HSIP

U.S. Department of Transportation
Federal Highway Administration

HSIP Noteworthy Practice Series

Revisiting SHSP Emphasis Areas

About the HSIP Noteworthy Practice Series

The Highway Safety Improvement Program (HSIP) is a core Federal-aid highway program with the primary purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. Many states and local agencies are successfully implementing innovative approaches to HSIP planning, implementation, and evaluation. The HSIP Noteworthy Practices Series presents case studies of these successful practices organized by specific HSIP topics. The individual case studies provide summaries of each practice, key accomplishments, results, and contact information for those interested in learning more.

Revisiting SHSP Emphasis Areas

FHWA guidance suggested Strategic Highway Safety Plan (SHSP) emphasis areas be selected "that offer the greatest potential for reducing fatalities and injuries." In developing their original SHSPs, most states began with the American Association of State Highway and Transportation Officials (AASHTO) SHSP as a guide. States selected and prioritized from AASHTO's 22 emphasis areas based on data analysis using various combinations of fatality and serious injury data. Some states defined new emphasis areas (i.e., rockfall). Others combined crash categories into broader priority areas (i.e., vulnerable road users including pedestrians, bicyclists, and motorcyclists). A few states organized emphasis areas into tiers defined by expected benefits and levels of implementation effort.

Safety priorities change as opportunities arise and/or barriers prevent progress. Some states defined review and update schedules and processes in their original SHSPs. Some initiated updates to improve their SHSPs after a few years of implementation effort demonstrated a need to revisit their emphasis areas. Others initiated updates to take advantage of lessons learned and experiences shared at the national level. A well organized update process helps states ensure the SHSP remains relevant and meaningful, and efforts continue to focus on areas with the greatest potential to improve safety.

Practices for revisiting emphasis areas range from simply reviewing updated data to reconfirm original emphasis area selections, to comprehensive data analysis and stakeholder outreach to take a fresh look at current and potential new emphasis areas. A number of states determined their first SHSP took on too much and decided to scale back to a more manageable number of emphasis areas. In such cases, fatality and injury data have been weighed against other factors such as available resources and levels of stakeholder cooperation. Some states actively track SHSP implementation and monitor performance measures on an ongoing basis as part of their review and update process.

For many states, developing the original SHSPs was a major undertaking. Not all are able to invest the same level of resources or maintain the same level of stakeholder interest in the update process. Some states opting to reduce the number of emphasis areas in their SHSPs have had difficulty determining the appropriate scope and selection criteria. Emerging topics, such as distracted driving, are also proving complicated to address in SHSPs when the science has not advanced far enough to allow for the same level of data analysis and countermeasure selection.

FHWA-SA-11-02

Noteworthy Practices

The following cases demonstrate noteworthy practices three states are using in revisiting SHSP emphasis areas:

- West Virginia focused their update efforts on reducing SHSP emphasis areas to a more manageable number. The state re-examined the data seeking a noticeable break in the number of fatalities attributed to different contributing factors and were able to identify four emphasis areas accounting for the majority of fatalities. Cross analyzing the data confirmed those areas also encompassed the largest portions of other crash types. The process of paring down the number of emphasis areas has reinvigorated stakeholders and generated strong support from safety partners. (read more)

- Washington State's *Target Zero* workgroup conducted an exhaustive analysis of 11 years of crash data to determine areas with the greatest potential to reduce deaths and disabling injuries. The resulting *Target Zero* update established four priority levels of emphasis areas. The four-tier structure helps to more effectively prioritize the traffic safety emphasis areas and apply the resources needed to address the *Target Zero* vision. In addition, the latest update includes county-level data analysis using the same four-tier priority level framework. (read more)

- Louisiana began the process of updating their SHSP with one of the primary objectives to "narrow the focus of the SHSP to the areas of greatest need and potential for success as identified through a detailed data analysis process." Two of the original emphasis areas were aggressive driving and distracted driving. Data analysis confirmed these continue to be significant safety problems, but revealed difficulty in assessing the nature and true extent of the problems. The State elected to establish task forces to examine these issues in greater depth, define the issues, and identify strategies and actions with some promise before reinstating them as full SHSP emphasis areas. (read more)

To access these full case studies, click on the individual links above or visit the FHWA Office of Safety on-line at: http://safety.fhwa.dot.gov/hsip.

Focusing on Fewer Emphasis Areas

West Virginia

In September 2007, West Virginia released its first statewide Strategic Highway Safety Plan (SHSP). The 2007 SHSP included nine emphasis areas established by the Highway Safety Management Team (HSMT)[1] based on analysis of six years of fatality, serious injury, and crash data, along with stakeholder input. Some emphasis areas included subareas. For example, at risk drivers and users included: suspended or revoked drivers, unlicensed drivers, multiple crash/citation drivers, uninsured drivers, younger drivers, older drivers, motorcycles, and ATV drivers. Including all subareas, the State was attempting to address 23 different areas within the purview of the SHSP.

After several years of attempting implementation, it became clear to the HSMT that the scope of the SHSP was unmanageable. Staff from the different agencies were stretched too thin. Having to participate in all the different areas but being unable to dedicate sufficient attention to individual areas stalled implementation and discouraged personnel. In attempting to address the priorities of every stakeholder who had come to the table, they had taken on too much.

Recognizing it was time to update their SHSP, the HSMT knew they wanted to take a different approach but did not have a clear plan of action until getting involved as one of the pilot states for the National *SHSP Implementation Process Model* (IPM). The pilot provided the opportunity to breathe new life into West Virginia's SHSP. It offered new ideas through implementation strategies from the IPM as well as through regular discussions about experiences and lessons learned with other pilot states. Among other takeaways, involvement in the pilot convinced the HSMT that making their plan work would require reducing the number of emphasis areas.

[1] The HSMT is a group of representatives from many facets of state and Federal agencies which all have some area of highways safety responsibilities within their purview. Since the early to mid 1990s this group has existed either formally or informally and has strived to coordinate and effectively manage highway safety programs and initiatives in West Virginia.

Key Accomplishments

- Narrowed SHSP emphasis areas down to a more manageable number through a data-driven process.
- Provided a more focused scope for pursuing the goal of "Zero Fatalities…Saving One Life at a Time."
- Re-energized partners leading to more active involvement in SHSP efforts.

The process began by focusing on the original goal of "Zero Fatalities…Saving One Life at a Time." The goal had been buried on page five of the original SHSP but was brought front and center in the update and subsequent marketing campaigns.

The HSMT took a new look at the data to determine which emphasis areas had the greatest potential for meeting the goal. They reevaluated the data seeking a noticeable break in the number of fatalities attributed to different contributing factors and were able to identify four emphasis areas accounting for the majority of fatalities on West Virginia roadways: roadway departure, occupant protection, impaired drivers, and at-risk driver age groups (ages 15 to 20 and over 65). They further reinforced the selection by cross analyzing the data and finding these four areas encompassed large portions of other crash types (i.e., roadway departures crashes involved many of the heavy truck, wildlife, and speeding-related crashes). Stakeholders focusing on the other individual crash types were thus invited to participate in emphasis area teams to explore ways to collectively address common concerns. Finally, a fifth emphasis area, improving highway safety data, was added to the update acknowledging the importance of a data-driven approach to safety.

Results

The updated SHSP is due for publication in the fall of 2010, but the process of paring down the number of emphasis areas has already reinvigorated stakeholders and generated strong support from safety partners. The HSMT is strong and active. With fewer emphasis areas, partners have been able to commit time to participate in meetings and collaborative efforts. Communications staff are now assigned to every team and are more prepared to answer questions from the public. Marketing efforts, both internally and externally, have been made easier with a more focused SHSP.

