Public Transit Rider Origin–Destination Survey Methods and Technologies

A Synthesis of Transit Practice

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Public Transit Rider Origin–Destination Survey Methods and Technologies

A Synthesis of Transit Practice

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2019
TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation’s growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, adapt appropriate new technologies from other industries, and introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in TRB Special Report 213—Research for Public Transit: New Directions, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), Transportation 2000, also recognized the need for local, problem-solving research. TCRP, modeled after the successful National Cooperative Highway Research Program (NCHRP), undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes various transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA; the National Academies of Sciences, Engineering, and Medicine, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

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TCRP provides a forum where transit agencies can cooperatively address common operational problems. TCRP results support and complement other ongoing transit research and training programs.

TCRP SYNTHESIS 138

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Transit administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, “Synthesis of Information Related to Transit Problems,” searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, Synthesis of Transit Practice.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

FOREWORD
By Mariela Garcia-Colberg
Staff Officer
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This synthesis provides an overview of the current state of practice regarding public transit rider origin–destination survey methods and technologies. The study, prepared by Andrew Zalewski and his team from Foursquare Integrated Transportation Planning, Inc., alongside Transport Foundry, LLC, captures the state of the practice among agencies of different sizes, geographic locations, and modes and evaluates the opportunities for and challenges of conducting surveys in an era of emerging technologies.

The study presents a literature review and results of a survey of transit agencies that conduct all different types of rider surveys. Fifty-seven completed responses were received from the 67 agencies in the survey sample, a response rate of 86 percent. Case examples of five transit systems are provided; these present an in-depth analysis of various survey strategies and include two agencies that have leveraged passive data to complement or eliminate origin–destination surveys.

This synthesis will assist all transit agencies that conduct origin–destination surveys; the report presents the reality and complexity of conducting this type of survey and will allow agencies to compare what they are currently doing with what others are doing, get ideas about what other strategies are possible, and make better decisions about surveying in the future.

The members of the topic panel are acknowledged on page iv. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.
# CONTENTS

1 Summary

4 **Chapter 1** Introduction
   4 Study Objectives
   5 Organization of the Report
   5 Methodology

9 **Chapter 2** Literature Review
   9 Federal Guidance and Requirements
   10 Overview of Survey Methods
   12 Response Rate Influences
   15 Completion Rate Influences
   17 Survey Sampling Plan
   20 Survey Expansion Methods
   22 Harnessing Passive Data Collection

25 **Chapter 3** Current State of Practice
   25 Background
   25 Planning a Survey
   27 Survey Approach and Instrument Design
   32 Survey Sampling Plan
   34 Assessing Survey Data Quality
   37 Survey Expansion
   37 Emerging Data Alternatives to On-Board Surveying
   38 Summary of Current State of Practice

41 **Chapter 4** Case Examples
   41 Metropolitan Transportation Commission
   45 TriMet
   48 Los Angeles Metro
   50 Chatham Area Transit
   52 Massachusetts Bay Transportation Authority

55 **Chapter 5** Conclusion
   57 Future Research Questions

59 Glossary of Terms

61 References

A-1 **Appendix A** Survey Questionnaire

B-1 **Appendix B** Selection of Sample Survey Instruments

C-1 **Appendix C** Synthesis Questionnaire Results
Public Transit Rider Origin–Destination Survey Methods and Technologies

The purpose of this synthesis study is to understand how the current state of practice in transit rider surveys, notably origin–destination (OD) surveys, is evolving due to emerging technologies and supplemental data sources. This study builds on the work of TCRP Synthesis 63: On-Board and Intercept Transit Survey Techniques (Schaller, 2005).

The rider survey (also referred to as an intercept survey or an on-board survey), is a transit system method in which participants are recruited in public, typically on board a transit vehicle or at a transit stop, on a randomized basis. Transit providers rely on rider surveys to collect a range of data about riders and their trip-making behavior.

One of the most complex types of rider surveys is the OD study. OD studies attempt to capture the trip patterns and characteristics of transit riders. Great effort is placed in ensuring that the results from these studies are statistically valid, because data from OD surveys can play several critical functions: providing inputs for regional travel demand models, meeting federal reporting requirements (notably around Title VI of the Civil Rights Act—[FTA, 2012]), supporting transit service planning, and assessing the impacts of transit investments. The expressed purpose of any given survey, however, influences survey methods that are used and the costs associated with them.

Over the last decade, new technologies—such as mobile devices, high-speed cellular Internet, and automated data collection tools—have changed how organizations conduct surveys. Moreover, the emergence of big data generated by fare cards, mobile phones, and the GPS system provides new alternatives to traditional rider surveys. This report follows up on prior TCRP research on the topic to document the changing state of survey practice.

The synthesis was developed to provide an overview of current survey methods and technologies to transit professionals, and assumes no prior knowledge of rider surveys. The information presented is derived from a broad literature review, a nationwide survey of 67 organizations responsible for transit surveys, and in-depth examples of innovative survey and OD study practices.

One of the major findings is the growing prevalence of handheld tablet devices as a survey input mode. Half of the respondents to the synthesis survey have used tablets to conduct rider surveys. The main motivating factor for using tablets was improved data quality; tablets can eliminate transcription errors, enable the real-time monitoring of surveyors, and allow for the automatic validation of responses.

Other survey methods include paper-based surveys (either self-administered or interview-administered), online surveys with in-person recruitment, and telephone surveys with in-person recruitment.
Another major finding is the impact that passive data—automatically collected data originally intended for other purposes—is having on survey practices. Survey organizations increasingly rely on automatic vehicle location (AVL) systems, automatic passenger counters (APCs), and fare-card data to develop survey sampling plans and survey expansion factors. Some transit providers utilize predictive models, such as fare-card data, to infer boarding and alighting patterns without a passenger survey. One transit provider respondent has decided to use third-party cell phone, location-based service (LBS) and GPS data to replace on-board OD surveys.

The use of passive data, notably third-party LBS data, is still in its infancy. One of the limits of passive data is that while they can provide survey administrators with a large sample of information, the data only report on limited characteristics (e.g., boarding/alighting location). Passive data are often not suitable to collect demographic, language proficiency, first and last mile information, or customer satisfaction data. New data sources and improvements in computing power and data processing techniques may yield significant innovations in the field of passive data.

This synthesis found a lack of standards for survey wording and deployment. The types of questions asked in OD surveys are similar across transit providers, yet there is little coordination among providers on question wording and the specifics of survey deployment. The commonalities between surveys that do exist appear due to the use of the same survey contractor, and not a concerted effort to develop common standards for OD surveys. When creating a new survey instrument, organizations often create questions from scratch or rely on their previous survey instrument. Survey methods vary widely across the industry, including the preferred sampling plan, survey mode, and expansion methodology. Even some key measures used to monitor surveys, such as response rate, are inconsistently tracked or defined in different ways by the survey participants. This lack of standardized design and question wording makes evaluating the effectiveness of various survey practices a challenge.

Regardless of the survey method used, the same fundamentals of good survey design hold true. Surveyors must field a suitably large sample to yield statistically valid results. The necessary sample size depends on the type of data collected and level of precision desired; an OD survey on a route will need a larger sample for valid stop-specific data than simply route-level data. Sample bias is another area to be carefully addressed in survey design and implementation. Certain groups of riders are less likely to participate in surveys, and special attention paid to them could ensure that the survey sample is representative of overall transit ridership. Commonly underrepresented groups include populations with limited English proficiency (LEP); riders on short trips; persons with cognitive, visual, or auditory disabilities; and persons with limited literacy.

This synthesis identifies several areas for additional research. Without a controlled study environment, it is challenging to develop replicable strategies for improving survey practice. Some specific areas for further research that might help transit systems include:

- Standardization of survey questions, including an assessment of optimal wording;
- Establishing a consistent set of metrics to be reported on for study efforts, including a standard method of calculating the response rate, count of usable surveys, and survey cost;
- Controlled study of various survey methods to determine the most effective survey mode and sampling strategies;
- Research on more sophisticated expansion methodology in a controlled environment where results can be validated against other data sources;
• Research on the emerging and theoretical uses of passive and big data to support or supplant transit OD surveys;
• Inquiry into the skills and training that transit providers and contractors need to better take advantage of new tools and techniques that rely on big data;
• Research into the potential of crowdsourced data (used extensively in public engagement) for OD studies;
• Research on the feasibility of collecting OD data voluntarily through a rider’s personal device (opt in), including the response bias associated with this method;
• Assessment of incentives to increase response rates;
• Impacts of technology use—such as tablets and computer-aided telephone interview (CATI)—on the survey response rates of underrepresented populations;
• Understanding effective strategies to increase the participation rates of individuals with LEP; and
• Guidance on the appropriate sample size for OD surveys based on an organization’s desired level of precision.
Transit providers rely on rider surveys to collect a range of data, from customer demographics to rider preferences and satisfaction. One of the most complex types of surveys conducted by transit providers are origin–destination (OD) studies. OD studies attempt to capture the trip patterns and characteristics of transit riders. Great effort is placed in ensuring that the results from these studies are statistically valid, because data from OD surveys play several critical functions: providing inputs for regional travel demand models, meeting federal reporting requirements (notably around Title VI of the Civil Rights Act [FTA, 2012]), supporting transit service planning, and assessing the impacts of transit investments.

To accurately conduct an OD survey, the organization administering the survey must field a randomized sample large enough to yield statistically valid results (or, alternatively, a 100 percent census of all riders). The typical rider survey approach is to distribute and collect paper surveys aboard buses and at transit stops. Transit providers and their partners have long struggled with gathering adequate samples, minimizing bias, and containing survey costs with this method. Over the last decade, new technologies—such as handheld devices, high-speed cellular Internet, and automated data collection tools—have changed how organizations conduct surveys. Moreover, the emergence of passive “big” data from fare cards, mobile phones, and GPS systems, provides new alternatives to traditional rider surveys.

Note on Terminology

This study frequently uses the terms on-board survey and rider survey to refer interchangeably to a randomized survey of transit riders where recruitment of participants occurs in public (e.g., on a bus, at a train station). On-board surveys refer specifically to rider surveys that are conducted on board a transit vehicle.

Study Objectives

This synthesis summarizes the current state of practice in transit rider surveys, most notably how emerging technologies and data sources are affecting the ways that these surveys are conducted. Although the synthesis includes examples from other types of surveys, the focus is on OD surveys; they represent the most complex and most costly type of survey regularly performed by a transit provider. This report strives to address several key questions:

- What is the relationship between methods of surveying and measures such as costs, response rates, and completion rates?
- How has the wide adoption of mobile devices such as tablets affected survey practices?
• How do surveyors avoid sampling bias and maximize survey response and completion rates?
• How are emerging methods and data sources being used to complement or supplant on-board, or rider, surveys and being incorporated in transit modeling?

The precursor to this study was TCRP Synthesis 63: On-Board and Intercept Transit Survey Techniques (Schaller, 2005). That study contains valuable information on survey design and fielding methodologies. Instead of replicating the work found in TCRP Synthesis 63, this study focuses on describing new survey practices being adopted by the transit industry. The report strives to provide transit industry professionals a broad overview of new technologies and data techniques. It also outlines areas of further research.

Organization of the Report

The report is divided into five chapters:

• **Chapter 1: Introduction**: Background, overview, organization, and methodology of the report.
• **Chapter 2: Literature Review**: Summary of literature related to the existing survey practice, including federal guidance and requirements; survey approach and instrument design; sampling plan strategies, assessing survey data quality, and survey response expansion; and overview of passive data acquisition methodologies used to gather OD information.
• **Chapter 3: Current State of Practice**: Results of a national survey summarizing survey practices among 57 transit providers and regional planning organizations.
• **Chapter 4: Case Examples**: Five case studies highlighting various survey strategies, including two agencies that have leveraged passive data to complement or eliminate OD surveys.
• **Chapter 5: Conclusion**: Summary of key findings and areas for further research.
• **Appendices**: Study questionnaire and sample rider survey instruments as submitted by respondents. Full collection of tables summarizing synthesis questionnaire results.

Methodology

This report relies primarily on three sources of information: existing literature, a survey of organizations responsible for conducting transit surveys, and interviews with representatives from four transit providers and one metropolitan planning organization (MPO).

Literature Review

The literature review began with a broad search of existing TCRP reports, white papers, academic research, documentation from prior survey efforts, and federal guidance on the following topics:

• Federal guidance and requirements related to transit surveys,
• Survey approach and instrument design,
• Survey sampling plan development,
• Survey data quality assessment and management,
• Survey expansion methods, and
• Passive data.

The literature review is intended to provide the reader with a high-level overview of existing survey practices, including transit professionals with no prior experience in survey design or implementation.
Current State of Practice Survey

To better understand the current state of practice in OD studies, an online questionnaire was distributed to 67 organizations responsible for overseeing such studies, including transit providers and regional planning organizations. The questionnaire covered a variety of topics, from the frequency of and justification for OD studies to how new technologies and data sources are integrated into survey efforts (see Appendix A for a copy of the questionnaire).

The 67 participants represent a diverse range of transit systems by size, location, and mode. Fifty-seven organizations responded at least partially to the survey (see Table 1 and Figure 1), resulting in an 85 percent response rate (see Table 2).

The results of the questionnaire are summarized and discussed in Chapter 3 of this report.

Table 1. Survey sample size and response rate.

<table>
<thead>
<tr>
<th>Transit Agency Size</th>
<th>Definition (annual unlinked trips)</th>
<th>Number of Agencies Contacted</th>
<th>Number of Responses Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very large</td>
<td>&gt;100 million</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Large</td>
<td>30 to 100 million</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Medium</td>
<td>10 to 30 million</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;10 million</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>67</td>
<td>57</td>
</tr>
</tbody>
</table>

Response rate: 85%

Source: National Transit Database, 2016 (FTA, 2016c).

Figure 1. Map of survey respondents.
Table 2. List of survey respondents.

<table>
<thead>
<tr>
<th>#</th>
<th>Organization</th>
<th>City, State</th>
<th>Size</th>
</tr>
</thead>
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(continued on next page)
Table 2. (Continued).

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<td>Winston-Salem Transit Authority (WSTA)</td>
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</table>

Case Examples

For detailed highlights of emerging trends in survey practice and OD studies, five case examples were selected from among the respondents to the questionnaire. Four transit operators and one MPO provide varied examples on how technologies, new sampling techniques, and passive data can be integrated into OD studies and transit surveys in general. The participants and the reason for their inclusion are as follows:

- Metropolitan Transportation Commission (San Francisco Bay Area) for its extensive experience fielding surveys for 23 transit agencies using a variety of methods.
- TriMet (Portland, Oregon) for its in-house survey practice and adoption of mobile tablets for all rider surveys.
- Los Angeles County Metropolitan Transportation Authority for its use of a two-step survey process and high rate of non-English survey responses.
- Massachusetts Bay Transportation Authority (Boston) for its use of a heuristic model that generates boarding and alighting tables based on fare-card data.
- Chatham Area Transit (Savannah, Georgia) for its decision to rely on third-party passive data in lieu of conducting future on-board OD surveys.
This literature review is intended to provide background on the current state of practice in transit technologies and examines a range of sources, including federal guidance, academic papers, policy white papers, existing survey documentation, and past TCRP syntheses. These sources were primarily identified using Google Scholar and TRB’s Transportation Research Information Documentation (TRID), as well as Internet research and reviews of federal guidance from the U.S. Department of Transportation.

The literature review is organized into seven parts for easier navigation of topics:

1. Federal guidance and regulations affecting surveys.
2. Overview of survey methods.
5. Survey sampling plans.
7. Emerging role of passive data.

**Federal Guidance and Requirements**

The federal government does not directly regulate how public agencies conduct OD surveys, but the Federal Transit Administration (FTA) of the U.S. Department of Transportation (U.S. DOT) offers guidance on the following federal laws and regulations that affect the frequency, content, and delivery of passenger surveys:

- **Title VI Requirements:** Title VI of the 1964 Civil Rights Act protects people from discrimination based on race, color, and national origin in programs and activities receiving federal financial assistance. The FTA Circular 4702.1B: Title VI Requirements (FTA, 2012) outlines current Title VI guidance and regulations for transit providers. The circular provides guidance on the types of information that transit agencies should collect, including information through passenger surveys, to ensure that they are compliant with Title VI.

- **Capital Investment Grants Program:** This FTA discretionary grant program funds transit capital investments, including heavy rail, commuter rail, light rail, streetcars, and bus rapid transit. OD surveys are used to support transit ridership forecasting for both New Starts and Small Starts projects (https://www.transit.dot.gov/CIG), in addition to the preparation of before-and-after studies for completed projects.

- **ADA/Accessibility Requirements:** FTA Circular 4710.1: Americans with Disabilities Act: Guidance (FTA, 2015) outlines ways in which transit providers should accommodate people with disabilities. The circular includes guidance on how to accommodate disabilities in written and oral communication.
Overview of Survey Methods

Transit providers and metropolitan planning organizations (MPOs) use several methods for developing and conducting rider surveys. Historically, the most common survey practice has been to distribute a self-administered paper survey to riders on board transit vehicles or at transit stops. However, advances in technology have made other survey modes, such as electronic tablets and online surveys, increasingly common. Research suggests that tablets have benefits such as reduced data cleaning requirements and higher data quality (Schmitt, 2012; Cummins et al., 2013; Agrawal et al., 2015). The following are the most common methods for conducting OD surveys:

Self-Administered Written Questionnaires

Self-administered paper-based surveys have historically been the most common method for conducting an OD rider survey (Schaller, 2005; AECOM, 2009; Schmitt, 2012). In this method, paper surveys are distributed to passengers on transit routes or stops/stations by either a surveyor or a driver. Respondents return the completed form either as they disembark or by mail.

- The primary benefit of this method is cost. With self-administered surveys, staff members can distribute and collect surveys en masse, reducing staffing needs and hours (Schaller, 2005).
- Though this method is efficient to administer, it can result in poorer data quality than other methods. The nature of the information requested on the survey can be complex (e.g., trip-making behavior) and respondents may misinterpret the questions that are being asked (Baltes, 2002; Schmitt, 2012).
- In the absence of a surveyor to clarify questions or automatic answer validation to screen out erroneous answers, questionnaire design and wording are especially important with a self-administered paper survey (Schaller, 2005). This is especially problematic when respondents enter incorrect origin and destination addresses that cannot be geocoded properly (Schmitt, 2012). The Pew Research Center (2018c) outlines best practices for survey question design and wording. Some recommendations include avoiding open-ended questions and limiting the number of response options. Pew notes that even small changes in question wording or response order can have a big impact on survey results (Pew Research Center, 2018c).
- Finally, surveyors who conduct a paper-based self-administered survey are not able to easily control who is invited to participate and cannot track responses in real time. With other survey methods, such as two-step surveys, surveyors can choose to oversample riders from certain population groups that historically are underrepresented in survey responses. Respondents with limited English proficiency or disabilities may lack the ability to complete a written form without assistance, which can leave members of these groups out of the pool of respondents entirely.

Personal Interview and Written Questionnaires

Interview-administered surveys are a strategy for overcoming the shortcomings of self-administered rider surveys (Schaller, 2005; Schmitt, 2012; Cummins et al., 2013). Using this method, a surveyor fills out a written survey questionnaire while walking the respondent through each question, providing clarification and guidance as needed. Interview methods can reduce misunderstanding of questions, increase response rates, and ensure that those with disabilities and limited English ability can participate (Schaller, 2005). This method is sometimes used in conjunction with self-administered surveys to accommodate users unable to fill out the survey on their own (Schaller, 2005).

- Interview-based written questionnaires are costlier to conduct than self-administered surveys because of the need for surveyors to spend time with every respondent (Schaller, 2005).
• Privacy concerns may prevent individuals or groups from participating if they do not want to share personal information with a surveyor (Agrawal et al., 2015).
• In addition, interview-based surveys are affected by the biases of the interviewer. Whereas a self-administered survey can simply be passed out to everyone on a transit vehicle, a sampling technique needs to be employed to select participants to be interviewed to ensure that surveys are randomly distributed (McHugh et al., 2017).

**Personal Interview and Handheld Tablets**

In recent years many transit providers have opted to use handheld tablet devices to conduct on-board surveys with transit passengers. Under this method, surveyors engage in personal interviews with individual transit riders and fill out electronic survey instruments on handheld devices (Tablet PCs, PDAs, iPads, etc.) (AECOM, 2009). This method has been recognized by FTA as a “legitimate and preferred” method for collecting survey data, and some researchers have recommended utilizing tablet devices and personal interviews over self-administered survey techniques (Schmitt, 2012; Agrawal et al., 2015; McHugh et al., 2017).

• Interview-administered tablet surveys can have some cost benefits over other survey modes, especially in terms of printing, postage costs, and data cleaning costs (McHugh et al., 2017).
• In a paper outlining how the Tri-County Metropolitan Transportation District of Oregon (TriMet) migrated its survey approach from paper to tablets, McHugh et al. found that using tablets “decreases time and cost significantly, generates more accurate and reliable data, improves customer relations, and is friendlier to the environment” (McHugh et al., 2017, p. 19). Tablets allow surveyors to integrate automatic validation of responses, monitor progress in real time, and reduce data entry errors, all contributing to higher data quality (Schmitt, 2012).
• There are downsides to a tablet-survey approach. Though many respondents may be receptive to surveyors using electronic devices, there may be generational differences in the level of comfort in such a process (Agrawal et al., 2015). Electronic interview surveys are affected by many of the same concerns affecting the paper interview method (e.g., privacy concerns, sample bias, quality of survey staff). In areas with large limited English proficiency (LEP) populations, passengers may be reluctant to answer personal questions about their daily activities (Agrawal et al., 2015). Having participants fill out demographic and income questions themselves may alleviate privacy concerns (B. Dong, B. McHugh, and V. Shank, personal communication, April 2018).

In reviewing literature on tablet-based surveys, it is important to note that the experience of the survey contractor and the design of the survey instrument greatly influence effectiveness of tablet-based surveys. Agrawal et al. (2015), unlike other researchers, found that tablet-based surveys yielded lower response rates at a higher cost than self-administered paper surveys. These results could be due to a high software error rate and the fact that the survey used in the study did not incorporate features such as survey logic, automatic data validation, and OD mapping, features demonstrated in other cases to result in higher data quality (McHugh et al., 2017; B. Dong, B. McHugh, and V. Shank, personal communication, April 2018; S. Israel, telephone interviews, March 30 and June 15, 2018).

**Two-Step Methods**

A less common method of randomized rider surveys is the two-step method, in which survey teams recruit riders on board vehicles or at transit stations in order to take a second more detailed survey—either online or through a computer-aided telephone interview (CATI) (Schmitt, 2012; Cummins et al., 2013; Agrawal et al., 2015). In some cases, the first step includes...
a basic questionnaire that can be filled out and returned to a surveyor. In others, the first step (card distribution) simply serves as an invitation to participate. For surveys that include a basic questionnaire as the first step, surveyors can use a respondent’s address, demographic, or income data to guide their sampling plan for the second step.

Major two-step methods include:

- **Web-Based Surveys**: Many transit providers are attracted to online surveys because they are often seen as faster and cheaper to complete, compared to self-administered or interview-supported paper and tablet-based surveys. When examined for effectiveness, however, web-based surveys that aim to collect OD information have generated mixed results.

  One of the greatest concerns about using online and web-based survey tools is the issue of coverage error (Schaller, 2005; Spitz et al., 2006). Although almost 90 percent of adults report using the Internet, use is higher among younger, wealthier, highly educated urban populations (Pew Research Center, 2018a). There is legitimate concern that the total population of transit riders may not be able to access the Internet on a regular basis and thus will not be able to participate in an online survey. But even for those who have regular access to the Internet, there is also a concern that the people who ultimately choose to complete such a survey may be a biased representation of the transit users (K. Cervenka, telephone interview, June 13, 2018).

- **Computer-Aided Telephone Interview Surveys**: In CATIs, surveyors review the responses in the first step, and then contact riders to ask more detailed questions about their trip. One of the great advantages of the CATI method is that the surveyor can contact riders in their preferred language (Agrawal et al., 2015). The Los Angeles County Metropolitan Transportation Authority (LA Metro) found that CATIs yielded a higher response from LEP riders; over 35 percent of respondents chose the Spanish-language option, increasing participation from a population that is often underrepresented in public transit surveys (Schmitt, 2012). One concern with this method is determining whether those who get called and complete a questionnaire are a sufficiently random representation of the population that is being studied.

### Choosing a Survey Method

Research has shown that different survey methods are appropriate in different contexts (Schaller, 2005; Schmitt, 2012; Agrawal et al., 2015). The FTA has cited tablet surveys as a preferred method of data collection (McHugh et al., 2017) and interview-administered tablet surveys (when conducted correctly) yield higher quality data than self-administered surveys (Schmitt, 2012). Depending on the transit system and type of survey, however, other methods may be more appropriate (see Table 3 for key strengths and weaknesses). In selecting a method, organizations should consider factors such as cost, technical know-how and capacity of the contractor/managing department, sociodemographics of the ridership population, and survey content.

An on-board survey is only as valuable as the quality of data that it provides on travel behavior. Survey approach and design can have a significant effect on data quality and it is critical that these surveys be designed to collect accurate, reliable, and useful data regardless of the survey instrument used.

### Response Rate Influences

The response rate of a survey is generally defined as the ratio of the number of returned surveys to the number of questionnaires distributed, but the specific way this rate is calculated varies from one agency to another (Agrawal et al., 2015). In some instances, the response rate is calculated as the ratio of the number of surveys returned to the total number of passengers receiving the survey. In others, it is calculated as a ratio of the number of surveys returned to the total number of passengers approached, including those that refused to participate in the survey.
Under either of these measures, a high response rate increases the likelihood that the sample accurately reflects the actual transit riding population by indicating good coverage across a population and reduced nonresponse bias (Agrawal et al., 2015).

Typical response rates can vary widely. According to Baltes (2002), a good response rate has historically been between 20 and 40 percent for on-board transit surveys. In the 2005 TCRP synthesis of intercept passenger surveys, transit providers reported response rates of between 33 and 67 percent (Schaller, 2005) while the survey conducted in this synthesis found an average response rate of 49 percent (this figure varied from 3 percent to 96 percent). A range of factors influence the response rate of a given survey, and can account for this variability, including design, environment, and demographics.

<table>
<thead>
<tr>
<th>Method</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| **Self-administered paper surveys** | - Most contractors are familiar with this method  
- Can quickly distribute surveys to many participants  
- Low cost per survey distributed  
- Survey length does not directly correspond with staff time per complete survey; still has an indirect impact as longer surveys lower response rates, requiring more fielding of responses  
- Allows rider to complete survey on their own time; may be appropriate for high-traffic locations (e.g., subway stations) where riders do not have the time to participate in an interview | - Poor data quality can result in high cost per usable survey response  
- Lower response rate (surveys received/surveys distributed)  
- Greater potential for question misinterpretation  
- Persons with limited English ability or literacy may struggle to complete the survey  
- Susceptible to sample and completion biases  
- Inability to track survey responses and data quality in real time |
| **Interview-administered tablet surveys** | - Better data quality  
- Ability to incorporate auto-validation and skip logic into survey instrument  
- Allows for tracking of responses in real time; can identify systematic biases or sampling issues more easily  
- Streamlined data entry and data cleaning  
- Interview approach can more flexibly accommodate users with low literacy or limited English-speaking ability | - May result in higher costs due to increase in staff hours to administer survey  
- Some users may be uncomfortable sharing personal details in an interview setting  
- Challenging to conduct in a crowded setting or place where user has limited time to participate in an interview |
| **Interview-administered paper surveys** | - Can be conducted alongside self-administered surveys to accommodate persons with certain disabilities, limited English proficiency, or limited literacy | - Does not benefit from the automation available in tablet surveys |
| **Two-step surveys** | - Effective in sampling short trips because full survey is completed later  
- Two-step method allows for targeted sampling of underrepresented groups  
- Can accommodate a wider range of languages than feasible with an in-person interview | - Participants may not accurately recall past trip  
- Distribution of survey during first step can amplify sampling bias  
- Lack of online access or phone may hinder response rate |
Design Factors Affecting Response Rate

The design of a survey and the method by which it is conducted can have a large influence on its response rate.

- **Survey Method:** As discussed above, survey methods can have a significant impact on response rate, with interview-based approaches frequently yielding a higher response rate than self-administered methods (Schmitt, 2012). Certain survey methods can also make it difficult to ensure an adequate rate of response from people with disabilities. In a self-administered method, a physically or visually disabled transit rider may be unable to complete the survey (Schaller, 2005). Methods that employ personal interviews, CATI responses, or online survey tools that are programmed to be compatible with screen reader technologies can overcome this obstacle.

- **Surveyors:** The use of surveyors, and their level of enthusiasm, diligence, and language ability, can also make a difference in response rates (Schaller, 2005). Multiple studies have found that using surveyors instead of a box to collect completed survey questionnaires increases the response rate (Schaller, 2005; Memarian et al., 2012). Transit providers have also reported that the quality of the surveyors hired was a significant factor in generating higher response rates (Schaller, 2005). Those that have staffed their survey teams with students have often found them to be effective (McHugh et al., 2017; Schaller, 2005), and one study found that female surveyors produced better response rates than their male counterparts (Memarian et al., 2012). In addition, if an individual with limited English proficiency is the subject of a survey, the surveyor’s ability to speak their native language would increase the likelihood of a response.

- **Incentives:** Incentives offered to encourage participation have also been shown to increase response rates (Baltes, 2002; Schaller, 2005; Memarian et al., 2012; Schmitt, 2012). In past surveys, such incentives have ranged from small giveaway items, such as pens, to free short-term transit passes, to entry into a drawing for a larger monetary prize or longer-term passes. One study suggested that the use of monetary prizes was more effective than other forms (Memarian et al., 2012).

- **Frequency:** The frequency with which on-board surveys are administered can have an influence as well. Transit providers have reported that administering surveys on a somewhat regular basis can improve response rates because customers come to expect them and learn that completing them can lead to meaningful changes in service and quality (Schaller, 2005). Surveying riders too frequently can have the opposite effect, as survey fatigue reduces responsiveness. Survey fatigue is challenging in OD surveys as the same rider may be approached multiple times during the study period.

- **Length:** Finally, the number of questions included in a survey make a difference in the overall response rate (Spitz, 2006; Cherrington, 2007; Memarian et al., 2012). Surveys that are too long can cause a respondent to never return a survey instrument, or not begin a survey at all. Though it can be a challenge to limit the number of questions, survey questionnaires should be designed to request only essential information related to trip characteristics and demographic data (Baltes, 2002; Cherrington, 2007; Memarian et al., 2012).

Environmental Factors Affecting Response Rate

Environmental characteristics of transit trips can also make it hard to collect responses in all desired situations:

- **Crowdedness:** If a survey is meant to be entirely completed on board a vehicle, this can lead to lower response rates. On a crowded, moving bus, riders may find it difficult to fill out a written form, and surveyors may find it difficult to conduct interviews for lack of privacy (Agrawal et al., 2015). Combined, these characteristics make it easier to conduct a survey during non-peak hours, which creates concerns about sample bias (Agrawal et al., 2015).
• **Short Trips**: Short transit trips are notably challenging to survey; respondents may simply not have enough time to complete an interview or a self-administered questionnaire (AECOM, 2009; Agrawal et al., 2015). Some providers have used auxiliary data collection to better target short trips (AECOM, 2009) such as two-step surveys or the option to complete the survey at another time.

• **Round Trips**: Transit riders on round-trip journeys may be less inclined to complete a survey if they were already surveyed on their inbound leg. This leads to lower response rates for outbound trips, notably trips taken during the evening peak period. Transit providers have tried to circumvent this by allowing riders to denote on a survey that they plan to take the exact same trip in the opposite direction later in the day (COTA, 2014).

• **Season**: Another environmental factor that could affect response rates is the time of year in which a survey is completed. Fall and spring are generally thought to have more typical travel patterns, whereas travel during the summer and winter may be irregular—summer is a popular vacation time and a recent study by Silver et al. (2016) concludes that avoiding winter months may be good practice if the survey aims to describe normal, weekday travel behavior. Note that seasonal effects on ridership differ between transit systems; for example, in warm climates such as South Florida, weather is not a major factor in the winter, but tourists visiting for spring break may disrupt typical transit travel patterns in the spring.

**Demographic Factors**

Response rates may differ between different demographic groups, affecting the quality of a survey sample (Baltes, 2002; Schaller, 2005). Some factors influencing response rates related to demographics include:

• **Transit Mode**: Schaller (2005) found that response rates tended to be higher for express bus, light rail, and commuter rail riders, which are modes that are more likely to have higher income riders of working age. These results implied that local-bus riders, who tend to have lower average incomes, may be systematically underrepresented. In addition, younger riders are often undercounted in transit surveys because many transit providers do not ask riders under a certain age to complete questionnaires (Neff and Pham, 2007).

• **Limited English-Proficient Populations**: One of the most difficult groups from which to ensure a high response rate are individuals with limited English proficiency (LEP). There are several reasons why those with LEP would choose not to participate in an on-board survey, including inability to understand the questions on a questionnaire, a lack of multilingual surveyors, and, in the case of surveys that use tablets, the desire to avoid having their behavior tracked by an electronic system (Schaller, 2005; Agrawal et al., 2015). To overcome a low response rate from this group, providing survey material in the most commonly spoken languages in the areas where the survey is being conducted, and providing multilingual surveyors can be a big help (Schaller, 2005). In addition, employing a two-step method with a multilingual CATI approach has proven to be an effective way to increase responses from individuals with LEP (Schmitt, 2012).

**Completion Rate Influences**

Whereas response rate is a measure that allows the agency to determine whether the returned surveys represent the transit-riding public, completion rate is a measure that shows if those responses can be used. Some determine completion rates by calculating the ratio of completed surveys to returned surveys, whereas others use a ratio of completed surveys to total passengers approached (Agrawal et al., 2015).
The definition of a “usable” survey response varies from agency to agency, and depends highly on the expressed goal of the survey. For most OD surveys, the essential information includes questions on trip characteristics and demographics (Cherrington, 2007). According to Schaller (2005), most transit providers determine if a survey is complete by either requiring that a certain percentage of questions are answered or that certain key questions are answered. For those that used a percentage-based determination in that study, the figure ranged from 25 to 90 percent, but most had a threshold over 50 percent (Schaller, 2005).

In a synthesis report on OD survey methods for the Florida Department of Transportation in 2012, Schmitt argues that for a response to be considered “usable,” the following data are essential:

1. Production/attraction zone (origin/destination),
2. Boarding/alighting location,
3. Access/egress mode,
4. Purpose from/to,
5. Key demographic attributes, and
6. Route sequence.

Completion rates are influenced by many factors that can inspire a respondent to provide answers to all questions presented. These include: the length of the survey, question non-response, question misinterpretation, and the method used to complete the survey.

**Survey Length**

A lengthy questionnaire can prevent someone from completely answering enough questions to make their response usable. This is especially the case for respondents completing short trips where they do not have time to complete a long form or a lengthy interview (Cherrington, 2007).

**Question Nonresponse**

Respondents may systematically skip certain survey questions (Agrawal et al., 2015). The reasons for this have been explored in a large body of research outside of transportation, and include cognitive and motivational factors (Beatty and Herrmann, 2002), issues of interpretation and comprehension (Moore et al., 1999), and perceived issues of confidentiality (Singer et al., 1992). Factors influencing question nonresponse include questions about personal information and whether the survey is being conducted in person.

- **Personal Information**: A persistent challenge for on-board surveys is questions that ask respondents to reveal personal information, such as income, race or ethnicity, and age (Cherrington, 2007; Agrawal et al., 2015; Lor et al., 2017). There is some evidence that respondents are more willing to answer these questions on a written, self-administered survey than in a personal interview, especially those having to do with income (Agrawal et al., 2015). Some researchers have found that providing closed-ended income categories may increase responses to these questions, instead of providing an open-ended answer option (Moore, 2006; Schmitt, 2012; Agrawal et al., 2015). One study suggested that survey designers take one step further and create income categories that are artificially low to encourage low-income riders to respond (Schmitt, 2012).
- **In-Person Interviews**: Lor et al. (2017) found that providing an in-person rationale for why personal questions on race and ethnicity, income, and age are being asked can increase the likelihood that they will be answered. This was especially true for questions concerning income. When personal interviews are used, respondents have also expressed more
willingness to answer questions on race and ethnicity if they are interviewed by someone of a similar racial or ethnic background (Lor et al., 2017).

**Question Misinterpretation**

The design and wording of survey questions has a big impact on completion rates. On self-administered surveys, question design is particularly important because there is little opportunity to ask for clarification from survey staff (Agrawal et al., 2015). In general, survey designers would benefit from following best practices that encourage paying close attention to question wording that might prove confusing to respondents (Tierney et al., 1996; Baltes, 2002; Cherrington, 2007). Words with ambiguous meanings, double barreled questions (i.e., two questions posed together but only one set of response options provided), double negatives, hypothetical situations, and acronyms should be avoided (Baltes, 2002). Survey pre-tests are recommended to ensure instructions are clear and questions are easy to understand (Baltes, 2002).

- **Origin/Destination:** Respondents to on-board surveys have historically misinterpreted questions regarding origin and destination, route sequencing, and one-way trips, which can lead to significant measurement error (Schmitt, 2012). Origin and destination reporting is particularly important for building a profile of rider behavior. To overcome potential errors in reporting for surveys without automatic validation (i.e., survey software determines that address is a real and valid location), Cherrington (2007) recommends that a survey should ask three variations of origin and destination location information in tandem to create redundancies in the answer: full address, cross streets (or a nearest corner), and the name of the place or building.

