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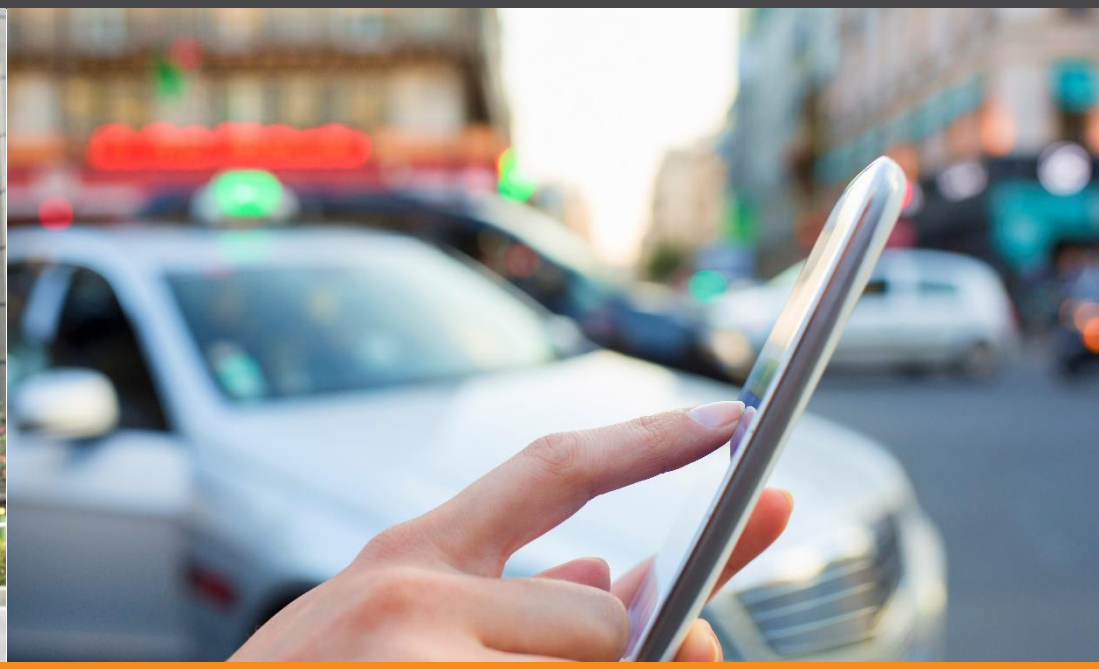
UNDERSTANDING THE FUTURE OF MOBILITY: TRANSPORTATION NETWORK COMPANY (TNC) SURVEY

Final Methodology Report | April 28, 2020



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1.0 INTRODUCTION

1.1 OVERVIEW

This methodology report documents a project to support analysis of key policy and planning questions related to Transportation Network Companies (TNCs). Specifically, this report details the methods used to conduct a TNC User Survey in the following three regions of California.

- Nine-county Bay Area (within the Metropolitan Transportation Commission (MTC) and San Francisco County Transportation Authority (SFCTA) planning regions).
- San Diego County (San Diego Association of Governments (SANDAG) planning region).
- Parts of Los Angeles and Orange counties (as defined by the Southern California Association of Governments (SCAG) and within SCAG's planning region).

All data were collected between November 2018 and November 2019. The TNC survey used an innovative research approach to collect demographic and travel pattern information from residents from the SANDAG, MTC, and SCAG planning regions. The goal of the survey was to obtain detailed travel behavior information that can be used to support comprehensive descriptive statistics of TNC usage, how TNCs fit into personal travel overall, and support the integration of TNCs into the detailed travel demand models used by metropolitan planning organizations (MPOs). (The appendix lists the detailed use cases provided by each MPO).

The remainder of this report includes information on the study design and survey sampling approach, survey instrument design, and branding.

1.2 STUDY TIMELINE

Initial Work to Design and Test a TNC-User Travel Survey

The TNC Data collection effort was composed of two separate but related efforts and initiated through two separate contracts. The first contract was with MTC and SFCTA and funded by those two agencies. The second task order was with SANDAG, MTC, and SCAG and was funded by Senate Bill 1 (SB1) Caltrans Planning Grant.

Initial project scoping work began with MTC and SFCTA in late 2017. MTC and SFCTA then jointly funded a contract task order in mid-2018 to design and pilot a TNC user survey study to accomplish similar objectives and analytical use cases that became the basis for this SB1-funded project.

The study design phase included effort to develop and refine the questionnaire, consider various sampling approaches, program and prepare the survey instruments in rMove, and

obtain foreign language translations for the supported languages of Spanish, Traditional Chinese, and Simplified Chinese.

The initial task order to design the study was then expanded to implement a Bay Area-only survey effort to capture approximately 18,000 person-days of travel, evenly split between San Francisco (9,000 person-days) and the other eight Bay Area counties (9,000 person-days).

The study team piloted an intercept-based sampling approach in September and October 2018. That pilot study evaluated the effectiveness of recruiting study participants from predicted TNC use "hot spots" in the Bay Area and asking them to participate in a seven-day travel diary.

