

Household Travel Surveys: Overview, State of the Practice, and Tennessee Statewide Survey

Tennessee Model Users Group
December 4, 2024

Kyeil Kim, WSP
Jesse Casas, Westat



Agenda

1. Household Travel Surveys

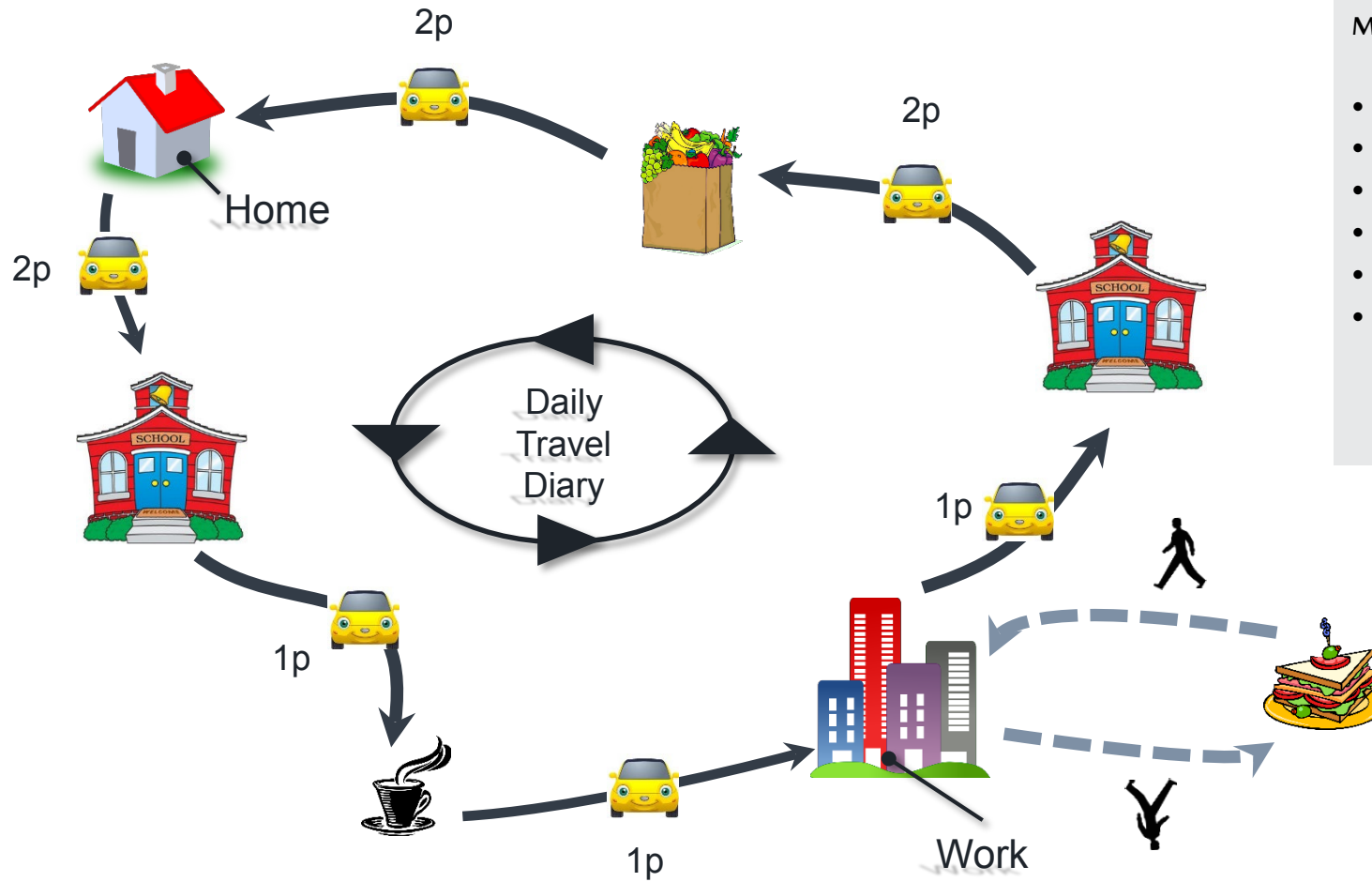
- Overview
- Data Elements
- Study Components
- State of the Practice

2. NHTS Core / Add-on Surveys

3. Tennessee Statewide Household Travel Survey

- Overview
- Survey Questionnaire Development
- Survey Implementation
- Data QA/QC
- Data Development

Daily Travels



Main data entities

- "Anchor": Household
- Primary destination: Work or other places
- Intermediate stop locations
- Persons
- Travel modes
- Tours or Trips

