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2021 SKAGIT TRAVEL SURVEY: FINAL REPORT

June 2022

Prepared for Skagit Council of Governments (SCOG)

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2021 Skagit Travel Survey: Final Report

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LIST OF ABBREVIATIONS

ABS	Address-based sample
ACS	American Community Survey
HH	Household
SCOG	Skagit Council of Governments

EXECUTIVE SUMMARY

1.1 SURVEY OBJECTIVES AND HIGHLIGHTS

The 2021 Skagit Travel Survey used a modern research approach to collect demographic and travel pattern information from residents throughout Skagit County in Washington State.

The highlights of this innovative approach include the following:

- **A two-part survey**:
  - Part one (the "recruit survey") gathered data on the household's demographic composition and typical travel behaviors.
  - Part two (the "travel diary") gathered individual travel data during a specified travel period for all members of the household (HH).
- **Multiple modes of data collection**:
  - Households with smartphones completed their travel diaries using the rMove™ smartphone app for up to seven consecutive days.
  - Households without smartphones participated by completing their travel diary online (rMove for Web) or by calling into the survey call center. These households reported travel for one day (Tuesday, Wednesday, or Thursday).
- **An address-based sample (ABS) and mailed survey invitations**:
  - The ABS included compensatory oversampling to improve the representativeness and quality of the final dataset. Compensatory oversampling focused on low-income households and higher minority populations areas.
  - Over the course of two weeks, invited households received a letter packet with comprehensive details about the survey and a "reminder" postcard.
- **Aligned questionnaires**:
  - The smartphone-based (rMove) and online-based (rMove for Web) questionnaires were largely consistent to ensure a single, consistent dataset at the end of the survey.
  - The questionnaire for both instruments was tailored to account for COVID-19 impacts (e.g., asking both current, and future expected telework frequency).
- **Advanced technologies and methods**:
  - The rMove app was the primary mode for travel data collection, which offered significant benefits for data quality and quantity (e.g., detailed trip paths, and lower degrees of underreporting).

  - The Bing Maps API helped capture and validate location and travel data.
  - The survey employed American Community Survey (ACS) data, along with RSG's market research experience and expertise, to develop the sampling plans and data weighting approaches.

- **Minimized respondent burden and increased engagement**:
  - The survey offered gift card incentives to households that completed the survey to improve the response rates (and thereby lower the overall mailing costs) and representativeness of the dataset. The average household received $18.11 in gift cards for their participation.
  - Survey respondents received customized reminders by email, telephone, or within the rMove smartphone app to encourage survey completion.
  - Survey respondents could also contact user support by telephone, email, or within the rMove smartphone app. Responses were generally provided within one business day.
  - The survey branding included an engaging logo and customized website to legitimize the survey and encourage responses.

The last household travel survey for Skagit County occurred in 2008 and surveyed 385 households in Skagit County. This survey collected responses from 672 households (74% increase over 2008), introduced new data collection technology, and deployed current data processing methods to support more accurate, representative travel behavior analysis in Skagit County.

Survey Timeline

Table 1 documents the project's schedule. RSG and SCOG conducted a small pretest to evaluate user experience in lieu of conducting a full pilot survey. This approach was designed to maximize the number of households and quality of data collected during the main survey.

The project was originally scheduled to collect survey data in spring 2020. Due to COVID-19, data collection was moved instead to fall 2021. Prior to data collection, the survey team adjusted the sampling plan, invitations, and survey questionnaires to ensure the process captured travel appropriately despite the gap between original planning and data collection.

TABLE 1: SURVEY TIMELINE

Phase	Timeline
Design the survey approach and questionnaire	January – April 2020
Create the sample plan	March 2020
Conduct and review pretest results	August 2021
Refine survey and survey materials	September 2021
Conduct household travel survey	October – December 2021
Clean and weight survey data	January – March 2022
Finalize survey documentation	March – June 2022
Project closure	June 2022

1.2 SURVEY RESULTS

The Skagit Travel Survey collected a rich set of demographic and travel behavior data from a representative sample of 672 households in the Skagit Council of Government (SCOG) planning area. The study collected data from 1,343 persons, representing 14,657 trips across 4,130 complete person-days from October 5 to December 2, 2021.

TABLE 2: RESULTS OVERVIEW

	Households Surveyed **672**	Weighted Households **48,489**
	Persons Surveyed **1,343**	Weighted Persons **116,701**
	Complete Person-Days **4,130**	Weighted Person-Days **105,737**

Key survey findings include the following:

- The overall trip rate for the region was 3.83 person trips per day. Most of those trips (3.32) were made by car.
- The median distance for both car and transit trips are 2.8 miles, though the median duration for car trips is 11.8 minutes compared to 18.6 minutes for transit trips.

- More than 20% of residents with incomes below $75,000 reported using transit more often than “never,” though most of those use transit less than monthly. Transit usage varies less by age, though those age 65 and older are slightly less likely to use transit at all compared to those under age 65.
- Among the 43% of respondents who said there are factors that could influence them to use transit more often, the top factors were more frequent service, bus stops closer to home, and faster transit travel times.
- Most respondents (54%) rated roadways as “Good” (45%) or “Very good” (9%). Fewer than 10% of respondents rated roadways as “Poor” (6%) or “Very poor” (2%).
- Residents travel the furthest and spend the most time traveling for work and social/recreational trips.
- Among those who travel to workplaces, the distribution of commute modes changed very little from before March 2020 to fall 2021.
- Despite seeing little change in the distribution of modes used to commute to work among those who travel to a workplace, there was an increase in the frequency of teleworking. The greatest change was in the frequency of those who already teleworked – primarily a decrease in those who telework 1 day per week (16% before March 2020 compared to 5% in fall 2021) and an increase in those who telework four or more days per week (22% before March 2020 compared to 37% in fall 2021).

A full analysis of results is included in Section 8.0.

2.0 SURVEY SAMPLING

2.1 SAMPLING GOALS

The 2021 survey originally aimed to collect data from 650 households, resulting in a 1.36% target sample rate (based on the 2014–2018 ACS). The survey collected data for 672 households (1.40% sample sate), surpassing the target by 3%.

Sampling Frame and Method

The sampling frame for this survey was the list of all households in Skagit County in Washington. The survey used ABS to select households for participation. ABS involves drawing a random sample of addresses from all residential addresses in that area. Using this method, all households within each defined area have an equal chance of selection for the sample. RSG purchased household mailing addresses from Marketing Systems Group, which maintains the Computer Delivery Sequence file from the US Postal Service. RSG stratified the sample using census block group data from the 2014–2018 ACS (the latest available at the time of sampling).

Sample Stratification/Segmentation

RSG coordinated with SCOG to determine key subgroups for sampling. Based on SCOG's interest in gathering a population-representative sample and RSG's prior survey experience, RSG proposed the following sample groups:

1. **General Population:** Comprised of block groups in the survey region that do not qualify for oversampling (based on criteria below). (50 block groups)
2. **Low-Income Oversample:** Comprised of the top 25% of block groups on the percent of low-income households. Specifically, those in which at least 25% of households have annual household incomes below $25,000. (15 block groups)
3. **Limited English Oversample:** Comprised of the top 15% of block groups on the percent of limited English-speaking households. Specifically, those in which at least 7% of households speak limited English. (11 block groups)
4. **American Indian / Alaska Native Oversample:** Comprised of the top 5% of block groups on the percent of persons with reported American Indian / Alaska Native race. Specifically, those in which at least 10% of persons reported American Indian / Alaska Native race. (5 block groups)

RSG and SCOG also considered oversampling areas with high Hispanic / Latino populations but found that the current thresholds for the three existing oversample groups encompassed the

block groups that would have been selected for Hispanic / Latino oversampling. Therefore, these block groups were not included as their own sample group (but were still oversampled).

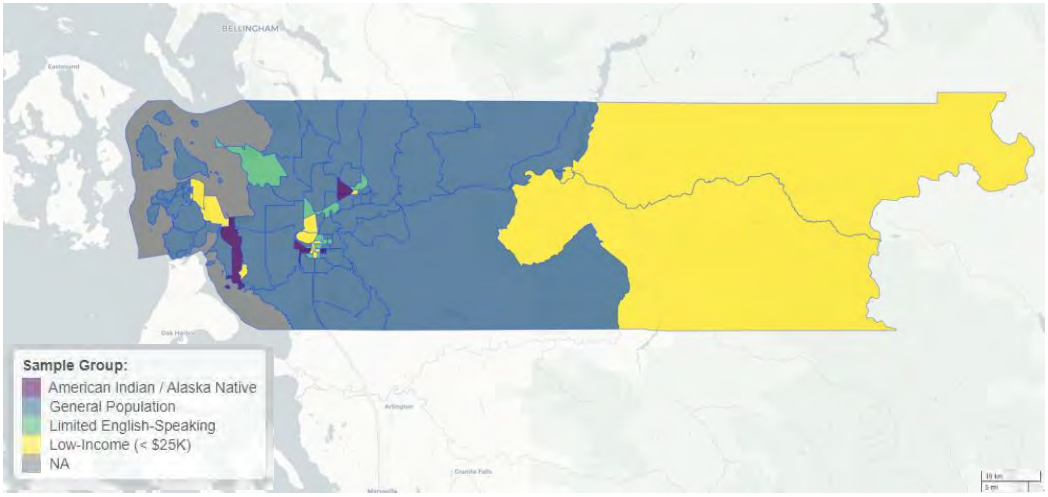
The number of households and persons in each sample group are listed in Table 3. The persons per household were relatively consistent across groups.

TABLE 3: SURVEY REGION HOUSEHOLDS AND PERSONS, BY SAMPLE GROUP

Sample Group	Census Block Groups	Total HHs	Total Persons	Persons per HH
General Population	50 (61.7%)	30,845 (64.3%)	78,905 (63.7%)	2.56
Low-Income	15 (18.5%)	6,381 (13.3%)	14,717 (11.9%)	2.31
Limited English	11 (13.6%)	7,588 (15.8%)	21,054 (17.0%)	2.77
American Indian / Alaska Native	5 (6.2%)	3,123 (6.5%)	9,231 (7.4%)	2.96
Total	**81**	**47,937**	**123,907**	**2.58**

Figure 1 below shows the geographic locations of the oversample regions. Many of the oversample groups were concentrated in Mount Vernon and Burlington, though the groups were spread throughout the entire survey region.

FIGURE 1: SAMPLE AND OVERSAMPLE REGIONS



Sample Rates

To determine the sample rates, RSG clustered the five sample groups into two sample segments: general population and compensatory oversample. The compensatory oversample segment included the low-income, limited English, and American Indian / Alaska Native groups. The general population group remained its own segment. The resulting segments and sample rates are summarized below and in Table 4.

TABLE 4: EXPECTED VS. ACTUAL SAMPLE RATES AND DATASET COMPOSITION

Sample Segment	Complete HHs (Estimated)	Complete HHs (Actual)	Sample Rate[1] (Estimated)	Sample Rate (Actual)
General Population	419	392	1.36%	1.27%
Compensatory (Low-income, Limited English, American Indian / Alaska Native)	231	280	1.35%	1.64%
Total	**650**	**672**	**1.36%**	**1.40%**

The final sample plan memo includes additional details about the sample plan. The analysis sections below contain a more detailed evaluation of how the sample plan performed in practice.

[1] Sample rate = complete households/total households in that segment.

3.0 SURVEY DESIGN

3.1 OVERVIEW

The 2021 survey combined multiple data collection methods, including smartphone, online, and telephone. While 37% of households completed their travel diaries by smartphone, 84% of all trips were collected by smartphone due to the extended travel log period from the smartphone app (up to 7 days) compared with the single-day online reporting. As described in more detail in the following sections, the survey design included two stages to recruit and collect data about households, their members, and their travel behaviors during the assigned travel period.

3.2 QUESTIONNAIRE & COVID-19 ADJUSTMENTS

The questionnaire for this survey (provided separately) aligned closely with the household travel survey questionnaires for other agencies in Washington in the past several years, including the Whatcom Council of Governments and the Puget Sound Regional Council. To account for changes due to COVID-19, the survey team tailored the questionnaire to ask about current, typical, and expected future travel (e.g., expected future telework frequency). RSG and SCOG also developed several region-specific questions to include in the survey, such as residents' opinions about transportation spending priorities and Skagit County road "grades."

3.3 SURVEY STAGES AND PARTICIPATION METHODS

This survey used an ABS approach with mailed recruitment materials (shown in Section 4.0). The mailed materials instructed households to visit the survey website or call a toll-free number to complete Part 1 (the demographic "recruit" survey). Households received instructions for Part 2 (the travel diary) shortly after completing Part 1.

Participation Group Assignments

Part 1 of the survey asked adults (age 18+) to share whether they had Apple or Android smartphones. Households in which all adults had Apple or Android smartphones were offered the option to report their travel in the rMove app for seven consecutive days. All other households as well as those who opted out of rMove app participation reported their travel online for one day using rMove for Web.

Travel Date Assignments

rMove app households were assigned to a seven-day travel period beginning 1 – 4 days after completing part 1 (depending on household size and the day on which they completed Part 1).

rMove for Web households were assigned to the next Tuesday, Wednesday, or Thursday (assigned roughly proportionally across each of the three weekdays).

Survey Components

Part 1 collected general demographic information (e.g., household size and person age) and established information to facilitate Part 2 (e.g., home/school/work addresses and number of vehicles). Part 2 collected all trip and travel day information and any person-level information (e.g., how often the participant uses transit).

Proxy Reporting for Child Trips

Among rMove households, only adults related to the main respondent were required to use the app on their smartphones. If a child in an rMove household was reported as a travel party member on an adult's trips, the trip was copied to the child's record. One rMove adult in each household was also designated to proxy report travel information for all children (under 18) in the household on a single travel day. This adult was asked to add trips to a child's roster if the child made an independent trip (e.g., riding the bus to school) or made a trip with someone outside of the household (e.g., getting a ride with a friend's parents).

Among online households, one adult (unassigned) was required to complete a full one-day travel diary for the children of the household. Like rMove, adult proxy reporters could copy children's trips from other adults and report new trips that the children made on their own.

Language Options

The invitation materials for the survey were printed in both English and Spanish. The survey instruments were fully translated into Spanish, and respondents could call the survey call center to participate (or ask questions) in Spanish.

Survey Incentives

RSG offered $10–15 gift card incentives—as communicated on the survey mailed materials—to all households that completed the survey. Travel surveys offer incentives to boost response rates and the quality of respondent data and to decrease the overall survey cost by reducing the number of mailed invitations. Without incentives, the number of required households to invite increases, and this increased mailing cost is greater than the cost of providing incentives. rMove app households were offered one $15 Visa gift card per adult after all related adults had completed the survey. Online households were offered one $10 Visa gift card per household. Households could also choose to receive no gift card.

4.0 SURVEY BRANDING, COMMUNICATION, AND ADMINISTRATION

4.1 SURVEY BRANDING

RSG developed the survey branding collaboratively with SCOG to ensure that the design fit the survey region. The complete branding package included the survey name, logo, color scheme, and font selections. The final 2021 survey logo is shown in Figure 2.