The "hot spots" were informed by previous data collected by SFCTA during their "TNCs Today" project.[1] At the time, the study team's hypothesis was that the most efficient way to sample frequent TNC users[2] would be to perform an intercept-based sampling approach leveraging this detailed "hot-spot" data.

In October 2018, the study team worked with MTC and SFCTA to analyze the results of the intercept-based pilot study. The results of this analysis led to the determination that an address-based sample (ABS) study design would capture just as many TNC users and TNC trips and offer better scalability to the rest of the Bay Area (and state). Such a design would also offer similar or better costs per sampled person and provide a better statistical framework for drawing inferences than an intercept-based approach which was not cost effective to scale for the greater Bay Area region.[3]

In November 2018, the study team implemented the first wave of an ABS-sampling approach in the Bay Area. The sampling approach, described below in Section 4.0 included targeted geographic oversampling for areas where more TNC users were predicted to live. This increased the number of TNC users and TNC trips in the dataset.

While the oversampling approach worked as expected, the overall response rates for November and December 2018 were lower than anticipated. Because of the sampling shortfall, the study team paused data collection to further refine the study design. This refinement occurred between December 2018 and January 2019.

After evaluating the shortfall in responses, the study team revised the study invitation materials mailed to invited households to more comprehensively describe the study to potential participants. The study team also tested different gift card incentive amounts ($15, $20, and $25 per person). These changes were to address factors within the study team's control. Additional

[1] San Francisco County Transportation Authority. 2017. "TNCs Today," https://tncstoday.sfcta.org/.
[2] TNC users were and still are a minority (often small) of the overall population.
[3] An intercept-based approach is a nonprobability sampling method and becomes less effective and scalable outside of core urban downtown areas.

hypotheses related to factors outside of the study team's control were the local wildfires and U.S. midterm elections occurring at the same time as the study's data collection effort.

In February 2019, the study team tested the revised invitation materials and conducted an A/B test on the different incentive amounts. The results indicated that the $15 and $25 incentives were similarly cost effective; for the Bay Area, the study team decided to leave the incentive at $15 per person.

After these print material changes, the response rates rebounded to the projected levels. The study team resumed full-scale additional data collection in March and April 2019 to ensure the sampling target (of 18,000 person-days) was met.

Extending TNC Survey Data Collection under this Senate Bill 1 (SB1)-Funded Project

In March 2019, SANDAG and the study team concluded contract negotiations for the SB1-funded project. This followed many months of effort among the partnering agencies for the SB1-funded project to submit a proposal to Caltrans for a Sustainable Communities Grant[4] and then perform a competitive procurement process to implement the grant funding.

The SB1-funded TNC survey project included sampling an additional 10,000 person-days in the MTC planning region, 10,000 person-days in the SCAG planning region, and 12,500 person-days in the SANDAG planning region (in addition to other tasks), while largely adhering to the same design as the existing Bay Area TNC survey project. Adhering to the same design allowed the study team to try to reduce costs, enable the ability to combine data across projects, and move more quickly into data collection efforts, which was a high priority for MTC and SANDAG.

During the project kickoff meeting in April 2019, the study team discussed options for how and when data collection could occur in each region. The contract scope indicated priority for aligned data collection periods across the regions. However, circumstances did not allow this. MTC indicated a desire to continue their data collection as soon as possible. The study team implemented additional sampling for the Bay Area by late April 2019 and concluded all Bay Area data collection by Memorial Day in 2019.

SANDAG indicated a very strong desire to launch their data collection as soon as possible to support their regional planning and modeling efforts. The study team and SANDAG immediately developed a sample plan, study invitation materials, and recruitment plan to collect data in May and June 2019. Due to the tight timeline, RSG and SANDAG tried to plan conservatively to ensure the sample did not fall short of the target. The results came in higher than expected, far surpassing the sample target (as shown in Section 4.0).

[4] https://dot.ca.gov/programs/transportation-planning/regional-planning/sustainable-transportation-planning-grants

SCAG indicated a less-constrained timetable for their data collection than SANDAG and MTC and, due to the desire to collect data when school was in session, the study team collected the SCAG TNC survey data in October and November 2019.

Following the data collection for each region, the study team cleaned, processed, and weighted the travel survey and GPS data, which totaled over 57,000 person days, 7,800 TNC trips, and over 300,000 total trips. As a travel survey that leveraged smartphone-based GPS, the study also collected more than 5.5 million GPS points associated with those trips. As a point of comparison, this is more days of travel diary data than was collected in these regions by the 2010-2012 California Statewide Household Travel Survey (CHTS) and by the 2016-2017 National Household Travel Survey add-on sample for the state of California.[5]

[5] 2010-2012 California Statewide Household Travel Survey report: https://www.nrel.gov/transportation/secure-transportation-data/assets/pdfs/calif_household_travel_survey.pdf and NHTS website: https://nhts.ornl.gov/

2.0 SURVEY INSTRUMENT

This chapter describes the questionnaire design process and the design itself, including questionnaire elements. This information is organized by subject, with corresponding questionnaire data elements provided alongside each subject area.