HTS Major Data Elements

- “Anchor”: Household
 - Location (address, TAZ, County FIPS)
 - Resident type
 - Household size & composition
 - Number of household vehicles
 - Household income
- Persons
 - Gender
 - Age
 - Relationship
 - Disability
 - Employment/student status
 - Number of hours worked
 - Teleworking status
 - Industry
 - Occupation
 - Work location
 - Education
 - Race/ethnicity

- Vehicle
 - Make/Model/Year
 - Body of vehicle
 - Type of fuel
 - Ownership
- Trips
 - Primary/secondary trip purpose
 - Mode of travel
 - Joint travel participants
 - Primary and intermediate stop locations
 - Parking/Transit Fare/Toll
 - Day of week
 - Departure/arrival times
 - Transit access/egress modes
 - Transit operators/lines

HTS Data Use

- HTS provides the most comprehensive data regarding people's travel
- HTS does not provide all travel data
 - Visitor travel
 - External-external trips
 - Freight movements/Truck trips
- Caution to use questions from HTS that are stated-preference nature
- Main use of HTS
 - Learning residents' travel behaviors
 - Calibrate travel demand models
 - Usage of transportation infrastructure
 - Changes in travel behaviors over time
 - Transportation infrastructure or service needs
 - Environmental Justice analysis
- Limitations of HTS
 - Response accuracy
 - Response rate / Nonresponse
 - Not enough samples

Study Components

- Public outreach plan
 - Maximize survey participation, Quality response
 - Press releases, Project website, News media, Social media
- Survey instrument design
 - “Purpose-driven”
 - Update travel demand model & regional performance measures
 - Transportation planning (LRP update)
 - Universal survey design may not work for every region
 - Survey data elements and modes
 - Variable names, data description, data type, response codes
 - Smartphone apps, web, telephone
- Sampling plan
 - Address-Based Sampling (ABS)
 - Includes all addresses from the USPS Computerized Delivery Sequence file
 - Stratified sampling
 - A probability sampling where the survey universe is divided into smaller groups and a random sample is chosen within group
 - Within group, households are selected with equal probabilities, but combined sample across groups comprise an unequal probability sample of households
 - Oversampling for some groups (zero vehicle households, low income, transit users, minorities, area type)

Study Components

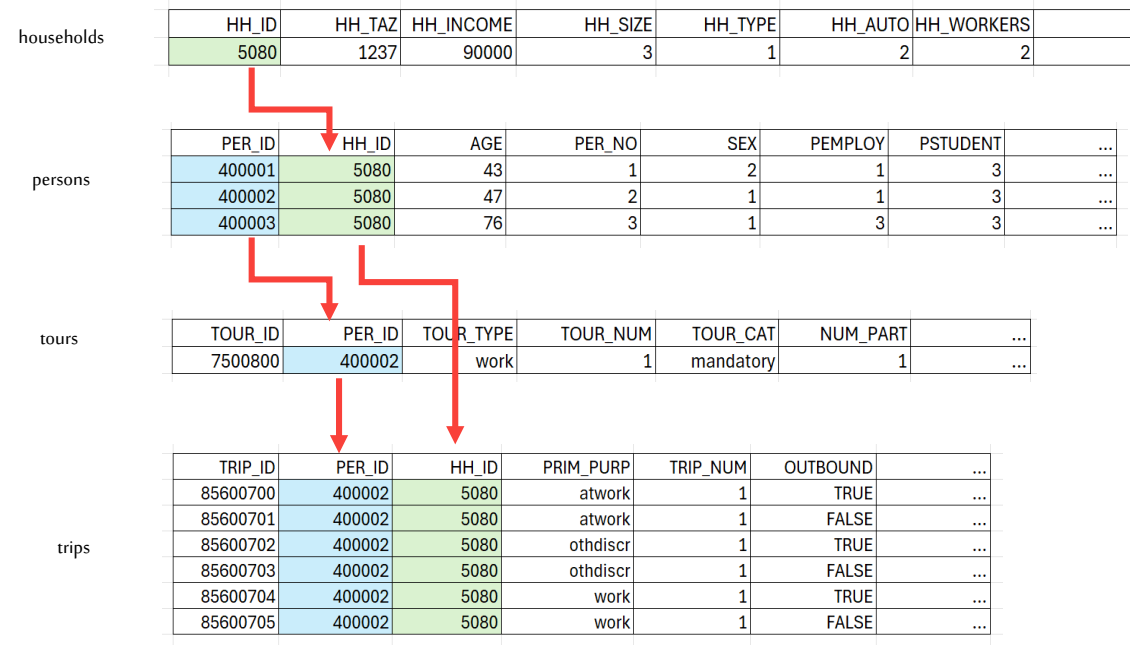
- Pre-test
 - Test survey instruments planned for the full study
 - Assess respondent reaction (e.g., questions understandable to all groups?)
 - Test core programs and data collection processes
 - Evaluate and complete the main survey instruments
- Main survey implementation
 - Target “Typical” weekday travel (3-day or 5-day equal or non-uniform distributions)
 - Household members aged 13 and older to record trips on a pre-assigned day
 - School in session, Non-holiday weekdays, Non-seasonal break days
- Post-survey data processing
 - Data processing and cleaning during survey
 - QA/QC for data completeness
 - Confirm all skip logic
 - Check for outliers
 - Confirm the geocode by stratification group

