

RESEARCH SPOTLIGHT

Project Information

REPORT NAME: Research and Development of a 3-Item Transportation Security Index Mobility Measurement Tool

START DATE: May 2024

REPORT DATE: June 2025

RESEARCH REPORT NUMBER: SPR-1749

PROJECT COST: \$200,800

COST SHARING: 20% MDOT, 80% FHWA through the SPR, Part II, Program

MDOT Project Managers

Richard Bayus

Transportation Planning Manager
Statewide Planning

BayusR@Michigan.gov
517-388-6891

James Dell

Statewide Transportation Planner
Statewide Planning

DellJ2@Michigan.gov
517-599-6194

RESEARCH ADVISORY PANEL MEMBERS:

Lindsey Dowswell, Karen Faussett, Kyle Haller, Sam Hetherington, Mary Hoffmeyer, and Jon Roberts.

Refining a survey tool to evaluate mobility and transportation insecurity

Assessing the mobility needs of various demographics and geographies is essential to making sound investments in transportation improvements. The Michigan Department of Transportation (MDOT) had access to a survey instrument that assesses these needs, but it is long and expensive to administer. Improving the survey process by reducing the number of questions in the survey instrument while still collecting sufficient data will allow the agency to better measure gaps in mobility across the state and provide the evidence needed for decision-makers to identify problem areas and solutions.

PROBLEM

Being able to drive, bike, walk, or take public transportation is essential for the most common tasks of daily life: going to work, attending school, visiting a doctor, or socializing with family and friends. By contrast, the term “transportation insecurity” both describes and measures the degree to which individuals are unable to get from place to place safely or efficiently because of a lack of resources. Collecting and then incorporating transportation insecurity data with traditional planning metrics like traffic and capacity can help MDOT make informed decisions to serve all transportation users.

The University of Michigan pioneered its 16-question Transportation Security Index (TSI) survey instrument to assess



Reducing the TSI survey instrument from six questions to three can lower survey costs while improving response rates and data quality.

transportation insecurity, but the question count was associated with high administration costs and lower response rates. It was later reduced to six questions but was still considered lengthy.

With this project, MDOT sought to develop and validate a shortened three-question TSI survey instrument that would

“This project statistically validated a form of the Transportation Security Index that is small enough to implement into our surveys and focus on areas of the state that are experiencing transportation insecurity.”

James Dell
Project Manager

more effectively and efficiently collect the information needed to identify who experiences transportation insecurity and where it exists.

RESEARCH

Investigators analyzed data from a nationally representative survey of the six-question TSI survey instrument. This analysis resulted in the elimination of two questions. Investigators then examined all possible three-question combinations using the remaining questions.

Next, content experts evaluated three potential versions of a three-question survey to ensure face validity. These experts included public transportation officials, planners, transit advocates, transportation researchers, health researchers, and material hardship scholars who examine a household's inability to provide basic necessities. Investigators then used feedback from these experts to create the following survey instrument that assessed both the material and relational symptoms of transportation insecurity:

1. To get to the places they need to go, people might walk; bike; take a bus, train or taxi; drive a car; or get a ride. In the past 30 days, how often did you skip going somewhere because of a problem with transportation?
2. In the past 30 days, how often were you **not** able to leave the house when

you wanted to because of a problem with transportation?

3. In the past 30 days, how often did problems with transportation affect your relationships with others?

To validate this preliminary survey, a split-ballot experiment presented respondents with identical questionnaires, including either the six- or three-question survey. Investigators analyzed the responses and compared the results, including prevalence estimates and associations with two health outcomes.

RESULTS

Statistical comparisons between the six- and three-question TSI survey instruments indicated comparable performance with similar psychometric properties and prevalence estimates. The three-question and six-question TSI surveys estimated 12 percent and 17 percent, respectively, of people in the U.S. experienced transportation insecurity in 2024. Further, both surveys found transportation insecurity was a predictor for poor health and depression. These results suggest the three-question TSI survey instrument is sufficiently comparable to the six-question survey instrument for estimating transportation insecurity prevalence and measures of association.

One crucial difference between the two instruments was completion time. Whereas the six-question TSI took, on average, 51.1 seconds to complete, the median completion time of the three-question TSI was only 28.5 seconds. Additionally, the six-question instrument can identify three categories of transportation insecurity (secure, marginal/low insecurity, moderate/high insecurity) while the three-question instrument can identify two categories (transportation secure, transportation insecure).

IMPLEMENTATION

Results indicate that the three-question TSI instrument is more efficient and cost-effective. The data collected can enable analyses to identify locations for improve-

ments, assess and track the causes of transportation insecurity over time and evaluate the effectiveness of investments. Investigators developed guidance that demonstrates the survey's utility and illustrates how it can be implemented.

In 2025, MDOT included the three-question TSI survey in its Attitudes and Perception Survey and its MI Travel Counts Household Travel Survey to better address the needs of residents in long-range planning efforts.

Research Administration

Principal Investigator

Alexandra Murphy

Assistant Research Scientist,
Poverty Solutions
University of Michigan
426 Thompson St.
Ann Arbor, MI 48104

murphyal@umich.edu
734-647-8837

Contact Us

PHONE: 517-281-4004

E-MAIL: MDOT-Research@Michigan.gov

WEBSITE: Michigan.gov/MDOTResearch

The final report is available online at

MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1749

If you require assistance accessing this information or require it in an alternative format, contact the Michigan Department of Transportation's (MDOT) Americans with Disabilities Act (ADA) coordinator at www.Michigan.gov/MDOT-ADA.

Research Spotlight produced by
CTC & Associates LLC, November 2025.