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PUTTING RESEARCH TO WORK BRIEF

Developing a Model for Reducing Bicycle/Motor Vehicle Crashes

Bicycling plays an important role in moving people in Wisconsin. For some residents, bicycling is their sole source of transportation. As many as 5% of commuters bike to work during peak months, while recreational bikers from Wisconsin and other states tour our country roads and trail systems. The Wisconsin Bicycle Transportation Plan, approved by Wisconsin DOT in 1999, seeks to increase cycling and decrease the level of bicycle/motor vehicle crashes through education, engineering and other measures. From 1999 to 2004, bicycle/vehicle crashes in Wisconsin decreased by 14%, suggesting that the program has been successful. WisDOT would like to build on the plan's success in future years to further decrease the crash rate.

What's the Problem?

A better understanding of the nature of bicycle/vehicle crashes occurring in Wisconsin was needed to help the department focus future efforts to decrease the number of serious crashes. A study identifying the types of crashes occurring, and the relationship between these crashes and road and traffic conditions, would provide WisDOT with valuable information for developing engineering and education countermeasures to increase cycling safety.

Research Objectives

Researchers' primary goals were to:

- Evaluate Wisconsin road, traffic and intersection conditions as possible contributing factors to bicycle crash rates and severity. Use "crash typing," an analytical technique, to aid in this evaluation. Crash typing uses crash records to assess existing conditions and their effect on the frequency and severity of bicycle/vehicle crashes, and identifies problem crash types. Crash typing has recently become more accessible and easy to use.
- Use this technique to identify prominent bicycle/vehicle crash types in Wisconsin during 2003.
- Use the findings from the crash typing to help guide the development of education, enforcement and design countermeasures for inclusion in future bicycle plans and projects.

Methodology

Researchers' tasks included:

Data collection. Researchers extracted bicycle/vehicle crash data from the Motor Vehicle Accident Report Form (MV4000) system, including statewide data for the six-year period from 1999 to 2004, and a breakdown of crashes by urban and rural locations for 2003. A preliminary analysis was performed to help illustrate some crash trends for the study period.

Crash typing. When this analysis was complete, the Pedestrian and Bicycle Crash Analysis Tool (PBCAT) was used to type the crashes. PBCAT was jointly developed by FHWA and the North Carolina Highway Research Center for typing crashes and suggesting countermeasures for problem crash types. Researchers typed crashes using diagrams available in MV4000 microfiche records to confirm the exact locations of the crashes (distance from intersection and direction, etc.).

Analysis. Researchers identified and analyzed the most prevalent PBCAT crash types during 2003, and analyzed in detail the crashes that occurred that year on urban streets and rural roadways. Crash data was geocoded into a GIS-based map created for the project, allowing researchers to more easily cross-reference crashes with roadway characteristics to identify relationships between crashes and roadway conditions.

Investigator

"Linking bicycle crash types with crash conditions will help us identify more effective countermeasures."

–Tom Huber
WisDOT Bureau of Planning
thomas.huber@dot.state.wi.us

Researchers found that rural crashes were rare, but that these crashes were quite often caused by motorists passing bicyclists. These crashes were proportionately more fatal than the same type of crash in an urban setting.

Results

Researchers outlined 16 major findings of this project, including the following:

- Motorists made the critical error in four of the top five crash types identified for 2003, suggesting the need for education to increase motorist awareness of bicyclists.
- Crashes caused by vehicles passing bicyclists represented a high percentage of all rural crash types. The incidence of these crashes was comparable for 20- and 22-foot roads but dropped significantly for 24-foot roads, possibly due to the additional passing width available.
- In urban settings, 70% of crashes occurred on streets that are functionally classified as collectors and arterials. This research indicates that connections for bicyclists are important along these busier streets.
- 29% of urban crashes were reported as sidepath/sidewalk crashes. A separated path adjacent to a street is often viewed as a premier facility. However, many of the potential locations for these paths are hazardous because of conflicts with intersections and driveways.

Implementation and Further Research

WisDOT planners will review the results of this research project and consider changes to the department's roadway and bikeway standards and guides. In addition, WisDOT is continuing its efforts to identify crash types and to determine whether there are correlations between crash types and crash locations. Once correlations and/or trends are found, engineers can design countermeasures to reduce crash frequency and severity. Additionally, bicycle and motorist education programs and campaigns can be adapted to focus on the most likely crash types. Police officers can also be made aware of the most common crash types for enforcement efforts.

As part of this project, researchers developed a preliminary crash analysis model capable of guiding future analyses of bicycle/vehicle crashes. Useful crash groups for future analyses include urban and rural crashes on the state highway and local roads networks.

Benefits

By increasing the availability of crash data for analysis, and by developing a model to aid in crash analysis and countermeasure development, this project strengthens WisDOT's ability to reduce bicycle/vehicle crashes in the state. Crash reduction benefits state residents by lowering cyclists' risk of injury and saving medical costs.

This brief summarizes Project 0092-05-18, "Bicycle Crash Analysis for Wisconsin Using a Crash Typing Tool (PBCAT) and Geographic Information System (GIS)," produced through the Wisconsin Department of Transportation Research Program, 4802 Sheboygan Ave., Madison, WI 53707.

James McDonnell, WisDOT Research and Communication Services

Co-investigator

"Crash reduction provides many benefits to state residents, including a lower risk of injury."

–Michael Amsden
Transportation Planner, formerly with the WisDOT Bureau of Planning

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