Study Components

- Data development
 - Two purposes
 - **Representativeness:** Weighting to match the regional households/population across the regional control totals
 - **Generalizability:** Any conclusion drawn from the expanded HTS should be generalizable and applicable to the regional population
 - Correct sampling errors
 - Multi-dimensional balancing
 - Find the best single set of weights to minimize the differences between the expanded survey totals and a priori specified control variable totals at both the household and person levels simultaneously.
 - Beyond typical sequentially applied iterative proportional fitting (IPF) algorithms
 - Apply a simultaneous optimization algorithm
 - Control variables by household and person
 - Constraints on the range of weights
 - Control geographies

Study Components

- Final forms of data
 - Households, persons, vehicles, tours/trips
 - Relational database



- Data mining and analysis
 - Many questions are answered by joining two or more data tables (e.g., income distribution by transit users)
 - Useful programs (SQL, R, Python) and custom dashboard

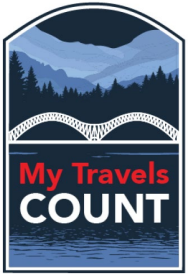
HTS State of Practice

- New trends: Data elements
 - Rideshare: users, operators
 - Micromobility (bicycles, e-scooters, e-bikes)
 - Goods and services for home delivery
- Survey options
 - Traditional HTS conducted every 10 year or so.
 - Continuous HTS
 - Smaller scale with more frequency
 - Small up front investment and routine programmatic expenditure
 - More opportunities to course-correct and adjust sampling plan
 - Adapt to emerging trends
 - NHTS add-on program
- Smartphone
 - Help correct underreporting
 - Less burden for respondents
 - Most used as compared to other survey modes (web and telephone)
 - Need a robust app
 - Could help increase response rate?
- ABS and PFS