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The Focus is Results

Tiered Emphasis Areas for Statewide and County Safety Planning

Washington

HSIP Noteworthy Practice Series

Revisiting SHSP Emphasis Areas

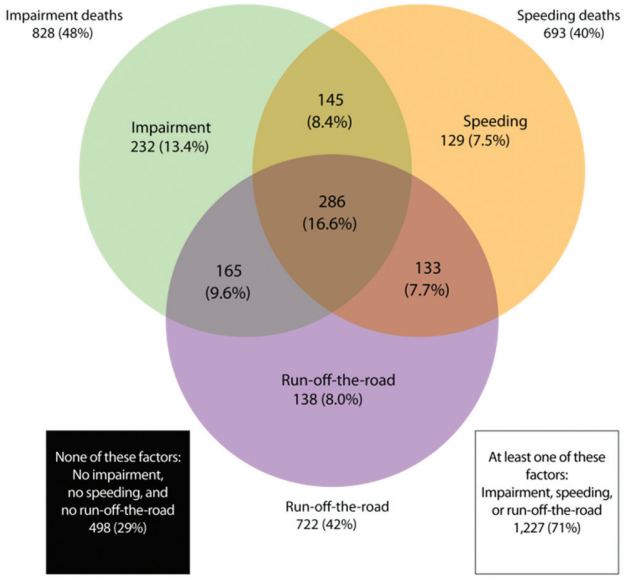
In 2000, prior to SAFETEA-LU, Washington State wrote *Target Zero: A Strategic Plan for Highway Safety.* The *Target Zero* Steering Committee, in cooperation with state, local, and private agencies, designed a plan to support a 30-year vision to achieve zero traffic deaths and disabling injuries. When SAFETEA-LU mandated states develop Strategic Highway Safety Plans (SHSP) in 2005, Washington State was well prepared to meet the challenge.

Previously, the Washington Traffic Safety Commission (WTSC), Washington State Department of Transportation (WSDOT), and other partners focused on trying to meet all traffic safety needs by spreading resources over a multitude of emphasis areas and projects. The analytic nature of the SHSP made it clear that a change in tactics and strategic planning was required to more effectively prioritize the traffic safety emphasis areas and apply the resources needed to address the *Target Zero* vision.

The *Target Zero* workgroup conducted an exhaustive analysis of 11 years of crash and trend data to determine which emphasis areas had the greatest potential to reduce deaths and disabling injuries. Recognizing traffic collisions are often attributable to multiple factors, data analysis revealed impairment and speed were highly associated with every other category of crashes (e.g., impairment and/or speed accounted for over one-half of all run-off-the-road collisions) The *Target Zero* Committee concluded if Washington State can meaningfully reduce impaired driving and speeding, death rates will be cut across the board, therefore, they identified impaired driving and speed as the top priority areas.

In setting priorities for the remaining traffic safety issue areas, the committee looked at the number of over-all traffic crashes, disabling injuries, and deaths; the ability of strategies to reduce disabling injuries and deaths; and the importance of the issue in promoting overall traffic safety (such as improving traffic data and EMS services). The resulting *Target Zero update* (published in February 2007) established four priority levels covering 22 emphasis areas to serve as a guide for related safety programs and for allocating limited safety resources. It also established a schedule of annual evaluation and revision every few years. Data analysis measuring progress and strategy effectiveness are the basis for revisiting emphasis areas and strategies.

The role of impairment, speed, and run-off-the-road collisions in 1,725 traffic fatalities in Washington 2006-2008



Data source: FARS and WSDOT Collision Database.

Following that model, the process for updating *Target Zero* began again with intensive data analysis and review of traffic safety planning documents between June and November 2009. The 2010 *Target Zero* update maintains the four-tier priority structure for guiding resource allocation and implementation efforts, with changes made to address new trends in fatal and serious injury crashes:

- Run-off-the-road collisions have been moved to Priority Level One, based on their involvement in 42 percent of all fatalities between 2006 and 2008. The update continues to focus on behavioral aspects of run-off-the-road collisions maintaining impaired driving and speed as priority level one emphasis areas. However, it also acknowledges the importance of engineering strategies specifically to decrease the likelihood a vehicle will leave the roadway and minimize the consequences of leaving the road.
- Distracted drivers have been separated from drowsy drivers and moved into Level Two priority based on their involvement in fatal collisions. (Drowsy drivers were moved to Level Four).
- Drivers without a valid license have been removed as a priority area. Recent analysis found that impairment, speeding, and distraction were the primary contributing factors in fatal crashes involving these drivers so focus will be on these factors.

In addition to revising statewide emphasis areas, updating *Target Zero* included efforts to improve county level safety planning through use of a consistent framework. A review of data found prioritization of statewide emphasis areas was heavily influenced by the most populous counties and cities, which did not necessarily reflect the same priorities for all areas. To address these discrepancies, data analysis was conducted for each individual county and presented in the same four-tier priority level framework.

Results

Washington's SHSP defines the emphasis areas and the priorities the State has determined have the greatest potential to continue reductions toward the goal of zero fatalities and serious injuries by 2030. Fatalities in the State have steadily dropped since 2005, down 8.6 percent from 2007 to 2008, with preliminary figures for 2009 showing a 6.1 percent decline in fatalities. The traffic fatality rate is also trending downwards dropping to 0.94 deaths per 100 million vehicle miles traveled (VMT) in 2008, the State's lowest rate on record.

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Speeding and Aggressive Driving and Distracted Driving Task Forces

Louisiana

Louisiana published their original Strategic Highway Safety Plan (SHSP) in September 2006. Using the American Association of State Highway Transportation Officials (AASHTO) SHSP as a point of departure, the State examined data and identified 11 high-priority emphasis areas with the most promise for driving down the human and economic costs of crashes. In 2009 Louisiana began the process of updating the SHSP with one of the primary stated objectives to "narrow the focus of the SHSP to the areas of greatest need and potential for success as identified through a detailed data analysis process."

The update process included examination of the data and outreach to safety stakeholders. While attempting to narrow the focus, a careful look at the data revealed some difficulties in assessing the nature and true extent of two of the original emphasis areas – speeding and aggressive driving, and distracted driving. Aggressive driving is a difficult concept to define and involves several typical violations associated with driver behavior. The most often cited violation in aggressive driving crashes is "careless operation." The 2005 crash report form introduced a new variable addressing distracted driving. However, in many cases, looking closer at the data revealed the factors contributing to distraction were often recorded as "unknown."

The SHSP Implementation Team recognized aggressive driving and distracted driving represent significant safety problems. However, the Team believed a pragmatic and beneficial approach would be to establish task forces to examine these issues in greater depth before they could conduct the necessary emphasis area level analysis. This resulted in the creation of two Task Forces with the following roles:

Key Accomplishments

- Maintained a data-driven approach to identifying SHSP emphasis areas.
- Provided a framework for addressing significant "developing" emphasis areas.

- Determine infraction definitions, i.e., develop a definition that can be used by law enforcement, the judiciary, etc.;
- Review the literature and research to identify effective countermeasures;
- Review current practice and laws to determine and propose changes;
- Participate in quarterly SHSP implementation team meetings; and
- Report findings to the Executive Committee and Implementation Team.

By establishing the task forces on aggressive driving and distracted driving, Louisiana maintained a data-driven approach to defining SHSP emphasis areas with the greatest potential to reduce fatalities and serious injuries while acknowledging the potential significance of such topics.

Results

To date, approximately 40 stakeholders representing the 4 Es of safety (engineering, enforcement, education, and EMS) have signed up for either the Distracted Task Force or the Aggressive Driving Task Force. The Task Forces are setting out to determine: 1) appropriate methods for analyzing the data to develop a clear picture of the problem; and 2) effective countermeasures. Once those tasks are accomplished, the intent is to transition the "developing" emphasis areas into full SHSP emphasis areas.

