Florida Department of Transportation Research

Two-Level Approach to Safety Planning Incorporating the Highway Safety Manual (HSM) Network Screening

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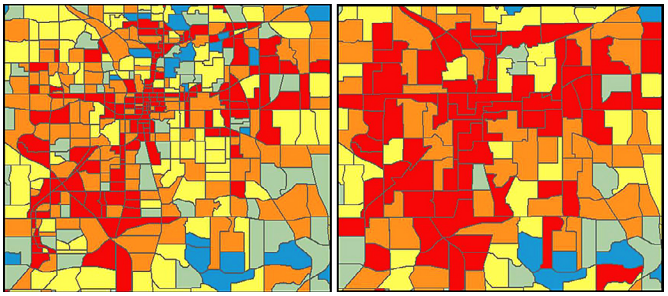
In this project, University of Central Florida researchers combined two types of safety analysis, microscopic and macroscopic, to overcome their limitations. Microscopic models focus on traffic flows and related parameters. Macroscopic models are based on analyzing zones in the roadway network; they are more efficient than micro models at integrating zone-level features into crash prediction, but they identify hot zones, not specific hotspots. The researchers' method combined macroscopic efficiency with microscopic specificity.

The researchers found that the traffic analysis zones (TAZ) currently used as the basic geographic units in macroscopic modeling overpredicted crashes at zone boundaries, so they developed a new study unit, the traffic safety analysis zone (TSAZ). This reduced boundary crash overestimation, but not enough, so the researchers designed a nested structure to analyze safety performance separately for boundary and interior crashes. The nested structure allowed different contributing factors for different crash types, providing more accurate and predictable results than a single model.

The goal of safety analysis is to generate safety performance factors (SPF), equations that relate crash rate to roadway characteristics. SPFs are predictive, so they can be used to test how proposed roadway changes alter crash rates. For SPF analysis, the researchers adopted a Bayesian Poisson lognormal spatial error model (BPLSEM), which has a valuable spatial autocorrelation component, further reducing the boundary effect. For micro level analysis, the researchers developed SPFs for the major function classes of roads in the study area. The research team used Full Bayesian Poisson lognormal models to predict crash frequency but tried four different variable combinations to identify the best model.

The researchers identified crash clusters at the macro- and microscopic levels, and they



Safety analysis of downtown Orlando looks very different as TAZs (left) versus TSAZs (right). The scales are different but both run from blue (fewest crashes) through green, yellow, and orange to red (most crashes).

integrated these screening results, combining SPFs from different scales, areas, and roadway types, appropriately weighting each group, and choosing a measurement for the final results.

Accurate safety analysis can pinpoint crash clusters and help set the most problematic roadways at the highest priority for correction, leading to a greater impact on sparing life and property on Florida's roadways.

Project Manager: Joe Santos, FDOT Safety Office
Principal Investigator: Mohamed Abdel-Aty, University of Central Florida
For more information, visit http://www.dot.state.fl.us/research-center