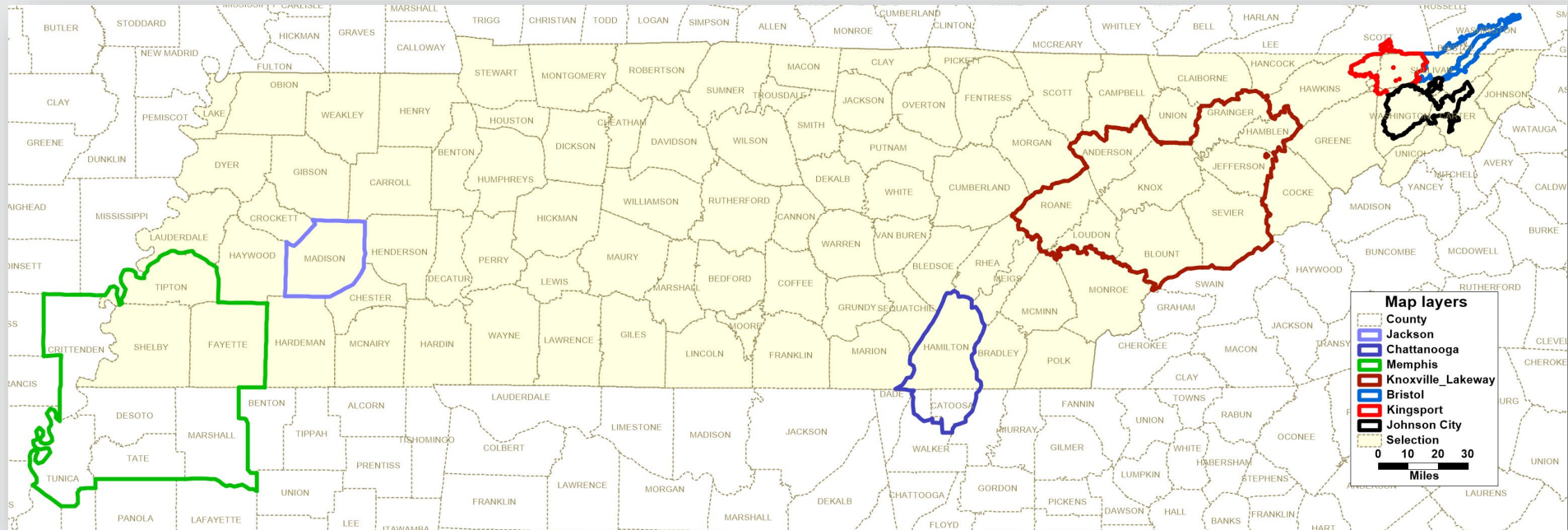
2024 NHTS Core and Add-On

- Core Survey
 - 7,500 national surveys (all 50 states)
 - 365 days of assigned travel dates
 - Mutually exclusive selection from Add-On surveys
- Add-On Survey (aka Pooled Fund)
 - 20,000 in addition to Core
 - Georgia, Wisconsin, Rhode Island, Tennessee
- Tennessee Add-on
 - 1,500 total surveys
 - Includes non-MPO counties
 - Only includes area within the state boundary (i.e., does not include border states or areas that are part of Memphis MPO (AR, MS), Chattanooga (GA), and Tri-City (VA))

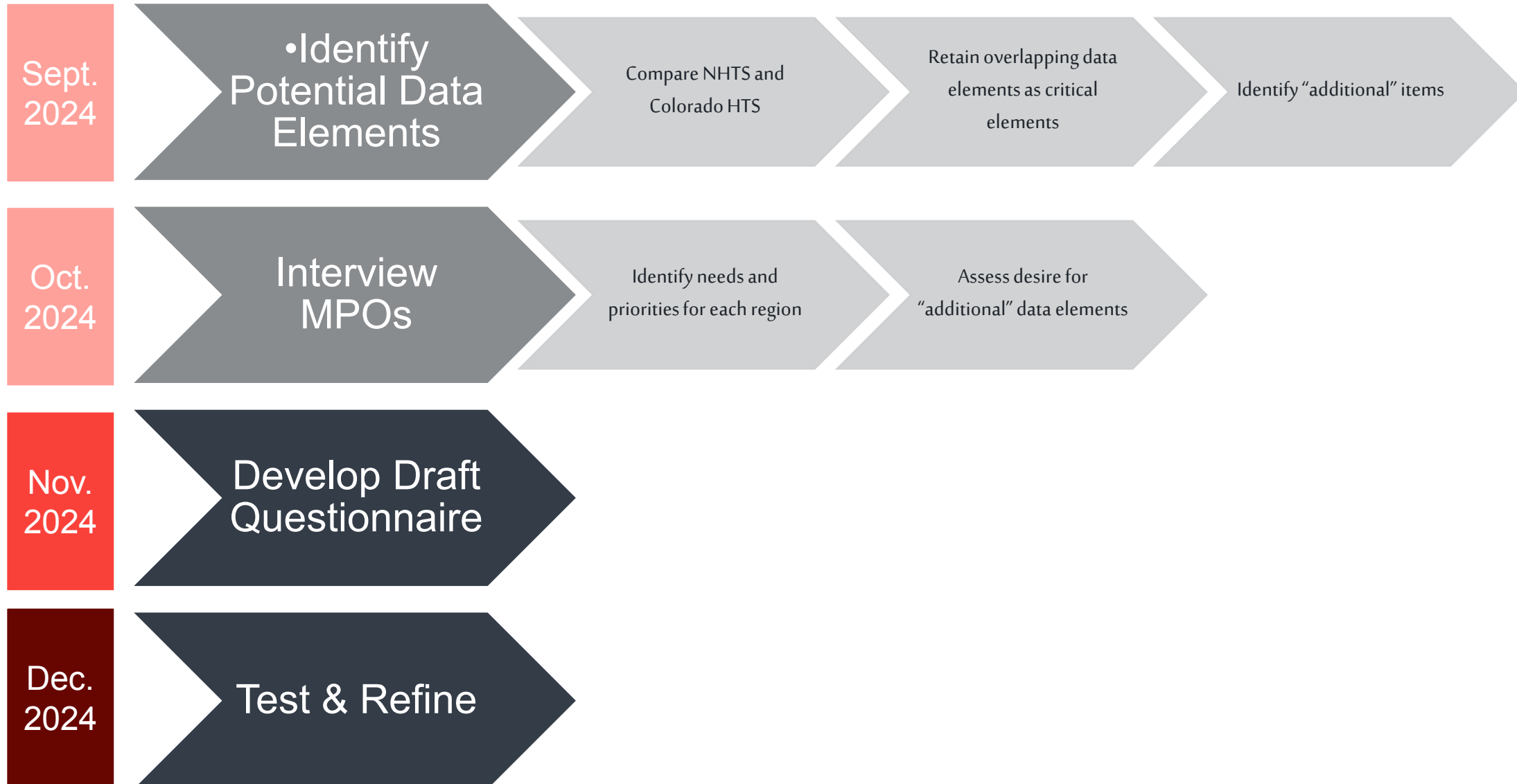
Tennessee Statewide Household Travel Survey: Overview