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Safety Data Collection, Analysis, and Sharing

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Safety Data Collection, Analysis, and Sharing

The Strategic Highway Safety Plan (SHSP) provides a data-driven framework for highway safety stakeholders to identify key safety needs, guide investment decisions, and align and leverage collective resources. The purpose of a data-driven process is to direct resources to projects and programs with the greatest potential for reducing fatalities and serious injuries. The strength of the SHSP and other safety plans lies in a state's ability to collect, analyze, and share safety data as appropriate.

A variety of strategies can be employed to collect quality data, perform analysis, and ensure safety stakeholders can access the data and the analysis. National Highway Traffic Safety Administration (NHTSA) section 408 grants provide funding to improve timeliness, accuracy, uniformity, completeness, integration, and accessibility of safety data. Projects to improve data collection and analysis may also be eligible for Federal HSIP funding. In some states, multiple agencies provide funding for data collection and management through interagency agreements.

Data are analyzed to identify and prioritize safety problems, establish goals and objectives, select strategies and countermeasures, and develop action plans. They are also analyzed to monitor and evaluate results, and provide feedback into the planning process. Analysis can involve simple statistical investigations of crash trends, types, and contributing factors, or sophisticated tools such as SafetyAnalyst and the Highway Safety Manual.

In many cases, safety data are unavailable or unknown. Information in police crash reports may vary among localities. Medical records, insurance records, and licensing information may not be available or linked to the crash data; and roadway inventory information may be limited and difficult to link to the crash data system. These and other data quality problems inhibit the effectiveness of efforts to improve transportation safety. However, access to timely and accurate safety data is critical for successful SHSP implementation.

A variety of programs and departments receive safety data from the state agency or department maintaining the data. Local governments, Metropolitan Planning Organizations (MPO), advocacy groups, and private consultants generally request crash data to conduct various planning activities and projects. The agency maintaining the data may provide raw or filtered datasets that can be readily used by local agencies. Access to reliable data for all stakeholders enables them to more effectively address safety in their transportation and safety plans, and helps foster collaboration among stakeholders.

FHWA-SA-11-02

Noteworthy Practices

The following cases demonstrate noteworthy practices several states are using to share SHSP data with stakeholders:

- The Louisiana Department of Transportation and Development (LDOTD) is among the first DOTs to hire a Law Enforcement Expert (LEE) dedicated to working with law enforcement agencies on improving crash data collection. The LEE works statewide and reviews crash reports to identify and resolve potential issues with crash report completion in the various jurisdictions. Louisiana's crash data accuracy and completeness has improved through the use of the LEE and has led to better informed decision-making in the State's efforts to improve safety. The LEE is also involved with SHSP implementation and helps keep regional teams focused on the data driven approach for focusing on the emphasis areas and potential countermeasures and strategies. (read more)

- The Minnesota DOT (MnDOT) recently embarked on a statewide initiative to create a roadway safety plan for each of the State's 87 counties. These plans build on the foundation established by Minnesota's SHSP, but utilize a data analysis approach geared toward identifying a specific set of safety projects directly linked to the causation factors associated with the most severe crashes on each county's highway system. The data driven process established for county safety plans has helped position counties to more effectively compete for safety funds and make improvements on local roadways with greater potential to reduce the number of fatal and serious injury crashes. (read more)

- The New Jersey DOT (NJDOT) contracted with the Rutgers University Transportation Safety Resource Center (TSRC) to develop a roadway safety decision support tool for safety stakeholders. The web-based software tool supporting collection, analysis, and distribution of transportation safety data has been instrumental in the development and implementation of the SHSP. The approximately 500 agencies using the analysis software enjoy easy access to transportation safety data and can perform analyses to support their local safety initiatives as well as those at the state level. (read more)

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Law Enforcement Expert for Improved Data Collection

Louisiana

The Louisiana Department of Transportation and Development (LDOTD) is responsible for collecting motor vehicle crash data for the entire State of Louisiana, as well as maintaining the state crash database. This equates to about 165,000 crash reports a year from state, parish, and local law enforcement agencies. The accuracy and timeliness of this data are critical in prioritizing safety improvements for roadways and intersections. LDOTD has the responsibility to ensure prioritization of limited highway safety funds is based on the ability to reduce the most crashes, injuries, and fatalities relative to the initial construction cost and any associated increase in maintenance costs. LDOTD analyzes the entire state roadway system on a yearly basis and compiles a list of locations exceeding a threshold for crashes, injuries, and fatalities to allocate highway safety funds where the greatest safety benefit can be achieved.

LDOTD found incorrect and incomplete coding of the crash reports by law enforcement officers affected the quality and accuracy of the crash data. In addition, the Legislature designated LDOTD as the agency responsible for implementing and coordinating a Statewide Incident Management Program, which requires widespread statewide coordination between LDOTD, law enforcement agencies, and emergency response personnel. In 2008, the agency hired a Law Enforcement Expert (LEE) to help address data deficiencies and meet the new Legislative requirement. Given the responsibilities of the position and because the LEE would reach out to a wide variety of law enforcement officers, a decision was made to hire a person with significant leadership experience with the state police, i.e., a Captain or above.

The LEE works statewide and reviews crash reports to identify trends or potential issues with crash report completion by the various jurisdictions. For example, the LEE might identify a disproportionately high number of crashes with the contributing factor marked as "failure to control" within a particular agency. When this type of situation arises, the LEE meets with the agency to identify any underlying reasons for the trend in reporting (e.g., training, edit checks, etc.). If there are issues, the LEE helps train the officers on proper procedures. Additional LEE responsibilities directly related to improving the quality and accuracy of crash data include:

- Develop a student and train-the-trainer course in crash investigation to familiarize law enforcement personnel with the concepts and techniques of crash reconstruction.
- Schedule classes and train law enforcement academy instructors in crash investigation and reconstruction concepts and techniques (train-the-trainer course).
- Schedule classes and train students in crash investigation and in reconstruction concepts and techniques.
- Provide crash investigation and reconstruction services to the Highway Safety Section for the LDOTD Tort Reduction Program.
- Provide crash investigation and reconstruction expertise to the nine LDOTD Districts during their investigation of crash locations.
- Serve as a member on the statewide Traffic Records Coordinating Committee (TRCC) and the Subcommittee responsible for revising the State crash report to adhere to required Model Uniform Crash Criteria (MUCC).

The LEE also assists with Strategic Highway Safety Plan (SHSP) implementation at both the local and regional level. Working with LDOTD and Louisiana State University, the LEE provides the SHSP regional coalitions with the data they need to develop and implement regional action plans, strategies, and performance measures.

Key Accomplishments

- LDOTD is among the first DOTs to hire a Law Enforcement Expert (LEE) dedicated to working with law enforcement agencies on improving crash data collection.
- Instituted a direct link between LDOTD (both headquarters and District offices) and law enforcement agencies around the State.
- Utilizing a former law enforcement officer has facilitated communication and outreach to local law enforcement agencies.

Results

Louisiana's crash data accuracy and completeness have been enhanced through the use of the LEE, which has led to better informed decision-making in the State's efforts to improve safety. Training law enforcement agencies has greatly improved location data through better application of Global Positioning System (GPS) technology. Educating local law enforcement officers on the electronic crash report form and increasing their awareness and understanding of the importance of accurate, complete data has resulted in more regular reporting of data elements previously often omitted, such as the manner of collision. Outreach to local law enforcement has also raised awareness of the availability of data from the state to guide local crash reduction programs.

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Data Analysis for County Highway Safety Plans

Minnesota

The Minnesota Department of Transportation (MnDOT) has made $3.5 million available to develop Highway Safety Plans for each of the State's 87 counties. The concept is to build on the foundation established by Minnesota's Strategic Highway Safety Plan (SHSP), with the primary objective of identifying a specific set of safety projects directly linked to the causation factors associated with the most severe crashes on each county's highway system.

