* | *Neutral* | *Somewhat agree* | *Strongly agree* |
|---|---|---|---|---|---|
| AVs would help me avoid impaired driving (*e.g.*, under the effects of medication or alcohol). | ○ | ○ | ○ | ○ | ○ |
| AVs will eliminate my joy of driving. | ○ | ○ | ○ | ○ | ○ |
| AVs would make me feel safer on the street as a pedestrian or as a cyclist. | ○ | ○ | ○ | ○ | ○ |
| I would feel comfortable having an AV pick-up/drop-off children without adult supervision. | ○ | ○ | ○ | ○ | ○ |
| I am concerned about the potential failure of AV sensors, equipment, technology, or programs. | ○ | ○ | ○ | ○ | ○ |
| AVs would make traveling by car less stressful for me. | ○ | ○ | ○ | ○ | ○ |
| I would feel comfortable sleeping while traveling in an AV. | ○ | ○ | ○ | ○ | ○ |
| I would make more long-distance trips when AVs are available because I wouldn't | ○ | ○ | ○ | ○ | ○ |

have to drive.

| | | | | | |
|---|---|---|---|---|---|
| I am concerned that my travel logs and personal information stored in AVs could be leaked. | ○ | ○ | ○ | ○ | ○ |
| I would send an AV to pick-up groceries/laundry/food orders by itself. | ○ | ○ | ○ | ○ | ○ |
| I will never ride in an AV. | ○ | ○ | ○ | ○ | ○ |
| I want the ability to take control of the AV at any time during the ride. | ○ | ○ | ○ | ○ | ○ |
| AVs would make it easy to share vehicles within my household because they can pick-up/drop-off household members on their own. | ○ | ○ | ○ | ○ | ○ |
| AVs would save me time and money for parking by dropping me off and parking themselves. | ○ | ○ | ○ | ○ | ○ |

*If you do not commute to work or school, please go to question 4.*

3. Imagine a future when you have regular access to an AV (by owning, leasing, or using automated ridehailing services) and you can do other activities while riding in an AV. How much longer would you be willing to commute in an AV (compared to your current commute)?

○ Up to 5 additional minutes (one way)
○ Between 5 and 15 additional minutes (one way)
○ Between 15 and 30 additional minutes (one way)
○ More than 30 additional minutes (one way)
○ I would not accept a longer commute even when I have access to an AV

4. Imagine a future when you **can access an AV** (by owning, leasing, or using automated ridehailing services). How likely would you change in each of the following ways?

| | *Very unlikely* | *Somewhat Unlikely* | *Neutral* | *Somewhat likely* | *Very likely* |
|---|---|---|---|---|---|
| Make additional trips that I do not make now | ○ | ○ | ○ | ○ | ○ |
| Travel farther to go shopping or eat out | ○ | ○ | ○ | ○ | ○ |
| Travel farther to go to social/recreational activities | ○ | ○ | ○ | ○ | ○ |
| Travel and do more activities after dark | ○ | ○ | ○ | ○ | ○ |
| Make more long-distance road trips | ○ | ○ | ○ | ○ | ○ |
| Travel more in peak hours (because I can do | ○ | ○ | ○ | ○ | ○ |

other activities while traveling in an AV)

| | | | | | |
|---|---|---|---|---|---|
| Move to a better location or home | ○ | ○ | ○ | ○ | ○ |
| Change my workplace to a location with better/more jobs | ○ | ○ | ○ | ○ | ○ |
| Tolerate congestion better because I don't have to drive | ○ | ○ | ○ | ○ | ○ |

5. When do you expect to buy an AV?

○ I will be one of the first people to buy an AV.
○ I will eventually buy an AV, but only after these vehicles are in common use.
○ I will never buy an AV. *Please go to question 7, on this page.*

6. Suppose you were looking to purchase a new vehicle. The regular human-driven model of the vehicle you wish to purchase costs $25,000. How much more would you be willing to pay for a fully autonomous version of the vehicle?

