

Moving Forward with the Next Generation Travel Behavior Data Collection and Processing

Background

Since 1969, the Federal Highway Administration (FHWA) has been collecting travel behavior data to answer evolving questions related to how, why, when, and where people travel through a probability-based random sampling survey approach under the Nationwide Personal Transportation Survey (NPTS) and the National Household Travel Survey (NHTS) programs.

The NPTS and NHTS programs have been proven highly successful in delivering the only national, publicly available travel behavior data by providing foundational data and information to the transportation community. Trip rate data and other relevant policy-, program-, and project-related information have enabled broad transportation policy analysis, travel demand forecasting, and policy scenario testing. However, to move these highly successful travel behavior data programs forward is not without significant challenges, such as the following:

- The decline of landline telephone service in American households has been recognized as being detrimental to the time-proven random digit dialing (RDD) sampling survey approach. This decline has forced data collectors to abandon the RDD approach during the 2017 NHTS and instead adopt an address-based sampling method to reach a more representative sample.
- The decline of the public's participation in surveys has posed another significant challenge. Despite heavy recruiting efforts carried out with the 2017 NHTS, the overall response rate was still below 20 percent. This low participation rate drives up survey costs due to the need for more extensive recruitment efforts, reduces data reliability due to the reduced representativeness of the overall sample, and generates doubts about data representativeness.

Although there has been a decline in active public participation, the good news is that passive transportation data, such as Global Positioning System (GPS) navigation data, vehicle telematics data, location-based service (LBS) data, cellular data, and social media data, are becoming more prevalent and available than ever before, and the resultant data products are more meaningful in explaining travel behavior as we move forward. These developments require current data programs to be re-evaluated, adjusted, and transformed to ensure the relevance, reliability, and affordability of travel behavior data programs.

FHWA has been conducting extensive research in travel behavior data collection under its Exploratory Advanced Research Program to take advantage of advances in technology. These research efforts range from data fusion, to smartphone application deployment, to integrated cellular data utilization. FHWA is committed to developing and deploying the most efficient, economical, and value-added travel behavior data for the Nation, including supporting and collaborating with State transportation departments, metropolitan planning organizations (MPOs), local agencies, and other public and private entities to obtain State and local specific data.

Given the challenges and opportunities in collecting travel behavior data, FHWA is launching the Next Generation Travel Behavior Data Initiative to establish a continuous travel monitoring program that will provide annual national and local data. The work plan for the next 5 yr is to gather and publish annual national travel behavior data and offer opportunities for States, MPOs, and other entities to obtain agency-specific data.

Objectives

The objectives of the Next Generation Travel Behavior Data Initiative are as follows:

- 1) Establish the Next Generation Travel Behavior Data program to collect, process, estimate, and report national, state and local travel behavior data on an annual basis.
- 2) Enable and facilitate State transportation departments, MPOs, and other entities' participation in the new data gathering program with high efficiency and great flexibility.

Deliverables

The Next Generation Travel Behavior Data Initiative will produce the following three major components of travel behavior data and information:

- **Component 1:** National travel behavior data.
- **Component 2:** National origin-destination (OD) data.
- **Component 3:** State and local data.

FHWA will be financially responsible for data collected and compiled under the framework of components 1 and 2. Component 3 will provide agency-specific data for State transportation departments, MPOs, and other entities participating in a pooled fund effort. Each component is described in further detail in the following subsections.

Component 1: National Travel Behavior Data

At the national level, the Next Generation Travel Behavior Data Initiative will continue to provide key travel behavior data of the existing NHTS Program as well as data on new and emerging travel trends, such as travel provided by transportation network companies. Such data, including trip-level records, weights, and summaries will be provided annually. As a start, the following data and information will be provided:

- **Average trip rate data:** Average trip rate data include the following:
 - Daily person trip rate.
 - Daily vehicle trip rate.
 - Average person trip length (both distance and time).
 - Average vehicle trip length (both distance and time).
- **Average trip rate data by trip purpose:** Trip purpose may include work, work-related business, shopping, school, social and recreational, family/person errands, and other. There is the

possibility that these may be reduced to fewer categories. Further analysis will be performed for final data dimension. Examples of average trip rate data by trip purpose include the following:

- Daily person trip rate.
 - Daily vehicle trip rate.
 - Average person trip length (both distance and time).
 - Average vehicle trip length (both distance and time).
- **Person trip modal share:** Travel modes may include private vehicle, transit, taxi, other for-hire transport (e.g., transportation network companies), walk, bicycle, and others. The final data dimension will be determined after further analysis, with the potential for some modes being combined into fewer categories. Mode share data will include details regarding the following:
 - The proportion of modes used.
 - Mode use by time of day, travel distance, and time spent traveling by each mode.
- **Person trip modal share by trip purpose:** Travel modes may include private vehicle, transit, taxi, other for-hire transport (e.g., transportation network companies), walk, bicycle, and others. Trip purpose may include work and work-related business, shopping, and other. The final data dimensions will be determined after further analysis, with the potential for some modes and purposes being combined into fewer categories, and are anticipated to include details regarding the following:
 - The proportion of modes used stratified by trip purpose.
 - Mode use by time of day, travel distance, and time spent traveling by each mode stratified by trip purpose.
- **Average trip rate data by gender:** Average trip rate data by gender (i.e., male and female) include the following:
 - Daily person trip rate.
 - Daily vehicle trip rate.
 - Average person trip length (by distance and time).
 - Average vehicle trip length (by distance and time).
- **Average trip rate data by income:** Average trip rate data by income may be based on Census income groupings, with a final stratification being determined after further analysis. These data include the following:
 - Daily person trip rate.
 - Daily vehicle trip rate.
 - Average person trip length (by distance and time).
 - Average vehicle trip length (by distance and time).
- **Average trip rate data by age group:** Specific age groups may include under 16, 16–24, 25–64, and 66+. The final stratification will be determined after further analysis. These data include the following:
 - Daily person trip rate.

- Daily vehicle trip rate.
 - Average person trip length (by distance and time).
 - Average vehicle trip length (by distance and time).
- **Average trip rate data by age group and gender:** Specific age groups may include under 16, 16–24, 25–64, and 66+. The final stratification will be determined pending after analysis. These data include the following:
 - Daily person trip rate.
 - Daily vehicle trip rate.
 - Average person trip length (by distance and time).
 - Average vehicle trip length (by distance and time).
- **Average trip rate data by time of day:** Trip departure and arrival time will be aggregated to 5-, 15-, 30-, or 60-min time slices, with the final aggregation being determined after further analysis. These may be further stratified by trip purpose and travel mode, which will also be determined after further analysis. These data include the following:
 - Person trips.
 - Vehicle trips.
- **National trip rates by urban and rural dimensions:** National trip rates by urban and rural dimensions include the following:
 - Person trips.
 - Vehicle trips.

Component 2: National OD Data

This component will provide annual OD data (i.e., cumulative number of trips for an entire calendar year) at the metropolitan statistical area (MSA) and remainder of State levels by travel mode and trip purpose. The data should cover both inter-zonal and intra-zonal trips. Additional details about each are as follows:

- **MSA and remainder of State geography:** OD data will provide details about national travel in relation to the two geographic units of MSA and remainder of State levels, which are defined as follows:
 - MSA delineation will be per the current White House Office of Management and Budget standard and per the U.S. Census Bureau’s most current data publication relevant to the year during which the data tabulations are produced.
 - For a multi-state MSA, each State shall be considered as a separate MSA zone. For example, the Chicago–Naperville–Elgin, Illinois–Indiana–Wisconsin MSA shall be separated out as follows: (1) Chicago–Naperville–Elgin_Illinois, (2) Chicago–Naperville–Elgin_Indiana, and (3) Chicago–Naperville–Elgin_Wisconsin.

- For any given State, all areas not in MSAs will be defined as “remainder of State.” Additionally, a State without an MSA designation shall also be treated as “remainder of State.”
- **Travel modes:** Travel modes include the following:
 - Automobile.
 - Bus.
 - Rail.
 - Air.
- **Travel purpose:** Travel purpose includes at a minimum work and non-work. Final trip purpose groupings will be determined after further analysis.

Component 3: State and Local Data

This component is reserved for participating State transportation departments, MPOs, and other entities to obtain agency-specific data under the framework of Component 1 and Component 2 in the pooled fund program.

FHWA will be financially responsible for Components 1 and 2. For Component 3, participating agencies can purchase additional survey samples and/or more detailed passive data. For example, an agency may desire the geographic resolution to be extended to the traffic analysis zone level for OD information. Sample size can be enhanced in a specific geography, and local specific questions can also be asked. Agencies can tailor participation based on their data needs (with participation time periods linked to annual data products).

