

## Exhibit D

### Research Project Requirement Template

#### From Cross-Sectional to Longitudinal: The Impact of Sampling Strategies on Measuring Mobility Choices

**Recipient/Grant (Contract) Number:** The University of Texas at Austin/Grant # 69A3552344815 and 69A3552348320

**Center Name:** Center for Understanding Future Travel Behavior and Demand (TBD)

**Research Priority:** Improving Mobility of People and Goods

**Principal Investigator(s):** Ram M. Pendyala and Irfan Batur

**Project Partners:** N/A

**Research Project Funding:** \$200,000 (Federal + non-Federal funding)

**Project Start and End Date:** 9/1/2024 - 5/31/2026

**Project Description:** The transportation profession has long relied on surveys as a main source of data. These surveys are used across a broad range of applications, including but not limited to, travel demand forecasting, travel behavior analysis, policy evaluation, environmental impact assessment, equity analysis, and economic evaluation. Despite the increasing accessibility of passive data collection methods, such as cell phone tracking and location-based services, surveys remain invaluable sources for gaining deep insights into the transportation landscape. These comprehensive data sets form the backbone of various models, evaluations, and planning efforts in transportation. The efficacy and credibility of these models and planning efforts are dependent on the assumption that survey data are reasonably representative of the population under study. However, the representativeness of a survey is intrinsically linked to which sampling strategies were used in recruiting and targeting respondents.

Employing effective sampling strategies is not just about ensuring data quality; it is also a matter of cost-effectiveness and efficiency. For example, a targeted web-based survey of students may be combined with a traditional phone-based household survey to better represent younger age groups. Different sampling strategies serve different purposes. While convenience sampling may be quick and economical, it can introduce biases. Purchasing email lists targets specific segments but may lack broader representativeness. Similarly, online panels, such as those offered by Qualtrics, often yield samples of professional survey-takers, which might not adequately mirror the larger population as they miss less frequent survey participants. These complexities raise important questions: Do these varied sampling methods introduce biases that result in fundamentally different samples, affecting both the socio-demographic profiles of respondents and their mobility patterns? Even more so, do respondents recruited through different sampling strategies exhibit similar evolutions in their mobility choices over time?

This study addresses these questions by leveraging a longitudinal data set collected through three different sampling methods across three waves during the COVID-19 pandemic. While existing studies have occasionally touched on this issue, they have mostly relied on cross-sectional surveys, limiting their findings to a single point in time. By employing a longitudinal data set collected over three waves during the COVID-19 pandemic, this study not only assesses the representativeness and biases associated with different sampling methods but also investigates how these samples evolve over time in terms of mobility choices. This dual focus provides a more comprehensive understanding of the role of sampling strategies, thereby enriching both current research and shaping future directions in data collection methods within the realm of travel behavior research.

The study first evaluates the degree to which the three sampling strategies used in the first wave produce similar socio-demographic profiles. It then revisits the first wave of the survey with the objective of understanding the pre-pandemic mobility behaviors of respondents from the three sub-samples. This is achieved after weighting each of these samples separately to ensure an apple-to-apple comparison. Lastly, the study shifts from a cross-sectional to a longitudinal analysis. This section focuses on the "stayers' sample" (participants who responded to all survey waves) and examines how the mobility characteristics of the three sub-samples evolve over time. The expected results will offer concrete evidence regarding the effectiveness of various sampling methods, facilitating the development of more efficient and cost-effective data collection strategies. In turn, this will improve the reliability and relevance of travel demand models, policy evaluations, and long-term transportation planning, especially during periods of rapid societal change, such as the post-pandemic era.

**US DOT Priorities:** This project aligns with two of the USDOT's research priorities: Transformation Research and Equity. Its primary contribution is in the area of Data-Driven Insight. By improving the representativeness of survey data, the project will ensure that transportation research and policy decisions are inclusive of diverse population segments, thus supporting "Equitable Mobility for All," as emphasized in the strategic plan (p. 36). Additionally, the plan discusses the "Integrated System-of-Systems" approach and highlights the need for research that is "People-Centered, Safe, Data Driven, Intelligent, Integrated and Interoperable, Sustainably Powered, Secure and Resilient, Adaptive and Dynamic, Connected" (p. 52). By aiming to adapt survey methodologies and data collection mechanisms to contemporary societal dynamics, this project commits to evolving transportation research practices and needs. It ensures that surveys remain relevant and effective in the face of rapid societal and technological changes.

**Outputs:** The anticipated outputs of this project include a unique dataset, academic papers, and policy briefs. This dataset will be distinctive as it is a panel dataset collected over three waves. The final dataset, along with relevant data dictionaries and readme files, will be made available in an appropriate public repository. This dataset will facilitate further analysis to illuminate various systematic biases associated with survey data collection methods and other purposes, enabling other researchers to access and use the data for further inquiries. The research team will analyze this dataset and produce an academic paper discussing sampling biases and the extent to which weighting practices can mitigate these biases. This paper will be presented at academic conferences and submitted as a peer-reviewed journal article. Additionally, throughout the project timeline, the team will disseminate some of the findings, especially those that are time-sensitive and particularly relevant to policymakers and planners, through policy briefs.

**Outcomes/Impacts:** This project aims to analyze the impact of survey sampling strategies on data representativeness and understanding of travel behavior over time. Through longitudinal analysis and statistical modeling, it will reveal how different sampling approaches affect the evolution of mobility choices among respondents. The findings will guide transportation researchers, policymakers, and planners in evaluating and refining data collection methods. This will lead to more accurate travel demand models and policy evaluations, enhancing transportation planning's reliability, especially during rapid societal changes like the post-pandemic era, and in response to technological advancements.

Through its detailed analysis of survey sampling strategies and their impact on data representativeness, the project will enhance the effectiveness of transportation systems by informing more precise travel demand models and policy evaluations. Such improvements are anticipated to lead to better demand management and more equitable transportation planning. The findings will expand the scientific understanding of effective data collection techniques, contributing significantly to the field. Ultimately, this project will crucially guide planners and policymakers in adopting data-driven strategies to tackle contemporary transportation challenges, fostering resilience and fairness amidst swift societal and technological shifts.

**Final Research Report:** A URL link to the final report will be provided upon completion of the project.