FIGURE 2: 2021 SURVEY LOGO

4.2 SURVEY INVITATION MATERIALS

Each invited household received two mailings:

- **Invitation Packet**: The cover letter explained the survey purpose and described the steps necessary to complete the survey. The invitation packet also included a frequently asked questions sheet.
- **Reminder Postcard**: One reminder postcard arrived at each household approximately one week after the invitation packet. These cards included the survey phone number, website address, and participant login information. Note that due to mail delivery delays, some households had a longer period between the invitation packet and reminder postcard arrival.

Figure 3 below shows the postcard invitations.

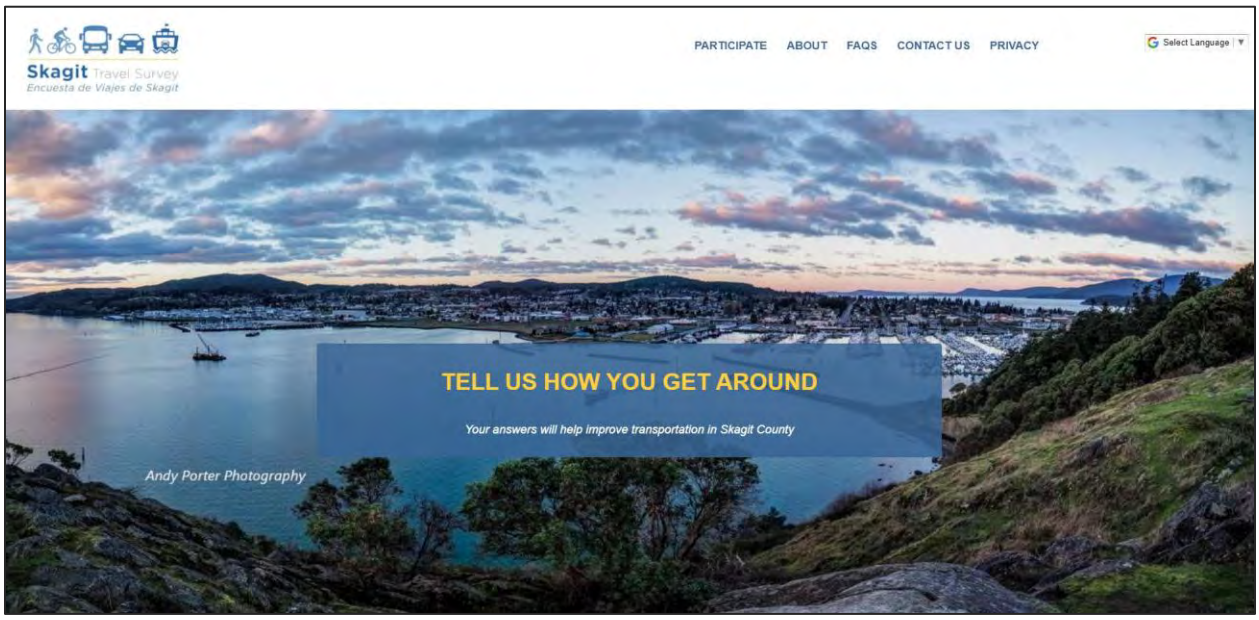
FIGURE 3: 2021 TRAVEL SURVEY POSTCARDS (FRONT AND BACK)

4.3 SURVEY WEBSITE

RSG developed a project website to describe the survey and facilitate survey participation. This site was simple, intuitive, and easy to navigate on desktop computers and mobile devices.

While the survey was open to respondents, participants could access the survey by entering their passwords on the website's home page. Figure 4 shows a screenshot from the survey website.

FIGURE 4: PROJECT WEBSITE HOME PAGE



5.0 PARTICIPANT SUPPORT

This survey utilized both inbound and outbound participant support. “Inbound” refers to communications that participants initiated, and “outbound” refers to communications that RSG initiated.

Outbound Participant Support

RSG used several types of outbound participant support (beyond the previously mentioned website and invitation materials) to aid survey administration. The primary sources of outbound support were automated email reminders, reminder phone calls, and in-app reminders or notifications (rMove participants only).

Email Reminders and Phone Calls

RSG required all rMove participants to provide email addresses. Online participants could provide both an email address (required for most households, unless participating through the call center) and an optional phone number. Any household that provided an email address received email reminders, while households that only provided a phone number were reminded by phone.

The survey call center conducted all phone reminders. These reminders occurred on the following schedule:

- One day before each household’s travel date.
- One day after each household’s travel date.
- Three to five days after each household’s travel date (if the household had not yet completed the survey).

Reminder emails occurred on a similar schedule, although more frequently. RSG sent email reminders/notifications throughout the travel period to all households that provided an email address during Part 1 of the survey. Households received emails within an hour of completing Part 1, prior to the rMove travel periods (reminding participants to activate the app), the day before the travel period began, the day after each travel period ended, and 3–5 days after the end of the travel period if the household had not yet completed the survey.

In-App Reminders (rMove)

rMove participants also had in-app reminders to encourage them to complete all surveys during their travel periods. Participants received notifications as soon as a new survey was available—either several minutes after the end of a trip or the morning after a travel day. rMove participants reporting their children’s trips by proxy also received reminders to review and add to their children’s trip rosters.

Inbound Participant Support

In addition to all outbound participant support, RSG provided three primary means through which participants could contact survey administrators. All participants could call a toll-free number to reach the survey call center or submit questions through the contact form on the website. rMove participants also had the option to submit feedback directly through the app.

6.0 DATASET PREPARATION

Throughout the survey, RSG implemented strict dataset preparation and quality control checks to ensure data was properly collected, stored, and analyzed. Before survey fielding, survey instrument testing confirmed that survey responses were recorded correctly. During data collection, all survey instruments employed real-time validations and logic checks to ensure consistent coding and logical response combinations and to prevent skipped questions. After the data collection period ended, additional time was spent reviewing, cleaning, and processing the raw data to prepare the unweighted dataset for analysis (described further below). The full steps and details of data processing are provided in the separate dataset guide.

Initial Data Review

The first step of the data cleaning process was to remove households from the dataset that met the following exclusion criteria:

1. The household reported a home location outside Skagit County (despite receiving a mailing at a Skagit County address). Most dropped households were excluded for this reason.
2. The household reported contact information that matches other households (indicating duplicates). In these few cases, RSG kept the first “household” to report their travel diary and removed the subsequent records.

Completion and Exclusion Criteria

Following the initial data review, households were then further reviewed for survey completion. Households were considered complete if they met the following conditions:

1. The household completed the recruit survey by answering all required questions.
2. The household completed a travel diary for all participating household members on at least one concurrent weekday.

All online households have a single complete travel day. rMove households must have at least one complete travel day (where all surveys are completed on the same day by all household adults) but may have up to seven completed travel days. Partially complete rMove travel days were included in the final dataset but flagged accordingly.

Additional Data Cleaning

Further data cleaning steps are summarized below.

Missing Values

Where appropriate, RSG derived missing codes to support survey analysis.

Survey data may be missing for six reasons:

1. **A value or response was not required under the circumstances.**

   Example: Participants who traveled by bus were not asked if they were the driver or passenger on the trip.

   Coded as: 995 for categorical variables, blank/NA for continuous variables

2. **A respondent indicated that the question was not applicable and skipped that question.**

   Example: Some participants did not share how they pay to park at work because they do not park at work (e.g., carpool).

   Coded as: 996 (often labeled as “Not applicable”)

3. **A respondent indicated that they didn’t know the answer and skipped that question.**

   Example: Some participants who made a vehicle trip and paid to park the vehicle may not remember the amount they paid.

   Coded as: 998 (Don’t know)

4. **A respondent indicated that they preferred not to answer a question and skipped that question.**

   Example: Some participants chose not to provide their household income.

   Coded as: 999 (Prefer not to answer)

5. **A respondent did not answer part of a survey that was required.**

   Example: An rMove app participant did not complete a trip survey during their travel period and their travel mode is missing.

   Coded as: -9998 (Non-response) for categorical variables, blank/NA for continuous variables.

6. **A technological or logical error occurred.**

   Example: A logic or data collection error occurred, resulting in missing responses for otherwise required data/questions. These occurrences impact a very small share of the dataset and are limited to variables that do not inhibit overall data usage.

   Coded as: -9999 (Error).

Other notes about missing survey data:

- For a survey to be complete, all survey questions asked of the participant must have been answered in the app or online instrument.
- Households that reported their travel for more than one day but less than seven days may have missing responses at the household and person level for non-critical variables. These cases are marked as 995 instead of -9998 because they were not required for completion.
- Continuous variables (e.g., trip distance, trip duration) are not coded with missing value codes and are instead left empty when missing to avoid interfering with statistical calculations.
- Due to the large size of the location table, missing values were left exactly as they were collected. Speed, heading, and accuracy can all potentially contain missing values that are either stored as “-1”, NA, or 0. Analysis on those fields should filter to where the values are greater than zero.

Derived and Recoded Variables

To facilitate analysis, RSG also derived and recoded several key variables. These variables are summarized below:

Household-level Derived Variables

- Completion status
- Home geographies (block group, zone)
- Aggregate income (based on the initial and follow-up income questions)

Person-level Derived Variables

- Completion status
- Number of complete days
- Work/school geographies (state, county, block group, zone)

Day-level Variables

- Completion status
- Number of trips per day
- Day completion status

Trip-level Variables

- Trip speed
- Trip path distance (based on the GPS location data)
- Trip origin and destination geographies (state, county, block group, zone)
- Departure time (imputed in some cases)
- Trip purpose (imputed in some cases)
- Mode type and purpose categories
- Access and egress flags

Imputation

While the survey collected all key trip and travel day information, departure time and trip purposes required further imputation in certain cases based on the way the rMove app collects trips. These processes are outlined below.

Departure Time

In some cases, the rMove app may have detected the start of a trip after its true start time, which can yield invalid or extreme values for trip duration and speed. In these cases, the fields depart_date, depart_hour, and depart_minute were adjusted for “late pickup” conditions using the following approach:

- Departure time was imputed using the median speed between all locations along the trip, excluding the origin point, and the distance between the origin and the next point on the trip. For trips with fewer than three recorded locations, imputed departure time is set three minutes earlier than the original departure time to compensate for rMove’s 3-5-minute ping interval. Note that some trips that are the result of split loop trips may only have three or fewer points but will use the imputed depart time from before the loop trip was split and thus may not be included in this rule.
- If the imputed departure time overlaps with the previous trip’s arrival time, the previous trip’s arrival time was instead used as the departure time. Regardless of the number of locations along a trip, if the imputed departure time was later than the initially reported departure time, the imputed departure time is set to the original departure time. User-added trips as well as long distance passenger mode trips are also set to the original departure time, as user-added trips are not subject to “late pickup” conditions, and long-distance passenger modes are often plane trips where all collected traces contain speed

information from other modes and thus are less reliable (as rMove cannot collect locations when a phone is in “airplane mode”).

Duration and speed were calculated based on the imputed departure time.

Purpose

Respondents reported the purpose of the trip destination in each trip survey. The origin purpose is derived from the destination purpose of the previous trip, except for the first trip in the travel period or where an rMove trip occurs after a trip with item non-response. For the first trip in the travel period, the origin purpose can be inferred from “begin_day” in the day table.

When purpose was not asked because an analyst split a user-reported trip during data cleaning (creating a new destination along a trip), purpose values are derived where possible based on proximity (within 150 meters) to estimated home, work, or school locations. If the location is not proximate to home, work, or school locations, the purpose is set to “other.”

The purpose category variables (o_purpose_category, d_purpose_category) contain aggregated purpose values based on the type of purpose at the origin/destination of each trip. Dataset users are welcome to perform their own recoding of the purpose categories as well.

Trip purposes were imputed in cases where a purpose reported by the user was assumed to be inaccurate based on information about that person’s reported habitual locations and other trips (primarily to home, work, and school locations). The trip purpose imputation approach was applied to all rMove trips in person-days with at least 1 complete trip and no more than 10 incomplete trips. (“Incomplete” trips are trips for which the respondent did not answer the trip-specific survey questions about purpose, mode, etc. for the given trip.)

The approach was to apply various “tests” in logical sequence to trips for which the stated purpose is not consistent with the location type based on the reported habitual locations. In general terms, the tests were designed to:

- Check the respondent’s reported destination purpose when it conflicts with the destination location type. (The details of the tests depend on the trip purpose, with different criteria used for change-mode trips, escort trips, linked transit trips, trips with home destinations but other reported purposes, etc.)
- Identify cases where respondents swapped the order of two or more trips when reporting their details.
- Identify cases where respondents may have omitted a trip and shifted remaining reported trip details by one trip when reporting the rest of their trips.
- Fill in missing data by sampling destination purposes from other trips made to the same locations, either by the same respondent or by other respondents.

Mode_type Derivation

To facilitate analysis, RSG created a variable called “mode_type,” which synthesizes trip survey answers when rMove respondents report more than one mode on a trip (in mode_1 to mode_4). Table 5 below shows the full crosswalk of which detailed modes correspond to which mode_types. Higher values of mode_type were prioritized over lower mode_type values in the derivation. For example, transit trips, with mode_type 13, were prioritized over walk trips, with mode_type 1. When transit trips were unlinked using the Google API during cleaning, the non-transit legs of the trip were recoded using Google’s suggested mode (most frequently “walk” or “car”).

TABLE 5: MODE_TYPE DERIVATION (CONTINUED ON NEXT PAGE)

DETAILED MODE	DETAILED MODE VALUE	MODE TYPE	MODE TYPE VALUE
Walk (or jog/wheelchair)	1	Walk	1
Skateboard or rollerblade	43		
Standard bicycle (my household’s)	2	Bicycle	2
Borrowed bicycle (e.g., a friend’s)	3		
Other rented bicycle	4		
Electric bicycle (my household’s)	82		
Bike-share - standard bicycle	69	Bike-share	3
Bike-share - electric bicycle	70		
Scooter-share (e.g., Bird, Lime)	83	Scooter	4
Segway	74		
Regular taxi (e.g., Yellow Cab)	36	Taxi	5
Other hired car service (e.g., black car, limo)	60		
Uber, Lyft, or other smartphone-app ride service	49	Smartphone-app ride hailing service	6
Medical transportation service	63	Other	997
Other micromobility device	75		
Personal scooter or moped (not shared)	77		
Other	997		
Household vehicle 1 - 6	6 - 13	Vehicle	8

DETAILED MODE	DETAILED MODE VALUE	MODE TYPE	MODE TYPE VALUE
Other vehicle in household	16		
Rental car	17		
Other vehicle (not my household's)	22		
Friend/relative/colleague's car	34		
Other motorcycle in household	47		
Other motorcycle (not my household's)	54		
Carshare service (e.g., Zipcar)	18		
Peer-to-peer car rental (e.g., Turo)	59	Carshare	9
Carpool match (e.g., Waze Carpool)	76		
K-12 school bus	24	School bus	10
Vanpool	21		
Other private shuttle/bus (e.g., a hotel's, an airport's)	26	Shuttle	11
Paratransit/Dial-a-Ride	27		
University/college shuttle/bus	38		
Public (city) bus	23		
Other bus	28	Transit	13
Rail (e.g., train, subway)	42		
Intercity bus (e.g., Greyhound)	25		
Airplane/helicopter	31	Long distance passenger mode	14
Vehicle ferry (took vehicle on board)	79		
Other public ferry or water taxi	32		

7.0 EXPANSION AND WEIGHTING

Household travel surveys cover a fraction of the population, yet the resulting datasets help analyze and make inferences about the population at large. Weighting is the process of comparing selected demographics in the survey to external control data, like the census or the ACS, and adjusting the profile of the survey dataset to improve the representativeness of the population in the survey area.