- Led by TDOT and select members of the TN MPO Association, conduct TSHTS for 8 participating MPOs that include TN and neighboring area in other states
- Target sample size: 10,500 households
- Purposes:
 - MPO travel demand models update in MPOs' LRP update cycle
 - Data-driven transportation planning and policy decision making



Survey Questionnaire: Development Process



Survey Questionnaire: “Overlapping” Data Elements

Required for Travel Model Development

- Household and Person Demographics
 - Age, sex, worker status, student status
 - Income
- Vehicles
 - Ownership/availability
- Travel
 - Work and/or school locations
 - Telecommuting
- Trips
 - Start/end times
 - People on trip
 - Purpose
 - Mode

Good to Have

- Household and Person Demographics
 - Race/ethnicity, education, number of jobs, disability
 - Home ownership, housing type
- Vehicles
 - Make, model, year
 - Fuel type
- Travel
 - Use of emerging transportation modes / technology
- Trips
 - Vehicle use

MPO Interviews

Topic Area	Memphis	Chattanooga	Knoxville / Lakeway	Bristol	Johnson City	Kingsport	Jackson	Recommendation
Disability (extra info)	Medium	Low	Low	High	High	Low	Medium	Keep for Bristol/Johnson City/Kingsport, Jackson, and Memphis, remove for others
Military affiliation	Low	Low	Low	Low	High	Low	Low	Keep for Bristol/Johnson City/Kingsport
Secondary jobs	High	Medium	Medium	Medium	High	Medium	Low	Keep
Drivers of on-demand services	High	Low	Low	Low	High	Medium	Low	Keep for Memphis, remove for others
Comparisons about current travel versus pre-COVID	Medium	Medium	Low	Medium	Low	Low	Low	Remove question(s)
Safety measures taken when riding e-scooters/bikeshare	Low	Low	Low	Low	Low	Low	Low	Remove question(s)
Concerns/barriers for bike/walk	High	High	High	High	High	Low	High	Keep
Concerns/barriers for transit	High	High	High	High	Medium	Low	High	Keep
Ranking transportation investments	Medium	High	High	High	Medium	High	High	Keep
EV charging infrastructure	Medium	Low	Low	Medium	Medium	Medium	Medium	Keep some basic questions - remove questions about infrastructure at each location on trip
Walk access time	High	High	Medium	Medium	Medium	Low	Low	Keep
Parking at home	Low	Low	Low	Low	Low	Low	Low	Remove question(s)
Parking at destination (cost, location, availability)	High	Medium	Medium	Low	Low	Low	Low	Keep, except for tri city region
Toll payment	Low	Low	Low	Low	Low	Low	Low	Remove question(s)
Transit fare (\$ amount, payment method, passes, subsidies)	High	Low	Low	Low	Low	Medium	Low	Keep for Memphis
Loop trips	High	Low	Medium	Medium	Medium	Medium	Low	Keep
Essential worker	Low	Low	Low	Low	Low	Low	Low	Remove question(s)
Online school/classes	High	High	High	High	High	High	High	Keep
Unmet needs/barriers	High	High	High	High	High	High	High	Keep / add for all