- **Route Sequencing:** The literature suggests that questions on route sequencing are especially challenging for riders. When asked to list all route numbers that will be used on a one-way trip, the respondents may reply by providing all possible routes that they could have used (Schmitt, 2012). Respondents may also misinterpret the meaning of a one-way trip, which is evident in circumstances when both the origin and destination of a trip are reported as “home” (Schmitt, 2012). Graphic and written explanations can help clarify questions for survey respondents (Schmitt, 2012).

**Survey Sampling Plan**

In some smaller transit providers, it is logistically possible to complete a census of all riders, but most transit providers must create a sampling plan to solicit survey responses from a representative slice of the population, or a sample. To identify a representative sample, survey designers must:

1. Understand their target population, study population, and sampling frame;  
2. Choose a sampling method;  
3. Determine the correct sample size; and  
4. Create a sampling plan that manages or minimizes expected sample bias.

**Target Population, Study Population, and Sample Frame**

The first step in creating a sampling plan is to identify the target population, study population, and sample frame (see Figure 2). Defining these three factors will affect what a survey is measuring:

- The **target population**, or theoretical population, for any survey is the population of interest to the research. For surveys that examine transit trip-making behavior, the targets of the survey are trips utilizing transit, not transit riders (Baltes, 2002; Schaller,
If the expressed purpose of an on-board survey is to collect attitudinal data from riders, then the target population would be transit riders (Baltes, 2002; Cherrington, 2007). The main difference between these two is that surveys that aim to collect information on trips may end up collecting multiple responses from one rider, whereas a survey that focuses on riders will likely only seek one response per rider. In circumstances in which a survey is meant to gather both types of information, it is up to the survey designer to determine what the emphasis of the survey should be and create a survey method that avoids the double counting of attitudinal data. This is often accomplished by asking riders to fill out a new survey questionnaire for each trip, but to omit answers to attitudinal questions if they have already filled them out once (Schaller, 2005).

- The **study population** is a subset of the target population that can be reached to conduct the survey. For on-board transit surveys, the target and study populations are usually the same, because all riders can theoretically be reached while riding in a transit vehicle. In 2005, Schaller determined that most providers that were surveyed in the study defined their study population to be “all riders” of their transit system, whereas others identified riders within a specific geographic area, riders on certain routes, or riders during certain time periods to be their study populations.

- The **sampling frame** is a complete listing of all specific items in the identified study population. For on-board transit surveys, the frame usually consists of all customers that are on the bus or rail routes that are being studied (Schaller, 2005). A frame can be defined generally as all riders on a given route, or further defined by days of the week, time of day, and direction of travel (Schaller, 2005).

### Sampling Methods

Agencies have used several different methods to identify a sample of riders that will be approached to complete a survey. Generally, sample methods can be grouped into two categories: probability, or random sampling, and nonprobability, or nonrandom sampling (Baltes, 2002). Though it is impossible to eliminate all sources of bias through a sampling plan, the standard practice in transit surveys is to use probability sampling methods because they are more likely to achieve a representative sample of riders (Baltes, 2002; Schaller, 2005; Cherrington, 2007). The three methods of probability sampling (see Figure 3) are as follows:

- **Simple Random Sample**: Under a simple random sample, each trip surveyed is selected by chance from the larger population, and the probability of selecting an individual within a sampling frame is the same (Baltes, 2002; Cherrington, 2007). Though a simple random sample is attractive from a methodological standpoint by maintaining the probability of any one trip being selected for inclusion, this method is rarely used for on-board surveys because it can be difficult to field (Schaller, 2005; Cherrington, 2007). If bus routes, for instance, are selected completely at random, survey staff may spend a large amount of time traveling from one route to another in a system (Schaller, 2005).
**Simple Random Sample:** Surveyors are placed at each subway station within a system and hand out surveys to riders entering the system.

**Stratified Sample:** A team of surveyors spends each day surveying a different bus route until the entire sample frame is surveyed.

**Systematic Sample:** Every fifth rider boarding a vehicle is asked to participate in an interview-led survey.

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**Figure 3. Examples of simple, stratified, and systematic samples in origin-destination surveys.**

- **Stratified Random Sample:** In a stratified random sample, the sample frame is divided into homogeneous subsets, or strata, and then random sampling techniques are used to select individuals from within those strata (Baltes, 2002; Schaller, 2005; Cherrington, 2007). Transit operators often stratify a survey sample by mode, route, bus or train run, time of day, or service type, and then select participants at random from each of those groups (Cherrington, 2007). This method ensures that specific subgroups of transit trips are captured.

- **Systematic Sample:** A systematic sample, otherwise known as an interval sample, selects every Nth trip within the sample frame to participate in a survey (Schaller, 2005; Cherrington, 2007). Though the selection of individual trips to be included in the sample is not completely random, each trip has an equal likelihood of being selected (Cherrington, 2007). This method is particularly useful for survey methods that utilize personal interviews. Since it is impossible to interview every rider on a given route, this method maintains randomness and ensures that surveyors do not simply approach those who seem friendly or similar in appearance to them (Schaller, 2005).

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**Sample Size and Error**

Determining the sample size needed for a survey depends on the objectives of the survey, the target population size, and the level of precision desired in the responses (Baltes, 2002; Schaller, 2005). Any survey that relies on a sample will feature some level of error compared to the population as a whole (Baltes, 2002).

The difference between a true, but unknown, value for an entire population and the observed value gathered from a sample is known as sampling error (Baltes, 2002; Schaller, 2005). The sample size required for a specific survey is highly dependent on the level of sample error that can be tolerated at specific confidence intervals. Confidence intervals represent the percentage of time that the survey designer is willing to be correct, and are usually set at 95 percent for social science surveys (Baltes, 2002). This would mean that, 95 percent of the time that a survey is completed, the results from a truly randomized sample are expected to fall within certain percentage ranges.

The sample size requirements are dictated by the degree of precision desired; for example, an OD survey with valid results on a route-by-route basis will require a larger sample than one reporting only on systemwide statistics. In developing the sampling plan, organizations must balance the competing interests of managing sample size (and therefore cost) and achieving a high level of precision for survey results.

There are a variety of resources for guidance on statistical methodology and concepts such as sample error and confidence intervals, including several listed on the webpage of the Federal Committee on Statistical Methodology (https://nces.ed.gov/FCSM/policies.asp).
Sample Bias

Systematic errors created by a sampling method are referred to as sample bias (Baltes, 2002). Whether or not bias is present in a sample is hard to quantify, because a 100-percent census of all transit trips in a system is almost never available for comparison. Even though biases are found to some degree in all surveys, transit providers should try to minimize them when designing sampling procedures (Baltes, 2002).

The three most common sources of sample bias in on-board transit surveys are noncoverage bias, nonresponse bias, and self-selection bias (Baltes, 2002; Schaller, 2005).

• Noncoverage Bias: Noncoverage bias is present when a sampling plan does not include all subsets of a study population. For on-board transit surveys, this type of bias would be present if trips taken by certain groups of individuals are not included in the sample frame (Baltes, 2002; Schaller, 2005). Examples of such bias include a sampling frame that excludes persons under age 16 from participating or days of the week when certain route patterns operate.

• Nonresponse Bias: Nonresponse bias can be present when a portion of the study population that possesses certain traits does not respond to a survey, causing the responses collected to be significantly different from those that would have been collected from the full population (Baltes, 2002; Schaller, 2005). This type of bias causes the results of a survey unrepresentative of the study population, since certain traits of trips reported (e.g., length of trip, mode used, sociodemographic characteristics of rider) may be disproportionately present. Though it is nearly impossible to calculate the error from nonresponse, it can be evaluated by comparing characteristics of the respondents with those of the total population to find whether certain groups were left out (Schaller, 2005).

• Self-Selection Bias: Survey responses almost always include some level of self-selection bias, which happens when individuals voluntarily choose to respond, or not respond, to a survey questionnaire on their own (Baltes, 2002). This is more likely to happen with surveys that do not have sampling plans that aim to target specific individuals to participate, such as methods that invite all transit riders on a bus to participate, online surveys open to all transit riders, or mail-in surveys sent to all transit riders (Baltes, 2002). In these cases, participants who have a strong inclination to respond will often self-select to participate, whereas those that do not have such an inclination may not.

Survey Expansion Methods

Because most OD surveys include only a sample of riders, survey results must be expanded to reflect the total rider population. As discussed earlier, response rates differ based on a range of factors such as the route being surveyed, demographics of respondents, and length of trip. Applying an expansion factor to each response allows a survey to partially control for these different response rates. The following section outlines a variety of expansion techniques outlined in the literature.

Boardings-Based Expansion Method

The most common method for expanding survey results is by multiplying the number of responses by the ratio of responses to boardings. As described by Schmitt (2012), such expansion factors are frequently developed across three dimensions: route, direction, and time of day. A bidirectional route broken into an AM peak, midday, and PM peak period would therefore have six separate expansion factors based on ridership within each directional subperiod. Boardings are commonly determined based on data from fare boxes, automatic passenger counters (APCs), or manual ride checks.
Some transit providers choose to include location along the route as a fourth expansion factor dimension (Schmitt, 2012). Phoenix’s Valley Metro 2010–2011 on-board survey broke routes with 4,000 daily boardings or more into segments for expansion purposes. The segments included multiple stops and were delineated to ensure expansion factors did not exceed 40 for any given segment (ETC Institute, 2011). For agencies such as Valley Metro, accurate counts of stop-level boardings, alightings, and passenger load are needed to determine the correct expansion factor.

**Other Approaches to Survey Expansion**

Boarding-based expansion factors help to control for differences in response rates by time of day, route, or location, but fail to account for survey bias based on other factors such as demographics or income. There is limited literature on the development or use of more sophisticated expansion factors for transit surveys specifically. The Transportation Research Board in 2007 released a research needs statement titled “Expansion Factors for Transit Survey Responses” (TRB, 2007) which called for further research to be done on the topic.

Examples do exist of providers applying other practices to more accurately expand survey results, notably in the use of more sophisticated control counts than purely ridership, the use of synthetic records, and the iterative proportional fitting (IPF) method of weighting responses.

- **Control Counts**: To establish an improved basis for expansion, providers look to various data sources to establish control counts that can be used to determine whether any groups of riders are overrepresented or underrepresented in the sample. The most common type of control count is to collect data on rider unlinked trips (i.e., where a rider boards and alights). This can be done by either conducting a separate on/off survey or through data generated by automatic fare collection systems. The latter is only viable in systems where rider entries and exits are recorded. Schmitt (2012) highlights innovative methods that providers use to establish control counts. For example, Tri-Rail in Southern Florida found that riders who drove and parked at its stations had a higher response rate than those who were dropped off or used another mode, such as a bus or walking. To account for this, Tri-Rail conducted manual counts of access/egress mode to inform expansion factors. Other methods mentioned in the paper include establishing control with fare data to ensure control for any response bias by fare media used and boarding (Schmitt, 2012).

- **Synthetic Records**: One method identified in the literature is the use of synthetic records, the practice of creating a record of trips to fill gaps in the OD data. In its 2013 on-board survey, Central Ohio Transit Authority (COTA) created separate expansion factors based on route, direction, time of day, and route segment. It compared the survey records to APC data and identified any period, direction, or segments where APC data existed without a corresponding survey record. For such instances, a “synthetic” record was added to survey data to account for identified gaps (COTA, 2014, p. A-6).

- **Iterative Proportional Fitting**: The COTA survey also utilized IPF to create its expansion factors. IPF is a procedure used to adjust sample data across two dimensions such as boardings and alightings (see Figure 4). Agencies such as COTA utilize IPF to expand segment-to-segment survey response totals for a particular route to equal the boardings and alightings recorded by APCs. IPF is used to correct for response bias based on distance because short trips frequently have fewer proportional survey responses (Schmitt, 2012).

**Transforming Results to Linked Trips**

FTA suggests that OD studies include a conversion of survey results into linked trips (K. Cervenka, telephone interview, June 13, 2018). A linked trip is a trip from origin to destination on a transit system and can include multiple routes and transfers. Survey data are
expanded based on unlinked trips, which counts each boarding as a separate trip regardless of transfers. To transform unlinked trips to linked trips, each expansion weight needs to be divided by the number of unlinked segments that the respondent rode during their trip. For example, if a survey response includes two transfers and three routes, the expansion factor applied to that response should be divided by three. If a survey response includes no transfers, it should be divided by one.

To check for transfer bias in the survey sample, survey results can be validated through a linked trip decomposition test. This test calculates the number of expected trips per route based on linked trip data and compares it to actual ridership. A large difference between the predicted and actual value means that transfer trips are either being undercounted or over-counted (K. Cervenka, telephone interview, June 13, 2018).

### Survey Expansion and Sample Quality

Survey expansion can help reduce response bias but ultimately cannot address all systematic forms of response bias. As outlined by Schmitt (2012), having better data on rider characteristics before a survey is conducted allows providers to develop better sampling plans.

### Harnessing Passive Data Collection

“Passive data” refers to data collected for other purposes, which may nevertheless be used for transit network planning. These data are often collected automatically, such as with APCs, or using entirely separate processes such as cellular phone location records. This contrasts with “active” methods such as surveys. New passive data collection technologies are being used to generate new sources of travel behavior data. These new data sources are used in a variety of contexts, but have been more commonly applied to highway-related studies. Improvements to technologies, and to services running on those technologies, have resulted in increasing availability of passive data, which have value to transit planning in addition to highway planning.

Data collected passively present a trade-off in terms of detail and population size with active data. Whereas active data allow researchers to know many aspects of a small population, passive data show fewer aspects of a large population. In active data collection, planners design a survey to capture specific answers to questions they are asking: the survey responses contain every piece of behavioral information, and the responses are weighted to represent the population of interest. At the same time, on-board transit surveys can suffer from nonresponse biases and small samples. Efforts to increase response rates and/or sample size are expensive.

Passive data differ in that researchers and planners cannot generally design the data collection: the specific collection technology defines both the data collected and the population from which it is drawn.

<table>
<thead>
<tr>
<th>Original Data (Surveys Collected)</th>
<th>Weighted Data</th>
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<tr>
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<tr>
<td>15</td>
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</tr>
</tbody>
</table>

which the data are collected. As a result, passive data sets tend to be “incomplete” in the sense that not every question can be answered from a single product. Automated fare collection cards collect key details of every trip made on a transit system but cannot independently reveal trip purpose or details about the traveler. It is left to the researcher to identify and merge other data sets that may provide more information, or to develop data processing algorithms to infer missing elements.

It is impossible to describe the usefulness of passive data to on-board survey methods, then, without considering the technologies used to collect, process, and distribute them. There are generally two classes of passive data that are relevant to collecting information about transit riders: data collected by transit providers and data collected by outside parties. Both are discussed.

**Data Collected by Transit Providers**

There are several sources of passive data collected directly by transit agencies through their normal operations. Many agencies are leveraging these data for planning and reporting in addition to their initial purposes.

- **Electronic Fare Collection Systems**: Transit agencies who use EFC collect boarding data every time a passenger pays a fare. Given sufficient fare-card penetration and fare system design, it is possible to reconstruct complete trip and tour records for passengers in the system. An extensive summary of early research in this area is available from Pelletier et al. (2010), and algorithms for building tours from boarding data are presented by Seaborn et al. (2009), Wang et al. (2011), and Ma et al. (2013). Efforts to join EFC data to socioeconomic data such as income and age include home-based matching to Census data or probabilistic linking of trips to surveys (Kusakabe and Asakura, 2014). Chapter 4 of this synthesis includes a case example of MBTA’s use of fare-card data to estimate boarding, transfer, and alighting patterns of riders.

- **Mobile Ticketing Systems**: Many transit agencies are developing mobile applications that can conceivably collect information about the ultimate origin and destination of a participating passenger’s trips rather than simply where the passenger entered and exited the transit system. The applications could also provide more information about incidental activities between transfers, such as shopping or other errands around transfer locations, information that is not available in EFC data. *TCRP Synthesis 125* (Okunieff, 2017) on these applications does not report that any agencies are using the data in this way, though Rahman et al. (2016) execute a planning exercise using such data.

- **Mobile and Desktop Trip Planners**: Many transit providers maintain their own branded mobile applications that provide schedule and route information as well as real-time tracking for the next bus or train. In the same way that an agency might use a mobile ticketing system to collect information about riders, so might an application that provides real-time tracking information. OD data could also be harvested from open trip planners embedded on agency websites using tools such as 1-Click (Cambridge Systematics) and OpenTripPlanner (http://www.opentripplanner.org), although desktop and mobile data may need to be cross-referenced to see if researched trips are ever made.

**Data Collected by Outside Parties**

There are also sources of passive data collected by commercial entities and nonprofit organizations.

- **Origin–Destination Matrices**: There are commercially marketed OD data products derived from cellular phone or mobile device location data. Cellular data can have high penetration rates but large geographic tolerances; mobile device data may be more precise but the
penetration rate is lower and, in many cases, undisclosed. At present, neither type of data is likely to provide statistics on the number of people taking transit between points in a system. What the data can do, however, is identify total demand between points within the region, divided by time period. This can inform activities such as bus network redesign and long-range scenario planning.

- **Mobile Applications and GTFS-ride/GTFS-flex**: Mobile applications that take advantage of General Transit Feed Specification (GTFS) real-time data, such as Citymapper (https://citymapper.com), OneBusAway (https://onebusaway.org), and Transit app (https://transitapp.com), could aggregate observed positional data and report route-level OD data to agencies or a public data clearinghouse. With all of these applications, it would be easiest to share observed demand between app developers and transit providers using a common, shared data standard. One such standard—GTFS-ride (https://www.gtfs-ride.org)—is being developed in partnership between the Oregon Department of Transportation (ODOT) and Oregon State. It is an open, fixed-route transit ridership data standard that allows for improved ridership data collection, storing, sharing, reporting, and analysis. Another TRB-sponsored data standard under development for flexible-route service is the General Transit Feed Specification Flex (GTFS-flex), which could expand GTFS-ride to cover flexible services as well (DemandTrans Solutions, 2018; Center for Urban Transportation Research, 1996).

**The Future of Passive Data**

Passive data could provide transit planners with information on travel behavior at more regular intervals, and at lower costs, than active data collection can. The trade-off, though, is that the technologies collecting data passively can change rapidly. Users of passive data therefore must be able to adapt efficiently and think critically about who the data are representing, what they are showing, and who is missing. The other big passive data challenge is that it yields different data types and results than active data collection. Passive data will almost always show just a few aspects of a large sample, whereas active data explain the exact breadth of information about a population that the surveyor is interested in, albeit a small sample. Multiple sets of passive data can be merged using innovative techniques to understand more about a population observed through passive data, but there is little to no research or guidance available on how Title VI requirements might be satisfied in this way. Further research along these lines would allow more transit operators to embrace passive data in their planning processes.
Current State of Practice

Background

To better understand the current state of practice for origin–destination (OD) studies, an online questionnaire was distributed to 67 organizations throughout the United States responsible for overseeing these studies, including transit providers and metropolitan planning organizations (MPOs).

Participants were selected from the National Transit Database to represent a range of transit systems by size, location, and mode, and based on the availability of contacts and recommendations from the study committee. Fifty-seven of the organizations responded at least partially to the questionnaire, resulting in an 85 percent response rate.

Responses to the study questions were divided into the following sections:

A. Planning a Survey
B. Survey Approach and Instrument Design
C. Survey Sampling Plan
D. Assessing Survey Data Quality
E. Survey Expansion
F. Emerging Data Alternatives to On-Board, or Intercept, Surveying

Modes Surveyed

Survey respondents reported conducting OD surveys on all common modes of public transportation, with 92 percent stating they completed their latest survey on local bus (see Table 4).

System Size

Survey respondents were categorized in certain instances by the size of the transit system being surveyed. System size was defined as total annual unlinked trips according to 2016 NTD data (FTA, 2016c; see Table).

Planning a Survey

Frequency of Survey Completion

The use of OD surveys among transit providers and MPOs is extremely common (see Figure 5). Of the organizations that participated in this study, 93 percent reported completing an OD survey at some point in their history. This is not surprising, given that these types of surveys provide information on a wide variety of topics relevant to service planning and service provision.
The frequency by which respondent organizations administer new surveys varies (see Figure 5). Of the organizations that participated in this study, 7 percent responded that they do so on a rolling (continual) basis; another 7 percent, annually; 40 percent every 2 to 5 years; 23 percent every 6 to 10 years; and 2 percent complete a survey less than once every 10 years. The remaining organizations that have completed rider surveys in the past have done so either at irregular increments or when specific circumstances arise that require a survey to be completed. These circumstances include the completion of large projects, service changes, when funding becomes available, or when the local MPO is also in the process of administering a wider survey effort.

There was no discernable relationship between the size of an organization and the frequency at which they complete a rider survey, though the only respondents that reported collecting rider survey data on a regular or rolling basis were doing so for very-large transit systems.

**How Respondents Use Survey Data**

Respondents stated that they conducted OD surveys to support long-range planning, travel-demand modeling, route planning, and Title VI compliance. Most respondents stated that they did not have trouble justifying the cost of the survey to their leadership; federal compliance was the most commonly cited justification made to leadership for funding.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
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<td>Local bus, including electric bus and trolley bus</td>
<td>47</td>
<td>92</td>
</tr>
<tr>
<td>Commuter bus</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Streetcar or light rail</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>Bus rapid transit</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Commuter rail</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Heavy rail (subway, metro, rapid transit)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Paratransit or demand-response service</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Ferry</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Other (express bus)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>51</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

The frequency by which respondent organizations administer new surveys varies (see Figure 5). Of the organizations that participated in this study, 7 percent responded that they do so on a rolling (continual) basis; another 7 percent, annually; 40 percent every 2 to 5 years; 23 percent every 6 to 10 years; and 2 percent complete a survey less than once every 10 years. The remaining organizations that have completed rider surveys in the past have done so either at irregular increments or when specific circumstances arise that require a survey to be completed. These circumstances include the completion of large projects, service changes, when funding becomes available, or when the local MPO is also in the process of administering a wider survey effort.

There was no discernable relationship between the size of an organization and the frequency at which they complete a rider survey, though the only respondents that reported collecting rider survey data on a regular or rolling basis were doing so for very-large transit systems.

**How Respondents Use Survey Data**

Respondents stated that they conducted OD surveys to support long-range planning, travel-demand modeling, route planning, and Title VI compliance. Most respondents stated that they did not have trouble justifying the cost of the survey to their leadership; federal compliance was the most commonly cited justification made to leadership for funding.
Table 5. Funding sources.

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local government</td>
<td>25</td>
<td>51</td>
</tr>
<tr>
<td>Federal government</td>
<td>23</td>
<td>47</td>
</tr>
<tr>
<td>Metropolitan planning organization</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>State government</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total Respondents</td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

How Surveys Are Funded

A wide variety of funding sources are used to pay for rider surveys, with the most common source of funding being local and federal funds (see Table 5). Many organizations rely on a mix of funding sources to pay for surveys.

Regional Coordination

In most circumstances the transit agency (86 percent of respondents) is the primary party responsible for overseeing a rider survey effort (see Figure 6). Another 10 percent of surveys are led by the MPO.

When asked if their most recent survey was administered in coordination with other transit agencies or the regional MPO, 59 percent responded in the affirmative. Rider survey results can affect many aspects of transportation planning, including those under the purview of other agencies and government entities.

Survey Approach and Instrument Design

Survey Modes Used

The survey methods used by respondents were generally consistent with those identified in the literature review (Chapter 2). Respondents most often conducted surveys by paper (67 percent) or by tablet computer (53 percent); a much smaller share of respondents conducted surveys online or with a two-step approach (see Figure 7).
Survey Methods Used

Respondents used a variety of methods, including self-administered, interview-administered, and two-step surveys:

- The most common method overall among respondents was a self-administered paper survey that staff members distributed to riders—who then returned the survey directly to staff members or placed it in a collection box (57 percent of respondents).
- The second most common survey method was an interview-administered survey using tablets (53 percent of respondents). One-fifth of respondents offered both a tablet and a paper survey option.
- Forty-one percent of respondents used multiple survey methods. Paper-based survey instruments were most frequently combined with other methods, which may indicate that organizations responsible for completing OD studies continue to offer these as an option as they introduce other methods.
- Notably, no respondents administered their last survey using an online method alone. Invitations to the online survey were most frequently handed out by survey staff directly to riders or distributed through seat-drops. One respondent reported advertising their online survey in transit stations, on buses, and through social media (not advisable because this method may yield a very high rate of response bias); another invited participants through e-mail; and another gave respondents to a paper survey the option to complete it online.
- Eight percent of respondents used a two-step method in which riders were asked to complete a short survey aboard the vehicle, followed by an in-depth computer-aided telephone interview (CATI).
- Only one respondent utilized an “other” method. This organization tracked boarding and alighting completely electronically and thus collected trip-making behavior automatically without interacting directly with riders.

Tablets

Because tablets are an emerging survey mode, this synthesis questionnaire included several questions specifically on how and why respondents are utilizing tablets in their survey practice. All respondents chose to adopt tablets to improve data quality; a majority also stated that they use tablets to shorten data processing times and reduce labor costs associated with data cleaning and analysis, printing, and paper handling (see Table 6).
There were a few less commonly cited reasons for using tablets. Two respondents mentioned FTA encouragement to use tablet technologies. Others chose tablets because they allow geocoding on the fly, provide a higher level of quality control and assurance, provide better origin and destination GIS data, and because previous research showed that they would increase response rates.

Tablet surveys can be administered either as a “smart survey” with automatic data validation built into the process, or as a “static survey” that simply collects the data through a tablet interface but does not take full advantage of data validation capabilities. Most respondents that used tablets in their most recent survey reported incorporating some type of automatic data validation (see Table 7). Surprisingly, 17 percent of respondents administered a tablet survey that does not incorporate any response validation.

While most respondents indicated that tablets improved data quality, responses were inconclusive on whether tablets reduced survey costs. The majority of respondents did not know if costs went up or down, while 18 percent reported lower costs and 29 percent reported higher costs.

**Days of Week and Times of Day Surveyed**

Nearly all providers (94 percent) completed surveys during all weekday time periods, whereas two respondents did so only during peak and midday hours and one only during off-peak hours. Saturday and Sunday time periods were surveyed to a lesser extent. Of those

<table>
<thead>
<tr>
<th>Table 6. Reasons why tablets were used.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reason</strong></td>
</tr>
<tr>
<td>Improved data quality due to automated validation of responses</td>
</tr>
<tr>
<td>Shortened wait period between the completion of field survey and availability of data for analysis</td>
</tr>
<tr>
<td>Reduced labor costs related to data cleaning and analysis</td>
</tr>
<tr>
<td>Reduced labor and materials costs related to printing and paper handling</td>
</tr>
<tr>
<td>Enabled a new approach to survey design</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total respondents</td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

<table>
<thead>
<tr>
<th>Table 7. Type of validation strategies used.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Validation Used</strong></td>
</tr>
<tr>
<td>Consistency of responses (e.g., transit route used was consistent with stops used)</td>
</tr>
<tr>
<td>Addresses</td>
</tr>
<tr>
<td>Reasonableness of responses was validated (e.g., number of vehicles available in household less than 20)</td>
</tr>
<tr>
<td>Stop locations</td>
</tr>
<tr>
<td>Responses were required for each question (e.g., to prevent missed questions)</td>
</tr>
<tr>
<td>No automatic response validation</td>
</tr>
<tr>
<td>Total respondents</td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
that surveyed riders on Saturdays and Sundays, most drew their sample from all time periods. Finally, no respondent limited their surveys to only one direction of travel.

**Survey Distribution Locations/Extent of Routes**

Respondents reported using a variety of survey sampling strategies, with a notable difference in approach between self-administered and interview-administered surveys. Regardless of the method, most respondents conducted the surveys aboard vehicles instead of at transit stops and stations.

- Among those with a paper survey instrument or invitation, 55 percent distributed the survey only on select trips and 28 percent reported distributing surveys on all trips. A small number of respondents distributed surveys at select bus stops or stations, and others either distributed surveys both at stops and onboard vehicles or on one select route.
- If a tablet or other interview-supported method was used, respondents approached recruitment differently than paper surveys. Since an interview-supported survey takes more staff time per person approached, survey administrators cannot easily invite all riders on all trips to participate. To organize their sampling method, 79 percent of respondents set up a randomized method for recruitment, such as inviting riders to participate based on their boarding order. The remaining respondents approached all adult riders on a surveyed trip.

**Survey Question Design**

While respondents use the rider survey data for many different reasons (see Table 8), they tended to cover similar topics on their surveys. Nearly all respondents indicated that they included questions on trip purpose, demographics, fare type, access/egress modes, and frequency of transit use. Fewer than half of respondents asked questions on rider satisfaction, and only 8 percent asked about support of policy and planning proposals. Finally, in the “other” category, a variety of questions were posed to riders, including several system-specific questions.

The literature review illustrates the importance of survey question design and wording; however, there is little standardization in survey instrument development. Most respondents based their surveys on their own past surveys or developed questions from scratch. Ten percent of respondents relied on their MPOs for question wording, and a handful of respondents used external sources, such as surveys from other providers.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip purpose</td>
<td>51</td>
<td>96</td>
</tr>
<tr>
<td>Rider demographics</td>
<td>50</td>
<td>94</td>
</tr>
<tr>
<td>Type of fare used</td>
<td>46</td>
<td>87</td>
</tr>
<tr>
<td>Means of access and egress</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>Frequency of transit use</td>
<td>41</td>
<td>77</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>Rider support for policy and planning proposals</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
Boarding and alighting information is the most basic type of question included in OD surveys. Fifty-one percent of respondents asked riders to indicate the boarding and alighting location for all trip segments to capture transfer locations and routing. Thirty-five percent only asked for the first and last boarding location. A small number of respondents reported inferring the transfer location based on boarding, alighting and/or routes.

Special Accommodations for Specific Population Groups

When conducting surveys of transit riders, survey administrators have found that special accommodations were often needed to ensure that specific population groups could participate. Two groups that may require structural changes in survey administration are persons with disabilities and those with limited English proficiency (LEP). In most circumstances, without specific accommodations, the opinions and trip-making behaviors of members of these groups are unlikely to be captured.

- **Accessibility:** Though many people with disabilities can participate fully without accommodation, respondents included training and resources for survey staff that can increase participation. Fifty-four percent of respondents provided training to survey staff on how to interact with people with different kinds of disabilities (e.g., physical, visual, auditory, and cognitive). Fewer than half of respondents provided special accommodations for riders, such as a screen reader–compatible online survey, integration of adaptive technologies with tablet surveys, or the availability of proxy respondents for those unable to complete the survey on their own. More than one-quarter of respondents reported not using any specific strategies to accommodate disabled passengers.

- **Multilingual Surveys:** Because it is not feasible to accommodate every language spoken by passengers, survey administrators tend to focus resources on the most widely spoken languages in their service areas. Ninety-three percent of respondents provided surveys in languages other than English, with the most common being Spanish, Chinese, Korean, and Vietnamese. Fifty-eight percent of respondents reported hiring multilingual surveyors who could administer their survey in a foreign language.

Survey Length

Survey administrators must design rider surveys to be long enough to capture the desired information, yet not so long or complex as to cause confusion or response fatigue. For respondents, the approximate time needed to complete their most recent rider surveys ranged from 2 to 30 minutes, but the majority reported times between 5 and 10 minutes. The average time needed to complete these surveys was 7.4 minutes across all respondents. The number of questions reported ranged from 10 to 61, with 29 questions as the average (see Table 9).

Survey Cost

Survey administration costs varied widely among respondents. Of the organizations that responded to these questions, the cost of completing a rider survey ranged from $2,100 for a

<table>
<thead>
<tr>
<th>Survey Characteristic</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Complete (in minutes)</td>
<td>7.4</td>
<td>2</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Number of Questions</td>
<td>29</td>
<td>10</td>
<td>61</td>
<td>45</td>
</tr>
</tbody>
</table>
small transit agency to $5 million for a very large one, with a median cost of $530,899 dollars. Survey costs increased with agency size (see Table 10 and Figure 8).

The substantial overlap in the range of costs indicates that the size of the agency is not the only factor dictating survey costs. The most expensive survey completed by a small agency, for instance, was more expensive than the cheapest survey completed by a very large agency. Other factors that influence the cost include the desired sample size, the length and complexity of survey questions, whether the survey relied on contractors, the transit mode surveyed (e.g., large agency surveying a low-ridership mode) and the survey methods used.

The costs per complete and usable response varied across respondents as well, ranging from $6.19 to $139.78 per response, with a median cost of $36.83 per response (see Table 11 and Figure 9).

A plurality of respondents reported that survey costs grew by more than 10 percent between the second most-recent survey and their most recent survey. Only 7 percent of respondents reported a decline in survey costs, while 20 percent saw no change (see Figure 10).

### Survey Sampling Plan

The decisions that survey designers make concerning sampling frame, population, and sample size can have a large impact on results. Sample size is directly related to the level of specificity that a summary of survey results can provide (see Table 12). The greater the level of geographic detail, the larger the sample required. A survey of ridership characteristics taken at the transit stop level will need a much larger sample than a survey of general rider characteristics across the system.
Table 11. Costs per completed survey.

<table>
<thead>
<tr>
<th>Cost Per Complete/Usable</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$36.83</td>
<td>$6.19</td>
<td>$139.78</td>
<td>21</td>
</tr>
</tbody>
</table>

Figure 9. Cost per completed survey (median, average, range, and 2 standard deviations).

Figure 10. Change in cost compared to previous survey efforts.

Table 12. Level of geography for which survey results can be summarized.

<table>
<thead>
<tr>
<th>Level of Geography</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certain-higher ridership routes as well as the entire mode</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Only for an entire mode of service</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Route-level (may exclude lower ridership routes)</td>
<td>16</td>
<td>39</td>
</tr>
<tr>
<td>Route segment level</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Stop level</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Total respondents</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>
The majority of respondents indicated that their sample size was large enough to provide results at either the route level, stop level, or route segment level of geographic specificity. A smaller percentage of organizations were only able to summarize their results to select high-riderhip routes or for an entire mode of service.

**Surveying Minors**

Minors (under 18 years old), historically, have often been excluded from intercept OD survey samples, though many respondents now appear to be implementing sampling techniques to remedy this (see Table 13). Thirty-three percent of respondents surveyed minors who appear to be above a certain age, ranging from 11 to 16. Seventeen percent of respondents approached all riders no matter what their age, and 3 percent included a supplementary survey for minors.

**Assessing Survey Data Quality**

To maximize the accuracy of a survey and minimize response bias, survey designers aim for high response and completion rates. A high response rate indicates that a survey likely has good coverage across a selected sample of a population, whereas a high completion rate indicates that many of those responses are usable for the survey’s expressed purpose.

**Response Rate Calculations**

Among respondents there is no consistent method for calculating the survey response rate, making it challenging to compare response rates across transit providers. FTA recommends using the number of surveys distributed (self-administered surveys) or number of persons approached as the response base (interview-administered surveys); a plurality of respondents used one of these two methods (see Table 14). More than half used another method to calculate

---

**Table 13. How minors were incorporated in the survey sample.**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific efforts</td>
<td>17</td>
<td>47</td>
</tr>
<tr>
<td>Riders younger than 18 approached</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>All riders approached</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Supplementary survey</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total respondents</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

**Table 14. Response base method.**

<table>
<thead>
<tr>
<th>Method</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger counts</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Number of surveys distributed</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Number of persons approached by interviewers</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Total respondents</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>
the response rate, with surprisingly 35 percent of respondents basing the response rate on passenger counts.

**Reported Response Rates**

The average response rate reported was 49 percent, but the range of reported response rates was extremely large (see Table 15). The lowest response rate was 3 percent and the highest was 88 percent. Respondents using tablets to administer their surveys had the highest response rate (63 percent), followed by paper (34 percent), and online (5 percent). These results are consistent with the findings of the case examples in Chapter 4.

This report struggled to collect accurate data on survey response rates. Only 23 respondents provided adequate data to calculate the response rate. Moreover, respondents calculated response rates in a variety of manners and, anecdotally, some respondents voiced skepticism in the accuracy of response rate data provided by a contractor. More research is needed to draw definitive conclusions on how survey methods affect response rates across a larger array of transit agencies.

The response rates reported by respondents remained relatively consistent over time from one survey to the next. Comparing their most recent survey to past survey efforts, 47 percent reported little change in response rates, 39 percent reported an increase, and 14 percent reported a decrease.

**Sampling Short Trips**

No matter the rider survey method, accurately incorporating short trips into the sample is a challenge, usually because riders completing short trips are not on a vehicle long enough to encounter a surveyor or complete a survey. When asked an open-ended question about how they captured these types of trips, respondents indicated that the most common method was to gather the rider’s name, phone number, and alighting location for short trips and follow up later with a phone call. Other respondents allowed riders to return their survey instruments by mail, provided an online link to complete the questionnaire, or distributed a custom short version of the survey aimed at these riders.

**Underrepresented Population Groups**

Respondents identified a variety of user groups from whom they struggle to field a representative sample during surveys (see Table 16). The most commonly reported underrepresented groups are LEP riders, minors, limited-literacy riders, and short-trip riders. Other groups that were reported as undercounted, but to a lesser extent, include riders with disabilities, riders

### Table 15. Average response rates by survey method.

<table>
<thead>
<tr>
<th>Method</th>
<th>% Average Response Rate</th>
<th>% Min</th>
<th>% Max</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>All methods/method undefined</td>
<td>49</td>
<td>3</td>
<td>96</td>
<td>19</td>
</tr>
<tr>
<td>Tablet</td>
<td>63</td>
<td>5</td>
<td>88</td>
<td>8</td>
</tr>
<tr>
<td>Paper</td>
<td>34</td>
<td>10</td>
<td>71</td>
<td>11</td>
</tr>
<tr>
<td>Online</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

*aSome respondents specified response rate by survey method while others only provided totals, hence “all methods” line is not an average of the tablet, paper, and online row.*
belonging to particular ethnic or racial groups, low-income riders, and riders that use transit during specific time periods and days.

