Traffic Crash Variables in Wisconsin

Research Objectives

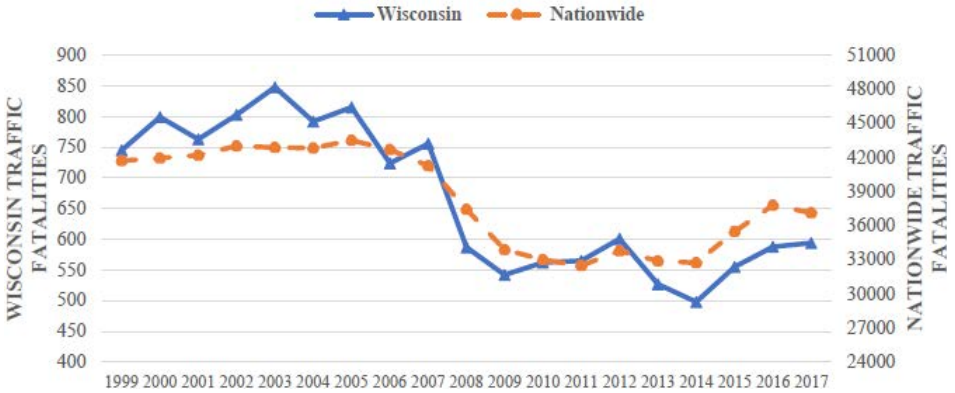
- Develop methodologies for identifying behavioral and engineering variables relating to reportable crashes

Research Benefits

- Developed a comprehensive reference for traffic safety professionals and researchers to analyze causes of crashes and recommend countermeasures

Background

Traffic fatality and injury rates have steadily decreased since 1950 thanks to the collective impacts of law enforcement, driver education, highway engineering, emergency medical services and advancements in vehicle safety technologies. However, motor vehicle crashes are still a leading cause of death in Wisconsin.



Trends in traffic crash fatalities between 1999 and 2017

Traffic crash patterns react to changes in travel demand; driver demographics and behavior; highway design and traffic control; vehicle safety features; and broad economic trends. Crashes can also be affected by new or significant modifications to safety laws or policies that result in substantial increases in safety investments (e.g., speed limits, mandatory seatbelts, blood alcohol limits and bans on handheld devices).

The notion that traffic crashes are not accidents, but avoidable events, underscores the importance of identifying relevant, significant and correctable factors leading to a crash. The goal of this research was to provide methodologies for identifying the most pertinent behavioral and engineering variables relating to reportable crashes.

Methodology

A three-pronged approach was taken to study the complexity of crash occurrence in diverse and varying contexts, including: area-level modeling (census tract); site-specific modeling (roadway segment); and event-oriented modeling (crash events). More than 100 variables were evaluated in over a dozen statistical models. The effect of risky driving behaviors on traffic safety was measured using Wisconsin traffic citation data. Street corridor-based pedestrian and bike crash prediction models were calibrated by data collected from various sources throughout the state.

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"This research brings us closer to understanding this multi-faceted problem and highlights the need for better underlying data."
– Laura Vande Hey, WisDOT

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Final report is available at:
WisDOT Research website

Results

While over 90 percent of crashes are caused primarily by driver error there are usually a confluence of contributing risk factors. The research team developed new methodologies for the three approaches to effectively quantify the impact of variables on crash counts (or account for their absence when they are not available).

1) Area-level models offer macroscopic analysis that incorporates global trends, such as socio-demographic-induced changes and infrastructure changes, in generating reliable estimates for the safety impacts of engineering and behavioral countermeasures under various growth scenarios.
2) Novel statistical regression methods offer a microscopic view of specific roadway segments to help identify the performance of key roadway design elements under the influence of human factors.
3) Driver factor models provide granular insights into errors leading to crashes.

Recommendations for implementation

The findings of this study will serve as an important and comprehensive reference for traffic safety professionals and researchers. Through the study's three-pronged approach, the causes of crashes can be analyzed effectively, and potential countermeasures can be recommended. The complexity of causes of crashes affirms that a single approach is inadequate to handle such a broad spectrum of data with diverse and varying characteristics. Although some results in this study require further investigation, the overall findings emphasize the importance of data quality, sharing and distribution, as well as reliable analytical methods for making Wisconsin's highways safer.

This brief summarizes Policy Research Program Project 0092-16-11,
"Identifying Variables Relating to the Causes of Traffic Crashes."