RSG provided household, person, day, and trip weights for analysis. Note that RSG did not weight travel data for Monday, Friday, Saturday, or Sunday because (a) data was only collected from smartphone-participating households on those days, (b) the travel behavior for those days is not assumed to be interchangeable with the behavior for Tuesday-Thursday, and (c) the data is used primarily to analyze and model typical weekday travel.

The full weighting memo provided to SCOG contains the detailed description of the weighting process. The targets used for weighting are summarized in Figure 5.

FIGURE 5: WEIGHTING TARGETS

Household-level:	Person-level:
• Total households • Household size • Number of household workers • Household income • Number of household vehicles • Presence of children	• Total persons • Gender • Age • Worker status • Race • University student status

The full weighting process is delineated in a separate weighting memo provided with the final dataset delivery.

Notes for Data Users

Although HTS data provides opportunities for many types of analysis, data users should always consider the context and best uses for the data. For example, it is important to consider the universe of survey respondents in mind to ensure the data is logical. The 2021 Skagit Travel Survey was designed to collect typical weekday data from residents in Skagit County. Therefore, the HTS dataset is not ideal for understanding weekend or visitor analysis (for example).

Data users should always use weighted data in any analysis intended to draw conclusions about the region (as opposed to survey takers). Note that only Tuesday, Wednesday, and Thursday days were weighted in this study, so any weighted analyses do not represent travel on other days.

Finally, data users should ensure sufficient sample size (and acknowledge margins of error) in any analysis. The smaller the sample size, the larger the margin of error. Sample sizes and margins of error are a complicated topic, but a typical rule of thumb is to ensure at least 30 observations of a behavior to draw reasonable conclusions.

8.0 SURVEY RESULTS

8.1 RESULTS OVERVIEW

The Skagit Travel Survey collected a rich set of demographic and travel behavior data from a representative sample of 672 households in the Skagit Council of Government (SCOG) planning area. The study collected data from 1,343 persons, representing 14,657 trips across 4,130 complete person-days from October 5 to December 2, 2021.

TABLE 6: RESULTS OVERVIEW

	Households Surveyed **672**	Weighted Households **48,489**
	Persons Surveyed **1,343**	Weighted Persons **116,701**
	Complete Person-Days **4,130**	Weighted Person-Days **105,737**

The following sections evaluate the success of the sampling plan and provide descriptive statistics for key questions in the survey and key travel behaviors from the travel diaries.

8.2 SAMPLE PLAN EVALUATION

This section evaluates the performance of the sample plan. Overall, this study targeted 650 households with complete travel surveys and obtained 672 households, which is 3% more households than expected.

Table 7 shows the expected and actual response rate by sampling segment. The actual response rate matched expectations while the general population response rate was slightly lower than expected and the compensatory response rate slightly higher than expected. The actual response rate for the compensatory segment was lower than for the general population, so oversampling those segments was still valuable to ensure the total target was met.

TABLE 7: EXPECTED AND ACTUAL RESPONSE BY SAMPLING SEGMENT

		Expected		*Actual*	
Segment	**Invitations**	**Response Rate**	**Complete Households**	**Response Rate**	**Complete Households**
General Population	16,360	2.6%	419	2.4%	392
Compensatory *(Low Income, Limited English, American Indian / Alaska Native)*	13,640	1.7%	231	2.1%	280
TOTAL	**30,000**	**2.2%**	**650**	**2.2%**	**672**

8.3 DEMOGRAPHIC SUMMARY

This section analyzes the demographic composition of the final, weighted dataset. Unless otherwise noted, all analyses use weighted data. Weighted data means that the individual sample records have been assigned multipliers (weighting factors) so that, cumulatively, the variation in subgroup sample sizes is adjusted to align with the actual subgroup population sizes observed in the American Community Survey (ACS) data for the region. For an evaluation of how closely the *unweighted* dataset matched the ACS data for the region, please see the separate memo on the data weighting approach.

Household Characteristics

The distribution of household characteristics by diary mode (online / call center vs. smartphone app) were very similar overall (Figure 6 through Figure 8). In many regions (including the 2018 Whatcom HTS region), smartphone participants have higher incomes on average. While there were slight variations by income, the two diary modes were comparable overall.

FIGURE 6: HOUSEHOLD SIZE BY DIARY MODE (WEIGHTED)

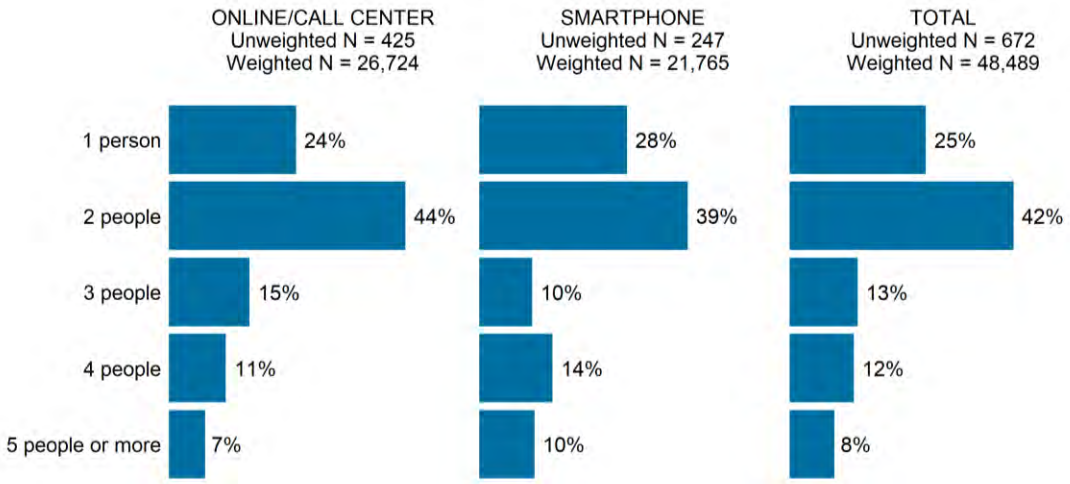


FIGURE 7: HOUSEHOLD INCOME BY DIARY MODE (WEIGHTED)

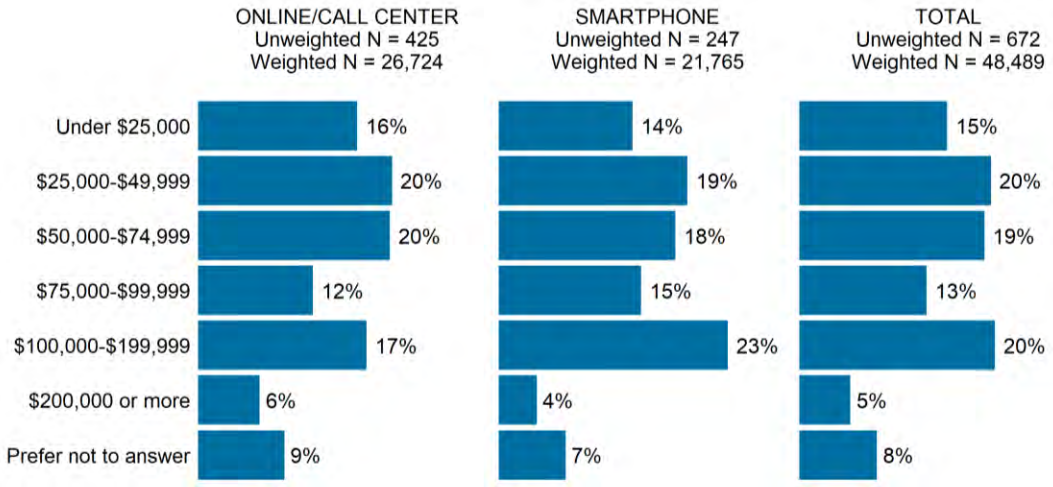
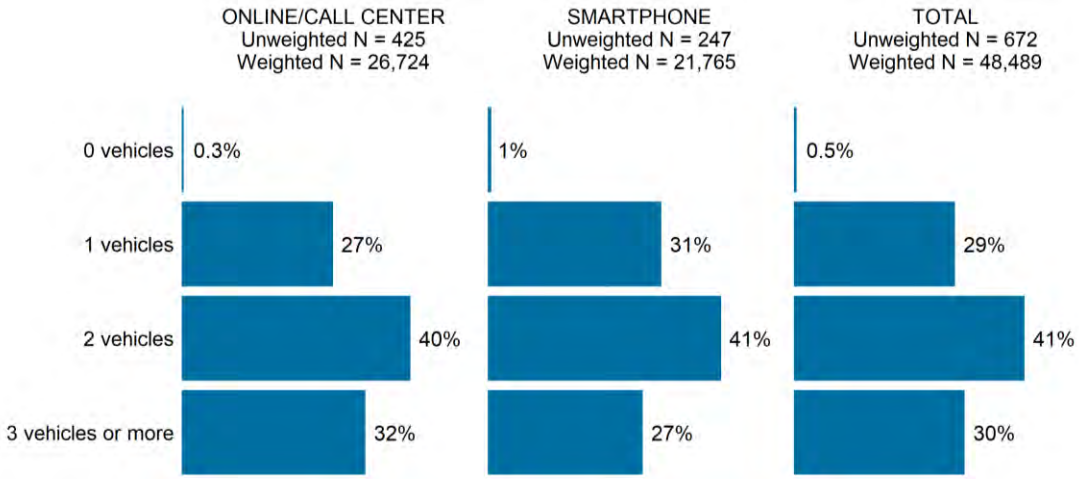


FIGURE 8: HOUSEHOLD VEHICLES BY DIARY MODE (WEIGHTED)



Person Characteristics

Unlike household characteristics, person-level characteristics varied more by diary mode (Figure 9 through Person employment status did not vary greatly by diary mode with the greatest difference being in the share of respondents who reported part-time employment (15% of online / call center respondents compared to 9% of smartphone respondents) (Figure 13).

Figure 13). While smartphone households were more likely to have children (27% compared to 15% of online and call center households), online and call center households were more likely to include young adults aged 18-34. Online and call center households were also more likely to include adults aged 65 and older (Figure 9). Gender distributions were roughly the same between the two participation modes (Figure 10).

FIGURE 9: PERSON AGE BY DIARY MODE (WEIGHTED)

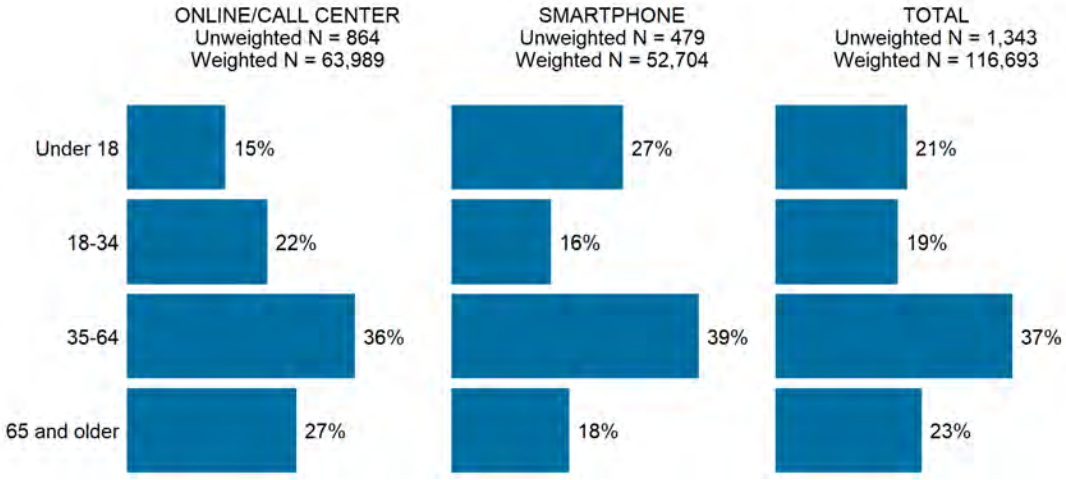
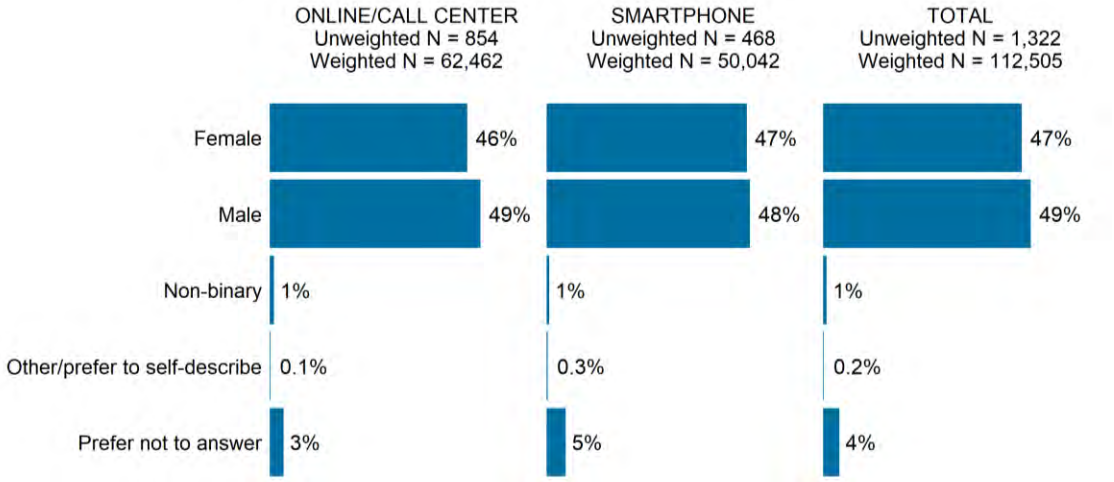


FIGURE 10: PERSON GENDER BY DIARY MODE (WEIGHTED)



Households with non-White and/or Hispanic respondents were more likely to participate online or by call center, though online participants also had much higher shares of respondents reporting “prefer not to answer” (Figure 11 and Figure 12). Among those who did report their race / ethnicity, online household participants were twice as likely to report “other race” and four times as likely to report “Mexican, Mexican American, or Chicano” ethnicity.