Organizations and agencies can also participate in this pooled fund program without executing any actual local data procurements but desire to be kept informed with the latest developments and have an opportunity to contribute to the design decisions. The pooled fund effort plans to have annual workshops and periodic webinars for information sharing and learning opportunities. Agencies can increase their participation to purchase additional data on an annual basis.

Participants in the pooled fund program will benefit from at least the following aspects:

- Having the opportunity to shape the new Next Generation Travel Behavior Data Program and being a part of big data transformation in the travel behavior field.
- Obtaining next generation travel behavior data at the State and local levels that can be applied to transportation modeling, planning, policy, and other areas.
- Gaining nationally consistent data so that data controls and comparisons can be efficiently enabled.
- Accessing the latest data and information, enabling participating agencies and organizations to keep up with the state of practice.
- Gaining centralized technical and peer support in data applications.

- Lowering the cost of data acquisition compared to individual procurements thanks to the economies of scale of the pooled fund program.
- Having no or minimum contracting or oversight hassles (i.e., contractors will be coordinated centrally).

Potential Processes and Procedures

The following processes and procedures are for the sole purpose of illustrating FHWA's Office of Highway Policy Information's understanding of potential approaches to accomplish this initiative's objectives. They should not be interpreted as approaches or methods that must be used by a contractor or as being endorsed by FHWA. Contractor deliverables are performance-based deliverables and are provided in the subsequent Performance Standards section. Potential processes and procedures as understood by FHWA's Office of Highway Policy Information include the following:

- A completely random national sample shall be established for surveying core behavior data items covering all distance travel. It is expected that these core data will be used as the control and complement other data such as passive data.
- Passive data, such as GPS navigation data, vehicle telematics data, LBS data, cellular data, and social media data, as well as appropriate census data can be integrated into the core survey data. The integrated data shall enhance and improve both the survey data and passive data to derive deliverable data and information, including OD, travel mode, trip purpose, and time of day.
- Micro-scale OD data are attainable through proper data dimensions. For example, by collapsing trip purposes, empty cells associated with OD matrices should become fewer.
- FHWA will be financially responsible for components 1 and 2 and provide the data (as specified) to agencies and the public. States, MPOs, and other entities can acquire additional data through this pooled fund initiative under component 3 or through independent means to acquire more locally suited data. The national data provided by FHWA can serve as a control and benchmarks for States and MPOs. States and MPOs can join and leave the program in 1-yr increments.
- Multi-year procurement and multiple award packages will be released from the pooled fund program, which may engage one or more contractors or contractor teams to provide travel behavior data to FHWA and participating agencies. Separate efforts may also be procured to support, check, and validate the data and work.

Performance Standards

Deliverables shall be in conformity with at least the following national controls:

- American Community Survey population and population related data for the data year delivered.

- Total transit trips for all urban areas and rural areas (in combination and separately) in conformance with the Federal Transit Administration’s National Transit Database data after converting all trips to linked trips.
- Air trips conforming to the Airline Origin and Destination Survey Data and the T-100 data. (Keep in mind that airport locations may not be the same as appropriate OD locations.)
- Data for vehicle-miles traveled for the entire Nation conforming to trending information presented with FHWA’s Highway Performance Monitoring System data.
- Sufficiently transparent methods and approaches used for information and data derivation from passive data to enable both the public and public agency staff to understand and make sound judgments on strengths, weaknesses, and issues such processes may have on the final data.
- Documentation offering scientific and statistical rationale where a reader can be reasonably assured that such methods and approaches are technically sound and reasonable.
- Core sample survey data that are reasonably in conformance with the OD data derived from passive data after expanding with the national population at the national geographical level and individual partner geographic resolution.

Comments

Other details include the following:

- The project duration is 5 yr.
- Participation for agencies and organizations that will acquire local data under component 3 will require each participant to pay between \$25,000 and \$2.5 million per specification per year. (The exact amount of contribution will be determined based on the degree of customization and sample size collected.)
- Participation for agencies and organizations that will not acquire any local data under component 3 will require each participant to pay \$5,000 per year.
- All States, MPOs, local agencies, private organizations, and businesses are welcome to participate.
- FHWA expects to receive approval for State planning and research (SP&R) fund match waivers for State transportation departments and MPOs.

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