**Standards for Completion**

Respondents used different standards to determine whether a completed survey was usable (see Table 17). Only 17 percent reported that all survey questions had to be answered to count a survey as usable. Accurately recorded origin and destination and boarding and alighting stops were the most commonly required responses for a survey to be considered usable.

**Number of Completed Surveys**

The total number of completed surveys needed for statistically significant results is a function of the size of the transit system and the level of specificity with which results are meant to be summarized (see Table 18). As expected, larger transit agencies on average achieve a larger sample of completed surveys, yet overall there was a large range in the number of completed surveys achieved by respondents. The purpose of the survey, desired level of specificity, and modes being surveyed all affect an organization’s target number of completed surveys.

### Table 16. Underrepresented population groups.

<table>
<thead>
<tr>
<th>Population Group</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-English speakers</td>
<td>22</td>
<td>63</td>
</tr>
<tr>
<td>Persons under the age of 18</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>Persons with limited literacy</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>Riders making short transit trips</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Riders with disabilities</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Riders during times of day surveyed (e.g., PM peak vs. AM peak ridership)</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Particular ethnic or racial groups</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Low-income riders</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Transit-dependent riders</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>35</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

### Table 17. Standards for completion.

<table>
<thead>
<tr>
<th>Standards</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin and destination locations could be geocoded accurately</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Boarding and alighting stops were identified</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Trip purpose was collected</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Access and egress mode was collected</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Route sequence (for trips that included a transfer) was collected</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Respondents’ demographic information was collected</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>All questions were completed</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Other</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>Do not know</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>46</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
Current State of Practice

Survey Expansion

Most OD surveys include only a sample of riders, and so survey results must be expanded to reflect the total rider population (see Chapter 2). Route-level ridership was the most commonly used factor (62 percent) to generate survey expansion. Other common factors include on and off counts collected from station or stop-level data using automatic passenger counters (APCs) or turnstile counts (52 percent), boardings by route (50 percent), boardings by route and direction (50 percent), boardings by time of day (50 percent), and boardings by stop or segment (48 percent). To a lesser extent, respondents reported using census data, park and ride counts, and other travel survey results, such as modal split, to determine the appropriate expansion factor.

In addition to performing an initial survey expansion to reflect the sample population, four respondents chose to re-expand their survey results with new data. The reasons for doing so vary among respondents, but most reported re-expanding survey results to reflect more recent ridership levels in order to validate regional travel demand models.

Emerging Data Alternatives to On-Board Surveying

Big data refers to large data sets (including passive data automatically generated for other purposes) that can be analyzed to yield information on rider behavior and travel patterns. These data sources are more robust than passenger surveys but report on a narrower set of characteristics.

Transit providers already generate a range of big data internally. Automatic vehicle location (AVL) and APCs provide a steady stream of data. Systems with electronic fare payment can utilize fare-card data to analyze travel patterns and rider behavior. Even General Transit Feed Specification (GTFS) feeds can be harnessed to analyze level of service and automate the creation of sampling plans.

Alongside internally generated data is a range of third-party data that transit providers can harness. Location-based services from mobile apps and cellular location data can be anonymized and aggregated to provide a robust snapshot of travel behavior.

Use of Big Data

When asked how they incorporate big data into their organization, 98 percent responded that they use fare-box and fare-card data collected from boardings and alightings, and 93 percent reported using AVL and APC data to support their planning and administrative processes (see Table 19). Eighty-two percent of respondents use data created for a GTFS, which defines a common format for all public transportation schedules and associated geographic information.

Table 18. Number of completed surveys by provider size.

<table>
<thead>
<tr>
<th>Provider Size</th>
<th>Definition (Annual Unlinked Trips)</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td></td>
<td>16,070</td>
<td>339</td>
<td>96,614</td>
<td>29</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;10 million</td>
<td>2,092</td>
<td>339</td>
<td>4,189</td>
<td>9</td>
</tr>
<tr>
<td>Medium</td>
<td>10–30 million</td>
<td>5,520</td>
<td>352</td>
<td>7,987</td>
<td>6</td>
</tr>
<tr>
<td>Large</td>
<td>30–100 million</td>
<td>20,958</td>
<td>5,008</td>
<td>33,897</td>
<td>5</td>
</tr>
<tr>
<td>Very large</td>
<td>&gt;100 million</td>
<td>38,755</td>
<td>2,274</td>
<td>96,614</td>
<td>7</td>
</tr>
</tbody>
</table>
When asked how incorporating big data has affected intercept OD surveys, respondents predominantly used the data to improve sampling strategies and refine expansion factors (see Table 20). One-fifth of respondents were able to reduce the scope and scale of their survey efforts because of big data, and one transit provider decided to forgo traditional surveys entirely.

**Challenges with Big Data**

Though external data sources can benefit transit providers, there are challenges to incorporating these new resources into the planning processes. Respondents were most concerned about the lack of quality data related to transit ridership. Other widely cited challenges to harnessing big data were concerns over certain riders being systematically underrepresented in the data, the cost of such data sources, and a lack of in-house knowledge to process and use such data (see Table 21).

**Summary of Current State of Practice**

The respondents to the synthesis survey are only a small fraction of the 2,000+ providers in the National Transit Database, but provide a valuable snapshot of the transit survey practice. Survey respondents carried almost 70 percent of nationwide transit ridership in 2016 according to the National Transit Database (FTA, 2016c) and are diverse in terms of size, location,

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**Table 19. Prevalence of the utilization of big data.**

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fare-box and fare-card data</td>
<td>43</td>
<td>98</td>
</tr>
<tr>
<td>Automatic vehicle locator and automatic passenger counter data</td>
<td>41</td>
<td>93</td>
</tr>
<tr>
<td>General Transit Feed Specification data</td>
<td>36</td>
<td>82</td>
</tr>
<tr>
<td>Third-party data services that provide travel flow based on passively collected geospatial information</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Third-party data on rider characteristics and demographics</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Video analytics (e.g., facial recognition software)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

**Table 20. Impact of big data on survey techniques.**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve sampling strategy</td>
<td>28</td>
<td>64</td>
</tr>
<tr>
<td>Refine expansion factors applied to survey results</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Not currently affecting the survey process</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Reduce the scope and scale of traditional rider surveys</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Eliminate entirely the need for rider surveys</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
Current State of Practice

and mode. Transit providers, as opposed to regional organizations and jurisdictions, represent the majority of respondents.

**Frequency, Motivator, and Justification for OD Surveys**

Seventy-seven percent of participants conducted an OD survey in the last 10 years, with a plurality conducting such surveys on 2- to 5-year intervals. Generally, larger organizations tend to conduct surveys more frequently than smaller ones. While the motivating factor behind such surveys varied widely, the most commonly cited reason was federal compliance (48 percent), followed by travel demand model development (23 percent) and planning purposes (21 percent). The most common source of funding for OD surveys was federal and local funds.

**Standardization of Survey Practices**

One of the key findings of this synthesis is that while respondents are collecting much of the same kinds of data in their surveys, there is a lack of standardization in survey practice, most notably in question wording and survey instrument design. Most of the commonalities among survey instruments submitted by respondents for this study were due to having the same survey vendor or consultant and not because of any industrywide guidance.

**Survey Mode**

While paper-based surveys continue to be the most common mode of survey, 53 percent of respondents used either tablet surveys alone or tablet surveys in combination with another survey mode. Tablet surveys were most commonly adopted to improve data quality, because they can eliminate errors from transcribing answers and validate responses in real time.

**Reducing Sample Bias**

Sample bias is one of the major challenges to successfully conducting a rider survey. Respondents reported that they struggle most with sufficiently sampling LEP riders. Several strategies have been implemented to improve language access, including use of bilingual survey teams, translation of the survey instrument, and alternative survey method for specific language communities.

Other groups commonly cited as underrepresented in surveys are people with disabilities or limited literacy. These groups have been accommodated by respondents in a variety of ways,

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**Table 21. Big data challenges.**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of quality data related to transit ridership</td>
<td>27</td>
<td>61</td>
</tr>
<tr>
<td>Concerns that certain groups of riders are underrepresented</td>
<td>23</td>
<td>52</td>
</tr>
<tr>
<td>Cost of acquiring data</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Lack of in-house knowledge to fully use and process data sources</td>
<td>21</td>
<td>48</td>
</tr>
<tr>
<td>Concerns that utilizing big data will not comply with regulatory requirements such as Title VI</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
including improved survey staff training, availability of a verbal or written survey option, and accessible survey options (e.g., screen reader-compatible surveys).

Use of Passive/Big Data

When using big data, respondents largely rely on internally generated sources of data, such as fare cards, GTFS feeds, and AVL or APC systems. Twenty-seven percent of respondents utilize third-party passive data sources, such as aggregated cell-phone location data. Presently, big data are used mostly to refine sampling plans and refine expansion factors. Only one-fifth of respondents use these data to reduce the scope of or eliminate their intercept OD surveys.
Case Examples

Five case examples were chosen to highlight the current state of practice of origin–destination (OD) transit surveys. Interviews were conducted in March and April 2018 with representatives from the following organizations:

- Metropolitan Transportation Commission (San Francisco Bay Area)
- Los Angeles County Metropolitan Transportation Authority
- Chatham Area Transit (Savannah, GA)
- Massachusetts Bay Transportation Authority (Boston)
- TriMet (Portland, OR)

These organizations provided a range of insights, from effective techniques in conducting rider surveys to the use of passive data to supplant the survey process.

Metropolitan Transportation Commission

Background

The Metropolitan Transportation Commission (MTC) is the metropolitan planning organization (MPO) for the nine counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma) in the San Francisco Bay area (see Figure 11). MTC is responsible for planning, financing, and coordinating OD survey efforts for the 23 transit agencies within the region. These 23 transit providers—AC Transit/Dumbarton Express, Altamont Commuter Express (ACE), BART, Caltrain, County Connection, Fairfield Suisun Transit (FAST), Golden Gate Transit & Ferry/Marin Transit, Livermore Amador Valley Transit Authority (WHEELS), Muni (SFMTA), Napa VINE, Petaluma Transit, Rio Vista Delta Breeze, SamTrans, San Francisco Bay Ferry, Santa Rosa CityBus, SMART, Soltrans, Sonoma County Transit, TriDelta Transit, Union City Transit, Vacaville City Coach, VTA, and WestCAT—operate express bus, ferry service, light rail, heavy rail, and commuter rail, together serving more than 1.7 million boardings per day.

MTC was selected as a case example because of the scale of its survey efforts. MTC is nearly continuously conducting surveys for one of its 23 transit providers, affording it the opportunity to gain experience across modes and experiment with different survey approaches. Information in this section draws from interviews conducted with Shimon Israel, Senior Planner at MTC (March 30 and June 15, 2018).

MTC funds and manages OD survey efforts, and hires contractors to staff and conduct the actual survey process. MTC works directly with the contractor to manage all contracting, invoicing, and scheduling. For the seven largest transit operators in the region, MTC funds 80 percent of the survey costs, with the operator responsible for the remaining 20 percent.
For the smaller agencies, MTC funds the entire cost of the study. Because of the importance of acquiring accurate transit data, a critical element of maintaining the regional travel model, MTC has not had problems justifying survey expenses internally or to the public.

**Evolution of Survey Practice**

MTC began leading the OD surveys for all transit providers in the Bay Area in 2012 to improve data quality and standardization. Inconsistency in survey quality and frequency across operators made comparing data between the systems challenging. As a regional organization, which also manages regional household travel surveys and a travel model, MTC was a natural home for such an effort.

Based on the positive experience of Los Angeles (see LA Metro case example), MTC initially utilized a two-step computer-aided telephone interview (CATI) approach for its surveys. The two-step approach involved handing out a brief paper rider survey followed shortly by a more detailed telephone interview. MTC found that CATI surveys resulted in fewer data errors than paper surveys but yielded a low response rate.

MTC decided to transition to a tablet-based interview approach for its next round of surveys, based on FTA guidance and the positive experience with tablets by some of MTC’s survey contractors. Tablets have yielded high response rates and high-quality data (MTC reports an average response rate of more than 75 percent, although with the caveat that this figure comes from its contractors and has not been independently verified). In addition, unlike traditional paper surveys, trained interviewers can clarify questions for respondents taking a tablet-based survey. MTC’s contractors can track responses in real time and more quickly address quality issues in the field. A CATI option is still offered as an alternative mode in cases where a respondent is...
unable to complete a survey in person. MTC reports that CATI surveys represent a small share of total responses.

Survey Methodology

MTC follows most of the best practices in survey design and implementation advocated by FTA, such as the use of pre-testing, auto-validation of survey responses, real-time monitoring of survey responses and data quality, accommodations for surveying short trips, and use of on/off surveys for sample plan development and result expansion (K. Cervenka, telephone interview, June 13, 2018). The following summarizes MTC’s general approach for surveys; however, there is some variety in survey methodology based on the system and survey vendor conducting the work.

• Frequency and Timing of Surveys: Surveys are conducted every fall and spring, resulting in each of the 23 agencies being surveyed on a 5- to 7-year cycle. MTC avoids surveying during the summer and winter to avoid seasonal-specific changes to transportation demand such as Christmas and summer break.

• Survey Instrument Design: MTC utilizes a standard survey, with the option for agencies to add five or six custom questions. Surveys cover origin and destination trip data and demographic information for Title VI federal requirements. During the survey development, MTC consulted with FTA as well as with some of its peers on survey design.

• On/Off Surveys: Before conducting a survey, MTC will sometimes conduct a study to track the boarding and alighting pairs of riders. These studies are typically conducted for higher ridership routes (>2,000 boardings per day) or routes that serve multiple different types of markets along its alignment. On BART, the region’s rapid transit system, boarding and alighting locations are automatically collected through the electronic fare collection system. For other transit providers, MTC will conduct an on/off survey by distributing cards to riders as they board and collecting the cards as they alight. The boarding and alighting data are used to develop the sampling plan and expansion factors.

• Pre-Testing: MTC conducts pre-tests before most of its rider surveys. Typically, the pre-tests focus on deploying the survey in challenging environments likely to be encountered in the field. For example, pre-testing on MUNI focused on how to best intercept passengers on crowded buses with rear-door boarding. MTC also uses pre-testing to gauge the public’s receptiveness to new questions, especially if the question is of a sensitive nature. At the end of the pre-test phase, the survey vendor provides MTC with a report outlining challenges identified during the pre-test and recommendations for addressing them.

• Survey Recruitment: As mentioned previously, MTC relies largely on an interview-administered tablet approach for surveys. Survey staff are placed aboard vehicles or at station platforms. Participants are selected randomly based on the vendor’s selection algorithm. The selection process may vary depending on conditions such as location and crowdedness. For example, on BART the surveyor may be instructed to approach someone at a certain location on the platform, whereas on a crowded MUNI bus, they instead may be instructed to approach a rider at a particular clock-face location relative to where the surveyor is standing (e.g., approach the person at your 9 o’clock).

• Survey Monitoring: One of MTC’s vendors can track survey responses in real time. Monitoring tools allow management to identify and address systematic issues quickly—for example, instances where a surveyor is regularly skipping certain questions or showing bias in the race, gender, or age of people being approached.

• Accommodations for Short Trips: Short trips are notably challenging to collect data on during OD surveys. MTC’s vendors utilize a range of strategies to accommodate such riders. Surveyors often will get on or off a vehicle with the rider so that they can complete
the survey during the trip. In instances where that is not feasible, the rider will be asked for contact information and contacted within 24 hours to complete a CATI survey. In instances where surveyors are below quota on certain trip pairs, surveyors will begin recruiting riders on platforms or vehicles solely based on the length or location of their trip.

- **Accommodations for Low–English Proficient Riders:** Survey staff are often bilingual and can assist riders in completing surveys in their native language. In instances where a language cannot be accommodated by the survey staff, the rider’s contact information is collected and a follow-up CATI survey is performed.

- **Recruitment of Minors:** To avoid age bias in the sample, MTC has measures to recruit minors. Surveyors are instructed to openly approach riders who appear 16-years or older. In cases where the rider appears younger than that, the surveyor asks an accompanying adult to act as a proxy. MTC does not typically sample school-tripper routes that are disproportionately ridden by minors.

- **Handling of Sensitive Questions:** Certain sensitive questions, such as the participant’s income or gender, may raise privacy and completion bias concerns. Such questions are left for the end of the survey. Surveyors can hand the tablet over to respondents to complete such questions on their own.

- **Survey Expansion:** Survey results are expanded based not only on ridership but trip characteristics observed in the on/off study conducted before the survey itself. Trip pairs underrepresented in the data are assigned higher weights. In cases where a trip is not reflected in survey results, a synthetic record is added that does not include any demographic characteristics.

**Results**

While MTC strongly supports and recommends the use of tablets to conduct surveys, tablets are not without their challenges. MTC expressed concern that there may be bias in an interviewer’s selection and respondent’s willingness to participate. For example, interviewers may skip a rider who appears homeless, while potential respondents may be fearful of engaging with tablets due to privacy concerns and technology barriers. MTC is currently conducting pilot studies to determine the extent to which using tablets may introduce bias against populations within different racial and ethnic and/or household income categories.

Additionally, MTC stressed the importance of well-trained survey staff. Because of the breadth of the survey effort, MTC must rely on contracted temporary workers to administer tablet surveys. These temporary workers may not all have the same survey administration skill level. In addition, temporary employees are incentivized to complete a certain number of surveys per shift. Incentivizing the volume of surveys administered may compromise the quality of some of the data (i.e., interviewers may rush to finish one survey and not administer the entire survey to obtain an additional response). The real-time monitoring tools mentioned earlier are important for managing quality and identifying any employee issues early on.

MTC believes that the increased cost of using tablets is justified by improved data. There have been minor concerns over lost or stolen tablets; contractors, however, are responsible for the security of the tablets. MTC staff did note that certain transit operators did not allow surveying with tablets on late-night trips because of crime concerns, but this did not have a large impact on the overall data quality.

**Lessons Learned**

Moving forward, MTC will continue to look at the impact that tablets may have on respondent selection bias related to Title VI populations. MTC is aware that there may be human error in the survey sampling, but believes tablet results are still far superior to other surveying methods.
methods. Because survey data are used to calibrate the regional travel model, accurate and high-quality data are essential. In a discussion about survey administration lessons learned, MTC staff noted the following:

1. Tablets obtain a higher response rate than other methods.
2. The quality of data from tablet surveys is excellent, justifying the increased cost.
3. Training and monitoring interviewers is extremely important to the success of the tablet method.
4. CATI is an important option to have available to obtain information on short trips and on persons with limited English proficiency.
5. Pre-testing is an important step in the process and allows surveyors to identify and address challenges early on.
6. Even with tablets, urban bus remains the hardest mode to survey due to the number of short trips and diverse populations, as well as the usage of rear-door boarding.

**TriMet**

The Tri-County Metropolitan Transportation District of Oregon (TriMet) operates bus, light rail, commuter rail, and paratransit service across a three-county region centered on Portland, Oregon. The agency carries more than 300,000 riders on a typical weekday. TriMet was selected as a case example for this report because the agency is a strong proponent of the tablet-based survey approach, and unlike many other large transit providers, has chosen to develop in-house surveying capacity in lieu of relying on outside contractors. The agency regularly designs and manages a range of rider surveys such as OD studies, before-and-after studies, fare studies, satisfaction surveys, and APC validation.

This case example is the result of correspondence with Baofeng Dong, Bibiana McHugh, and Virginia Shank at TriMet during April 2018, along with findings documented by McHugh et al. (2017) in “Conducting Onboard Transit Rider Surveys with Electronic Handheld Tablets: An Agencywide Consolidated Approach,” which was discussed as well in the literature review chapter.

**Background and Overview of Survey Approach**

TriMet’s Information Technology-GIS department is responsible for managing all survey efforts. The agency internally handles development of the sampling plan, data processing, and data analysis. All survey equipment, including the Android tablets used to conduct the surveys, are furnished by the agency. TriMet developed a custom survey software in-house that uses Open Data Kit, an open-source set of tools for mobile data collection and management.

The agency chose to conduct its surveys in-house to retain knowledge internally, improve efficiency, and reduce costs. In the past, the agency has used vendors to provide survey staff but after switching from paper to tablet surveys in 2014, has relied exclusively on student interns recruited from local colleges and universities. These students are interviewed by TriMet and paid through a temp agency. The agency’s 2016 systemwide fare study, which collected 17,719 completed surveys, required 18 interns and 3 supervisors.

TriMet implements several measures to manage data quality, beginning with the recruitment of its interns. The agency looks for individuals who reflect the racial, linguistic, and ethnic diversity of its ridership and demonstrate a familiarity with the system, technical know-how, customer service skills, a professional attitude, and good work history. Recruits go through a 3-day training program. In the field, staff work closely with experienced supervisors. TriMet has
also leveraged the real-time capabilities of tablets to monitor survey progress through an online dashboard (see Figure 12).

As mentioned previously, the agency conducts a wide range of surveys to support functions such as before-and-after reporting, Title VI requirements, service planning, and fare policy. TriMet has not conducted a systemwide OD study since the early 2000s, but has completed corridor-specific OD surveys to assess transit system improvements such as the MAX Orange Line. To meet Title VI reporting requirements, TriMet incorporated demographic, income, and English proficiency questions into its 2016 Fare Survey.

2014–2015 Orange Line Before Study Origin–Destination Survey

The MAX Orange Line light rail between Downtown Portland and Milwaukie, Oregon, started revenue service in Fall 2015. As part of its before-and-after reporting requirements, TriMet conducted an OD survey along the future light rail corridor before its opening. The study area included light rail and bus lines. The agency’s approach to tablet surveys is fairly similar to that of MTC:

- TriMet conducts an on/off study to determine boarding and alighting pairs before deploying its full survey; agency staff distributed a scannable card to passengers aboard buses upon entry, and then collected the card when passengers alighted to determine each passenger’s start and end stop. On MAX light rail, TriMet modified this approach because it was not practical for station survey staff at all doors along the train. Instead, staff went through the
car asking each passenger about their boarding and alighting station. Boarding and alighting data were used to develop the survey sampling plan and expansion factors.

- The full survey is an interview-administered tablet survey conducted aboard the vehicle. To reduce selection bias, a random-number generator determines which riders were approached by survey staff. The survey program would validate responses in real time to reduce data entry error. TriMet offered the full survey in English and Spanish, and limited English proficiency questions in 11 additional languages.

TriMet did not offer a financial incentive for users to take the survey. Agency staff found that riders were self-motivated to take the survey by a desire to provide feedback and help improve TriMet service.

Finally, TriMet implemented strategies to address the undersampling of short trips. Surveyors were instructed to ask riders a subset of required questions if their trip was too short to complete the full survey. In the expansion phase, data from the on/off study were used to increase the weight of short trips that were undersampled in the survey responses.

### Results

TriMet has demonstrated cost savings and efficiencies gained from its tablet survey approach by comparing its 2012 Fare Study, which was conducted using paper and pencil, to its 2016 Fare Study, which was conducted entirely by tablet (McHugh et al., 2017). Some of the key advantages for the tablet approach include:

- A 32 percent reduction in survey costs while yielding 4 percent more complete surveys. Tablet surveys enabled functions such as skip logic which shortened the time per survey, allowing for shorter shifts and more completed surveys per sample hour. The availability of survey results in real time eliminated oversampling. Additional cost savings were achieved due to the switch from staffing the survey with contractors to student interns.
- A 48 percent improvement in response rate.
- Reduction in data cleaning and processing requirements. Results were available 1 month after the survey was fielded, compared to 6 months for the 2012 survey.
- Ability to monitor data quality in real time and identify issues as they arose.

### Key Take-Aways

This case example highlights several key lessons for transit providers planning their own survey efforts:

- Conducting a survey in-house can result in cost savings, build internal capacity, and give agency staff greater control over data quality and sampling strategies. TriMet was able to rely extensively on student-interns to staff the surveys. TriMet staff recognized that not all transit providers have the dedicated staff, expertise, and data infrastructure necessary to field surveys in-house (McHugh et al., 2017). A sustained commitment from management allowed TriMet to build its internal survey capacity. As the agency is conducting a near-continuous range of surveys, it can amortize its investment in staff and equipment over time.
- Instead of relying on costly systemwide OD surveys to collect Title VI information, TriMet has incorporated Title VI questions into other survey efforts such as its 2016 Fare Survey.
- Tablet-based surveys improved data quality compared to paper-surveys. TriMet (like MTC) noted many benefits of using tablets over paper, including the ability to validate responses in the field, elimination of data entry/transcribing requirements, and the use of real-time monitoring of survey responses to quickly identify systematic data collection issues. Tablet surveys also have a much lower rate of invalid surveys.
• TriMet found that tablet surveys were less costly to administer than paper-based surveys. Among transit providers surveyed in this report, only 19 percent of respondents saw savings due to tablets compared to 26 percent who reported a cost increase (the remainder saw no change or did not know). TriMet staff suggested several factors that led to their cost savings compared to other survey respondents:
  – TriMet utilized open-source software instead of paying a vendor for survey tools.
  – The agency did not provide a paper-based option in parallel to its tablet survey, which reduced printing and postage costs.
  – TriMet partnered with local colleges to staff its 2016 survey, which reduced the cost of labor compared to the 2012 survey, which was staffed by a survey contractor.
  – The questionnaire design, sampling plan, data cleaning, survey expansion, and survey analysis are all done in-house.
  – TriMet did not supplement on-board tablet surveys with follow-up phone calls.
  – Survey vendors are still in the process of adopting tablet surveys and may not be taking full advantage of the technology to improve cost-efficiencies:
    • Eliminates the need for oversampling,
    • Reduces data entry costs, and
    • Fewer responses are thrown out for invalid answers.

Los Angeles Metro

Background

The Los Angeles County Metropolitan Transportation Authority (LACMTA or Metro) is the third-largest transit system by ridership in the nation, with over 1.3 million riders each day on bus, light rail, and metro. LACMTA’s OD survey efforts stand out for two reasons: their large-scale use of the two-step CATI method, and their high response rate among non-English speakers. On April 2, 2018, the TCRP study team conducted an interview with LA Metro Principal Transportation Planner John Stesney about the agency’s OD study practices.

Metro completed its most recent OD survey in 2011. Because 20 percent of transit trips within Metro’s service area occur on other local providers, Metro conducted the survey for all transit providers in Los Angeles County. Metro manages its own regional travel demand model and it was important to have an accurate regionwide snapshot of transit travel patterns.

Survey Methodology

Prior to 2011, Metro used paper surveys for its OD surveys. The low data quality from paper surveys incentivized Metro to find a better method. As part of a pilot study with the FTA to advance the state of survey practice, Metro found that paper surveys resulted in a high degree of response error, because participants frequently misunderstood or incorrectly completed questions. The pilot study determined that a two-step CATI method would result in improved data quality, while an interview method would result in high-quality data but would be unrealistic due to time constraints, especially for short trips.

In 2011, LA Metro hired a contractor to conduct its first OD survey after the FTA pilot program. The contractor selected had CATI experience and had conducted such surveys for other agencies. LA Metro attributes the success of its CATI survey to the expertise of the contractor and does not feel that the organization has the resources to re-create a CATI survey internally.

In the first step of the CATI survey process, contractor staff handed out cards to riders with three contact information questions (see Figure 13). The card was printed in English on one side and in Spanish on the other. Riders could return the completed cards to staff members. Riders
would receive a follow-up phone interview within a week of completing the three-question on-board survey. Phone interviewers received training on both the survey method and service area. While conducting the phone survey, the interviewers had access to survey software that allowed them to visualize (e.g., see streets, routes, and stops) and verify the reasonableness of responses in real time, ensuring collection of higher quality data. LA Metro felt that the use of a phone survey reduced interviewer bias. All respondents had an equal likelihood of being selected, but the results may not reflect a truly random sample because of any response bias occurring in the first step of the survey.

Results

The contractor was also responsible for cleaning and analyzing the data. The data quality obtained from the CATI survey approach was a significant improvement over the paper surveys. The survey had a high response rate at 65 percent (defined as number of approached respondents who completed both steps of the process; response rates were reported by the vendor and not independently verified by Metro). The agency believes offering multiple $500 gift cards helped increase the response rate. The agency initially experienced internal pushback from offering such a large incentive; however, it successfully made the case by demonstrating the savings a $10,000 investment in incentives can have for a $1.5 million study.
More than one-third (35 percent) of the surveys were completed in a language other than English. Phone staff were bilingual in Spanish, and a language line was available for respondents seeking to complete the survey in a language other than English or Spanish.

While Metro felt that the CATI approach improved response quality over prior paper surveys, the organization did experience some issues with its approach. The survey may have undersampled LEP populations—notably, those speaking a language other than Spanish. Additionally, respondents were hesitant to provide income information. While incentives were received positively by the public, there were a few incidents of people falsely claiming to have won the prize.

Lessons Learned

In a discussion about lessons learned, Metro noted the following:

1. Contractor staff training and expertise are key to successful survey implementation.
2. Metro felt providing a high-value monetary incentive helped increase the response rate.
   In the future, the agency would like to increase the amount of incentives provided they represent only a small share of the cost of conducting a large-scale survey effort.
3. The CATI method obtained a higher response rate and more accurate data than paper surveys.
4. Paper surveys, without an interviewer, are hard for respondents to understand.

Chatham Area Transit

Rider surveys are not the only method to collect information on OD patterns for transit riders. Many agencies are using passively collected data—records that exist for another purpose, or that are collected without active means—to derive actionable planning information. This case example considers a small transit operator that built an OD planning tool with the help of triangulated cellular device location data.

Chatham Area Transit (CAT) is the primary transit agency in Savannah, Georgia, serving riders in Chatham County (2015 population 286,956). It operates approximately 70 vehicles on 17 routes, and serves about 13,000 weekday riders (FTA, 2016a).

Over the last few years CAT observed declining bus ridership on their system, about 1 percent per year between 2013 and 2016. In an effort to reverse this decline and better serve their community, CAT elected to initiate a major network redesign. To inform the redesign, CAT undertook an OD study. Information in this section is drawn from personal interview with Grant Sparks, Planning Manager at CAT (March 29, 2018).

Although CAT conducted a rider survey in 2013, the data collected at that time were inadequate for a variety of reasons. As the purpose of the system redesign was to better serve the traveling population, including those not already taking transit, CAT determined that updating the previous study with the same methodology, which would only focus on existing riders, was not sufficient; the goal of the system redesign was also to capture potential riders that are not currently served.

Survey Methodology

CAT elected to take a passive data approach to their system redesign OD study, with a focus on the entire traveling population. In this approach, CAT assembled study data from previously collected sources, with three major elements:

- Mobile device data purchased from a commercial vendor,
- Stop-level boarding data from a previous study, and
- Transit propensity scores based on Census data.
Working with the regional MPO, CAT purchased AirSage (https://airsage.com) data for their study region. AirSage obtains mobile device location data from cellular networks and application services and processes the data into zone-based flows distinguished by time of day, imputed trip purpose (home to work, home to other, etc.), and population (resident, visitor, inbound commuter). CAT worked with their consultants to carefully specify the data purchase. They determined that using data from October 2015 and April 2016 would provide the clearest picture of regular operations, avoiding both peak visitor season as well as disruptions from hurricanes. Because cellular triangulation has some geographic margin of error, CAT and the MPO aggregated traffic analysis zones in the central city into larger districts suitable for AirSage to use.

CAT is in the process of installing APC and AVL systems in its vehicles, but these systems were not available for the OD study. As such, CAT and its consultants used stop-level boarding and transfer data from the 2013 OD survey to build a picture of existing transit patterns.

The final piece of data for the study is a geographic transit-use propensity score that the consultants developed from aggregate Census data, considering job and household density in addition to income level and other demographic characteristics. The score is based on information from the TCRP Transit Capacity and Quality of Service Manual (Kittelson and Associates, Inc., et al. 2013).

**Results**

By overlaying the cellular OD trip patterns for all trips, the stop-level ridership data, and the transit propensity score, CAT made several observations that could help it improve its service offerings:

- The transit network was originally designed on the assumption that all transit riders would want to come downtown, but a shopping mall and hospital on the edge of the urban core appear to be relatively larger trip attractors for likely transit riders.
- Up to 60 percent of the CAT service area is in neighborhoods with a low propensity to use transit.
- There is a discrepancy between transit service and desired travel paths.

CAT has contracted with consultants to redesign its transit services, and they anticipate that the data and findings from this study will be useful toward that effort.

**Next Steps**

In this most recent OD study, the consultants’ focus was not solely on providing information in a single effort, but on building a framework for regular and updated insight that CAT can use independently. For example, when its APC and AVL systems come online in the next couple of years, these data will supply the stop-level boarding data that in this study were based on data from the 2013 travel survey. CAT can also purchase the mobile device data at regular intervals, and again look for places and paths where transit service and overall trip patterns align or conflict.

CAT has no plans to conduct a major transit rider OD survey in the future. CAT will conduct regular customer attitude surveys as a supplement to the data-driven process described in this case example.

CAT intends to meet Title VI requirements in its redesign by analyzing the impacts of service changes, including to neighborhoods not well served by the existing system. CAT plans to use service area Census demographic data in its Title VI analysis and the report it submits to FTA; the Title VI report in the Remix transit planning software will provide a starting point for this analysis.
Another major source of passive data for transit planning is data that agencies themselves collect through various systems. Electronic fare collection (EFC) systems record when particular fare cards are used to pay fares, and on which vehicle; AVL data provide information on where the vehicles are located when a fare card is used. Information on passenger loads can be obtained from transit agency APC systems. This case example focuses on a large transit agency that has built a powerful model based on these passive systems to study its passenger flows.

The Massachusetts Bay Transportation Authority (MBTA) is the regional transit agency for the greater Boston area. The MBTA operates commuter rail, heavy rail, light rail, and bus services with approximately 1.3 million unlinked weekday trips. Information in this section comes from an interview with L. Paget-Seekins and A. Gartsman, planning staff at the MBTA, on April 4, 2018.

In 2015–2017, the MBTA contracted with Central Transportation Planning Staff (CTPS, the regional MPO) to administer a transit rider survey. The survey was developed primarily to fulfill the MBTA’s Title VI obligation to “collect information on the race, color, national origin, English proficiency, language spoken at home, household income and travel patterns of their riders using customer surveys” (FTA, 2012, Chap. IV-8). The data will also inform the regional travel demand model operated by CTPS.

This survey is not, however, the only data that MBTA uses to study person movements through its system and plan for service changes. Through a partnership with researchers at the Massachusetts Institute of Technology (MIT), the MBTA has developed a passive and inferred data model called the Origin-Destination-Transfer (ODX) model.

**ODX Methodology**

The ODX model utilizes data from the MBTA’s EFC, AVL, and APC systems to produce an inferred matrix of transit trip boardings, alightings, and transfers. The MBTA’s stream of fare-card, AVL, and APC data is stored on servers available to the MBTA and the research team. The model is aggregated each quarter to inform the MBTA’s schedule changes.

The MBTA only records fare-card data when a rider validates their card upon entering a vehicle or subway station. This means that there is no fare-card record of transfers within the paid-fare area of a subway station or alightings anywhere within the system. For this reason, the ODX data generation process infers the boarding, alighting, and transfer points of a person’s trip by comparing tap-on points throughout a person’s day and applying rules for when a change in service counts as a new trip, or when it counts as a transfer. Figure 14 illustrates part of the logic used by the ODX model. The details of these rules are available in work by Wang et al. (2011) and Gordon et al. (2013). ODX source data do not include passengers who pay cash fares, which represent 3 percent to 4 percent of the MBTA’s riders; the MBTA observes that these riders are not randomly distributed, but are concentrated along certain routes and neighborhoods.

MIT researchers have access to the raw and processed data and use it in their own research projects subject to a nondisclosure agreement to protect sensitive passenger information.

The MBTA validates the ODX data in two basic ways. First, the ODX generation software produces statistics on the percentage of inferred points that can be tracked and referenced over time; the initial MBTA’s first blog post (MBTA, 2016a) on ODX reported that 97 percent of origin points, 75 percent of destinations, and 92 percent of transfers were inferred directly from...
the data (the balance are distributed according to the inferred patterns). Second, a group of MIT students volunteered their fare-card information along with precise daily activity patterns generated from the Moves mobile application (ProtoGeo Oy, 2015). With these validation methods, the MBTA feels satisfied in using the ODX data for service and fare planning.

**ODX and On-Board Surveys**

The MBTA feels that it cannot fulfill its Title VI obligations with ODX data because they do not observe or impute rider characteristics from the fare-card data. There has been a policy decision to not collect additional demographic information upon fare-card purchase or activation, and they do not feel that joining aggregate census data from inferred origin points would be adequate for meeting FTA standards for Title VI analyses, because the distribution of minority riders may not match the distribution of the minority population. Additionally, a detailed OD survey is the only way that MBTA feels it can study the modes passengers use to access transit.
(walk, park-and-ride, etc.). ODX data do not provide true trip origins and destinations, merely the boarding and alighting locations.