FIGURE 11: PERSON RACE BY DIARY MODE (WEIGHTED)

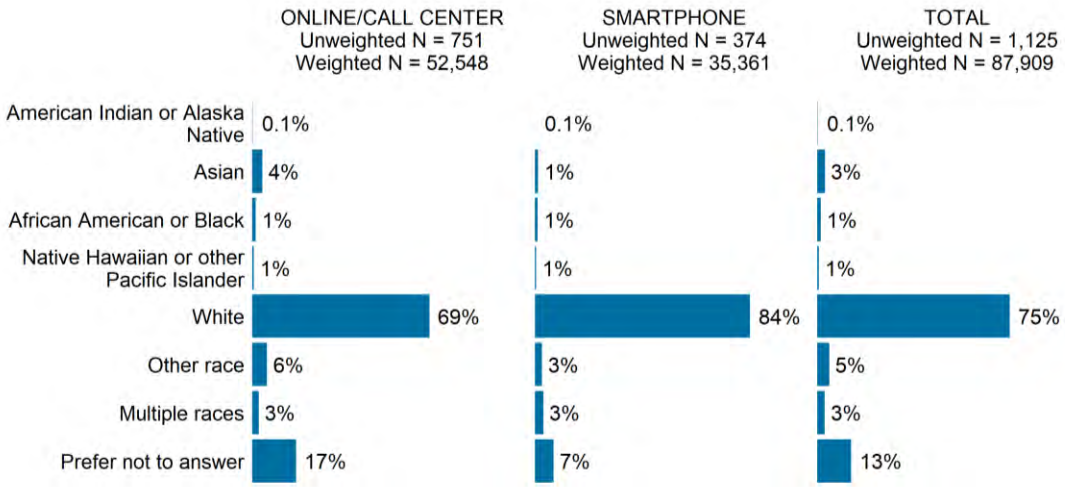
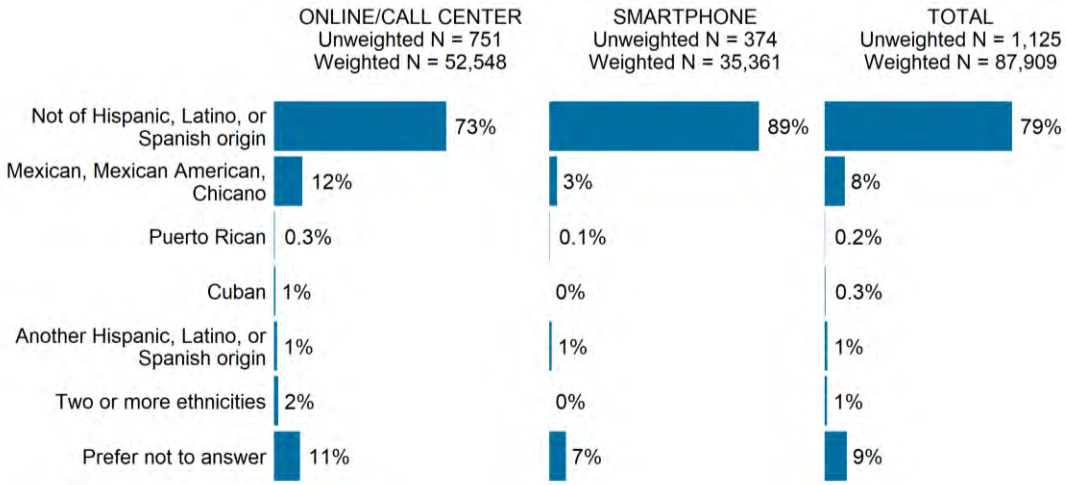
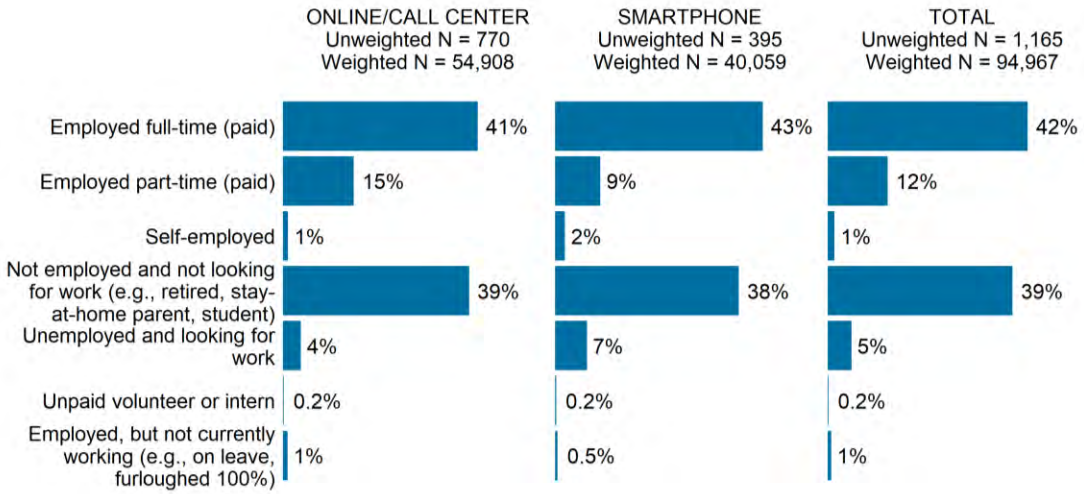


FIGURE 12: PERSON ETHNICITY BY DIARY MODE (WEIGHTED)



Person employment status did not vary greatly by diary mode with the greatest difference being in the share of respondents who reported part-time employment (15% of online / call center respondents compared to 9% of smartphone respondents) (Figure 13).

FIGURE 13: PERSON EMPLOYMENT STATUS BY DIARY MODE (WEIGHTED)



8.4 EMPLOYMENT ANALYSIS

To better understand how employment-related behaviors changed from before March 2020 to fall 2021, the survey asked employed respondents to report their typical commute modes during the two periods (if they travel to a workplace outside the home) and their typical teleworking

frequency. Among those who travel to workplaces, the distribution of commute modes changed very little across the two periods (Figure 14 and Figure 15).

Despite seeing little change in the distribution of modes used to commute to work among those who travel to a workplace, there was an increase in the frequency of teleworking. Interestingly, the share of those who reported teleworking less than weekly or never was identical between the two periods (45% of employed workers). The greatest change was in the frequency of those who already teleworked – primarily a decrease in those who telework 1 day per week (16% before March 2020 compared to 5% in fall 2021) and an increase in those who telework four or more days per week (22% before March 2020 compared to 37% in fall 2021) (Figure 16).

FIGURE 14: TYPICAL COMMUTE MODE TO WORK: FALL 2021 (WEIGHTED)

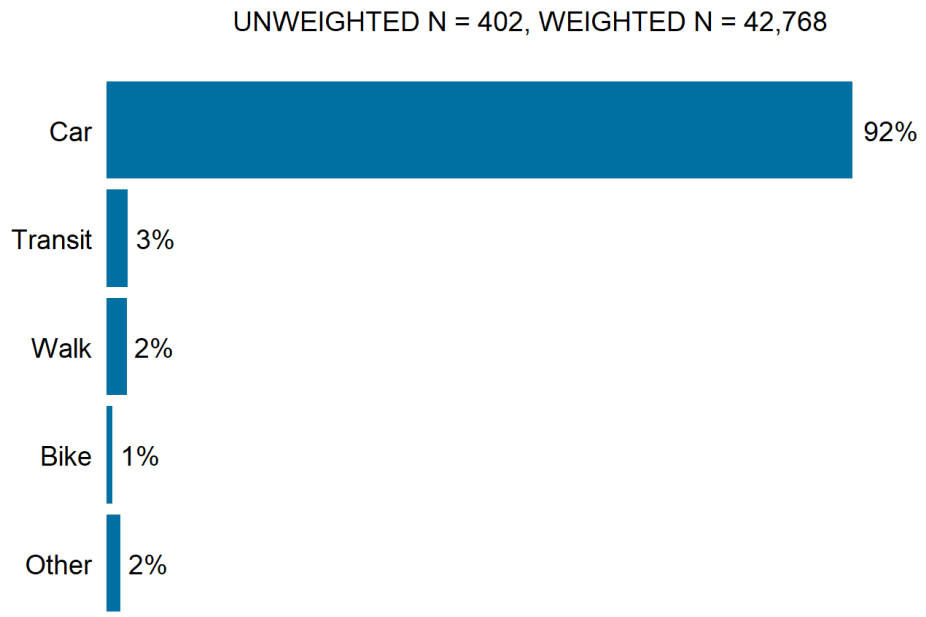


FIGURE 15: TYPICAL COMMUTE MODE TO WORK: BEFORE MARCH 2020 (WEIGHTED)

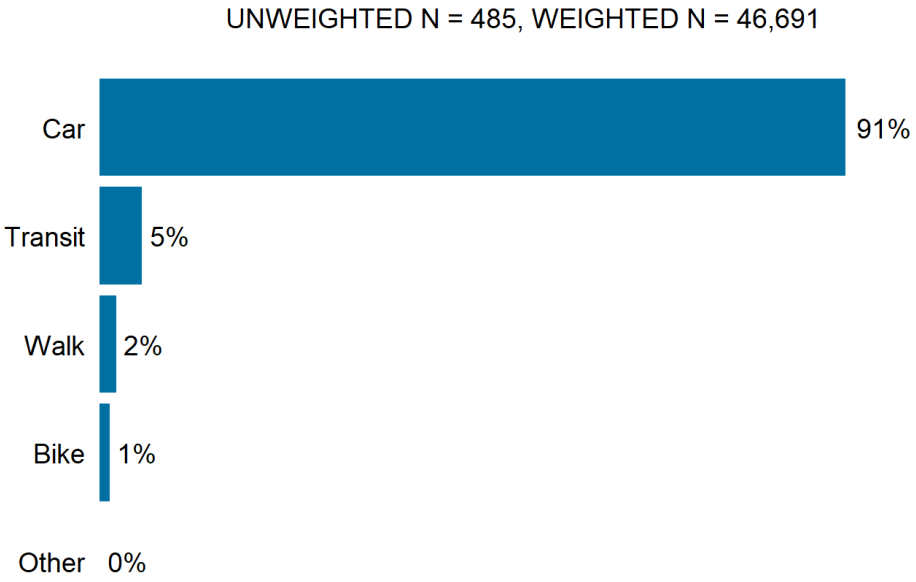
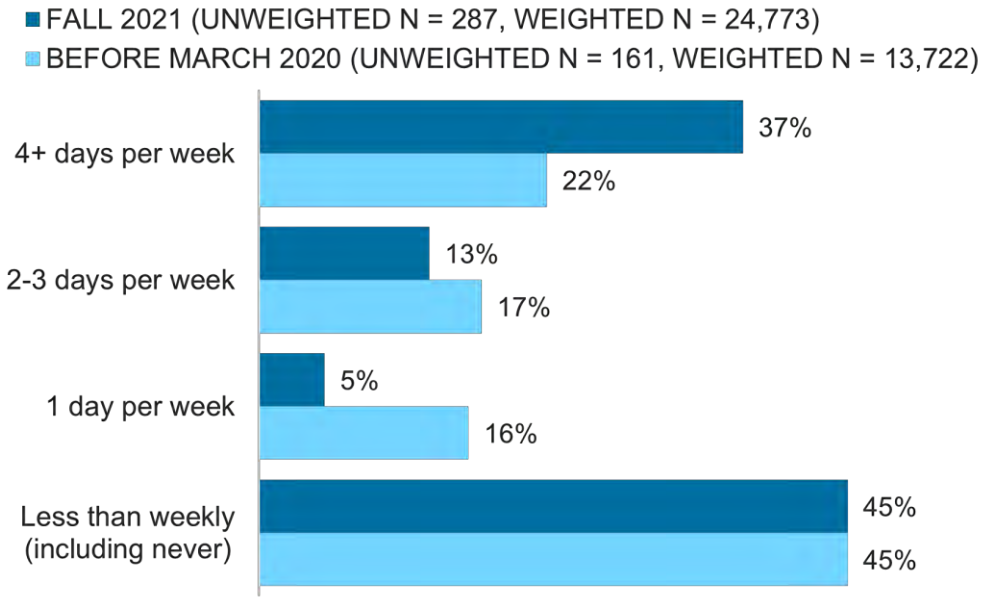


FIGURE 16: TYPICAL TELEWORK FREQUENCY: FALL 2021 AND BEFORE MARCH 2020 (WEIGHTED)



8.5 REGIONAL QUESTION SUMMARY

SCOG and RSG worked together to create several custom questions for the Skagit Travel Survey, beyond the typical demographic and travel behavior questions asked in household travel surveys. The results from these questions are summarized in Figure 17 through Figure 19.

Respondents were first asked how they would rate the condition of public roadways within Skagit County. Most respondents (54%) rated roadways as “Good” (45%) or “Very good” (9%). Fewer than 10% of respondents rated roadways as “Poor” (6%) or “Very poor” (2%) (Figure 17).

To support planning purposes, respondents were asked how they would prioritize spending in Skagit County across seven categories (walking, bicycling, multi-use trail, carpooling, bus service, ferry service, and roadways). Respondents ranked each item on a scale of 1-7 in importance, with “1” being the highest priority. Roadways had the lowest weighted average rank of 2.5 (indicating highest priority) while carpooling had the highest weighted average rank of 5.0 (indicating the lowest priority) (Table 8).

To further understand priorities within these categories, the survey asked respondents how they would spend $100 on different transportation investment areas – service expansion, maintenance and preservation, and safety and operations. Service expansion as well as safety and operations had nearly identical weighted average responses ($29.51 and $29.52, respectively) while respondents provided a weighted average response of $40.97 for maintenance and preservation, indicating higher priority in that area (Table 9).

