Data-Driven Safety Analysis

PROJECT CASE STUDY

Minnesota's Systemic Approach Integrates Safety Performance into Investment Decisions for Local Roads

Historically, approximately 60 percent of severe (fatal and serious injury) crashes have occurred on Minnesota's local road system. As the crashes occurred throughout many miles of roadways, the low crash density had resulted in the roads receiving minimal safety investment based on the traditional site analysis approach. To address this issue, the Minnesota Department of Transportation (MnDOT) assisted the counties in identifying low-cost, safety-related projects to implement on a systematic basis. The result has been far fewer fatalities on the county roadways.

Project Description

MnDOT's approach involved developing Road Safety Plans (RSPs) for each of the state's 87 counties, building on Minnesota's Strategic Highway Safety Plan (SHSP), to identify specific safety projects that would directly address the factors associated with the most severe crashes on each county's highway system.

To develop the safety plans, MnDOT conducted a statewide, comprehensive crash analysis as documented in the Federal Highway Administration (FHWA) Systemic Safety Project Selection Tool. This helped the counties identify the proportion of crashes occurring in urban versus rural areas, whether they were on state or local roads, their severity, and the primary crash types. The analysis showed that there were more severe crashes on the county system than on the state system and that the majority of these crashes were rural, involved roadway departure, and occurred on curves more than 50 percent of the time.

They disaggregated the statewide crash data based on the emphasis areas designated in the American Association of State Highway and Transportation Officials (AASHTO) Strategic Highway Safety Plan. The areas identified represented the best opportunities for a significant reduction in the number of severe and fatal crashes for each county.

MnDOT compiled an initial list of the safety countermeasures that had the greatest potential to address the focus crash types.

SYSTEMIC SAFETY ANALYSIS BENEFITS

Improved Safety
Systemic safety analysis helps identify priority crash types that represent the greatest potential for crash reduction.

Informed Decision-Making
Agencies can address high-risk elements not typically identified through traditional approaches.

Optimized Investment
Allows consideration of risk along with crash history for a comprehensive approach to deploying low-cost countermeasures.

Focus Area	Risk Factors
Curves	traffic volume, curve radius, presence of a visual trap, presence of an intersection, severe crash history
Intersections	geometry, traffic volume, proximity to a railroad crossing, commercial development
Segments	traffic volume, density of roadway departure crashes, curve density, edge risk assessment, access density

They screened the countermeasures using crash data, effectiveness and cost along with agency policies, procedures and experience. The result was a short list of safety strategies for each focus crash type.

Key Takeaway

- Systemic analysis includes all stakeholders and can be accomplished through partnerships with local agencies.

MnDOT also performed a detailed crash analysis to identify contributing crash factors and characteristics based on the findings of the initial crash analysis. This detailed analysis identified the high-risk locations on the two-lane, rural county highways (including segments, intersections and curves) based on system-wide factors such as the number of severe crashes, design features, traffic volumes and curve radius.

For example, two-lane rural curves were selected as one focus crash type. In analyzing the county roadways and applying the risk factors for curves, MnDOT found that severe crashes were overrepresented on roadways with 500-1,500 in average daily traffic volume. Similarly, when comparing the percentage of both fatal and severe roadway departure crashes occurring on a specified curve radius, MnDOT identified curves with a 500-1,500 foot radii as possible targets for systemic improvements. They also reviewed these locations for the presence of visual traps or intersections. In all, MnDOT analyzed 504 curves as part of this systemic analysis, resulting in the identification of 32 high-priority curves.

The priority safety strategies eventually selected for the three focus areas included enhanced road edges with rumble strips and 6-inch edge lines, enhanced curve delineation (chevrons), and upgraded traffic signs and streetlights for intersections. MnDOT added this systemic component to its Highway Safety Improvement Program (HSIP) in order to fund the projects that the RSP program helped the counties identify.

Conclusions

MnDOT's systemic analysis used a data-driven, systematic process to develop specific safety projects for each site targeted for investment. It provided a decision-making process for countermeasure selection that allowed county engineers the opportunity to identify treatment preferences while selecting projects for MnDOT funding. In addition, developing the RSPs increased general awareness and familiarity among the local agencies in identifying safety issues on their roadways and suitable countermeasures to address them.

ADDITIONAL RESOURCES

- Additional details on this project and on FHWA's Systemic Safety Project Selection Tool are available at: *http://safety.fhwa.dot.gov/systemic/fhwasa13019/sspst.pdf*
- A brief description of the data analysis for the Road Safety Plans is available at: *http://safety.fhwa.dot.gov/hsip/resources/fhwasa1102/data_mn.cfm*
- More information on Data-Driven Safety Analysis is available on the Every Day Counts website: *http://www.fhwa.dot.gov/everydaycounts/edc-3/analysis.cfm*

For additional information, please contact:

Jerry Roche
FHWA Office of Safety
515-233-7323
Jerry.Roche@dot.gov

John McFadden
FHWA Resource Center
410-962-0982
John.Mcfadden@dot.gov

Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery

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