

# LINK21

CONNECT NORTHERN CALIFORNIA

## MARKET ANALYSIS REPORT

### APPENDIX C: LINK21 MOBILITY SURVEY

---

March 2022

Link21 is committed to ensuring that information is available in appropriate alternative formats to meet the requirements of persons with disabilities. If you require an alternative version of this file, please email [link21dc@link21program.org](mailto:link21dc@link21program.org).

**Prepared By:**  
**Link21 Project Management Consultants (PMC)**

DRAFT - DELIBERATIVE





**INTENTIONALLY LEFT BLANK**

DRAFT - DELIBERATIVE



## ISSUE AND REVISION RECORD

REVISION	DATE	PREPARER(S)	PMC REVIEWER(S) <sup>1</sup>	APPROVER <sup>2</sup>	DESCRIPTION/ NOTES
			BART/CCJPA REVIEWER(S)	BART/CCJPA APPROVER	
0	10/26/2021	Derek Cheah, Steer	Elisa Tejedor, Steer	Sudhish Verma, HNTB	Working DRAFT submittal
	11/10/2021	---	Andrew Tang, Emily Alter, Duncan Watry, BART; Camille Tsao, CCJPA	Andrew Tang, BART	Working DRAFT submittal review
1	03/18/2022	Derek Cheah, Steer	Elisa Tejedor, Steer	Sudhish Verma, HNTB	DRAFT submittal
		---	Name, Agency	Name, Agency	<i>No review requirement</i>

## SHAREPOINT PATH

Records Center/BUSC Record Center/WPA.02/1-BUSC-PH0-Market\_Analysis\_Report\_Appendix\_C-DRAFT

DRAFT - DELIBERATIVE



**INTENTIONALLY LEFT BLANK**

DRAFT - DELIBERATIVE



## TABLE OF CONTENTS

<b>1. Link21 Mobility Survey Development</b> .....	1-1
1.1. Overview .....	1-1
1.2. Survey Instrument .....	1-2
1.3. Survey Administration .....	1-3
1.4. Screening and Quotas.....	1-3
1.5. Data Cleaning and Weighting .....	1-9
1.6. Link21 Survey Structure .....	1-10
<b>2. Qualifying Trips</b> .....	2-1
2.1. Home County .....	2-1
2.2. Age .....	2-2
2.3. Trip Date .....	2-2
2.4. Socioeconomic Variables .....	2-3
<b>3. Megaregion Traveler Mode Preferences</b> .....	3-1
3.1. Trip Characteristics.....	3-1
3.1.1. <i>Trip Purpose</i> .....	3-1
3.1.2. <i>Trip Distance</i> .....	3-1
3.1.3. <i>Journey Time</i> .....	3-3
3.1.4. <i>Day of the Week</i> .....	3-4
3.1.5. <i>Frequency</i> .....	3-5
3.1.6. <i>Travel Party</i> .....	3-5
<b>4. Megaregion Traveler Characteristics</b> .....	4-1
4.1. Equity Indicators .....	4-1
4.1.1. <i>Race and Ethnicity</i> .....	4-1
4.1.2. <i>Household Income</i> .....	4-2
4.1.3. <i>Housing and Transportation Costs</i> .....	4-4
4.1.4. <i>Vehicle Availability</i> .....	4-5
4.1.5. <i>Employment and Occupation</i> .....	4-7
4.1.6. <i>Educational Attainment</i> .....	4-9
4.2. Other Household Characteristics.....	4-9
4.2.1. <i>Household Size</i> .....	4-9

DRAFT - DELIBERATIVE



4.2.2. *Housing Relocation* ..... 4-10

5. Constraints and Incentives to Use Rail ..... 5-1

5.1. Ease of Crossing the Bay ..... 5-1

5.2. Reasons for Using Rail ..... 5-2

5.3. Reasons for Not Using Rail ..... 5-4

5.4. Service Characteristics ..... 5-5

5.5. Rail Operators Satisfaction ..... 5-6

5.6. Other Factors Influencing Mode Choice ..... 5-9

5.7. Nighttime Services ..... 5-11

6. Key Markets Summary ..... 6-1

6.1. Car Ownership ..... 6-1

6.2. Commute Trips ..... 6-4

6.3. Equity ..... 6-6

**FIGURES**

Figure 1-1. Link21 Mobility Survey Qualifying Criteria ..... 1-4

Figure 1-2. Mobility Survey Geographic Grouping ..... 1-7

Figure 2-1. Link21 Mobility Survey: Home County ..... 2-1

Figure 2-2. Link21 Mobility Survey: Mode of Travel by Age ..... 2-2

Figure 2-3. Link21 Mobility Survey: Date of Last Trip ..... 2-3

Figure 2-4. Link21 Mobility Survey: Household Income ..... 2-3

Figure 2-5. Link21 Mobility Survey vs. Megaregion NHTS – Household Income ..... 2-4

Figure 2-6. Link21 Mobility Survey: Race and Ethnicity ..... 2-4

Figure 2-7. Link21 Mobility Survey vs. NHTS Hispanic or Latino ..... 2-5

Figure 3-1. Link21 Mobility Survey: Income and Trip Purpose ..... 3-1

Figure 3-2. Link21 Mobility Survey: Travel Distance ..... 3-2

Figure 3-3. Link21 Mobility Survey: Travel Distance by Income ..... 3-2

Figure 3-4. Link21 Mobility Survey: Journey Time ..... 3-3

Figure 3-5. Link21 Mobility Survey: Journey Time by Trip Purpose ..... 3-4

Figure 3-6. Link21 Mobility Survey: Day of the Week ..... 3-4

Figure 3-7. Link21 Mobility Survey: Trip Frequency ..... 3-5

DRAFT - DELIBERATIVE



Figure 3-8. Link21 Mobility Survey: Number of People Traveling Together .....3-6

Figure 4-1. Link21 Mobility Survey: Race and Ethnicity by County .....4-1

Figure 4-2. Link21 Mobility Survey: Household Income .....4-2

Figure 4-3. Link21 Mobility Survey: Ethnicity and Household Income.....4-2

Figure 4-4. Link21 Mobility Survey: Income for Non-white Respondents by County .....4-3

Figure 4-5. Link21 Mobility Survey: Income for White Respondents by County .....4-3

Figure 4-6. Link21 Mobility Survey: Housing Costs by Income.....4-4

Figure 4-7. Link21 Mobility Survey: Household Transportation Costs by Income .....4-4

Figure 4-8. Link21 Mobility Survey: Household Transportation Costs by Race and Ethnicity .....4-5

Figure 4-9. Link21 Mobility Survey: Vehicle Availability .....4-6

Figure 4-10. Link21 Mobility Survey: Vehicle Availability by Race and Ethnicity .....4-6

Figure 4-11. Link21 Mobility Survey: Employment Status .....4-7

Figure 4-12. Link21 Mobility Survey: Industry Type.....4-7

Figure 4-13. Link21 Mobility Survey: Industry Type by Race and Ethnicity .....4-8

Figure 4-14. Link21 Mobility Survey: Industry Type by Household Income .....4-8

Figure 4-15. Link21 Mobility Survey: Education Level.....4-9

Figure 4-16. Link21 Mobility Survey: Household Size .....4-10

Figure 4-17. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs ....4-10

Figure 4-18. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs by Race and Ethnicity .....4-11

Figure 4-19. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs by Household Income .....4-11

Figure 4-20. Link21 Mobility Survey: Increased Commuting Travel Time as a Result of Moving.....4-12

Figure 4-21. Link21 Mobility Survey: Decreased Rail Access as a Result of Moving .4-12

Figure 5-1. Link21 Mobility Survey: Rail is an Alternative to Cross the Bay (by car availability).....5-2

Figure 5-2. Link21 Mobility Survey: Reasons for Using Rail .....5-3

Figure 5-3. Link21 Mobility Survey: Reasons for Not Using Rail .....5-4

Figure 5-4. Link21 Mobility Survey: Service Characteristics .....5-5

Figure 5-5. Link21 Mobility Survey: Service Improvement Suggestions for BART .....5-7

DRAFT - DELIBERATIVE



Figure 5-6. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – ACE.....5-7

Figure 5-7. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Capital Corridor .....5-8

Figure 5-8. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Amtrak San Joaquins.....5-8

Figure 5-9. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Caltrain .....5-8

Figure 5-10. Link21 Mobility Survey: Importance of Arriving on Time .....5-9

Figure 5-11. Link21 Mobility Survey: Importance of Arriving on Time by Geography ...5-9

Figure 5-12. Link21 Mobility Survey: Importance of Arriving on Time by Purpose .....5-10

Figure 5-13. Link21 Mobility Survey: Frequency of Service.....5-10

Figure 5-14. Link21 Mobility Survey: Frequency of Service by OD Market.....5-11

Figure 5-15. Link21 Mobility Survey: Frequency of Service Commute and Non-Commute.....5-11

Figure 5-16. Link21 Mobility Survey: Willingness to Use Night Service (for those who used it before) .....5-12

Figure 6-1. Link21 Mobility Survey: Car Ownership and Primary Mode.....6-1

Figure 6-2. Link21 Mobility Survey: Households with and without an Auto by Education Level .....6-2

Figure 6-3. Link21 Mobility Survey: Car Ownership and Employment Status .....6-2

Figure 6-4. Link21 Mobility Survey: Car Ownership and Geography .....6-3

Figure 6-5. Link21 Mobility Survey: Car Ownership and Household Income.....6-3

Figure 6-6. Link21 Mobility Survey: Car Ownership and Race and Ethnicity .....6-4

Figure 6-7. Link21 Mobility Survey: Commuting Trips and Frequency.....6-4

Figure 6-8. Link21 Mobility Survey: Commute Trips and Journey Time.....6-5

Figure 6-9. Link21 Mobility Survey: Commute Trips and Rail Alternatives .....6-5

Figure 6-10. Link21 Mobility Survey: Race and Ethnicity by Household Income.....6-6

Figure 6-11. Link21 Mobility Survey: Geography and Household Income .....6-7

Figure 6-12. Link21 Mobility Survey: Household Income by Primary Mode.....6-7

Figure 6-13. Link21 Mobility Survey: Race and Ethnicity by Primary Mode.....6-8

DRAFT - DELIBERATIVE



## TABLES

Table 1-1. Link21 Mobility Survey: Geography Quotas and Sample Sizes.....	1-8
Table 1-2. Link21 Mobility Survey: Mode Quotas .....	1-8
Table 1-3. Link21 Mobility Survey: Trip Purpose Quotas .....	1-8
Table 1-4. Link21 Mobility Survey: Race and Ethnicity Representation .....	1-9
Table 1-5. Link21 Mobility Survey: Household Income Representation .....	1-9
Table 1-6. Link21 Mobility Survey Structure .....	1-11
Table 5-1. Link21 Mobility Survey: Ease of Crossing the Bay .....	5-1
Table 5-2. Link21 Mobility Survey: Top Five Reasons for Using Rail Ranked as #1 ....	5-3
Table 5-3. Link21 Megaregional Travel Survey: Top Five Reasons for Not Using Rail Ranked as #1 .....	5-5
Table 5-4. Link21 Megaregional Travel Survey: Service Characteristics Ranked as #1....	5-6

DRAFT - DELIBERATIVE



**INTENTIONALLY LEFT BLANK**

DRAFT - DELIBERATIVE



## ACRONYMS AND ABBREVIATIONS

ACRONYM/ABBREVIATION	DEFINITION
<b>BART</b>	San Francisco Bay Area Rapid Transit
<b>CCJPA</b>	Capitol Corridor Joint Powers Authority
<b>ACS</b>	American Community Survey
<b>CCTS</b>	Core Capacity Transit Study
<b>CTPP</b>	Census Transportation Planning Products
<b>MTC</b>	Metropolitan Transportation Commission
<b>NHTS</b>	National Household Travel Survey
<b>OD</b>	origin-destination
<b>PMC</b>	Program Management Consultants

## LINK21 PROGRAM TEAM NAMES

TEAM NAME	TEAM MEMBERS
<b>PMC</b>	The HNTB Team
<b>Program Management Team (PMT)</b>	BART/CCJPA + PMC
<b>Consultants</b>	Consultants supporting program identification/project selection
<b>Link21 Team</b>	PMT + Consultants

DRAFT - DELIBERATIVE



**INTENTIONALLY LET BLANK**

DRAFT - DELIBERATIVE



# 1. LINK21 MOBILITY SURVEY DEVELOPMENT

As part of the market analysis task for the Link21 Program (Link21), the Program Management Consultants (PMC) developed the Link21 Mobility Survey (herein referred to as the survey) to gather information on barriers to and incentives for using rail in the Northern California Megaregion (Megaregion), particularly for trips in the Transbay Corridor.

The market analysis is primarily concerned with understanding which transbay trips could be made by rail should additional rail service be provided, or existing rail service improved. This requires an estimation of unmet rail demand and a characterization of the key drivers of suppressed rail demand. A specific aim of the survey is to provide local and recent behavioral data to inform such estimation and characterization; data which will provide/verify parameters in the Market Analysis Spreadsheet Tool (MAST), described in Chapter 8 and Appendix B.

The survey was conducted online between June 17, 2020 and July 27, 2020. It collected over 2,000 responses from Megaregion residents. The results provided in this report are *unweighted*.<sup>1</sup>

## 1.1. Overview

The PMC conducted a behavioral survey of current Megaregion travelers that made recent transbay trips to obtain data on travelers' behaviors and mode choice preferences. This behavioral survey of Megaregion travelers that made recent transbay trips refines Link21's understanding of travel through the transbay corridor and the potential for increasing rail usage in the Megaregion.

The survey was designed, developed, hosted, and analyzed using primarily an online panel of megaregional respondents. A pilot was conducted over three days between June 17 and June 19, 2020, collecting over 100 preliminary responses. The main survey was launched on June 26, 2020, and it remained online for one full month until July 27, 2020. A total of 2,063 completed surveys were collected. After removing unusable responses, 2,046 surveys were retained for analysis. Online respondents were screened for having taken a recent trip (recall period of six months) across the San Francisco Bay before the COVID-19 pandemic. Care was taken during the survey to focus the questions on trip behaviors before the pandemic.

---

<sup>1</sup> To make their samples more representative of the population being studied, some survey analyses apply weights to individual responses. These weights are factors used to scale up or down the relative importance of a given individual response, depending on the relative share of each respondent and their demographic characteristics in the survey sample versus overall population. Given the high-level and exploratory nature of this survey analysis, a weighting process was not used.



Specific topics where the survey provided insight into transbay travelers in the Megaregion, specifically those who took recent transbay trips as defined previously, include:

- How people living in the Megaregion view the different types of rail services.
- How attitudes towards rail vary by journey purpose.
- How the propensity to use rail varies by region and by different groups within the same population.
- To what extent poor access to rail is a barrier to rail use.
- The importance of having a direct rail service.
- What is currently happening to suppress demand for rail.
- What the competing modes are and whether trips are not being taken.

## 1.2. Survey Instrument

The PMC used a customized and dynamic online survey instrument that provided various advantages, mainly:

- The survey questions were customized to each respondent's most recent qualifying trip.
- It included effective dynamic branching to improve the efficiency and reduce the cost of data collection; it enabled more flexibility in asking the respondent relevant questions.
- The survey contained logic checks to ensure that only logical responses could be entered into the system.
- Respondents were given the opportunity to correct trip choice and confirm or make necessary adjustments to their responses.
- Respondents could provide specific origin and destination (OD) locations using Google Map application programming interface (API) and geographic information system (GIS) data that could be easily extracted for each respondent.
- Respondents could participate from the comfort of their home at a time that was most convenient for them and take as much time as they needed.

The PMC used a panel provider, Dynata, to conduct this survey, a leading market research company holding an extensive panel of residents in North America. They are experts in various fieldwork techniques, including providing samples that are representative of census data. The survey was distributed to the paid online panel of respondents who are residents of the Megaregion and are over 16 years old. Additional quotas based on trip origin and trip purpose were enforced to only retain a representative sample of travelers.



The survey was structured so that it could be completed in a reasonable amount of time with half of the respondents completing it in under 16 minutes.<sup>2</sup>

### 1.3. Survey Administration

The survey was designed, coded, and hosted online. Before launching the survey to the full panel, the survey was piloted to a limited sample to test the survey with the general public. The pilot was conducted over three days between June 17 and June 19, 2020. During the pilot, the team collected over 100 responses. When all 100 responses were collected, the survey was paused and the team evaluated the performance of the survey tools and methods, including:

- Efficiency of the questionnaire design and clarity of questions.
- Time required to complete the questionnaire.
- Efficacy of the web-based platform and identification of programming bugs.
- Suitability of questions and respondents' fatigue.
- Efficacy of data processing and cleaning processes.

Minor editorial changes were made to the survey as a result of the pilot and the main survey was launched to all on July 26, 2020. Survey progress was monitored on a continuing basis and adjusted the recruitment strategy as required to achieve the desired targets for each market segment.

### 1.4. Screening and Quotas

A number of questions were used to establish eligibility to take the survey. This section ensured a trip was made by car, rail, ferry, or bus across the San Francisco Bay (either direction) via the San Francisco-Oakland Bay Bridge (Bay Bridge), San Francisco Bay Area Rapid Transit (BART), or ferry services between December 2019 and March 2020 (pre-COVID-19).

Each respondent was shown a series of screening questions to determine if they made a qualifying trip. If they qualified and if the quota for the market segment they belonged to had not been reached, they were directed to take the rest of the survey. If they did not qualify or if the quota for their market segment had been reached, they were terminated.

Qualifying criteria included:

- Residents of the 21-county Megaregion
- Aged 16 years or more

---

<sup>2</sup> Average time was 25 minutes and median time was 16 minutes



- Made a San Francisco Bay trip using one of the transbay crossings in **Figure 1-1**:
  - Bay Bridge (by car or bus)
  - BART Transbay Tunnel
  - Ferry route
- Trip made between December 1, 2019 and February 29, 2020 (pre-COVID-19)

**Figure 1-1. Link21 Mobility Survey Qualifying Criteria**



DRAFT - DELIBERATIVE



This survey is about trips that you may make between the east side and the west side of San Francisco Bay via the Bay Bridge, BART, or any ferry service as highlighted in the map below. We would like to hear about trips that:

- Occurred between **December 1, 2019 and February 29, 2020** (pre-COVID-19)
- Used **at least one** of the crossings in the map below
- Were made in a **personal vehicle** (e.g., car, pickup truck, minivan, motorcycle, bicycle) or using **transit** (e.g., trains, buses, ferries)

In addition to these qualifying criteria, quotas were set to collect samples large enough to obtain robust estimates of users' behaviors by market segment. Minimum quotas of at least 100-150 responses per market segment were set to allow for such estimation (census representation of age, income, ethnicity, etc.). Over 2,000 completed and valid responses were collected between June 26 and July 27, 2020 (in addition to 100 responses from the pilot/soft launch), targeting Megaregion residents making trips across the bay. Using available data about the population, minimum and maximum quotas were implemented during the data collection.

Specific quotas included:

- **Geography:** The regions are shown in **Figure 1-2** and are as follows:
  - Region A: Solano, Sacramento, Yolo, Yuba, Sutter, Placer, El Dorado, Stanislaus, Merced, and San Joaquin counties (10 counties total)
  - Region B: Alameda and Contra Costa counties
  - Region C: Santa Clara County
  - Region D: Marin, Sonoma, and Napa counties
  - Region E: San Francisco and San Mateo counties
  - Region F: Monterey, Santa Cruz, and San Benito counties

Quotas for each geographic region are presented in **Table 1-1** and were informed by census journey-to-work data. Over half of the commute trips were made between San Mateo and San Francisco counties (Region E) and Alameda and Contra Costa counties (Region B).

- **Mode:** **Table 1-2** presents quotas by mode and was informed by mode shares documented in the Metropolitan Transportation Commission's (MTC) Core Capacity Transit Study (CCTS). All day travel was roughly split 60% auto and 40% transit.
- **Trip Purpose:** **Table 1-3** presents quotas for trip purpose and was informed by MTC's travel demand model's (Travel Model 1.5 [TM1.5]) trip purposes for cross-bay trips data. Work trips represented over 50% of transbay trips.

In some cases, the number of survey responses collected for a given geography, mode, or trip purpose were slightly smaller than the corresponding quota (typically by no more than 10%). For each case, response collection was stopped short of meeting the quota



due to the lower than expected response rate; thus, diminishing return on cost and effort to collect the final 10% of responses.

The survey then asked qualified respondents a series of questions about their most recent trip<sup>3</sup> in the past three to six months and included questions that characterized the trips, such as origin, destination, travel distance, travel mode, trip purpose, and frequency. Subsequent questions focused on general travel behavior and attitudes towards rail usage. Sociodemographic data were also collected at the end of the survey to compare the sample demographic distributions with the general population distributions.