FIGURE 17: "WHAT GRADE WOULD YOU GIVE THE CONDITION OF PUBLIC ROADWAYS WITHIN SKAGIT COUNTY?" (WEIGHTED)

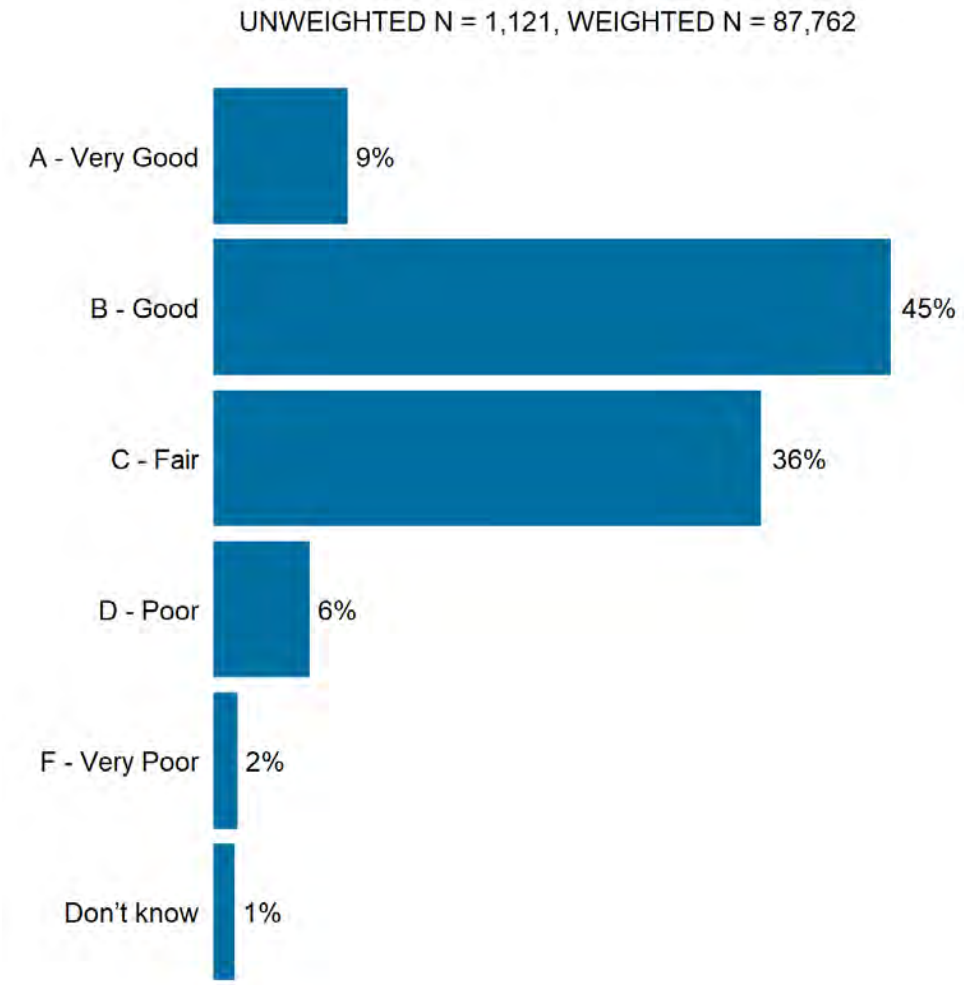


TABLE 8: "AS WE PRIORITIZE SPENDING ON TRANSPORTATION PROJECTS, HOW SHOULD WE RANK THE FOLLOWING AREAS?" (RANK 1-7, WITH 1 BEING THE TOP PRIORITY)

CATEGORY	WEIGHTED AVERAGE RANK
Roadways	2.5
Walking	3.8
Bus Service	3.8
Bicycling	4.1
Multi-use Trail	4.1
Ferry Service	4.7
Carpooling	5.0

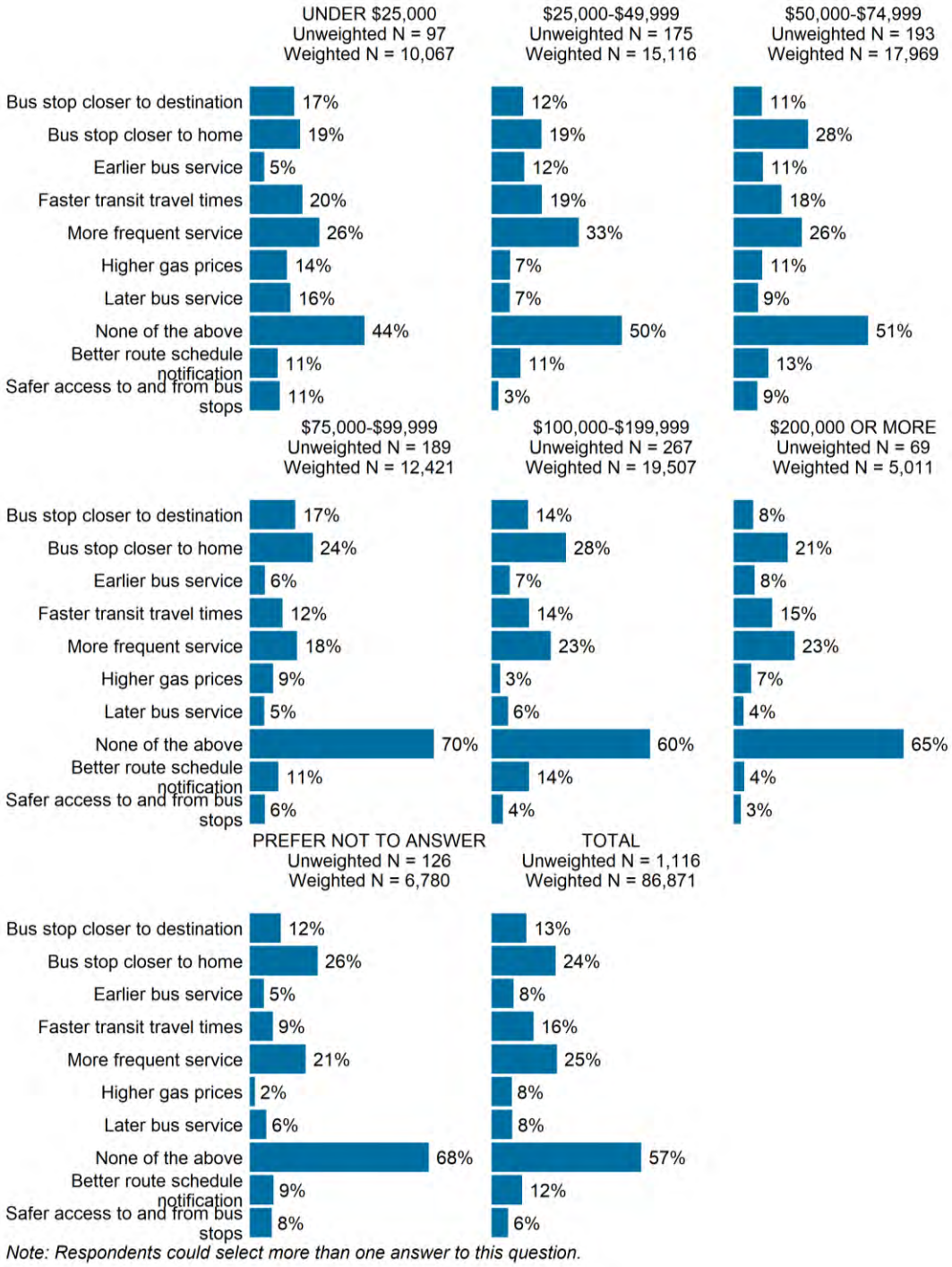
TABLE 9: "HOW WOULD YOU SPEND $100 IN SKAGIT COUNTY?"

CATEGORY	WEIGHTED AVERAGE AMOUNT
Service Expansion	$29.51
Maintenance and Preservation	$40.97
Safety and Operations	$29.52

Respondents who reported using transit fewer than 5 days per week (including never) were asked which factors would encourage them to use Skagit Transit fixed route services more often (Figure 18). Most participants (57%) responded that no factors would increase their use of transit, though responses varied by income. Lower income levels were more likely than higher income levels to report factors that would encourage them to use transit. The top three factors that would increase usage were more frequent service, bus stops closer to home, and faster transit travel times.

Lastly, respondents who reported that they ride bicycles were asked how often they wear helmets when riding a bicycle. Most respondents (79%) reported that they always wear a helmet while 6% reported that they never wear a helmet while riding a bicycle (Figure 19).

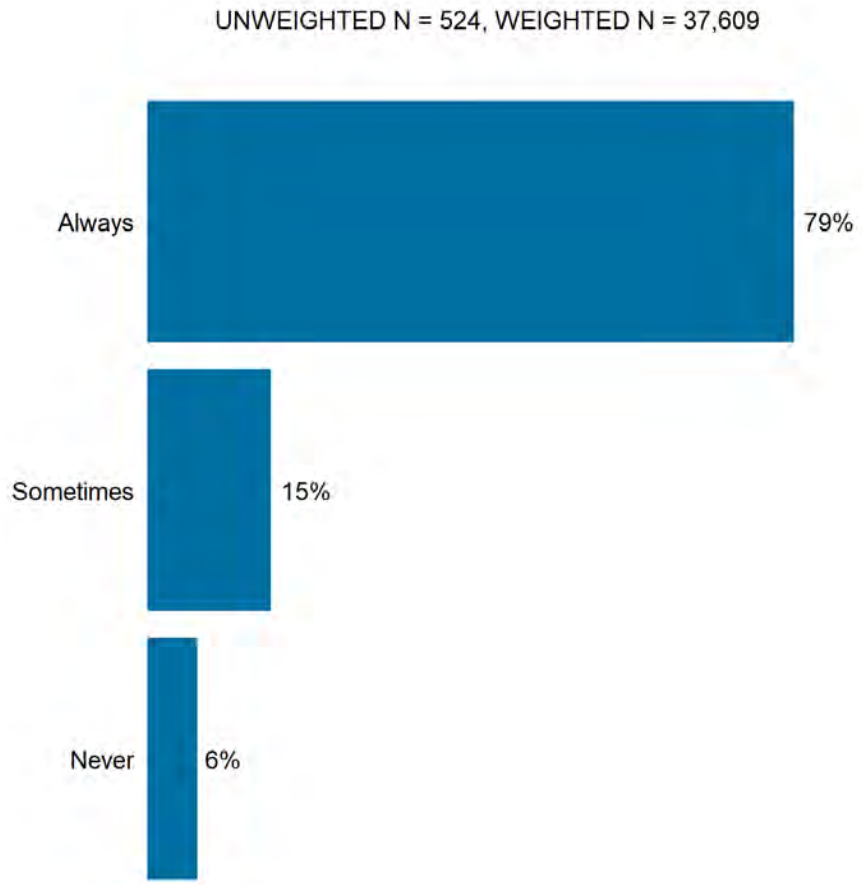
FIGURE 18: "WHICH OF THE FOLLOWING FACTORS WOULD ENCOURAGE YOU TO INCREASE YOUR USE OF SKAGIT TRANSIT FIXED ROUTE SERVICES?" (WEIGHTED)[2]



Note: Respondents could select more than one answer to this question.

[2] Note that "Prefer not to answer" refers to the reported income category in this figure.

FIGURE 19: "HOW OFTEN DO YOU WEAR A HELMET WHEN RIDING A BICYCLE?" (WEIGHTED)



8.6 TRIP ANALYSIS

This section describes the travel data collected during the survey using distributions and trip rates. RSG has also included a visualized O-D matrix by Skagit zone to align with the passive data report for this project, delivered separately. In some cases, these metrics are segmented by important variables, such as household income, age, or time of day.

Trip Rates

The total weighted trip rate was 3.83 person trips per day. In reviewing trip rates by age, those under age 18 make the fewest trips (2.1 trips per day on average) while those of age 35-64 make the most trips (4.7 trips per day on average) (Figure 20). All income groups also have similar trip rates though those with incomes below $25,000 and within $50,000 - $74,999 have the highest trip rates at 4.0 and 4.5 trips per day, respectively (Figure 21).

FIGURE 20: PERSON TRIP RATE BY AGE (WEIGHTED)

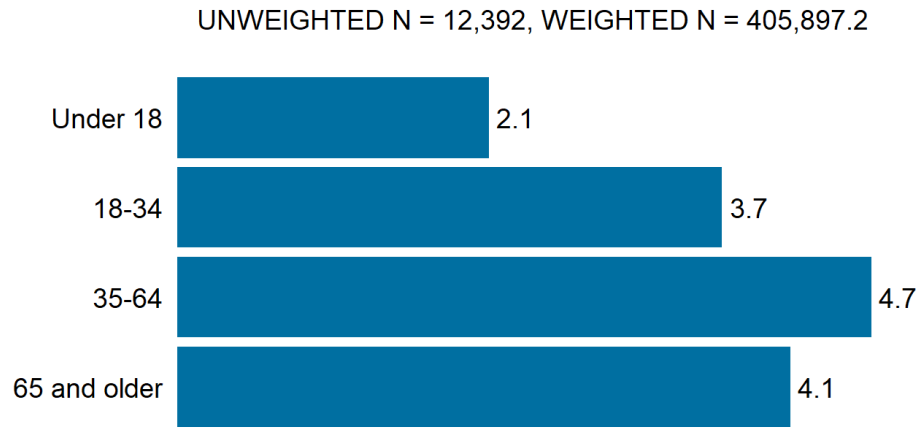
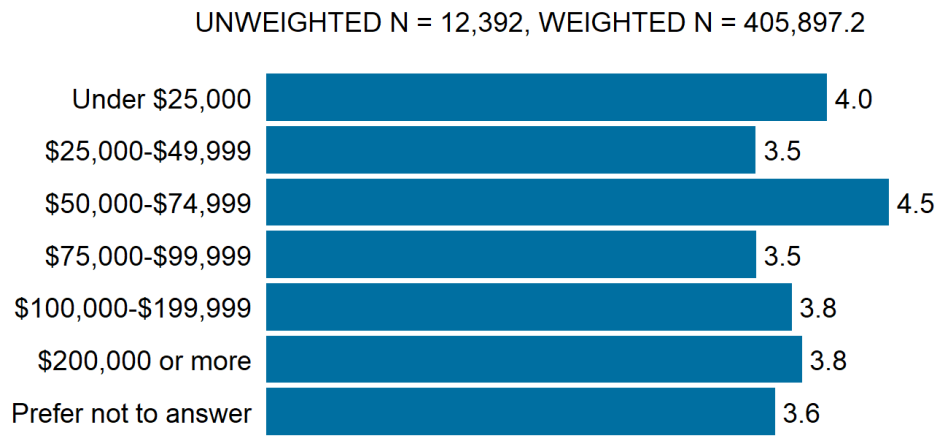


FIGURE 21: PERSON TRIP RATE BY INCOME (WEIGHTED)



In looking at trip rates by mode, respondents took 3.32 trips per day by car and 0.39 trips per day walking. All other modes had trip rates below 0.1 trips per day (Figure 22). On average, respondents took 1.08 trips home each day, 0.80 shopping trips each day and 0.33 work trips each day (Figure 23).

FIGURE 22: PERSON TRIP RATE BY TRIP MODE (WEIGHTED)

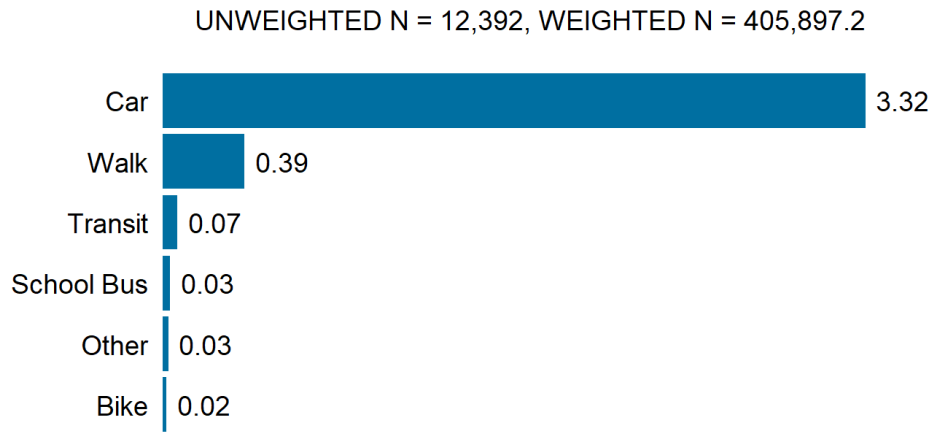
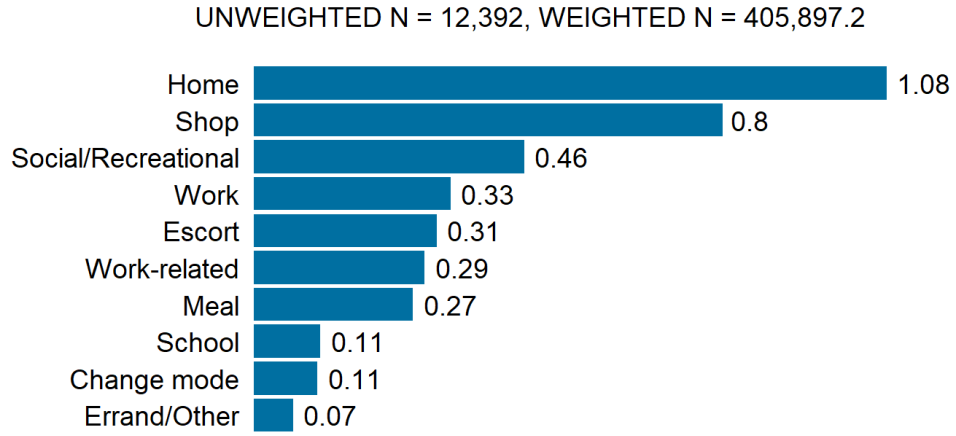


FIGURE 23: PERSON TRIP RATE BY TRIP PURPOSE (WEIGHTED)



Trip Modes

Figure 24 though Figure 27 show distributions of travel modes by income, age, trip purpose, and time of day. In most cases, the predominate mode used is “car,” representing 87% of all weighted trips.