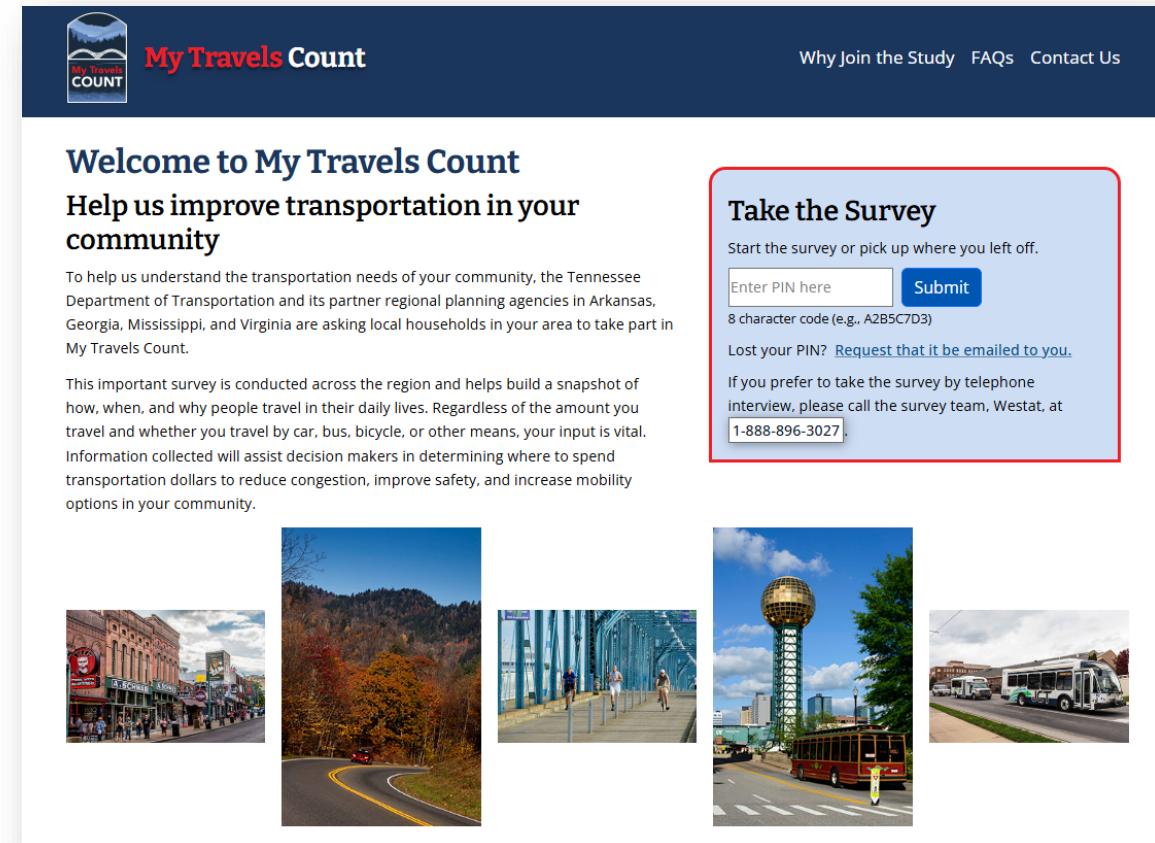
My Travels Count Survey: Sampling

- Sample Size by MPO
- Nashville, Clarksville, Cleveland MPOs and non-MPO counties excluded
- Address-based Sampling
- Oversample for Hard-to-Reach
- Main Survey Monitoring (Feb-May)
- Travel Days Mon-Fri
- While schools are in session

MPO	Sample Size	2024 NHTS Add-On	Grand Total
Bristol	500	30	530
Chattanooga	1,500	82	1,582
Jackson	500	30	530
Johnson City	500	44	544
Kingsport	500	30	530
Knoxville	2,500	196	2,696
Lakeway	500	30	530
Memphis	4,000	200	4,200
Other		858	858
TOTAL	10,500	1,500	12,000

Main Survey Preparation

- Recruitment
 - 660,000 invitations will be mailed
 - Goal is for 19,800 recruited households
 - First travel dates assigned in early February
 - Web and telephone options
- Travel Reporting (Retrieval)
 - 10,500 among the 19,800 recruited
 - Travel from those 5+ years of age



The screenshot shows the 'My Travels Count' website. The header is dark blue with the 'My Travels Count' logo on the left and links for 'Why Join the Study', 'FAQs', and 'Contact Us' on the right. The main content area has a white background. On the left, a 'Welcome to My Travels Count' section explains the survey's purpose and provides a link to request a PIN. On the right, a 'Take the Survey' section contains a form with a text input for the PIN, a 'Submit' button, and a link to request a PIN. Below the text, there are six small images: a street scene with shops, a winding road with autumn trees, a blue bridge, a water tower, a bus, and a street with a bus stop.

My Travels Count

Why Join the Study FAQs Contact Us

Welcome to My Travels Count

Help us improve transportation in your community

To help us understand the transportation needs of your community, the Tennessee Department of Transportation and its partner regional planning agencies in Arkansas, Georgia, Mississippi, and Virginia are asking local households in your area to take part in My Travels Count.

This important survey is conducted across the region and helps build a snapshot of how, when, and why people travel in their daily lives. Regardless of the amount you travel and whether you travel by car, bus, bicycle, or other means, your input is vital. Information collected will assist decision makers in determining where to spend transportation dollars to reduce congestion, improve safety, and increase mobility options in your community.