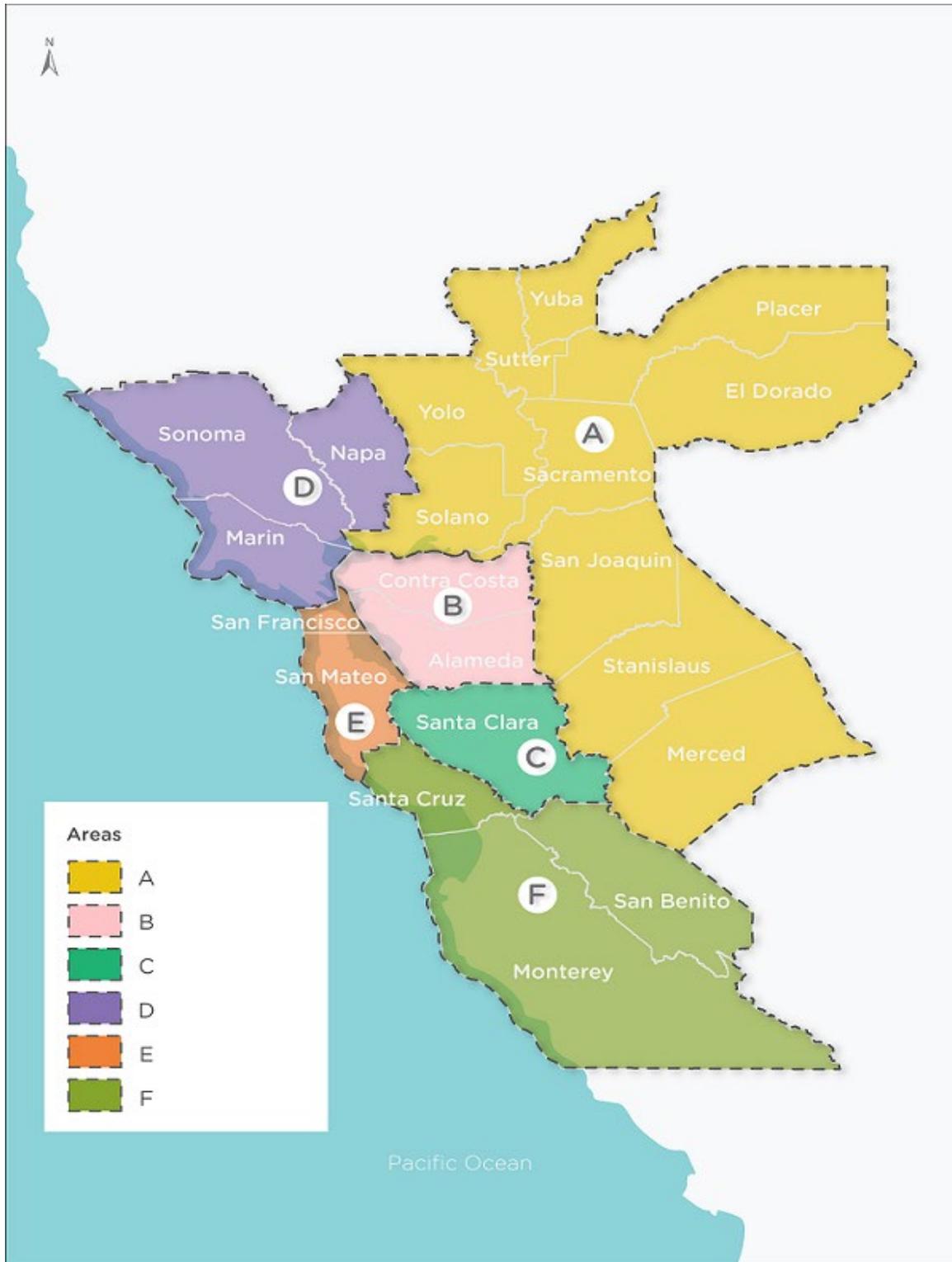
DRAFT - DELIBERATIVE

---

<sup>3</sup> Survey participants may have taken multiple transbay trips, each with a different purpose, origin, destination, mode, etc. When interpreting subsequent findings or analyses about the participant pool, it is important to note that the market analysis only reports on each participant's most recent transbay trip, (e.g., while it reports that only 1% of transbay trips were for school purposes, that share excludes travelers who travel transbay for school purposes but may have had a more recent transbay trip for work or leisure that was ultimately reported).



**Figure 1-2. Mobility Survey Geographic Grouping**



DRAFT - DELIBERATIVE

**Table 1-1. Link21 Mobility Survey: Geography Quotas and Sample Sizes**

REGION ORIGIN	REGION DESTINATION	SAMPLE OBSERVED SHARE	TARGET
A	E	8% (175)	125
B	E	50% (1,014)	1,200
C/E	E/C	13% (259)	250
D	E	12% (252)	250
E	A/B/D	15% (306)	300
E/F	F/E	2% (40)	30
<b>Total</b>		<b>100% (2,046)</b>	<b>2,155</b>

Source: Targets based on Census Transportation Planning Products (CTPP) Journey-to-work flows (2012-2016).

**Table 1-2. Link21 Mobility Survey: Mode Quotas**

MODE	SAMPLE OBSERVED SHARE	TARGET
Auto	60% (1,223)	1,300
Transit	38% (823)	900
Other	2% (37)	N/A
<b>Total</b>	<b>100% (2,083)</b>	<b>2,200</b>

Source: Targets based on Bay Area CCTS Transbay mode shares (2015).

**Table 1-3. Link21 Mobility Survey: Trip Purpose Quotas**

PURPOSE	SAMPLE OBSERVED SHARE	TARGET
Work	51% (1,048)	1,500
School	1% (9)	75
Other	48% (989)	600
<b>Total</b>	<b>100% (2,046)</b>	<b>2,175</b>

Source: Targets based on MTC travel demand model estimated volumes across the bay by purpose (2015).

In addition to these quotas, the PMC and Dynata tracked other socioeconomic indicators, such as ethnicity and household income, to compare with census data.

**Table 1-4** and **Table 1-5** compare the transbay survey sample shares for ethnicity and income, respectively, with census shares in the Megaregion.

**Table 1-4** suggests that only 14% of transbay travelers are Hispanic or Latino, compared with a 27% census share in the Megaregion, but this smaller proportion is at least partially explained by having reached out to a lower proportion of this ethnic group



(the undersampling is due to low samples for this ethnic group from the data provider). Additionally, as shown in greater detail in Section 2.4, this share is comparable to that obtained from the National Household Travel Survey (NHTS) (14% in survey sample vs 18% in NHTS sample).

**Table 1-4. Link21 Mobility Survey: Race and Ethnicity Representation**

RACE AND ETHNICITY	TRANSBAY SAMPLE OBSERVED SHARES	MEGAREGION CENSUS SHARES
American Indian or Alaska	1% (16)	0.3%
Asian, Pacific Islander	28% (565)	19%
Native Hawaiian or Other	1% (21)	1%
Black or African-American	6% (124)	5%
Hispanic or Latino, any race	14% (290)	27%
White/Caucasian	44% (900)	40%
Multiple-race, non-Hispanic	6% (130)	8%

Source: Steer 2020 Transbay survey (Transbay sample shares) and analysis of American Community Survey (ACS) data (2017) (Megaregion census share).

**Table 1-5** does not show significant differences between the income distribution of transbay travelers and that of megaregional residents.

**Table 1-5. Link21 Mobility Survey: Household Income Representation**

HOUSEHOLD INCOME	SAMPLE OBSERVED SHARE	MEGAREGION CENSUS SHARES
Less than \$9,999	4% (77)	5%
\$10,000 - \$29,999	17% (321)	15%
\$30,000 - \$49,999	10% (192)	14%
\$50,000 - \$99,999	30% (592)	27%
\$100,000 - \$149,999	19% (377)	17%
Over \$150,000	20% (393)	23%

Source: Steer 2020 Transbay survey (Transbay sample shares) and analysis of ACS data (2017) (Megaregion census share).

## 1.5. Data Cleaning and Weighting

The 2,063 completed survey responses were reviewed for reasonableness and accuracy: 17 of them were removed during data cleaning and the remaining 2,046 surveys were used for data analysis. Criteria, such as very quick completion time (less than five minutes), inconsistent responses, or unrealistically high or low stated travel times were used to identify outliers and clean the survey of nonsensical responses.

DRAFT - DELIBERATIVE



The results in this report are *unweighted* values. Quotas based on geography, mode, and purpose ensured the survey was representative of the transbay population along these dimensions. No quotas were explicitly set on race and income. While care was taken to seek responses from a census-representative sample of the population with an emphasis on race and income, the sample provider was not able to provide enough Hispanic responses: 14% of those invited to take the survey were Hispanic or Latino, while the Megaregion census reports nearly 27% Hispanic and Latino. This is a weakness of the current survey. On the income side, the income distribution was itself close to the Federal Highway Administration's (FHWA) Megaregion NHTS<sup>4</sup> income distribution.

Quotas by geography were enforced to obtain responses in proportion to what the CTPP journey-to-work reports across the bay, as described in Section 1.4. To meet quotas, more invitations were sent to residents in Alameda and San Francisco counties compared to what their actual share of the population is.

The population of travelers that qualifies for the survey — in this case, the population that travels across the bay — is not necessarily the same as the whole Megaregion population. In fact, the composition of the population of transbay travelers is likely to be different than that of the entire region. For example, the share of travelers from counties that are closer to the crossing is higher than the share of travelers coming from further away. The share of minorities or low-income travelers across the bay may be different than that of the whole population and might be skewed by socioeconomic, cultural, and geographic imperatives. Office job workers may be more likely to travel across the bay to downtown San Francisco from one of the residential suburbs skewing the transbay population toward certain demographics. Minorities may face barriers to travel across the bay. They may travel more locally due to the nature of their work, their residence location, or they may not be traveling as much due to economic hardship or other barriers to travel.

When possible, unweighted survey results are shown next to the NHTS responses for comparison purposes.

## 1.6. Link21 Survey Structure

The survey had the following overall structure and sections:

- **Introduction** to the survey, its purpose, and how it relates to the COVID-19 situation.
- **Screening** to retain only respondents who are making qualifying trips within the area of interest.

---

<sup>4</sup> The NHTS is the authoritative source on the travel behavior of the American public. It is the only source of national data that allows one to analyze trends in personal and household travel. It includes daily non-commercial travel by all modes, including characteristics of the people traveling, their household, and their vehicles. Steer estimated the proportion of Transbay users based on OD data.



- **Qualifying trip information** to understand decision-making processes on a most recent qualifying trip (pre-COVID).
- **Behavioral and attitudinal information, including:**
  - General willingness to travel to evaluate overall propensity to travel and frequency of bay-crossing trips, including likely changes post-COVID.
  - Perceptions of ease of crossing the bay to characterize reasons for unmet bay-crossing demand.
  - Experience of using rail in the Megaregion to characterize reasons for use/lack of use of rail.
- **Socioeconomic information** to expand the sample to the population (using census data) and match responses with user groups.

**Table 1-6** summarizes the structure and focus questions within each section.

**Table 1-6. Link21 Mobility Survey Structure**

SECTION	FOCUS OF QUESTIONS
<b>Screening</b>	<ul style="list-style-type: none"> <li>▫ Ensure a trip was made within the Megaregion by any mode between San Francisco and Oakland (either direction) in the past three to six months (pre-COVID)</li> <li>▫ Aged 16 years or more</li> <li>▫ Megaregion resident</li> </ul>
<b>Qualifying Information and Characterization of Trips</b>	<ul style="list-style-type: none"> <li>▫ Questions on most recent cross-bay trip:                             <ul style="list-style-type: none"> <li>— Time since and frequency of trip</li> <li>— Ultimate origin-destination (OD)</li> <li>— Time of day</li> <li>— Day of week</li> <li>— Journey time</li> <li>— Travel party size</li> <li>— Cost of one-way trip per person (including parking costs)</li> <li>— Mode(s) used</li> <li>— Trip frequency</li> <li>— Trip purpose</li> </ul> </li> <li>▫ Rail-specific questions                             <ul style="list-style-type: none"> <li>— Station OD</li> <li>— Station access and egress modes</li> <li>— Number of transfers</li> <li>— Why did you choose rail?</li> <li>— Satisfaction with key attributes/priorities for improvement</li> </ul> </li> <li>▫ For non-rail users:                             <ul style="list-style-type: none"> <li>— Why not use rail?</li> </ul> </li> <li>▫ Willingness to pay for cross-bay travel by mode</li> </ul>

DRAFT - DELIBERATIVE



SECTION	FOCUS OF QUESTIONS
<b>Attitudinal Questions</b>	<ul style="list-style-type: none"><li>▫ Whether/the extent to which rail service levels impact how often trips are made across the bay.</li><li>▫ How strongly respondents agree/disagree with various statements regarding ease of crossing the bay, parking availability, number of transfers, etc.</li><li>▫ How will their behavior change if rail services were improved?</li><li>▫ What rail service characteristics do respondents value the most?</li><li>▫ Overall satisfaction of using various rail operators, including BART, ACE (Altamont Corridor Express) Rail, Capitol Corridor, Amtrak San Joaquin, and Caltrain.</li><li>▫ For each rail service, reasons for dissatisfaction and areas for improvements.</li><li>▫ Potential behavioral changes post-COVID.</li></ul>
<b>Socioeconomic Characterization</b>	<ul style="list-style-type: none"><li>▫ Auto ownership/availability</li><li>▫ Age</li><li>▫ Household income</li><li>▫ Household size</li><li>▫ Employment status and industry</li><li>▫ Race and ethnicity</li><li>▫ Housing and transportation cost burden</li><li>▫ Migration</li></ul>

DRAFT - DELIBERATIVE



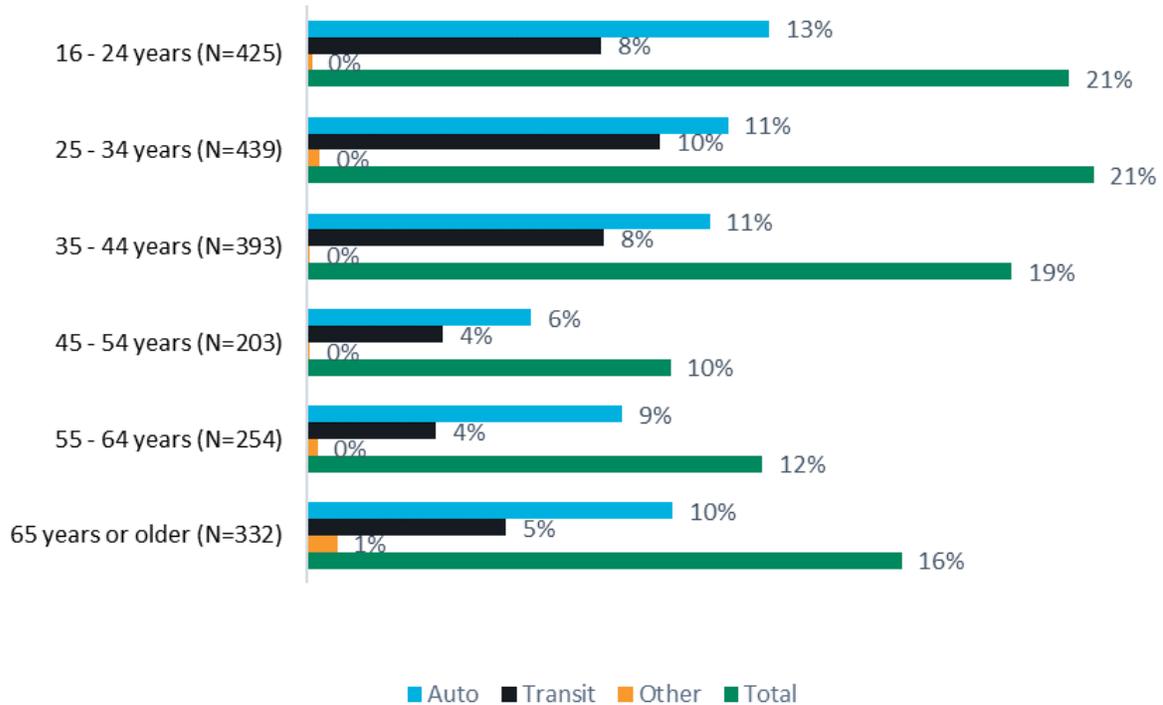


## 2.2. Age

Mode of travel across the bay by age is shown in **Figure 2-2**. Auto is the main mode for all age groups, but adults between the ages of 16-24, 25-34, and 35-44 have the highest shares of transit modes usage to cross the bay.

**Figure 2-2. Link21 Mobility Survey: Mode of Travel by Age**

Question: What category best describes your age?



DRAFT - DELIBERATIVE

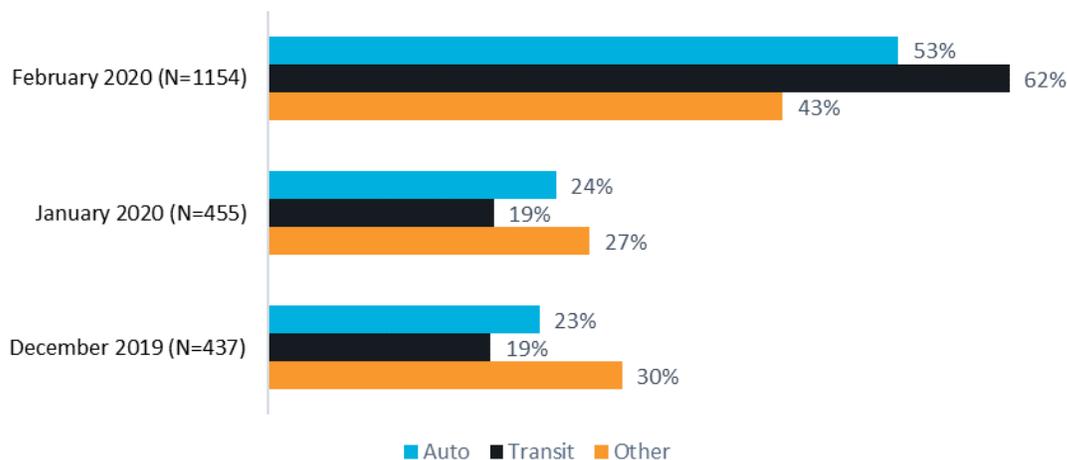
## 2.3. Trip Date

Most trips in the survey occurred in February 2020, as shown in **Figure 2-3**.



### Figure 2-3. Link21 Mobility Survey: Date of Last Trip

Question: Approximately, when was the last time you traveled across the San Francisco Bay via the Bay Bridge, BART, or any ferry services?

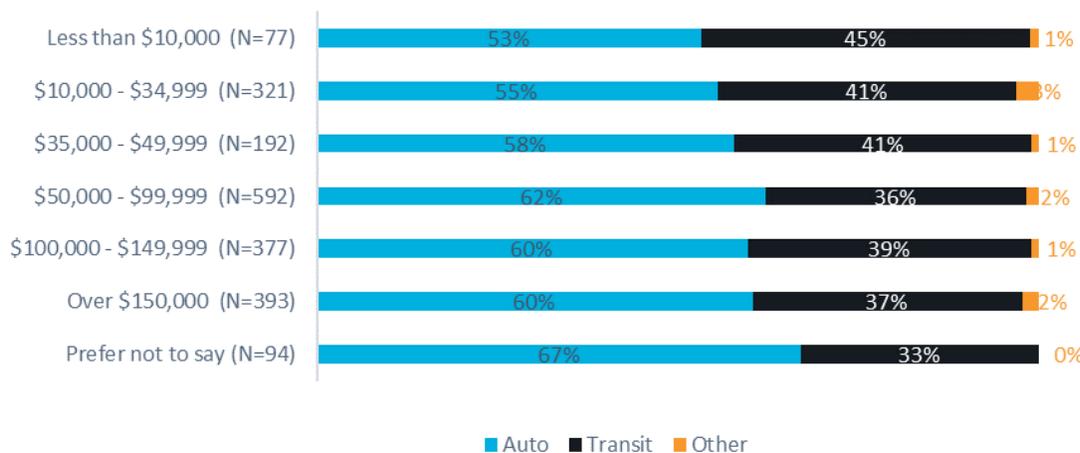


## 2.4. Socioeconomic Variables

The income distribution of the survey respondents in **Figure 2-4** is about the same as that of the general population with the top three income brackets (\$50,000 and over) representing roughly 66% (1,362 out of 2,046) of responses. Income had a moderate impact on mode usage. Respondents with income levels less than \$50,000 traveled slightly more by transit (41-45%) compared to other income groups (33-39%).

### Figure 2-4. Link21 Mobility Survey: Household Income

Question: Which of the following categories best describes your household’s total annual income before taxes for 2019?

