RESEARCH ADMINISTRATION
Bureau of Field Services
Michigan Department of Transportation

Research Spotlight

Local data will help Michigan make better safety investment decisions

MDOT staff are aiming to use data-driven processes and practices from the AASHTO Highway Safety Manual (HSM) to estimate the safety impacts of various crash reduction strategies and highway design alternatives, such as adding a median or varying the widths of lanes or shoulders. While these models, also known as safety performance functions (SPFs), are useful, the HSM recommends that transportation agencies improve them by either calibrating the SPFs for local conditions or recalculating them using local data. This Spotlight describes two MDOT research projects undertaken to generate SPFs for urban roads in Michigan.

Project Information

REPORT NAMES: Michigan Urban Trunkline Intersections Safety Performance Functions (SPFs) Development and Support; Michigan Urban Trunkline Segments Safety Performance Functions (SPFs) Development and Support

START DATES: September 2013, March 2014

REPORT DATES: June 2015, July 2016

RESEARCH REPORT NUMBERS: RC-1628, RC-1639

TOTAL COST: $445,664 (total for both projects)

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

MDOT Project Manager

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Problem

Historically, transportation agencies have chosen locations for safety improvement projects based on either crash history alone, or by analyzing crash history with respect to traffic volume. This approach is not optimal, because crashes are relatively rare and somewhat random events. Because of this, crash frequencies observed in the short term do not necessarily reflect how likely traffic crashes are in the long term.

Local conditions and behaviors have a big impact on road safety. The studies described in this Spotlight developed safety performance functions specific to Michigan for use in making safety investment decisions.

In addition, safety treatments do not have the same impact at all locations. Site-specific differences affect how much a given treatment will improve safety.

SPFs offer a data-driven approach to selecting safety enhancements. DOTs can use them to identify candidate project

(continued)

> *"This research will allow us to assess Michigan's road network more efficiently and choose treatments that provide the most safety for the least amount of money."*
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> **Dean Kanitz, P.E.**
> Project Manager

locations and select treatment options that will produce the optimal safety results at the lowest cost.

Since the models developed for the HSM are based on data from states across the country, MDOT decided to improve their accuracy for Michigan by recalculating the models with Michigan-based data.

Research

While researchers conducted separate projects to develop SPFs for urban trunkline segments and urban trunkline intersections, the research process was similar for both.

The researchers assembled data about traffic crashes, traffic volumes and roadway geometry from several sources. Much of the data was recorded in AASHTOWare's Safety Analyst software, while additional information came from Google Earth and from databases maintained by MDOT, the Michigan State Police, and the Michigan Geographic Data Library.

The researchers evaluated how the base SPFs from the HSM fit urban intersections and segments in Michigan, and generated calibration factors. Since the calibration demonstrated that the base SPFs did not consistently predict safety impacts in Michigan, the researchers developed Michigan-specific SPFs for different urban intersections and segments.

Results

The research developed two separate sets of SPFs for various types of trunkline intersections or segments:

- Less complex SPFs were developed based solely on a site's traffic volume and MDOT region. MDOT and local agencies can use these models as a network screening tool, and MDOT will incorporate these SPFs in its implementation of AASHTOWare's Safety Analyst software.
- The other models consider traffic volume, MDOT region and crash modification factors (CMFs). These models are more detailed SPFs that provide state and local engineers with a better understanding of the safety impacts of an investment decision. MDOT will use these SPFs to revise its spreadsheet tool that automates the model calculations for state and local engineers.

Value

Having SPFs that reflect Michigan's unique driving environment will help MDOT select the most cost-effective safety improvements with the greatest potential to save lives. Local transportation agencies will also be able to apply these SPFs in their own decision-making. The precise benefit of improving this decision-making process depends on the resources that are available for implementing safety treatments. Since the cost of a traffic fatality in Michigan is estimated at more than $3.6 million (including medical care, property damage, lost earnings and quality-of-life costs), safety improvements have significant economic benefits as well.

MDOT plans to incorporate the new SPFs in its use of the Interactive Highway Safety Design Model, a software tool for analyzing the safety effects of geometric design decisions on highways. The information will also aid in MDOT's Toward Zero Deaths highway safety campaign.

An upcoming project will develop SPFs for rural intersections and segments, which is aimed at assisting local road agencies in Michigan.

Research Administration

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This project was initiated at Detroit's Wayne State University, where both investigators were formerly associate professors.

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These final reports are available online at
www.michigan.gov/documents/mdot/RC1628_497550_7.pdf and www.michigan.gov/documents/mdot/SPR-1639_539388_7.pdf.

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