2.1 QUESTIONNAIRE DESIGN PROCESS

This project employed a collaborative process that leveraged existing survey content, including questionnaire designs from recent projects in the state of California. This was done to capture comprehensive travel behavior data on emerging mobility and TNC travel.

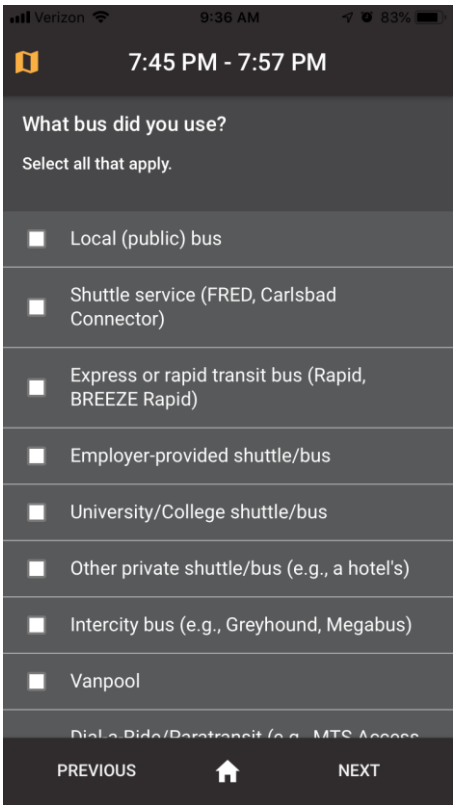
In 2017, four MPOs in California (MTC, SACOG, SANDAG, and SCAG) pooled their resources as part of a separate project to create a “standard” household travel survey instrument that could be used in each of their regions. The results of that questionnaire design effort were piloted in the Sacramento Area Council of Governments (SACOG) planning region in early 2018, and further used in the large-scale Sacramento Regional Transportation Study in spring 2018.

That questionnaire was the starting point for a revision process led by MTC and SFCTA in mid-2018 to ensure it captured greater detail for TNC trips and other topics of interest. These revisions were focused on ensuring the resulting datasets would meet the study objectives.

When the TNC survey was extended to the San Diego and Southern California regions with funding from the SB1 grant, the same questionnaire was used for those regions. Relatively minor updates, improvements, and “localization” text additions were modified for those two additional regions. Updates included adjusting trade and service names, using local transit operations, and making some small improvements to question phrasing. Figure 1 (next page) shows an example of this localization for the San Diego region, which is served by Breeze Rapid bus service and therefore shown in the parenthesis for the express bus answer choice.

In all cases, the study team programmed and performed extensive quality control on the surveys. The smartphone-based GPS travel surveys were conducted using rMove™, RSG’s proprietary software. The resultant survey instruments were of high quality and enable the resulting dataset for each of the three regions to allow for a combined dataset and joint analysis, as well as combination or comparison with the SACOG 2018 household travel survey dataset or the SANDAG 2017 household travel survey dataset.

FIGURE 1: EXAMPLE OF RMOVE LOCALIZATION



Source: RSG

2.2 QUESTIONNAIRE CONTENT & VARIABLES

The rMove smartphone survey questionnaire included three components: a presurvey, daily surveys, and trip surveys, as introduced in Section 3.5. Participants completed the presurvey after downloading the app, entering their study password, and agreeing to the terms and conditions. The presurvey collected participants' household-level demographic information such as household size and household income, established basic information about all individual household members such as age group and employment status, and obtained any additional household-level information such as vehicle make and model for all household vehicles which assisted with intelligent validation in the subsequent trip surveys.

A trip survey was generated for every trip a participant took, as captured by rMove. Participants were regularly prompted and encouraged to keep their smartphone sensors (GPS, WiFi, accelerometer) on during their seven-day study period. Participants were prompted to complete the trip survey immediately after arriving at their destination. Trip surveys were also generated for any trips a participant added manually. The trip surveys collected participants' trip information such as purpose, mode, and travel party size.

The daily surveys gathered participants' person-level demographic information such as gender and ethnicity, typical travel behaviors including work, school, and home information, and travel-day information such as time teleworked that day or whether the participant received deliveries. The daily survey questions were asked over the course of participants' seven-day travel period, with each day's daily survey pertaining to a specific topic. A separate appendix is provided with enumeration of all variables collected, included the daily questions.

As noted above, the project objectives and use cases focused on supporting integration of TNCs into detailed travel demand models and understanding many other aspects of TNC travel behavior. This objective required capturing as much detail of the TNC trip as possible, guiding the TNC-focused design of the survey questionnaire. Key questions related to TNC behavior were included in both daily surveys and trip surveys.

In daily surveys, participants were asked:

- Whether they use TNCs.
- Frequency of TNC usage.
- Whether they are TNC drivers.
- Their likelihood of choosing a driverless (automated) TNC option in the future after being shown hypothetical fare discounts.