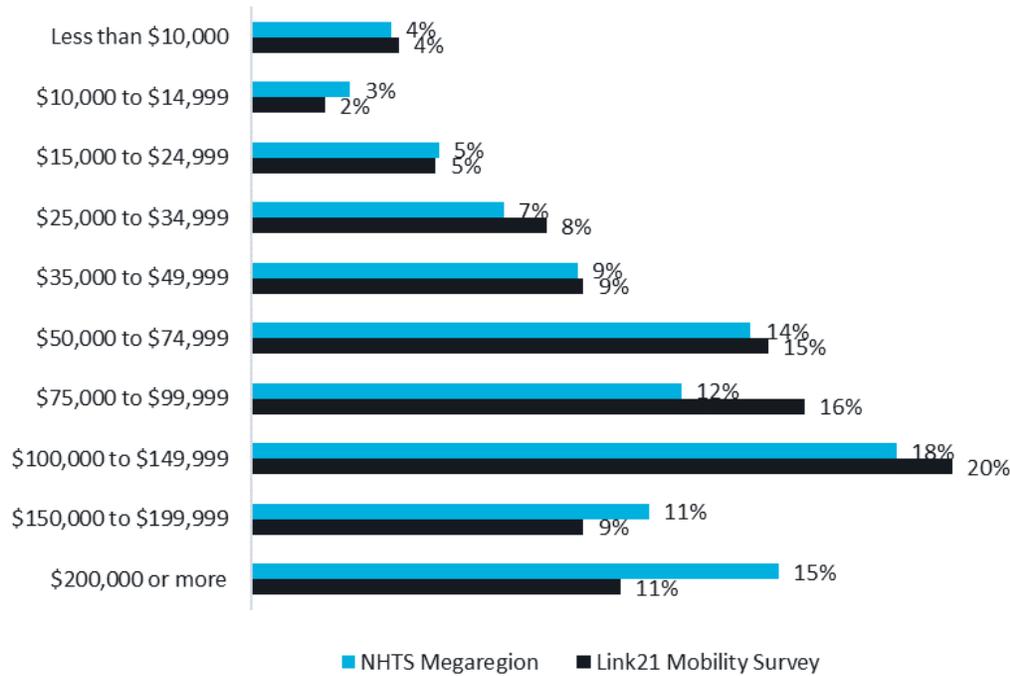


The transbay survey income distribution is close to the Megaregion NHTS income distribution, as shown in **Figure 2-5**.

DRAFT - DELIBERATIVE



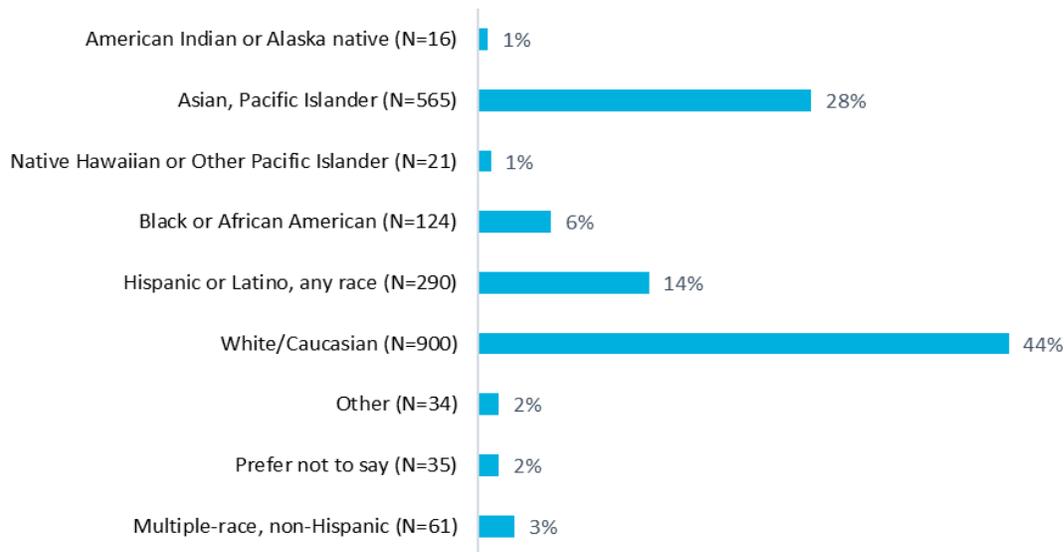
**Figure 2-5. Link21 Mobility Survey vs. Megaregion NHTS – Household Income**



**Figure 2-6** shows the ethnicity of travelers by primary mode. Only 14% of transbay travelers are Hispanic or Latino in the survey, while the Megaregion is composed of 27% Hispanic or Latino. As explained in Section 1.5, the survey was sent to a lower proportion of Hispanics due to low samples from this group.

**Figure 2-6. Link21 Mobility Survey: Race and Ethnicity**

Question: What is your race or ethnic identification?



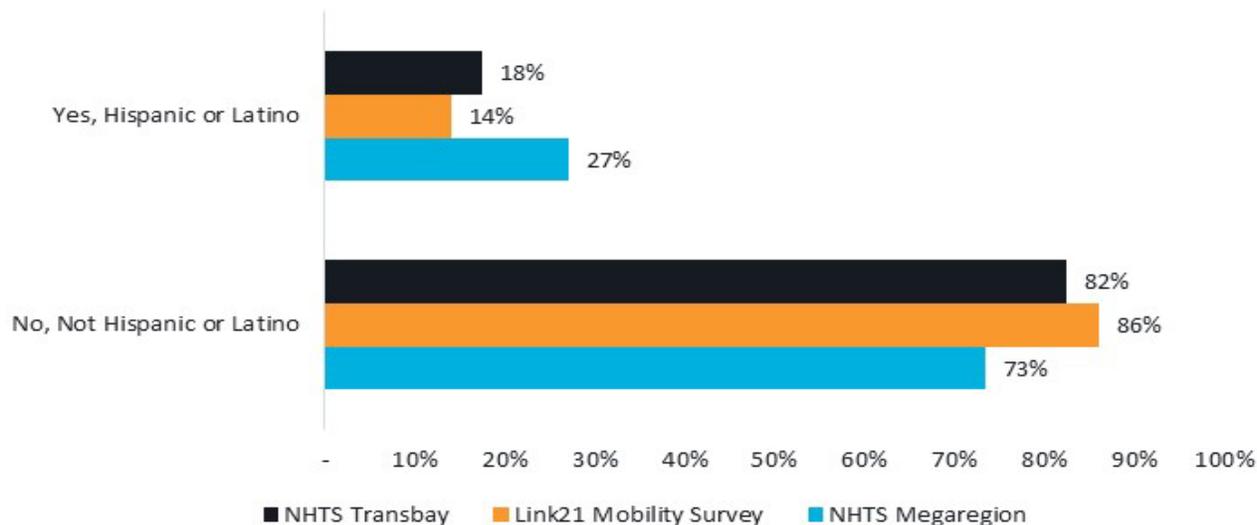
To estimate the proportion of Hispanic and Latino populations crossing the bay, a statistical analysis was performed to compare the income and ethnicity characteristics

DRAFT - DELIBERATIVE



of those likely to cross the bay<sup>5</sup> with those of the overall Megaregion population in the NHTS. As shown in **Figure 2-7**, the analysis of NHTS data (obtained from a valid, weighted sample of households across the country and the Megaregion) shows that an estimated 18% of transbay travelers are Hispanic or Latino, whereas the Megaregion is composed of 27% Hispanic or Latino.

**Figure 2-7. Link21 Mobility Survey vs. NHTS Hispanic or Latino**



DRAFT - DELIBERATIVE

<sup>5</sup> The NHTS does not provide the path used by travelers; instead those likely to cross the bay based on the origin and destination of their trips were identified.



**INTENTIONALLY LEFT BLANK**

DRAFT - DELIBERATIVE



### 3. MEGAREGION TRAVELER MODE PREFERENCES

As noted in the previous section, the travel and trip characteristics, described in this and subsequent sections, were developed based on the surveys that have been screened using quotas described in Section 1.4. The market analysis uses more reliable data sources for travel volumes and patterns, trip purposes, mode shares, and times of travel, which were processed and analyzed to represent the entire Megaregion. Information on general existing and future conditions should be obtained from the sources described in Appendix A and in the main body of the report.

#### 3.1. Trip Characteristics

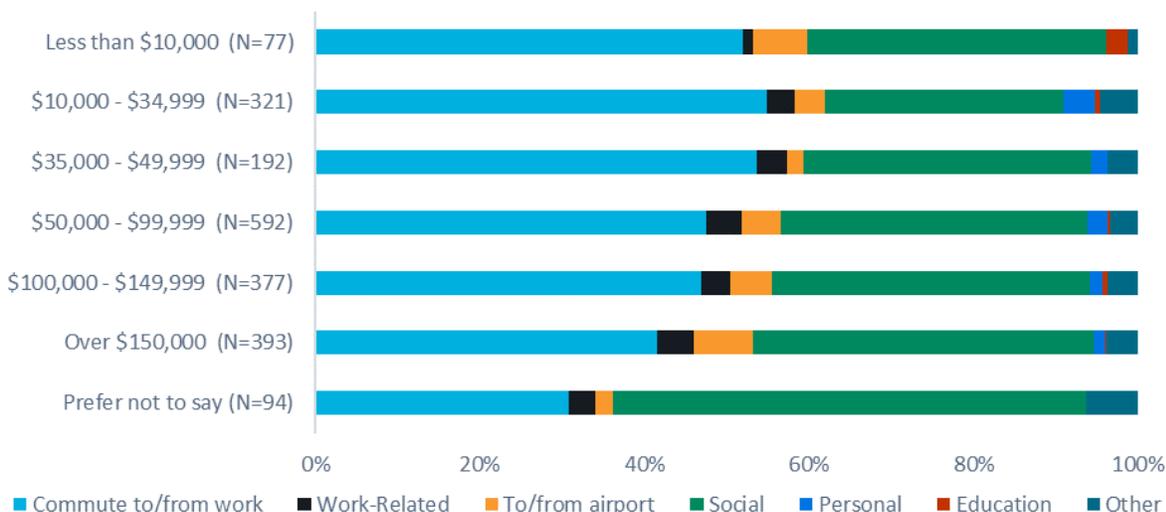
##### 3.1.1. Trip Purpose

Figure 3-1 shows the breakdown of trip purposes by income groups. The proportion of social trips (which included visiting friends/family, shopping, restaurants, outdoors, and events) increased as income increased.

Figure 3-1. Link21 Mobility Survey: Income and Trip Purpose

Question 1: What was the primary purpose of this trip?

Question 2: Which of the following categories best describes your household’s total annual income before taxes for 2019?



##### 3.1.2. Trip Distance

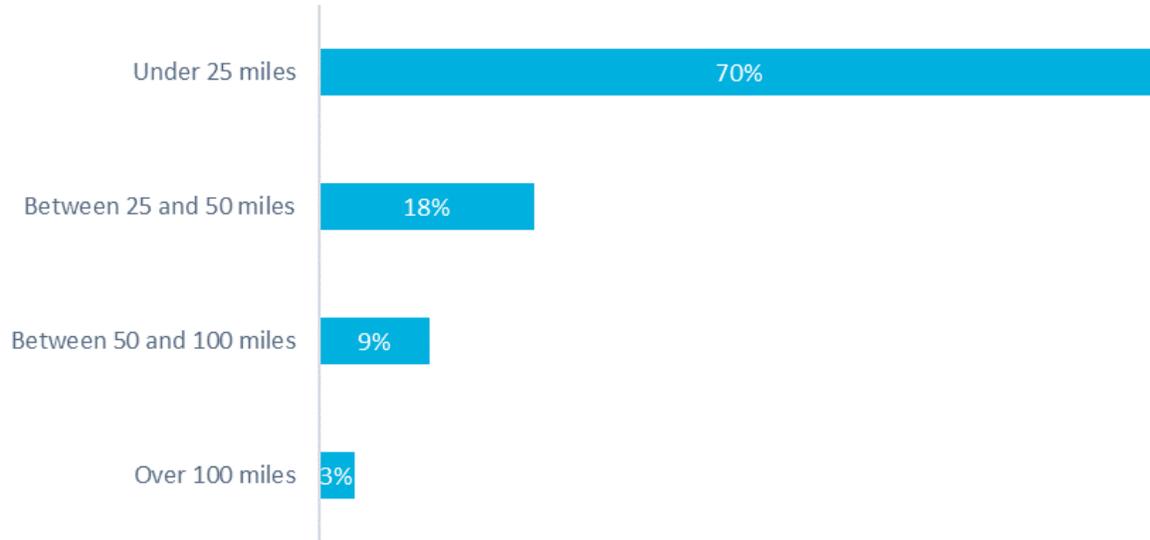
More than 70% of trips surveyed were less than 25 miles. For reference, the analysis of the NHTS survey shows that about 59% of the in-scope trips in the Megaregion (trips crossing the bay) are under 25 miles. As such, factors impacting longer-distance travelers may be underrepresented in the survey responses.

DRAFT - DELIBERATIVE



### Figure 3-2. Link21 Mobility Survey: Travel Distance

Question: Where did you start and end this trip (click on the map)?



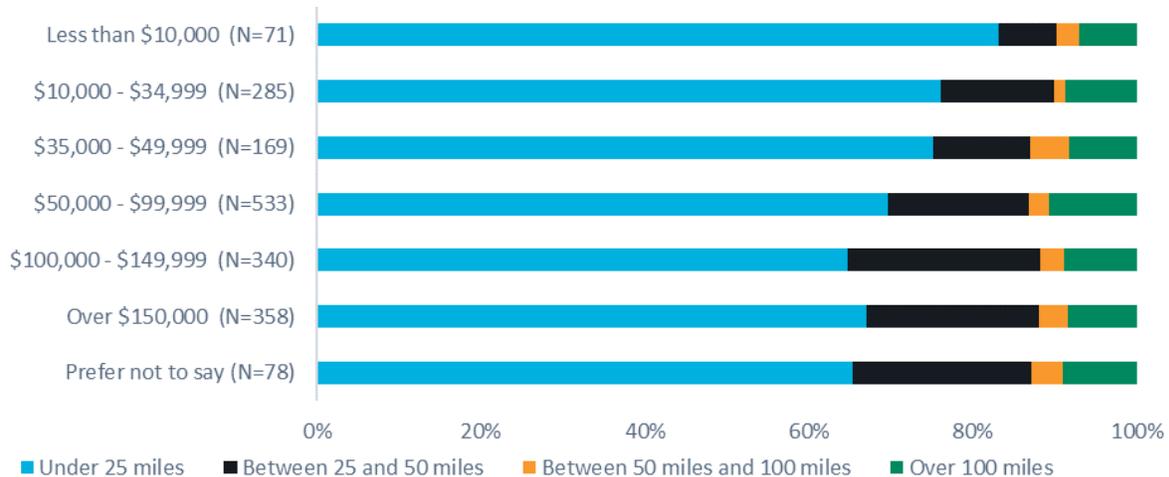
**Figure 3-3** represents travel distance by income; 211 out of 2,046 records were removed because of unreasonable origin or destination clicked by respondents (e.g., origin and destination are at the same place). Respondents with an income of less than \$35,000 tend to take more short-distance trips compared to those whose income is greater than \$100,000.

The NHTS survey corroborated the finding that lower income households tend to travel shorter distances compared to other income groups.

### Figure 3-3. Link21 Mobility Survey: Travel Distance by Income

Question 1: Where did you start and end this trip (click on the map)?

Question 2: Which of the following categories best describes your household’s total annual income before taxes for 2019?



DRAFT - DELIBERATIVE

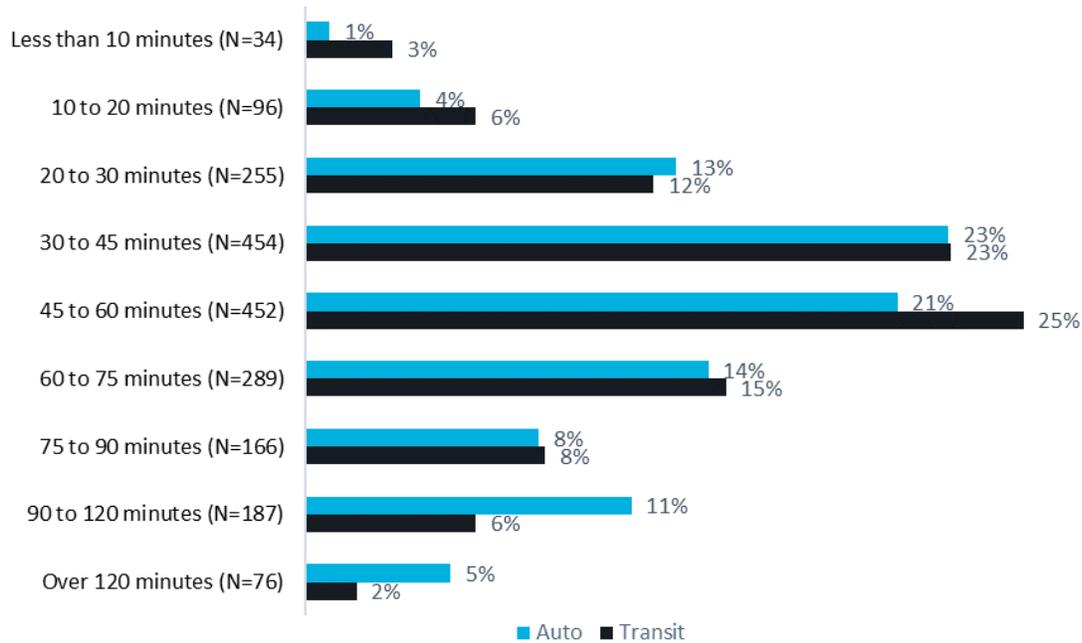


### 3.1.3. Journey Time

Reported journey times are shown in **Figure 3-4**. Median travel time for both auto and transit users is between 45 and 60 minutes. Auto users' mean travel time is slightly higher than that of transit users at 60 minutes for auto versus 50 minutes for transit. This may be due to higher propensity to use auto for trips with longer journey times or traffic congestion crossing the bay.

**Figure 3-4. Link21 Mobility Survey: Journey Time**

**Question: How long did it take you to make this one-way trip?**



DRAFT - DELIBERATIVE

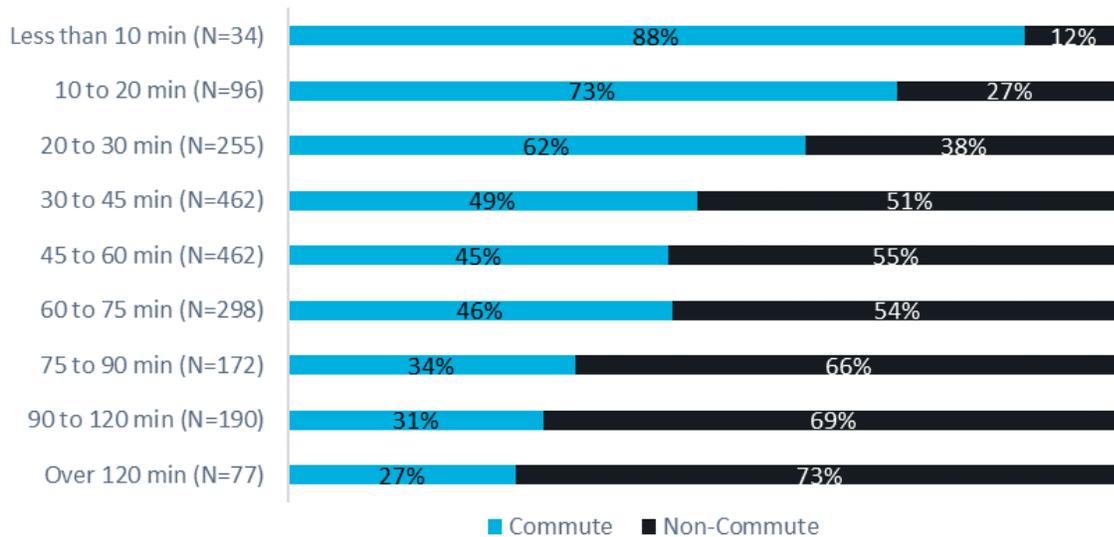


Figure 3-5 shows journey time by trip purpose. Commute trips are on average 49 minutes long (median between 30 and 45 minutes) and are typically shorter than non-commute trips (mean 62 minutes, median between 45 and 60 minutes).

Figure 3-5. Link21 Mobility Survey: Journey Time by Trip Purpose

Question 1: How long did it take you to make this one-way trip?

Question 2: What was the primary purpose of this trip?

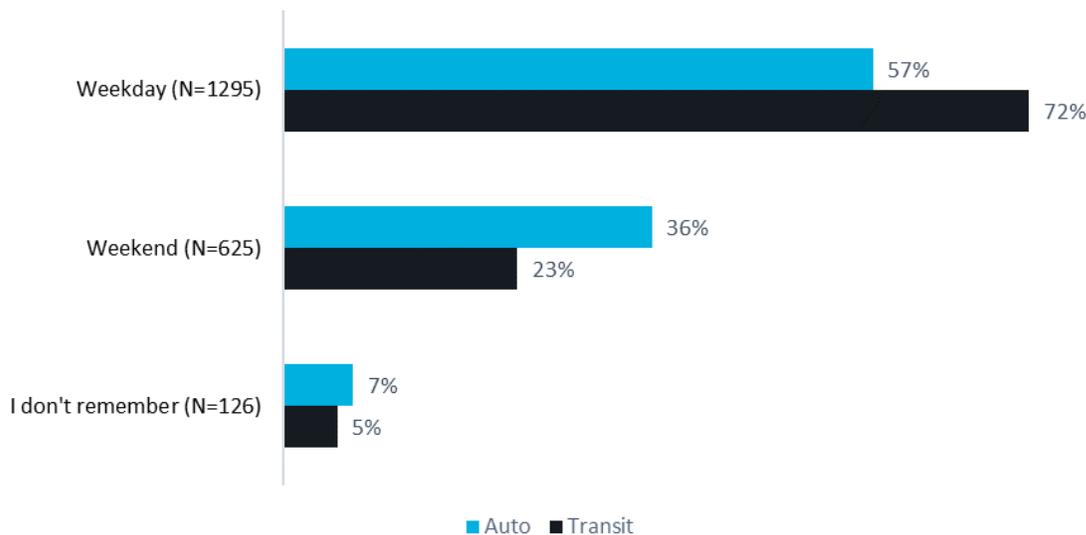


### 3.1.4. Day of the Week

In Figure 3-6, 63% (1,295 out of 2,046) of trips take place on a weekday. While almost 50% of weekday trips are made by transit, only 30% of weekend trips are made by transit.

