Designing a data collection program to keep pace with innovations in transportation

OBJECTIVES

Discuss the design of the Travel Behavior Inventory data collection program

Highlight how new modes and travel behaviors have been captured in the preliminary results of the 2018-2019 Travel Behavior Inventory through new methods

Show how the design of the program provides opportunity to make informed decisions about future efforts and incorporate new methods with less risk
Travel Behavior Inventory Team

**PROJECT REVIEW TEAM**
- **Jonathan Ehrlich** Project Manager
- **Dennis Farmer** Project Advisor
- **Eric Lind** Project Advisor
- **Jim Henricksen** Project Advisor

**CONSULTANT TEAM**
- **Elizabeth Greene** Principal
- **Joann Lynch** Project Manager

**STAKEHOLDERS**

**Twin Cities Regional Travel Forecasting Committee**
- Federal Highway Administration
- Minnesota Department of Transportation
- Wisconsin Department of Transportation
- Metro Transit
- Metropolitan Council
- County representatives from the 19-county metro area
- City representatives from Minneapolis and St. Paul
- University of Minnesota
Designing a recurrent transportation data collection program
The TBI is a **household travel survey** of the greater Twin Cities region that has been conducted every 10 years since 1949.

Two significant changes in 2018:

1. **Recurrent** survey program every other year
2. Began using a **smartphone GPS application** as the primary means of data collection
What is a household travel survey?

CORE SURVEY DATA COLLECTED

**Household:** resides within the pre-specified study region

**Person:** all members report demographic and trip information

**Vehicle:** all vehicle details and trips collected

**Trip:** all household trips made during a specific period

SUPPLEMENTAL DATA COLLECTED

Transportation network company usage (Uber, Lyft, etc.)

Autonomous vehicle attitudes/interests
Why conduct a household travel survey?

To understand daily travel and activities: how we travel, where we go, how much time it takes us, and why we make trips

DATA NEEDS

A representative sample of the region for:

• Transportation planning
• Travel demand modeling
• Measuring changing behaviors

DATA USE

• Congestion management
• Transit improvements
• Bike lane and sidewalk planning
• Parking management
Why transition to a biennial recurrent travel survey program?

Planners can keep pace with changes in the transportation industry and regional development (e.g., new modes, changing neighborhoods).

Recurrent programs 1) provide opportunity for rapid improvement cycles based on recent results and 2) create cost efficiencies as the program evolves incrementally year over year.

**TBI recurrent program schedule – 12 months of data collection every other year**

- 2018 Pilot
  - 400 households

- 2018-2019
  - Wave 1
  - 7,500 households

- 2020-2021
  - Wave 2
  - 3,700 households

- 2022-2023
  - Wave 3
  - 3,700 households
Why transition to smartphone app data collection?

CORE SURVEY DATA COLLECTED

Demographic data

*Household, person, and vehicle data*

Travel diary data

*How we travel, where we go, how long it takes us, what we do when we arrive*

Smartphone app data collection:

- Increases data quality/quantity
- Decreases burden and non-response from hard-to-reach groups

COLLECTED VIA SMARTPHONE GPS APP
How does smartphone app data collection work?

Passive/automatic collection of spatial data for seven days AND prompted in-app surveys

TRIP SURVEY

DAILY SURVEY
Using smartphone data collection to understand new modes and new travel behaviors

Trip route data shows geographic hot spots for new modes

Detailed trip information can be collected without significant burden

Measuring telework behavior

Measuring delivery services use and new trip replacement behaviors
2018-2019 Travel Behavior Inventory Results
2018-2019 Travel Behavior Inventory Snapshot

- **7,800 HOUSEHOLDS**
- **13,200 VEHICLES**
- **16,100 PERSONS**
- **83,900 DAYS OF TRAVEL**

**PARTICIPATION MODE**
- 32% Online or Call Center Diary
- 68% rMove Diary

**ANALYZING RESULTS**
1. Methodology & Design
2. Sample Demographics
3. Travel Data
4. New Modes & Behavior
Improved Methodology and Design
Smartphone allows for timely prompted recall of trip details

HOURS BETWEEN TRIP END & TRIP SURVEY COMPLETION

- 30% in 1 hour or Less
- 11% in 1 to 2 hours
- 17% in 2 to 5 hours
- 14% in 5 to 12 hours
- 28% in 12+ hours

Participants answer surveys throughout the day reducing the effect of recall bias

21% of trip surveys answered within 30 minutes of travel

DISTRIBUTION OF TRIP ENDS & SURVEY COMPLETIONS BY HOUR OF DAY
Sample Profile

Key Household-level Demographics

**Smartphone participants** have a higher share of households with 3+ members.

**Household Income by Participation Group**

- Smartphone participants were more likely to provide their household income.