In trip surveys, TNC-specific questions were asked when participants reported that they used a TNC mode for that trip. These questions include:

- Which company they used.
- Which type of service they used (e.g., pooled, regular, premium).
- How many other passengers were on a pooled ride.
- Whether they scheduled the ride in advance within the app.
- At what point they decided to use a TNC for that trip.
- How long they waited between ordering the ride and the vehicle arriving.
- Who paid for the ride.
- How much the ride fare was.
- If they used a promotion or discount for the ride.
- What mode they would have used if TNCs did not exist.

Please also note that the project also has a detailed codebook of all survey question variables, passively collected variables, and all derived variables, as well as a memo summarizing the survey question variables in table format. Both provide additional detail.

3.0 SURVEY BRANDING, COMMUNICATION, AND ADMINISTRATION

This chapter provides additional information regarding the survey's design and branding and invitation materials. It also details the project website that participants could visit to obtain more study information and describes the frequency and nature of communications the study team received from survey participants.

3.1 SURVEY BRANDING

The study team developed the study branding collaboratively with MTC, SANDAG, and SCAG to ensure that the design fit the local study regions. The complete branding package included the study name, logo, color scheme, and font selections. Figure 2 shows the final study logos for each of the three study regions. The study branding for the Bay Area repurposed the branding used by MTC and SFCTA for the separately contracted 2018–19 Bay Area TNC Survey. The study branding for the San Diego region repurposed the branding used in the 2016–17 regional household travel survey in part to ensure ability to gain approval on time for the desired survey launch.

FIGURE 2: LOGOS FOR EACH REGIONAL STUDY

Source: RSG

3.2 SURVEY PARTICIPATION

Invitation Mailings

Each invited household received two mailings:

- **Invitation Packet**: The study team sent one study invitation packet to invited households. This packet included a study-branded envelope, a cover letter explaining the study purpose that described how to participate in the study and was signed by the relevant agency executive(s), and an insert translated to Spanish, Simplified Chinese, and Traditional Chinese. The invitation packet also included a frequently asked questions page.
- **Reminder Postcard**: One reminder postcard arrived at each household approximately one week after the invitation packet. Like the initial postcards, these cards included the study phone number, website address, and participant login information.

The final mailed materials were provided separately as PDFs with the project's final deliverables package. Figure 3 summarizes the materials used for the Bay Area survey (the first study to launch). Each region used a separate visual design, but the contents of the materials remained nearly identical.

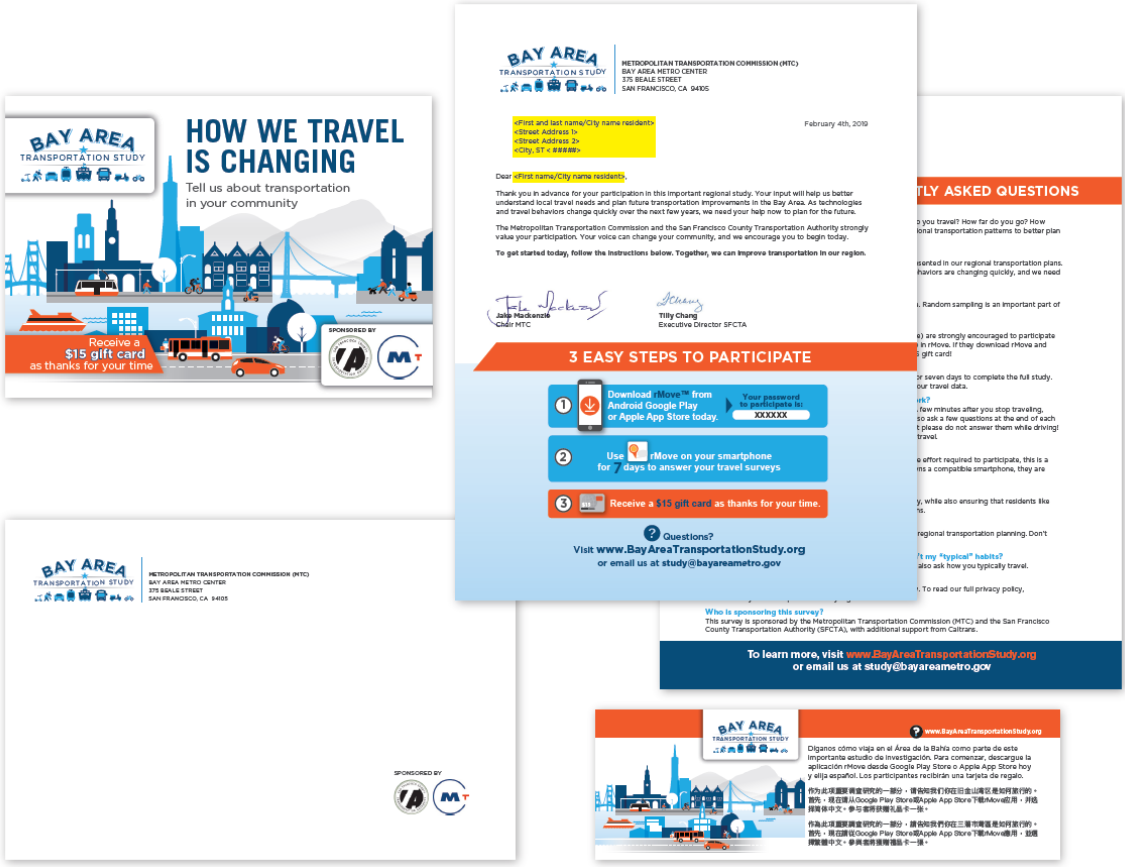
See separate section below for sampling method detail.