Figure 3-6. Link21 Mobility Survey: Day of the Week

Question: What day of week did this trip occur?



DRAFT - DELIBERATIVE

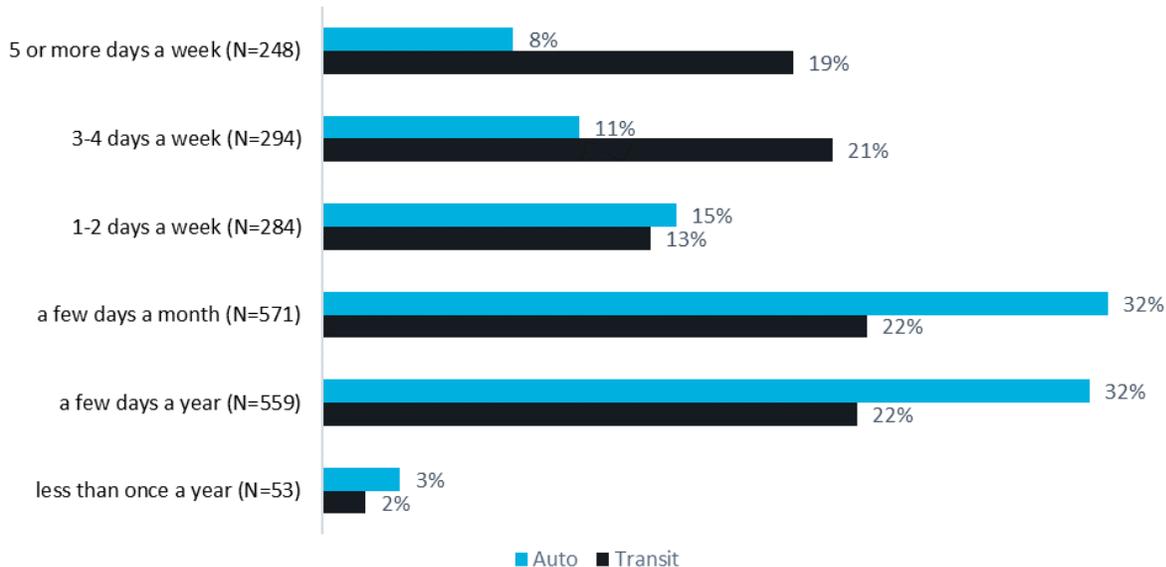


### 3.1.5. Frequency

In **Figure 3-7**, over 40% (826 out of 2,009 — removed 37 responses with “Other” modes) of respondents cross the bay at least once a week. As the frequency of trips decreased, travel by transit decreased, indicating that travelers who cross the bay on a regular basis (more than three days a week) are more likely to use transit.

**Figure 3-7. Link21 Mobility Survey: Trip Frequency**

**Question: Before COVID-19, how frequently did you travel between the east side and the west side of the San Francisco Bay by any type of transportation?**



### 3.1.6. Travel Party

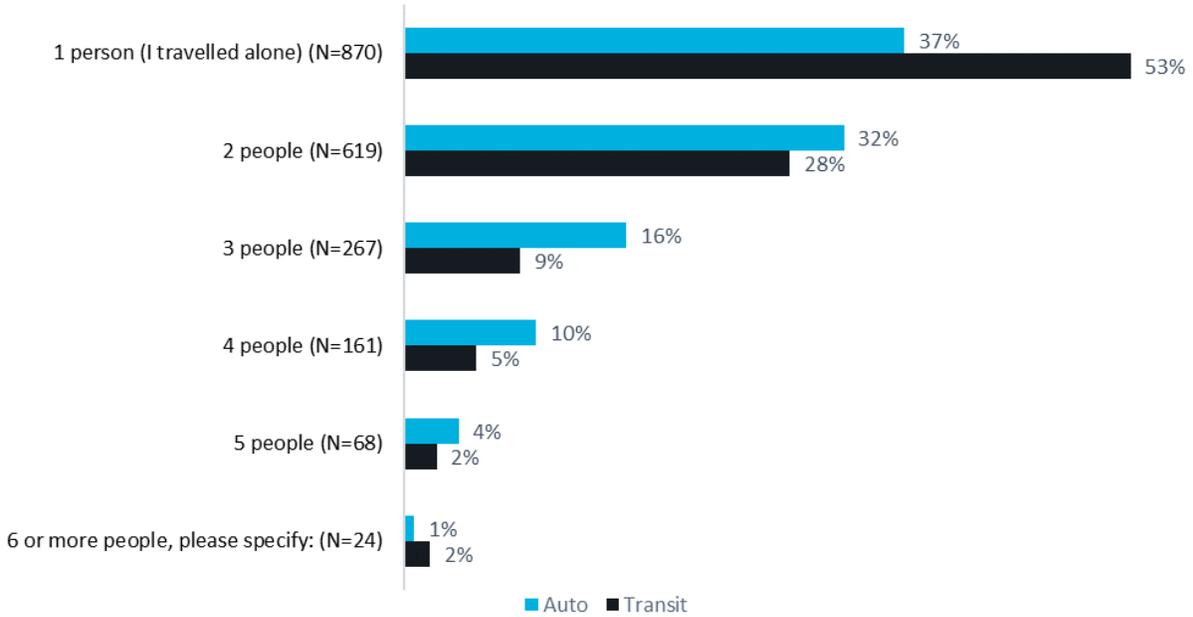
In **Figure 3-8**, 74% (1,489 out of 2,009 — removed 37 responses with “Other” modes) of respondents traveled between the east side and west side of the bay with one other person or by themselves. Additionally, the difference in mode share distribution among travel party size could be attributed to cost sharing (i.e., the per-person cost of driving decreases as party size increases but stays the same for using transit) and/or ease or comfort of driving with someone else compared to using transit.

DRAFT - DELIBERATIVE



### Figure 3-8. Link21 Mobility Survey: Number of People Traveling Together

Question: How many people, including yourself, travelled together between the east side and west side of the San Francisco Bay on your most recent trip?



DRAFT - DELIBERATIVE



## 4. MEGAREGION TRAVELER CHARACTERISTICS

### 4.1. Equity Indicators

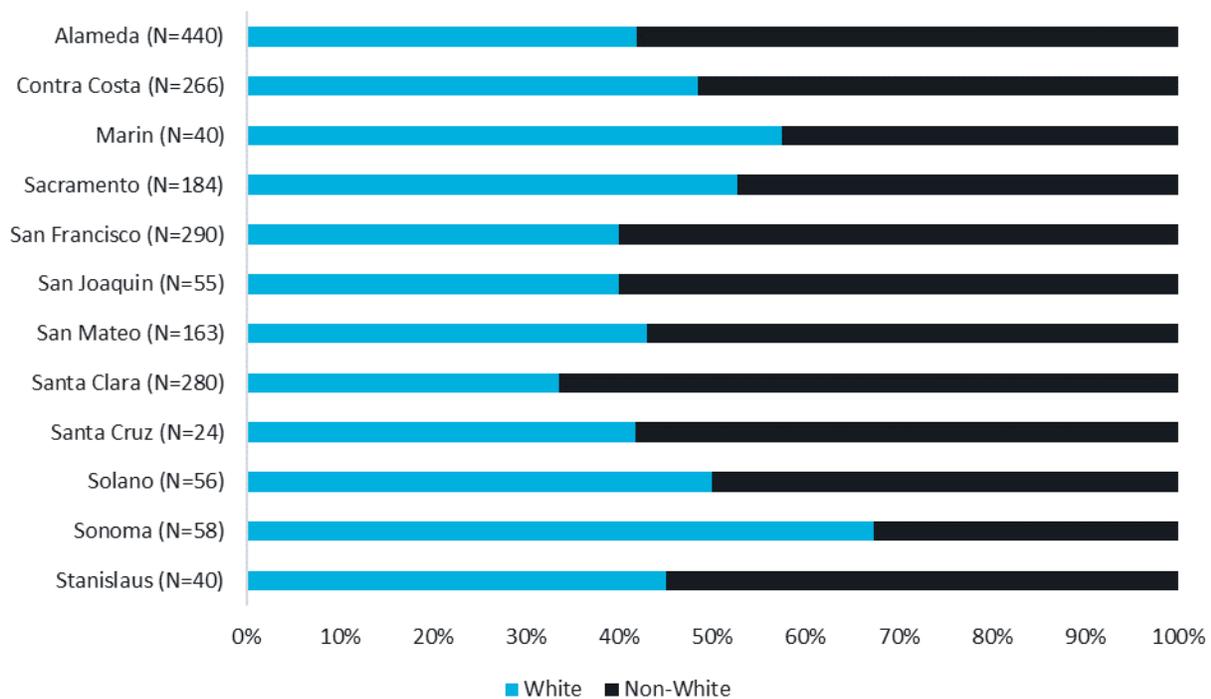
#### 4.1.1. Race and Ethnicity

Over half of the transbay travelers sampled are non-white. **Figure 4-1** shows the proportions of non-white respondents by county. The highest proportion of non-white respondents are in Santa Clara, San Francisco, and Alameda counties.

**Figure 4-1. Link21 Mobility Survey: Race and Ethnicity by County**

Question 1: What is your race or ethnic identification?

Question 2: What is your home Zip Code (County)?



DRAFT - DELIBERATIVE

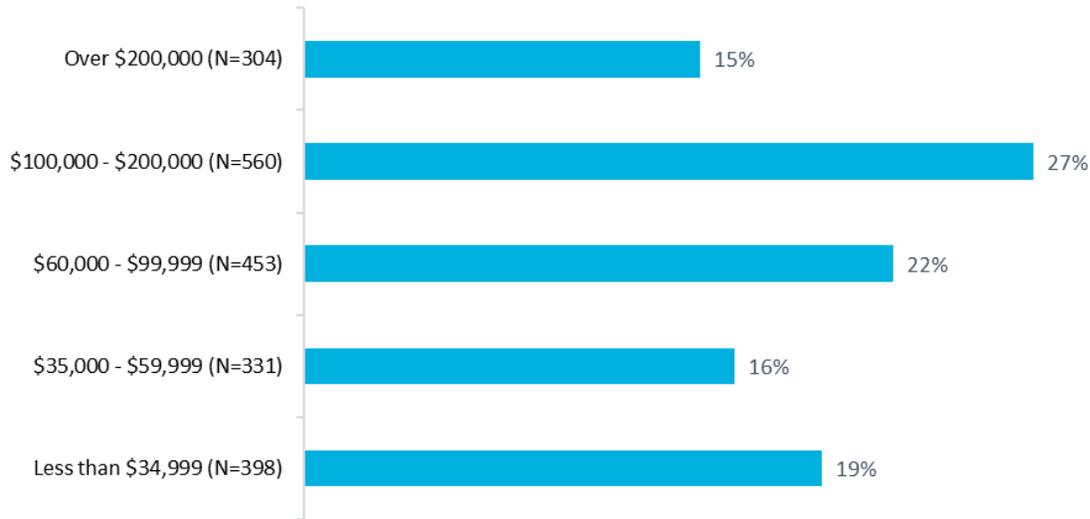


### 4.1.2. Household Income

Figure 4-2 presents household income distribution. The results indicate that 19% of the respondents have a household income of less than \$35,000, while 42% have an income of over \$100,000.

Figure 4-2. Link21 Mobility Survey: Household Income

Question: Which of the following categories best describes your household’s total annual income before taxes for 2019?

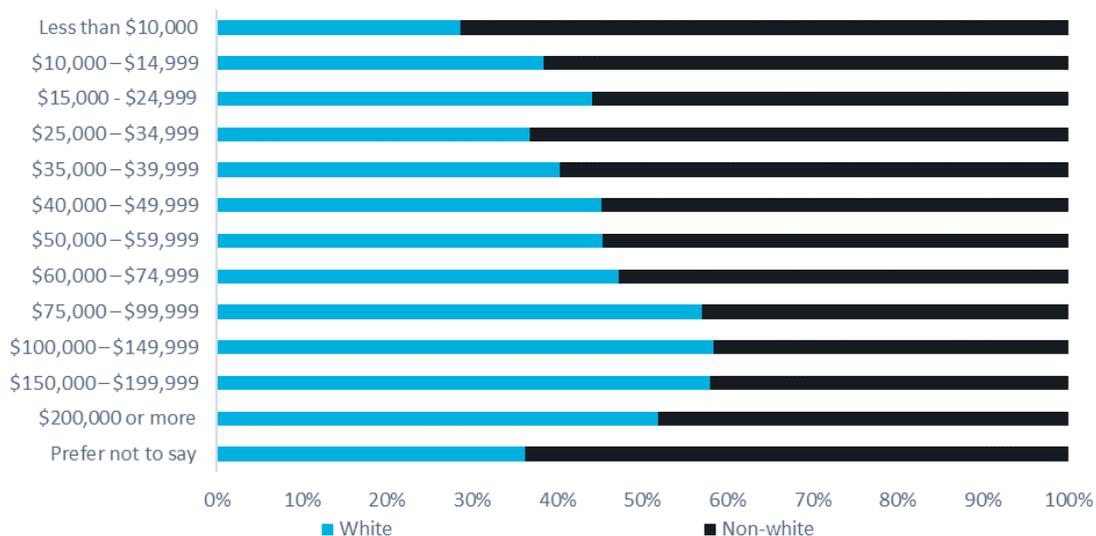


As shown in Figure 4-3, there was a greater share of non-white respondents with an income of less than \$35,000 compared to respondents that identified as White/Caucasian.

Figure 4-3. Link21 Mobility Survey: Ethnicity and Household Income

Question 1: Which of the following categories best describes your household’s total annual income before taxes for 2019?

Question 2: What is your race or ethnic identification?



DRAFT - DELIBERATIVE



Figure 4-4 and Figure 4-5 show the household income distribution by county for non-white and white respondents, respectively.

**Figure 4-4. Link21 Mobility Survey: Income for Non-white Respondents by County**

**Question 1: Which of the following categories best describes your household's total annual income before taxes for 2019?**

**Question 2: What is your race or ethnic identification?**

**Question 3: What is your home Zip Code? (County)?**

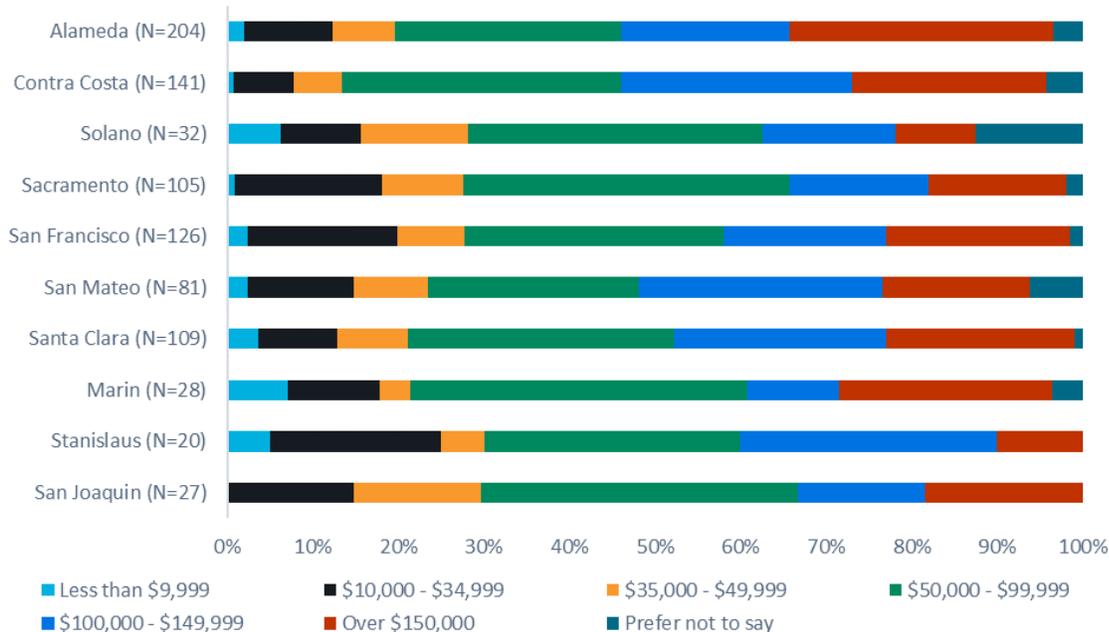


**Figure 4-5. Link21 Mobility Survey: Income for White Respondents by County**

**Question 1: Which of the following categories best describes your household's total annual income before taxes for 2019?**

**Question 2: What is your race or ethnic identification?**

**Question 3: What is your home Zip Code? (County)?**



DRAFT - DELIBERATIVE

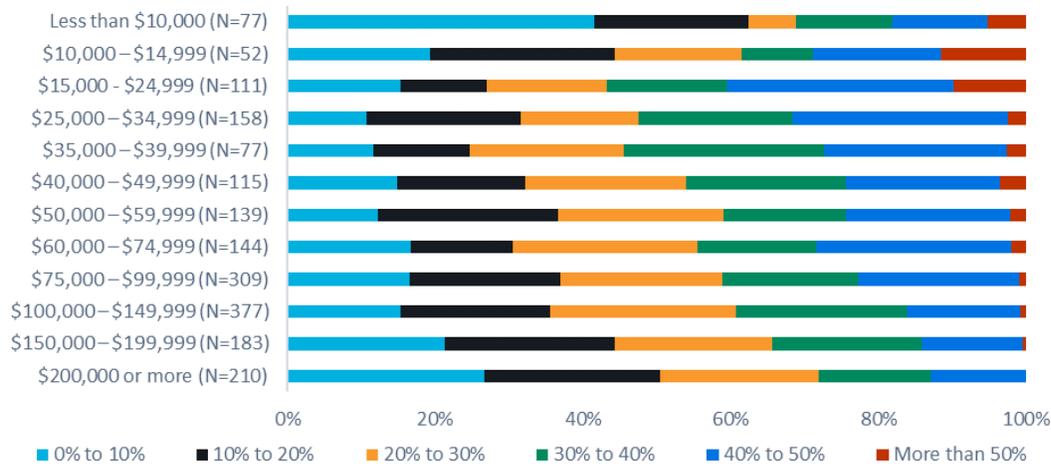


### 4.1.3. Housing and Transportation Costs

Respondents were asked how much of their income was spent on housing and transportation costs. **Figure 4-6** illustrates the distribution of housing cost shares by income bracket. Half or more of the households in many income brackets spend more than 30% of their income on housing costs. Respondents with housing costs greater than 40% of their income are frequently in lower income brackets. This does not hold for the lowest income bracket (less than \$10,000), and this may be explained by free or subsidized housing or house-sharing arrangements.

**Figure 4-6. Link21 Mobility Survey: Housing Costs by Income**

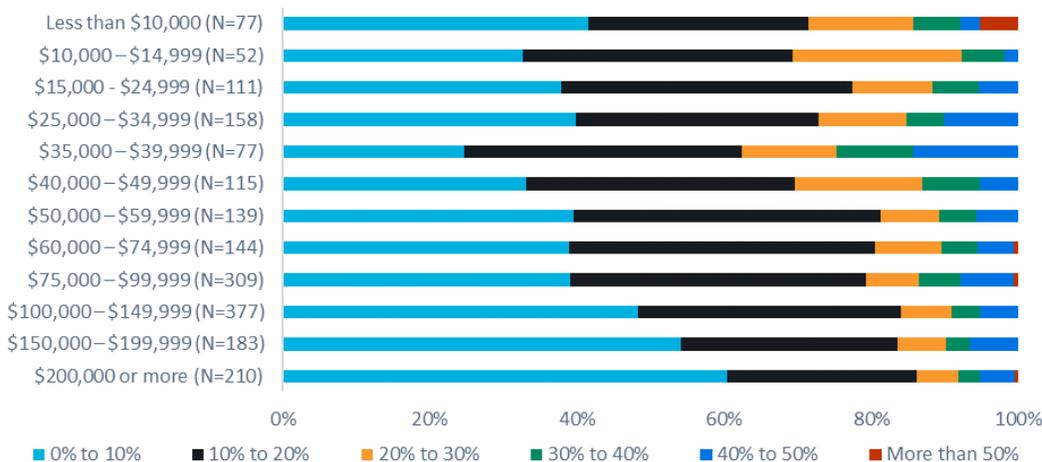
**Question: Approximately, how much of your income (percentage, %) do you spend on housing costs ?**



For transportation costs, as shown in **Figure 4-7**, there are fewer disparities across income groups, except that the share of income spent on transportation decreases for households with incomes above \$100,000.