The first step in developing each county plan has been to conduct a comprehensive crash analysis to disaggregate crashes by system (state or local), severity (serious injury, fatal), location type (urban or rural), and crash type. Through comprehensive crash analysis, MnDOT assisted counties with identifying whether the majority of the severe crashes are occurring on the state or local system and in urban or rural areas. This helps identify where the greatest proportion of crashes are occurring, as well as the primary crash types.

The counties have then disaggregated the crashes based on the 22 emphasis areas identified by the American Association of State Highway and Transportation Official's (AASHTO) to identify the critical emphasis areas (e.g., young drivers, seat belt usage, road departure, intersections). The identified emphasis areas represent the greatest potential to significantly reduce the number of severe and fatal crashes in the corresponding county.

Once emphasis areas were identified, an initial list of potential safety countermeasures was compiled using the strategies included in the National Cooperative Highway Research Program (NCHRP) 500 Series Reports – Guidance for Implementation of AASHTO's SHSP. The county staff reviewed the initial list and eliminated strategies considered too expensive or experimental, and the remaining strategies were prioritized through a Safety Strategies Workshop, which included various safety partners in the county (e.g., public works, law enforcement, planning, public health, elected officials, MnDOT staff, etc.). During the workshop the results of the data driven analytical process were shared with the safety partners, who then discussed and prioritized the list of safety strategies.

Key Accomplishments

- Established a process for developing data-driven county safety plans.
- Provided data analysis support to counties for improved problem and project identification.
- Established a better link between crash causation and implementation of safety strategies on local roadways.

Following the prioritization of safety strategies, a detailed crash analysis was conducted to identify contributing crash factors and characteristics based on the findings of the initial crash analysis. This analysis identified high risk locations (e.g., segments, horizontal curves, intersection) based on systemwide factors such as number of severe crashes, design features, traffic volumes, curve radius, etc.

In most cases the severe and fatal crashes have been spread over many miles of roadways, resulting in a low density of crashes. To address this issue, one of the key objectives of the county safety plans is to identify low-cost safety-related projects focused on the county's identified emphasis areas to implement on a systematic basis. At this point in the process, projects were identified based on the results of the detailed crash analysis and the identified high-priority strategies. Some county lists of potential projects have included multiple years of projects – ultimately implementation will be dependent on securing HSIP funding or integration of these low cost measures into other programs such as 3R (Resurfacing, Restoring, Rehabilitation).

Results

As of December 2010, 23 counties have developed safety plans. The data analysis used to develop the plans has helped position counties to more effectively identify projects eligible for future HSIP funding cycles and to make improvements on local roadways with greater potential to reduce the number of fatal and serious injury crashes. The comprehensive data analysis has also positioned MnDOT to more subjectively quantify safety needs on the local roadways as part of the State's systemic approach to safety improvements. Furthermore, through a process similar to the development of the statewide SHSP, development of county safety plans have fostered a greater safety culture among county stakeholders.

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Data Sharing and Decision Support Tool

New Jersey

The New Jersey Department of Transportation (NJDOT) recognized a need to provide transportation safety data in a more user-friendly format. Providing easier access to data and enhanced analytic capabilities would encourage participation by safety partners in the State's various safety programs, including its SHSP efforts.

The State contracted with the Rutgers University Transportation Safety Resource Center (TSRC) to develop a roadway safety decision support tool. This software program enables users to quickly filter, analyze, and map crash records. The tool also allows merging of specialized data sources with crash records, enabling in-depth analysis.

The TSRC developed the software as a web-based application to enable public agency personnel to quickly analyze safety data. By hosting the tool on a platform of servers, large amounts of data can be accommodated with little effect on execution speed. The application processes queries submitted on-line, produces reports mapping crash location and severity, and identifies contributing factors. Users can access the software from any Internet-enabled computer without requiring a high level of computing power. The program is secured through the use of login IDs and passwords to protect content and allows users to save filters and preferences. The program enables network screening, economic analysis, and diagnosis. The network screening layer integrates methodologies currently used by safety engineers to locate high-crash intersections or segments. Crash rates can be calculated for any filter/query. The software also includes a model to predict crash frequencies and severity for selected roadways. Future elements will incorporate the safety performance function calculations from the new Highway Safety Manual into the program for all classifications of roadways to determine which locations have the greatest potential for safety improvement.

Key Accomplishments

- Developed new system for on-line access to transportation safety data enabling safety partners to make data-driven safety decisions.
- Enhanced capabilities to analyze data and tailor reports to support safety initiatives.
- Distributed safety data broadly to encourage greater SHSP participation.

The Center also provides engineering, planning, training, and outreach services to local governments and assists with crash data analysis to support SHSP implementation. NJDOT funds work of the TSRC through the HSIP.

Results

The web-based software tool supporting collection, analysis, and distribution of transportation safety data has been instrumental in the development and implementation of the SHSP. The approximately 500 agencies using the analysis software enjoy easy access to transportation safety data and can perform analyses to support their local safety initiatives as well as those at the state level. Broad dissemination of safety data and the availability of this tool has encouraged participation in the SHSP by safety partners at all levels.

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HSIP Project Evaluation

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HSIP Project Evaluation

Evaluation is critical to determine if a project or group of projects is achieving the desired results and to ensure investments are cost-effective. Evaluation provides a quantitative estimate of the effects on safety, which is valuable information for future planning. Evaluation results enable a state to determine if appropriate countermeasures were used at particular locations, whether any adverse impacts occurred, if corrective action is necessary, and how effective those countermeasures would be for similar sites in the future.

Various methods exist for evaluating projects, but any evaluation should consider a minimum of three to five years of before and after crash data, the target crash type of the improvement, and crash severity (a countermeasure may increase the total number of crashes, but reduce the crash severity). Ideally, project evaluation should incorporate more advanced techniques (e.g., safety performance functions (SPFs), Empirical Bayes (EB) method) to account for natural fluctuations in crashes from year to year and other changes potentially impacting evaluation results.

The majority of states are conducting project evaluations based on a simple before-after analysis, and a few are using evaluation results to develop state-specific crash modification factors (CMFs) for various countermeasures. While simple before-after evaluations are rather easy to perform and may provide a basic understanding of safety changes, they assume any change was due solely to the safety improvement at the site and may misrepresent the true effectiveness of a project due to the effects of regression-to-the-mean.[1] The EB method can be incorporated into project evaluations to reduce the effects of regression-to-the-mean. However, very few states have been able to use the EB method since it requires calibrated SPFs. Many states do not have the training, resources, tools, manpower, or necessary data to calibrate SPFs.

Another challenge is that individual states may not have enough installations of a particular countermeasure to develop quality CMFs. The Evaluations of Low Cost Safety Improvements Pooled Fund Study (ELCSI PFS) combines the implementation efforts of multiple states to develop reliable estimates of countermeasure effectiveness. States can independently initiate similar efforts.

[1] Regression-to-the-mean bias describes a situation in which crash rates are artificially high (or low) during the before period and would have decreased (or increased) even without an improvement to the site.

FHWA-SA-11-02

Noteworthy Practices

The following cases demonstrate noteworthy practices four states are using in HSIP project evaluations:

- The Colorado DOT developed SPFs for all roadway facility and intersection types in the State, which enabled the DOT to institutionalize the EB method into all safety project evaluations and reduce the effects of regression-to-the-mean. (read more)
- The Florida DOT developed an on-line database application of safety improvement projects that automates the processes for conducting benefit-cost analysis to compare different countermeasures and for conducting safety project evaluations to develop crash reduction factors (CRF). The application has also enabled Florida to develop and continue to refine state-specific CRFs for several countermeasures based on the project evaluation results. (read more)
- The North Carolina DOT created a safety project evaluation group to conduct evaluations on all spot safety projects in the State. The project evaluations provided field engineers with valuable feedback on the effectiveness of safety projects and countermeasures. (read more)
- The University of Wisconsin Traffic Operations and Safety (TOPS) Laboratory, under contract to Wisconsin DOT, developed a project evaluation process incorporating EB analysis into all HSIP project evaluations. The TOPS Laboratory compared benefit-cost analysis using simple before-after analysis results and EB to demonstrate the importance of using statistical evaluations to reduce the overestimation of safety benefits due to regression-to-the-mean. (read more)

To access these full case studies, click on the individual links above or visit the FHWA Office of Safety on-line at: http://safety.fhwa.dot.gov/hsip.

