RESEARCH ADMINISTRATION
Bureau of Field Services
Michigan Department of Transportation

Research Spotlight

Balancing safety and capacity for road diet lane conversions

For the minimal cost of restriping the roadway pavement, Michigan can convert a traditional four-lane undivided highway to three lanes: two travel lanes and a center turning lane (with optional bicycle lanes). The practice, called a road diet, was first tried by MDOT in the late 1980s as a way to improve safety while accommodating current highway use levels. Now commonplace in Michigan, road diets became the subject of an MDOT research project to help update guidelines for how and when they can do the most good.

Project Information

REPORT NAME: Safety and Operational Analysis of Four-Lane to Three-Lane Conversions (Road Diets) in Michigan

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

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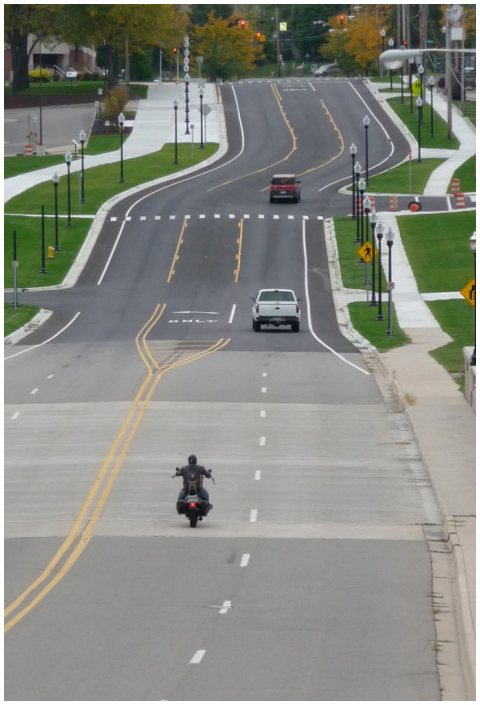
Problem

To be effective, road diet conversions should improve safety without creating operations issues. MDOT needed to methodically examine the impacts of existing road diet conversions in order to update the process for identifying new locations where road diets would be appropriate. This information is not just important to MDOT. The department works with local agencies to help them implement road diets (more than half of the road diet mileage in Michigan is under local jurisdiction), providing engineering support and helping to identify funding sources for implementing these safety improvements.



A road diet in Flint: Four lanes (foreground) give way to a highway with a center turn lane and bicycle lanes.

Approach

Researchers addressed this topic from safety and operations perspectives, two factors that need to be balanced with care. From a safety standpoint, the research

(continued)

> *"When applied to an appropriate site, a road diet can mean a safer road and reduced operating costs. Each road diet is different, and this research helps us understand how and where to implement them."*
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sought to determine whether and how road diets were making a difference on collision frequencies and rates. With respect to operations, it looked to establish traffic thresholds—total daily traffic or peak-hour volumes—above which the reduction of travel lanes could cause undue congestion and negate the possible benefits of a road diet conversion.

Research

Since road diets have been in service in Michigan for years, researchers could analyze detailed before-and-after crash data to determine the safety effects of road diets. Investigators considered data from 24 sites in Michigan and analyzed regional traffic trends to filter out extraneous influences on collision rates. They also examined crashes by category (such as left turns across traffic and rear-end collisions) to help establish which types might be affected by road diet implementations.

To assess operations, the researchers examined traffic levels at existing road diet sites and used Synchro software to model operational effects and traffic impacts. Two metrics of interest were the average daily traffic volume and peak-hour traffic volume. An average daily volume of 20,000 is an often-cited threshold above which road diets are presumed not to be useful. FHWA currently requires operational analysis for prospective road diet conversion sites when the average daily volume exceeds 15,000 vehicles.

Results

The analysis showed that for the types of crashes where road diets would be expected to make a difference, the number of collisions was reduced by about 40 percent (a crash modification factor of approximately 0.60). This finding correlates well with studies completed by other states. In particular, road diets are most effective in addressing hazards created by left-turning vehicles. On a standard four-lane roadway, left-turning vehicles block traffic behind them, may accept shorter gaps in oncoming traffic to turn and must cross two lanes of oncoming traffic. On a road diet, they are taken out of traffic flow in a dedicated turn lane and must only cross one lane of oncoming traffic. Overall safety benefits are likely to be more modest, with a crash modification factor of about 0.90 for total crashes.

The research findings from the operational analysis indicated potential concerns for road diet conversions on roads with daily traffic volumes as low as 10,000 vehicles, but researchers noted that daily values are only a rough indicator and are highly site-specific. Peak-hour traffic volume was found to be a much more critical indicator: Heavy rush hour traffic (or the lack of rush hour traffic in a tourist area) will better indicate worst-case congestion issues caused by reduced travel lanes. The research suggests using a peak-hour traffic volume of 1,000 vehicles as a maximum threshold for implementing road diets. However, the researchers believe a Synchro-type analysis should be undertaken in all instances so that site-specific characteristics can be appropriately considered.

Value

This research has helped MDOT review its policies on road diets while continuing to provide up-to-date guidance and support to local agencies. In particular, MDOT now requires modeling and traffic analysis for road diets that exceed the volume thresholds recommended in the study for its own sites. Although not required by MDOT or FHWA, local agencies might consider doing the same. The findings point to the care that should be taken in selecting road diet sites. Road diets are not one-size-fits-all solutions. They are most effective when targeted at sites experiencing the types of safety issues that road diets are most likely to fix.

Research Administration

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