**Figure 4-7. Link21 Mobility Survey: Household Transportation Costs by Income**

**Question: Approximately, how much of your income (percentage, %) do you spend on transportation?**



DRAFT - DELIBERATIVE

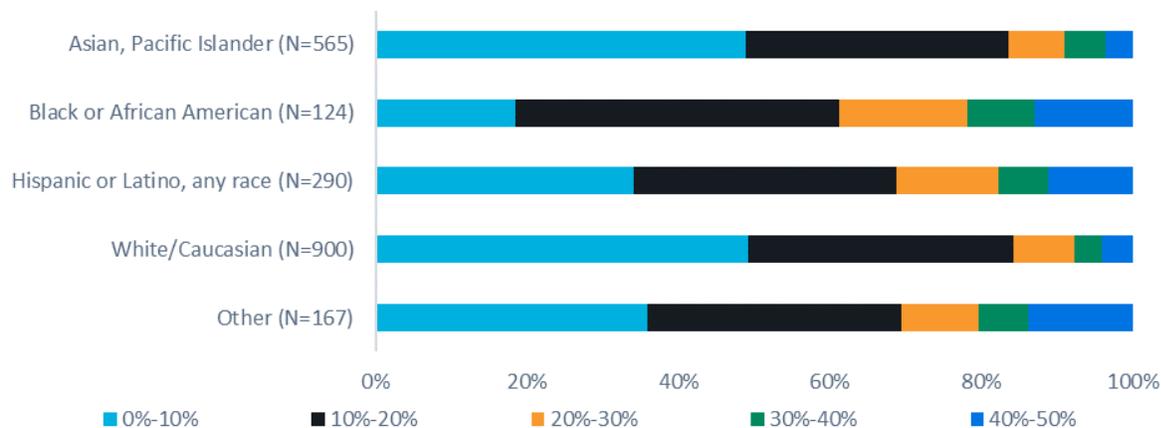


Overall, most travelers spend less than 20% of their household income on transportation costs. More than half of San Francisco households spend less than 10% of their income on transportation. This makes sense given its denser transit network, the potentially lower cost of using transit than owning and driving a car, and the closer proximity to jobs for many households relative to the Megaregion.

As shown in **Figure 4-8**, White/Caucasian and Asian, Pacific Islander respondents spend less of their income on transportation costs compared to others. The highest burden of transportation cost relative to household income falls into the Hispanic or Latino and Black or African-American groups.

**Figure 4-8. Link21 Mobility Survey: Household Transportation Costs by Race and Ethnicity**

**Question 1: Approximately, how much of your income (percentage, %) do you spend on transportation costs (e.g. car purchase/lease/loan payment, insurance, maintenance, gas & oil, tires, parking, tolls, transit fares, etc)?**  
**Question 2: What is your race or ethnic identification?**



**4.1.4. Vehicle Availability**

Vehicle ownership by primary mode is illustrated in **Figure 4-9**; which shows that vehicle ownership does not vary significantly by mode used. Most of the respondents that identified transit (BART, bus, ferry) as their primary mode live in a household with a vehicle available to them.

DRAFT - DELIBERATIVE



### Figure 4-9. Link21 Mobility Survey: Vehicle Availability

Question 1: Do you have a car or motorcycle available to you for your trip across the bay?  
Question 2: How did you travel across the bay for this reported trip (portion of the trip crossing the Bay)?

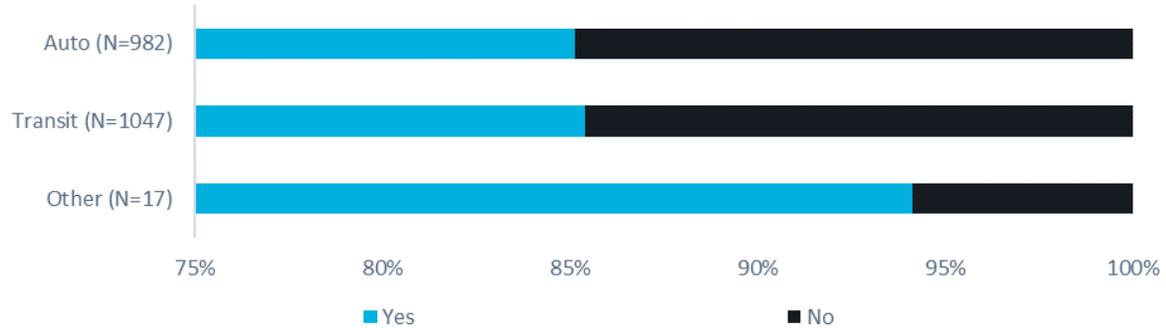
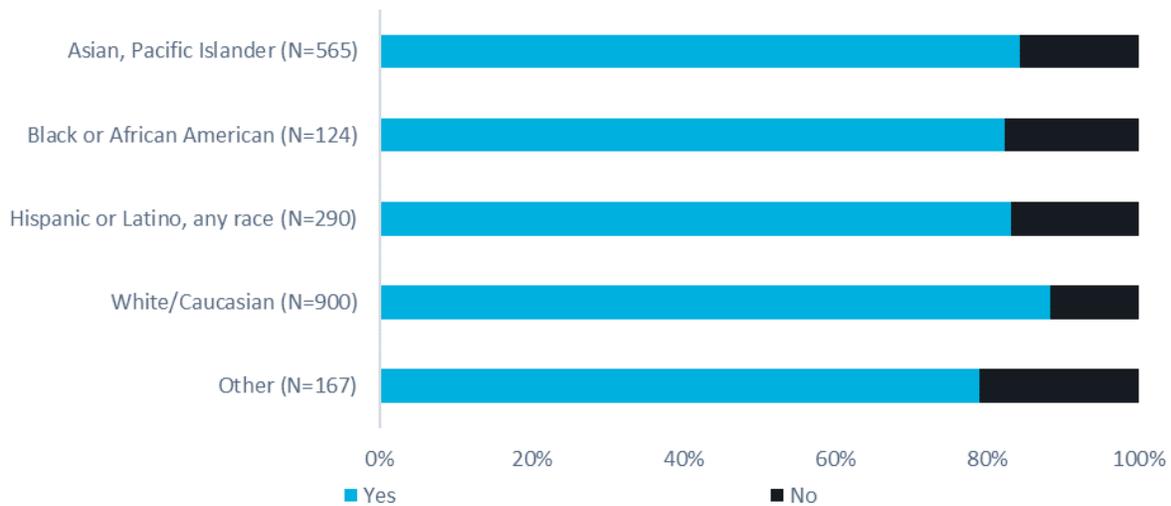


Figure 4-10 represents vehicle availability by race and ethnicity. Vehicle ownership does not vary significantly by race and ethnicity.

### Figure 4-10. Link21 Mobility Survey: Vehicle Availability by Race and Ethnicity

Question 1: Do you have a car or motorcycle available to you for your trip across the bay?  
Question 2: What is your race or ethnic identification?



DRAFT - DELIBERATIVE

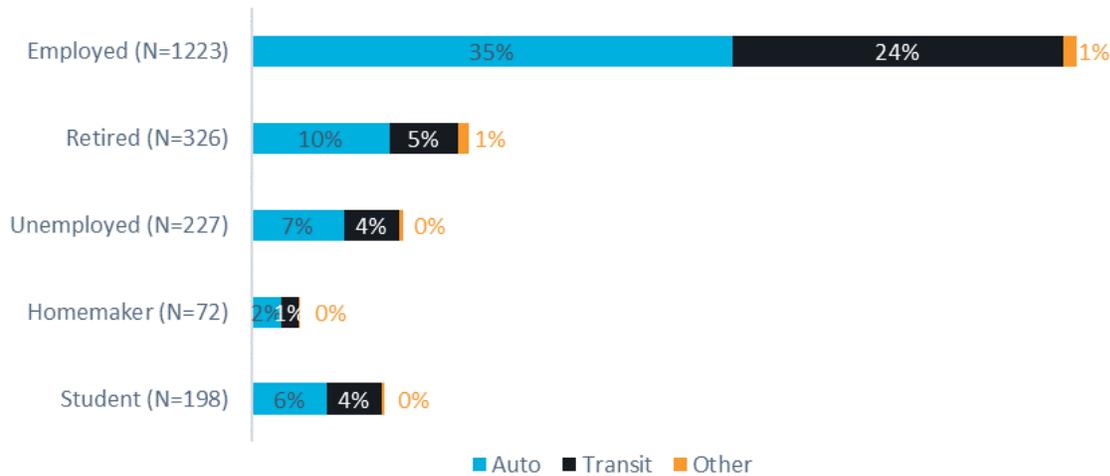


### 4.1.5. Employment and Occupation

As shown in **Figure 4-11**, about 60% (1,223 out of 2,046) of respondents are employed.

**Figure 4-11. Link21 Mobility Survey: Employment Status**

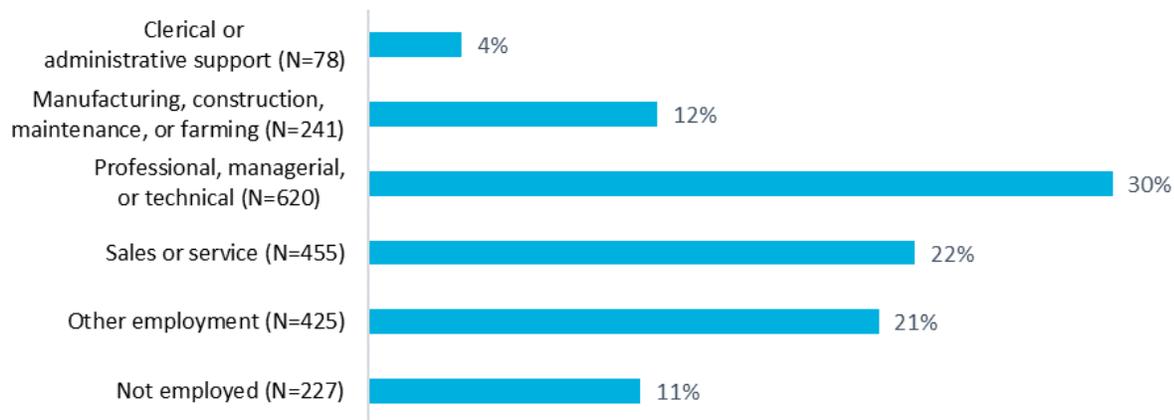
**Question: Which of the following categories best describes employment status?**



**Figure 4-12** represents types of work for respondents in the survey, of which 30% are professional, managerial, or technical, and 11% are not employed.

**Figure 4-12. Link21 Mobility Survey: Industry Type**

**Question: What best describes your type of work?**



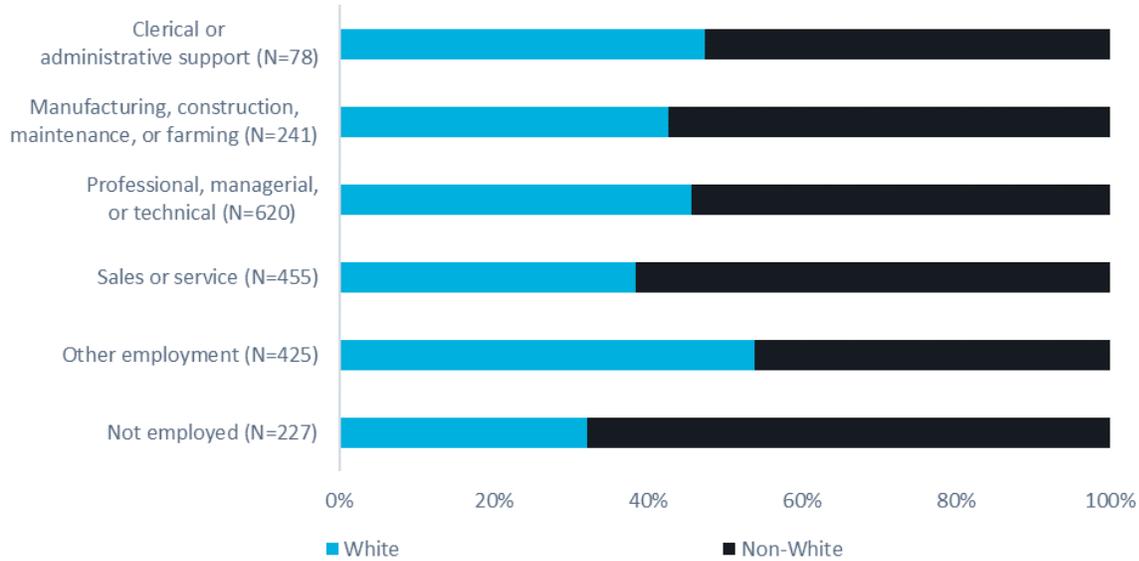
DRAFT - DELIBERATIVE



Figure 4-13 represents industry type by race and ethnicity. The number of white and non-white respondents does not vary significantly in clerical or administrative support, manufacturing, construction, maintenance, farming, professional, managerial, and technical jobs. However, it appears that white respondents are slightly less likely to be in the “Sales or Service” or “Not employed” categories.

Figure 4-13. Link21 Mobility Survey: Industry Type by Race and Ethnicity

Question 1: What best describes your type of work?  
Question 2: What is your race or ethnic identification?



As shown in Figure 4-14, clerical or administrative support, professional, managerial, technical, and other employment tends to have higher incomes.

Figure 4-14. Link21 Mobility Survey: Industry Type by Household Income

Question 1: What best describes your type of work?  
Question 2: Which of the following categories best describes your household’s total annual income before taxes for 2019?



DRAFT - DELIBERATIVE



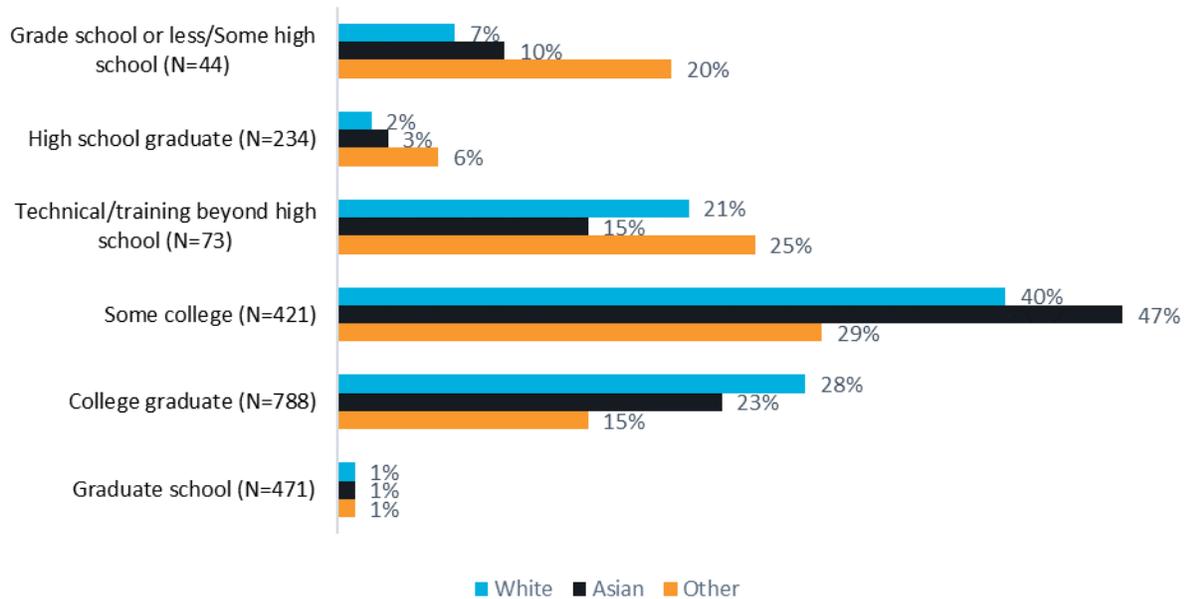
### 4.1.6. Educational Attainment

As shown in **Figure 4-15**, white and Asian respondents tend to have higher levels of education compared to other races. About 70% of white and Asian respondents completed some college or higher.

**Figure 4-15. Link21 Mobility Survey: Education Level**

**Question 1: What is the highest level of education you completed?**

**Question 2: What is your race or ethnic identification?**



## 4.2. Other Household Characteristics

### 4.2.1. Household Size

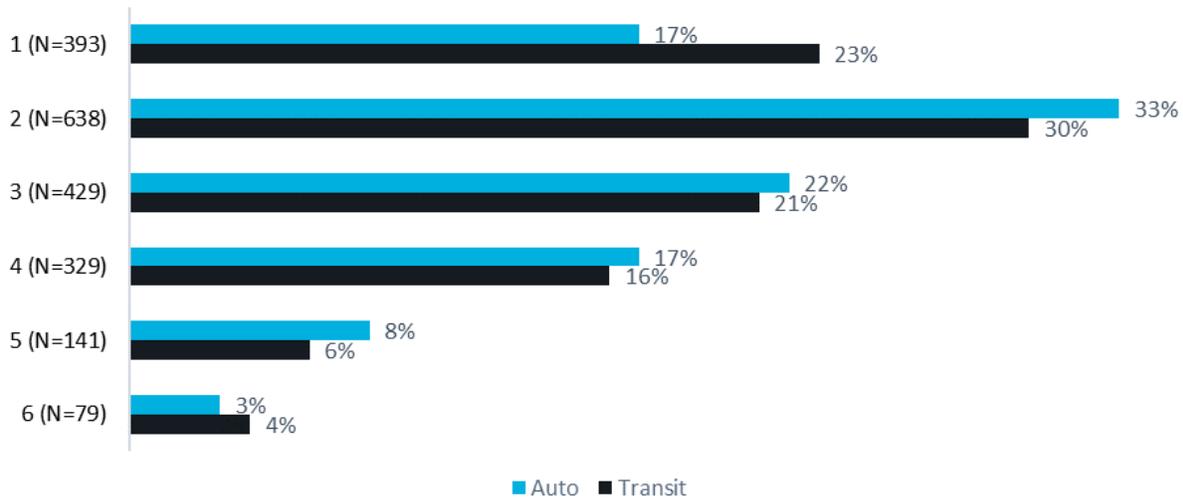
As shown in **Figure 4-16**, the most common responses for household size are two or three persons. In single-person households, transit users make up a greater share compared to other household sizes.

DRAFT - DELIBERATIVE



**Figure 4-16. Link21 Mobility Survey: Household Size**

**Question: Including yourself, how many people live in your household?**



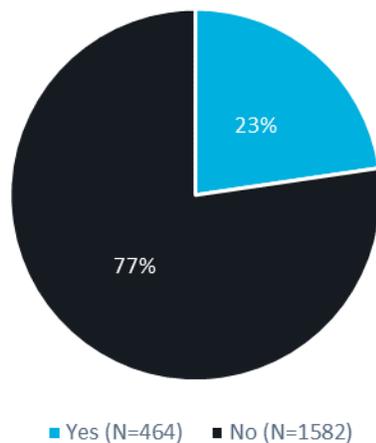
### 4.2.2. Housing Relocation

Respondents were asked if they had relocated in the past three years as a result of increasing housing costs.

**Figure 4-17** shows the results. Overall, 23% of respondents said they had moved as a result of increased housing costs. On the other hand, housing costs can also serve as a barrier or disincentive to moving, (e.g., residents under rent control or who own their property may want to move but cannot afford anything else in their area or the broader Megaregion). The breakdown by racial and income brackets are presented in **Figure 4-18** and **Figure 4-19**.

**Figure 4-17. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs**

**Question: Have you had to move in the past 3 years because of increasing housing costs?**



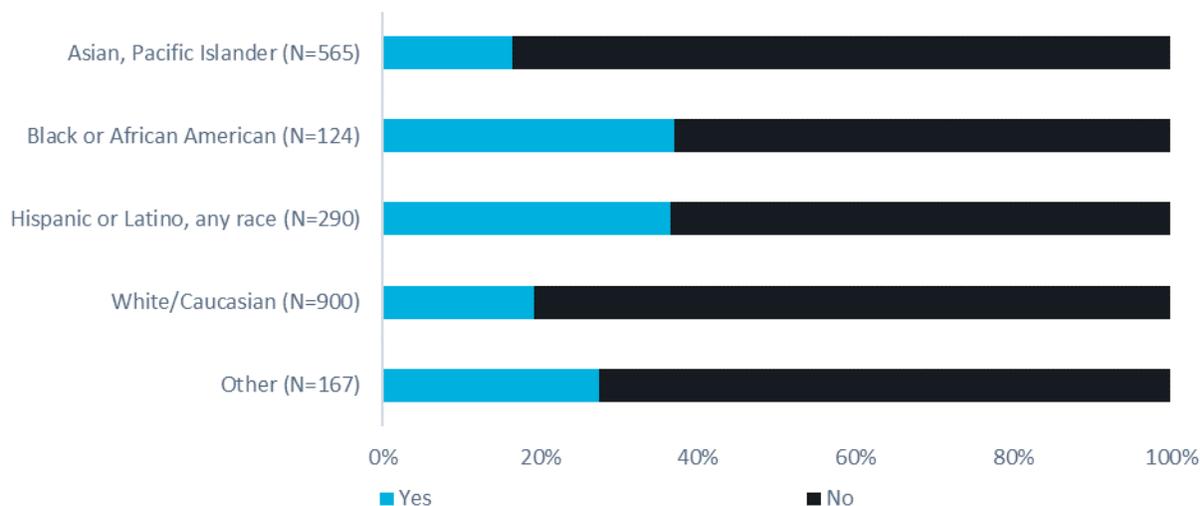
Black or African-American and Hispanic respondents were more likely to have stated that they had moved due to rising housing costs compared to white and Asian respondents.