Project Evaluations Using Empirical Bayes

Colorado

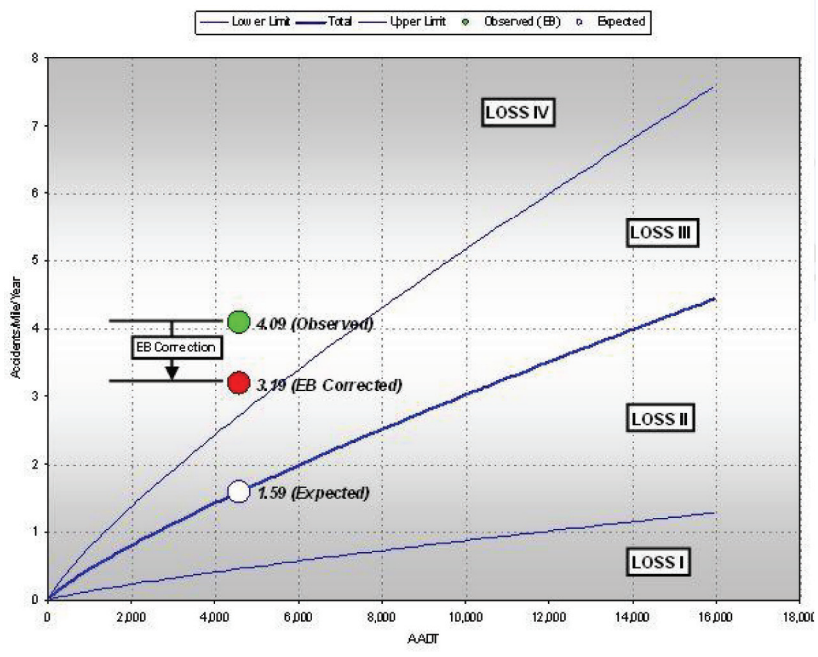
Incorporating the Empirical Bayes (EB) method into project evaluations reduces the potential overestimation of safety benefits due to regression-to-the-mean. While the EB method is not difficult in itself, it requires safety performance functions (SPF) for the type of facilities on which projects are being evaluated.

SPFs were originally developed by Colorado Department of Transportation (CDOT) for use in the network screening process. While crash rates are commonly used to measure safety, the crash rate implies a linear relationship between safety and exposure, which can often be misleading since rates change with Annual Average Daily Traffic (AADT). To capture how this rate change takes place, design engineers at the CDOT started to calibrate SPFs in the late 1990s, as part of the development of the Level of Service of Safety (LOSS) concept. LOSS is used to identify locations with potential for safety improvement and reflects how a roadway segment is performing in regard to its expected crash frequency and severity at a specific level of AADT, based on the SPF. By 2001, CDOT had calibrated SPFs for all public roadways (state and local) in Colorado, stratified by the number of lanes, terrain, environment, and functional classification. In 2009, CDOT in collaboration with consultants developed SPFs for all intersection types.

Key Accomplishments

- Developed SPFs for all roadway facility and intersection types in the state.
- Institutionalized the use of the Empirical Bayes method as a standard procedure for safety evaluation analysis to reduce effects of regression-to-the-mean.

The development of SPFs has not only advanced CDOT's network screening process, it also has enabled CDOT to institutionalize the use of the EB method as a standard procedure for safety evaluation analysis. Colorado has traditionally used a simple spreadsheet with three to five years of before and after data to conduct project evaluations. CDOT is currently working on applying an EB correction to evaluate sites on an SPF graph as shown. The use of the EB method is particularly effective when it takes a long time for a few crashes to occur, as is often the case on Colorado rural roads.



Results

CDOT developed SPFs for all state and local roadway facilities and intersection types. The development of the SPFs has enabled CDOT to fully institutionalize the EB method for all safety analysis at CDOT and reduce the effects of regression-to-the-mean.

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The Focus is Results

Crash Reduction Analysis System Hub

Florida

Crash reduction factors (CRF) provide agencies with an estimate of the expected crash reduction and/or benefits associated with various countermeasures. However, since local conditions (e.g., roadway, driver, traffic, weather, crash investigation techniques) may vary from agency to agency, state specific CRFs provide a more accurate indication of the effectiveness of various countermeasures. Prior to the development of the Crash Reduction Analysis System Hub (CRASH), the Florida Department of Transportation (FDOT) did not have a central database that combined crash data and safety project data to determine CRFs, or a mechanism in place to provide FHWA with a report on the effectiveness of safety projects in reducing crashes. The individual districts maintained the historical data for their safety improvement projects, which were in various formats and were not easily accessible for developing CRFs. In an effort to systematically maintain statewide safety improvement project data and facilitate a continual process of developing and updating state specific CRFs, the FDOT funded a research project with the Lehman Center for Transportation Research to develop the CRASH application.

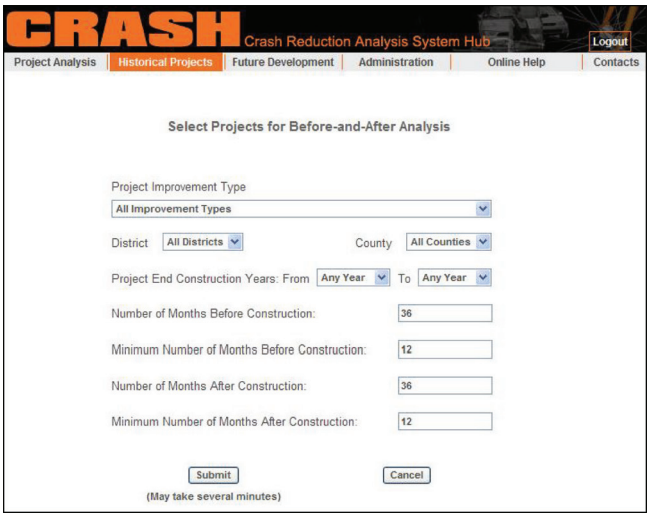
The CRASH application is a web database of safety improvement projects on the FDOT intranet. The District Safety Engineers (DSE) input all Highway Safety Improvement Program (HSIP) funded projects into CRASH, which stores individual safety improvement projects and crash data. The application uses before and after crash counts to evaluate the CRFs for the countermeasures implemented in the safety improvement projects entered in the system. The State Safety Engineer (system administrator) updates the CRFs annually; although they can be updated at any time. The CRFs are typically calculated based on five years of before and after data, but the system administrator may specify a time period for the calculation.

Key Accomplishments

- Developed an online database of safety improvement projects and state-specific CRFs.
- Automated processes for benefit-cost analysis and safety project evaluations.

The CRASH application enables the DSEs to easily evaluate different countermeasures and conduct a benefit-cost analysis by inputting project limits and selecting crash data years. CRASH currently includes 135 different improvements types. When the user selects a proposed countermeasure, the application provides a range of CRFs for crashes in various categories based on historical crash reductions or increases associated with past projects. The user can select the standard CRF or input a user defined value in cases where no sufficient studies in Florida exist to develop a state specific CRF.

The CRASH system enables easy performance tracking of safety efforts. It provides various functions for data retrieval and exportation for other analysis and reporting purposes, including the annual HSIP report.



Results

The CRASH application has enabled Florida to develop state-specific CRFs for several countermeasures based on the evaluation results of implemented HSIP projects. The system has also reduced the level of effort required to conduct benefit-cost analyses and project evaluations by automating the processes.