Language Options

Study invitations were printed in English and included translated inserts in Spanish, Simplified Chinese, and Traditional Chinese.[6] The rMove survey was offered in English, Spanish, Simplified Chinese, and Traditional Chinese.

[6] The SANDAG invitation materials also included a toll-free number for individuals needing assistance under the Americans with Disabilities Act.

FIGURE 3: COMPILATION OF INVITATION MATERIALS USED IN THE BAY AREA



Source: RSG

Survey Incentives

The study team proactively balanced considerations of cost effectiveness, response rates and data quality, and project timelines. Traditionally, travel surveys offer incentives to boost response rates and the quality of respondent data and to decrease the overall cost of mailed invitations. Without incentives, more households must be invited to reach the target response rate, and the mailing costs are greater than the cost of providing incentives.

For this project, the study team offered gift card incentives to all participants who completed the study. Participants could choose between an Amazon.com or Starbucks e-gift card when completing the presurvey. Participants could also choose to receive no gift card.

The amount varied by survey region, from $15 in the Bay Area to $25 in San Diego and Southern California. The study team tried different incentive values over the course of the Bay Area TNC survey effort, settling on $15 for that region. This amount was later increased to $25 for the San Diego and Southern California regions to ensure meeting sample targets on the

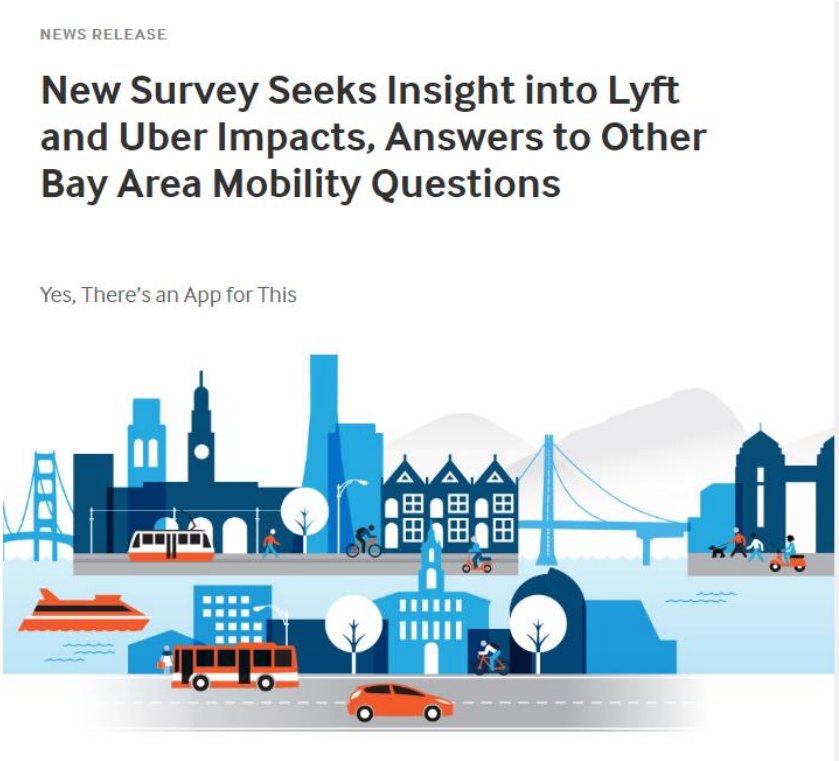
desired timelines and to offset initial participation challenges in some of the TNC oversample areas.

3.3 STUDY WEBSITE

The study team supported the development of locally branded website content for each planning region to describe the study and facilitate survey participation. Each agency implemented the suggested content on their own websites according to their preferences and required protocols. The goal was to provide an online location that invited participants could visit to confirm the details of the project and the agency's support therein.

A screenshot of each agency's content was provided as a PDF with the project's final deliverables package. A screenshot from the MTC website (the first study to launch) is shown below in Figure 4.

FIGURE 4: SCREENSHOT OF MTC AGENCY WEBSITE STUDY SUMMARY



Source: Metropolitan Transportation Commission

3.4 SURVEY PARTICIPANT COMMUNICATIONS

Participants in large-scale public surveys often need to be able to communicate with the study administrators. For this project's three survey regions, the study team provided participant

support and communication directly via the rMove app, email marketing services, and study-specific email inboxes.

The study team used email marketing tools to send automated and personalized emails to participants upon starting the survey and upon the completion of their travel week; the latter was done to ensure they completed all surveys within rMove. rMove also provided regular in-app reminders and notifications during the surveys, ensuring that participants answered their trip and daily surveys in a timely manner.