**Smartphone** participants had a higher share of households with 3+ members, compared to **Online & Call Center** participants.
Sample Profile
Key Person-level Demographics

A higher share of persons age 18 to 35 participated using smartphones.

Online and call center participants were more likely to be unemployed – which is reasonable given the higher share of participants age 65+ using that mode.
Quality of Travel Data
Differences in Trip Collection by Survey Mode

rMove collected a higher proportion of short trips
Understanding New Modes and Behaviors
Recurrent programs can evolve year over year

30% of adult participants use one or more shared services.

SHARED SERVICES USAGE

- Uses takes Uber, Lyft, or other smartphone-app car service: 29.3%
- Uses bikeshare: 3.0%
- Uses carshare: 0.8%
- Uses vanpool: 0.5%
- Drives for Uber, Lyft, or other smartphone-app car service: 0.3%
- Uses peer-to-peer car rental: 0.1%

Daily Survey:

Which of the following, if any, do you use? Select all that apply.

- Use/take Uber, Lyft, or other smartphone-app car service
- Drive for Uber, Lyft, or other smartphone-app car service
- Carshare (e.g., HOURCAR, Car2Go, ZipCar)
- Peer-to-peer car rental (e.g., Getaround)
- Bikeshare (e.g., Nice Ride)
- Vanpool
- None of the above
30% of adult participants use smartphone-app ride services.

Among users, 35% use these services at least 1-3 days a month if not more frequently.
Understanding New Modes and Behaviors

TNC Users Snapshot

Participants under age 45 are more likely to be TNC users.

Low-income households have a higher share of non-TNC users.

Households with incomes over $100,000 have a significantly higher share of TNC users.
Geographic hot-spots where new modes are being used can be identified through trip route data collected via the smartphone-app.
Understanding New Modes and Behaviors

Trip replacement behaviors

On 22% of travel days at least one delivery occurred.

<table>
<thead>
<tr>
<th>GOODS &amp; SERVICES DELIVERIES ON TRAVEL DAY BY TYPE OF DELIVERY</th>
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<tbody>
<tr>
<td>Received packages at home (e.g., FedEx, UPS, USPS)</td>
</tr>
<tr>
<td>Received personal packages at work (e.g., FedEx, UPS, USPS)</td>
</tr>
<tr>
<td>Food was delivered to home (e.g., take-out, groceries)</td>
</tr>
<tr>
<td>Someone came to home to do work (e.g., landscaping, plumber, house cleaning)</td>
</tr>
<tr>
<td>Received packages at offsite locker</td>
</tr>
<tr>
<td>Other type of delivery</td>
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<tr>
<td>Received packages at home</td>
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</table>
Understanding New Modes and Behaviors

Trip replacement behaviors

42% of employed adult participants reported that they telework.

FREQUENCY OF TELEWORKING
(Among those who reported teleworking)

- Less than monthly: 36%
- 1-3 days per month: 27%
- 1 day a week: 15%
- 2-3 days a week: 13%
- 4 days a week: 4%
- 5 days a week: 4%
- 6-7 days a week: 2%
Planning for a Recurrent Program
Looking forward and planning for a recurrent program

Recurrent programs provide opportunity for year-over-year updates based on emergent modes and behaviors

- Results of each wave will help determine design for the subsequent wave
- Each wave can evolve based on current data needs

**TBI recurrent program schedule**

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Wave 1 Study Design Experiments

**Differential Incentives**
Increase completion rates for hard-to-reach populations

**Targeted Oversampling**
Increase proportion of hard-to-reach households in the sample

**Door-to-door Outreach**
Encourage hard-to-reach households to participate

**Travel Date Reassignment**
Provide a second chance for survey dropouts to complete

Opportunity to make informed decisions about future efforts and incorporate new methods with less risk.
### Potential areas of interest for 2020

<table>
<thead>
<tr>
<th><strong>Adding survey question modules</strong></th>
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<td>Electric vehicle attitudes and behaviors among owners and non-owners</td>
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<th><strong>Using passive data sources to oversample behaviors of interest</strong></th>
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<tr>
<td>Using passive data to supplement survey data on airport travel or special event travel</td>
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<th><strong>Follow-up panel surveys for target populations</strong></th>
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<tr>
<td>Survey of bikeshare users</td>
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<th><strong>Special generator surveys</strong></th>
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<td>University survey to capture student travel behavior</td>
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Designing a travel behavior data collection program

Balancing sample size and the survey data type collected with study cost.

- **Sample Size**: 2018 TBI has a sample size of 7,500 while the 2010 TBI had a sample of 13,000.

- **Survey Data Type**: Smartphone-app data collection with a 7-day diary provides significantly more days of data in comparison to 24-hour online or phone diaries.

- **Study Cost**: By evolving methods to smartphone-app data collection, smaller sample sizes can meet or exceed agency data needs at a lower cost point.
CONTACTS

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