That said, the MBTA is considering using ODX data to meet its obligations for reporting unlinked passenger trips and passenger-miles traveled to the National Transit Database. They are working to validate the ODX data against their existing survey-based method and are hoping to receive FTA approval. Additionally, the MBTA has used ODX data to study bus crowding along multiple-route corridors (MBTA, 2016b) and is using it to develop a new service plan (MBTA, 2017) with detailed and updated data that would be unavailable with traditional means.
Conclusion

The purpose of this synthesis was to summarize the current state of practice in transit rider surveys, most notably how emerging technologies and data sources are affecting the ways these surveys are conducted. While the synthesis includes examples from other types of surveys, the focus is on origin–destination (OD) surveys since they represent the most complex and costliest type of survey regularly performed by a transit provider.

Over the last decade, new technologies—such as mobile devices, high-speed cellular Internet, and automated data collection tools—have changed how organizations conduct surveys. Moreover, the emergence of big data from fare cards, mobile phones, and GPS systems provides new alternatives to traditional rider surveys. This report follows up on prior TCRP research on the topic to document the changing state of survey practice.

The synthesis was developed to provide an overview of survey practice methods and technologies to transit professionals. The information presented is derived from:

- A broad literature review of existing TCRP reports, white papers, academic research, documentation from prior survey efforts, and federal guidance.
- A survey distributed to 67 organizations responsible for overseeing such studies, and covering a variety of topics including the frequency of and justification for OD studies and how new technologies and data sources are integrated into survey efforts (see Appendix A for a copy of the questionnaire, and Appendix C for the results).
- Interviews with representatives from four transit providers and one metropolitan planning organization (MPO) on how technologies, new sampling techniques, and passive data can be integrated into OD studies and transit surveys in general.

While new technologies and data sources have been changing both the methods and frequency of transit rider surveys in recent years, the fundamentals of good survey design and implementation have remained constant. Rider surveys, regardless of method, must overcome sample biases, reach a representative sample of transit riders, and be carefully designed to minimize misinterpretation of questions or response fatigue.

The survey conducted for this report, along with the literature and case studies, highlights a wide range of practices in OD studies and transit passenger surveys. Some of the key findings include:

**Leveraging Passive and Automated Data**

Better data allow for improvements to sampling plans and response expansion: Automated data sources such as fare cards, automatic vehicle location (AVL), and automatic passenger counters (APCs) allow transit providers to develop more precise sampling plans, which can help increase the overall quality of survey results. These passive and automated data sources can also
be useful inputs for expanding survey data; methods such as iterative proportional fitting would be much more challenging to implement without AVL or APC data.

**Passive data are powerful sources of information for transit providers but cannot completely supplant traditional surveys:** Passive data and surveys both play a distinct role, and transit providers should understand the trade-offs inherent in each data source when exploring how to utilize passive data. With surveys, transit providers can collect and cross-tabulate a wide range of rider characteristics and trip information. The downside, however, is that surveys are expensive, take a long time to conduct and analyze, and are susceptible to systematic bias. Passive data allow transit providers to collect information on a more narrowly defined set of characteristics (e.g., OD patterns) but across a large sample size quickly and affordably. This information will surely have an impact on how providers plan and monitor their systems, but cannot replace the range of information gathered in an on-board survey, including critical Title VI demographics.

**Survey Methods**

**Tablets are becoming the preferred mode for collecting survey data:** Transit providers felt that the benefits of utilizing tablets for surveys outweighed their downsides. The most commonly cited benefit of tablets was improved data quality and reduced data entry needs. Tablet surveys yielded, on average, a higher response rate (when calculated by number of riders approached) and allow for a more sophisticated survey instrument that includes skip logic. The downside of tablets is that they are more labor-intensive because the survey is usually administered by an interviewer instead of being self-administered by the rider. It is unclear whether the additional time spent administering the survey by employees counteracts the efficiencies gained from better data quality and reduced data entry costs; the literature review and survey provided inconclusive findings on this topic.

**Tablets need to be effectively deployed to yield benefits:** Tablets by themselves do not necessarily yield any survey benefits over paper. It is the capability of tablets to validate data, reduce error, monitor progress in real time, and automate parts of the survey process that make them an appealing survey mode. Survey organizations may achieve poor results with tablets if such capabilities are not incorporated into the survey instrument.

**Transit providers report mixed results with two-step computer-aided telephone interviews (CATI):** Metro in Los Angeles and MTC in the San Francisco Bay Area have both experimented with the two-step CATI method. Metro found that the method yielded improvements to data quality and high response rates among non-English speakers, typically an underrepresented population in rider surveys. By contrast, MTC continues to offer a CATI option to accommodate short trips and LEP riders but does not utilize it as their primary survey method. MTC found that CATI surveys suffered from a low response rate, raising survey costs and sample bias concerns.

**Survey Design and Fielding**

**An organization’s study objectives drive the ideal survey method and design:** Transit providers have managed the cost and complexity of their survey efforts by identifying their most crucial data needs. Collecting data to validate and support travel demand models requires large-scale surveys that include questions about a customer’s entire trip chain. Providers may choose to collect Title VI, customer satisfaction, fare usage, and sociodemographic data through a more limited survey with a smaller sample size. Information on boardings, alightings, and transfers can be collected by a simple ride check, or through passive data sources such as fare-card data and AVL or APC data. The varying purposes behind surveys can explain in part the large variation in survey cost and sample size.

**There are no transit industrywide standards for survey design and question wording:** While there is literature on best practices in survey design and deployment, there are few
widely accepted standards within the transit industry. For example, when creating a new survey instrument, organizations often create questions from scratch or rely on previous examples due to the lack of standardized question wording. Moreover, survey methods vary widely across the industry, including the preferred sampling plan, survey mode, and expansion methodology. Finally, even some key measures used to monitor surveys, such as response rate, are inconsistently tracked or defined in different ways by the survey participants. This lack of standardized design and question wording makes evaluating the effectiveness of various survey practices a challenge.

**Transit providers find value in investing in internal capacity to design and deploy surveys:** Transit providers often rely on contractors or outside partners to oversee, develop, and deploy passenger surveys. Conducting surveys in-house requires having staff with specialized expertise in survey design, deployment, and analysis, along with the equipment and data infrastructure necessary to manage surveys. The example of TriMet in Portland, Oregon, highlights the benefits of conducting surveys in-house, including knowledge retention, increased flexibility to deploy surveys, and cost savings. Implementing an internal survey practice requires sustained investment and may not be feasible without the support of the organization’s leadership or desirable if the agency conducts surveys too infrequently to realize cost savings.

**Common Challenges**

**Organizations navigate a wide variety of survey methods and approaches:** Transit providers face a daunting array of methods for conducting rider surveys. Choosing the correct approach is a basic challenge for every survey. Rather minor differences in methodology, such as the method used to accommodate short trips, question wording, or whether or not a pre-test is done, can greatly affect the quality of survey results.

**Origin–destination questions are frequently misinterpreted:** Question wording and survey instrument design can greatly affect the quality of responses. Trip chain questions, which ask the public to describe their entire trip from origin to destination, are frequently misinterpreted. One participant in this study adopted an interview-administered survey approach after discovering that even their own agency staff did not fill out surveys correctly.

**Collecting a random and representative sample is an ongoing challenge:** Case example participants felt that, even when utilizing recognized best practices in survey design and deployment, they were unable to fully eliminate bias from their surveys. Organizations grapple with several sampling issues, including the bias of surveyors, undersampling of certain trip types and demographic groups, and systematic skipping of certain survey questions. Low-income riders, minorities, minors, and LEP individuals are frequently underrepresented in survey samples.

**Short trips are especially challenging to survey:** Short trips are less likely to be encountered by surveyors because short-trip riders spend less time in the transit system. Such trips can suffer from a higher survey incomplete rate because respondents do not have the time to fully complete or participate at all in the survey. Survey organizations use a wide variety of strategies to increase records for short trips, ranging from allowing participants to complete the survey off-vehicle by paper, online, or over the phone, to the availability of a special short survey with only essential questions. Certain data expansion methods also allow surveyors to address systematic under-sampling of short trips.

**Future Research Questions**

To date, there has been no large-scale study evaluating the effectiveness of transit survey methods across a range of providers and regions. In the synthesis survey and case studies, this report yields sometimes conflicting findings. An approach that worked for one organization
was ineffective in another. Data collected in this report are insufficient to determine whether the success or failure of a survey method was attributed to the survey tool or other factors, such as availability of incentives, rider characteristics, or mode. A controlled study encompassing multiple transit providers would be needed to isolate the factors influencing survey quality and determine the ideal survey methods for different circumstances. Respondents to the synthesis survey defined or calculated key metrics such as response rate, response base, completed surveys, and survey cost in different ways.

The use of passive data is in its infancy, and transit professionals are still refining and experimenting with how such data can be utilized to support or supplant survey methods. The current state of practice with passive data will likely be out of date in a few years. One limit of a synthesis report such as this one is that it captures current practice; additional research could explore theoretical and practical applications of passive data.

Some of the key research topics for further inquiry could include:

- Standardization of survey questions, including an assessment of optimal wording;
- Establishing a consistent set of metrics to be reported on for study efforts, including a standard method of calculating the response rate, count of usable surveys, and survey cost;
- Controlled study of various survey methods to determine the most effective survey mode and sampling strategies;
- Research on more sophisticated expansion methodology in a controlled environment where results can be validated against other data sources;
- Research on the emerging and theoretical uses of passive and big data to support or supplant transit OD surveys;
- Inquiry into the skills and training that transit providers and contractors need to better take advantage of new tools and techniques that rely on big data;
- Research into the potential of crowdsourced data (used extensively in public engagement) for OD studies;
- Research on the feasibility of collecting OD data voluntarily through a rider’s personal device (opt-in), including the response bias associated with this method;
- Assessment of incentives to increase response rates;
- Impacts of technology use—such as tablets and CATI—on the survey response rates of underrepresented populations;
- Understanding effective strategies to increase the participation rates of individuals with LEP; and
- Guidance on the appropriate sample size for OD surveys based on an organization’s desired level of precision.

This is an exciting time for the practice of rider surveys and OD studies. Transit providers and their partner organizations have never had so many data collection options at their disposal. Tablet surveys are allowing organizations to create more sophisticated survey instruments that incorporate features to monitor and control data quality. The use of passive data for OD studies is still in its infancy and is a space primed for innovation over the next decade.

With all the changes to survey practice, it is important for organizations involved in OD studies to understand the various trade-offs in approaches. Although it is hard to predict what innovations to survey practice and OD data will arise over the coming years, the fundamentals of good survey design will remain constant, including the need to collect data from an unbiased and representative sample of riders in an adequate quantity to make statistically sound conclusions.
Glossary of Terms

Alighting: Act of getting off a transit vehicle.
Boarding: Act of getting on a transit vehicle.
Completion rate: Ratio of the number of complete surveys to the number of questionnaires distributed (what qualifies as “complete” and the specific way this rate is calculated varies).
Computer-aided telephone interview (CATI): An interview-based survey technique where the participant is contacted over the phone to complete a survey; the surveyor uses a computer program to input the results.
Destination: Terminal point of a trip using any mode of transportation.
General Transit Feed Specification (GTFS): Defines a common format for public transportation schedules and associated geographic information, which are made publicly accessible.
MPO: Metropolitan planning organization.
Origin: Starting point of a trip on any mode of transportation.
Passive data: Data collected for purposes other than completing a survey, which may be used to augment or replace survey results.
Question nonresponse: When survey respondents systematically skip certain survey questions.
Representative sample: Survey sample that includes a representative slice of the population.
Response rates: Ratio of the number of returned surveys to the number of questionnaires distributed (the specific way this rate is calculated varies from one agency to another).
Rider survey: Surveys that are conducted in-person, generally in a public place or business (also called intercept survey or on-board survey).
Route sequencing: All the route numbers that will be used on a one-way trip.
Sample: Group of people that the survey administrator or researcher selects and contacts to be included in a survey.
Sample bias: Systematic errors created by a sampling method.
Sample error: Difference between a true, but unknown, value for an entire population and the observed value gathered from a sample.
Sampling frame: Complete listing of all specific items in the identified study population (for on-board transit surveys, the frame usually consists of all customers who are on the bus or rail routes that are being studied).
**Sampling plan:** Detailed outline of what measurements will be taken at what times, on which material, in what manner, and by whom.

**Seat drops:** Survey technique in which a researcher drops off questionnaires (i.e., on train or bus seats) for respondents to complete in their own time.

**Simple random sample:** Sampling technique in which each respondent is selected by chance from the larger population, and the probability of selecting any individual within a sampling frame is the same.

**Stratified random sample:** Survey sampling technique in which the sample frame is divided in homogeneous subsets, or strata, and then random sampling techniques are used to select individuals from within those strata.

**Study population:** Subset of the target population that it is possible to reach to conduct the survey (for on-board transit surveys, the target and study populations are usually the same).

**Survey method:** Way in which a survey questionnaire is distributed and completed (i.e., online, paper, phone, or handheld device).

**Systematic sample:** Sampling technique in which every $N$th trip within the sample frame is selected to participate in a survey (also called an interval sample).

**Target population:** Population of interest to the research (for surveys that examine transit trip-making behavior, the target population of the survey are trips utilizing transit; also called a theoretical population).
References


Public Transit Rider Origin–Destination Survey Methods and Technologies


Sparks, G. Telephone interview with G. Macfarlane, March 29, 2018.


Survey Questionnaire
The Transportation Research Board (TRB) is preparing a synthesis of current practices on **Origin and Destination Survey Methods and Technology**. This is being done for the Transit Cooperative Research Program (TCRP) in cooperation with the Federal Transit Administration (FTA) and the American Public Transportation Association (APTA). The synthesis will provide practical information and guidance for transit agencies of all sizes in profiling innovative and successful practices, lessons learned, and gaps in information.

This survey questionnaire is being distributed to those responsible for designing and conducting origin destination surveys at 67 transit agencies and MPOs throughout the United States. If you are not the appropriate person at your agency to complete this survey, please forward it to the correct person.

**Please compete and submit this survey questionnaire by February 15, 2018.** If you have any questions, please do not hesitate to contact our principal investigator, Andrew Zalewski at: azalewski@foursquareitp.com.

Thank you very much for participating in this survey!

**QUESTIONNAIRE INSTRUCTIONS:**

1. **To view and print the entire questionnaire,** Click on the following link and print using "control p".

2. **To save your partial answers, or to forward a partially completed questionnaire to another party,** click on the "Save and Continue Later" link in the upper right hand corner of your screen. A link to the partially completed questionnaire will be emailed to you from SurveyGizmo. To return to the questionnaire later, open the email from SurveyGizmo and click on the link. To invite a colleague to complete part of the survey, simply click on the "Save and Continue" link and enter your colleague's email address. Please note that the questionnaire can be saved and passed around multiple times, but respondents must use the link emailed from SurveyGizmo. *We suggest using the “Save and Continue Later” feature if there will be more than 15 minutes of inactivity while the survey is opened, as some firewalls may terminate due to inactivity.*

3. **To view and print your answers before submitting the survey,** click forward to the page following the final question. Print using “control p”.

4. **To submit the survey,** click on "Submit" on the last page.
For the purposes of this study questionnaire, an origin-destination survey is defined as a survey that:

- Intercepts passengers while they are onboard a transit vehicle or at a transit stop, either through self-administered surveys or personal interviews. These methods may be used in conjunction with “seat-drop” questionnaires mailed back to the agency at a later date, or follow-up interviews.
- Is primarily conducted to collect a statistically representative sample of rider origin-destination travel patterns and demographics.
- Is conducted at a large scale in order to gather data for an entire transit system or transit mode. Surveys of individual transit routes are not a concern of this study unless the surveys were conducted as part of a larger systematic origin-destination survey effort.

Please answer the following questions to the best of your ability. Leave blank any questions which you are unable to respond to or do not apply. Research staff may contact you to follow-up on your responses.

Agency Contact Information

Page description:
Please provide your contact information and agency information. This information will be used to help us reach out if we have any questions.
1.

Your Name:*  

Agency/Organization: *  

Email Address:*  

Phone Number:*  

Survey Prevalence and Frequency

Page exit logic: Skip / Disqualify Logic  
IF: #3 Question "About how often does your agency conduct an origin-destination survey?" is one of the following answers ("Never") THEN: Jump to page 16 - Thank You!

2.

In what year did your organization last complete a transit intercept or on-board origin-destination survey?  

What was the official name of this survey effort?
3. About how often does your agency conduct an origin-destination survey?

☐ On an ongoing or rolling basis

☐ Annually

☐ Every 2 to 5 years

☐ Every 6 to 10 years

☐ Less often than once every 10 years. Frequency:

☐ Other, Explain:

☐ Never

Coordination with Other Agencies

4. Was the last survey coordinated with other transit agencies, or a regional planning agency?

☐ Yes

☐ No

If yes, which agencies were involved and what aspects of the survey were coordinated?
5. Select any organizations which utilize data from the most recent origin destination survey:

*Check all that apply*

- ☐ Transit agency
- ☐ Regional planning organization (e.g. MPO)
- ☐ Local governments
- ☐ State agencies
- ☐ Other

6. What was your organization’s primary justification for conducting an origin-destination survey?
7. For what purposes have survey data been used?

*Check all that apply*

- [ ] Route planning
- [ ] Schedule planning
- [ ] Long-range planning
- [ ] Modeling or Forecasting
- [ ] Title VI Planning
- [ ] Federal or state grant requirements

- [ ] Other:
  
  [ ] Other:
8. Has your agency had difficulty justifying the need for and/or cost of origin-destination surveys to decision makers (e.g. board members, internal agency stakeholders, elected officials)?

○ Yes
○ No

If yes, what ultimately convinced decision makers to move forward with the survey?


9. What was the funding source used to complete the survey?

Describe source: (e.g. general fund, federal grant, MPO grant)


10. Does your region utilize an activity-based/tour-based regional transportation model?
   - Yes
   - No
   - Not Sure

Comments

Survey Characteristics

Page description:
For the following questions, please respond based on your agency’s most recently completed on-board survey.

11. What topics were addressed in the survey?
   Check all that apply.
   - Trip purpose
   - Means of access and egress
   - Type of fare used
   - Frequency of transit use
   - Rider demographics
   - Customer satisfaction
   - Rider support for policy and planning proposals
   - Other:
12. How many questions were in the survey?

13. Were the survey questions drawn from a standardized format or another agency’s on-board survey?
   - Yes, questions from the Transit Performance Monitoring System (TPMS)
   - Yes, questions from another agency’s on-board survey were used
   - Yes, questions drawn from agency’s previous on-board survey
   - Yes, questions from other existing source used. Explain: 
   - No, questions written specifically for this on-board survey

14. If yes to the above question, did your organization make modifications to the standardized survey?
   - Yes; Describe:
   - No

15. If a customer’s one-way trip included a transfer, did the survey capture the location of transfers?
   - No, only the locations where the first boarding and final alighting occurred
   - Yes, all stops where boarding and alighting occurred during the trip
   - Other, elaborate: 

16. **What survey method(s) were used?**

- Paper Survey: Staff hand out survey, self-administered and returned to survey staff
- Paper Survey: Hand out paper survey, self-administered and mailed back
- Paper Survey: Seat drops (paper surveys left on seats and mailed back or returned at designated location)
- Paper Survey: Interviews administered by survey staff (e.g., read aloud) and recorded on paper
- Online Survey: Hand out invitation to online survey (with URL), self-administered and submitted
- Online Survey: Seat drop invitation to online questionnaire (with URL), self-administered and submitted
- Tablet Survey: Interviews administered by survey staff (e.g., read aloud) and recorded on tablets
- Tablet Survey: Hand out tablet survey, self-administered and returned to survey staff
- Two Step Survey: Short on-board survey followed by self-administered web survey
- Two Step Survey: Short on-board survey followed by staff administered survey over the phone
- Other:

**Page exit logic:** Skip / Disqualify Logic

**IF:** #16 Question "**What survey method(s) were used?**" is not one of the following answers ("Tablet Survey: Hand out tablet survey, self-administered and returned to survey staff","Tablet Survey: Interviews administered by survey staff (e.g., read aloud) and recorded on tablets","Other:"))

**THEN:** Jump to [page 10 - Response Rates](#)
17. Which transit modes were surveyed in your most recent origin-destination survey?

Select all that apply

- Local Bus, including Electric Bus and Trolley Bus
- Streetcar or Light Rail
- Bus Rapid Transit
- Heavy Rail (subway, metro, rapid transit)
- Ferry
- Commuter Rail
- Commuter Bus
- Paratransit or Demand-Response Service
- Other:

18. Select which days and time periods were surveyed:

Check which best apply

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</tbody>
</table>
19. If surveys were handed out, were they distributed on all scheduled trips during the above time periods?

*Check all that apply*

- Yes, distributed on all trips on-board the vehicle
- Yes, distributed continuously but at station/stop instead of on-vehicle
- No, only distributed on a select number of trips
- No, surveys only distributed at certain stations/stops
- No, other:

20. If the tablet or interview method was used, how were the transit riders selected for recruitment?

*Check one that best applies*

- All adult riders on a surveyed trip approached to take survey
- Adult riders selected for survey on a random basis (e.g. every 5th passenger to board a vehicle)
- Adult riders selected based on some other basis. Explain:

21. What efforts were made to include riders under the age of 18?
Tablet Survey Methods

**Page description:**
If Tablets were used, please answer the following questions:

22. **For what reasons did your agency decide to conduct your most recent survey using tablets?**
   *Check out all that apply*
   - Improved data quality due to automated validation of responses
   - Shortened wait period between the completion of field survey and availability of data for analysis
   - Reduced labor and materials costs related to printing and paper handling
   - Reduced labor costs related to data cleaning and analysis
   - Enable a new approach to survey design

   - Other:  

   *
23. Did using tablets reduce costs relative to paper-based survey methods employed by your agency?
   - Lower costs per completed survey
   - Higher costs per completed survey
   - Same cost per completed survey
   - I do not know

Provide any additional relevant details:

24. In which ways were tablet survey responses validated as the respondent completed the survey?
   
   Check all that apply
   - Addresses were validated
   - Stop locations were validated
   - Consistency of responses was validated (e.g., transit route used was consistent with stops used)
   - Reasonableness of responses was validated (e.g., number of vehicles available in household less than 20)
   - Responses were required for each question (e.g., to prevent missed questions).
   - No automatic response validation
25. If your agency used both tablet and paper survey methods in a single survey, or switched from paper to tablet methods, did your agency experience challenges comparing or combining these data sources?

☐ Yes; Please elaborate:

☐ No

26. Which of the following tablet operating systems were used in the survey?

☐ iOS (i.e. Apple iPad)

☐ Android OS

☐ Microsoft Windows (including Windows Mobile and Windows RT)

☐ Other:

27. Which statement best describes the tablet survey app used by your organization?

☐ Third-party app

☐ Custom app developed in-house by my organization

☐ Custom app developed by a hired consultant or survey firm

☐ Other:


28. How many tablets were used to conduct the survey?
   - Number of tablet devices:
   - Do not know

Response Rates

29. How did you measure the base used to calculate the survey’s response rate?
   Select one
   - Number of surveys distributed
   - Number of persons approached by interviewers
   - Passenger counts
   - Other:
30. What was the minimum standard applied to determine if a record was usable enough to incorporate into the survey results?

*Check all that apply*

- [ ] Origin and destination locations could be geocoded accurately
- [ ] Boarding and alighting stops identified
- [ ] Access & egress mode was collected
- [ ] Trip purpose was collected
- [ ] Route sequence (for trips that included a transfer) was collected
- [ ] Respondent’s demographic information was collected
- [ ] All questions completed
- [ ] Other:

[ ] Do Not Know
31. Please provide the following figures (by survey method if possible) to the best of your ability:

“Usable” is based on your agency’s own definition in the previous question, and “Response base rate” is defined by your agency’s own definition in the question before that.

If information is not available by survey method, please provide at least total value and/or response rate.

<table>
<thead>
<tr>
<th>Survey Method:</th>
<th>Survey Response Base:</th>
<th>Number of Surveys Returned:</th>
<th>Number of Complete or Usable Surveys Returned:</th>
<th>Response Rate (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1:</td>
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<td>Method 2:</td>
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<td>Total:</td>
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</tbody>
</table>

32. What was the approximate time required (in minutes) to complete the surveys?

Include complete responses only, to the extent possible

[Blank]
33. Describe efforts your agency took, if any, to capture the responses of customers taking short transit trips:

34. Did you offer incentives to induce higher response rates (e.g., free transit fares)?
   - Yes, non-fare monetary incentive (e.g. gift card)
   - Yes, free or discounted fares
   - Yes, other. Describe:
     
   - No

35. What languages were the surveys offered in?
   - English
   - Spanish
   - Chinese
   - French
   - Others:
     
36. How many surveys were returned in a language other than English?
37. **Did you hire surveyors to administer the survey in foreign languages?**
   - [ ] Yes
   - [ ] No

38. **What steps were taken to accommodate disabilities?**
   *Click all that apply*
   - [ ] Surveyors were trained on how to interact with people with disabilities
   - [ ] Proxy respondents were provided for those that could not complete surveys on their own
   - [ ] Adaptive technology was used for surveys administered on tablets
   - [ ] Online versions of the survey were compatible with screen reader technology
   - [ ] None
   - [ ] Other:
39.

To the best of your knowledge, please identify any groups of riders you feel were under-represented in the sample based on how the survey was deployed:

- Non-English speakers
- Particular ethnic or racial groups
- Transit dependent riders
- Riders with disabilities
- Low-income riders
- Persons with limited literacy
- Persons under the age of 18
- Short transit trips
- Riders during times of day surveyed (e.g. PM peak vs AM Peak ridership)

- Other: [Blank]

Please describe any attempts to address the under-sampling of groups identified above:

[Blank]
40. What was the approximate cost of conducting the on-board survey?
*Please provide your best estimate if exact costs or hours are not known*

**Consultants/Contractors** (in dollars):

**In-house Professional Staff** (in dollars or hours):

**In-house field staff** (in dollars or hours):

**Survey equipment (e.g. tablets)** (in dollars):

**Incentive Costs** (in dollars):

If a detailed breakdown of costs is not available, please provide your best estimate of **Total Cost including consultants, contractors, and agency staff** (in dollars):
41. Which of the following were used to create expansion factors for survey responses?

*Check all that apply*

- [ ] Census data
- [ ] Boardings by route
- [ ] Boardings by route and direction
- [ ] Boardings by time-of-day
- [ ] Boardings by stop or segment
- [ ] On and off counts (via stop/station level data such as APC or turnstile counts)
- [ ] Route-level ridership (via farebox counts or other sources)
- [ ] Other travel survey results (e.g., regional travel survey across all travel modes)

- [ ] Other:

- [ ] Other:

- [ ] None
- [ ] I do not know
42. What was the smallest geography that the survey returned usable results for analysis?

Select one which best applied

- Only for an entire mode of service
- Certain-higher ridership routes as well as the entire mode
- Route-level (can exclude lower ridership routes were achieving a statistical significant sample would be impractical)
- Route-segment level
- Stop-level

43. Since your most recent origin-destination survey was conducted, has your organization re-expanded the results based on newer data?

- No
- Yes

If yes, please elaborate on why:
Impact of Big Data on Surveys

44. Which of the following examples of “Big Data” does your organization utilize? 

*Check all that apply*

- [ ] Third-party data services (e.g. StreetLight Data) that provide travel flow based on passively-collected geospatial information such as cell phone or GPS location.
- [ ] Third-party data on rider characteristics and demographics.
- [ ] Automatic Vehicle Locator (AVL) and Automatic Passenger Counter (APC) data
- [ ] Fare-box and fare card data
- [ ] GTFS data
- [ ] Video analytics (e.g. facial recognition software)
- [ ] Other:
  
  [ ] Other:
  
  [ ] None
45. Which of the following best describes how these data sources are impacting how your agency conducts on-board surveys?

*Check all that apply*

- [ ] Improve sampling strategy
- [ ] Refine expansion factors applied to survey results
- [ ] Reduce the scope and scale of traditional on-board surveys
- [ ] Eliminate entirely the need for on-board surveys
- [ ] Not currently impacting the survey process
- [ ] Other:


46. What are some challenges your agency faces in utilizing big data to support or supplement on-board surveys?

*Check all that apply*

- [ ] Lack of in-house knowledge to fully use and process data sources
- [ ] Lack of quality data related to transit ridership
- [ ] Concerns that certain groups of riders are under-represented
- [ ] Concerns that utilizing big data will not comply with regulatory requirements such as Title VI
- [ ] Cost of acquiring data
- [ ] Other:


- [ ] Other:
Comparing Survey Practices

Page description:
The following questions ask you to compare your most recent major origin-destination survey effort to its preceding origin-destination survey effort.

47. Which of the following ways has your most recent survey differed from preceding origin-destination surveys?

Check all that apply

☐ New mode of survey (e.g. tablet); List newly introduced mode(s):

☐ Utilize new practice for survey expansion; Describe:

☐ Change in length of survey; Describe:

☐ New sampling strategy; Describe:

☐ Change in survey questions; Describe:

☐ No change
48.

How much did the cost change between your most recent survey effort and its predecessor?

- Little to no change (i.e. +/- 10% change)
- Cost increased with most recent survey (>10% change)
- Cost decreased with most recent survey (<-10% change)
- Do Not Know

If costs changed substantially, please elaborate on reasons why you think that was the case (e.g. vendor, survey mode, survey methodology) along with the change in cost if available.

49.

How much did the survey sample size (number of riders approached) change from your most recent survey effort and its predecessor?

- Little to no change (e.g. +/- 10% change)
- Response rate increased
- Response rate decreased

If available, please provide the change in sample size:
50. If needed, please provide any additional comments relevant to your previous on-board survey not already addressed in the questions above:

![Comment field]

[VALIDATION] Accepts 1 file. **Allowed types:** png, gif, jpg, jpeg, doc, xls, docx, xlsx, pdf, txt, mov, mp3, mp4. Max file size: 500 KB

51. **Please attach a copy of the survey instrument used in your most recent survey, or send to azalewski@foursquareitp.com**

[Browse...]

---

Thank You!

Thank you for taking our survey. Your response is very important to us.

**Action:** Review

New Review
Selection of Sample Survey Instruments

Surveys on the following pages are reproduced courtesy of the following transit providers and regional planning organizations:

- Alameda Contra-Costa Transit—dba AC Transit
- Berks Area Regional Transportation Authority (BARTA)
- Capital Metropolitan Transportation Authority—dba CapMetro
- Central Florida Regional Transportation Authority—dba LYNX
- Central Ohio Transit Authority (COTA)
- Charlotte Area Transit System (CATS)
- City of Phoenix Public Transit Department—dba Valley Metro
- Madison Area Transportation Planning Board (MATPB)
- Metropolitan Council
- Pinellas Suncoast Transit Authority (PSTA)
- Regional Transportation Commission of Southern Nevada—dba RTC
- Regional Transportation District
- San Diego Association of Governments (SANDAG)
- Metropolitan Area Planning Agency (MAPA)/Transit Authority of Omaha—dba Metro
- Tri-County Metropolitan Transportation District (TriMet)
- Utah Transit Authority (UTA)

Oakland, CA
Reading, PA
Austin, TX
Orlando, FL
Columbus, OH
Charlotte, NC
Phoenix, AZ
Madison, WI
Minneapolis, MN
Saint Petersburg, FL
Las Vegas, NV
Denver, CO
San Diego, CA
Omaha, NE
Portland, OR
Salt Lake City, UT
Tablet records: Surveyor name, device ID, date, survey start and end time

Section 1: To be filled out by surveyor

1. Current route information
   • Enter route
   • Enter direction

2. Is the rider willing to take the survey?
   • If yes, continue
   • If no - refuse, thank and terminate. Refusal is recorded and used for response rate.
   • Incomplete, started but terminated. Record as incomplete.

3. Does the person age 12 or older speak?
   • English → skip to Question 5
   • Spanish → skip to Spanish Question 5
   • No → Allow customer to answer Questions 4a and 4b and then Terminate Survey

4a. Select One (NOTE: These choices are translated)
   • I speak Vietnamese
   • I speak Chinese
   • I speak Russian
   • I speak Korean
   • I speak Japanese
   • I speak Ukrainian
   • I speak Romanian
   • I speak Tagalog
   • I speak Arabic
   • I speak Mon-Khmher, Cambodian
   • I speak Somali
   • I speak Hmong
   • Other
   • NR

4b. How well do you speak English?
   • Not at all
   • Not well
   • Well
   • Very well

5. Starting location
   Hint: Where did you first START this one-way trip?
   • Your usual WORKPLACE
   • Other business related
   • Your HOME
   • College / University (students only)
• Airport, Amtrak/Greyhound/BoltBus Terminal (as a passenger)
• Recreation / sightseeing
• Medical appointment / doctor’s visit
• Social visits (friends/relatives)
• Personal business (bank, post office)
• Pick up/drop off someone (daycare, school)
• Shopping
• Eating/Dining Out
• School (K-12)
• Hotel
• Sporting event
• Other (specify)

6. Ending location
Hint: Where will you finally END this one-way trip?
• Your usual WORKPLACE
• Other business related
• Your HOME
• College / University (students only)
• Airport, Amtrak/Greyhound/BoltBus Terminal (as a passenger)
• Recreation / sightseeing
• Medical appointment / doctor’s visit
• Social visits (friends/relatives)
• Personal business (bank, post office)
• Pick up/drop off someone (daycare, school)
• Shopping
• Eating/Dining Out
• School (K-12)
• Hotel
• Sporting event
• Other (specify)

7. Starting and Ending Location and Boarding and Alighting External App ("Click to choose where that is located")
Hint: Swipe right after picking location or checking 'yes'
• Origin Latitude
• Origin Longitude
• Destination Latitude
• Destination Longitude
• ON Stop
• OFF Stop

Is the starting location outside of the region? (Note: only necessary if no location is picked from map such as park-and-ride or regional bus trips originating from outside region. Interstate bus or any plane trips into region should use the Greyhound/Amtrak/BoltBus/Airport terminals as starting location)
• Yes
• No
Is the ending location outside of the region? (Note: only necessary if no location is picked from map such as park-and-ride or regional bus trips destined for outside region. Interstate bus or any plane trips into region should use the Greyhound/Amtrak/BoltBus/Airport terminals as ending location)

- Yes
- No

8. How did you get to the first stop from your starting location?
Hint: The first stop is where you boarded the FIRST bus, MAX, WES or streetcar on this one-way trip.

- Walked -> How many blocks did you walk?
- Dropped off
- Bicycled
- Drove & parked -> Where did you park?
- Carpoled & parked -> Where did you park?
- Ride hailing/Uber/Lyft/Taxi
- Car sharing.Car2go/Zipcar
- Other (specify)

9. How will you get to your ending location?
Hint: The ending location is where you are going after the LAST bus, MAX, WES or streetcar on this one-way trip.

- Walk -> How many blocks will you walk?
- Get picked up
- Bicycle
- Drive -> Where are you parked?
- Carpool -> Where are you parked?
- Ride hailing/Uber/Lyft/Taxi
- Car sharing.Car2go/Zipcar
- Other (specify)

10. How many transfers did you make before boarding this bus/rail?
Hint: Choose the number of bus/rail transfers you made BEFORE you boarded this bus/rail since leaving the place where you STARTED this one-way trip.

- No transfers
- 1 transfer
- 2 transfers
- 3 transfers

11. Which route/rail line did you board FIRST on this one-way trip? (only if transfers before >= 1)
   Which route/rail line did you board SECOND on this one-way trip? (only if transfers before >= 2)
   Which route/rail line did you board THIRD on this one-way trip? (only if transfers before = 3)

12. How many transfers will you make after getting off this bus/rail?
Hint: Choose the number of bus/rail transfers will you make AFTER you get off this bus/rail on your way to the place where you are ENDING this one-way trip?