Participants were able to contact the study team within the app or through the study email inbox. Occasionally, participants sent along their thoughts or comments; in other cases, they sought support or guidance. In almost all cases, the study team responded within one business day to all requests for support.

No external call center providers were used in this study as the study sample was of smartphone-owning adults with the focus to oversample TNC behavior. This decision saved resources and was made jointly by the agencies and the project team.

3.5 SURVEY STAGES AND PARTICIPATION METHODS

Travel Date Assignments

Both the mailed and emailed materials instructed eligible individuals to download/install rMove using a unique password enclosed in the invitation materials and all communications. Adults (age 18+) with an iOS or Android smartphone were eligible to participate in the study.

All participants were assigned to a seven-day travel period beginning the day after they completed the in-app presurvey. Participants reported their travel for seven consecutive days and could access, edit, or finish any incomplete surveys for one week following the end of their travel period.

Invitation of Other Household Members

Other adults in participants' households could also opt-in to join the study but were not required to participate. As a reminder, this study was not a household travel diary study and instead focused on TNC user behavior. Households with multiple adults participating could all install rMove on their smartphones using the same password and then select which household member they were from the list of household adults. Given the person-level survey design and the focus on smartphone-owning adults, this study did not include require proxy reporting of child travel.

4.0 SAMPLING TO ACHIEVE ANALYTIC GOALS

The study collected person-level travel pattern data and used rMove for both recruitment and data collection. Participants recruited into the study and provided travel and demographic data over a seven-day travel period. The study team prioritized collecting TNC use behavior data over enabling participation from non-smartphone-owning populations.

4.1 ANALYTICAL AND MODELING USE CASES DRIVING THE STUDY DESIGN

This project sought to support the analysis of key policy and planning questions related to TNCs. To accomplish this objective, the study team collected and analyzed detailed travel behavior information. These data, in turn, can support comprehensive descriptive statistics of TNC usage, explain how TNCs fit into personal travel overall, and support the integration of TNCs into the detailed travel demand models used by MPOs. The core use cases pertained to mode choice models for travel demand modeling (TDM), robust descriptive statistics around regional TNC travel, and demographic profiles of TNC users. More detail is provided in the appendix with use cases provided by MTC, SANDAG, SCAG, and SFCTA.

This chapter describes the study team's survey sampling goals. It also discusses the study areas and sampling methods.

4.2 SAMPLING GOALS

By request of the agencies to maximize response and usable data, the project used a sample target based on the number of complete person-days. The study aimed to collect 32,500 person-days of travel data in total, with the following targets assigned to each region:

- 10,000 complete travel days from the Bay Area (MTC).
- 12,500 complete travel days and 1,350 TNC trips from San Diego County (SANDAG).
- 10,000 complete travel days from parts of Los Angeles and Orange counties (SCAG).

As mentioned previously, MTC and SFCTA separately funded data collection for at least 18,000 complete travel days in the months prior to the start of the SB-1 funded study, bringing the total number of travel days collected to a minimum of 50,500.[7] Note also that the required quota of TNC trips in the San Diego region impacted the level of aggressive oversampling required and

[7] For the purposes of this report and the analysis, no further distinction is made about the funding source of the data. All data are included in the report and analyses unless stated otherwise.

means the sampling in San Diego was intentionally not seeking to be population proportional for the region.

4.3 STUDY AREAS

The study team conducted the three surveys within the planning areas for the three MPOs. The MTC study sampled from the entire nine-county Bay Area[8] and the SANDAG study sampled from all of San Diego County. However, most of the sample was for dense and urban parts of San Diego County, and large portions of Los Angeles and Orange counties in the SCAG planning region, to support the sampling objectives. Each MPO approved a separate sampling memo with additional detail.

4.4 SAMPLING METHODS

Sampling Frame

The study team used address-based sampling (ABS) to select households for participation. ABS draws a random sample of addresses from all residential addresses in a given geography. Using this method, all households within each defined sample stratum or segment have an equal chance of selection for the sample. After finalizing the sample plan, the study team purchased household mailing addresses from Marketing Systems Group (MSG), which maintains the Computer Delivery Sequence file from the United States Postal Service (USPS). ABS frames are considered the highest quality and most comprehensive sample frames for this type of survey project.

The study team stratified the samples using census Block Group (BG) data from the most current American Community Survey (ACS) available at the time, which was the 2013–2017 survey for the San Diego and Southern California studies, and 2012–2016 for the Bay Area study. The study team stratified the sample using census BGs, which are the smallest geography for which most census and ACS tables are publicly available. Each BG generally contains between 600 and 3,000 people.

Even though this was a *person-based* study and the sample frame is the list of all *households* in the region, this sampling and study approach allowed for broad, representative, and probability-based participation. Roughly 90% of the invited households were addressed to a specific adult residing at that address.[9] The 10% of invitations for which the sample provider was not able to append an individual's name were addressed to "[Postal City] Resident" (e.g., "San Diego

[8] Metropolitan Transportation Commission. 2020. "Nine Bay Area Counties," https://mtc.ca.gov/about-mtc/what-mtc/nine-bay-area-counties.
[9] The response rate for "named" invitations is generally much higher than for unnamed invitations, helping to reduce sampling costs and decreasing nonresponse bias.