○ Up to $1,000 more
○ Between $1,000 and $3,000 more
○ Between $3,000 and $5,000 more
○ Between $5,000 and $8,000 more
○ Greater than $8,000 more
○ I would NOT be willing to pay any additional amount for the autonomous version of the vehicle

7. Suppose ridehailing companies (*e.g.,* Uber and Lyft) will start using AVs to serve trip requests. Please rate your level of agreement with the following statements.

| | *Strongly disagree* | *Somewhat disagree* | *Neutral* | *Somewhat agree* | *Strongly agree* |
|---|---|---|---|---|---|
| I will use AV ridehailing services alone or with coworkers, friends, or family. | ○ | ○ | ○ | ○ | ○ |
| I will use AV ridehailing services with other passengers I don't know. | ○ | ○ | ○ | ○ | ○ |
| I would be willing to pay extra for having a backup human driver inside the AV during my ride. | ○ | ○ | ○ | ○ | ○ |
| I would feel comfortable leasing my personal AV to ridehailing companies so that I can earn money when I am not using it. | ○ | ○ | ○ | ○ | ○ |

8. Considering **the number of cars** your household currently owns, how might that **change when AVs are available for purchase or use as a ridehailing service**?

○ Likely own **fewer** cars than today
○ Likely own **the same** number of cars as today
○ Likely own **more** cars than today

9. Suppose you have regular access to an AV (by owning, leasing, or using automated ridehailing services). How would your use of different modes of transportation change in such a future? *Please choose one answer in each row.*

| | *Use Less* | *Use the Same* | *Use More* |
|---|---|---|---|
| Human-driven personal vehicle | ○ | ○ | ○ |
| Human-driven ridehailing service | ○ | ○ | ○ |
| Public transit: bus | ○ | ○ | ○ |
| Public transit: light rail | ○ | ○ | ○ |
| Walk | ○ | ○ | ○ |
| Bicycle or scooter | ○ | ○ | ○ |
| Airplane | ○ | ○ | ○ |

10. To what extent do you agree with the following statements for AVs?

| | *Strongly disagree* | *Somewhat disagree* | *Neutral* | *Somewhat agree* | *Strongly agree* |
|---|---|---|---|---|---|
| AVs should be allowed on the market only when they prove to be at least as safe as human drivers. | ○ | ○ | ○ | ○ | ○ |
| AVs should prioritize the safety of pedestrians and bicyclists over that of passengers in the vehicle. | ○ | ○ | ○ | ○ | ○ |
| AV owners should be able to program how their AVs prioritize safety of different groups in the event of a crash (*e.g.*, pedestrians, bicyclists, other vehicles, or AV passengers). | ○ | ○ | ○ | ○ | ○ |
| Laws should be passed to require AVs to travel at 25 mph or less on city streets. | ○ | ○ | ○ | ○ | ○ |
| In an AV crash, vehicle manufacturers and their insurance companies should be held responsible (instead of the AV owner, passenger, or operator). | ○ | ○ | ○ | ○ | ○ |
| The government should establish dedicated AV-only lanes/areas. | ○ | ○ | ○ | ○ | ○ |

11. Suppose AVs are now available for purchase, lease/rent, or to use via automated ridehailing services, and **half of the vehicles on the streets are AVs**. What would you do when **faced with your next car purchase decision** in each of the following scenarios? Please rank the alternatives **based on your preference (1=most preferred; 3=least preferred).** *Please do not give the same rank to multiple alternatives.*

**Scenario 1**

| Options | **Option A:** Buy a regular vehicle | **Option B:** Buy an AV | **Option C:** Don't buy a vehicle and use AV ridehailing/rental services |
|---|---|---|---|
| **Costs** | $ 500/month + $ 0.75/mile<br>Average wait time: 0 minutes | $ 500/month + $ 0.75/mile<br>Average wait time: 0 minutes | $ 0/month + $ 2.25/mile<br>Average wait time: 6 minutes |
| **Rank** | _____ | _____ | _____ |