- No transfers
• 1 transfer
• 2 transfers
• 3 transfers

13. Which route or rail line will you board NEXT on this one-way trip? (only if transfers after >= 1)
Which route or rail line will you board AFTER THAT on this one-way trip? (only if transfers after >= 2)
Which route or rail line will you board LAST on this one-way trip? (only if transfers after = 3)

Section 2: To be filled out by respondent

Highlight: Green=Everyone, Yellow=TriMet, Blue=Hop, Pink=Not Hop
Text: Blue=not TriMet

14. Did you pay for this trip by tapping a Hop card or ticket, or mobile phone, at a Hop reader?

- No, I didn’t tap but paid some other way (includes paper ticket, mobile app, monthly pass, etc.)
- Yes, using a plastic Hop card
- Yes, using a mobile wallet, like Android Pay, Apple Pay, or Samsung Pay
- Yes, using a contactless bank card
- Yes, using a Hop card added to my phone (hide for now)
- Yes, using a single paper Hop 2-1/2 hour ticket
- Yes, using a single paper Hop Day Pass
- Don’t know

Ask if Q14 = No or Don’t know

15. Which fare did you use for this trip?
- TriMet fare
- Streetcar fare --> skip to Q28
- C-TRAN fare --> skip to Q28
Ask if Q14=Yes OR Q15=TriMet

16. Which fare type do you have?
- Adult
- Youth
- Honored Citizen
- LIFT

Ask if Q14=No or Don’t know

17. Did you pay with a …
- Single 2 ½ hour ticket
- Book of 10 2 ½ hour tickets
- 1-Day Pass
- Book of 5 1-Day Passes
- 7-Day Pass
- 14-Day Pass
- Monthly/30-Day Pass
- Annual Pass
- Other (specify) __________

Ask if Q17 = Annual, Other

18. Did you use a ….
- Employee ID with TriMet sticker
- High School ID with embedded TriMet logo
- College ID with embedded TriMet logo
- Honored Citizen Downtown Pass
- Other (specify) __________
- None of the above

Ask if Q17 is anything except Annual, Other

19. Where did you purchase or get your fare for this trip?
- On-board the vehicle
- Retail store
- Work
- School
- Mobile Ticket App
- Ticket Vending Machine
- TriMet ticket office
- Social Service agency
- Other (specify) __________

Ask if Q14=Single paper HOP 2-1/2 hr ticket OR Q17=Single 2 ½ hr ticket or Book of 10 2 ½ hr tickets

20. Is your single-fare payment being used for a one-way or a round-trip?
- One-way trip
- Round-trip

Ask if Q14=Single paper HOP Day Pass OR Q17=1-Day Pass or Book of 5-1-Day Passes

21. How many one-way trips will you make on your Day Pass today?
- Drop down list from 1-10 or more
22. Where did you purchase or get your fare for this trip?
   - Work
   - School
   - Ticket Vending Machine
   - TriMet ticket office
   - Social Service agency
   - Other (specify) ______________

23. How do you add fare to your Hop card? (check all that apply)
   - Website (myhopcard.com)
   - Retail store
   - Mobile App
   - TriMet Ticket Office
   - By phone (1-844-MYHOPCARD)
   - Provided by my employer or college
   - Provided by a social service agency (or maybe this is captured in other?)
   - Other (specify) __________

24. Before Hop, where did you purchase or get your fare? (check all that apply)
   - On-board the vehicle
   - Retail store
   - Ticket Vending Machine
   - Work
   - School
   - Mobile Ticket App
   - On-line
   - TriMet ticket office
   - Social Service agency
   - Other (specify) ______________

25. How many one-way trips will you make on transit today?
   - Drop down list from 1-10 or more

26. Are you completing a round trip on transit in 2-1/2 hours?
   - Yes/No/Don't know

27. How many trips have you made on a TriMet bus or MAX or WES in the last 7 days?
   (count each direction as one trip)
   - Enter number (less than 70)

28. How did you usually make this trip before Tilikum Crossing opened?
   - Drove
   - Was dropped off/picked up
   - Carpooled
   - Used a different bus/MAX/WES/streetcar route
• Walked
• Bicycled
• I did not make this trip, because I have moved to this area (neighborhood or Portland) after Tilikum Crossing opened in September 2015
• I did not make this trip, because I didn't go to this destination two years ago
• I made this trip the same way as today
• Other (specify)

29. Do you have a current driver's license?
• Yes
• No

30. Including yourself, how many people live in your household? Enter number of people

31. Including yourself, how many people in your household work outside the home? Enter number of people

32. How many working cars, trucks, vans or motorcycles are there in your household? Enter number of vehicles

33. Are you a college student?
• No
• Yes, part-time
• Yes, full-time

34. Which college do you attend? (check all that apply)
• Clackamas Community College
• Concordia University
• Lewis & Clark College
• Mount Hood Community College
• Oregon Health and Science University
• Pacific University
• Portland Community College
• Portland State University
• Reed College
• University of Portland
• Other (specify)

35. What is your race or ethnicity? (check all that apply)
• Asian/Asian American
• African American/Black
• Caucasian/White
• Hispanic/Latino
• Middle Eastern or North African
• American Indian or Alaskan Native
• Pacific Islander
• Bi-racial or multi-racial
• Other (specify)
36. What is your age?
   - Under 18
   - 18-24
   - 25-34
   - 35-44
   - 45-54
   - 55-64
   - 65 or more

37. Which do you identify with?
   - Female
   - Male
   - Transgender
   - Other (specify)

38. What was your total annual household income before taxes in 2016?
   - Under $10,000
   - $10,000 - $19,999
   - $20,000 - $29,999
   - $30,000 - $39,999
   - $40,000 - $49,999
   - $50,000 - $59,999
   - $60,000 - $69,999
   - $70,000 - $79,999
   - $80,000 - $89,999
   - $90,000 - $99,999
   - $100,000 - $124,999
   - $125,000 - $150,000
   - Over $150,000
   - Don’t know

39. What is your home zip code? ____________

40. Is English your native language?
   - Yes $ \rightarrow$ Terminate survey
   - No

41. If no, what is your native language?
   - Spanish
   - Vietnamese
   - Chinese
   - Russian
   - Korean
   - Japanese
   - Ukrainian
   - Romanian
   - Tagalog
   - Arabic
• Mon-Khmher, Cambodian
• Somali
• Hmong
• Other (specify)

*Ask if survey is in Spanish or Q40=No*

42. **How well do you speak English?**
• Not at all
• Not well
• Well
• Very well
**Metropolitan Council 2016 Transit On Board Survey**

Please take a few minutes to be counted as we plan the future of your transit system.

All personal information will only be disclosed as required by law. The Metropolitan Council will not sell this data.

**What is your HOME ADDRESS** (please be specific, ex: 123 W. Main St):
(If you are visiting the Minneapolis - St. Paul area, please list the hotel name or address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

**COMING FROM?**

1. What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
   - Work
   - College / University (students only)
   - School K-12 (students only)
   - Doctor / Clinic / Hospital (non-work)
   - Shopping
   - Recreation / Sightseeing / Restaurant
   - Social Visit / Religious / Personal / Community
   - Airport (passengers only)
   - Sporting or Special Event
   - Your HOME ➔ Go to Question #4
   - Other: ________________

2. What is the **NAME** of the place you are coming from now?

   __________________________________________________________

3. What is the **EXACT ADDRESS** of this place? (OR Intersection if you do not know the exact address: )

   City: ______________  State: ______  Zip: __________

4. How did you GET FROM your origin (the place in Question #1) TO THE VERY FIRST bus / train you used for this one-way trip?
   - Walk
   - Wheelchair or motorized cart
   - Bike (answer 4a)
   - Was dropped off by someone (answer 4a)
   - Drove alone and parked (answer 4a)
   - Drove on road with others and parked (answer 4a)
   - Car share (e.g. Car2Go, etc.) (answer 4a)
   - Taxi. (answer 4a)
   - Uber, Lyft, etc. (answer 4a)
   - Other: ________________

4a. Where did you board the first bus / train you used for this one-way trip (Nearest intersection / Park-n-Ride lot):

   ________________________________________________________

5. Where did you get ON this bus? Please provide the nearest intersection / station name / Park-n-Ride lot:

6. Where will you get OFF this bus? Please provide the nearest intersection / station name / Park-n-Ride lot:

**GOING TO?**

6. What type of place are you GOING TO NOW? (the ending place for your one-way trip)
   - Work
   - College / University (students only)
   - School K-12 (students only)
   - Doctor / Clinic / Hospital (non-work)
   - Shopping
   - Recreation / Sightseeing / Restaurant
   - Social Visit / Religious / Personal / Community
   - Airport (passengers only)
   - Sporting or Special Event
   - Your HOME ➔ Go to Question #9
   - Other: ________________

7. What is the **NAME** of the place you are going to now?

   __________________________________________________________

8. What is the **EXACT ADDRESS** of this place? (OR Intersection if you do not know the exact address: )

   City: ______________  State: ______  Zip: __________

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus / train you will use for this one-way trip?
   - Walk
   - Wheelchair or motorized cart
   - Bike (answer 9a)
   - Be picked up by someone (answer 9a)
   - Get in a parked vehicle & drive alone (answer 9a)
   - Get in a parked vehicle & drive/ride w/others (answer 9a)
   - Car share (e.g. Car2Go, etc.) (answer 9a)
   - Taxi (answer 9a)
   - Uber, Lyft, etc. (answer 9a)
   - Other: ________________

9a. Where will you get off the last bus / train you are using for this one-way trip (Nearest intersection / Park-n-Ride lot): ________________

10. Where will you get OFF this bus? Please provide the nearest intersection / station name / Park-n-Ride lot:

11a. Did you transfer FROM another bus/Train BEFORE getting on this bus?  
   - Yes  
   - No

11b. Will you transfer TO another bus/Train AFTER getting off this bus? 
   - Yes  
   - No

11c. Please list the BUS / TRAIN ROUTES in the exact order you use them for this one-way trip

START ➔ 1st Route ➔ 2nd Route ➔ 3rd Route ➔ 4th Route ➔ END

[Continue]
OTHER INFORMATION ABOUT THIS TRIP

12. What time did you BOARD this bus/train? _______ : _______ am / pm (circle one)

13. Will you (or did you) make this same trip in exactly the opposite direction today?
   ○ No  ○ Yes - At what time did/will you leave for this trip in the opposite direction? _____:_____:_______ am/pm (circle one)

14. What fare payment methods were used for this one-way trip? (select all that apply)
   ○ Cash  ○ U Pass  ○ Day Pass  ○ 10 Ride  ○ College Pass  ○ Go to Stored Value  ○ Student Pass  ○ Weekly/Monthly Pass  ○ Metro Pass  ○ Mobile ticket
   ○ Qualified Free Ride (service connected veteran)  ○ Free Fare Zone  ○ Other:_____________________

15. What type of fare was this?
   ○ Regular (13-64)  ○ Limited Mobility Pass  ○ Senior (Over 65)  ○ Student / Youth (age 6-12)

16. Since you most recently left your home (or the place you are staying in the Twin Cities area) and the next time you will return home (or the place you are staying), did you or will you...
   (check all that apply)
   ○ No other trip  ○ Go to work  ○ Go to school  ○ Go shopping  ○ Buy a meal/beverage  ○ Visit friend/relative or attend a religious/social event  ○ Other errands
   ○ Other (please specify):_____________________

ABOUT YOU AND YOUR HOUSEHOLD

17. Are you a visitor to the Minneapolis – St. Paul region?  ○ No  ○ Yes (if YES, please skip to Q24)

18. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles

18a. [If #18 is more than NONE] Could you have used one of these vehicles for this trip?  ○ Yes  ○ No

19. Including YOU, how many people live in your household? _______ people

20. Including YOU, how many people (over age 15) in your household are employed full/part-time? _______ people

21. What is your employment status? (check the one response that BEST describes you)
   ○ Employed full-time  ○ Not currently employed – seeking work  ○ Retired
   ○ Employed part-time  ○ Not currently employed – not seeking work  ○ Stay at home parent or caregiver

22. What is your student status? (check the one response that BEST describes you)
   ○ Not a student  ○ Yes – College/University/Community College  ○ Yes – K - 12th grade
   ○ Yes – Vocational / Technical / Trade school  ○ Other:_____________________

22a. Does your employer or school subsidize (pay for) all or part of your transit fare?
   ○ Yes (all)  ○ Yes (some)  ○ None of the cost

23. Do you have a valid driver’s license?  ○ Yes  ○ No

24. What is your AGE?  ○ Under 12  ○ 13-15  ○ 16-17  ○ 18-24  ○ 25-34  ○ 35-44  ○ 45-54  ○ 55-64  ○ 65-74  ○ 75-84  ○ 85 and over

25. What is your race / ethnicity? (check all that apply)
   ○ American Indian/Alaska Native  ○ Asian  ○ Black/African/African American  ○ Hispanic/Latino
   ○ Native Hawaiian/Pacific Islander  ○ White  ○ Other: ____________________

26. What is your gender?  ○ Male  ○ Female

27. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2015 before taxes?
   ○ Less than $15,000  ○ $15,000 - $24,999  ○ $25,000 - $34,999  ○ $35,000 - $49,999  ○ $50,000 - $69,999
   ○ $70,000 - $99,999  ○ $100,000 - $149,999  ○ $150,000 - $199,999  ○ $200,000 or more

28. Do you speak a language other than English at home?  ○ No  ○ Yes - Which language? __________________

28a. [If #28 is Yes] How well do you speak English?  ○ Very Well  ○ Well  ○ Less than well  ○ Not at all

29. Do you consider yourself to have a disability?  ○ Yes  ○ No

30. How did you usually make this trip prior to the Green Line opening (same starting and ending points)?
   ○ Used different bus/rail routes  ○ Walk  ○ Bike  ○ Drove/Picked-up/Dropped-off/Carpooled
   ○ Did not make this trip, moved to this area/neighborhood within the last two years
   ○ Did not make this trip, didn’t go to this origin or destination location two years ago
   ○ Did not go to this area in last 2 years, “did the Green Line impact your decision?”  ○ Yes  ○ No
   ○ Other (please specify):_____________________

REGISTER TO WIN $100

People who submit an accurately completed survey will be entered in a random drawing for one of
Five $100 Visa gift cards. You must provide your home address at the beginning of the survey and answer all
questions to be eligible.

Your Name: ____________________________
Phone Number: (____) ____________________

Thank you for your help!
Hi, my name is ______ and I have been retained by Capital Metro to conduct a brief interview regarding your experience with riding the (bus/train). This survey will assist Capital Metro to improve existing services and will only take about five minutes. We know your time is valuable so as a way of saying thank you, if you complete this survey and provide us with your name and phone number or email address, your name will be entered into a contest to win a monthly pass. If you already ride free, you can give the pass to a family member or friend.

S1. Have you participated in an on-board survey for Capital Metro in the past 3 months?

( ) Yes - Thank & Terminate
( ) No - Continue

a. Would you prefer to continue this survey in English or Spanish?

( ) English  ( ) Spanish

1. What is your age? ____________________________ years (IF <16, Thank & Terminate)

2. Where did you get ON this (Bus/Train)? (Stop Number from list)

Stop #__________

3. Where did you come from?

( ) Home  ( ) Shopping (Grocery)
( ) Work  ( ) Shopping (Other)
( ) Medical  ( ) College (other than University of Texas)
( ) Personal/Recreational  ( ) The University of Texas
( ) School (Elementary/Middle/High School)  ( ) Airport
( ) Other (specify)______________________

BUS/TRAIN INTERCEPT SURVEY
COUNT EVERY FOURTH PERSON ON THE BUS/TRAIN AND ASK TO INTERVIEW THE PERSON.
4. What is the address OR nearest corner of the place you started your journey today? (Please specify street, lane, road, etc... and if applicable, east, west, north, or south)

Address

Block Number Street Name

Nearest Corner & First street name Second street name

IF THE RESPONDENT CANNOT PROVIDE A STREET ADDRESS, AFTER PROBING, ASK:
What is the nearest landmark or building from the place you started your journey today

5. How did you get to the (Bus/Train) STOP?

( ) Transferred from Bus/train Route #: _____________. How many blocks did you walk from that bus/train to this one? _________ (0 or more)

( ) Rode with someone or be picked up – we will drive _________ miles.

( ) Drove my car _________ miles.

( ) Walked _________ blocks (0 or more).

( ) Rode a bike _________ miles.

( ) Other (specify) ___________________________________

6. How will you get from this (Bus/Train) to your final destination?

( ) I will transfer to Bus/train Route #: _____________. How many blocks will you walk from this bus/train to that one? _________ (0 or more)

( ) I will ride with someone or be picked up – we will drive _________ miles.

( ) I will drive a car _________ miles.

( ) I will walk _________ blocks (0 or more).

( ) I will ride a bike _________ miles.

( ) Other (specify) ___________________________________

7. Where are you going to?

( ) Home ( ) Shopping (Grocery)

( ) Work ( ) Shopping (Other)

( ) Medical ( ) College (other than University of Texas)

( ) Personal/Recreational ( ) The University of Texas

( ) School (Elementary/Middle/High School) ( ) Airport

( ) Other (specify) ___________________________
8. What is the address OR nearest corner of your final destination? *(Please specify street, lane, road, etc... and if applicable, east, west, north, or south)*

Address

Block Number Street Name

Nearest Corner & First street name Second street name

IF THE RESPONDENT CANNOT PROVIDE A STREET ADDRESS, AFTER PROBING, ASK:
What is the nearest landmark or building to your final destination

__________________________________________________________________________

9. How did you pay to get on this *(Bus/Train)*? *(HAND RESPONDENT SHOW CARD)*

( ) Single Ride (cash)
( ) Single Ride Reduced Fare (cash)
( ) Day Pass (cash)
( ) Day Pass Reduced Fare (cash)
( ) 7 Day Pass
( ) 31 Day Pass
( ) 31 Day Pass Reduced Fare
( ) Business Pass (COA, ACC, Travis County)
( ) MetroAccess
( ) UT ID
( ) Employee Dependent
( ) Free
( ) Other, specify ____________

10. Did you use the Mobile App to purchase your pass? (   ) Yes (   ) No

11. Which fare category do you pay
(   ) Adult (   ) Child
(   ) Senior (   ) Disabled
(   ) Student

[Q12-Q14 ASK ONLY IF ROUTE = 550(MetroRail), 801(MetroRapid), & 803(MetroRapid)]

12. How long have you used *(MetroRapid/MetroRail)* service?

(   ) Less than 1 month
(   ) 2-4 months
(   ) 4-6 months
(   ) 6-12 months
(   ) 1-2 years
(   ) 2-3 years
(   ) 4-5 years
(   ) This is my first time
13. Before you began using (MetroRail/MetroRapid), what method of transportation would you have used to get to your current destination

( ) I used MetroBus
( ) I rode with someone or was picked up
( ) I drove my car
( ) I walked
( ) I rode a bike
( ) None, have always used MetroRail/MetroRapid for this destination
( ) Other (specify) _____________________

14. What made you decide to use this service instead of your previous form of transportation (check all that apply)?

( ) Reach my destination faster
( ) More reliable
( ) More frequent service
( ) Wi-Fi
( ) Bike carrying capacity
( ) Real-time information
( ) Dedicated station/line
( ) Helps the environment
( ) Helps offset the cost of transportation
( ) Sanity/improved health
( ) Other (specify) _____________________

15. How many working cars, trucks, or vans are available for use by your household?

( ) Zero ( ) One ( ) Two ( ) Three or more

16. Could you have used one of these vehicles to make THIS TRIP instead of riding the bus?

( ) Yes
( ) No

17. How many people reside in your household? (Family and non-family members)

( ) One ( ) Two ( ) Three ( ) Four ( ) Five ( ) Six ( ) Seven or more

18. (RACE/ETHNICITY) Are you…?

( ) White/Anglo ( ) African American ( ) Hispanic/Latino
( ) Asian ( ) Native American ( ) Other ________
(specify)

19. What is your preferred language spoken at home?

( ) English ( ) Spanish ( ) Mandarin Chinese
( ) Vietnamese ( ) Other (specify) _____________________
20. **BY OBSERVATION: GENDER**
   ( ) Male
   ( ) Female

(HAND RESPONDENT CARD A)

21. Please read off the letter on this card that best represents your total combined yearly income of you and all members of your household (including non-family members living in your household).

   A $0 - $4,999  E $20,000 - $24,999  I $60,000 - $69,999
   B $5,000 - $9,999  F $25,000 - $29,999  J $70,000 - $79,999
   C $10,000 - $14,999  G $30,000 - $39,999  K $80,000 - $100,000
   D $15,000 - $19,999  H $40,000 - $59,999  L Over $100,000

   IF REFUSED --- Is your annual household income above or below $20,000.
   ( ) Above $20,000  ( ) Below $20,000  ( ) Refused

22. How often do you use Capital Metro?
   ( ) 6-7 days a week  ( ) 1-2 days a month
   ( ) 5 days a week  ( ) Less that 1 day a month
   ( ) 3-4 days a week  ( ) This is my first time
   ( ) 1-2 days a week

23. How long have you lived in the Austin area?
   ( ) Less than one year  ( ) 4-5 years
   ( ) 1-2 years  ( ) 5-6 years
   ( ) 2-3 years  ( ) 6-7 years
   ( ) 3-4 years  ( ) 7 or more years

Thank you for your time. So that we may enter you in a contest to win a monthly or annual pass, may I have your name and telephone number?

Name__________________________________________

Telephone:______________________________________
## CARD A

<table>
<thead>
<tr>
<th>Code</th>
<th>Income Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 - $4,999</td>
</tr>
<tr>
<td>B</td>
<td>$5,000 - $9,999</td>
</tr>
<tr>
<td>C</td>
<td>$10,000 - $14,999</td>
</tr>
<tr>
<td>D</td>
<td>$15,000 - $19,999</td>
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<tr>
<td>K</td>
<td>$80,000 – 100,000</td>
</tr>
<tr>
<td>L</td>
<td>Over $100,000</td>
</tr>
</tbody>
</table>
LYNX 2016 – 2017 Transit On Board Survey

Please take a few minutes to be counted as we plan the future of your transit system.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS (please be specific, ex: 123 W. Main St):

(If you are visiting the Orlando area, please list the hotel name or address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

COMING FROM?
1. What type of place are you COMING FROM NOW?
   (the starting place for your one-way trip)
   ○ Work or work related
   ○ College / University (students only)
   ○ School K-12 (students only)
   ○ Medical / Doctor / Clinic / Hospital (non-work)
   ○ Shopping
   ○ Recreation / Sightseeing / Restaurant
   ○ Social Visit / Recreation / Religious / Community
   ○ Airport (passengers only)
   ○ Sporting or Special Event
   ○ Your HOME ➔ Go to Question #4
   ○ Other:

2. What is the NAME of the place you are coming from now?

3. What is the EXACT ADDRESS of this place? (or Intersection if you do not know the exact address:)
   City: ___________ State: _______ Zip: ______

4. How did you GET FROM your origin (the place in Question #1) TO THE VERY FIRST bus / SunRail you used for this one-way trip?
   ○ Walk
   ○ Personal Bike (answer 4a)
   ○ Bike share (answer 4a)
   ○ Was dropped off by someone (answer 4a)
   ○ Drove alone and parked (answer 4a)
   ○ Drove or rode with others and parked (answer 4a)
   ○ Car share (e.g. Zip Car, etc.) (answer 4a)
   ○ Taxi (answer 4a)
   ○ Uber, Lyft, etc. (answer 4a)
   ○ Other.

4a. Where did you board the first bus / SunRail you used for this one-way trip
   (Nearest intersection / Park-n-Ride lot):

5. Where did you get ON this bus/SunRail?
   Please provide the nearest intersection / station name / Park-n-Ride lot:

GOING TO?
6. What type of place are you GOING TO NOW?
   (the ending place for your one-way trip)
   ○ Work or work related
   ○ College / University (students only)
   ○ School K-12 (students only)
   ○ Medical / Clinic / Hospital (non-work)
   ○ Shopping
   ○ Recreation / Sightseeing / Restaurant
   ○ Social Visit / Recreation / Religious / Community
   ○ Airport (passengers only)
   ○ Sporting or Special Event
   ○ Your HOME ➔ Go to Question #9
   ○ Other:

7. What is the NAME of the place you are going to now?

8. What is the EXACT ADDRESS of this place? (or Intersection if you do not know the exact address:)
   City: ___________ State: _______ Zip: ______

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus / SunRail you will use for this one-way trip?
   ○ Walk
   ○ Personal Bike (answer 9a)
   ○ Bike share (answer 9a)
   ○ Be picked up by someone (answer 9a)
   ○ Get in a parked vehicle & drive alone (answer 9a)
   ○ Get in a parked vehicle & drive/ride w/others (answer 9a)
   ○ Car share (e.g. Zip Car, etc.) (answer 9a)
   ○ Taxi (answer 9a)
   ○ Uber, Lyft, etc. (answer 9a)
   ○ Other.

9a. Where will you get off the last bus / SunRail you are using for this one-way trip
   (Nearest intersection / Park-n-Ride lot):

10. Where will you get OFF this bus/SunRail?
    Please provide the nearest intersection / station name / Park-n-Ride lot:

11a. Did you transfer FROM another bus/train BEFORE getting on this bus?
   ○ Yes  ○ No

11b. Will you transfer TO another bus/train AFTER getting off this bus?
   ○ Yes  ○ No

11c. Please list the BUS / SunRail ROUTES in the exact order you use them for this one-way trip

START ➔ [ ] ➔ [ ] ➔ [ ] ➔ [ ] ➔ END

1st Route  2nd Route  3rd Route  4th Route
OTHER INFORMATION ABOUT THIS TRIP

12. What time did you BOARD this bus/train? _______ : _______ am / pm (circle one)

13. Will you (or did you) make this same trip in exactly the opposite direction today?
   - No
   - Yes - At what time did / will you leave for this trip in the opposite direction? _______ : _______ am / pm (circle one)

14. What fare payment methods were used for this one-way trip? (select all that apply)
   - Cash
   - Single Ride Ticket
   - O Day Pass
   - O 7 Day Pass
   - O 30 Day Pass
   - O Transfer
   - O SunRail One-way
   - O SunRail Round Trip
   - Other

15. What type of fare was this?
   - Standard (age 19-64)
   - AdvantAge Pass
   - Disabled
   - AdvantAge Pass Senior (age 65 & over)
   - Youth Pass (age 7-18)
   - Youth (age 6 & Under)

17. On average how often do you use LYNX services?
   - 7 days a week
   - 5 days a week
   - 3 days a week
   - 1 day a week or less
   - 2 days a week
   - First time riding
   - Never

18. On average how often do you use SunRail services?
   - 7 days a week
   - 5 days a week
   - 3 days a week
   - 1 day a week or less
   - 2 days a week
   - First time riding
   - Never

19. How would you have made this trip if LYNX / SunRail were not available?
   - O Walk
   - O Bicycle
   - O Drive own vehicle
   - O Ride with someone else
   - O Borrow vehicle
   - O Taxi/Uber
   - O Would not make trip

20. Are you a visitor to the Orlando region?
   - No
   - Yes (if YES, please skip to Q26)

21. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles

21a. [If #21 is more than NONE] Could you have used one of these vehicles for this trip?
   - O Yes
   - O No

22. Including YOU, how many people live in your household? _______ people

23. Including YOU, how many people (over age 15) in your household are employed full/part-time? _______ people

24. What is your employment status? (check the one response that BEST describes you)
   - Employed full-time
   - Not currently employed – seeking work
   - Retired
   - Employed part-time
   - Not currently employed – not seeking work
   - Homemaker or caregiver

24a. [If #24 is Employed Full or Part Time] What is your employment industry?
   - Retail Trade
   - Arts, Entertainment, Recreation, Accommodation, Food Services
   - Finance, Insurance, Real Estate Rental and Leasing
   - Educational Services, Health Care, Social Assistance
   - Professional, Scientific, Management, Administrative, Waste Management
   - Other

25. What is your student status? (check the one response that BEST describes you)
   - Not a student
   - Yes – College / University / Community College
   - Yes – K - 12th grade
   - Yes – Vocational / Technical / Trade school / Other

26. Do you have a valid driver’s license?
   - O Yes
   - O No

27. What is your AGE?
   - Under 12
   - 13-15
   - 16-17
   - 18-24
   - 25-34
   - 35-44
   - 45-54
   - 55-64
   - 65-74
   - 75-84
   - 85 and over

28. What is your race / ethnicity? (check all that apply)
   - American Indian/Alaska Native
   - Asian
   - Black/African/African American
   - Hispanic/Latino
   - Native Hawaiian/Pacific Islander
   - White
   - Other:_____________________ 

29. What is your gender?
   - Male
   - Female

30. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2015 before taxes?
   - Less than $10,000
   - $10,000 - $19,999
   - $20,000 - $29,999
   - $30,000 - $39,999
   - $40,000 - $49,999
   - $50,000 – $74,999
   - $75,000 - $99,999
   - $100,000 or more

31. Do you speak a language other than English at home?
   - O No
   - O Yes - Which language?____________________

31a. [If #31 is Yes] How well do you speak English?
   - O Very Well
   - O Well
   - O Less than well
   - O Not at all

32. Do you consider yourself to have a disability?
   - O Yes
   - O No

33. Are you Armed Forces, Military, or Veteran?
   - O No
   - O Yes, Active Military
   - O Yes, Reserve Duty
   - O Yes, Retired

34. How did you usually make this trip prior to the SunRail opening (same starting and ending points)?
   - O Used different bus
   - O Walk
   - O Bike
   - O Drove/Picked-up/Dropped-off/Carpooled
   - O Did not make this trip, moved to this area/neighborhood prior to SunRail
   - O Did not make this trip, did not go to this origin / destination location prior to SunRail

34a. If you “Moved to this area since SunRail,” did SunRail impact your decision?
   - O Yes
   - O No

34b. If you “Did not go to this origin / destination since SunRail,” did SunRail impact your decision?
   - O Yes
   - O No

REGISTER TO WIN!
People who submit an accurately completed survey will be entered in a random drawing for one of Ten 30 Day Passes. You must provide your home address at the beginning of the survey and answer all questions to be eligible.

Your Name:________________________________________

Phone Number: (_____) ____________________________

Thank you for your help!
Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS?: (please be specific, ex: 123 W. Main St):
(If you are visiting the Phoenix area, please list the address where you are staying)

______________________________
Street Address
______________________________
City: ____________________ State: ______  Zip: ________

COMING FROM?

1. What type of place are you COMING FROM NOW?
   (the starting place for your one-way trip)
   - Your usual WORKPLACE
   - Other work related
   - College / University (students only)
   - Airport (as an air passenger)
   - Recreation (movies, fishing, etc.)
   - Social visits (friends/relatives)
   - Personal business (bank, post office)
   - Pick up/drop off someone (daycare, school)
   - Your HOME
   - Other:

2. What is the NAME of the place you are coming from now?
   ________________________________________________

3. What is the EXACT ADDRESS of this place?
   (OR intersection if you do not know the exact address: )
   ________________________________________________
   City: ____________________ State: ______  Zip: ________

4. How did you GET FROM the place in Question #1 TO THE VERY FIRST bus or train you used for this one-way trip?
   - Walked all the way: how far did you walk? _______ blocks
   - Walked part of the way (got dropped off and then walked)
   - Bike
   - Wheelchair / Scooter
   - Was dropped off by someone (answer 4a)
   - Drove alone and parked (answer 4a)
   - Drove or rode with others and parked (answer 4a)

4a. Where did you board the first bus or train you used for this one-way trip?
   (Write the nearest intersection / park-and-ride lot / rail station below):
   __________________________________________________

5. Where did you get ON this bus/train?
   Please provide the nearest intersection / station name / park-and-ride lot:
   ________________________________________________

GOING TO?

6. What type of place are you GOING TO NOW?
   (the ending place for your one-way trip)
   - Your usual WORKPLACE
   - Other work related
   - College / University (students only)
   - Airport (as an air passenger)
   - Recreation (movies, fishing, etc.)
   - Social visits (friends/relatives)
   - Personal business (bank, post office)
   - Pick up/drop off someone (daycare, school)
   - Your HOME
   - Other:

7. What is the NAME of the place you are going to now?
   ________________________________________________

8. What is the EXACT ADDRESS of this place?
   (OR intersection if you do not know the exact address: )
   ________________________________________________
   City: ____________________ State: ______  Zip: ________

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus or train you will use for this one-way trip?
   - Walk all the way: how far will you walk? _______ blocks
   - Walk part of the way (will walk then get picked up)
   - Bike
   - Wheelchair / Scooter
   - Be picked up by someone (answer 9a)
   - Get in a parked vehicle & drive alone (answer 9a)
   - Get in a parked vehicle & drive/ride w/others (answer 9a)

9a. Where will you get off the last bus or train you are using for this one-way trip?
   (Write the nearest intersection / park-and-ride lot / rail station below):
   __________________________________________________

10. Where will you get OFF this bus/train?
    Please provide the nearest intersection / station name / park-and-ride lot:
    ________________________________________________

11. INCLUDING THIS BUS/TRAIN, how many TOTAL BUSES/TRAINS will you use to make THIS ONE-WAY TRIP?
    - One, only this bus/train
    - Two
    - Three
    - Four or more

11a. Please list the routes and/or rail stations in the exact order you use them for this one-way trip.

START ➔  ➔  ➔  ➔  ➔  ➔  ➔  ➔  ➔  ➔  ➔ END

1st route/rail station
2nd route/rail station
3rd route/rail station
4th route/rail station
5th route/rail station
OTHER INFORMATION ABOUT THIS TRIP(s)

12. What time did you BOARD this bus/train? _______ : _______ am / pm (circle one)

13. Will you (or did you) make this same trip on exactly the same routes in the opposite direction today?
   ○ No ○ Yes - At what time did/will you leave for this trip in the opposite direction? _______ : _______ am/pm (circle one)

Other Information

14. What kind of fare did you use for this trip?
   ○ All-Day Pass ○ 7-Day Pass ○ 15-Day Pass ○ 31-Day Pass ○ FREE
   ○ ASU U-Pass ○ Employer Subsidized Pass (Platinum Pass) ○ Semester Pass ○ Courtesy Pass
   ○ Full Fare ○ Youth Fare ○ Senior Fare ○ Person with Disability Fare
   ○ Field Trip Pass ○ Dial A Ride ID Card ○ Reduced Fare ○ Other: ____________________

15. How do you usually get transit schedule Information?
   ○ Transit Book ○ Valley Metro website ○ Customer service ○ Posted schedule at bus stop
   ○ Mobile site ○ NextRide ○ Other (specify)_________

ABOUT YOU AND YOUR HOUSEHOLD

16. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles

17. [If #16 is more than NONE] Could you have used one of these vehicles for this trip?
   ○ Yes ○ No

18. Including YOU, how many people live in your household? _______ people

19. Including YOU, how many adults (age 16 and older) live in your household? _______ people

20. Including YOU, how many people in your household are employed full/part-time outside the home? _______ people

21. Are you: (check the one response that BEST describes you)
   ○ Full-time (at least 35hrs per weeks)
   ○ Part-time (less than 35hrs per weeks)
   ○ Not currently employed but seeking work
   ○ Not currently employed and not seeking work
   ○ Homemaker

22. Are you a student? (check the one response that BEST describes you)
   ○ Yes – College/university
   ○ Yes – K - 12th grade
   ○ Yes – vocational/technical/trade school

22a. [If #22 is Yes] Please specify your college/university/school name:________________________________

23. Do you have a valid driver’s license?
   ○ Yes ○ No

24. Are you a United States Veteran?
   ○ Yes ○ No

25. Are you a visitor to the Phoenix area?  ○ Yes ○ No

26. Are you a person with a disability?  ○ Yes ○ No

26a. If #26 is Yes] Which of the following types of disabilities apply, if any?
   ○ Low vision ○ Deaf/hard of hearing ○ Mobility problem-use a wheelchair ○ declined
   ○ Blindness ○ Mental/cognitive impairment ○ Mobility problem-do not use wheelchair ○ Other

27. What is your AGE?
   ○ Under 16 ○ 16-24 ○ 25-34 ○ 35-44 ○ 45-54 ○ 55-64 ○ 65+

28. Are you? (check all that apply)
   ○ American Indian / Alaska Native ○ Asian ○ Black/African American ○ Hispanic/Latino
   ○ Native Hawaiian / Pacific Islander ○ White ○ Other: ____________________

29. What is your gender?  ○ Male ○ Female

30. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2013 before taxes?
   ○ Below $5,000 ○ $5,000 - $9,999 ○ $10,000 - $14,999 ○ $15,000 - $19,999
   ○ $20,000 - $24,999 ○ $25,000 - $29,999 ○ $30,000 - $34,999 ○ $35,000 - $39,999
   ○ $40,000 - $44,999 ○ $45,000 - $49,999 ○ $50,000 - $59,999 ○ $60,000 - $69,999
   ○ $70,000 - $79,999 ○ $80,000 - $89,999 ○ $90,000 - $99,999 ○ $100,000 - $119,999
   ○ $120,000 or more

31. Do you speak a language other than English at home?
   ○ Yes - Which language? ____________
   ○ No

IF YES: How well do you speak English?
   ○ Very Well ○ Well ○ Less than well ○ Not at all

REGISTER TO WIN $100
People who submit an accurately completed survey will be entered in a random drawing for one of TWENTY $100 cash prizes. You must provide your home address at the beginning of the survey to be eligible.

Name: ______________________________________
Phone Number: (_____) _______________________
E-mail address: _______________________________
Dear Metro Rider:

Thank you for taking the time to answer questions about you, your bus service, and how you use it. The information you provide is very important and will be used to guide improvements to bus service in the future.

If possible, please complete this survey on the bus and return it to the surveyors. If you are unable to do so, please complete the survey as soon as possible, and fold it so the mailing label is visible and drop it into any mailbox.

You may also scan the QR code at the end of survey or go to the following website to complete the survey: www.surveygizmo.com/s3/1957304/madison

☐ Check here if you already filled out a survey on another trip. Please continue to complete this form.