Resident"). The study design allowed multiple adults per household to participate, with each adult's data counting toward the sample targets and TNC trip quotas.

The initial stage of the Bay Area TNC survey in 2018 only requested that one adult per household participate in the study to try to maximize sample across as many households as possible. To help alleviate initially low response rates, however, all data collection in 2019 allowed multiple adults from the same household to participate. If opting in, participants in the same household shared the same travel period, but each received their own incentive for participating, and each was treated as a separate observation in the weighting and expansion process.

ABS is limited to residents of the region and does not capture the travel behavior of visitors or of nearby residents (e.g., Tijuana residents' travel in San Diego). TNCs are believed to be commonly used by visitors to a region, so this is a limitation of this approach but was outside the scope of this study.

Lastly, ABS is a type of probability sampling. This means the results can be generalized to represent the entire region by way of a data-weighting process. Separate and detailed weighting methods documentation is provided with the report.

Additional Email Sampling in San Diego

All three surveys used ABS for sampling, but the San Diego survey also included an email-based sampling component. The 2016–17 SDRTS, the last household travel study conducted by SANDAG, included an option to recontact participants for future regional studies. This project recontacted a subset of those participants to help reduce sampling costs and to potentially study trends over time for TNC use. The plan was to recontact enough participants to get over 250 persons from the SDRTS to participate; however, due to the strong response to the ABS in San Diego, the plans for email-based recruitment were scaled back to only capture travel data from 95 persons.

Stratification and Segmentation

The regional sample plans oversampled areas expected to have higher shares of residents who use TNCs. To geographically oversample for TNC users, the study team applied a model based on the San Diego 2016–2017 household travel survey data that predicted which census BGs contain the residents with the most TNC activity. This model had been successfully applied elsewhere in California on the Sacramento Regional Transportation Study in 2018–19 and the Bay Area TNC Survey in 2018–19. The model used ACS data to predict the average TNC trips per household that will be reported by survey respondents in each BG (and assumed a one-week rMove household travel study). Separate appendices are available with the 2018 memo summarizing the model used, as well as the detailed sample plan memos approved by each region.

To illustrate, the detail, in San Diego the resulting TNC trip estimates were then split into five strata based on the expected intensity of TNC use. Overall, 411 block groups, or 24% of all households, fell into one of the TNC oversample strata. In any given week and on average, the "Very High" BGs were expected to have 0.8 or more TNC trips per household, the "High" block groups between 0.6 and 0.8 TNC trips per household, the "Medium" block groups between 0.4 and 0.6 TNC trips per household, and the "Low" block groups between 0.2 and 0.4 TNC trips per households. The rest of the county was considered "General Population" with little predicted TNC use (at least circa 2016–17).

TABLE 1 TNC OVERSAMPLE STRATA FOR SAN DIEGO COUNTY

Est. TNC trips per HH per week	Strata description of TNC use	Number of Block Groups	HHs (2013-17 ACS)	Percent of Total HHs	TNC Trips per HH Day (in 2016-17)	TNC Trips per Day, relative to GenPop
0 – 0.2	0-None (GenPop)	1,384	847,949	76.3%	0.012	1.0
0.2 – 0.4	0.2-Low TNC	280	172,770	15.5%	0.047	3.8
0.4 – 0.6	0.4-Medium TNC	93	61,866	5.6%	0.079	6.5
0.6 – 0.8	0.6-High TNC	31	24,819	2.2%	0.111	9.2
0.8 or more	0.8-Very High TNC	7	4,335	0.4%	0.150	12.4

Sampling Results

Table 2 shows the complete person and complete person-day[10] totals for each region, along with the total number of TNC trips captured for each region. The sample sizes per region varied, but each region had at least 1,000 TNC trips and roughly 10,000 person-days of travel. Across all data collection, the project captured over 57,000 complete person-days of travel. This exceeded the project's overall goal of 50,500 complete person-days of travel. Just over 10% of person-days were from "other adults" in the household. Conversely, roughly 90% of households only had one participant in the survey.

TABLE 2: SAMPLE TOTALS AND KEY FIGURES FOR EACH SURVEY REGION

REGION	PERSONS WITH 1+ COMPLETE DAYS	TOTAL COMPLETE PERSON-DAYS	TOTAL TNC TRIPS
Bay Area	5,010	30,170	5,140
San Diego	2,804	17,340	1,578
Los Angeles & Orange Counties	1,590	9,901	1,099
Total	**9,404**	**57,411**	**7,817**

Source: RSG

[10] A complete person-day is when a person completes all trip surveys and the daily survey for a given travel day. A person is considered complete if they have at least one complete person-day.

Table 3 contains the data totals of the entire project dataset, which includes all collected information from households with at least one complete participant. Note that as this project used a person-level survey design, households comprised of both participants and non-participants are included in the household and person tables, but these households only report basic demographic information about non-participant household members.