**Scenario 2**

| Options | **Option A:** Buy a regular vehicle | **Option B:** Buy an AV | **Option C:** Don't buy a vehicle and use AV ridehailing/rental services |
|---|---|---|---|
| **Costs** | $ 500/month + $ 0.25/mile<br>Average wait time: 0 minutes | $ 625/month + $ 0.50/mile<br>Average wait time: 0 minutes | $ 0/month + $ 1.50/mile<br>Average wait time: 6 minutes |
| **Rank** | _____ | _____ | _____ |

12. Suppose you are traveling with family members to a neighborhood park in an AV. Which of the following would you do in the vehicle during your trip? *Select **up to three** activities.*

    ☐ Work, or study
    ☐ Talk on the phone/ send or read text messages/ teleconference
    ☐ Read
    ☐ Sleep
    ☐ Watch movies/ TV/ other entertainment
    ☐ Play games
    ☐ Eat and drink
    ☐ Interact with other passengers
    ☐ Enjoy the scenery
    ☐ Watch the road, even though I would not be driving
    ☐ I would not ride in an AV
    ☐ Other (please, specify): _____

13. Suppose you are going out to spend some time with your friends (*e.g.*, going to their house or to a bar). You have the following seven options for your transportation. Rank the alternatives listed from most preferred (Rank 1) to least preferred (Rank 7). *Please do not give the same rank to multiple alternatives.*

| ***Rank*** | ***Alternative*** | ***Wait time*** | ***In-vehicle travel time*** | ***Cost for entire trip*** |
|---|---|---|---|---|
| | **Private vehicle**: Use your own private vehicle (human-driven or AV) | No wait | 24 minutes | $1.00 |
| | **Bicycle** | No wait | 48 minutes | $0.00 |
| | **Public transit**: Use bus or rail | 10 minutes | 48 minutes | $1.25 |

| | | | | |
|---|---|---|---|---|
| | **Private ridehailing**: Get a ride with a human-driven ridehailing service (*e.g.*, Uber, Lyft) | 6 minutes | 24 minutes | $30.00 |
| | **Shared ridehailing**: Get a human-driven ride in a vehicle in which other passengers may be added. | 7 minutes | 34 minutes | $15.00 |
| | **AV private ridehailing**: Same as ridehailing, except that the vehicle will be autonomous. | 6 minutes | 24 minutes | $30.00 |
| | **AV shared ridehailing**: Same as shared ridehailing, except that the vehicle will be autonomous. | 7 minutes | 34 minutes | $15.00 |

## Section F: Background Information

We have reached the last section of this survey! To help us generalize the response from this small sample to the population as a whole, we would like to ask you a few background questions. Your privacy is guaranteed.

1. In what year were you born? _____

2. What is your gender?

   ○ Male
   ○ Female
   ○ Other
   ○ Prefer not to answer

3. Where were you born?

   ○ United States or U.S. territory
   ○ Other country
   ○ Prefer not to answer

4. Are you Hispanic or Latino?

   ○ No
   ○ Yes
   ○ Prefer not to answer

5. Which of the following categories do you identify with? Please check **no more than two categories**.

   ☐ White/Caucasian
   ☐ Black/African American
   ☐ Native American
   ☐ Asian or Pacific Islander
   ☐ Other (please specify): _____
   ☐ Prefer not to answer

6. What is your educational background? *Check the highest level of education you have attained.*

   ○ Some grade/high school
   ○ Completed high school or GED
   ○ Some college or technical school

○ Bachelor's degree(s) or some graduate school
○ Completed graduate degree(s)

7. **Including yourself**, how many people live in your household? _____
*By "household" we mean "people who live together and share at least some financial resources." Unrelated housemates/roommates are usually* ***not*** *considered members of the same household even if they live in the same housing unit.*
*If you live alone, please go to question 9.*