DRAFT - DELIBERATIVE



**Figure 4-18. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs by Race and Ethnicity**

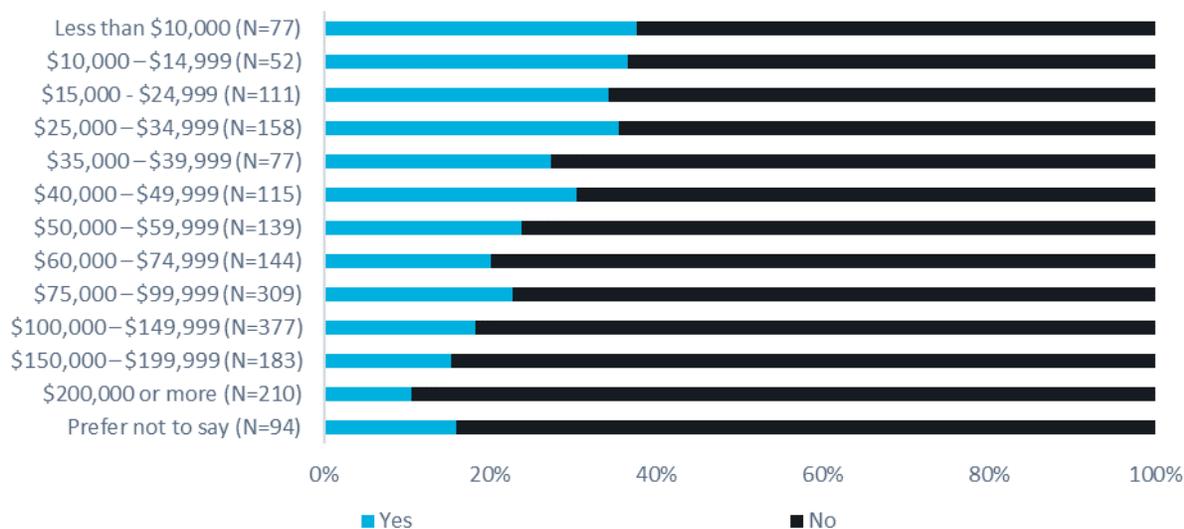
**Question 1: Have you had to move in the past 3 years because of increasing housing costs?**  
**Question 2: What is your race or ethnic identification?**



**Figure 4-19** shows the relationship between income and moving as a result of rising housing costs. As income increases, the proportion of respondents that are moving as a result of housing costs decreases.

**Figure 4-19. Link21 Mobility Survey: Moving as a Result of Rising Housing Costs by Household Income**

**Question 1: Have you had to move in the past 3 years because of increasing housing costs?**  
**Question 2: Which of the following categories best describes your household’s total annual income before taxes for 2019?**



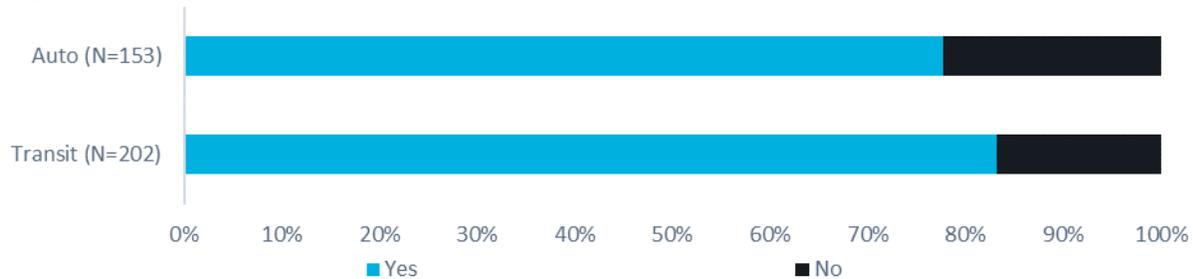
DRAFT - DELIBERATIVE



Figure 4-20 illustrates the subset of respondents that selected ‘yes’ in the relocation question. The survey asked those respondents if their typical commute to work and/or school was longer as a result of moving. Based on the responses, commute times have increased for all modes, though the most impact has been experienced by transit users. A higher share of transit users have moved to areas which have resulted in longer transit commute times.

**Figure 4-20. Link21 Mobility Survey: Increased Commuting Travel Time as a Result of Moving**

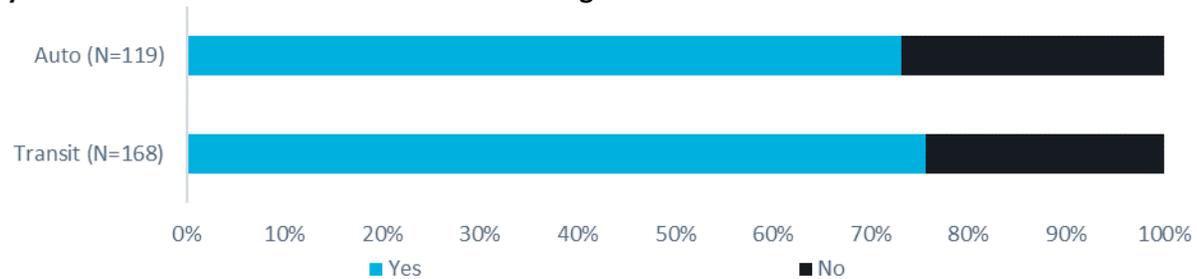
Question: Has your typical commute to work and/or school gotten longer because of having to move?



The survey also asked those respondents who had to move and whose commutes had increased if their rail accessibility had decreased as a result of the move. Figure 4-21 illustrates the responses for those travelers.

**Figure 4-21. Link21 Mobility Survey: Decreased Rail Access as a Result of Moving**

Question: Since you have moved due to rising housing costs and commute times increased, has your access to rail decreased because of having to move?



DRAFT - DELIBERATIVE



## 5. CONSTRAINTS AND INCENTIVES TO USE RAIL

### 5.1. Ease of Crossing the Bay

The survey asked respondents about their perception of ease of crossing the bay along various dimensions, including mode of travel, time of day, and reasons for or against choosing a particular mode.

Respondents were asked how strongly they agree or disagree with the statements above by selecting “Agree”, “Somewhat agree”, “Neither agree nor disagree”, “Somewhat disagree” and “Disagree”. **Table 5-1** presents the proportion of respondents that selected “Agree” and “Somewhat agree” for each statement. Results indicate that most users find it easy to cross the bay using their car and transit (BART), though this might depend on the time of day.

**Table 5-1. Link21 Mobility Survey: Ease of Crossing the Bay**

STATEMENTS	PERCENTAGE OF “I AGREE” AND “SOMEWHAT AGREE” RESPONSES
Depending on the time of day, I find it easy to cross the bay using a car.	68%
I find it easy to cross the bay using a car.	66%
I make all the trips I would like to across the bay.	63%
I find it easy to cross the bay using BART.	62%
Depending on the time of day, I find it easy to cross the bay using BART.	61%
Transfers make trips across the bay on transit inconvenient.	56%
Trips across the bay on transit take too long.	54%
Lack of parking space at stations prevent me from using transit to cross the bay.	53%
Crowded trains prevent me from using transit to cross the bay.	52%
The length of my commute causes me stress and negatively impacts my health.	38%
I find it easy to cross the bay using other transit services (buses and ferries).	38%
The length of my commute negatively impacts my family.	34%
I use the train because I have no other choice but would prefer a better option.	33%

DRAFT - DELIBERATIVE

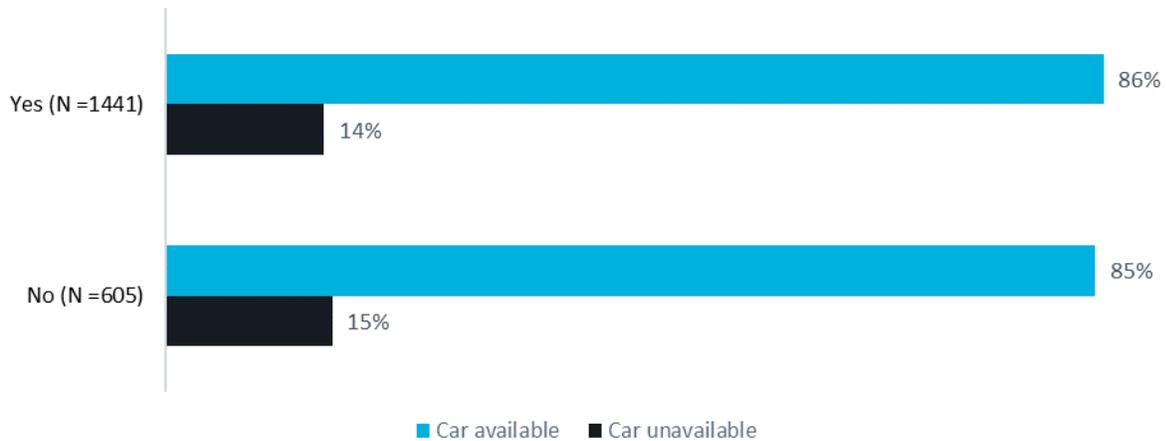


All respondents were asked if rail was a viable alternative to cross the bay. **Figure 5-1** presents the results by vehicle ownership (having a car available in their household). Seventy percent (1,441) of the respondents indicated that rail was a viable alternative to cross the bay.<sup>6</sup> Of the 1,441 respondents who consider rail a viable alternative, 86% of them have a car available at their home.

**Figure 5-1. Link21 Mobility Survey: Rail is an Alternative to Cross the Bay (by car availability)**

**Question 1: Before COVID-19, was rail and/or BART an alternative for you to travel across the San Francisco Bay and through Northern California Megaregion?**

**Question 2: Do you have a car or motorcycle available to you for your trips across the bay?**



## 5.2. Reasons for Using Rail

Current rail users — respondents that select BART, rail, or light rail — were asked why they chose rail and/or rapid transit as part of their trip. Respondents were asked to rank all reasons that apply to their decision from the most important to the least important. The list included:

- Less expensive than driving.
- Less expensive than other options (ridesharing, taxi, etc.).
- Faster than driving; greater time savings.
- I do not have access to a car.
- I can work on the train.
- I don't like traffic.
- I can find a seat on the train.

<sup>6</sup> Note that due to the previously mentioned potential oversampling of transbay travelers who travel less than 25 miles, this number and the share of respondents indicating that rail was a viable alternative to cross the bay could be inflated.



- I can find parking near a station.
- The trains are clean.

**Figure 5-2** presents the top eight reasons that are weighted<sup>7</sup> for why users choose rail to travel across the Megaregion. The top reasons cited were related to costs, travel time savings, and traffic avoidance.

**Figure 5-2. Link21 Mobility Survey: Reasons for Using Rail**



The top five reasons selected as number one (most important) by respondents are presented in **Table 5-2**. The three reasons that ranked the highest were costs, travel times, and avoiding traffic.

**Table 5-2. Link21 Mobility Survey: Top Five Reasons for Using Rail Ranked as #1**

MOST CITED REASONS FOR USING RAIL	NUMBER OF TIMES RANKED AS #1
Less expensive than driving	263
Faster than driving; greater time savings	131
Can avoid traffic	106
Less expensive than other options (ridesharing, taxi, etc.)	88
Do not have access to a car	80

<sup>7</sup> Weights applied inversely proportional to the ranked position (e.g., first position 1, second position 1/2, third position 1/3).



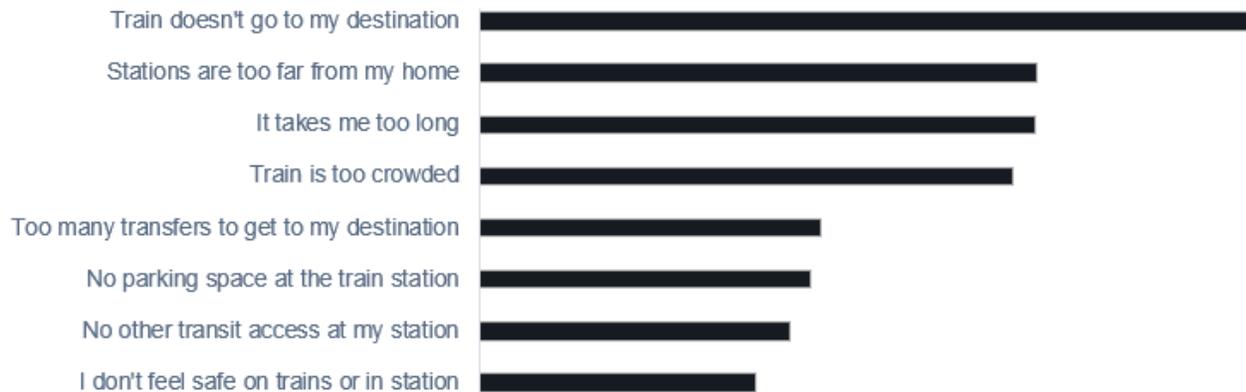
### 5.3. Reasons for Not Using Rail

Respondents who do not use rail were asked why they do not choose it as a traveling option for their trip across the bay. The reasons included:

- Train is too crowded.
- No parking space at the train station.
- No other transit access at my station.
- Train doesn't go to my destination.
- Stations are too far from my home.
- Too many transfers to get to my destination.
- It takes me too long.
- It is too infrequent.
- It is too expensive.
- The train is often late.
- Concerned about personal security on trains or in stations.
- Trains and stations are dirty.
- Planning a trip by rail is too confusing.
- The train doesn't run when I travel.

**Figure 5-3** presents the top eight reasons why travelers are not using rail as part of their trip across the bay (weighted). The main reasons cited by respondents include geographic coverage, travel times, and crowding.<sup>8</sup>

**Figure 5-3. Link21 Mobility Survey: Reasons for Not Using Rail**



<sup>8</sup> Similarly, the undersampling of long-distance transbay trips might have influenced the top eight reasons. Some of these issues, such as stations too far from travelers' homes, are more acute or prominent for longer-distance trips taking place further away from the Transbay Corridor.

DRAFT - DELIBERATIVE



The top five (unweighted) reasons ranked as number one are presented in **Table 5-3** and include reasons like geographic coverage, crowding, and travel time.

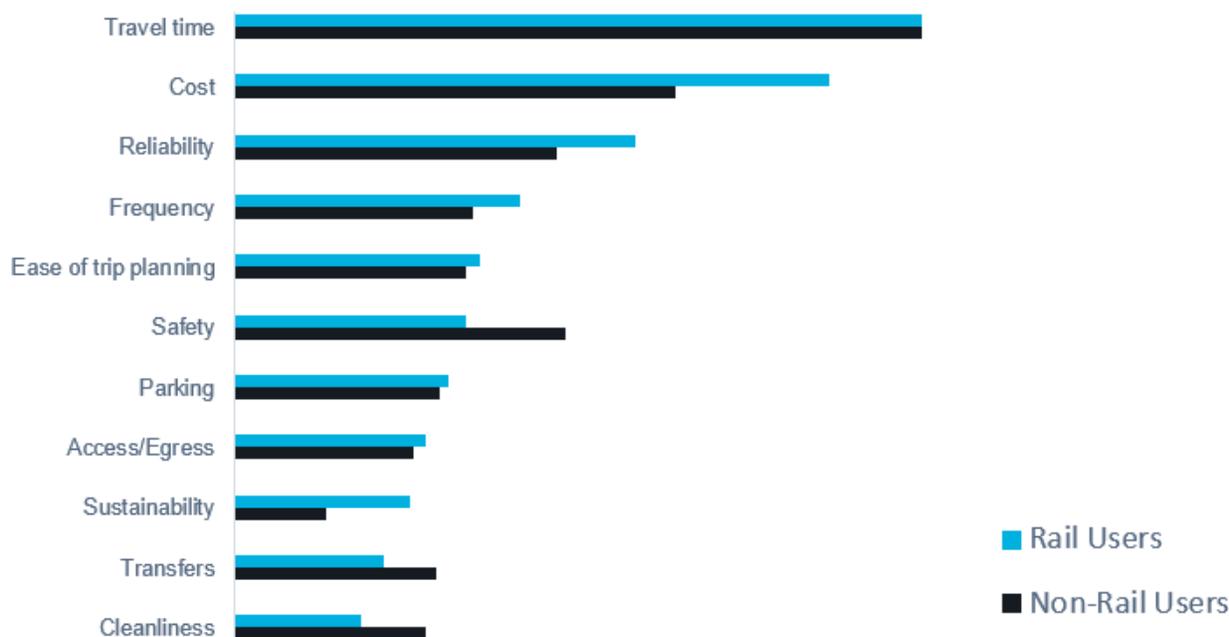
**Table 5-3. Link21 Megaregional Travel Survey: Top Five Reasons for Not Using Rail Ranked as #1**

MOST CITED REASONS FOR NOT USING RAIL	NUMBER OF TIMES RANKED AS #1
Train doesn't go to my destination	355
Train is too crowded	220
Stations are too far from my home	161
It takes me too long	114
No parking space at the train station	83

### 5.4. Service Characteristics

The survey asked all respondents what they value most when choosing rail, as well as key attributes and priorities of improvements when selecting rail or BART. This question did not refer to their last trip, but generally about their behaviors and attitudes toward rail. Respondents were asked to rank eight different service characteristics. **Figure 5-4** presents the responses for rail and non-rail users for all service attributes (weighted). Rail users cited travel times, costs, and reliability as the top attributes. Though non-rail users cited similar attributes, they valued safety (ranked as third) more than reliability.

**Figure 5-4. Link21 Mobility Survey: Service Characteristics**



The top three characteristics picked by respondents as the number one reason for choosing rail were travel time, cost, and safety as presented in **Table 5-4**.

DRAFT - DELIBERATIVE

**Table 5-4. Link21 Megaregional Travel Survey: Service Characteristics Ranked as #1**

SERVICE CHARACTERISTIC	NUMBER OF TIMES RANKED AS #1
<b>Travel time</b>	<b>860</b>
<b>Cost</b>	<b>433</b>
<b>Safety</b>	<b>173</b>
Reliability	155
Ease of trip planning	113
Access/Egress	73
Frequency	69
Parking	61
Transfers	45
Cleanliness	33
Sustainability	31

## 5.5. Rail Operators Satisfaction

All respondents were asked about their satisfaction with the following rail operators, if they took them before, and what improvement(s) they would like to see most. Respondents could check all that applied.

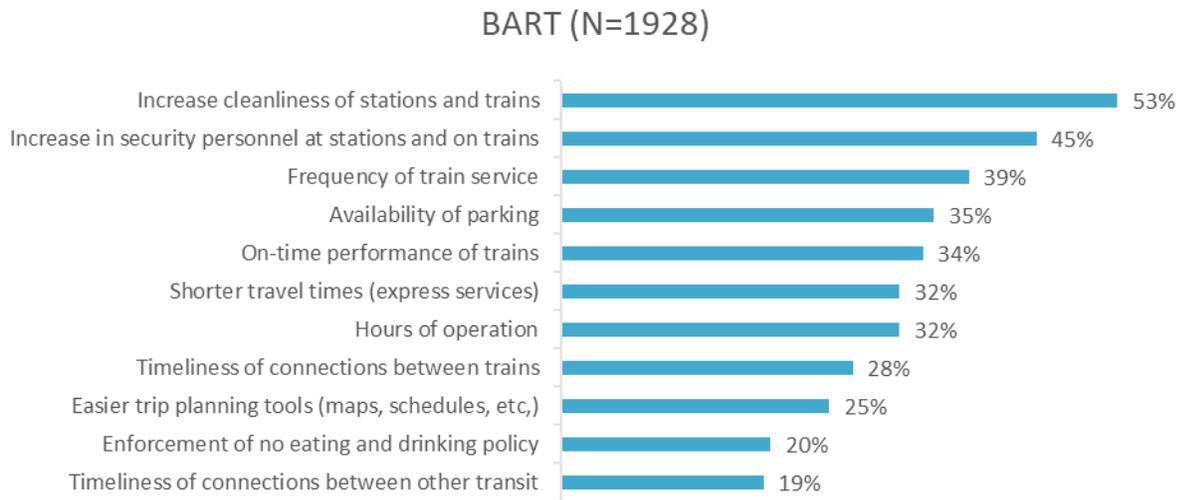
- BART
- ACE Rail
- Capital Corridor
- Amtrak San Joaquin
- Caltrain

As shown in **Figure 5-5**, increasing cleanliness and security personnel were the most cited suggestions for BART.