### ABOUT YOUR BUS RIDE

1. **What is the ROUTE NUMBER?**
   - Route: ___________________________________

2. **What time did you get on THIS ROUTE?**
   - Time: _________   ☐ AM   ☐ PM

3. **Where did you BEGIN this one-way trip? (only one)**
   - ☐ Home/Residence  ☐ Medical/Dental
   - ☐ Place of Work  ☐ Store/Shopping
   - ☐ College/University  ☐ Restaurant/Eat Out
   - ☐ School (K-12)  ☐ Social/Recreation
   - ☐ Other ____________________________________

   Where was that located?
   - Place name and exact address: ______________________
   - __________________________________________________
   - Or nearest street intersection:
   - On street: _______________________________________
   - At street: _______________________________________

4. **How did you arrive at the FIRST bus stop at the BEGINNING of this trip? (only one)**
   - ☐ Walked _____ blocks
   - ☐ Rode bike
   - ☐ Was dropped off at bus stop
   - ☐ Drove/rode in a vehicle and parked on the street
   - ☐ Drove/rode in a vehicle and parked at park-and-ride or other lot
   - ☐ Used wheelchair/scooter

5. **Did you TRANSFER or CHANGE to THIS ROUTE? (only one)**
   - ☐ No   ☐ Yes

6. **At what bus stop did you get ON THIS ROUTE?**
   - Nearest street intersection:
   - On street: _______________________________________
   - At street: _______________________________________
   - Place Name: _____________________________________

7. **At what bus stop will you get OFF THIS ROUTE?**
   - Nearest street intersection:
   - On street: _______________________________________
   - At street: _______________________________________
   - Place Name: _____________________________________

8. **Will you TRANSFER or CHANGE ROUTES to complete your trip? (only one)**
   - ☐ No   ☐ Yes

9. **How will you get from your LAST bus stop to your FINAL destination for this trip? (only one)**
   - ☐ Walk _____ blocks
   - ☐ Ride bike
   - ☐ Will be picked up at bus stop
   - ☐ Drive/rode in a vehicle parked on the street
   - ☐ Drive/rode in a vehicle parked at park-and-ride lot or other lot
   - ☐ Will use wheelchair/scooter

10. **What is your FINAL destination for this one-way trip? (only one)**
    - ☐ Home/Residence  ☐ Medical/Dental
    - ☐ Place of Work  ☐ Store/Shopping
    - ☐ College/University  ☐ Restaurant/Eat Out
    - ☐ School (K-12)  ☐ Social/Recreation
    - ☐ Other _______________________________________

    Where is that located?
    - Place name and exact address: ______________________
    - __________________________________________________
    - Or nearest street intersection:
    - On street: _______________________________________
    - At street: _______________________________________

11. **How many TRANSFERS or ROUTE CHANGES will you make in total on this trip?**
    - Number of transfers ______

12. **What ROUTES (in order) will you take on this trip?**
    - Route#_____           Route#______           Route#______

13. **How did you PAY for this trip? (only one)**
    - ☐ Cash
    - ☐ Unlimited Ride Pass (student/employee)
    - ☐ 10-Ride Card
    - ☐ 31-Day Pass
    - ☐ 31-Day Pass (low income)
    - ☐ EZ Rider Youth Pass
    - ☐ Other

14. **Did you use a Senior/Disabled or Youth Fare? (only one)**
    - ☐ Senior/Disabled  ☐ Youth  ☐ Neither

15. **How many times per week do you make this same trip using Metro Transit? (only one)**
    - ☐ Less than once a week  ☐ 3-4 trips a week
    - ☐ 1-2 trips a week  ☐ 5 or more trips a week

### ABOUT YOURSELF

16. **What is YOUR age? _____ Years**

17. **What is YOUR gender? (only one)**
   - ☐ Male  ☐ Female  ☐ Do not identify as either

18. **Are YOU employed? (only one)**
   - ☐ No   ☐ Yes

19. **Do YOU have a valid driver’s license? (only one)**
   - ☐ No  ☐ Yes
20. Are YOU a college/university student? ( √ only one)
   [ ] No  [ ] Yes

21. Are YOU of Hispanic, Latino, or Spanish origin? ( √ only one)
   [ ] No  [ ] Yes

22. Of what racial group(s) do YOU consider yourself a member? ( √ all that apply)
   [ ] Black/African-American
   [ ] American Indian/Alaska Native
   [ ] Asian
   [ ] Hawaiian Native/Pacific Islander
   [ ] White
   [ ] Two or more races
   [ ] Other

23. Do YOU speak English well? ( √ only one)
   [ ] No  [ ] Yes

24. Which language(s) do YOU speak at home? ( √ all that apply)
   [ ] English
   [ ] Spanish
   [ ] Hmong/Miao
   [ ] Other

25. How long have YOU used Metro Transit? ( √ only one)
   [ ] Less than 6 mos.  [ ] 6 mos. to 2 years  [ ] 3 years to 5 years  [ ] More than 5 years

---

### ABOUT YOUR HOUSEHOLD

Note: If you are a college student living away from home, do NOT include your parents’ household information. If you are currently staying with room-mates, PLEASE include information about your room-mates when describing your household.

26. Including yourself, how many people live in YOUR household?
   [ ] ________ Number of people in household

27. Including yourself, how many people in YOUR household are employed?
   [ ] ________ Number of workers in household

28. How many motor vehicles (cars, vans, motorbikes, or trucks) are available to people in YOUR household? ( √ only one)
   [ ] 0
   [ ] 1  [ ] 2
   [ ] 3 or more

---

29. Were any of these vehicles available today for YOU to make this trip? ( √ only one)
   [ ] No  [ ] Yes

30. What category best describes the combined total income (before taxes) in 2014 for everyone in YOUR household? ( √ only one)
   [ ] Under $15,000  [ ] $15,000-$34,999  [ ] $35,000-$49,999
   [ ] $40,000-$59,999  [ ] $50,000-$74,999  [ ] $75,000-$99,999
   [ ] $100,000 and more

### WHAT DO YOU THINK?

Circle HOW YOU RATE Metro service overall.

<table>
<thead>
<tr>
<th>N/A</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cleanliness of buses</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b. Personal safety while riding</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c. Personal safety at bus stops</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d. Personal safety at transfer points</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e. Convenience of routes</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f. Driver courtesy</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g. Time waiting for buses</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h. Travel time on buses</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>i. Crowding on buses</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>j. Maps and schedules</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>k. On-line trip planning</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>l. Bus tracking</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>m. Overall satisfaction</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Comments on Metro service:
_____________________________________________________
_____________________________________________________
_____________________________________________________
_____________________________________________________

Please provide your e-mail information if you would like to participate in future Metro Transit research studies. Your e-mail information will be strictly confidential.

Email contact: _________________________________________

Please refold with mailing panel out and tape securely.
**Fall 2016 On-Board Survey**
**Ridership now and over last year, Reliability, Satisfaction, Demographics**
**Final**

**Tablet records:** Surveyor name, device ID, date, survey start and end time

**Surveyor**

Is the rider willing to take the survey?
- If yes, continue
- Only if passenger tells you they took it before: Say: Please take a shorter survey to tell us about this trip (half the length of the other survey).
- If no - refuse, thank and terminate. Refusal is recorded and used for response rate.
- If no – trip too short, thank and terminate. Refusal is recorded and used for response rate.
- Incomplete, started but terminated. Record as incomplete.

**Surveyor**

- Enter route
- Enter direction

**Surveyor**

Does the person age 12 or older speak:
- English
- Spanish
- Some other language

If English or Spanish, go to appropriate survey – long version or short version.

If some other language, turn to first translated page and have respondent answer questions:

A. Language I speak at home:_________________

List of languages is: Vietnamese, Chinese (simplified), Russian, Korean, Japanese, Ukrainian, Romanian, Tagalong, Arabic, Cambodian (Mon-Khmer), Somali

Based on language picked in A, go to next page translated in appropriate language.

B. How well do you speak English?
- Not at all
- Not well
- Well
- Very well

C. Thank you. Please hand the tablet back to the surveyor.

**Introduction**

To help it improve service and the customer experience, TriMet would like to ask you a few questions about your ridership and your satisfaction with its services.

All the answers you give on this survey are completely confidential and will only be used when grouped with the answers of others. You will not be asked for any information identifying who you are.
Surveyor asks the first questions (unless Spanish)

1. How satisfied are you with the trip you are taking now?

(If needed: Would you say satisfied, dissatisfied, or neutral? If not neutral, is that very or somewhat?)
  • Very satisfied
  • Somewhat satisfied
  • Neutral (neither satisfied nor dissatisfied)
  • Somewhat dissatisfied
  • Very dissatisfied
  • Don’t know

Ask if Q1=dissatisfied
Keep on the same page as Q1

2. Why do you feel that way? _____________________

(Note to surveyor: Important - do not give examples, let them answer the question. Probe: Anything else? If they don’t have an answer write in don’t know.)

Surveyor asks the first questions (unless Spanish)

3. Where did you first START current your one-way trip? For instance was it from home, work...
  • Home
  • Work
  • School
  • Recreation
  • Shopping
  • Personal business
  • Visit family/friends
  • Medical appointment/hospital visit
  • Other (specify)

4. Where will you END your current one-way trip? For instance, home, work...
  • Home
  • Work
  • School
  • Recreation
  • Shopping
  • Personal business
  • Visit family/friends
  • Medical appointment/hospital visit
  • Other (specify)

5. Where was the starting location of your trip? That is where you first started, such as home or work, not the TriMet stop or station. Please answer by giving a street and cross-street, or an address, or a landmark (such as Safeway on Hawthorne).___________________
6. Where is the ending location of your trip? Again, not a stop or station but your destination, such as home or work. Please answer by giving a street and cross-street, or an address, or a landmark (such as Safeway on Hawthorne). _________________

7. Thinking back to a year ago, would you say you are now riding TriMet more, the same or less than before?
   - More  → skip to Q14
   - The same  → skip to Q14
   - Less  → DON'T READ  → Try to get answer of more/same/less  → skip to Q14

Ask if less in Q7, then skip to Q10

8. Why are you riding less? DO NOT READ LIST OR SHOW LIST (check all that apply)
   (Note to surveyor: Important - do not give examples, let them answer the question.
   Probe: Anything else? If they don't have an answer check don't know.)

   - Gasoline prices low
   - Home changed
   - Work changed
   - School changed
   - Life change (new child, retired, etc)
   - Telecommute more (work at home more)
   - Take ride hailing services (Uber/Lyft Taxi)
   - On-time issues (reliability)
   - Frequency not enough
   - Crowding issues (want a seat)
   - Span of service not enough (early/late/weekend)
   - Fare prices too high
   - Drive instead (try and get why)
   - Bicycle instead (try and get why)
   - Walk instead (try and get why)
   - Other (specify) ______________
   - Don't know

Ask if more in Q7, then skip to Q12

9. Why are you riding more? DO NOT READ LIST OR SHOW LIST (check all that apply)
   (Note to surveyor: Important - do not give examples, let them answer the question.
   Probe: Anything else? If they don't have an answer check don't know.)

   If they say “drive/bike/walk instead” follow up with – why are you driving/biking/walking instead. We are trying to get at why they switched.

   - Home change
   - Work change
   - School change
   - Lifestyle change (new child, retire, etc)
   - Convenience / ease of use
• Traffic congestion
• Driving not preferred
• Telecommute less (work at home less)
• Take less ride hailing services (Uber/Lyft/taxi)
• Parking too expensive
• Fare prices low (compared to driving/parking)
• Drive less (try and get why)
• Bicycle less (try and get why)
• Walk less (try and get why)
• Other (specify) ______________
• Don't know

Surveyor now hands tablet to passenger

To move to the next questions, swipe across screen or tap arrow at bottom of screen.

If less in Q7 – ask Q10 and Q11 – then skip to Q14

The next questions ask about riding TriMet less now than you did a year ago.

*10. What type of trips, if any, are you taking less of on TriMet? (check all that apply)
• Work
• School
• Recreation
• Shopping
• Personal business
• Visit family/friends
• Medical appointment/hospital visit
• Other (specify)
• Don’t know
• None

*11. What types of transportation, if any, are you using for the trips you used to take on TriMet? (check all that apply)
• Car
• Someone drives me
• Bike
• Walk
• Streetcar
• Carpool
• Uber/Lyft/taxi
• Work at home more often
• Other (specify)
• Don’t know
• None

If more in Q7 - ask Q12 and Q13 - then continue to Q14

These next questions ask about riding TriMet more than you did a year ago.

12. What type of trips, if any, are you taking more of on TriMet? (check all that apply)
• Work
• School
• Recreation
• Shopping
• Personal business
• Visit family/friends
• Medical appointment/hospital visit
• Other (specify)
• Don’t know
• None

13. What types of transportation, if any, are you using less of because you are taking TriMet more? (check all that apply)
• Car
• Someone drives me
• Bicycle
• Walk
• Streetcar
• Carpool
• Uber/Lyft/taxi
• Work at home less often
• Other (specify)
• Don’t know
• None

14. How important is the price of gasoline in your decision to ride or not ride TriMet?
• Very unimportant
• Somewhat unimportant
• Somewhat important
• Very important
• Don’t know

15. How often do you use Lyft, Uber or taxi service?
• Never
• Rarely
• Occasionally
• Frequently
• Don’t know

16. How often do you ride a bicycle for transportation, other than for leisure?
• Never ride a bicycle
• Never ride a bicycle other than for leisure
• Rarely
• Occasionally
• Frequently
• Don’t know

17. If you work outside the home, about how many days per week do you work at home rather than going into the office?
• Don’t work outside the home
18. Which of these categories best describes your current ridership on TriMet?
- Frequent rider – I ride almost every day
- Regular rider – I ride several times a week
- Occasional rider – I ride a couple of times a month
- Infrequent rider – I ride less than once a month
- Don’t know

19. About how long have you been riding TriMet?
- Less than 1 year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- Over 10 years
- Don’t know

20. Overall, how do you feel about the job TriMet is doing? Do you approve or disapprove? Is that strongly or somewhat (approve or disapprove)
- Strongly approve
- Somewhat approve
- Somewhat disapprove
- Strongly disapprove
- Don’t know

21. What is the one thing you would want to see changed to increase your approval of TriMet? (choose one best answer)
- Frequency improved (comes more often)
- Reliability improved (on-time performance better)
- Service expanded (earlier, later, weekends)
- Routes go to more places (more coverage)
- Stops/stations closer to my origin or destination
- Crowding less (get a seat)
- Faster trip
- Transfer less
- Safer trip
- Fare less expensive
- Other (specify)___________________
- Nothing
- Don’t know
22. How would you get to the places you need to go if TriMet was not an option? (check all that apply)
   • Drive my own car, truck, van or motorcycle
   • Purchase a car, truck, van or motorcycle
   • Get rides from someone else
   • Walk
   • Bicycle
   • Use car share services like Zipcar or Car2Go
   • Use services like taxi, Lyft or Uber
   • I would not be able to get to all the places I need to go.
   • Other (specify)
   • Don’t know

23. Do you normally have a car available for your use, either as the driver or as a passenger (not including car share services like Zipcar or Car2Go)?
   • Yes, as the driver
   • Yes, as a passenger only
   • No
   • Don’t know

24. What is your home zip code? ____________

25. What is your age?
   • Under 18
   • 18-24
   • 25-34
   • 35-44
   • 45-54
   • 55-64
   • 65 or more

26. What gender do you identify with?
   • Female
   • Male
   • Transgender
   • Other (specify)

27. What is your race or ethnicity? (check all that apply)
   • Asian/Asian American
   • African American/Black
   • Caucasian/White
   • Hispanic/Latino
   • Middle Eastern or North African
   • Native American Indian
   • Pacific Islander
   • Bi-racial or multi-racial
   • Other (specify)

28. Including yourself, how many people live in your household? _____ (1-10 or more)
29. What was your total annual household income before taxes in 2015?
   - Under $10,000
   - $10,000 - $19,999
   - $20,000 - $29,999
   - $30,000 - $39,999
   - $40,000 - $49,999
   - $50,000 - $59,999
   - $60,000 - $69,999
   - $70,000 - $79,999
   - $80,000 - $89,999
   - $90,000 - $99,999
   - $100,000 - $124,999
   - $125,000 - $150,000
   - Over $150,000
   - Don’t know

30. Do you speak a language other than English at home?
   - Yes
   - No

Keep on same page as Q30

31. If yes, what is that language? ____________________________

Ask if survey is in Spanish

32. How well do you speak English?
   - Not at all
   - Not well
   - Well
   - Very well
RTC 2014 On-Board Transit Survey

Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS: (please be specific, ex: 123 W. Main St):
(If you are visiting the Las Vegas area, please list the hotel name or address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

COMING FROM?
1. What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
   - Place of Work
   - Other work related
   - College / University (students only)
   - School K-12 (students only)
   - Medical / Hospital, non-work
   - Hotel / Casino / Convention Center
   - Shopping / Eating / Dining
   - Recreation / Sightseeing / Sporting Event
   - Airport (passengers only)
   - Your HOME ➔ Go to Question #4
   - Other:

2. What is the NAME of the place you are coming from now?

3. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )
   - City: __________________ State: ______  Zip: ________

4. How did you GET FROM the place in Question #1 TO THE VERY FIRST bus you used for this one-way trip?
   - Walk – how long did you walk? ________ minutes
   - Bike – how long did you bike? ________ minutes
   - Wheelchair / Scooter – how long? ________ minutes
   - Was dropped off by someone (answer 4a)
   - Drove alone and parked (answer 4a)
   - Drove or rode with others and parked (answer 4a)

4a. Where did you board the first bus you used for this one-way trip (Write the nearest intersection / park-and-ride lot below):

5. Where did you get ON this bus? Please provide the nearest intersection / station name / park-and-ride lot:

GOING TO?
6. What type of place are you GOING TO NOW? (the ending place for your one-way trip)
   - Place of Work
   - Other work related
   - College / University (students only)
   - School K-12 (students only)
   - Medical / Hospital
   - Hotel / Casino / Convention Center
   - Shopping / Eating / Dining
   - Recreation / Sightseeing / Sporting Event
   - Airport (passengers only)
   - Your HOME ➔ Go to Question #9
   - Other:

7. What is the NAME of the place you are going to now?

8. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )
   - City: __________________ State: ______  Zip: ________

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus you will use for this one-way trip?
   - Walk – how long will you walk? ________ minutes
   - Bike – how long will you bike? ________ minutes
   - Wheelchair / Scooter – how long? ________ minutes
   - Be picked up by someone (answer 9a)
   - Get in a parked vehicle & drive alone (answer 9a)
   - Get in a parked vehicle & drive/ride w/others (answer 9a)

9a. Where will you get off the last bus you are using for this one-way trip (Write the nearest intersection / park-and-ride lot below):

10. Where will you get OFF this bus? Please provide the nearest intersection / station name / park-and-ride lot:

11. INCLUDING THIS BUS, how many TOTAL BUSES will you use to make THIS ONE-WAY TRIP?
   - One, only this bus
   - Two
   - Three
   - Four or more

11a. Please list the BUS ROUTES in the exact order you use them for this one-way trip.

START ➔ [ ] ➔ [ ] ➔ [ ] ➔ [ ] ➔ [ ] ➔ END

1st Bus Route
2nd Bus Route
3rd Bus Route
4th Bus Route
OTHER INFORMATION ABOUT THIS TRIP

12. What time did you BOARD this bus? _____ : _____ am / pm (circle one)

13. Will you (or did you) make this same trip in exactly the opposite direction today?
   ○ No  ○ Yes - At what time did you leave for this trip in the opposite direction? _____ : _____ am/pm (circle one)

14. How many people (including yourself) are traveling in your group for this one-way trip? ________ people

15. What type of fare did you use for this one-way trip?
   ○ Single Ride  ○ 2-hour pass  ○ 24-hour pass  ○ 30-day pass  ○ U Pass

ABOUT YOU AND YOUR HOUSEHOLD

16. Are you a visitor to the Las Vegas area? ○No  ○ Yes (if YES, please skip to after Q27)

17. How many vehicles (cars, trucks, or motorcycles) are available to your household? ________ vehicles

17a. [If #17 is more than NONE] Could you have used one of these vehicles for this trip? ○Yes  ○No

18. Including YOU, how many people live in your household? ________ people

19. Including YOU, how many people (over age 15) in your household are employed full/part-time? ________ people

20. Are you: (check the one response that BEST describes you)
   ○ Employed full-time  ○ Employed part-time
   ○ Not currently employed but seeking work  ○ Not currently employed and not seeking work
   ○ Retired  ○ Homemaker

21. Are you a student? (check the one response that BEST describes you)
   ○ Not a student  ○ Yes – Full Time college/university
   ○ Yes – Part Time college/university  ○ Yes – vocational/technical/trade school
   ○ Yes – K - 12th grade  ○ Yes – other

21a. [If #21 is Yes] Please specify your college/university/school name:________________________________________

22. Do you have a valid driver’s license? ○Yes  ○ No

23. What is your AGE? ○Under 18  ○18-24  ○25-34  ○35-44  ○45-54  ○55-64  ○65+

24. Are you? (check all that apply)
   ○ American Indian / Alaska Native  ○ Asian  ○ Black/African American  ○ Hispanic/Latino
   ○ Native Hawaiian / Pacific Islander  ○ White  ○ Other: __________________________

25. What is your gender?  ○ Male  ○ Female

26. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2013 before taxes?
   ○ Less than $10,000  ○ $10,000 - $19,999  ○ $20,000 - $29,999
   ○ $30,000 - $39,999  ○ $40,000 - $49,999  ○ $50,000 - $59,999
   ○ $60,000 - $74,999  ○ $75,000 - $99,999  ○ $100,000 or more

27. Do you speak a language other than English at home? ○ No  ○ Yes - Which language? ______________________

27a. [If #27 is Yes] How well do you speak English? ○ Very Well  ○ Well  ○ Less than well  ○ Not at all

REGISTER TO WIN $100

People who submit an accurately completed survey will be entered in a random drawing for one of Ten $100 cash prizes. You must provide your home address at the beginning of the survey to be eligible.

Your Name: _______________________________________
Phone Number: (_____) _________________________
E-mail address: ___________________________________

Thank you for your help!
If you completed this survey before getting off the bus, please return this survey to the survey staff. If you did not have time to complete the survey during your trip, please return it within 24 hours using the postage-paid envelope that was provided.
PSTA needs your help to provide improved bus service in Pinellas County. Please help us serve you better by completing this survey and returning it to the surveyor or any PSTA driver. If you don’t have time to complete the survey during this bus trip, please return it on your next trip. Thank you.

1. What time is it NOW? _____(Hour): _____(Minute) (AM PM) (Please circle one)

This survey is about the ONE-WAY transit trip you are making now!

Example of ONE-WAY Bus Trip

HOME (START) ➔ FIRST BUS ➔ SECOND BUS ➔ WORK (END)

2. What TYPE OF PLACE are you COMING FROM NOW? (Please ✓ the starting place of this ONE-WAY TRIP) (Please ✓ only one)


3. What is the ADDRESS, NAME, OR NEAREST INTERSECTION of the PLACE, BUSINESS, OR BUILDING you are COMING FROM NOW?

Address or Intersection (e.g., 1000 East Bay Drive, US 19 & Gulf to Bay Boulevard)

Name of Place, Business, or Building (e.g., Tyrone Mall)

City State Zip

4. How did you get to the first bus stop for this ONE-WAY TRIP? (Please ✓ only ONE)


# blocks? ______ # miles? ______

4. Was dropped off 5. Rode with someone who parked 6. Other (specify)________________

5. What is the LOCATION OF THE BUS STOP where you GOT ON THE FIRST BUS used on this one-way trip?

Cross Streets_______________________

Transit Center or Park-and-Ride Lot ______________________

(e.g., Williams Park, Ulmerton Park-and-Ride, Gateway Mall)

6. LIST ALL of the BUS ROUTES in the EXACT ORDER you will use to make THIS ONE-WAY TRIP:

FIRST Bus Route ➔ SECOND Bus Route ➔ THIRD Bus Route ➔ FOURTH Bus Route

7. What TYPE OF PLACE are you GOING TO NOW on this ONE-WAY TRIP? (Please ✓ the ending place of this ONE-WAY TRIP) (Please ✓ only ONE)


8. What is the ADDRESS, NAME, OR NEAREST INTERSECTION of the PLACE, BUSINESS, OR BUILDING you are GOING TO NOW?

Address or Intersection (e.g., 1000 East Bay Drive, US 19 & Gulf to Bay Boulevard)

Name of Place, Business, or Building (e.g., Tyrone Mall)

City State Zip

9. After you get off the last bus you will use to complete this ONE-WAY TRIP, how will you get to your FINAL DESTINATION? (Please ✓ only ONE)

1. Walk 2. Bicycle 3. Drive

# blocks? ______ # miles? ______

4. Will be picked up 5. Rode with someone who parked 6. Other (specify)________________

10. What is the LOCATION OF THE BUS STOP where you WILL GET OFF THE LAST BUS on this one-way trip?

Cross Streets_______________________

Transit Center or Park-and-Ride Lot ______________________

(e.g., Williams Park, Ulmerton Park-and-Ride, Gateway Mall)

PLEASE CONTINUE ON BACK OF SURVEY ➔
11. How many working vehicles (cars, motorcycles, trucks, vans) are at your home? (✓ only ONE)
   1. 1  2. 2  3. 3 or more  4. None

12. How would you make this one-way trip if not by bus? (Please ✓ only ONE)
   1. Drive  2. Wouldn’t make trip  3. Other (specify) ________

13. What type of fare did you pay when you GOT ON THIS BUS? (Please ✓ only ONE)
   1. Regular Cash Fare  2. 20-Ride Premium GO Card
   3. 7-Day Unlimited GO Card  4. Passport
   7. 31-Day Unlimited GO Card  8. Other (specify) ___________
   9. Route 100x and 300x

14. On average, how many days a week do you ride the bus?
   1. 1  2. 2  3. 3  4. 4  5. 5  6. 6  7. 7
   8. Once a month or less  9. First time riding

15. Including yourself, how many people live in your home? (✓ only ONE)
   1. 1  2. 2  3. 3  4. 4 or more

16. Do you have a valid driver’s license?
   1. Yes  2. No

17. How many months out of the year do you reside in Pinellas County?
   1. Less than one month  2. 1 to 6 months  3. 6 to 12 months

18. Are you....
   1. Employed full-time (35 hours or more per week)
   2. Employed part-time (less than 35 hours per week)
   3. Not currently employed
   4. Retired

19. Are you a student?
   1. Not a student  2. Yes: Kindergarten through 12th Grade
   3. Yes: College/Technical

20. Which three of the following service improvements would make PSTA better for you to use? (Please ✓ THREE)
   1. More frequent service on existing routes
   2. Bus stop improvements (shelters, benches, better sidewalk access)
   3. Fewer/easier transfers
   4. Later service on existing routes
   5. More weekend service on existing routes
   7. Add new route from ___________ to ___________
   8. Other (specify) ___________

21. How do you prefer to receive information about PSTA services and programs? (✓ all that apply)
   1. PSTA website  2. Printed schedules
   3. PSTA Transfer Centers  4. Call PSTA
   5. Bus signs/shelters  6. Through Work or School

22. Your age is?
   1. 15 or Under  2. 16 to 24  3. 25 to 34  4. 35 to 44
   5. 45 to 54  6. 55 to 64  7. 65 to 74  8. Over 74

23. What is your gender?  1. Male  2. Female

24. What is your race or ethnic heritage? (Please ✓ only ONE)
   1. White  2. Black/African American
   6. Other (specify) ___________

25. What was the range of your total household income for 2011?
   1. Under $5,000  2. $5,000 to $9,999
   3. $10,000 to $14,999  4. $15,000 to $19,999
   5. $20,000 to $24,999  6. $25,000 to $29,999
   7. $30,000 to $39,999  8. $40,000 to $49,999
   9. $50,000 or more

THANK YOU FOR COMPLETING THE SURVEY!
Please take a few moments to help CATS plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

Did you have a MOTOR VEHICLE AVAILABLE to make THIS ONE-WAY TRIP? (If your car is in the shop or someone else is using your car right now, then you did NOT have a vehicle available and must fill in “No.”)

- [ ] Yes
- [ ] No

What is your HOME ADDRESS and PHONE number: (please be specific, ex: 123 W. Main St): (If you are visiting the Charlotte area, please list the address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

*Phone Number  *  We will only call you to confirm these survey responses

COMING FROM?

1. What type of place are you COMING FROM NOW (the starting place for your one-way trip)?
   - [ ] Your HOME → Go to Question #3
   - [ ] Work
   - [ ] College / University (student only)
   - [ ] School (K-12) (student only)
   - [ ] Shopping
   - [ ] Airport (air passenger only)
   - [ ] Doctor’s appointment / hospital visit
   - [ ] Restaurant (eat meal)
   - [ ] Other:

2. What is the NAME of the place you are coming from now?

____________________________________________

3. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )

City: __________ State: ______ Zip: ______

4. How did you GET FROM the place in Question #1 TO THE FIRST bus or train you used for this one-way trip?
   - [ ] Walked ___ short walk (less than 1/2 mi OR less than 10 minutes)
   - [ ] _____ medium walk (1/2 - 1 mile OR 10 - 20 minutes)
   - [ ] _____ long walk (>1 mile OR >20 minutes)
   - [ ] Bicycled ___ short ride (less than 1/2 mi OR less than 5 minutes)
   - [ ] _____ medium ride (1/2 - 2 miles OR 5 - 20 minutes)
   - [ ] _____ long ride (>2 miles OR >20 minutes)
   - [ ] Dropped off by someone
   - [ ] Carpooled and parked
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection

How many people were in the car with you?
   - [ ] One
   - [ ] Two
   - [ ] Three
   - [ ] Four or more
   - [ ] Drove alone and parked
     - Name of Parking Lot OR Intersection

GOING TO?

5. What type of place are you GOING TO NOW (the ending place for your one-way trip)?
   - [ ] Your HOME → Go to Question #7
   - [ ] Work
   - [ ] College / University (student only)
   - [ ] School (K-12) (student only)
   - [ ] Shopping
   - [ ] Airport (air passenger only)
   - [ ] Doctor’s appointment / hospital visit
   - [ ] Restaurant (eat meal)
   - [ ] Other:

6. What is the NAME of the place you are going to now?

____________________________________________

7. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )

City: __________ State: ______ Zip: ______

8. How will you GET TO your destination (listed in Question #5) after you get off the LAST bus or train you will use for this one-way trip?
   - [ ] Walk ___ short walk (less than 1/2 mi OR less than 10 minutes)
   - [ ] _____ medium walk (1/2 - 1 mile OR 10 - 20 minutes)
   - [ ] _____ long walk (>1 mile OR >20 minutes)
   - [ ] Bicycle ___ short ride (less than 1/2 mi OR less than 5 minutes)
   - [ ] _____ medium ride (1/2 - 2 miles OR 5 - 20 minutes)
   - [ ] _____ long ride (>2 miles OR >20 minutes)
   - [ ] Get picked up from
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection
   - [ ] Carpool from
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection
     - Name of Parking Lot OR Intersection

How many people will be in the car with you?
   - [ ] One
   - [ ] Two
   - [ ] Three
   - [ ] Four or more
   - [ ] Drive alone from
     - Name of Parking Lot OR Intersection

Continue
REMEMBER: The following questions are about THIS ONE WAY TRIP you are making NOW:

**THIS BUS**

9. What time did you **BOARD** this bus? _______ : _______ am / pm (circle one)

10. What is the **NEAREST INTERSECTION** where you **BOARDED** this bus?

Street 1 (OR name of place): ____________________________ & Street 2: ____________________________

11. What is the **NEAREST INTERSECTION** where you will **GET OFF** this bus?

Street 1 (OR name of place): ____________________________ & Street 2: ____________________________

12. **INCLUDING THIS BUS**, how many **TOTAL BUSES AND TRAINS** will you use to make **THIS ONE WAY TRIP**?

☐ One, only this bus  ☐ Two  ☐ Three  ☐ Four or more

List the **ROUTES** in the exact order you use them for this one way trip.

<table>
<thead>
<tr>
<th>START</th>
<th>1st Route #</th>
<th>2nd Route #</th>
<th>3rd Route #</th>
<th>4th Route #</th>
<th>END</th>
</tr>
</thead>
</table>

13. Did you / Will you make **THIS TRIP** in **EXACTLY** the opposite direction today?

☐ No  ☐ Yes – what time? _______ : _______ am / pm (circle one)

14. Do you receive a **DISCOUNT** for your **FARE**?

☐ Yes - what kind?  ☐ No

☐ Employer offers pass discount  ☐ Youth/Student discount  ☐ Senior/ADA discount  ☐ Free fare

**OTHER IMPORTANT ITEMS**

15. How many years have you been using public transit in the Charlotte area?

☐ 3 years or more  ☐ Less than 3 years

*If you marked **LESS THAN 3 YEARS**, why did you start using public transit in the Charlotte area? (Check all that apply)*

☐ Moved to the area within the last 3 years  ☐ Started a new job  ☐ Environmental benefits  ☐ Other (specify below)

☐ The LYNX Blue Line light rail service  ☐ Started school  ☐ To save money  ☐ Do not have a car  ☐ Employer offers incentives to ride transit  ☐ Lost my job

16. If bus / rail service was **NOT AVAILABLE**, how would you make this entire one-way trip?

☐ I would not make this trip  ☐ Walk / bike  ☐ Drive myself  ☐ Get dropped off by someone

17. How many **WORKING** vehicles (cars, trucks, or motorcycles) **ARE AVAILABLE** to your household?

☐ None  ☐ One  ☐ Two  ☐ Three  ☐ Four or more

18. **INCLUDING YOU**, how many people **LIVE** in your household? _______ people

19. **INCLUDING YOU**, how many people have a **VALID** driver’s license in your household?

_________ people

20. Do **YOU** have a valid driver’s license?

☐ Yes  ☐ No

21. Are **YOU** a student?

☐ Not a student  ☐ Yes – student, K thru 12th grade (specify school name): ____________________________

☐ Yes – student, other (specify institution name): ____________________________

22. What best describes your current work status:

☐ Employed full-time (at least 35 hours per week)  ☐ Employed part-time (less than 35 hours per week)

☐ Not currently employed, but not retired  ☐ Retired

23. **INCLUDING YOU**, how many people living in your household are **EMPLOYED**? ___ people

24. Which of the following categories **BEST** describes your **TOTAL ANNUAL HOUSEHOLD INCOME** in 2012 before taxes?

☐ Less than $16,000  ☐ $16,000 – $24,999  ☐ $25,000 – $33,999  ☐ $34,000 – $49,999

☐ $50,000 – $59,999  ☐ $60,000 – $74,999  ☐ $75,000 or more

RETURN the **COMPLETED SURVEY** to the **SURVEYOR** OR return it within 24 hours using the provided postage-paid envelope. **Thank you!**
1. ¿Cuál es el propósito principal de su viaje de LLEGADA del día de hoy?

2. ¿En qué estación de Metro-North tomó (tomará) en Manhattan (vaya a la pregunta 3)?

3. ¿En qué estación del metro (vaya a la pregunta 39) salió (salió) de su casa?

4. ¿Cuál es el propósito principal de su viaje de SALIDA del día de hoy?

5. ¿Cuál es el propósito principal de su viaje de SALIDA del día de hoy?

6. ¿Qué tiempo tardó para llegar a esta estación?

7. ¿Cómo llegó hasta la última estación de Metro-North para llegar al destino final?

8. ¿Cómo llegaría desde el trabajo hasta su hogar si no hubiera un tren Metro-North?

9. ¿Cuántas veces al día toma el tren Metro-North? (vaya a la pregunta 39)

10. ¿Cómo llegaré desde la última estación de Metro-North hasta el destino final?

11. ¿Qué estación de Metro-North tomaría el tren para llegar al destino final?

12. ¿Utilizará una MetroCard en su camino al destino final?

13. ¿Cuánto le costó su boleto Metro-North?

14. ¿Cuántas veces ha utilizado Metro-North?

15. ¿Cuántos viajes de LLEGADA ha tomado en Metro-North en los siguientes periodos?

16. ¿Cuántos viajes de SALIDA ha tomado en Metro-North en los siguientes periodos?

17. ¿Dónde compró el boleto para su viaje de LLEGADA del día de hoy?

18. ¿Cuanto (cuánto) le costó el boleto para su viaje de LLEGADA del día de hoy?

19. ¿Cuánto le costó el boleto para su viaje de SALIDA del día de hoy?

20. ¿Cuál es el propósito principal de su viaje de SALIDA del día de hoy?

21. ¿Cuál es el propósito principal de su viaje de LLEGADA del día de hoy?

22. ¿Cuáles son las estaciones de Metro-North que visitó?

23. ¿Cuáles estaciones de Metro-North visitará?

24. ¿Cuál es el propósito principal de su viaje de LLEGADA del día de hoy?

25. ¿Cuál es el propósito principal de su viaje de SALIDA del día de hoy?

26. ¿CÓMO HARÁ EL PAGO DE LA TARIFA DE METRO-NORTH REGULARMENTE?

27. ¿Cuál es el idioma principal que hablan en su casa?
BARTA - Rider Survey - 2011

Dear Customers: We'd like to learn more about you and your travel needs to help BARTA plan its future services. Please read each question and mark the most appropriate answer. Please complete only one survey card during this survey process. Thank you.