Take the Survey



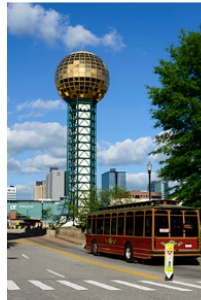



Start the survey or pick up where you left off.

Enter PIN here

8 character code (e.g., A2B5C7D3)

Lost your PIN? [Request that it be emailed to you.](#)

If you prefer to take the survey by telephone interview, please call the survey team, Westat, at 1-888-896-3027



So How Do Achieve Those Goals?

- Public Outreach
 - Public Engagement Plan – guidelines for MPO outreach
 - Press releases – to media, community-based orgs, elected officials, etc.
- Weekly mailings
 - Limited time for adjustments
 - Can modify volume for last two of 8 mailings
- Offer Multi-Modal Data Collection Options
 - Web, phone, smartphone app
 - Not everyone in a household will use the same mode
- Constant Communications
 - Personalized incentives
 - Reminders

Personalized Incentive Structure



Real-time, integrated source for participant and household information



Provides clear, concise instructions



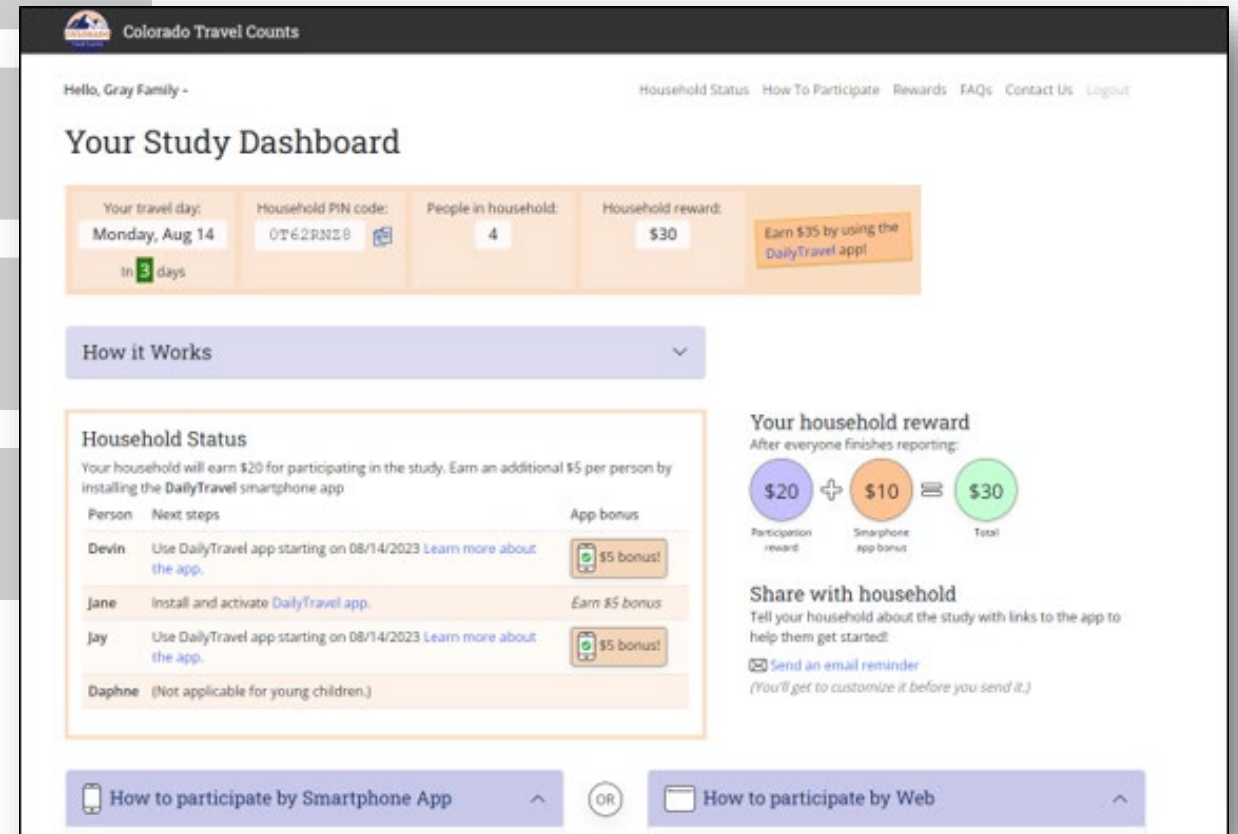
Details total incentive amounts



Highlights app-use incentives



Provides survey and app FAQs



Colorado Travel Counts

Hello, Gray Family - Household Status How To Participate Rewards FAQs Contact Us Logout

Your Study Dashboard

Your travel day: Monday, Aug 14 In 3 days	Household PIN code: 0T62R32Z8	People in household: 4	Household reward: \$30 Earn \$35 by using the DailyTravel app!
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How it Works

Household Status

Your household will earn \$20 for participating in the study. Earn an additional \$5 per person by installing the DailyTravel smartphone app.