Mode choice varies very little by income above $50,000. Those with incomes of $25,000 - $49,999 had the lowest share of car trips (77%) while those with incomes below $25,000 or incomes between $75,000 and $99,999 had the highest share of car trips (91%). 95% of trips among those reporting “prefer not to answer” income were car trips (Figure 24).

Mode choice also varies little by age except for those of age 18-34, who reported more walk and transit trips. (Figure 25).

Most trip purposes were also predominately car trips, excluding school trips (higher shares of walk, school bus, other modes), social / recreation trips (higher share of walk trips), and change mode trips (higher share of walk and transit trips). These differences are expected and are like most regions (e.g., it is expected that most school bus trips are used to travel to and from school) (Figure 26).

In reviewing trip modes by time of day, car trips are still most popular at all times of day. Walk trips are much less frequent from the hours of 6 – 9 am while transit trips are more frequent from 6 pm – 6 am (Figure 27).

FIGURE 24: TRIP MODE BY INCOME (WEIGHTED)

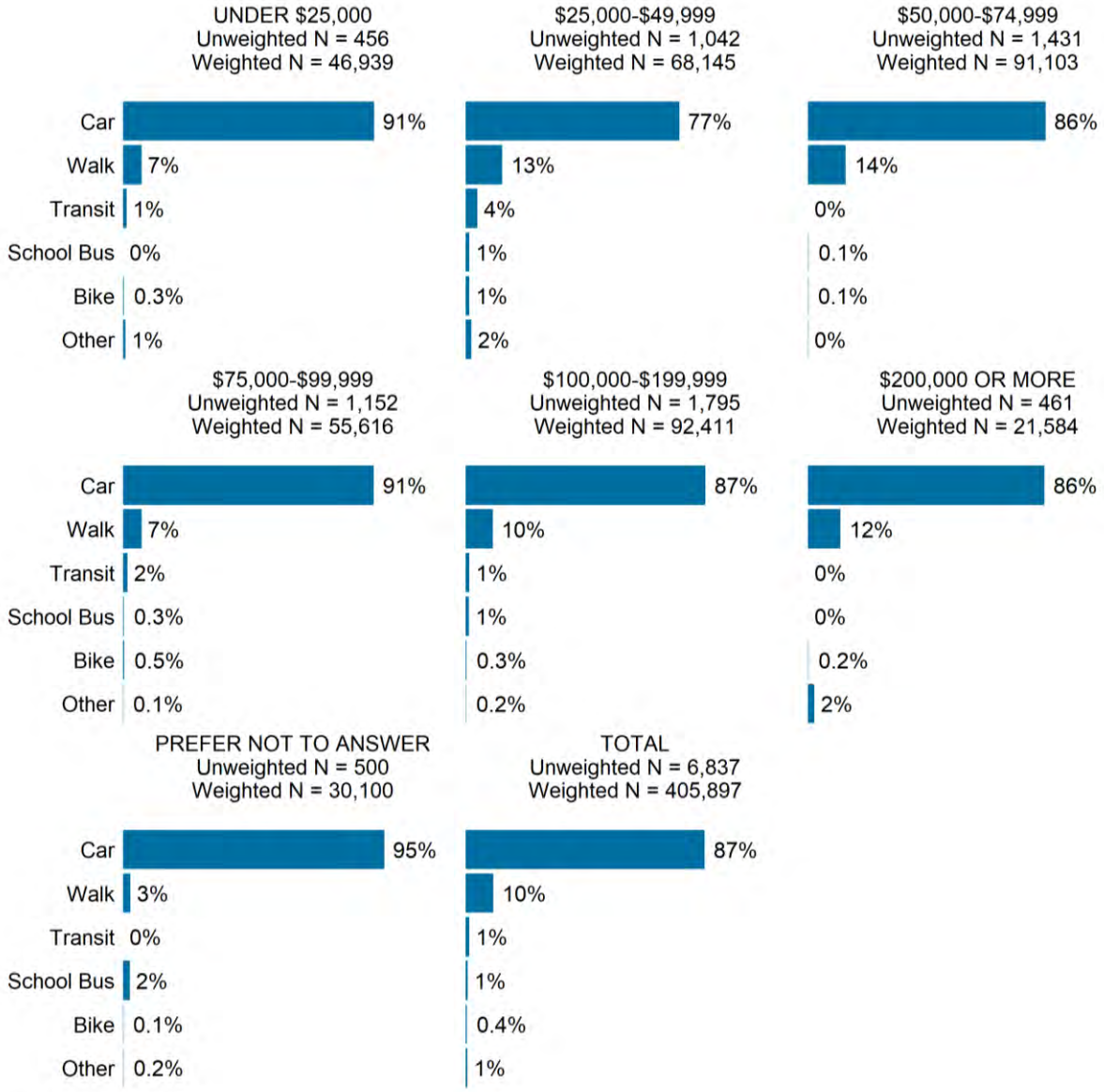


FIGURE 25: TRIP MODE BY AGE (WEIGHTED)

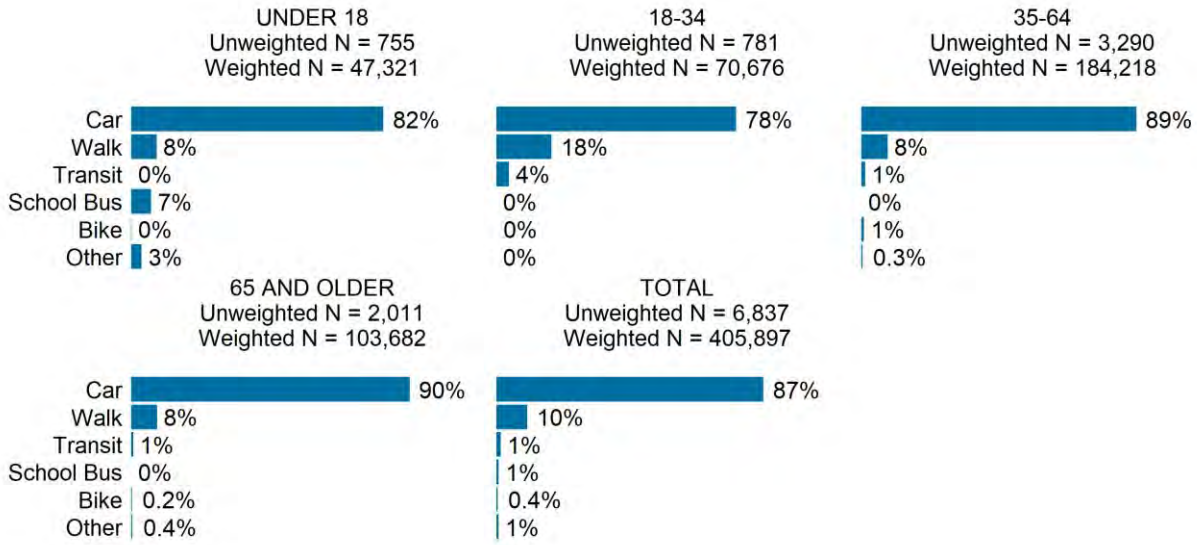


FIGURE 26: TRIP MODE BY TRIP PURPOSE (WEIGHTED)

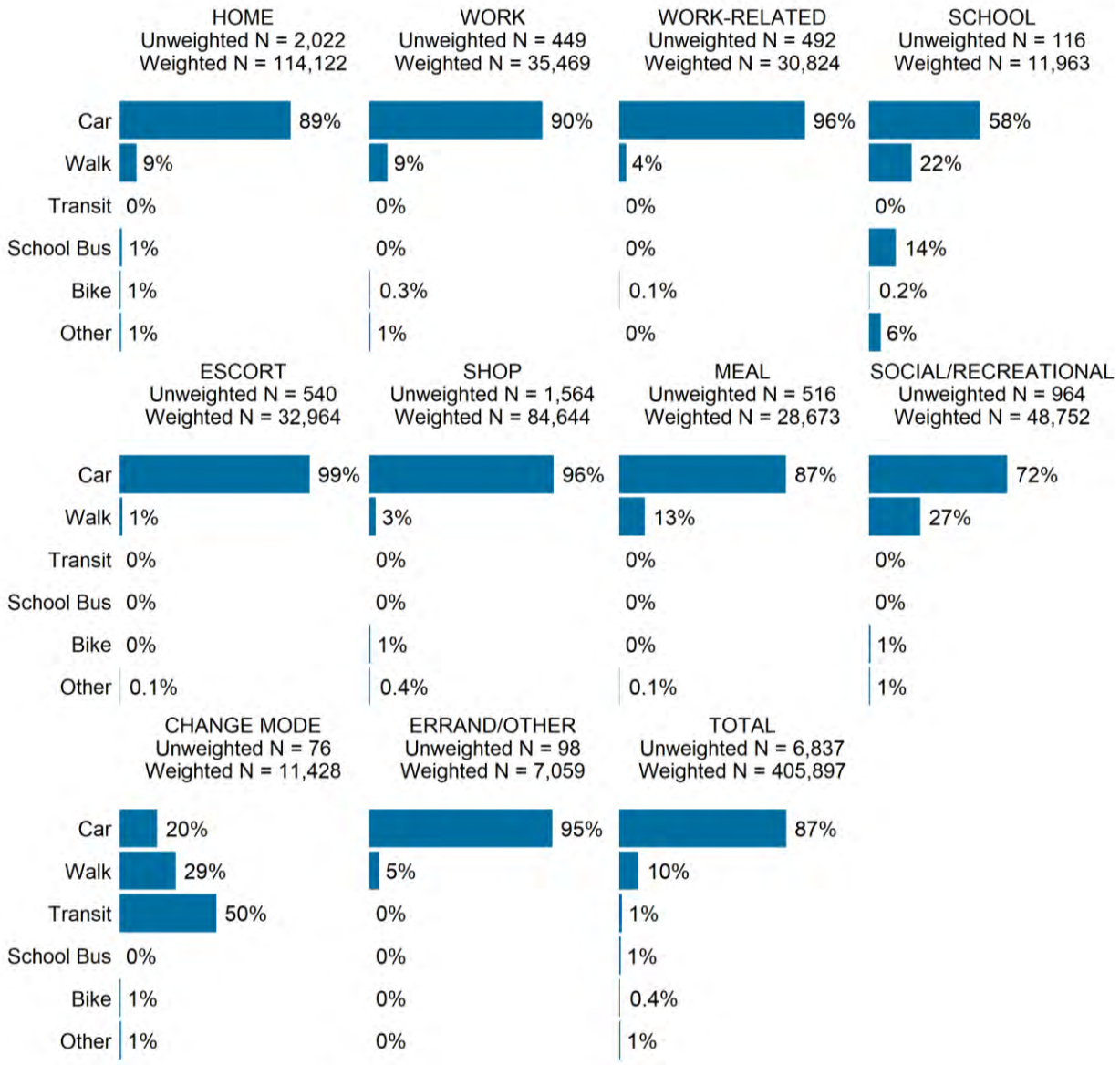
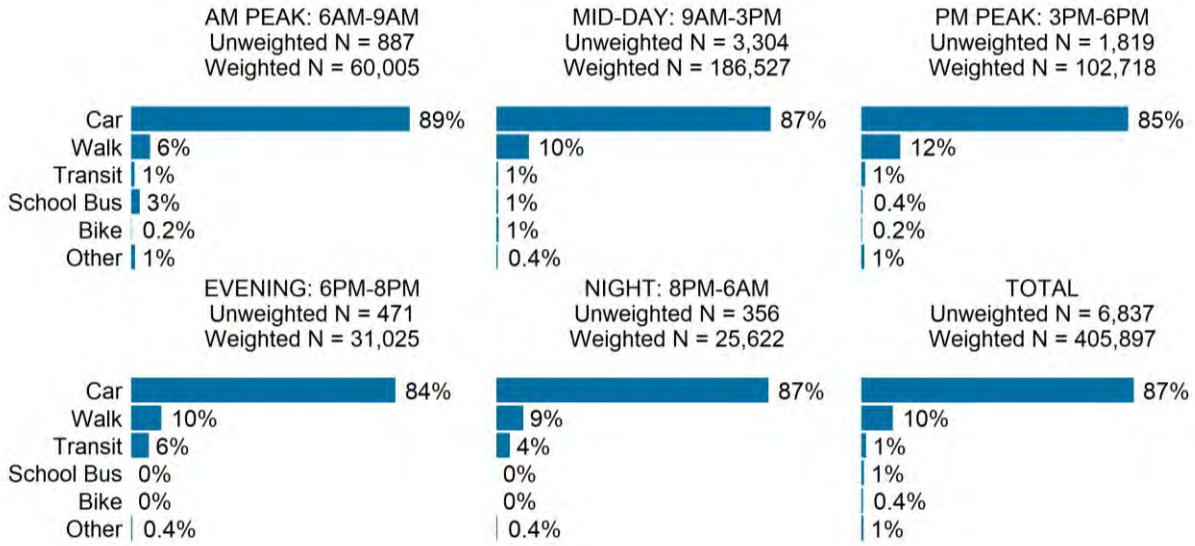


FIGURE 27: TRIP MODE BY TIME OF DAY (WEIGHTED)



Typical Transit Frequency

Adult respondents were asked how often they typically use transit (bus or rail).

Table 10 and Table 11 show the weighted distribution of responses by income and age, respectively. Unweighted sample sizes are also included for context. More than 20% of residents with incomes below $75,000 reported using transit more often than “never,” though most of those use transit less than monthly (Table 10). Transit usage varies less by age, though those age 65 and older are slightly less likely to use transit at all compared to those under age 65 (Table 11).

