Florida Department of Transportation Research

Validation and Application of Highway Safety Manual (Part D) in Florida
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Ongoing surveillance programs on roads and highways in the U.S. have produced large amounts of data on many aspects of transportation. Crash statistics are among the most important products of these efforts as they help engineers pinpoint collision hotspots and begin the process of developing and implementing treatments to reduce collisions. The treatments are monitored for their effectiveness, which is quantified by crash modification factors (CMFs). A CMF applies to a specific combination of safety treatment, highway geometry, and traffic characteristics, such as installation of rumble strips on a rural road near an upcoming stop sign or reconfiguration of a turn lane to make safer the intersection of two busy four-lane highways near a suburban mall.

CMFs for a wide range of situations are compiled in the Highway Safety Manual (HSM), Part D. However, before these CMFs can be used confidently, they must be assessed for local situations, as undertaken in this project by University of Central Florida researchers. They developed Florida-specific CMFs matching those in the HSM, evaluated differences between them, and recommended which CMFs to apply.

As for many projects of this type, the researchers found that the necessary data had to be gathered from many sources, such as the Financial Management Database, the Roadway Characteristics Inventory, and the Crash Analysis Reporting Database, as well as various plans, maps, and photographs. Data were used to identify the treatment's date and location and the location's road geometry and traffic characteristics before and after treatment and its historical crash records.

A counterpart to the CMF is the SPF, the safety performance function, which predicts crash frequency on the basis of statistics, geometries, etc., like CMFs. The researchers developed Florida-specific SPFs using several statistical methods, including before-after and cross-sectional. Before-after methods used were naïve before-after, before-after with comparison group, and before-after with Empirical Bayesian (EB) methods. Florida-specific SPFs were then used alone and with other data to develop different sets of CMFs. CMFs with the lowest standard error were used for further analysis.

Statistical analysis of highway incidents can pinpoint crash-prone locations and recommend appropriate treatments to improve safety.

The researchers found that, when compared to HSM CMFs, the Florida-specific CMFs were statistically significantly better at matching real-world effects of the chosen safety treatments. Some treatments were not covered in the HSM, but in those cases, the Florida-specific CMFs demonstrated a positive effect of the treatment. This approach gives engineers a method for deciding to use the HSM CMFs or when CMFs must be developed for a particular setting.

The use of tools like CMFs provides engineers with a provable, data-driven approach to safety treatments. Projects like this exploit the vast amount of data being collected about roadways and add to an expanding understanding and body of knowledge. The result is safer, more well designed roadways.

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