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The Focus is Results

Safety Evaluation Group

North Carolina

HSIP Noteworthy Practice Series

HSIP Project Evaluation

In 1999, the North Carolina Department of Transportation (NCDOT) created a permanent group of employees to focus on safety project evaluation. The purpose for the group was to establish a formal project evaluation process to verify the success of the state's efforts in safety.

In the first four years following its formation, the group established a process for conducting project evaluation and identified what results would be most useful to the field engineers. The group's initial efforts were more research and technically oriented but, to better serve the needs of the field engineers, the results of the evaluation studies were simplified (the field engineers were most interested in the before and after crash diagrams and changes in crash patterns). Originally, the group conducted about 50 project evaluations a year with one supervisor and six engineers, but now the group completes approximately 200 evaluations a year with reduced staff (one supervisor, four engineers, and one technician).

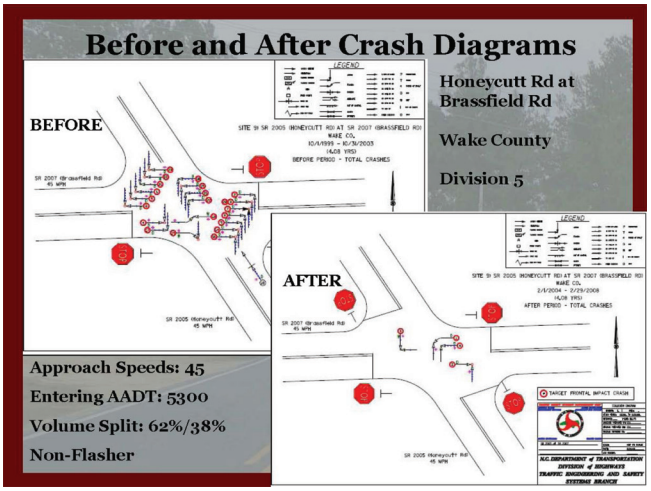
The safety evaluation group conducts simple before-after studies on all spot safety projects once a minimum of three years of before and after data are available (the same time periods are used for both the before and after periods). For each project, the group prepares an evaluation report including before and after crash type and severity data, collision diagrams, photos, and discussion of the study results. After an evaluation report is completed, it is submitted to the field engineer who originally developed the project to provide feedback on whether the project successfully mitigated the previously identified safety issue. For projects unsuccessfully mitigating the safety issue or resulting in a different crash pattern, the evaluation report provides the field engineer with an opportunity to reassess the conditions and identify a different countermeasure. NCDOT is currently working on developing a process to track projects not successfully mitigating the safety issue they were intended to address.

Key Accomplishments

- Established a group focused on safety project evaluation.
- Promoted the use of effective countermeasures.
- Provided feedback to engineers on the effectiveness of their individual safety projects and various countermeasures.

The evaluation group compiles a spreadsheet of all the completed project evaluation studies. The spreadsheet provides the category of improvement, before and after traffic volumes, location, traffic control, geometry, etc., and provides a link to the detailed evaluation report. The spreadsheet is updated regularly and posted on the NCDOT web site (http://www.ncdot.org/doh/preconstruct/traffic/safety/Reports/completed.html). It can be used by engineers to determine which treatments have worked in the past.

The group also develops crash modification factors (CMF) using the Empirical Bayes (EB) method when enough sample sites and data are available. North Carolina specifically focuses on developing CMFs for countermeasures not already extensively researched.



In efforts to promote a particular countermeasure to the field engineers, NCDOT's evaluation group has also conducted studies on well documented countermeasures to provide evidence of crash reduction effectiveness. One example is the use of four-way stop control. Although several studies document the effectiveness of this countermeasure, many field engineers in North Carolina did not consider it a viable countermeasure. The group evaluated over 50 intersections throughout the State and demonstrated four-way stop controls were effective. Study results were presented to field engineers in an effort to change their perspective. While field engineers were very receptive to the study results, it is too early to determine if it has increased the use of four-way stop control in the State.

Results

Since the establishment of the safety evaluation group, North Carolina has evaluated and documented the results of more than 600 projects. The evaluation reports provide field engineers with valuable feedback on the effectiveness of their safety projects, as well as various countermeasures, and promote the use of effective countermeasures.

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University Conducting HSIP Project Evaluations Using Empirical Bayes

Wisconsin

HSIP Noteworthy Practice Series

HSIP Project Evaluation

Wisconsin DOT contracted with the University of Wisconsin Traffic Operations and Safety (TOPS) Laboratory to investigate multiple project evaluation methods through a research grant for HSIP evaluation support. Initial research efforts included project evaluations based on before and after collision maps using the software Intersection Magic and before-after evaluations using benefit-cost analysis. From the beginning of the research, the intent was to use Empirical Bayes (EB) analysis in the project evaluations, but Wisconsin did not have safety performance functions (SPFs), which are required for the EB method. However, once the State acquired the SafetyAnalyst software, the TOPS Laboratory was able to incorporate the EB method into the project evaluations by using the SPFs contained in SafetyAnalyst. The SPFs in SafetyAnalyst were developed using national data and are intended to be calibrated to local conditions. While it was not possible to calibrate the SPFs to Wisconsin conditions due to lack of data, the TOPS Laboratory uses the SPFs to provide a comparison of performance in Wisconsin to that of the nation.

The TOPS Laboratory developed a process to extract the appropriate crashes (by location, type, and year) from the Wisconsin crash database based on the project location and scheduled start and completion dates for evaluation purposes. HSIP projects are evaluated based on five years of before data and three years of after data. Fatal and injury crashes are the focus of the evaluation, but the analysis also considers target crash types based on the nature of the improvement.

The TOPS Laboratory conducts a benefit-cost analysis based on results of both a simple before-after evaluation and an EB analysis to evaluate the projects from an economic perspective. This provides a simple comparison of the results of the two evaluation methods (as shown[1]) and demonstrates how a simple before-after evaluation can overestimate the safety benefits.

[1] In the table shown, "S. No." refers to the site number for the project evaluated, and the "FOS (financial operating system) ID" is used by Wisconsin DOT as the specific project identifier.

Key Accomplishments

- Developed a project evaluation process incorporating Empirical Bayes analysis into all HSIP project evaluations.
- Demonstrated the importance of using statistical evaluations to reduce the overestimation of safety benefits due to regression-to-the-mean bias.

S. No.	FOS ID	Benefit-Cost Analysis Using Empirical Bayes Estimates	Benefit Cost Analysis Using Before-After Data
1	10220674	1.38	2.86
2	11504371	31.64	44.66
3	12060680	N/A	N/A
4	15300191	5.34	5.94
5	22001570	1.39	2.01
6	22401570	7.72	7.91
7	40500971	1.01	1.21
8	44790371	5.14	5.34
9	45401572	1.66	1.79
10	46851471	1.22	1.24
11	50600072	0.76	1.28
12	52520071	1.04	2.21
13	69960674	1.58	1.52
14	69991072	-1.19	-0.86
15	70300370	0.33	0.36
16	72200191	13.09	14.66
17	86100270	1.71	1.62
18	86810571	1.44	1.47
19	92000371	2.00	2.94

Results

Originally, engineers in Wisconsin were reluctant to use EB. However, with the assistance of the TOPS Laboratory, the Wisconsin DOT was able to successfully implement a project evaluation process incorporating EB analysis and to receive buy-in at the regional level. The TOPS Laboratory demonstrated the importance of statistical EB techniques in project evaluations through a comparison benefit-cost analysis using simple before and after results to before and after using EB. The results demonstrate the EB analysis reduces the overestimation of safety benefits due to regression-to-the-mean bias.

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HSIP Noteworthy Practice Series

Use of the HSIP Flexible Funding Provision

About the HSIP Noteworthy Practice Series

The Highway Safety Improvement Program (HSIP) is a core Federal-aid highway program with the primary purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. Many states and local agencies are successfully implementing innovative approaches to HSIP planning, implementation, and evaluation. The HSIP Noteworthy Practices Series presents case studies of these successful practices organized by specific HSIP topics. The individual case studies provide summaries of each practice, key accomplishments, results, and contact information for those interested in learning more.