**Figure 5-5. Link21 Mobility Survey: Service Improvement Suggestions for BART**

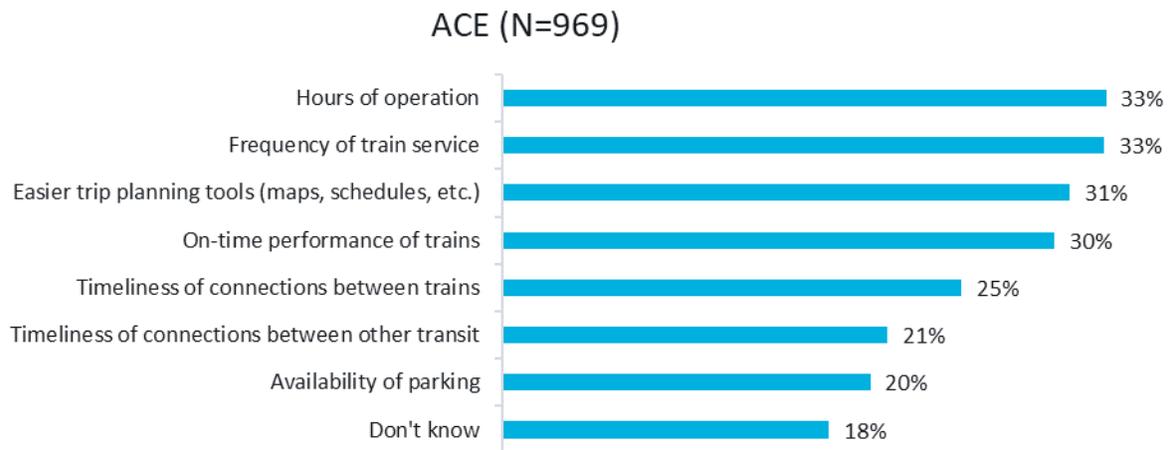
**Question: If BART could improve anything to provide better services, what should they do?**



**Figure 5-6, Figure 5-7, Figure 5-8, and Figure 5-9** show that hours of operation and frequency of train service are the most cited improvements that should be considered for ACE, Capitol Corridor, San Joaquins, and Caltrain, respectively.

**Figure 5-6. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – ACE**

**Question: If ACE Rail could improve anything to provide better services, what should they do?**

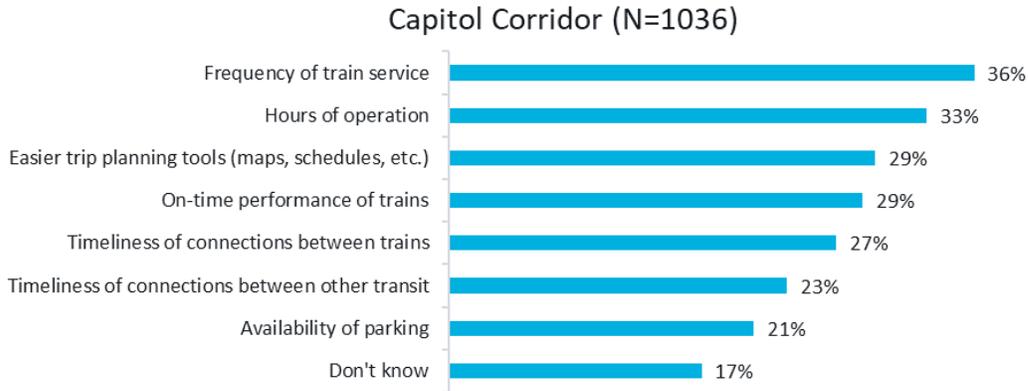


DRAFT - DELIBERATIVE



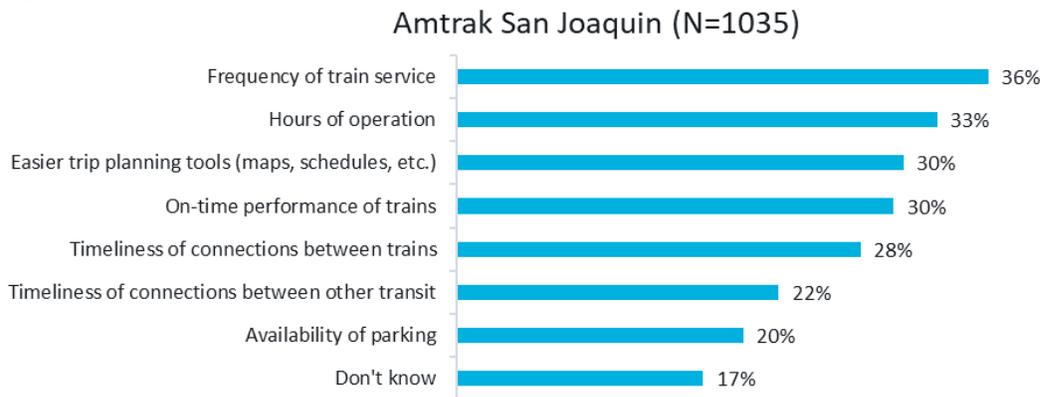
### Figure 5-7. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Capitol Corridor

Question: If Capitol Corridor could improve anything to provide better services, what should they do?



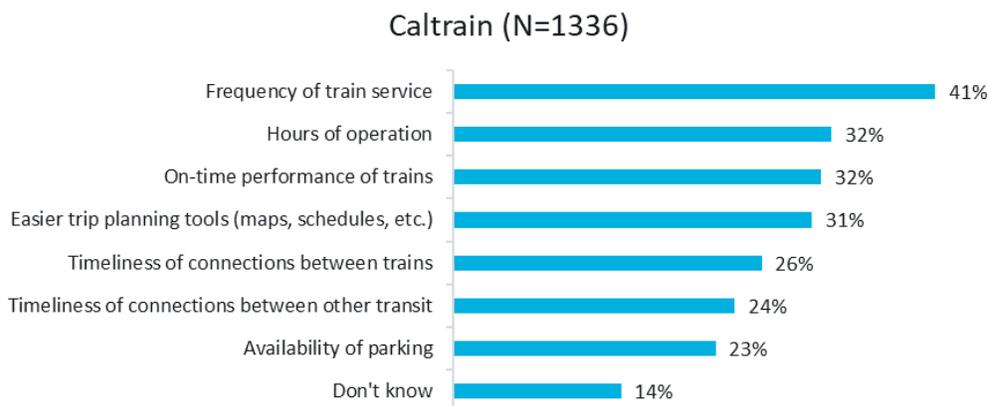
### Figure 5-8. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Amtrak San Joaquins

Question: If Amtrak San Joaquin could improve anything to provide better services, what should they do?



### Figure 5-9. Link21 Mobility Survey: Service Improvement Suggestions for Other Rail Operators – Caltrain

Question: If Caltrain could improve anything to provide better services, what should they do?



DRAFT - DELIBERATIVE

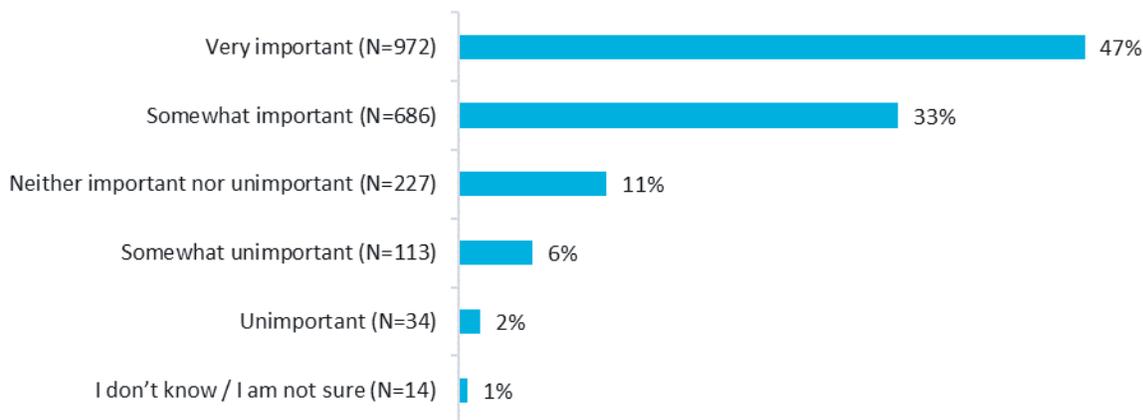


## 5.6. Other Factors Influencing Mode Choice

Respondents were asked how important it was for them to arrive at their destination on time. **Figure 5-10** shows 47% of all respondents indicated that arriving on time is very important, while 33% said it is somewhat important.

**Figure 5-10. Link21 Mobility Survey: Importance of Arriving on Time**

**Question: For your typical trip across the San Francisco Bay, how important is it that you get to your destination on time?**

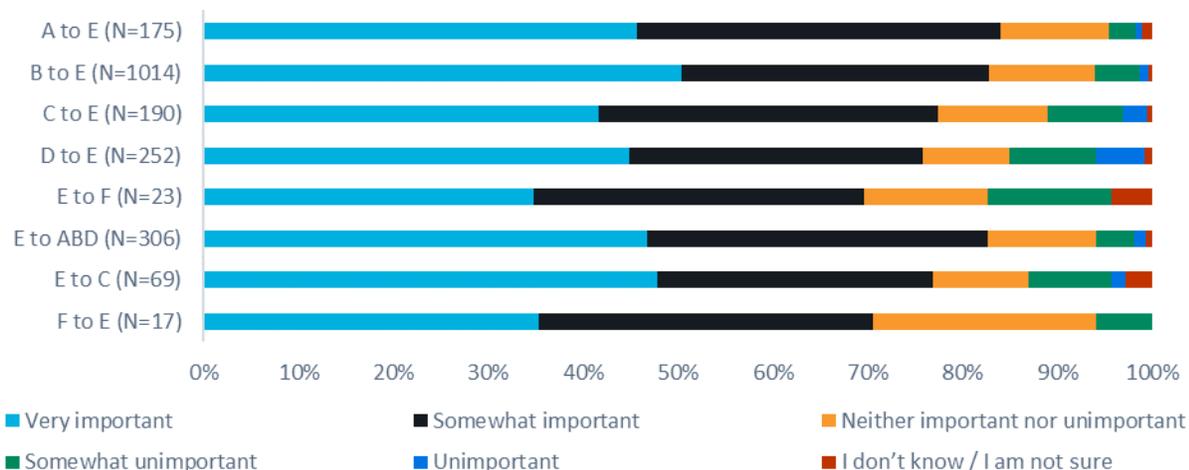


**Figure 5-11** shows the importance of arriving on time by geography, and **Figure 5-12** by trip purpose. People who travel from the halo counties, Alameda county, and Contra Costa county to San Francisco and San Mateo counties, and vice versa (regions A to E, B to E, and E to ABD) care more about arriving on time (combining very important and somewhat important). Commuters similarly care more about arriving on time than non-commuters.

**Figure 5-11. Link21 Mobility Survey: Importance of Arriving on Time by Geography**

**Question 1: For your typical trip across the San Francisco Bay, how important is it that you get to your destination on time?**

**Question 2: Have you travelled between any of these regions (A-E) via the San Francisco Bay?**



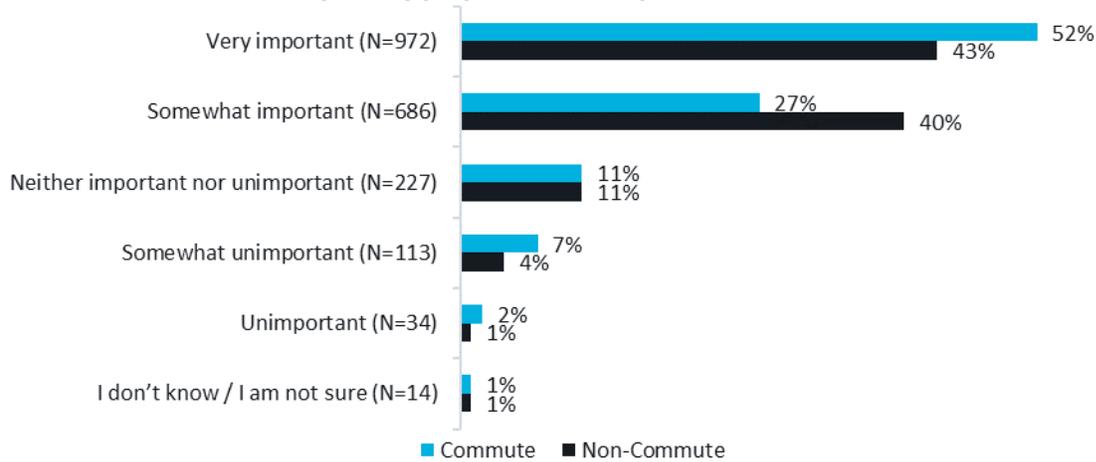
DRAFT - DELIBERATIVE



### Figure 5-12. Link21 Mobility Survey: Importance of Arriving on Time by Purpose

Question 1: For your typical trip across the San Francisco Bay, how important is it that you get to your destination on time?

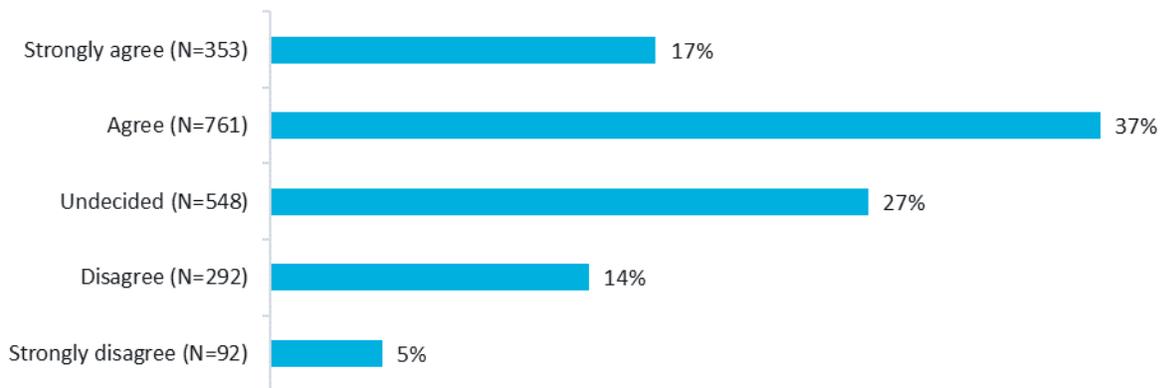
Question 2: : What was the primary purpose of this trip?



Respondents were also asked if the frequency of service impacted their decision to use or not use rail/rapid transit before the COVID-19 pandemic. Results are presented in **Figure 5-13**; 54% (1,114 out of 2,046) of the respondents stated that frequency of service impacted their decision to use rail (agree/strongly agree).

### Figure 5-13. Link21 Mobility Survey: Frequency of Service

Question: Before COVID-19, did the frequency of service impact your decision to use or not use rail/rapid transit in the Northern California Megaregion?



**Figure 5-14** shows the importance of the frequency of service by OD market.

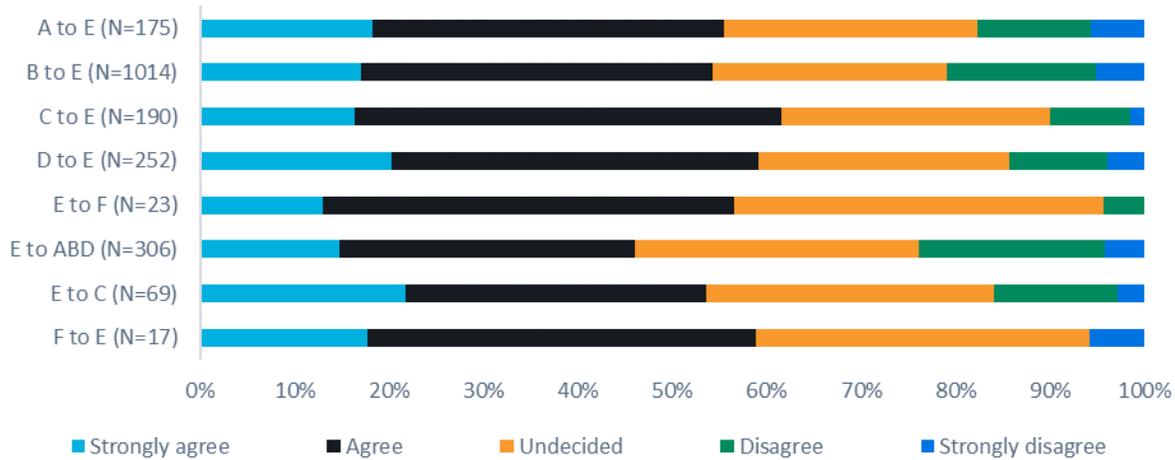
DRAFT - DELIBERATIVE



**Figure 5-14. Link21 Mobility Survey: Frequency of Service by OD Market**

**Question 1: Before COVID-19, did the frequency of service impact your decision to use or not use rail/rapid transit in the Northern California Megaregion?**

**Question 2: : Have you travelled between any of these regions (A-E) via the San Francisco Bay?**

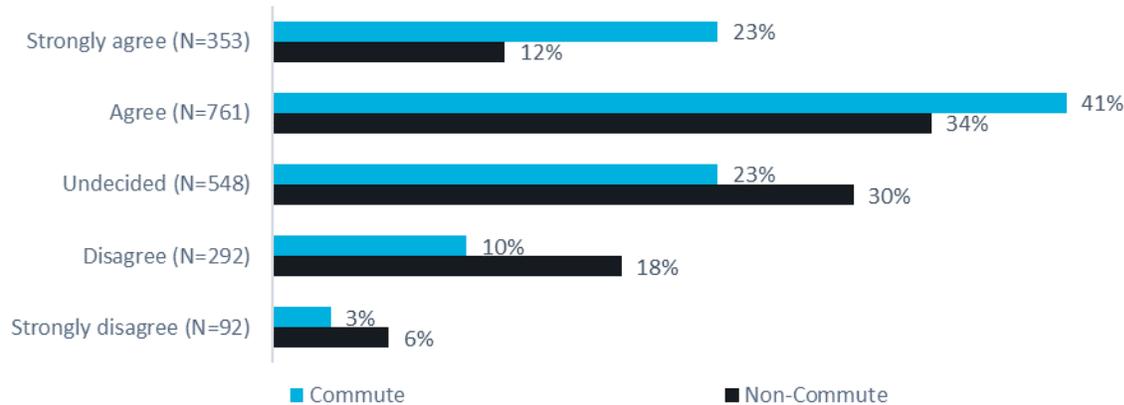


Respondents who commute to work care more about frequency or service, as shown in **Figure 5-15**.

**Figure 5-15. Link21 Mobility Survey: Frequency of Service Commute and Non-Commute**

**Question 1: Before COVID-19, did the frequency of service impact your decision to use or not use rail/rapid transit in the Northern California Megaregion?**

**Question 2: : What was the primary purpose of this trip?**



## 5.7. Nighttime Services

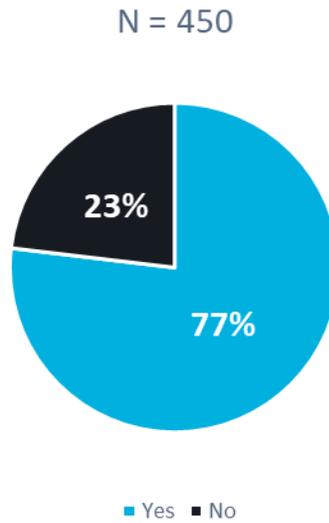
Respondents were asked if they traveled after midnight before COVID-19, and 450 out of 2,046 checked “Yes.” Within these 450 respondents, 77% of them are willing to use rail more if nighttime service is offered, as shown in **Figure 5-16**.

DRAFT - DELIBERATIVE



**Figure 5-16. Link21 Mobility Survey: Willingness to Use Night Service (for those who used it before)**

Question: Would you use rail more if the operators were to offer nighttime services (after midnight)?



DRAFT - DELIBERATIVE



## 6. KEY MARKETS SUMMARY

This section is organized around three themes, each corresponding to a market that could be served by Link21:

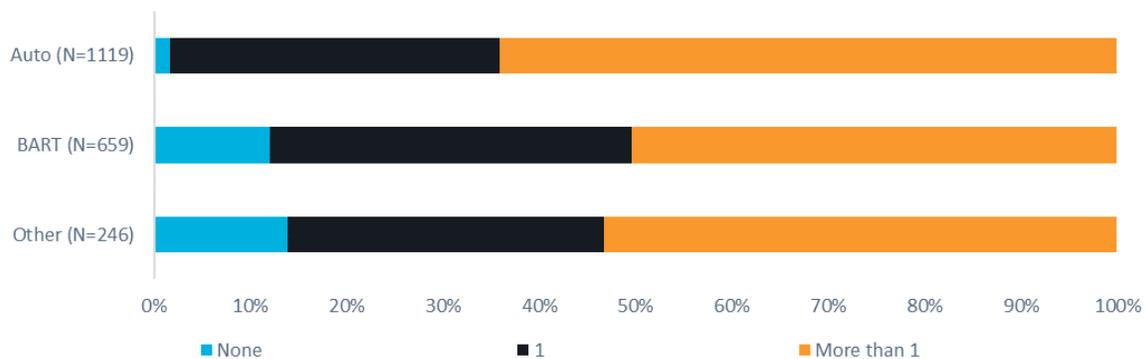
- Car ownership and travel across the bay
- Commute trip characteristics
- Equity issues focusing on minority and low-income travel behaviors

### 6.1. Car Ownership

**Figure 6-1** shows how car ownership impacts mode choice. As expected, respondents without a car in their household were more likely to choose BART or other modes rather than auto to travel across the bay.

**Figure 6-1. Link21 Mobility Survey: Car Ownership and Primary Mode**

Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?  
 Question 2: How did you travel across the bay for this trip (portion of the trip crossing the Bay)?



**Figure 6-2** shows the correlation between education and car ownership. People with higher education levels are more likely to have cars in their household.