TABLE 10: TRANSIT USAGE BY INCOME (WEIGHTED)

INCOME	UNWEIGHTED N	NEVER USES TRANSIT	USES TRANSIT LESS THAN MONTHLY	USES TRANSIT MONTHLY OR MORE
Under $25,000	97	79%	14%	7%
$25,000 - $49,000	177	78%	16%	6%
$50,000 - $74,999	194	76%	19%	5%
$75,000 - $99,999	190	90%	8%	2%
$100,000 - $199,999	268	82%	15%	3%
$200,000 or more	69	86%	14%	0%
Prefer not to answer	127	86%	12%	2%
TOTAL	**1,122**	**82%**	**14%**	**4%**

TABLE 11: TRANSIT USAGE BY AGE (WEIGHTED)

AGE	UNWEIGHTED N	NEVER USES TRANSIT	USES TRANSIT LESS THAN MONTHLY	USES TRANSIT MONTHLY OR MORE
18 – 34	162	86%	9%	5%
34 – 64	490	84%	12%	4%
65 and older	470	74%	23%	3%
TOTAL	**1,122**	**82%**	**14%**	**4%**

Trip Purposes

Figure 28 through Figure 30 show distributions of trip purpose by income, age, and time of day.

Trip purposes are mostly consistent by income, though there are clear variations in work and work-related trips, which comprise about 10% of trips for those with incomes below $50,000, 16% of trips for those with incomes of $50,000 to $99,999, and 24% of trips for those with incomes of $100,000 or greater (Figure 28).

In looking at trip purposes by age, the greatest differences again are in work and work-related trips as well as school trips. As expected, those under age 18 make the highest share of school trips (18%) and the lowest share of work and work-related trips (1%) (Figure 29).

By time of day, trip purposes of work, work-related, and school are most common during the AM peak (6-9 AM) while trips home are skewed in the PM peak (3-6 PM) and evening (6-8 PM). Most other trip purposes are relatively even throughout the day without distinct peaks (Figure 30)

FIGURE 28: TRIP PURPOSE BY INCOME (WEIGHTED)

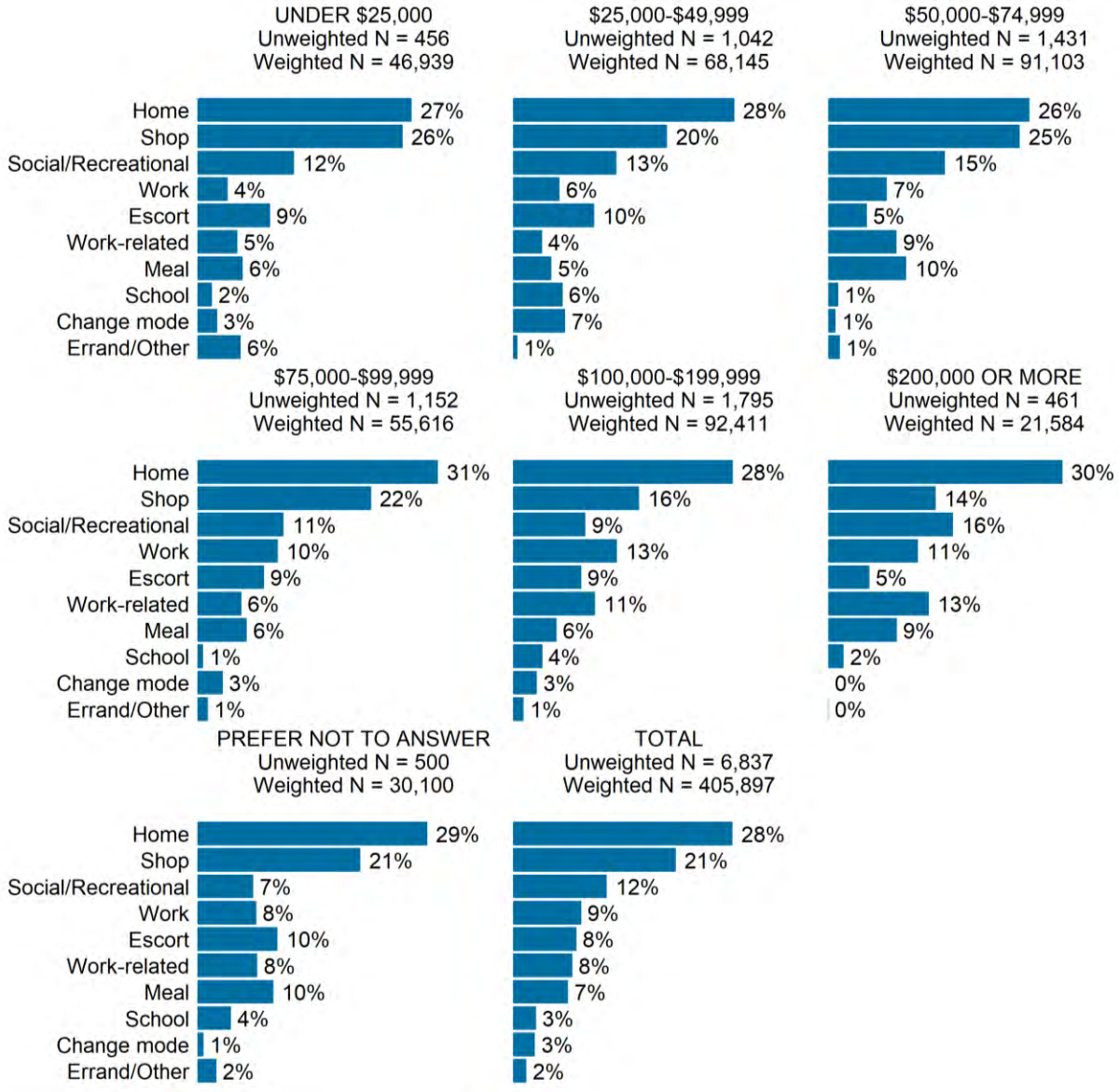


FIGURE 29: TRIP PURPOSE BY AGE (WEIGHTED)

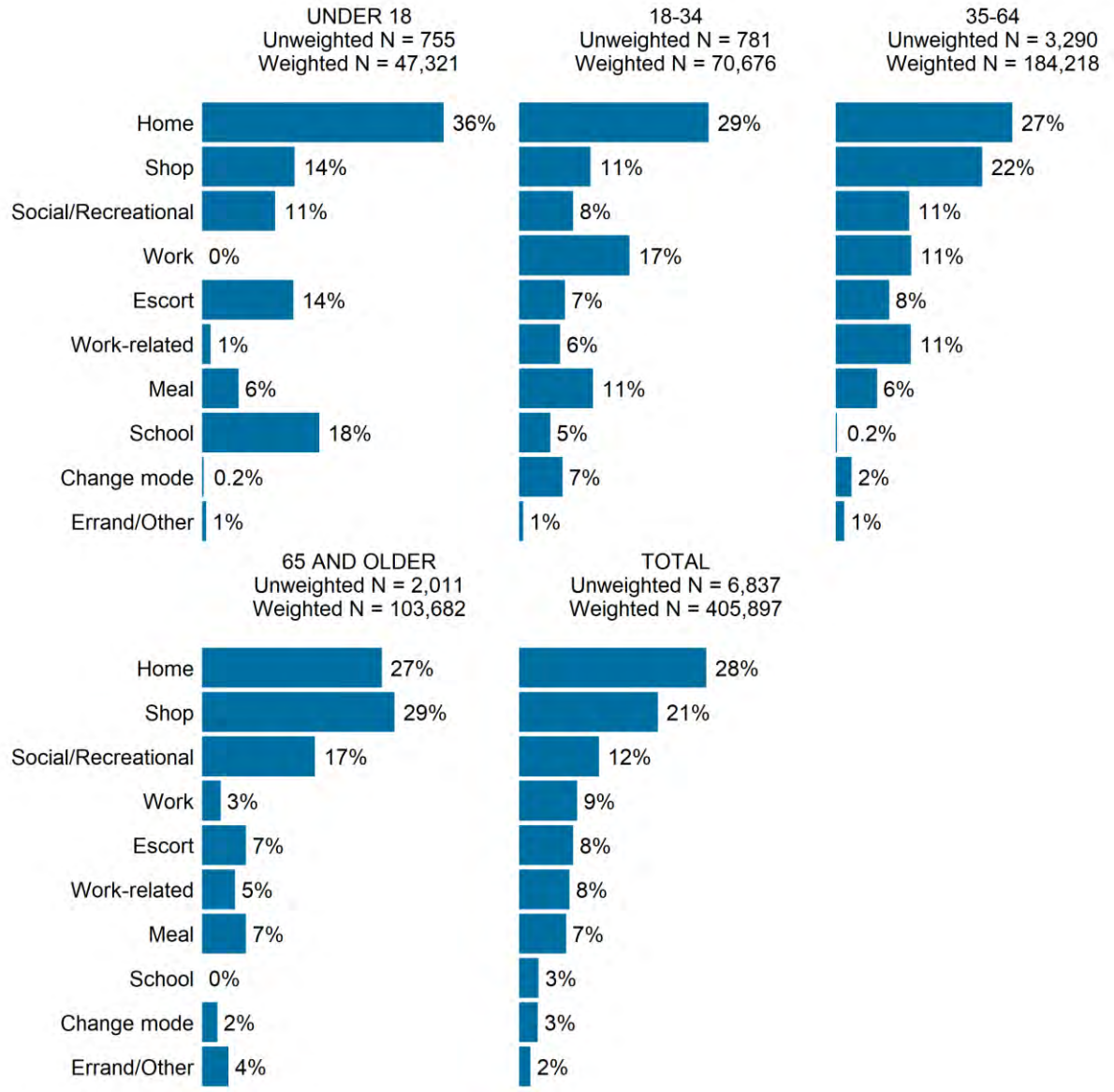
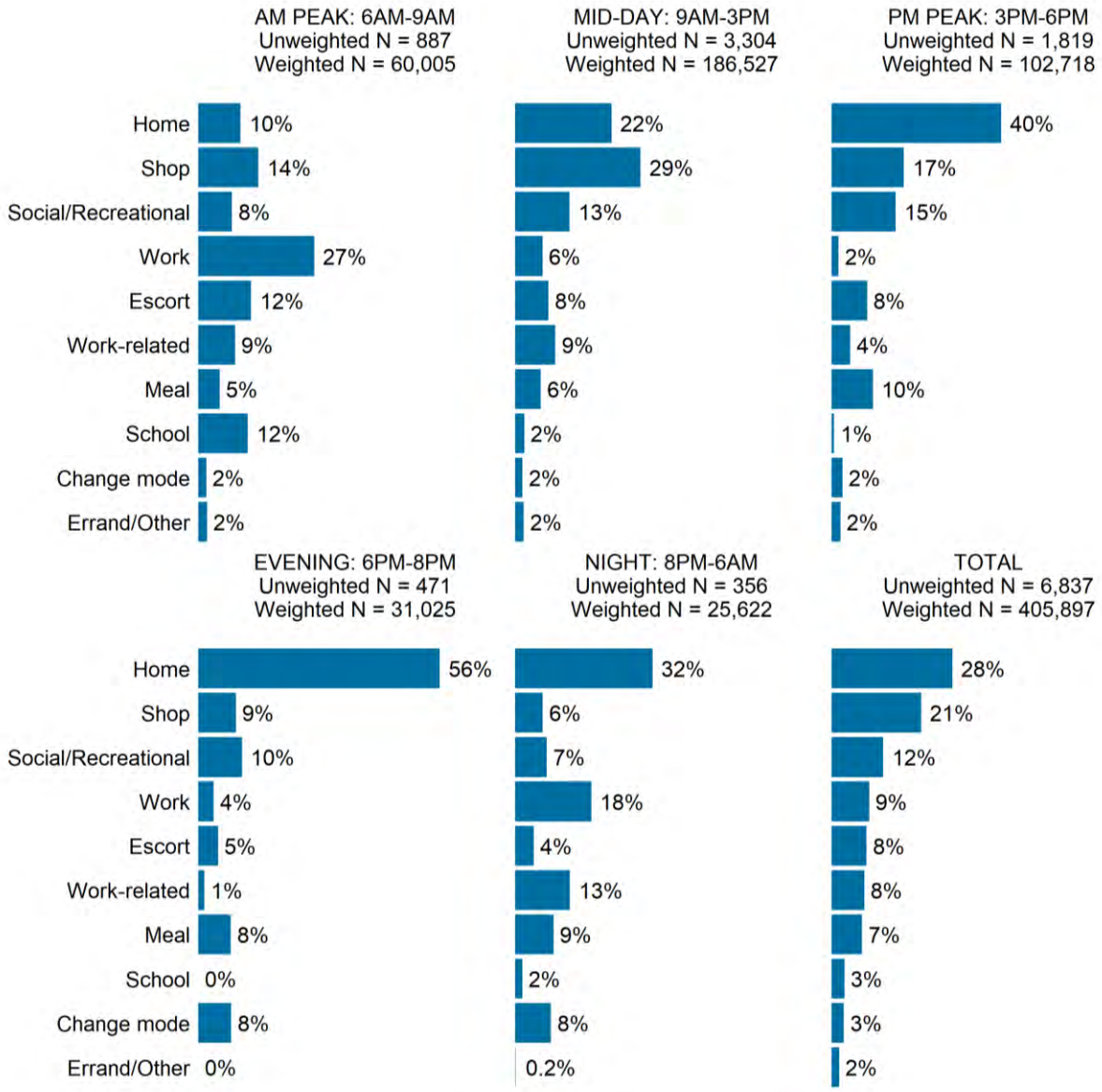


FIGURE 30: TRIP PURPOSE BY TIME OF DAY (WEIGHTED)



Trip Distances and Durations

This section shows trip distances and durations by mode and purpose categories. All tables are shown as medians to remove the impact of extreme outliers. These tables also include unweighted sample sizes to provide context for values. Note that some trips do not have derived distances available if they occurred over water where there is no Google distance information available.

In looking at trip distance and duration by mode (Table 12), all trip types have a median between 2-3 miles, excluding walk and school bus trips. These are expected given that walking trips tend to be shorter and school bus trips tend to be local. Travel times for most modes are under 20 minutes, excluding school bus trips, which are expectedly longer given their routes (Table 13).

TABLE 12: MEDIAN TRIP DISTANCE (MILES) BY TRAVEL MODE

TRAVEL MODE	UNWEIGHTED N	MEDIAN DISTANCE (MILES)
Car	10,712	2.8
Walk	1,406	0.4
Transit	40	2.8
Bike	88	2.1
School bus	28	1.6
Other	74	2.8

TABLE 13: MEDIAN TRIP DURATION (MINUTES) BY TRAVEL MODE

TRAVEL MODE	UNWEIGHTED N	MEDIAN DURATION (MINUTES)
Car	10,712	11.8
Walk	1,406	10.3
Transit	40	18.6
Bike	88	15.0
School bus	28	30.0
Other	74	19.0

In looking at trip distances by trip purpose, respondents reported traveling furthest for work trips at a median distance of 3.2 miles (Table 14). The longest duration trips have a purpose of social/recreational (13.2 minutes) with work trips just behind at 13.0 minutes (Table 15).