Use of the HSIP Flexible Funding Provision

Highway safety funds should be spent where they will have the highest payoff in terms of saving lives and reducing serious injuries. Flexibility in the use of HSIP funds is an important tool in the delivery of an overall safety strategy.

The HSIP, codified by SAFETEA-LU as section 148 of Title 23 U.S.C., apportions funds to states under section 104(b)(5) for a range of eligible safety activities focused primarily on infrastructure-related safety improvements. Section 148(e) addresses the opportunity to use these financial resources where they can make the greatest impact, as identified in a state's Strategic Highway Safety Plan (SHSP). This provision allows a state department of transportation (DOT) to use up to 10 percent annually of its HSIP funds for other types of safety projects under Title 23, as long as the state meets certain conditions.

To be eligible to use the 10 percent flexibility provision in a fiscal year a state must have an approved SHSP, certify it has met its railway-highway grade crossing and infrastructure safety needs, and submit a written request to the state Federal Highway Administration (FHWA) Division Office.

FHWA has provided extensive guidance on the implementation of the flexibility provision, including details on the process to follow, implementation and project eligibility, financing, reporting, and subsequent fiscal year approvals. This information can be found at: http://safety.fhwa.dot.gov/hsip/gen_info.

A decision on whether to flex funds is something the state must decide based on its needs and circumstances. As with all HSIP projects, a guiding principle should be the potential to improve safety. Through collaboration with safety partners, the SHSP process identifies statewide emphasis areas with the greatest potential for reducing fatalities and serious injuries. Linking HSIP projects, including flex funded activities, with the SHSP ensures the HSIP addresses priorities identified through the broader statewide strategic approach.

States have used HSIP flex funds to support a range of enforcement and education strategies identified in the SHSP. Examples include overtime safety enforcement, ignition interlock programs, work zone safety messages, safe ride home programs to prevent impaired driving, and outreach programs on the use of car seats. Participation in the SHSP has also led states to multidisciplinary approaches to leverage resources, such as combining speed enforcement programs and infrastructure improvements for reducing roadway departure crashes.

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Noteworthy Practices

The following cases demonstrate noteworthy practices several states are using to apply the HSIP flexible funding provision:

- The Alabama Department of Transportation (ALDOT) flexed HSIP funds to pay for targeted enforcement efforts on the state highway system. ALDOT identified areas where fatal and serious injury crashes were occurring in a process aligned with the Strategic Highway Safety Plan (SHSP). Agency staff identified major factors such as speeding and roadway departures, and provided crash maps to the state patrol. Flex funds were used to pay for overtime enforcement, with close coordination between the State Patrol and the DOT. (read more)

- The Michigan Department of Transportation (MDOT) flexed HSIP funds for a statewide radio public service announcement (PSA) campaign on safe winter driving to reduce the number of winter weather-related crashes. The *Ice and Snow, Take It Slow* campaign focuses in part on speed reduction linking it to the speeding element identified in the State's SHSP emphasis area on driver behavior and awareness. The program, based on an existing Clear Roads campaign, leveraged a partnership with the Michigan Association of Broadcasters. (read more)

- The Nevada Department of Transportation (NDOT) used flex funding to expand and strengthen several behavioral safety programs linked to the SHSP critical emphasis areas. Activities included expanding existing seat belt and impaired driving campaigns, developing a comprehensive Latino highway safety awareness and education program, rolling out a statewide teen program on safe driving, developing educational tip cards on topics related to the SHSP emphasis areas, and conducting a program for safe rides home on New Year's Eve and St. Patrick's Day. (read more)

- The Utah DOT (UDOT) used HSIP flex funds to support education and outreach programs linked to Utah's Comprehensive Safety Plan (the State's strategic highway safety plan). Programs are managed by several partner agencies and include developing a teen memoriam yearbook, expanding the Safe Kids Campaign to increase the use of car seats and booster seats, and supporting a Traffic Safety Resource Prosecutor position. (read more)

To access these full case studies, click on the individual links above or visit the FHWA Office of Safety on-line at: http://safety.fhwa.dot.gov/hsip.

Alabama Flexes HSIP Funds for Increased Enforcement

Alabama

Thirty percent of speeding crashes and 60 percent of roadway departure crashes occur on the 11,000 miles of Alabama's state highway system. According to Wes Elrod, Transportation Planning and Modal Programs Assistant Bureau Chief, a review of the data and current countermeasures indicated a need for increased enforcement.

Until the flex funding option became available in FY 2006, the Alabama Department of Transportation (ALDOT) did not have a mechanism to provide direct financial assistance to the Department of Public Safety (DPS) for increased enforcement on the state system. The Highway Safety Office (HSO) distributes a significant proportion of its National Highway Traffic Safety Administration (NHTSA) funds to local governments and only a limited amount to DPS. Recognizing limited resources for traffic enforcement, ALDOT used HSIP flex funds to increase enforcement strategies identified in the strategic highway safety plan (SHSP) addressing behavior to complement infrastructure improvements and more effectively reduce roadway departure crashes. ALDOT flexed between five and eight percent of its HSIP funds annually from FY 2007 to FY 2010, resulting in $1.5 to $2.8 million spent on noninfrastructure safety projects each of the past four years.

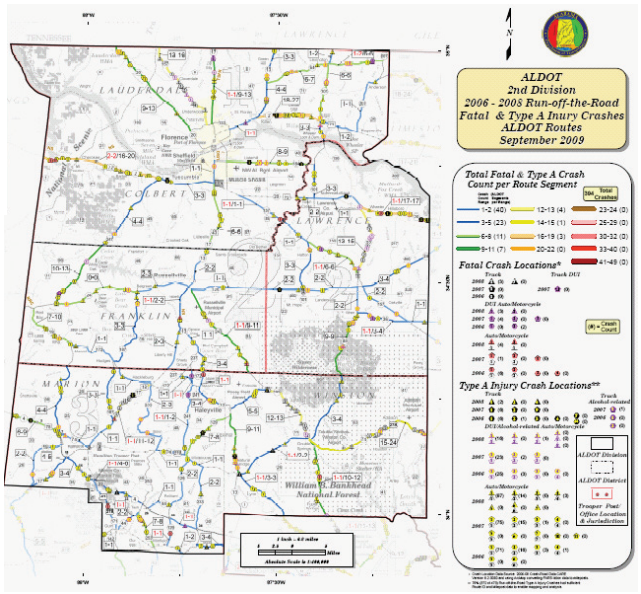
The majority of the flex funds paid for overtime for state police troopers to conduct speed enforcement activities, which is a strategy in the state SHSP Risky Driving Emphasis Area. ALDOT worked with the state police to determine how much overtime enforcement they could handle given personnel levels and agreed on an appropriate amount of HSIP funds to flex each year.

ALDOT identified fatal and serious injury crash locations and provided crash maps to the state police. Using the Critical Analysis Reporting Environment (CARE) crash records system ALDOT identified the time of day and the type of crashes. Troopers then focused their overtime efforts on those times and locations. ALDOT divided HSIP funds among the 12 state police trooper posts proportionally based on the number of high-crash corridors in each area.

Key Accomplishments

- Strengthened the partnership with Department of Public Safety, which is a member of the SHSP Executive Committee.
- Implemented an enhanced data-driven program of enforcement on the state highway system.
- Took advantage of joint crash data system to provide crash maps and time of day information to DPS.
- Increased the efficiency of state law enforcement by funding improved radar and GPS devices.

ALDOT closely monitored enforcement results and made adjustments as necessary. In quarterly reports, the state police provided the hours worked by each trooper and citations issued during overtime enforcement periods. ALDOT continuously evaluated results to ensure safety goals were met and whether the effort was a successful countermeasure for reducing both speeding and lane departure crashes.