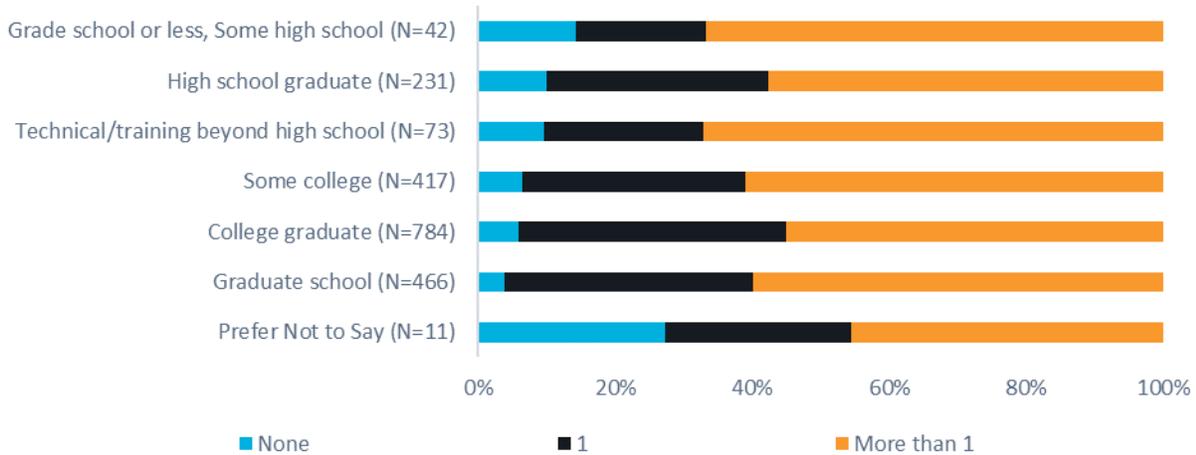
DRAFT - DELIBERATIVE



**Figure 6-2. Link21 Mobility Survey: Households with and without an Auto by Education Level**

**Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?**

**Question 2: What is the highest level of education you completed?**

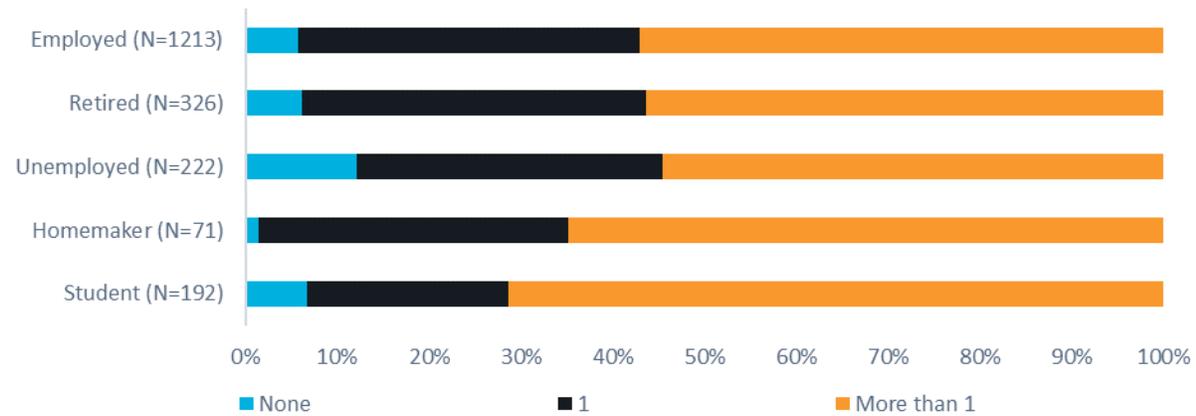


**Figure 6-3** shows car ownership by employment status. Unemployed people are less likely to own a car. Retired and employed respondents share a similar distribution on the number of motor vehicles within the household.

**Figure 6-3. Link21 Mobility Survey: Car Ownership and Employment Status**

**Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?**

**Question 2: Which of the following categories best describes employment status?**



**Figure 6-4** shows car ownership status by trip geography. Travelers from San Francisco and San Mateo counties (Region E) to the rest of the Bay Area except Santa Clara County, the Greater Sacramento Area, and the Northern San Joaquin Valley (Regions A, B, and D), and to Santa Clara County (Region C) are most likely to not own a car.

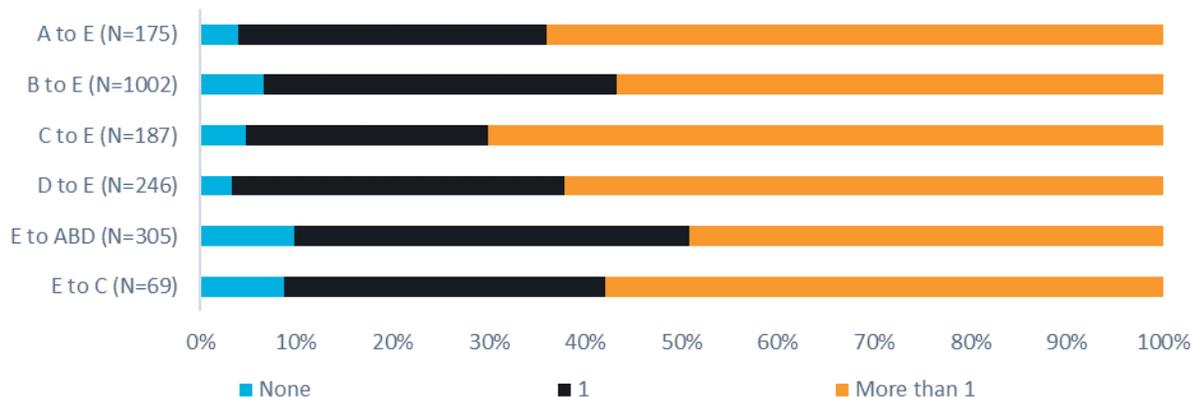
DRAFT - DELIBERATIVE



**Figure 6-4. Link21 Mobility Survey: Car Ownership and Geography**

**Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?**

**Question 2: Have you travelled between any of these regions (A-E) via the San Francisco Bay?**

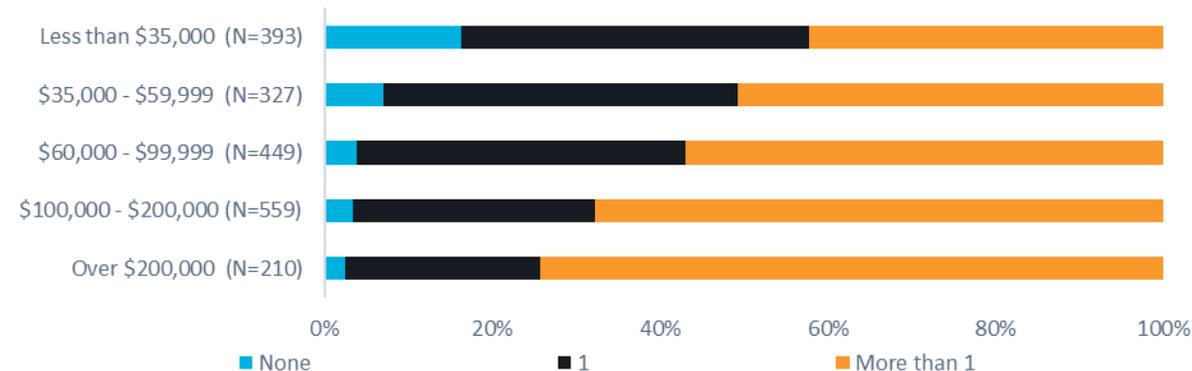


**Figure 6-5** shows the correlation between annual household income and car ownership. Households with higher incomes are more likely to have a car.

**Figure 6-5. Link21 Mobility Survey: Car Ownership and Household Income**

**Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?**

**Question 2: Which of the following categories best describes your household’s total annual income before taxes for 2019?**



**Figure 6-6** shows that over 10% of Black or African-American respondents in the survey do not have a car, which is the highest share among all race categories.

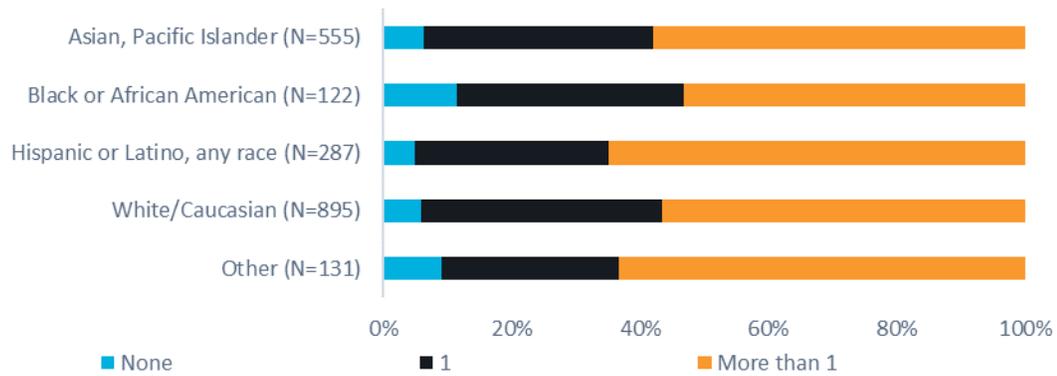
DRAFT - DELIBERATIVE



**Figure 6-6. Link21 Mobility Survey: Car Ownership and Race and Ethnicity**

**Question 1: How many motor vehicles (cars, motorcycles, pick-up trucks) does your household have?**

**Question 2: What is your race or ethnic identification?**



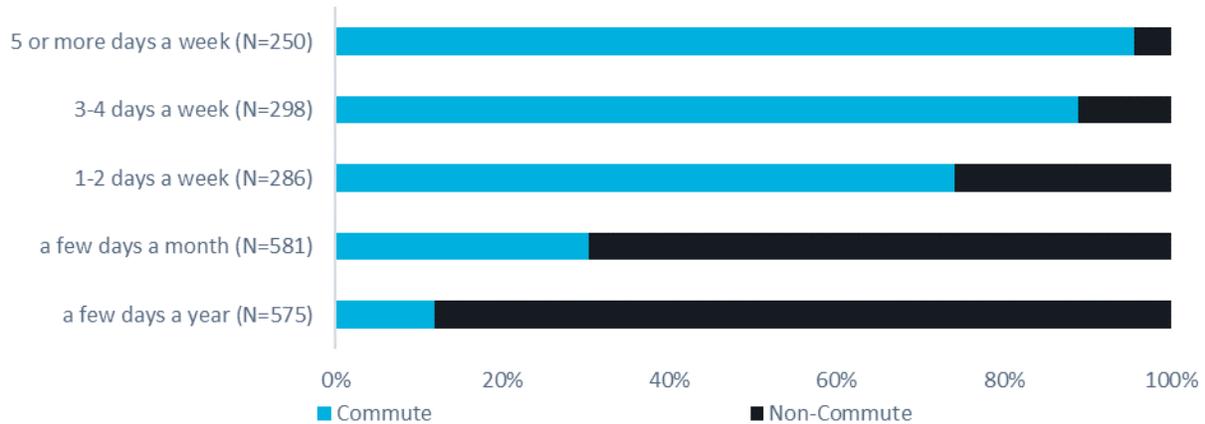
## 6.2. Commute Trips

Over 80% of trips made more than twice a week were commute trips, as shown in Figure 6-7.

**Figure 6-7. Link21 Mobility Survey: Commuting Trips and Frequency**

**Question 1: What was the primary purpose of this trip?**

**Question 2: Before COVID-19, how frequently did you travel between the east side and the west side of the San Francisco Bay by any type of transportation?**



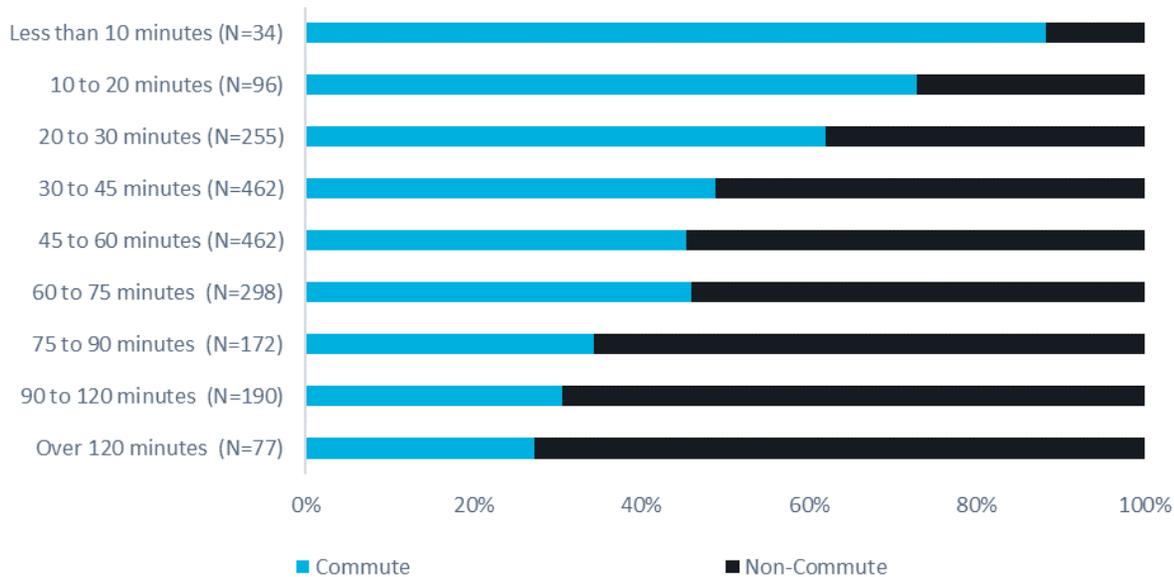
Commute trips were generally shorter than non-commute trips, as shown in Figure 6-8. Note that this finding only applies for transbay trips; when considering all trips in the Megaregion, the average non-commute trip could be shorter than the average commute trip.

DRAFT - DELIBERATIVE



**Figure 6-8. Link21 Mobility Survey: Commute Trips and Journey Time**

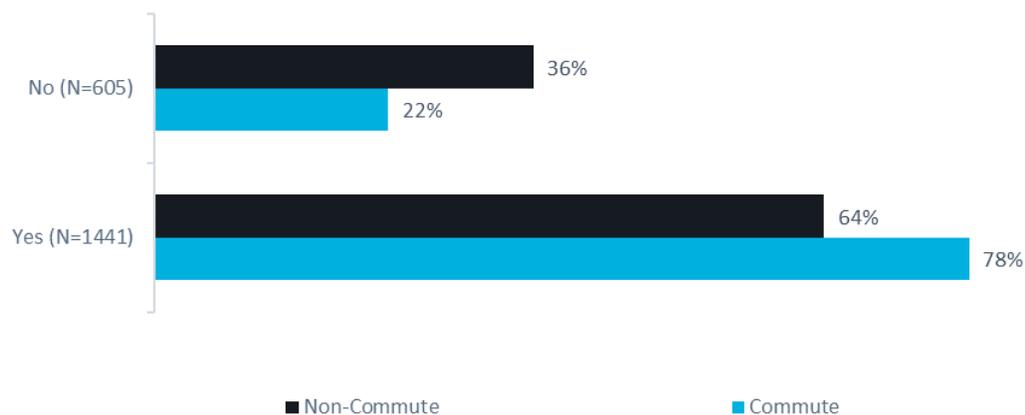
**Question 1: What was the primary purpose of this trip?**  
**Question 2: How long did it take you to make this one-way trip?**



Seventy percent (1,441 out of 2,046) of respondents consider rail and/or BART as an alternative to travel across the bay, and over half of them are commuters, as shown in **Figure 6-9**.

**Figure 6-9. Link21 Mobility Survey: Commute Trips and Rail Alternatives**

**Question 1: What was the primary purpose of this trip?**  
**Question 2: Before COVID-19, was rail and/or BART an alternative for you to travel across the San Francisco Bay and through Northern California Megaregion?**



DRAFT - DELIBERATIVE



### 6.3. Equity

**Figure 6-10** shows household income by race. Black or African-American respondents within the study area have the lowest incomes, followed by Other/Mixed Race and Hispanic and Latinos. Over 40% of Black or African-American and over 30% of Hispanic or Latino have an annual household income of less than \$35,000. More than 80% of White/Caucasian and Asian, Pacific Islander respondents have a household income greater than \$35,000.

**Figure 6-10. Link21 Mobility Survey: Race and Ethnicity by Household Income**

Question 1: What is your race or ethnic identification?

Question 2: Which of the following categories best describes your household's total annual income before taxes for 2019?



**Figure 6-11** shows the household income distribution by OD market. Respondents who travel from the Sacramento Region or Northern San Joaquin Valley (Region A) to San Francisco or San Mateo counties (Region E) and from San Francisco or San Mateo counties to Santa Clara County (Region C) tend to have higher incomes.

DRAFT - DELIBERATIVE



**Figure 6-11. Link21 Mobility Survey: Geography and Household Income**

**Question 1: Which of the following categories best describes your household’s total annual income before taxes for 2019?**

**Question 2: Have you travelled between any of these regions (A-E) via the San Francisco Bay?**

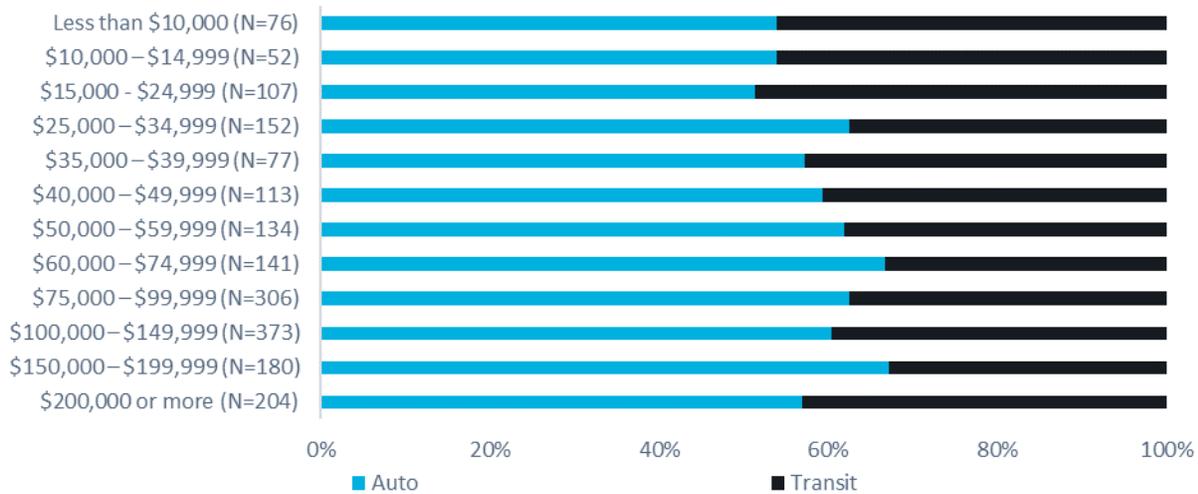


**Figure 6-12 and Figure 6-13** shows the distribution of household income, race, and OD market shares by mode (transit and auto).

**Figure 6-12. Link21 Mobility Survey: Household Income by Primary Mode**

**Question 1: Which of the following categories best describes your household’s total annual income before taxes for 2019?**

**Question 2: How did you travel across the bay for this trip (portion of the trip crossing the Bay)?**



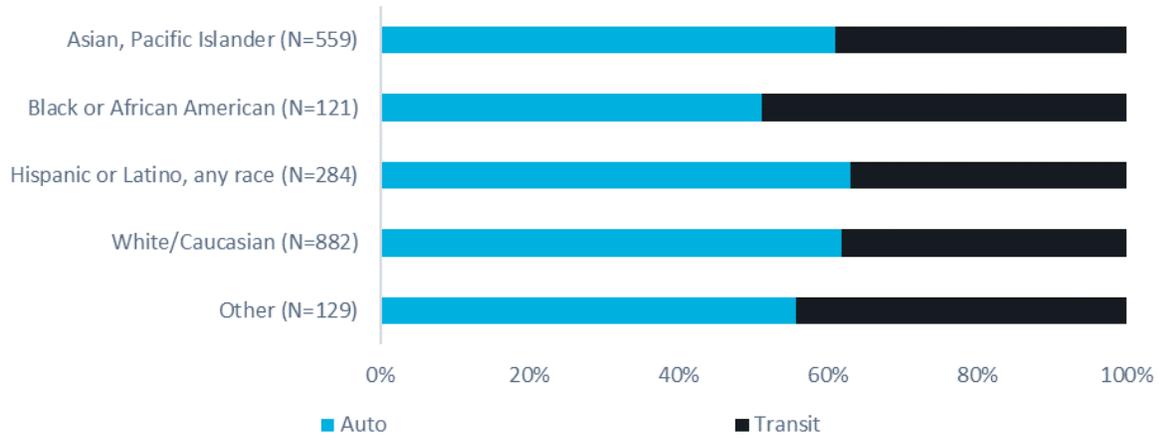
DRAFT - DELIBERATIVE



### Figure 6-13. Link21 Mobility Survey: Race and Ethnicity by Primary Mode

Question 1: What is your race or ethnic identification?

Question 2: How did you travel across the bay for this trip (portion of the trip crossing the Bay)?



DRAFT - DELIBERATIVE