8. Please describe the people who live with you.

| | *Relationship to you* | *Age category* | *Gender* | *Occupation* |
|---|---|---|---|---|
| Person 2 | ○ My partner/spouse<br>○ My or my partner's child or grandchild<br>○ My or my partner's parent or grandparent<br>○ Other | ○ 0 to 4 years old<br>○ 5 to 12 years old<br>○ 13 to 17 years old<br>○18 to 24 years old<br>○ 25 to 44 years old<br>○ 45 to 64 years old<br>○ 65 or more years old | ○ Male<br>○ Female | ○ Part-time worker<br>○ Full-time worker<br>○ Part-time student<br>○ Full-time student<br>○ Both student and worker<br>○ Neither worker nor student |
| Person 3 | ○ My partner/spouse<br>○ My or my partner's child or grandchild<br>○ My or my partner's parent or grandparent<br>○ Other | ○ 0 to 4 years old<br>○ 5 to 12 years old<br>○ 13 to 17 years old<br>○18 to 24 years old<br>○ 25 to 44 years old<br>○ 45 to 64 years old<br>○ 65 or more years old | ○ Male<br>○ Female | ○ Part-time worker<br>○ Full-time worker<br>○ Part-time student<br>○ Full-time student<br>○ Both student and worker<br>○ Neither worker nor student |
| Person 4 | ○ My partner/spouse<br>○ My or my partner's child or grandchild<br>○ My or my partner's parent or grandparent<br>○ Other | ○ 0 to 4 years old<br>○ 5 to 12 years old<br>○ 13 to 17 years old<br>○18 to 24 years old<br>○ 25 to 44 years old<br>○ 45 to 64 years old<br>○ 65 or more years old | ○ Male<br>○ Female | ○ Part-time worker<br>○ Full-time worker<br>○ Part-time student<br>○ Full-time student<br>○ Both student and worker<br>○ Neither worker nor student |
| Person 5 | ○ My partner/spouse<br>○ My or my partner's child or grandchild<br>○ My or my partner's parent | ○ 0 to 4 years old<br>○ 5 to 12 years old<br>○ 13 to 17 years old<br>○18 to 24 years old | ○ Male<br>○ Female | ○ Part-time worker<br>○ Full-time worker<br>○ Part-time student<br>○ Full-time student |

| | | | | |
|---|---|---|---|---|
| | or grandparent<br>○ Other | ○ 25 to 44 years old<br>○ 45 to 64 years old<br>○ 65 or more years old | | ○ Both student and worker<br>○ Neither worker nor student |
| Person 6 | ○ My partner/spouse<br>○ My or my partner's child or grandchild<br>○ My or my partner's parent or grandparent<br>○ Other | ○ 0 to 4 years old<br>○ 5 to 12 years old<br>○ 13 to 17 years old<br>○18 to 24 years old<br>○ 25 to 44 years old<br>○ 45 to 64 years old<br>○ 65 or more years old | ○ Male<br>○ Female | ○ Part-time worker<br>○ Full-time worker<br>○ Part-time student<br>○ Full-time student<br>○ Both student and worker<br>○ Neither worker nor student |

9. Knowing more about your **home location** will help us put your travel choices and opinions in context. Please provide your address or, if you prefer, major cross streets near your home.

   _____

   City: _____ State: _____ Zip code: _____

10. Please check the appropriate category for your annual *household* income before taxes.

    ○ Less than $25,000
    ○ $25,000 to $49,999
    ○ $50,000 to $74,999
    ○ $75,000 to $99,000
    ○ $100,000 to $149,999
    ○ $150,000 to $249,999
    ○ $250,000 or more

    *If you do not commute to work or school, please skip question 11.*

11. Knowing more about your work/school location will help us understand the transportation options available to you. Please give the address or, if you prefer, major cross streets close to your main workplace/school location. *If you travel to more than one location on a regular basis, enter the location to which you travel most often.*

    _____

City: _____ State: _____ Zip code: _____

**REWARDS!** Thank you for completing this survey. If you are interested in being considered for a **$10 Amazon e-gift card**, please provide your email address in the line below. Your email will only be used for the purpose of sending the reward.

_____

If you have any additional comments about your current travel, and the new transportation, you are welcome to share them in the space below.

**Thank you for your valuable participation in this study!**
All your responses have been successfully recorded.