Midblock Crash Analysis Using Precisely Geocoded Crashes

Over the past decade South Carolina has taken considerable strides towards improving crash data quality through widescale adoption of SCCATTS (South Carolina Collision and Ticket Tracking System). Using this more accurate crash data, a fixed-length short segment (100-ft.) network screening method was developed and tested to identify and prioritize midblock site specific locations with high crash incidence. These analytical screening methods were determined to be effective compared other methods identified in the literature and procedures were established for SCDOT to apply this screening methodology periodically to identify and prioritize future locations that are of greatest need of safety countermeasures.
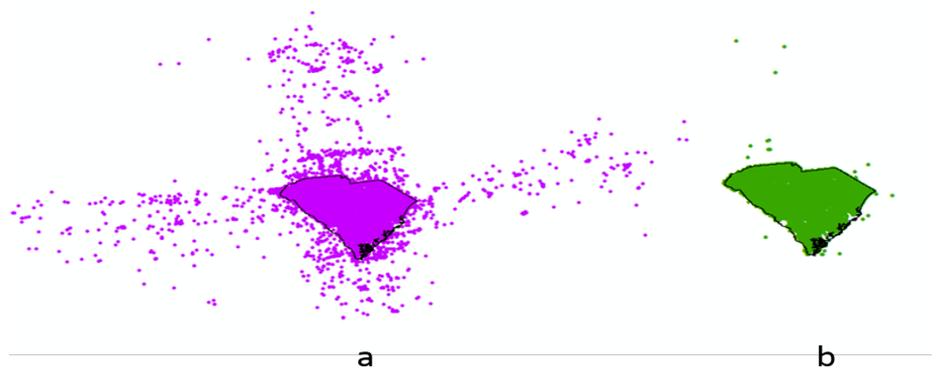
Geocoded Crashes in South Carolina: a) 2004 all; b) 2012 Highway Patrol

Problem

Traffic fatality rates consistently rank South Carolina among the highest rates for fatalities per VMT and fatalities per 100,000 population in the United States (SCDPS). Furthermore, South Carolina incurs nearly five billion dollars in economic loss annually due to roadway traffic crashes. In 2018, there were 158,777 reported motor vehicle crashes in South Carolina resulting in 1,036 fatalities and 58,044 injuries. Of particular concern are short midblock sections where crash clusters can be overlooked by current screening methods that are primarily focused on intersections or long sections between intersections.

Research

This research focused on use of short fixed-length roadway segments as the basis for statewide network screening of midblock crash locations. Based on comparative analyses, the optimal segment length to identify candidate locations for safety countermeasures was determined to be 100-feet. Using SCCATTS precisely geocoded locations of midblock crashes creates opportunities to identify short road segments with a high incidence of crashes. GIS (Geographic Information Systems) spatial analysis tools and methods provide an opportunity to automate statewide crash screening analysis for use by SCDOT, allowing a more robust investigation into

causation factors especially pertaining to the roadway environment. Results from application of a short fixed-length segment approach are easy to systematically tabulate, graphically interpret, and thematically display network threshold values for identifying hazardous segment locations though enhanced screening to support strategic highway safety prioritizations and statewide safety program decision-making. Analysis of crash and traffic data from South Carolina will yield support for which policies, standards, and guidelines can be identified and evaluated to ensure an optimally positive effect on safety, operational, and economic impacts.

High priority section of St. Matthews Rd., Orangeburg, SC, showing 100' segments with high crash frequencies

High priority horizontal curve section, Wade Hampton Blvd., Taylors, SC

Results

Based on comparative analysis, the ideal segment length for identifying candidate locations for safety countermeasures was determined to be 100-ft. This resolution allows crashes to be associated with single location specific characteristics, such as presence of a hazardous driveway, or an undesirable roadway geometry.

A survey of state highway agencies (n=24) indicated disparate crash reporting systems from a geocoding standpoint are used across the U.S. The survey also indicated there is no universal approach to network safety screening, however, most screening methods are performed on a segment basis, and crash rate and crash frequency are the most common metrics used for screening criteria.

Improved accuracies in crash location serve to support enhanced statewide safety screening, allow application of more robust analysis procedures to identify crash patterns associated with site specific characteristics, and facilitate formulation of targeted safety counter-measure programs. Short segment roadway safety screening is only viable if accurately geocoded crash data is available for an entire roadway network.

Results from short fixed-length segment screening are easy to systematically tabulate, graphically interpret, and thematically display network thresholds. These thresholds are used for identifying hazardous segment locations though enhanced screening to support strategic highway safety prioritizations and statewide safety program decision-making.

An average annual benefit for reduction of one crash was calculated as $74,405.90, using SC proportions of injury crash severity, and comprehensive crash unit cost.

An enhancement that could lead to substantial improvement of SCCATTS is to incorporate background reference aerial mapping rather than just roadway centerlines to help better pinpoint crash

locations relative to physical characteristics such as driveways.

Value & Benefit

Implementation of recommendations and methods identified through the findings and results of this research are anticipated to provide meaningful and measurable benefits for SCDOT and the traveling public. The largest benefit would result in increased traveler safety by targeting evidence-based problematic midblock locations around the state that have a documented recent history of unusually high frequency of crashes.

Systematic implementation of strategic safety countermeasures at these locations will reduce hazards and support network-wide reduction of crash frequency. Removal of roadway hazards will enhance safety for motor vehicles, bicycles, and pedestrians resulting in fewer crashes, injuries, and fatalities.

On average, traffic crashes in South Carolina annually equate to nearly $5 billion in economic losses. Targeting locations of highest crash frequency will facilitate effective and efficient use of SCDOT funding earmarked for safety enhancements across the expansive state network of streets, roads, and highways.