1. I got on the bus at ________________________________ (Street Intersection or Address) (City/Town) __________________________ Is this home? Yes No

2. The place I have come from is ________________________________ (Street Intersection or Address) (City/Town) __________________________

3. I am getting off this bus at ________________________________ (Street Intersection or Address) (City/Town) __________________________ Is this home? Yes No

4. The place I am going to is ________________________________ (Street Intersection or Address) (City/Town) __________________________

5. How did you get to this bus? Walked Block(s) Biked Another bus (Route # ) Drive car Will be picked up in car Other

6. After leaving this bus, how will you complete your trip to your final destination? Walk Block(s) Bike Other bus (Route # ) Drive car Will be picked up in car Other

7. How long have you been riding BARTA service? Less than a year 1-2 years 3-4 years 5 or more

8. How did you pay your fare on this bus? Adult Cash Student Cash Transfer Senior Citizen (Free) Persons with Disabilities (Half-Fare) Park-and-Ride Pass 1 Day Anywhere Pass 10-Trip Ticket (Adult) 10-Trip Ticket (Student) 31-Day Pass (Adult) 31-Day Pass (Student) 20-Trip Ticket (MATP)

9. What is the purpose of this trip today? School Work Shopping Personal Business Medical/Dental Social/Recreation Other

10. How do you rate BARTA service for each of the following: Excellent Good Fair Poor

<table>
<thead>
<tr>
<th>Service</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tbody>
<tr>
<td>Buses running on time</td>
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<td>Vehicle Cleanliness</td>
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<td>Fare received for fare charged</td>
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<td>Transfer Center Cleanliness</td>
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</table>

11. How many way bus trips do you make each week? (Count a round trip as two trips) 1 or Less 2-5 Times/Week 6-9 Times/Week 10 or More/Week

12. Which sources of information about BARTA service do you most often use? Select top 3: Bus schedules System Map Drivers Telephone information Transfer Center Internet: bartabus.com Notices in buses Newspapers Radio/TV Word of mouth Phone book Other

13. Compared to last year, you are riding: More Less About the same I am a new rider

14. Could you have made this trip if this service were not available? No Yes, but with inconvenience

15. Do you have a valid driver's license? Yes No

16. Was a car available for this trip? Yes No

17. How many vehicles does your household own? 0 1 2 3 or more

18. Your sex: Male Female Age: ________ years

19. What is your total family income in a year? Under $15,000 $15,000-$24,999 $25,000-$39,999 $40,000-$54,999 $55,000-$69,999 $70,000 and Greater

20. What is your age? 18-24 25-34 35-44 45-54 55-64 65 or older

21. What is your ethnicity? Caucasian African American Asian American Hispanic/Latino (of any race) Native Hawaiian and Other Pacific Islander Some other race Two or more races

22. What is the single most important improvement that you would suggest for BARTA service?

After completing this card, return it to the driver or survey worker. Thank you for your help.
Public Transit Rider Origin–Destination Survey Methods and Technologies

SANDAG 2015 On-Board Transit Survey

Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS? (please be specific, ex: 123 W. Main St):

(If you are visiting the San Diego area, please list the hotel name or address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>ZIP Code</th>
</tr>
</thead>
</table>

COMING FROM?
1. What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
   - Your usual Workplace
   - Other business related (e.g., meeting, delivery)
   - College / University (students only)
   - School K-12 (students only)
   - Medical Service / Hospital (non-work)
   - Shopping
   - Eating / Dining
   - Visit Friend / Family
   - Recreation / Sightseeing
   - Major Sporting Event, Concert, or Conference
   - Escorting / Accompanying someone

2. What is the NAME of the place you are coming from now?

3. What is the EXACT STREET ADDRESS of this place? (OR Intersection if you do not know)

4. How did you GET FROM the place in Questions #1-3 TO THE VERY FIRST bus / train / Trolley you used for this one-way trip?
   - Walk – how long? # minutes (go to Q5)
   - Bike – how long? # minutes (go to Q5)
   - Wheelchair – how long? # minutes (go to Q5)
   - Skateboard – how long? # minutes (go to Q5)
   - Was dropped off by someone (answer 4a)
   - Drives alone and parked (answer 4a)
   - Drives with others and parked (answer 4a)
   - Carshare (i.e. car2go, Zipcar, etc.) (answer 4a)
   - Taxi, Uber, Lyft, etc. (answer 4a)
   - Free Shuttle (answer 4a)
   - Other Specify__________________

4a. Where did you park/get dropped off before the FIRST bus / train / Trolley you used for this one-way trip (Nearest intersection / Park & Ride lot below):

GOING TO?
5. What type of place are you GOING TO NOW? (the ending place for your one-way trip)
   - Your usual Workplace
   - Other business related (e.g., meeting, delivery)
   - College / University (students only)
   - School K-12 (students only)
   - Medical Service / Hospital (non-work)
   - Shopping
   - Eating / Dining
   - Visit Friend / Family
   - Recreation / Sightseeing
   - Major Sporting Event, Concert, or Conference
   - Escorting / Accompanying someone

6. What is the NAME of the place you are going to now?

7. What is the EXACT STREET ADDRESS of this place? (OR Intersection if you do not know)

8. How will you GET TO your destination (listed in Questions #5-7) after you get off the LAST bus / train / Trolley you will use for this one-way trip?
   - Walk – how long? # minutes (go to Q9)
   - Bike – how long? # minutes (go to Q9)
   - Wheelchair – how long? # minutes (go to Q9)
   - Skateboard – how long? # minutes (go to Q9)
   - Be picked up by someone (answer 8a)
   - Get in a parked vehicle & drive alone (answer 8a)
   - Get in a parked vehicle & drive with others (answer 8a)
   - Carshare (i.e. car2go, Zipcar, etc.) (answer 8a)
   - Taxi, Uber, Lyft, etc. (answer 8a)
   - Free Shuttle (answer 8a)
   - Other Specify__________________

8a. Where did you park/get dropped off after the LAST bus / train / Trolley you are using for this one-way trip (Nearest intersection / Park & Ride lot below):

9. Did you transfer FROM another bus/train/Trolley BEFORE getting on this bus/train/Trolley?  
   - Yes  
   - No

10. Where did you GET ON THIS bus / train / Trolley?  
    Please provide the nearest intersection / station name / Park&Ride lot:

11. Where will you GET OFF THIS bus / train / Trolley?  
    Please provide the nearest intersection/station name / Park&Ride lot:

12. Will you transfer TO another bus/train/Trolley AFTER getting off this bus/train/Trolley?  
    - Yes  
    - No

13. Please list the SYSTEM and BUS / TRAIN / TROLLEY ROUTES (e.g., MTS Route 10, Trolley Blue Line,  
    Breeze Route 316, Sprinter, Coaster, Coaster Connection Route 444) in the exact order you use them for this one-way trip:

START  
1st Route  
2nd Route  
3rd Route  
4th Route  
END
OTHER INFORMATION ABOUT THIS TRIP

14. What time did you GET ON this bus/train/Trolley? _______ : _______ a.m. / p.m. (circle one)

15. What type of fare did you use for this one-way trip?
   - One-way fare
   - Regional Day Pass
   - Regional Plus Day Pass
   - SPRINT/BREEZE Day Pass
   - Regional Monthly Pass
   - Rapid Express Regional Monthly Pass
   - SPRINT/BREEZE Monthly Pass
   - COASTER Monthly - 1 Zone
   - COASTER Monthly - 2 Zone
   - COASTER Monthly – 3 Zone
   - COASTER S/D/M Monthly
   - College Pass – Please name college
   - Other ___

15b. Did you receive any of the following special fare discounts for your trip today? (check only one)
   - None
   - Senior (Age 60+)
   - Disabled
   - Medicare Recipient
   - Youth (Ages 6-18)

16. Will you (or did you) make this same trip using the same transit routes in exactly the opposite direction today? O No O Yes - At what time did/will you leave for this trip in the opposite direction? _______ : _______ am/pm (circle one)

17. Since you most recently left your home (or the place you are staying in the San Diego area) and the next time you will return home (or the place you are staying), did you or will you... (check all that apply)
   - Work
   - Go to school
   - Go shopping
   - Buy a meal/beverage
   - Visit friend/relative or attend a religious/social event
   - Other errands
   - Other (please specify): ____________________

17a. [If #17 is WORK] Provide Address ________________________________________________________

17b. [If #17 is SCHOOL] Provide School Name ________________________________________________

18. Are you a resident of?
   - San Diego County
   - Orange, Riverside, Imperial County
   - Mexico
   - Other

19. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles

19a. [If #19 is ONE OR MORE] Could you have used one of these vehicles to complete this trip? O Yes O No

20. Including YOU, how many people live in your household? _______ people

21. Including YOU, how many people (over age 15) in your household are employed full/part-time? _______ people

22. How many persons are traveling with you on this trip from the same origin to destination? _______ people

22a. [If #22 is ONE OR MORE] How many of these people are members of your household? _______ people

23. What is your employment status? (check the one response that BEST describes you)
   - Employed full-time (at least 35 hrs/wk)
   - Employed part-time (less than 35 hrs/wk)
   - Not currently employed, but seeking work
   - Not currently employed, and not seeking work
   - Retired
   - Homemaker

(IF YOU ARE EMPLOYED:
23a. Does your employer pay all or part of your transit fare? O Yes (all cost) O Yes (some cost) O None of the cost

24. What is your student status? (check the one response that BEST describes you)
   - Not a student
   - Yes – Full-time college/university
   - Yes – Part-time college/university
   - Yes – K-8th grade
   - Yes – 9th-12th grade
   - Yes – Vocational/technical/trade school
   - Yes – Other

25. Do you have a valid driver’s license? O Yes O No

26. What is your year of birth? _______ year

27. What is your Race / Ethnicity? (check all that apply)
   - American Indian / Alaska Native
   - Asian
   - Black/African American
   - Hispanic/Latino
   - Native Hawaiian / Pacific Islander
   - White
   - Other: ____________________

28. What is your gender? O Male O Female

29. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2014 before taxes?
   - $14,999 or less
   - $15,000 - $19,999
   - $20,000 - $24,999
   - $25,000 - $29,999
   - $30,000 - $34,999
   - $35,000 - $39,999
   - $40,000 - $44,999
   - $45,000 - $49,999
   - $50,000 - $59,999
   - $60,000 - $64,999
   - $65,000 - $74,999
   - $75,000 - $79,999
   - $80,000 - $84,999
   - $90,000 - $94,999
   - $100,000 - $149,999
   - $150,000 or above

30. Do you speak a language other than English at home? O No O Yes - Which language? ____________________

30a. [If #30 = Yes] How well do you speak English? O Very well O Well O Not very well O Not at all

31. How many days a week do you ride public transit? O Less than once a week O # Days _______

32. How do you rate public transit service in your area? O Good O Average O Poor

REGISTER TO WIN $100
People who submit an accurately completed survey will have the option of being entered in a random drawing for one of ten $100 gift cards. You must provide your home address at the beginning of the survey to be eligible.

Thank you for your help!
If you completed this survey before getting off the bus/train/Trolley, please return your completed survey to the survey staff. If you did not have time to complete the survey during your trip, please request an envelope and return it within 24 hours to be entered into the contest.
COTA On-Board Transit Survey

Route Code: ____________ Time: ______ am / pm Interviewer: ______ Serial #: ________

Please take a few moments to complete this important survey. Your input will be used to plan transportation improvements to transit service in the Central Ohio area. All information will be kept strictly confidential.

HOME Address: ____________________________ Zip: _____________
City: ________________________ State: ____________

<table>
<thead>
<tr>
<th>COMING FROM?</th>
<th>GOING TO?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What type of place are you COMING FROM now (the starting place for your one-way trip)?</td>
<td>5. What type of place are you GOING TO now (the ending place for your one-way trip)?</td>
</tr>
<tr>
<td>○ Your usual WORKPLACE</td>
<td>○ Shopping</td>
</tr>
<tr>
<td>○ Other business related</td>
<td>○ Other business related</td>
</tr>
<tr>
<td>○ College / University (students only)</td>
<td>○ College / University (students only)</td>
</tr>
<tr>
<td>○ Airport (as an air passenger)</td>
<td>○ School (K-12)</td>
</tr>
<tr>
<td>○ Recreation / sightseeing</td>
<td>○ Airport (as an air passenger)</td>
</tr>
<tr>
<td>○ Medical appointment / doctor’s visit</td>
<td>○ Recreation / sightseeing</td>
</tr>
<tr>
<td>○ Social visits (friends/relatives)</td>
<td>○ Medical appointment / doctor’s visit</td>
</tr>
<tr>
<td>○ Personal business (bank, post office)</td>
<td>○ Social visits (friends/relatives)</td>
</tr>
<tr>
<td>○ Pick up/drop off someone (daycare, school)</td>
<td>○ Personal business (bank, post office)</td>
</tr>
<tr>
<td>○ Your HOME \n Go to Question #4</td>
<td>○ Pick up/drop off someone (daycare, school)</td>
</tr>
<tr>
<td>○ Other: ________________________</td>
<td>○ Your HOME \n Go to Question #8</td>
</tr>
</tbody>
</table>

2. What is the NAME of the place you are coming from now?

3. What is the EXACT STREET ADDRESS of this place?

OR Intersection if street address is not known: ____________________________ & ____________________________
City: ____________________________ Zip: _____________

4. How did you get from the place in Question #1 to the very FIRST bus you used for this one-way trip?
| ○ Walk - how many blocks did you walk? | ○ Walk - how many blocks did you walk? |
| ○ Bike | ○ Bike |
| ○ Wheelchair/scooter | ○ Wheelchair/scooter |
| ○ Was dropped off by someone going someplace else – answer 4a | ○ Be picked up by someone – answer 8a |
| ○ Drove alone and parked – answer 4a | ○ Get in a parked vehicle & drive alone – answer 8a |
| ○ Drove or rode with others and parked – answer 4a | ○ Get in a parked vehicle & drive/ride with others – answer 8a |
| ○ Other: ________________________ | ○ Other: ________________________ |

4a. Where did you get dropped-off or park your vehicle?
Write the nearest intersection/park-n-ride lot below: ____________________________ & ____________________________

5. Where will you get OFF this bus?
Write the nearest intersection/park-n-ride lot below: ____________________________ & ____________________________

6. Where will you get picked-up or get your vehicle?
Write the nearest intersection/park-n-ride lot below: ____________________________ & ____________________________

THIS BUS

9. Approximately what time did you board this bus? Hour/Minute: ______ am / pm

10. Where did you get ON this bus?

11. Where did you get OFF this bus?

TRANSFERS

(Answer the following transfer questions based on your current one-way trip between the places listed in Questions 1 and 5 above.)

12. How many bus transfers DID you make between the place you are COMING FROM (in Question 1) and this bus?
<table>
<thead>
<tr>
<th>○ none</th>
<th>○ one</th>
<th>○ two</th>
<th>○ three</th>
</tr>
</thead>
</table>
12a. [If you had 1 or more transfers] Which route did you board FIRST on this one-way trip? ____________
12b. [If you had 2 or more transfers] Which route did you board SECOND on this one-way trip? ____________
12c. [If you had 3 or more transfers] Which route did you board THIRD on this one-way trip? ____________

13. How many bus transfers WILL you make AFTER you get off this bus on your way to the place you are GOING TO (in Question 5)?
<table>
<thead>
<tr>
<th>○ none</th>
<th>○ one</th>
<th>○ two</th>
<th>○ three</th>
</tr>
</thead>
</table>
13a. [If you will make 1 or more transfers] Which route will you board NEXT on this one-way trip? ____________
13b. [If you will make 2 or more transfers] Which route will you board SECOND on this one-way trip? ____________
13c. [If you will make 3 or more transfers] Which route will you board LAST on this one-way trip? ____________
14. How many other persons are traveling with you on this trip from the place you are COMING FROM (in Question 1) to the place you are GOING TO (in Question 5)? _______ people

14a. [If #14 is more than "0".] How many of these people are members of your household? _______ people

15. Will you (or did you) make this same trip in exactly the opposite direction today?
   ○ Yes  - At what time did/will you leave for this trip in the opposite direction? _______ am/pm  ○ No

16. Since you most recently left your home (or the place you are currently staying in the Central Ohio area) and the next time you will return home (or the place you are staying), did you or will you... (check all that apply)
   ○ go to work  ○ go shopping  ○ buy a meal/beverage  ○ go to school  ○ do other errands  ○ Other (please specify): __________________________

OTHER IMPORTANT ITEMS

17. On average, how many days per week do you use public transportation?
   ○ none  ○ one  ○ two  ○ three  ○ four  ○ five  ○ six  ○ seven

18. How did you pay for your trip today?
   ○ Cash Fare  ○ All Day Pass  ○ 1-trip ticket  ○ 2-trip ticket  ○ 5-trip ticket  ○ 10-trip ticket
   ○ 7-Day Pass  ○ 31-Day Pass  ○ Columbus Public/Metro School Student ID  ○ OSU/CCAD College ID  ○ Other: _______

19. Did you receive any of the following special fare discounts for your trip today? (check one)
   ○ None  ○ Seniors/Key/ADA  ○ Student (9-12)  ○ Student (College)  ○ Child 48" tall and over, under 12 years old
   ○ Child under 48" tall accompanied by adult  ○ Other: __________________________

20. Are you a resident of the Central Ohio area?  ○ Yes  ○ No

21. How many WORKING vehicles (cars, trucks, or motorcycles) are available to your household?
   ○ None  ○ One  ○ Two  ○ Three  ○ Four or more

21a. [If #21 is more than NONE] Could you have used one of these vehicles to complete this trip?  ○ Yes  ○ No

22. Including YOU, how many people live in your household? _______ people

23. Including YOU, how many people (over age 15) in your household are employed full-time or part-time? _______ people

24. Are you: (check the one response that BEST describes you)
   ○ Employed full-time  ○ Employed part-time
   ○ Not currently employed but seeking work  ○ Retired
   ○ Not currently employed and not seeking work  ○ Homemaker

25. Are you a student? (check the one response that BEST describes you)
   ○ Not a student  ○ Yes – Full-Time college/university (specify institution’s name): __________________________
   ○ Yes – student thru 12th grade  ○ Yes – Part Time college/university (specify institution’s name): __________________________
   ○ Yes – other (specify institution’s name): __________________________

26. Do you have a valid driver’s license?  ○ Yes  ○ No

27. Do you have an ADA certified physical disability or other disability that limits your mobility?
   ○ Yes – ADA Certified disability  ○ Yes – other disability  ○ No


29. Are you? (check all that apply)
   ○ Asian  ○ Hispanic/Latino  ○ Somali  ○ American Indian or Alaska Native
   ○ White/Caucasian  ○ Black/African American  ○ Other: __________________________

30. What is your gender?  ○ Male  ○ Female

31. Which of the following categories BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2012 before taxes?
   ○ Less than $10,000  ○ $10,000-$14,999  ○ $15,000-$24,999  ○ $25,000-$49,999  ○ $50,000-$74,999  ○ $75,000 +

32. Do you speak a language other than English at home?  ○ Yes  ○ No

33. Do you participate in the pre-tax transit pass program or other discounted transit pass program offered through your workplace?  ○ Yes  ○ No

34. Which of the following do you use to get information on COTA schedules? (check all that apply)
   ○ COTA website www.cota.com  ○ Google Transit  ○ Mobile Phone App  ○ TXT 4 NXT
   ○ Paper timetables  ○ COTA Call Center (228-1776)  ○ Other COTA information  ○ Other COTA item: __________________________

35. In what month and year did you start riding COTA? Month: ___________ Year: ___________

REGISTER TO WIN $100
People who submit an accurately completed survey will be entered in a random drawing for one of TEN $100 cash prizes.
You must provide your home address at the beginning of the survey to be eligible.
Your Name: ___________________________ Phone Number: (_____) _______________

Thank you for your help!
If you completed this survey before getting off the bus, please return this survey to the survey staff. If you did not have time to complete the survey during your trip, please return it within 24 hours using the postage-paid envelope that was provided.
Periodically, Metro asks transit riders to complete a survey to gather information about how people use the system and rider perception of our services. This is a voluntary survey. If you agree to take the survey, please answer all the questions and return the form today to the surveyor or to the bus driver on your next Metro trip. If you would like to enter into a drawing for one of four $25 gift cards or one of five 30-day passes, please provide your contact information in the box at the end.

The following questions are about the one-way trip you are making now. Example of a one-way trip:

![Diagram of a one-way trip]

Thanks for your help!

### Rider Survey 2017

1. **Where are you coming from?**
   - [ ] Medical Appointment/ Hospital Visit
   - [ ] School (K-12)
   - [ ] Personal/Social/Recreational Visit
   - [ ] Home
   - [ ] Work
   - [ ] College or University

2. **What is the address of the place you are coming from?**
   - [ ] Street # 1
   - [ ] Street # 2
   - [ ] Street Name
   - [ ] Cross Street 1
   - [ ] Cross Street 2
   - [ ] Zip Code

3. **How did you get to the bus stop to board the bus?**
   - [ ] Walked/Wheelchair/ Other Device
   - [ ] Rode with someone else who parked near the bus stop
   - [ ] Bicycle
   - [ ] Drove
   - [ ] Dropped off by someone/Uber/ taxi/rideshare

4. **Where did you board the bus?**
   - [ ] Street # 1
   - [ ] Street # 2
   - [ ] Cross Street 1
   - [ ] Cross Street 2
   - [ ] Zip Code

5. **Will you transfer to another bus?**
   - [ ] Yes
   - [ ] No

6. **Enter the bus route numbers**
   - Bus Route # 1
   - Bus Route # 2
   - Bus Route # 3

7. **Where are you going?**
   - [ ] Medical Appointment/ Hospital Visit
   - [ ] School (K-12)
   - [ ] Personal/Social/Recreational Visit
   - [ ] Home
   - [ ] Work
   - [ ] College or University

8. **What is the address of the place you are going to?**
   - [ ] Street # 1
   - [ ] Street # 2
   - [ ] Street Name
   - [ ] Cross Street 1
   - [ ] Cross Street 2
   - [ ] Zip Code

9. **How would you get to your final destination after you get off the bus?**
   - [ ] Walk/Wheelchair/ Other Device
   - [ ] Ride with someone else who parked near the bus stop
   - [ ] Bicycle
   - [ ] Drove
   - [ ] Dropped off by someone/Uber/ taxi/rideshare

10. **Where did you get-off the bus?**
    - [ ] Street # 1
    - [ ] Street # 2
    - [ ] Cross Street 1
    - [ ] Cross Street 2
    - [ ] Name of Place/Landmark

11. **How many working vehicles (cars, trucks, and motorcycles) are available in your household?**
    - [ ] 0
    - [ ] 1
    - [ ] 2
    - [ ] 3 or more

12. **Could you have used one of these vehicles to make THIS TRIP today?**
    - [ ] Yes
    - [ ] No

13. **Including yourself, how many people live in your household?**
    - [ ] 1
    - [ ] 2
    - [ ] 3
    - [ ] 4
    - [ ] 5 or more

14. **What is the combined annual income for your household?**
    - [ ] Less than $15,000
    - [ ] $15,000 - $24,999
    - [ ] $25,000 - $34,999
    - [ ] $35,000 - $49,999
    - [ ] $50,000 - $74,999
    - [ ] $75,000 or more
    - [ ] Do not know/Prefer not to answer

15. **What is your age?**
    - [ ] 18 years and under
    - [ ] 18 - 24 years
    - [ ] 25 - 34 years
    - [ ] 35 - 54 years
    - [ ] 55 - 64 years
    - [ ] 65 years and over

16. **What is your gender?**
    - [ ] Male
    - [ ] Female

17. **What is your race or ethnicity?**
    - [ ] Black/African American
    - [ ] White/Non-Hispanic
    - [ ] Hispanic/Latino(a)
    - [ ] Asian
    - [ ] American Indian
    - [ ] Other

18. **How long have you been riding Metro?**
    - [ ] Less than 6 months
    - [ ] 1 - 2 years
    - [ ] 3 - 5 years
    - [ ] 6 - 12 months
    - [ ] More than 5 years

19. **How often do you ride Metro in the Omaha area?**
    - [ ] Less than once per month
    - [ ] 1 or 2 days per week
    - [ ] 3 - 4 days per week
    - [ ] 1 or 2 days per week
    - [ ] More than 5 days per week
    - [ ] This is my first time

20. **How do you usually pay your fare? (mark one box)**
    - [ ] Cash Fare
    - [ ] 10 Ride Card
    - [ ] 30 Day Pass
    - [ ] Pass Program
    - [ ] Adult
    - [ ] Student
    - [ ] Senior/Disability
    - [ ] Cash
    - [ ] Credit Card/Debit Card
    - [ ] Online Purchase (Using online bank account, PayPal, credit card, etc.)
    - [ ] Other

21. **What is your preference for purchasing your metro ticket or pass? (check all that apply)**
    - [ ] Receiving Ride Alerts
    - [ ] Knowing location of the bus relative to your bus stop
    - [ ] Making a transfer within the Metro bus system is easy
    - [ ] Metro bus stops are easily accessible for pedestrians/bikers

22. **Using your smart phone or other mobile device, would you be interested in:**
    - [ ] Yes
    - [ ] No
    - [ ] Unsure
    - [ ] N/A

23. **Do you agree or disagree with the following statements:**
    - [ ] Strongly agree
    - [ ] Agree
    - [ ] No opinion
    - [ ] Disagree
    - [ ] Strongly disagree

24. If you would like to be entered into a drawing for one of four $25 gift cards or one of five 30-day passes, please provide your contact information.

   **Phone Number**
   **Email**
Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS? (please be specific, ex: 123 W. Main St):

(If you are visiting the Salt Lake City area, please list the hotel name or address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

**COMING FROM?**

1. What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
   - Work
   - College / University (students only)
   - School K-12 (students only)
   - Medical Service / Hospital (non-work)
   - Shopping
   - Recreation / Sightseeing / Restaurant
   - Social Visit / Church / Personal
   - Personal business or errands
   - Airport (passengers only)
   - Your HOME \(\rightarrow\) Go to Question #4
   - Other: ____________________

2. What is the NAME of the place you are coming from now?

3. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address:)

   City: ____________ State: ________ Zip: ____________

4. How did you GET FROM the place in Questions #1-3 TO THE VERY FIRST bus or train you used for this one-way trip?
   - Walk
   - Bike
   - Wheelchair
   - Was dropped off by someone (answer 4a)
   - Drove alone and parked (answer 4a)
   - Drove or rode with others and parked (answer 4a)
   - Uber, Lyft, etc. (answer 4a)

4a. Where did you board the FIRST bus / train you used for this one-way trip? (Nearest intersection / Park-n-Ride lot):

**GOING TO?**

5. What type of place are you GOING TO NOW? (the ending place for your one-way trip)
   - Work
   - College / University (students only)
   - School K-12 (students only)
   - Medical Service / Hospital (non-work)
   - Shopping
   - Recreation / Sightseeing / Restaurant
   - Social Visit / Church / Personal
   - Personal business or errands
   - Airport (passengers only)
   - Your HOME \(\rightarrow\) Go to Question #8
   - Other: ____________________

6. What is the NAME of the place you are going to now?

7. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address:)

   City: ____________ State: ________ Zip: ____________

8. How will you GET TO your destination (Qs #5-7) after you get off the LAST bus or train you will use for this one-way trip?
   - Walk
   - Bike
   - Wheelchair
   - Be picked up by someone (answer 8a)
   - Get in a parked vehicle & drive alone (answer 8a)
   - Get in a parked vehicle & drive/ride w/others (answer 8a)
   - Uber, Lyft, etc. (answer 8a)

8a. Where will you get off the LAST bus / train you are using for this one-way trip? (Nearest intersection / Park-n-Ride lot):

9. Did you transfer FROM another bus or train BEFORE getting on this bus? ○ Yes ○ No

10. Where did you GET ON THIS bus? Please provide the nearest intersection / station name / Park-n-Ride lot:

11. Where will you GET OFF THIS bus? Please provide the nearest intersection / station name / Park-n-Ride lot:

12. Will you transfer TO another bus or train AFTER getting off this bus? ○ Yes ○ No

13. Please list the BUS and TRAIN ROUTES in the exact order for this one-way trip.

   START \(\rightarrow\) 1st Route \(\rightarrow\) 2nd Route \(\rightarrow\) 3rd Route \(\rightarrow\) 4th Route \(\rightarrow\) END
OTHER INFORMATION ABOUT THIS TRIP

14. What time did you board this bus? _______ : _______ am/pm (circle one)

15. What fare payment methods were used for this one-way trip? (select all that apply)
   - Cash
   - Bus tokens
   - One-Way/Round Trip Ticket
   - U of U Electronic Pass (Tap On)
   - Other Electronic Fare Payment (Tap On)
   - FAREPAY
   - Medicaid Punch Card
   - Free Fare Zone
   - Other: ____________________

16. Will you (or did you) make this same trip using the same transit routes in exactly the opposite direction today? ○ No ○ Yes - At what time did/will you leave for this trip in the opposite direction? _______ : _______ am/pm (circle one)

17. How often do you ride UTA? ○ 7 days per week ○ 6 days per week ○ 5 days per week ○ 4 days per week ○ 3 days per week ○ 2 days per week ○ 1 day per week ○ Less than once per week ○ First time riding

18. Did you have another option to make this trip today? ○ Yes - I could have driven, carpooled, biked, taxi, Uber, etc. ○ No - Riding UTA or walking was my only option

ABOUT YOU AND YOUR HOUSEHOLD

19. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles
   19a. [If #19 is more than NONE] Could you have used one of these vehicles for this trip? ○ Yes ○ No
   19b. [If #19 is NONE] Are you planning to buy a car as soon as you are able? ○ Yes ○ No

20. Including YOU, how many people live in your household? _______ people

21. Including YOU, how many people (over age 15) in your household are employed full/part-time? _______ people

22. How many children under age 5 are you traveling with today? _______ people

23. What is your employment status? (check the one response that BEST describes you)
   ○ Employed full-time
   ○ Employed part-time
   ○ Self-Employed (full or part-time)
   ○ Homemaker
   ○ Retired
   ○ Not currently employed

24. What is your student status? (check the one response that BEST describes you)
   ○ Not a student
   ○ Yes – Full or Part-time College/university
   ○ Yes – K-12th grade
   ○ Yes – Other: ____________________

25. Do you have a disability that limits the kinds of transportation you use? ○ Yes ○ No

26. Do you have a valid driver’s license? ○ Yes ○ No

27. Do you have a smartphone (e.g. iPhone, Android / Windows Phone, Blackberry, etc.)? ○ Yes ○ No

28. What is your age? ○ Under 16 ○ 16-18 ○ 18-24 ○ 25-34 ○ 35-44 ○ 45-54 ○ 55-64 ○ 65+

29. What is your race / ethnicity? (check all that apply)
   ○ American Indian / Alaska Native
   ○ Asian
   ○ Black/African American
   ○ Hispanic/Latino
   ○ Native Hawaiian / Pacific Islander
   ○ White
   ○ Other: ____________________

30. What is your gender? ○ Female ○ Male

31. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2014 before taxes?
   ○ Less than $10,000 ○ $10,000 - $14,999 ○ $15,000 - $19,999 ○ $20,000 - $24,999 ○ $25,000 - $29,999 ○ $30,000 - $49,999 ○ $50,000 - $74,999 ○ $75,000 - $99,999 ○ $100,000 - $149,999 ○ $150,000 - $199,999 ○ $200,000 - $249,999 ○ $250,000 or above

32. Do you speak a language other than English at home? ○ No ○ Yes - Which language? _____________
   32a. [If #32 is Yes] How well do you speak English? ○ Very Well ○ Well ○ Less than well ○ Not at all

Please provide your contact info in the event that we need to contact you to better understand your answers.

Your Name: ___________________________________
Phone Number: (_____) _______________________
**ABOUT ME**

**What is your age?**
- Under 18
- 18 to 21
- 22 to 34
- 35 to 44
- 45 to 64
- 65 or over

**Do you currently have a valid driver’s license?**
- Yes
- No

**How many usable vehicles are in your household?**
- 0
- 1
- 2
- 3 or more

**What is your gender?**
- Man
- Woman
- Prefer not to say

**How do you self-identify by race?**
(Check all that apply.)
- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White
- Other (specify)
- Prefer not to say

**Are you Hispanic or Latino/Latina?**
- Yes
- No
- Prefer not to say

**How many people are in your household?**
___________ (include yourself)

**What is your current household income?**
- Less than $14,500
- $14,500 to $28,999
- $29,000 to $43,499
- $44,500 to $57,999
- $58,000 to $75,999
- $76,000 to $108,499
- $108,500 to $151,999
- $152,000 or more
- Prefer not to say

**Are you generally able to understand basic directions spoken or written in English?**
- Always
- Often
- Sometimes
- Never
- Prefer not to say

**In what language do you prefer to receive information about riding the MBTA?**
- English
- Other (specify) _________________

---

The MBTA needs your participation.

The MBTA is required to survey riders every five years to identify rider demographics and travel patterns. All answers are confidential.

Please take a few minutes to complete this census.

The MBTA will use the results of this census to plan future service and to make sure service is provided fairly.

To fill out the census:
Go online to www.mbta.com/census or use this form, and either return it to a survey distributor or drop it in the mail (no stamp needed).

Does this look familiar?
If you have previously completed the Rider Census online or on paper, please do not fill it out again.

Estimated completion time: 5 to 10 minutes

Thank you!

Solicite esta encuesta en español.

Peça uma cópia deste questionário em português.

Nhờ podi pedi ês pesquisa na Creolo di Cabo Verde.

索取本調查之繁體中文版

索取本調查之簡體中文版

Demandez ce questionnaire en français.

Yêu cầu phiếu khảo sát bằng tiếng Việt.
Please tell us about the most recent one-way trip that you made using the MBTA. Please include the entire trip from your start location to your destination.

**Date of Trip (MM/DD/YY) ______ / ______ / ______

**MY TRIP STARTED AT...**

- [ ] My home  
- [ ] My work  
- [ ] My school  
- [ ] Shopping  
- [ ] Personal errand (bank, daycare, etc.)  
- [ ] Medical or other appointment  
- [ ] Social/recreational/entertainment activity  
- [ ] Religious/civic/volunteer activity  
- [ ] Intercity transfer (airport/Amtrak/intercity bus)  
- [ ] Other   ___________________________________________

Nearest intersection ___________________________ at ___________________________.

City or town ___________________________ Zip code ________

[ ] I left this location at ___ AM  
[ ] I left this location at ___ PM

**HOW I GOT TO THE FIRST MBTA SERVICE**

- [ ] Walked  
- [ ] Bicycled  
- [ ] Drove alone  
- [ ] Carooled and parked  
- [ ] Dropped off by:  
  - [ ] Personal vehicle  
  - [ ] Taxi/rideshare company  
  - [ ] Private shuttle/other transit

How long did it take? ________ minutes

**MONTHLY PASS**

- [ ] Local Bus  
- [ ] LinkPass (Subway + Bus)  
- [ ] Student (M-5, M-7), Youth Pass  
- [ ] SeniorLinkPass  
- [ ] Commuter Rail Zone ______
- [ ] mTicket Zone ______
- [ ] Boat  
- [ ] Inner Express Bus  
- [ ] Outer Express Bus

**PAY-PER-RIDE**

- [ ] CharlieCard (plastic)  
- [ ] CharlieTicket (paper)  
- [ ] Full cash fare on board  
- [ ] mTicket (single/multi-ride)  
- [ ] 10-ride/single-ride ticket  
- [ ] Student reduced fare (S-Card)  
- [ ] Senior reduced fare  
- [ ] Disability reduced fare  
- [ ] 1-day LinkPass  
- [ ] 7-day LinkPass  
- [ ] Blind Access Card  
- [ ] Other   ___________________________________________

**HOW I PAID MY FARE**

- [ ] Bus (Route #)   ___________________________
- [ ] Silver Line (#/name)   ___________________________
- [ ] Mattapan Trolley   ___________________________
- [ ] Red Line   ___________________________
- [ ] Orange Line   ___________________________
- [ ] Blue Line  
- [ ] Green Line in subway, or at Lechmere or Science Park  
- [ ] Green Line on surface:  
  - [ ] B  
  - [ ] C  
  - [ ] D  
  - [ ] E  
- [ ] Commuter Rail Line (name)  
- [ ] Commuter/Ferry Boat Line (name)

Exited or transferred at: ___________________________ stop/station/dock

**TRANSFER ?  Yes  No**

**SECOND MBTA SERVICE**

- [ ] Bus (Route #)   ___________________________
- [ ] Silver Line (#/name)   ___________________________
- [ ] Mattapan Trolley   ___________________________
- [ ] Red Line   ___________________________
- [ ] Orange Line   ___________________________
- [ ] Blue Line  
- [ ] Green Line in subway, or at Lechmere or Science Park  
- [ ] Green Line on surface:  
  - [ ] B  
  - [ ] C  
  - [ ] D  
  - [ ] E  
- [ ] Commuter Rail Line (name)  
- [ ] Commuter/Ferry Boat Line (name)

Exited or transferred at: ___________________________ stop/station/dock

**TRANSFER ?  Yes  No**

**THIRD MBTA SERVICE**

- [ ] Bus (Route #)   ___________________________
- [ ] Silver Line (#/name)   ___________________________
- [ ] Mattapan Trolley   ___________________________
- [ ] Red Line   ___________________________
- [ ] Orange Line   ___________________________
- [ ] Blue Line  
- [ ] Green Line in subway, or at Lechmere or Science Park  
- [ ] Green Line on surface:  
  - [ ] B  
  - [ ] C  
  - [ ] D  
  - [ ] E  
- [ ] Commuter Rail Line (name)  
- [ ] Commuter/Ferry Boat Line (name)

Exited or transferred at: ___________________________ stop/station/dock

**TRANSFER ?  Yes  No**

**HOW I TOOK THE FIRST MBTA SERVICE**

- [ ] Walked  
- [ ] Bicycled  
- [ ] Drove alone  
- [ ] Carooled and parked  
- [ ] Dropped off by:  
  - [ ] Personal vehicle  
  - [ ] Taxi/rideshare company  
  - [ ] Private shuttle/other transit

How long did it take? ________ minutes

**MY TRIP ENDED AT...**

- [ ] Home  
- [ ] Work  
- [ ] School  
- [ ] Shopping  
- [ ] Personal errand (bank, daycare, etc.)  
- [ ] Medical or other appointment  
- [ ] Social/recreational/entertainment activity  
- [ ] Religious/civic/volunteer activity  
- [ ] Intercity transfer  
- [ ] Other   ___________________________________________

Nearest intersection ___________________________ at ___________________________.