Person	Next steps	App bonus
Devin	Use DailyTravel app starting on 08/14/2023 Learn more about the app.	\$5 bonus!
Jane	Install and activate DailyTravel app.	Earn \$5 bonus
Jay	Use DailyTravel app starting on 08/14/2023 Learn more about the app.	\$5 bonus!
Daphne	(Not applicable for young children.)	

Your household reward

After everyone finishes reporting:

\$20 Participation reward	+	\$10 Smartphone app bonus	=	\$30 Total
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Share with household

Tell your household about the study with links to the app to help them get started!

[Send an email reminder](#)
(You'll get to customize it before you send it.)

How to participate by Smartphone App OR How to participate by Web

Real Time Monitoring



Customizable reports



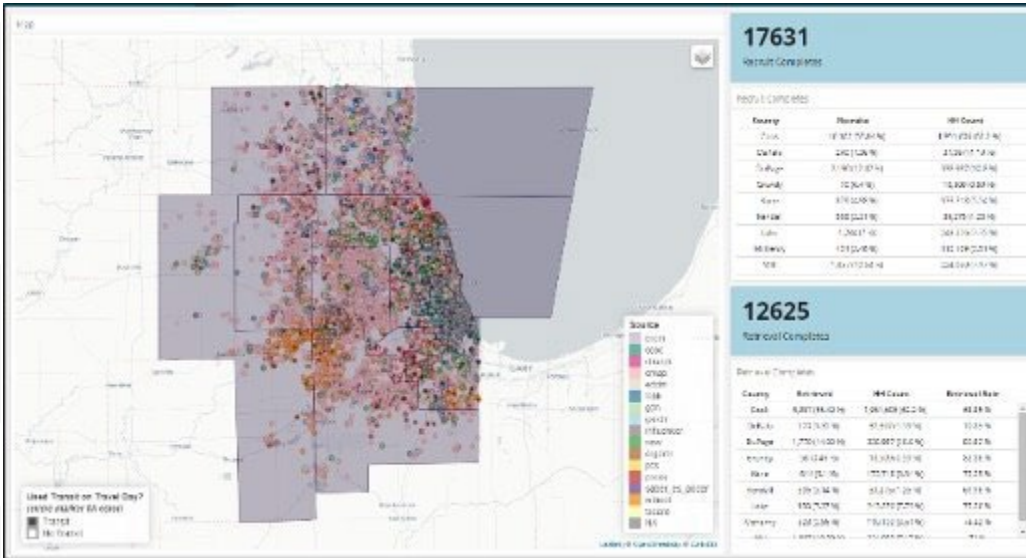
Interactive Dashboard



Completion Rate Statistics



Dynamic Pivot Tables/Charts



Count

Household Workers

Household Size	Household Workers	0	1	2	3+	Totals
-7		3	1			4
1		2,518	4,118	41	14	6,691
2		3,238	2,958	4,281	5	10,482
3		1,783	1,586	1,933	631	5,933
4+		3,790	2,441	3,510	1,163	10,904
null		28,395				28,395
Totals		39,727	11,104	9,765	1,813	62,409

Data Quality Control



Automated Questionnaire Checks

Real-time QA/QC within surveys

Web, telephone, and app surveys



Post-Collection Data Checks

Post-processing automated checks (45+)

Failed checks review by analyst

Frequency reviews



Geocoding Quality Control

Search services through Google API

Filter poor quality search results

Data Development

- Develop weights to survey data sets
- Prepare data for model estimation
 - Chain survey records into trip/tour records
- Multi-dimensional balancing (MDB)
 - Goal: Single set of weights that minimize difference between expanded survey totals and a priori specified control variables at household and person levels
 - Used for New York (NYMTC), Chicago (CMAP), Columbus (MORPC), Los Angeles (SCAG), Phoenix (MAG), Jerusalem, Vancouver, and the current NHTS
 - Flexible control specification

Data Development

- Conduct data QA/QC review from a modeling perspective
- Data will be processed into trips and tours
- Compare and contrast current survey data to 2022 NHTS data to assess reasonableness (improvements?)
- Validity Checks
 - Trips and tours identified by corresponding validity flags
 - Invalid attributes don't automatically disqualify records
 - Try to use other reported information to identify the missing information

Thank You

Kyeil Kim, Kyeil.kim@wsp.com

Jesse Casas, JesseCasas@westat.com