TABLE 14: MEDIAN TRIP DISTANCE (MILES) BY TRIP PURPOSE

TRIP PURPOSE	UNWEIGHTED N	MEDIAN DISTANCE (MILES)
Home	3,598	2.8
Work	661	3.2
Work-related	809	2.6
School	152	1.6
Escort	936	2.4
Shop	2,823	2.2
Meal	1,071	2.1
Social/Recreational	2,004	1.7
Change mode	123	1.5
Errand/Other	172	2.3

TABLE 15: MEDIAN TRIP DURATION (MINUTES) BY TRIP PURPOSE

TRIP PURPOSE	UNWEIGHTED N	MEDIAN DURATION (MINUTES)
Home	3,598	12.7
Work	661	13.0
Work-related	809	12.6
School	152	12.6
Escort	936	11.3
Shop	2,823	10.6
Meal	1,071	10.1
Social/Recreational	2,004	13.2
Change mode	123	9.4
Errand/Other	172	10.0

8.7 ZONE ANALYSIS

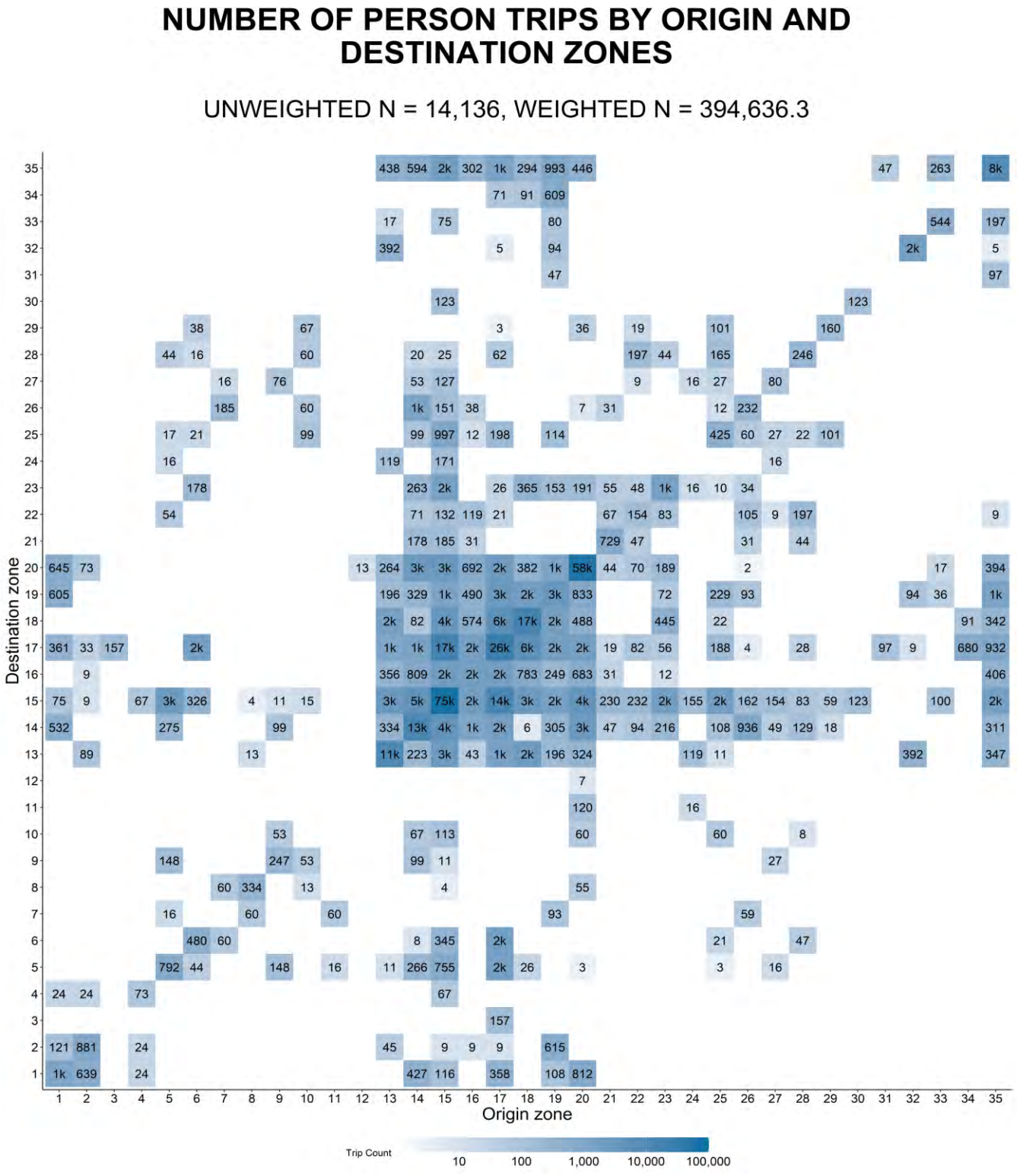
To facilitate regional analysis, each trip origin and destination in the dataset was coded to one of SCOG's analysis zones or districts, aligning with those used in the passive data analysis (delivered separately). These zones are assigned and labeled in Table 16 below. Figure 31 shows a visual representation of origins and destinations, shaded by frequency (where darker shades have higher frequencies and lighter shades have lower frequencies). Most trips in this study took place fully within Skagit County (zones 13 – 20) though there was also a clear concentration of trips to and from Bellingham (zone 1). Trips tended to be most concentrated on the diagonal, meaning that most trips were short distance within a single zone. This is consistent with the median trip distances presented in Section 8.6 above.

TABLE 16: ANALYSIS ZONES

ZONE NUMBER	ZONE NAME
1	North Whidbey
2	Central Whidbey
3	Camano
4	South Whidbey
5	Shoreline
6	Ballard
7	Seattle
8	SeaTac & Federal Way
9	Eastside
10	Northeast King
11	Southeast King
12	San Juan
13	East Skagit
14	Southwest Skagit
15	Mount Vernon
16	Bayview
17	Burlington
18	Sedro-Woolley
19	Northwest Skagit
20	Anacortes & Guemes

ZONE NUMBER	ZONE NAME
21	Stanwood
22	Tulalip
23	Arlington & Marysville
24	Darrington
25	North Everett
26	Paine Field & Mukilteo
27	Snohomish & Monroe
28	Edmonds & Lynnwood
29	Mill Creek & Bothell
30	Sky Valley
31	Blaine & Birch Bay
32	Ferndale & Lummi
33	Lynden
34	East Whatcom
35	Bellingham

FIGURE 31: TRIP ORIGIN AND DESTINATION BY SKAGIT ZONE



8.8 TRAVEL DAY ANALYSIS

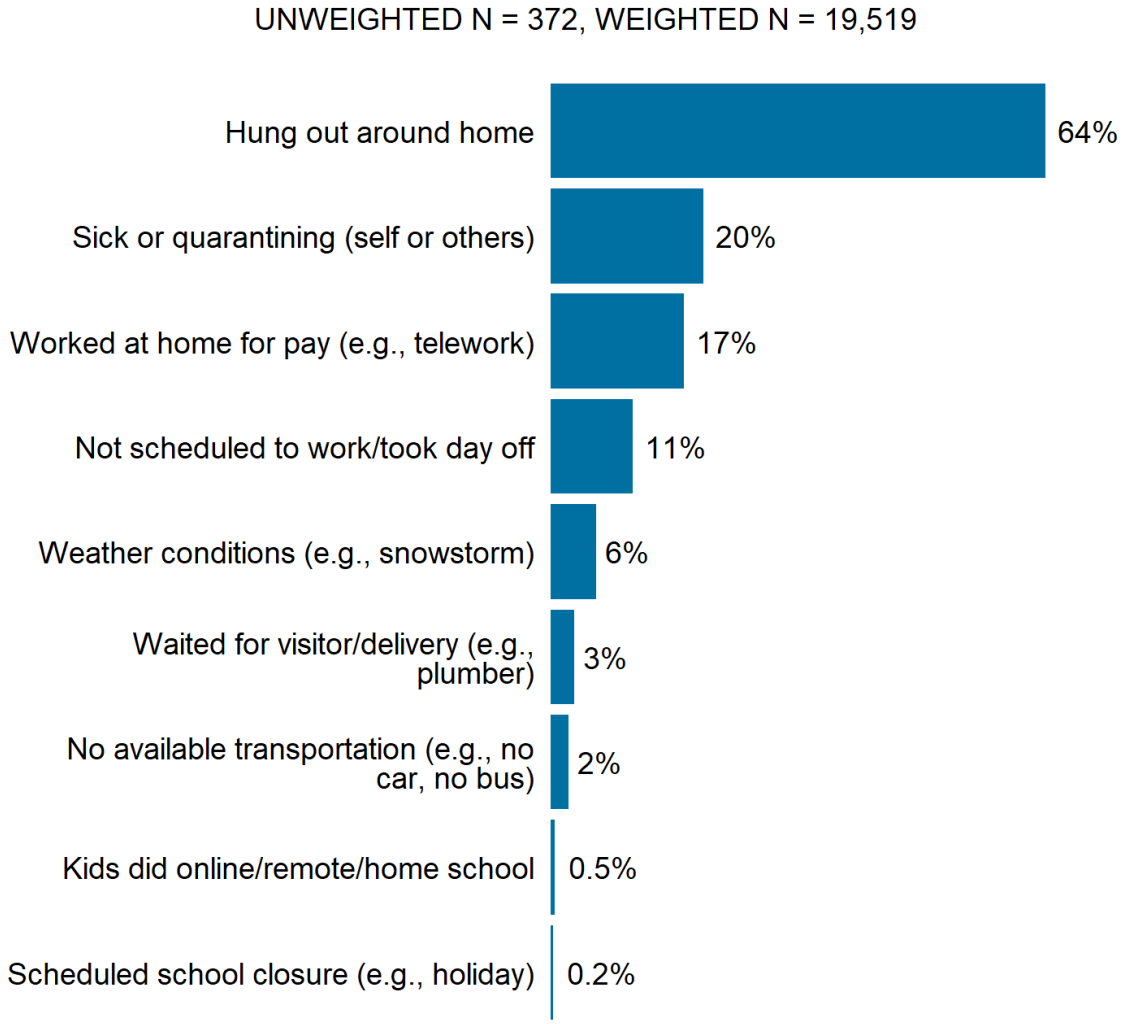
After each travel day, respondents were asked a handful of day-level questions to better understand their travel replacement activities. These included asking about their reasons for not traveling (if applicable), deliveries received on their travel day, and time spent telecommuting (if employed).

Among those who did not travel on their travel day, the most common reason was hanging out around home (64%) followed by being sick or quarantining (20%). 17% of respondents who did not travel on their travel day reported working from home as the reason (Figure 32).

Most respondents (66%) did not receive any deliveries on their travel days. It may be worth noting that the share of respondents who have reported receiving deliveries has increased in the past several years. For example, fewer than 15% of respondents in the 2018 WCOG HTS reported receiving deliveries on their travel day. This trend has also been observed in the recurrent PSRC HTS between 2019 and 2021. While household travel surveys are not suitable for fully quantifying the impact of freight travel, this trend may hint at regional transportation changes.

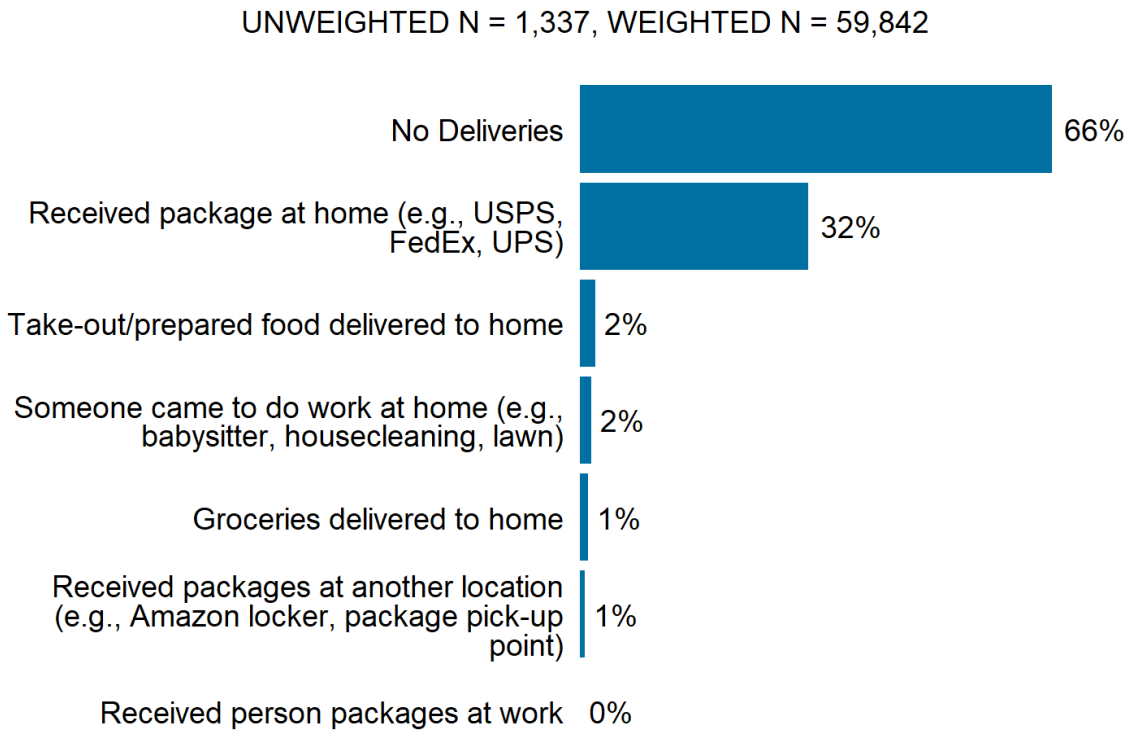
Lastly, employed respondents were asked how much time they spent teleworking at home on their travel day. 69% of employed respondents reported that they did not telework at all on their travel day while 19% reported teleworking six or more hours on their travel day. 37% of employed respondents reported “typically” working from home 4+ days per week (Figure 16), which roughly aligns with the 31% of employed respondents who reported teleworking on their travel day (Table 17).

FIGURE 32: REASONS FOR NOT TRAVELING ON TRAVEL DAY (IF NO TRAVEL) (WEIGHTED)



Note: Respondents could select more than one answer to this question.

FIGURE 33: DELIVERIES ON TRAVEL DAY (WEIGHTED)



Note: Respondents could select more than one answer to this question.

TABLE 17: TELECOMMUTE TIME ON TRAVEL DAY (WEIGHTED)

TELECOMMUTE TIME AMONG EMPLOYED RESPONDENTS	WEIGHTED %
0 hours (did not telework)	69%
Under 2 hours	3%
2 – 4 hours	6%
4 – 6 hours	3%
6+ hours	19%

9.0 CONCLUSION

The methods used in the 2021 Skagit Travel Survey provided higher-quality and more versatile data compared to traditional methods. The compensatory oversampling techniques resulted in a more representative sample than conventional random sampling would have allowed. Coherent, professional survey branding and user-friendly survey tools (e.g., Bing Maps API) communicated expectations with participants and maximized the total participation rate. The high proportion of smartphone-collected data allowed for more precise trip rates and greater quantity of trip information captured across multiple days. Overall, the survey applied innovative methods to capture higher-quality and higher-quantity data which will lead to greater analytical opportunities in the future.

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