TABLE 3: NUMBER OF DATASET RECORDS FOR EACH SURVEY REGION

REGION	HH	PERSON	VEHICLE	DAY	TRIP	LOCATION GPS POINTS
Bay Area	4,540	9,795	5,567	35,070	174,922	2,943,991
San Diego	2,382	4,801	3,554	19,628	101,004	1,816,155
Los Angeles & Orange Counties	1,361	3,024	1,965	11,130	56,006	902,312

Source: RSG

Sample response rates for the project can be evaluated at either the address-level or person-level. Because addresses could have multiple participants, we calculate recruited and completed addresses using the number of addresses where at least one resident has either recruited or completed, respectively. This ensures accurate rate calculations when dividing by the number of addresses invited. At the address-level, 2.5−4.5% of invited addresses had at least one resident recruit, and 70−80% of addresses with at least one resident recruited had at least one resident complete the survey. Table 4 shows the response rates of sample addresses from the three study regions.

TABLE 4: SAMPLE ADDRESS RESPONSE RATES BY SURVEY REGION

REGION	INVITED	RECRUITED	COMPLETED	RECRUIT RATE[11]	CONVERSION RATE[12]
Bay Area	249,109	6,416	4,540	2.58%	70.8%
San Diego	67,439	2,997	2,382	4.44%	79.5%
Los Angeles & Orange Counties	57,555	1,817	1,361	3.16%	74.9%

Source: RSG

The table below documents the person-level response rates by study region, where 70−80% of recruited participants completed the survey.[13]

[11] Recruit Rate = Recruited / Invited
[12] Conversion Rate = Completed / Recruited
[13] Because study invitations were sent at an address-level, and multiple residents at an address could participate, the number of individuals invited cannot be determined.

TABLE 5: PERSON-LEVEL RESPONSE RATES BY SURVEY REGION

REGION	RECRUITED	COMPLETED	CONVERSION RATE[12]
Bay Area	7,012	5,010	71.4%
San Diego	3,509	2,804	79.9%
Los Angeles & Orange Counties	2,099	1,590	75.8%

Source: RSG

APPENDIX A. RIDE-HAILING SURVEY ANALYTICAL USE CASES

This appendix lists the desired analytical use cases provided by each agency.

MTC AND SFCTA

- Estimation of model components for Auto ownership? (Test re-estimation with new TNC-inclusive accessibilities?):
  - Tour mode.
  - Trip mode.
- Development of expanded tour and trip mode targets for calibration of TNC Tours: totals and shares:
  - TNC Trips: totals and shares.
- Development of profiles for calibration of TNC users (e.g., demographics):
  - TNC trips (e.g., trip wait times).

SANDAG

- Improve San Diego resident mode choices model:
  - Dynamics among TNC, transit, and nonmotorized modes.
  - Pooled TNC versus nonpooled TNC.
  - Impact of TNC pricing on TNC mode shares.
- Improve airport models:
  - Mode choices to/from airports (San Diego Airport and CBX-TJ Airport).
- Visitor model:
  - Visitor mode choice model-dynamics among TNC, taxi, and rental car choices.
- Crossborder model:
  - Impact of TNC usage on north bound crossing mode choices (pedestrian versus autos).
  - Mode choices to/from Port of Entries.
- Auto ownership model:

  - Impact of TNC usage on auto ownership.
- Work location choice model:
  - Impact of TNC on work-from-home or no usual work location choices.
- TNC driver modeling:
  - Modify tour generation model to include TNC drivers as a separate market.
  - Modify tour/trip location choice models to include TNC drivers as a separate market.
  - Modify time-of-day choice model to include TNC drivers as a separate market.
  - Impact of TNC deadhead trips on VMT.

SCAG

- Analyze relationship between auto ownership/auto availability for ride-hailing services users.
- Analyze whether there are significant amount of ride-hailing services taken in at-work subtours.
- Consider incorporating TNCs to augment taxi mode in the model.
- Analyze impacts of rail-hailing services on first-mile/last-mile strategy.
- Analyze ride-hailing demand impacted by land use/accessibility.

APPENDIX B. LIST OF SUPPLEMENTAL DOCUMENTATION AND DATASET DOCUMENTATION

This appendix lists the additional documentation provided to each of the three regions (Bay Area, San Diego, and Southern California). Please contact the agency to request this information for the given region.

PROJECT MATERIALS

- Print invitation materials (pdf)
- Agency website mention of project (screenshot)
- Privacy policy used (pdf)

QUESTIONNAIRE

- Questionnaire data variables list (word file)
- Full list of all questions and answer choices (excel file)
- rMove questions (screenshots)

SAMPLING

- Sample plan (word file)
- Memo summarizing TNC oversampling model (separate project but provided by request)

DATA PREPARATION

- Purpose imputation methods memo (word file)
- Mode imputation model and methods memo (word file)
- Weighting methods and results memo (word file)

DATASET DOCUMENTATION

- Full dataset(s) (csv)
- Participant administrative dataset (e.g., list of participants willing to be re-contacted) (csv)
- Dataset code book (excel file)
- Dataset guide (word file)

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