City or town ___________________________ Zip code ________

[ ] I arrived at this location at ___ AM  
[ ] I arrived at this location at ___ PM

**I MAKE THIS TRIP ON THE MBTA...**

- [ ] 6-7 days a week  
- [ ] 5 days a week  
- [ ] 3-4 days a week  
- [ ] 1-2 days a week  
- [ ] 1-3 days a month  
- [ ] Less than once a month

Please check all that apply:

- [ ] Walk  
- [ ] Bicycle  
- [ ] Drive alone  
- [ ] Drive or ride in a carpool  
- [ ] Take a taxi or use a rideshare company  
- [ ] Take a private shuttle/other transit  
- [ ] Different MBTA service   ___________________________
- [ ] Other   ___________________________________________

**OTHER WAYS I MAKE THIS TRIP**

- [ ] Uber/Lyft  
- [ ] Taxi  
- [ ] Private shuttle/other transit

Do you sometimes make this trip another way?  
[ ] Yes  
[ ] No

**AND NOW, ABOUT YOU...**
Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS: (please be specific, ex: 123 W. Main St):  
(If you are visiting the San Francisco/Oakland area, please list the address where you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

COMING FROM?
1. What type of place are you COMING FROM NOW?  
   (The starting place for your one-way trip)  
   □ Your usual WORKPLACE  
   □ Work related  
   □ Your HOME  
   □ Hotel Residence (Visitor Only)  
   □ Social or recreational  
   □ Shopping  
   □ School (K-12) (student only)  
   □ College or University (student only)  
   □ Airport (airline passenger only)  
   □ Medical / dental  
   □ Dining / coffee  
   □ Escorting others pick up/drop off  
   □ Personal business  
   □ Other: ____________________

2. What is the NAME of the place you are coming from now?

3. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )  
   ______________________________________________  ______________________ _________ _________  
   Street Address      City    State  Zip Code

4. How did you GET FROM the place in Question #1 TO THE VERY FIRST bus or train you used for this one-way trip?  
   □ Walked all the way: how far did you walk? _______ blocks  
   □ BIKE  
       □ BIKE SHARE  
       □ Personal Bike  
   □ Was dropped off using Uber, Lyft, or similar service (answer 4a)  
   □ Taxi (answer 4a)  
   □ Was dropped off by someone – not a service (answer 4a)  
   □ Drove alone and parked (answer 4a)  
   □ Drove or rode with others and parked (answer 4a)

4a. Where did you get ON the first bus or train you used for this one-way trip (Write the nearest intersection / park-and-ride lot / rail station below):

5. Where did you get ON this bus?  
   Please provide the nearest intersection / stop or station name / park-and-ride lot:

GOING TO?
6. What type of place are you GOING TO NOW?  
   (The ending place for your one-way trip)  
   □ Your usual WORKPLACE  
   □ Work related  
   □ Your HOME  
   □ Hotel Residence (Visitor Only)  
   □ Social or recreational  
   □ Shopping  
   □ School (K-12) (student only)  
   □ College or University (student only)  
   □ Airport (airline passenger only)  
   □ Medical / dental  
   □ Dining / coffee  
   □ Escorting others (children, elderly)  
   □ Personal business  
   □ Other: ____________________

7. What is the NAME of the place you are going to now?

8. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )  
   ______________________________________________  ______________________ _________ _________  
   City: ______________  State: ______  Zip: ________

9. How will you GET TO your destination (listed in Question #6) after you get off the LAST bus or train you will use for this one-way trip?  
   □ Walked all the way: how far did you walk? _____ blocks  
   □ BIKE  
       □ BIKE SHARE  
       □ Personal Bike  
   □ Dropped off using Uber, Lyft, or similar service (answer 9a)  
   □ Taxi (answer 9a)  
   □ Dropped off by someone – not a service (answer 9a)  
   □ Drive alone (answer 9a)  
   □ Drive or ride with others (answer 9a)

9a. Where will you get off the last bus or train you are using for this one-way trip (Write the nearest intersection / park-and-ride lot / rail station below):

10. Where will you get OFF this bus?  
    Please provide the nearest intersection / stop or station name / park-and-ride lot:

11. INCLUDING THIS BUS, how many TOTAL BUSES/TRAINS will you use to make THIS ONE-WAY TRIP?  
   □ One, only this bus  
   □ Two  
   □ Three  
   □ Four or more

11a. Please list the routes and/or rail stations in the exact order you use them for this one-way trip.  
   START → → → → → END
   1st route #/rail station 2nd route/rail station 3rd route/rail station 4th route/rail station 5th route/rail station
OTHER INFORMATION ABOUT THIS TRIP(s)

12. What time did you BOARD this bus? _______ : _______ am / pm (circle one)

12a. Will you (or did you) make this same trip on exactly the same routes in the opposite direction today?
○ No  ○ Yes - At what time did you leave for this trip in the opposite direction? _______ : _______ am / pm (circle one)

13. What kind of fare did you pay for this trip?
○ Transbay  ○ Local

14. What fare category did you pay?
○ Adult  ○ Senior  ○ Disabled  ○ Youth  ○ Other

15. How did you pay for this one-way trip?
BY CLIPPER  BY CASH OR PAPER  BY OTHER
○ Cash value on Clipper  ○ Cash (coins and bills)  ○ EasyPass
○ Monthly pass on Clipper  ○ Day Pass bought earlier in day  ○ RTC Monthly Sticker
○ Transfer from different Agency  ○ Other: _______
○ Other Clipper: _______  ○ Day Pass purchased on this bus

15a. How many total AC Transit did or will you use today (include this bus in total count for the day)

Other Information

16. How many days in a typical week do you ride AC Transit?
○ 7 days/week  ○ 5 days/week  ○ 2-4 days/week  ○ 1 day/week  ○ 2-3 times/month  ○ 1 time/month  ○ Occasionally

17. Outside of AC Transit, which of the following do you use to get around in a week? (mark all that apply)
○ Drive myself  ○ Get dropped off  ○ Carpool  ○ Casual Carpool  ○ Uber/Lyft/similar rideshare  ○ Biking  ○ Walking  ○ Private car  ○ BART  ○ Ferry  ○ Other Public Transit  ○ Other: _______

18. If you were unable to pay with cash today, which of the following payment methods might you use? (mark all that apply)
○ Clipper card w/cash  ○ I've added at Walgreens/BART station/etc  ○ Clipper card with cash value  ○ I auto-load from a bank account  ○ App on my phone w/value  ○ I added at a grocery store/drugstore/etc  ○ Paid using a pre-paid card  ○ I purchased at a store  ○ Credit/debit card  ○ Smartphone app like ApplePay/GoogleWallet  ○ If I couldn't pay cash I wouldn't ride AC Transit

ABOUT YOU AND YOUR HOUSEHOLD

19. How many working vehicles (auto or motorcycles) are available to your household? _______ vehicles

20. Do you have a smart phone?
○ Yes  ○ No

20a. Do you have enough data to use the internet today? Yes  No

21. Including YOU, how many people live in your household? _______ people

22. Including YOU, how many adults (age 16 and older) that are employed full or part time live in your household? _______ people

23. Are you a student? (check the one response that BEST describes you)
○ Not a student  ○ Yes – Full Time college/university  ○ Yes – K - 12th grade  ○ Yes – Part Time college/university  ○ Yes – vocational/technical/trade school  ○ Yes – other

23a. [If #23 is Yes] Please specify your college/university/school name and address:

24. What year were you born? _______

25. Are you? (check all that apply)
○ Latino/Hispanic  ○ Black/African American  ○ Asian  ○ Middle Eastern/North African  ○ American Indian / Alaska Native  ○ Native Hawaiian / Pacific Islander  ○ White  ○ Other: _______

26. What is your gender?  ○ Male  ○ Female  ○ Other Gender: _______

27. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2016 before taxes?
○ Below $10,000  ○ $10,000-$19,999  ○ $20,000-$24,999  ○ $25,000-$34,999  ○ $35,000-$49,999  ○ $50,000-$59,999  ○ $60,000-$74,999  ○ $75,000-$99,999  ○ $100,000-$149,999  ○ $150,000-$199,999  ○ $200,000-$299,999  ○ $300,000-$399,999  ○ $400,000-$499,999  ○ $500,000 or more  ○ Not provided

28. Do you speak a language other than English at home?  ○ No  ○ Yes - Which language: _______

IF YES: How well do you speak English?  ○ Very Well  ○ Well  ○ Less than well  ○ Not at all

WIN A PRIZE!!!!!!

People who submit an accurately completed survey will be entered in a random drawing for a chance to win a $399 Visa gift card.

Name: ______________________________________

Phone Number: (_____) _______________________

E-mail address: _______________________________
RTD 2015 On-Board Transit Survey

(for office use only) Route Code: ___________ Dir: N S E W Time: ___________ Interviewer: ___________ Serial #: ___________

Please take a few moments to help plan for your transit needs by filling out this survey.

All personal information will be kept strictly confidential and WILL NOT be shared or sold.

What is your HOME ADDRESS? (please be specific, ex: 123 W. Main St):
(If you are visiting the Denver area, please list the hotel name or address you are staying)

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>State</th>
<th>Zip Code</th>
</tr>
</thead>
</table>

COMING FROM?
1. What type of place are you COMING FROM NOW? (the starting place for your one-way trip)
   ○ Work
   ○ College / University (students only)
   ○ School K-12 (students only)
   ○ Medical Service / Hospital (non-work)
   ○ Shopping
   ○ Recreation / Sightseeing / Restaurant
   ○ Social Visit / Church / Personal
   ○ Airport (passengers only)
   ○ Your HOME ➔ Go to Question #4
   ○ Other:

2. What is the NAME of the place you are coming from now?

3. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )

   City: ___________ State: _______ Zip: ___________

4. How did you GET FROM the place in Questions #1-3 TO THE VERY FIRST bus / train you used for this one-way trip?
   ○ Walk – how long did you walk? ________ # minutes
   ○ Bike – how long did you bike? ________ # minutes
   ○ Wheelchair – how long? ________ # minutes
   ○ Was dropped off by someone (answer 4a)
   ○ Drove alone and parked (answer 4a)
   ○ Drove or rode with others and parked (answer 4a)
   ○ Car share (e.g. Car2go, etc.) (answer 4a)
   ○ Taxi, Uber, Lyft, etc. (answer 4a)

4a. Where did you board the FIRST bus / train you used for this one-way trip? (Nearest intersection / Park-n-Ride lot):

GOING TO?
5. What type of place are you GOING TO NOW? (the ending place for your one-way trip)
   ○ Work
   ○ College / University (students only)
   ○ School K-12 (students only)
   ○ Medical Service / Hospital (non-work)
   ○ Shopping
   ○ Recreation / Sightseeing / Restaurant
   ○ Social Visit / Church / Personal
   ○ Airport (passengers only)
   ○ Your HOME ➔ Go to Question #8
   ○ Other:

6. What is the NAME of the place you are going to now?

7. What is the EXACT ADDRESS of this place? (OR Intersection if you do not know the exact address: )

   City: ___________ State: _______ Zip: ___________

8. How will you GET TO your destination (listed in Questions #5-7) after you get off the LAST bus / train you will use for this one-way trip?
   ○ Walk – how long will you walk? ________ # minutes
   ○ Bike – how long will you bike? ________ # minutes
   ○ Wheelchair – how long? ________ # minutes
   ○ Be picked up by someone (answer 8a)
   ○ Get in a parked vehicle & drive alone (answer 8a)
   ○ Get in a parked vehicle & drive/ride with others (answer 8a)
   ○ Car share (e.g. Car2go, etc.) (answer 8a)
   ○ Taxi, Uber, Lyft, etc. (answer 8a)

8a. Where will you get off the LAST bus / train you are using for this one-way trip? (Nearest intersection / Park-n-Ride lot):

9. Did you transfer FROM another bus/train BEFORE getting on this bus/train? ○ Yes ○ No

10. Where did you GET ON THIS bus / train? Please provide the nearest intersection / station name / Park-n-Ride lot:

11. Where will you GET OFF THIS bus / train? Please provide the nearest intersection / station name / Park-n-Ride lot:

12. Will you transfer TO another bus/train AFTER getting off this bus/train? ○ Yes ○ No

13. Please list the BUS / TRAIN ROUTES in the exact order you use them for this one-way trip (Including the Free MallRide and Free MetroRide)

<table>
<thead>
<tr>
<th>START ➔</th>
<th>1st Route</th>
<th>2nd Route</th>
<th>3rd Route</th>
<th>4th Route</th>
<th>END</th>
</tr>
</thead>
</table>

(Continue)
OTHER INFORMATION ABOUT THIS TRIP

14. What time did you BOARD this bus? _______: _______ am / pm (circle one)

15a. What fare payment methods were used for this one-way trip? (select all that apply)
   - Cash
   - Transfer
   - Day Pass
   - Other
   - Monthly Pass
   - 10 Ride
   - Free
   - College Pass
   - Eco Pass
   - Disabled
   - Senior (Over 65)
   - Student (age 6-19)

15b. What type of fare was this? (choose only one answer)
   - Regular
   - Disabled
   - Senior (Over 65)
   - College Pass
   - Eco Pass
   - Free
   - Other __________________________

16. Will you (or did you) make this same trip using the same transit routes in exactly the opposite direction today?
   - No
   - Yes - At what time did/will you leave for this trip in the opposite direction? _______:_______ am/pm (circle one)

17. If RTD services were not available, how would you have made this trip?
   - Would have walked
   - Would have driven myself
   - Would have ridden with someone else
   - Would have bicycled
   - Would have taken a taxi, Uber, Lyft, etc.
   - Would not have made this trip

ABOUT YOU AND YOUR HOUSEHOLD

18. Are you a visitor to the Denver area?  
   - No
   - Yes (if YES, please skip to after Q29)

19. How many vehicles (cars, trucks, or motorcycles) are available to your household? _______ vehicles

19a. [If #19 is more than NONE] Could you have used one of these vehicles for this trip?
   - Yes
   - No

20. Including YOU, how many people live in your household? _______ people

21. Including YOU, how many people (over age 15) in your household are employed full/part-time? _____ people

22. Are you: (check the one response that BEST describes you)
   - Employed full-time
   - Employed part-time
   - Not currently employed
   - Retired
   - Homemaker

23. Are you a student? (check the one response that BEST describes you)
   - Not a student
   - Yes – Full or Part-time College/university
   - Yes – K - 12th grade
   - Yes – other __________________________

24. Do you have a valid driver’s license?  
   - Yes
   - No

25. What is your AGE?  
   - Under 16
   - 16-19
   - 20-34
   - 35-50
   - 65+

26. Are you? (check all that apply)
   - American Indian / Alaska Native
   - Asian
   - Black/African American
   - Hispanic/Latino
   - Native Hawaiian / Pacific Islander
   - White
   - Other: __________________________

27. What is your gender?  
   - Male
   - Female

28. Which of the following BEST describes your TOTAL ANNUAL HOUSEHOLD INCOME in 2014 before taxes?
   - Less than $15,000
   - $15,000 - $19,999
   - $20,000 - $24,999
   - $25,000 - $29,999
   - $30,000 - $34,999
   - $35,000 - $39,999
   - $40,000 - $44,999
   - $45,000 - $49,999
   - $50,000 - $74,999
   - $75,000 - $99,999
   - $100,000 - $149,999
   - $150,000 or above

29. Do you speak a language other than English at home?  
   - No
   - Yes - Which language? __________________________

29a. [If #29 is Yes] How well do you speak English?
   - Very Well
   - Well
   - Less than well
   - Not at all

REGISTER TO WIN $100
People who submit an accurately completed survey will be entered in a random drawing for one of Ten $100 Visa gift cards. You must provide your home address at the beginning of the survey to be eligible.

Your Name: __________________________
Phone Number: (____) _________________________
E-mail address: __________________________

Thank you for your help!
If you completed this survey before getting off the bus, please return this survey to the survey staff. If you did not have time to complete the survey during your trip, please request an envelope and return it within 24 hours to be entered into the contest.
Synthesis Questionnaire Results
C-3 Table C-1. Modes surveyed.
C-3 Table C-2. Frequency of conducting origin-destination surveys, by organization size.
C-3 Table C-3. How on-board, or intercept, survey data are used.
C-4 Table C-4. Primary justification for on-board, or intercept, survey.
C-4 Table C-5. Funding sources.
C-4 Table C-6. Entity responsible for conducting surveys.
C-4 Table C-7. Regional coordination.
C-5 Table C-8. Frequency of use of major survey methods.
C-5 Table C-9. Permutations of survey methods employed by respondents.
C-5 Table C-10. Frequency of use of specific survey methods.
C-6 Table C-11. Reasons why tablets were used.
C-6 Table C-12. Type of validation strategies used.
C-6 Table C-13. Change in cost with tablets.
C-6 Table C-14. Tablet survey application development.
C-7 Table C-15. Time periods surveyed.
C-7 Table C-16. Paper survey distribution locations.
C-7 Table C-17. Recruitment techniques for tablet and other interview-based survey.
C-8 Table C-18. Topics addressed.
C-8 Table C-19. Primary source of survey questions.
C-8 Table C-20. Modifications to source questions.
C-8 Table C-21. Method for capturing transfers.
C-9 Table C-22. Strategies to accommodate people with disabilities.
C-9 Table C-23. Total number of languages in which surveys were available.
C-9 Table C-24. Survey length.
C-9 Table C-25. Survey cost by agency size.
C-10 Table C-26. Costs per completed survey.
C-10 Table C-27. Change in cost compared to previous survey efforts.
C-10 Table C-28. Level of geography for which survey results can be summarized.
C-10 Table C-29. Change in response rates from survey to survey.
C-10 Table C-30. How minors were incorporated in the survey sample.
C-11 Table C-31. Response base method.
C-11 Table C-32. Average response rates by survey method.
C-11 Table C-33. Underrepresented population groups.
C-12 Table C-34. Standards for completion.
C-12 Table C-35. Number of completed surveys by agency size.
C-12 Table C-36. Common survey expansion factors.
C-13 Table C-37. Prevalence of the utilization of “big data.”
C-13 Table C-38. Impact of “big data” on survey techniques.
C-13 Table C-39. Big data challenges.
Table C-1. Modes surveyed.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local bus, including electric bus and trolley bus</td>
<td>47</td>
<td>92</td>
</tr>
<tr>
<td>Commuter bus</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Streetcar or light rail</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>Bus rapid transit</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Commuter rail</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Heavy rail (subway, metro, rapid transit)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Paratransit or demand-response service</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Ferry</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Other (express bus)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>51</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-2. Frequency of conducting origin-destination surveys, by organization size.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>All (60)</th>
<th>Small (19)</th>
<th>Medium (14)</th>
<th>Large (10)</th>
<th>Very Large (14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing/rolling basis</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>29%</td>
</tr>
<tr>
<td>Annually</td>
<td>7%</td>
<td>16%</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Every 2 to 5 years</td>
<td>40%</td>
<td>26%</td>
<td>50%</td>
<td>70%</td>
<td>14%</td>
</tr>
<tr>
<td>Every 6 to 10 years</td>
<td>23%</td>
<td>32%</td>
<td>14%</td>
<td>10%</td>
<td>36%</td>
</tr>
<tr>
<td>&lt; Every 10 years</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>Never</td>
<td>7%</td>
<td>11%</td>
<td>7%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Other</td>
<td>15%</td>
<td>16%</td>
<td>21%</td>
<td>10%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Table C-3. How on-board, or intercept, survey data are used.

<table>
<thead>
<tr>
<th>Data Use</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-range planning</td>
<td>42</td>
<td>74</td>
</tr>
<tr>
<td>Modeling or forecasting</td>
<td>39</td>
<td>68</td>
</tr>
<tr>
<td>Route planning</td>
<td>39</td>
<td>68</td>
</tr>
<tr>
<td>Title VI planning</td>
<td>38</td>
<td>67</td>
</tr>
<tr>
<td>Schedule planning</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>Federal or state grant requirements</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>57</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.
Table C-4. Primary justification for on-board, or intercept, survey.

<table>
<thead>
<tr>
<th>Primary Justification</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal compliance</td>
<td>25</td>
<td>48</td>
</tr>
<tr>
<td>Model development</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Planning</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Understand customer needs</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Understand travel patterns</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Analyze service changes</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Ridership demographics</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>NTD reporting</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Complete operations analysis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Advise system redesign</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Time had elapsed, due for a new one</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total respondents</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-5. Funding sources.

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local funds</td>
<td>25</td>
<td>51</td>
</tr>
<tr>
<td>Federal funds</td>
<td>23</td>
<td>47</td>
</tr>
<tr>
<td>MPO funding</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>State funds</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total respondents</td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-6. Entity responsible for conducting surveys.

<table>
<thead>
<tr>
<th>Government Entity</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional transit agency</td>
<td>49</td>
<td>86</td>
</tr>
<tr>
<td>MPO</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>City</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Regional organization</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total respondents</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

Table C-7. Regional coordination.

<table>
<thead>
<tr>
<th>Coordinated with Other Transit Agencies or MPO?</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>Yes</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td>Total respondents</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>
### Table C-8. Frequency of use of major survey methods.

<table>
<thead>
<tr>
<th>Survey Method Utilized</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>34</td>
<td>67</td>
</tr>
<tr>
<td>Tablet</td>
<td>27</td>
<td>53</td>
</tr>
<tr>
<td>Online</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Two-step</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total respondents</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

### Table C-9. Permutations of survey methods employed by respondents.

<table>
<thead>
<tr>
<th>Methods Used</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Method</td>
<td>30</td>
<td>59%</td>
</tr>
<tr>
<td>Paper alone</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>Tablet alone</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td>Two-step alone</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Two or More Methods</td>
<td>20</td>
<td>39%</td>
</tr>
<tr>
<td>Paper + tablet</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Paper + online</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Paper + tablet + two-step</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Paper + online + two-step</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Paper + online + tablet</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Tablet + online</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total respondents</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

### Table C-10. Frequency of use of specific survey methods.

<table>
<thead>
<tr>
<th>Specific Method Used</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper survey: Staff handout survey, self-administered and returned to survey staff</td>
<td>29</td>
<td>57</td>
</tr>
<tr>
<td>Paper survey: Handout paper survey, self-administered and mailed back</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Paper survey: Interviews administered by survey staff (e.g., read aloud) and recorded on paper</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Paper survey: Seat drops (paper surveys left on seats and mailed back or returned at designated location)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Tablet survey: Handout tablet survey, self-administered and returned to survey staff</td>
<td>27</td>
<td>53</td>
</tr>
<tr>
<td>Tablet survey: Interviews administered by survey staff (e.g., read aloud) and recorded on tablets</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Two-step survey: Short on-board survey followed by staff-administered survey over the phone</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Two-step survey: Short on-board survey followed by self-administered web survey</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Online survey: Handout invitation to online survey (with URL), self-administered and submitted</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Online survey: Seat-drop invitation to online questionnaire (with URL), self-administered and submitted</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Online survey: Advertised via stations, buses, or social media</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Online survey: E-mail invitations</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Online: Paper survey with option to submit online</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total respondents</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.
Table C-11. Reasons why tablets were used.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved data quality due to automated validation of responses</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>Shortened wait period between completion of field survey and availability of data for analysis</td>
<td>17</td>
<td>61</td>
</tr>
<tr>
<td>Reduced labor costs related to data cleaning and analysis</td>
<td>17</td>
<td>61</td>
</tr>
<tr>
<td>Reduced labor and materials costs related to printing and paper handling</td>
<td>14</td>
<td>50</td>
</tr>
<tr>
<td>Enabled a new approach to survey design</td>
<td>11</td>
<td>39</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-12. Type of validation strategies used.

<table>
<thead>
<tr>
<th>Validation Used</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistency of responses (e.g., transit route used was consistent with stops used)</td>
<td>19</td>
<td>66</td>
</tr>
<tr>
<td>Addresses</td>
<td>18</td>
<td>62</td>
</tr>
<tr>
<td>Reasonableness of responses was validated (e.g., number of vehicles available in household less than 20)</td>
<td>17</td>
<td>59</td>
</tr>
<tr>
<td>Stop locations</td>
<td>16</td>
<td>55</td>
</tr>
<tr>
<td>Responses were required for each question (e.g., to prevent missed questions)</td>
<td>12</td>
<td>41</td>
</tr>
<tr>
<td>No automatic response validation</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-13. Change in cost with tablets.

<table>
<thead>
<tr>
<th>Change in Cost Compared to Paper Methods</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher costs per completed survey</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>Lower costs per completed survey</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>I do not know</td>
<td>15</td>
<td>54</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Table C-14. Tablet survey application development.

<table>
<thead>
<tr>
<th>Application Source</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom app developed by a hired consultant or survey firm</td>
<td>23</td>
<td>82</td>
</tr>
<tr>
<td>Custom app developed in-house</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Third-party app</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>
Table C-15.  Time periods surveyed.

<table>
<thead>
<tr>
<th>Days and Time Periods Surveyed</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday: All time periods</td>
<td>48</td>
<td>94</td>
</tr>
<tr>
<td>Weekday: Only peak and midday</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Weekday: Only peak periods</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weekday: Only peak periods in peak direction</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weekday: Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Saturday: All time periods</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Saturday: Only peak and midday</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Saturday: Only peak periods</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Saturday: only peak periods in peak direction</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Saturday: Other</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunday: All time periods</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>Sunday: Only peak and midday</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Sunday: Only peak periods</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunday: Only peak periods in peak direction</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunday: Other</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total respondents</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-16.  Paper survey distribution locations.

<table>
<thead>
<tr>
<th>Survey Distribution Location</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, only distributed on a select number of trips</td>
<td>22</td>
<td>55</td>
</tr>
<tr>
<td>Yes, distributed on all trips on board the vehicle</td>
<td>11</td>
<td>28</td>
</tr>
<tr>
<td>Yes, distributed continuously but at station/stop instead of on vehicle</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>No, other:</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Total respondents</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

Table C-17.  Recruitment techniques for tablet and other interview-based survey.

<table>
<thead>
<tr>
<th>Recruitment Technique</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult riders selected on a random basis</td>
<td>27</td>
<td>79</td>
</tr>
<tr>
<td>All adult riders on a surveyed trip approached</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>Total respondents</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
Table C-18.  Topics addressed.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip purpose</td>
<td>51</td>
<td>96</td>
</tr>
<tr>
<td>Rider demographics</td>
<td>50</td>
<td>94</td>
</tr>
<tr>
<td>Type of fare used</td>
<td>46</td>
<td>87</td>
</tr>
<tr>
<td>Means of access and egress</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>Frequency of transit use</td>
<td>41</td>
<td>77</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>Rider support for policy and planning proposals</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-19.  Primary source of survey questions.

<table>
<thead>
<tr>
<th>Source of Questions</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions drawn from organization’s previous on-board survey</td>
<td>26</td>
<td>51</td>
</tr>
<tr>
<td>Questions written specifically for this on-board survey</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>Questions from MPO</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Questions from another organization’s on-board survey were used</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Questions from the Transit Performance Monitoring System (TPMS)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Questions from other existing source used</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Table C-20.  Modifications to source questions.

<table>
<thead>
<tr>
<th>Modification to Standard Questions</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source questions were not modified</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>Source questions were modified</td>
<td>26</td>
<td>79</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Table C-21.  Method for capturing transfers.

<table>
<thead>
<tr>
<th>Method</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>All stops where boarding and alighting occurred during the trip were captured</td>
<td>26</td>
<td>51</td>
</tr>
<tr>
<td>The locations where the first boarding and final alighting occurred were captured</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>
Table C-22. Strategies to accommodate people with disabilities.

<table>
<thead>
<tr>
<th>Accessibility Strategy</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveyors were trained on how to interact with people with disabilities</td>
<td>21</td>
<td>54</td>
</tr>
<tr>
<td>None</td>
<td>11</td>
<td>28</td>
</tr>
<tr>
<td>Online versions of the survey were compatible with screen reader technology</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Proxy respondents were provided for those that could not complete surveys on their own</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Adaptive technology was used for surveys administered on tablets</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-23. Total number of languages in which surveys were available.

<table>
<thead>
<tr>
<th>Total Number of Languages</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>English only</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Two languages</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>Three languages</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Four languages</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Five languages</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Six languages</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Eight languages</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Thirteen languages</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

Table C-24. Survey length.

<table>
<thead>
<tr>
<th>Survey Characteristic</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to complete (minutes)</td>
<td>7.4</td>
<td>2</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Number of questions</td>
<td>29</td>
<td>10</td>
<td>61</td>
<td>45</td>
</tr>
</tbody>
</table>

Table C-25. Survey cost by agency size.

<table>
<thead>
<tr>
<th>Agency Size</th>
<th>Median, $</th>
<th>Min, $</th>
<th>Max, $</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>80,000</td>
<td>2,100</td>
<td>412,000</td>
<td>10</td>
</tr>
<tr>
<td>Medium</td>
<td>365,000</td>
<td>20,000</td>
<td>753,000</td>
<td>7</td>
</tr>
<tr>
<td>Large</td>
<td>750,000</td>
<td>340,000</td>
<td>1,248,443</td>
<td>6</td>
</tr>
<tr>
<td>Very large</td>
<td>1,140,000</td>
<td>91,390</td>
<td>5,000,000</td>
<td>10</td>
</tr>
<tr>
<td>All</td>
<td>530,899</td>
<td>2,100</td>
<td>5,000,000</td>
<td>34</td>
</tr>
</tbody>
</table>
Table C-26. Costs per completed survey.

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per complete/usable</td>
<td>$36.83</td>
<td>$6.19</td>
<td>$139.78</td>
<td>21</td>
</tr>
</tbody>
</table>

Table C-27. Change in cost compared to previous survey efforts.

<table>
<thead>
<tr>
<th>Change in Cost (Compared to Previous Survey)</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost decreased with most recent survey (&lt; –10% change)</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Cost increased with most recent survey (&gt; 10% change)</td>
<td>19</td>
<td>43</td>
</tr>
<tr>
<td>Little to no change (i.e., ±10% change)</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Do not know</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

Table C-28. Level of geography for which survey results can be summarized.

<table>
<thead>
<tr>
<th>Level of Geography</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certain-higher ridership routes as well as the entire mode</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Only for an entire mode of service</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Route level (may exclude lower ridership routes)</td>
<td>16</td>
<td>39</td>
</tr>
<tr>
<td>Route segment level</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Stop level</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

Table C-29. Change in response rates from survey to survey.

<table>
<thead>
<tr>
<th>Change in Response Rates</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little to no change (e.g., ±10% change)</td>
<td>17</td>
<td>47</td>
</tr>
<tr>
<td>Response rate increased</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>Response rate decreased</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Table C-30. How minors were incorporated in the survey sample.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific efforts</td>
<td>17</td>
<td>47</td>
</tr>
<tr>
<td>Riders younger than 18 approached</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>All riders approached</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Supplementary survey</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>
Table C-31. Response base method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger counts</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Number of surveys distributed</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Number of persons approached by interviewers</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Total respondents</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

Table C-32. Average response rates by survey method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Average Response Rate</th>
<th>Min</th>
<th>Max</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>All methods/method undefined a</td>
<td>49</td>
<td>3</td>
<td>96</td>
<td>19</td>
</tr>
<tr>
<td>Tablet</td>
<td>63</td>
<td>5</td>
<td>88</td>
<td>8</td>
</tr>
<tr>
<td>Paper</td>
<td>34</td>
<td>10</td>
<td>71</td>
<td>11</td>
</tr>
<tr>
<td>Online</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

aSome respondents specified response rate by survey method whereas others only provided totals, hence “all method” line is not an average of the tablet, paper, and online row.

Table C-33. Underrepresented population groups.

<table>
<thead>
<tr>
<th>Population Group</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-English Speakers</td>
<td>22</td>
<td>63</td>
</tr>
<tr>
<td>Persons under age 18</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>Persons with limited literacy</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>Riders making short transit trips</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>Riders with disabilities</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Riders during times of day surveyed (e.g., PM peak vs AM peak ridership)</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Particular ethnic or racial groups</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Low-income riders</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Transit-dependent riders</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total respondents</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.
Table C-34. Standards for completion.

<table>
<thead>
<tr>
<th>Standards</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin and destination locations could be geocoded accurately</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Boarding and alighting stops identified</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Trip purpose was collected</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Access and egress mode was collected</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Route sequence (for trips that included a transfer) was collected</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Respondent’s demographic information was collected</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>All questions were completed</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Other</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>Do not know</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>46</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.

Table C-35. Number of completed surveys by agency size.

<table>
<thead>
<tr>
<th>Agency Size</th>
<th>Definition (Annual Unlinked Trips)</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td></td>
<td>16,070</td>
<td>339</td>
<td>96,614</td>
<td>29</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;10 million</td>
<td>2,092</td>
<td>339</td>
<td>4,189</td>
<td>9</td>
</tr>
<tr>
<td>Medium</td>
<td>10–30 million</td>
<td>5,520</td>
<td>352</td>
<td>7,987</td>
<td>6</td>
</tr>
<tr>
<td>Large</td>
<td>30–100 million</td>
<td>20,958</td>
<td>5,008</td>
<td>33,897</td>
<td>5</td>
</tr>
<tr>
<td>Very large</td>
<td>&gt;100 million</td>
<td>38,755</td>
<td>2,274</td>
<td>96,614</td>
<td>7</td>
</tr>
</tbody>
</table>

Table C-36. Common survey expansion factors.

<table>
<thead>
<tr>
<th>Expansion Factor</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route-level ridership (via fare-box counts or other sources)</td>
<td>26</td>
<td>62</td>
</tr>
<tr>
<td>On and off counts (via stop/station-level data such as automatic passenger</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>counter or turnstile counts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boardings by route</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>Boardings by route and direction</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>Boardings by time of day</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>Boardings by stop or segment</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Census data</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Other travel survey results (e.g., regional travel survey across all travel</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>modes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iterative proportional fitting</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Do not know</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>42</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: Respondents had the option to choose multiple responses.
Table C-37. Prevalence of the utilization of “big data.”

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fare-box and fare-card data</td>
<td>43</td>
<td>98</td>
</tr>
<tr>
<td>Automatic vehicle locator and automatic passenger counter data</td>
<td>41</td>
<td>93</td>
</tr>
<tr>
<td>General Transit Feed Specification data</td>
<td>36</td>
<td>82</td>
</tr>
<tr>
<td>Third-party data services that provide travel flow based on passively collected geospatial information</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Third-party data on rider characteristics and demographics</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Video analytics (e.g., facial recognition software)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

Table C-38. Impact of “big data” on survey techniques.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve sampling strategy</td>
<td>28</td>
<td>64</td>
</tr>
<tr>
<td>Refine expansion factors applied to survey results</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Not currently affecting the survey process</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Reduce the scope and scale of traditional intercept surveys</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Eliminate entirely the need for intercept surveys</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*

Table C-39. Big data challenges.

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of quality data related to transit ridership</td>
<td>27</td>
<td>61</td>
</tr>
<tr>
<td>Concerns that certain groups of riders are underrepresented</td>
<td>23</td>
<td>52</td>
</tr>
<tr>
<td>Cost of acquiring data</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Lack of in-house knowledge to fully use and process data sources</td>
<td>21</td>
<td>48</td>
</tr>
<tr>
<td>Concerns that utilizing big data will not comply with regulatory requirements such as Title VI</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total respondents</strong></td>
<td><strong>44</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Respondents had the option to choose multiple responses.*
Abbreviations and acronyms used without definitions in TRB publications:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4A</td>
<td>Airlines for America</td>
</tr>
<tr>
<td>AAAE</td>
<td>American Association of Airport Executives</td>
</tr>
<tr>
<td>AASHO</td>
<td>American Association of State Highway Officials</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ACI–NA</td>
<td>Airports Council International–North America</td>
</tr>
<tr>
<td>ACRP</td>
<td>Airport Cooperative Research Program</td>
</tr>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
</tr>
<tr>
<td>APTA</td>
<td>American Public Transportation Association</td>
</tr>
<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>ATA</td>
<td>American Trucking Associations</td>
</tr>
<tr>
<td>CTAA</td>
<td>Community Transportation Association of America</td>
</tr>
<tr>
<td>CTBSSP</td>
<td>Commercial Truck and Bus Safety Synthesis Program</td>
</tr>
<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
</tr>
<tr>
<td>DOE</td>
<td>Department of Energy</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
</tr>
<tr>
<td>FAST</td>
<td>Fixing America's Surface Transportation Act (2015)</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FMCSA</td>
<td>Federal Motor Carrier Safety Administration</td>
</tr>
<tr>
<td>FRA</td>
<td>Federal Railroad Administration</td>
</tr>
<tr>
<td>FTA</td>
<td>Federal Transit Administration</td>
</tr>
<tr>
<td>HMCRP</td>
<td>Hazardous Materials Cooperative Research Program</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>ISTE A</td>
<td>Intermodal Surface Transportation Efficiency Act of 1991</td>
</tr>
<tr>
<td>ITE</td>
<td>Institute of Transportation Engineers</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NASAO</td>
<td>National Association of State Aviation Officials</td>
</tr>
<tr>
<td>NCFRP</td>
<td>National Cooperative Freight Research Program</td>
</tr>
<tr>
<td>NCHRP</td>
<td>National Cooperative Highway Research Program</td>
</tr>
<tr>
<td>NHTSA</td>
<td>National Highway Traffic Safety Administration</td>
</tr>
<tr>
<td>NTSB</td>
<td>National Transportation Safety Board</td>
</tr>
<tr>
<td>PHMSA</td>
<td>Pipeline and Hazardous Materials Safety Administration</td>
</tr>
<tr>
<td>RITA</td>
<td>Research and Innovative Technology Administration</td>
</tr>
<tr>
<td>SAE</td>
<td>Society of Automotive Engineers</td>
</tr>
<tr>
<td>SAFETEA-LU</td>
<td>Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)</td>
</tr>
<tr>
<td>TCRP</td>
<td>Transit Cooperative Research Program</td>
</tr>
<tr>
<td>TDC</td>
<td>Transit Development Corporation</td>
</tr>
<tr>
<td>TRB</td>
<td>Transportation Research Board</td>
</tr>
<tr>
<td>TSA</td>
<td>Transportation Security Administration</td>
</tr>
<tr>
<td>U.S. DOT</td>
<td>United States Department of Transportation</td>
</tr>
</tbody>
</table>