Results

Flexing HSIP funds for use by DPS for enforcement has resulted in a strong partnership between the state police and ALDOT staff, while addressing noninfrastructure emphasis areas from the SHSP. This effort has resulted in increased deployment of enforcement resources on the state highway system based on crash data. From 2007 to 2009 the number of fatal crashes involving speeding decreased 31 percent, from 369 in 2007 to 255 in 2009.

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Michigan Uses HSIP Flex Funds for Winter Safe Driving Campaign

Michigan

The Michigan Department of Transportation (MDOT) flexed $45,000 of its Highway Safety Improvement Program (HSIP) funds in FY 2008 to launch a radio public service announcement (PSA) campaign on safe winter driving, which was conducted from December 2007 through March 2008.

The MDOT Communications Department successfully used earned media (news coverage, editorials, etc.) to promote past campaigns, but the number of winter weather-related crashes and the launch of a new slogan and logo – *Ice & Snow, Take It Slow* – called for increased media exposure. The problem of winter-related crashes also resulted in support for the increased public outreach from the county road commissions around the State.

The MDOT Communications Department oversaw the implementation of the *Ice and Snow, Take It Slow* campaign, which in the past was supported by state funds. Support for this type of program was in jeopardy based on efforts to direct all state funding toward matching Federal monies on construction projects.

The *Ice and Snow, Take It Slow* campaign was developed by Clear Roads, a national winter maintenance program with 14 member states. Public information officers from 12 of the state DOTs, including Michigan, contributed time and effort to develop the message based on four top winter safety issues:

- Speed reduction;
- Safe travel around snowplows;
- Safe driving maneuvers; and
- Trip preparedness.

Speeding is part of Michigan's Strategic Highway Safety Plan (SHSP) emphasis area on driver behavior and awareness, providing an important link for the *Ice and Snow, Take It Slow* campaign.

Key Accomplishments

- Used HSIP flex funds to conduct a radio PSA campaign that focused on a high-crash situation, i.e., winter driving.
- Leveraged a partnership with the Michigan Association of Broadcasters for improved return on investment.
- Took advantage of existing Clear Roads campaign.

During the winter of 2008, MDOT, which designed the logo for use by 20 states, included the campaign tagline in all news releases, put winter driving safety tips on-line, displayed posters in all Michigan rest areas, and ran a statewide radio campaign. A partnership with the Michigan Association of Broadcasters enabled a wider distribution of the radio PSA, which resulted in securing more than four times the value of the media purchased and greatly extending the campaign's reach throughout the State.

Results

Because of the flex provision, Michigan has been able to sustain the campaign on safe winter driving, resulting in increased public awareness. Michigan fatal crashes in snow have decreased from a five-year rolling average of 77 in 2005 to 63 in 2009. Serious injury crashes involving snow have decreased from a five-year rolling average of 537 in 2005 to 413 in 2009.

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Nevada Funds Education and Outreach Programs with HSIP Flex Funds

Nevada

The Nevada Department of Transportation (NDOT) flexed $800,000 of its Highway Safety Improvement Program (HSIP) funds in FY 2009 (seven percent of the total) to fund a range of outreach and education campaigns linked to the State's Strategic Highway Safety Plan (SHSP) emphasis areas.

SHSP partners actively participated in identification of the flex projects. SHSP critical emphasis area (CEA) teams identified several projects focusing on seat belts, impaired driving, lane departures, intersections, and pedestrians. Other flex projects involving marketing and communications were identified by the Nevada Strategic Communications Alliance (SCA), comprised of public information officers from state agencies and private sector organizations with an interest in safety. The SCA manages communications and marketing related to the SHSP, and recommended strategies within the SHSP emphasis areas. The list of recommendations from the SCA and the CEA teams was reviewed by the SHSP Technical Working Group and then by the Nevada Executive Committee on Traffic Safety.

The increased communications among partners from the SHSP process resulted in several key developments. The Office of Traffic Safety (OTS) reported a reduction in funding for safety belt and impaired driving media campaigns. It is doubtful that without the SHSP forum NDOT and others would have been aware of this situation. The $300,000 in flex funds, which were used to increase media buys, extended these campaigns and augmented the outreach already underway.

The creation of the SCA resulted in innovative programs receiving much-needed support and expansion of successful programs statewide. NDOT invested $114,000 in flex funds in Nevada's *Prevent All Crashes Every Day* (PACE) program, which increases awareness of seatbelt use and the dangers of impaired and distracted driving among teens through presentations on the program at assemblies, teacher meetings, and other events. The flex funds enabled OTS to roll out the program beyond the Las Vegas area to other teens statewide.

Key Accomplishments

- Used Emphasis Area teams to identify safety projects for flex funding.
- Used HSIP flexible funding provision to expand successful and proven programs.
- Initiated a new education program to reach the Latino population.
- Strengthened relationships with safety partner agencies.

To reach the Latino population, NDOT invested $310,000 to hire regional coordinators and develop a comprehensive Latino community highway safety awareness and education program. The objective was to engage Latino audiences, particularly first- and second-generation Latinos, through culturally responsive media campaigns, enforcement operations, and educational programming targeting highway safety messages in the areas of seat belts, impaired driving, and pedestrian safety.

NDOT used $20,000 in flex funds to support the Nevada Department of Motor Vehicles (DMV) in publishing up to 150,000 educational tip cards on topics related to the SHSP emphasis areas, including teen driving, impaired driving, seat belts and child safety seats, pedestrian and bicycle safety, lane departures (move over law), and other new legislation. This project was an update and revitalization of the DMV's existing "Quick Tip" series.

NDOT allocated an additional $56,000 to the Regional Transportation Commission (RTC) of Washoe County to provide and promote a "Safe Ride Home" with free public transportation on New Year's Eve and St. Patrick's Day in Reno/Sparks along with a "Don't Drink and Drive/Safe Ride Home" education campaign.

NDOT staff found the flex fund application process to be fairly simple since the agency met the requirement of obligating funds for the infrastructure projects it had identified for the year. Additionally, given the FHWA division office's participation in SHSP implementation activities, the Nevada Division Office FHWA representative was familiar with the proposed projects.

Performance measures and tracking mechanisms are included in funding agreements with each of the implementing agencies. For example, process measures for tracking successful implementation include, among others, the number of materials distributed, the number of active partners, and the number of news stories about the issue. Outcome measures include changes in target audience behavior and attitude on seat belts, impaired driving, and pedestrian safety.

Results

Flexing of HSIP funding enabled NDOT to support multiple education and outreach programs related to the SHSP that would not have received funding or support otherwise. Included with efforts targeting the general population are programs to reduce fatalities and serious injuries among two high-risk groups – young drivers and Latinos. The successful PACE program was expanded from just one area to students all over the State. The proven effective *Click It or Ticket* and *Over the Limit Under Arrest* campaigns were also expanded. The RTC free ride program provided 7,326 rides between 7 p.m. and 4 a.m. on New Year's Eve in 2009. While data is not available for the specific day, the number of crashes involving driving under the influence (DUI) in December 2009 was 30 percent lower than in December 2008.

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Utah Flexes HSIP Funds to Enhance Partners' Safety Efforts

Utah

Overall, the Utah Department of Transportation (UDOT) spends about $20 million per year on roadway safety, one-half of which is funded via a state funding mechanism and one-half via the Highway Safety Improvement Program (HSIP). The State receives about $4 million per year in Federal highway safety grant funding (i.e., Sections 402, 405, 408, 410, etc.). According to crash data, the majority of fatal and serious injury crashes in Utah are behavior related. However, the state funding mechanism is limited to infrastructure investments. Given the level of behavior related crashes, UDOT decided to take full advantage of the HSIP flexibility provision to fund noninfrastructure safety programs. "There is a lot of talk about an integrated approach to safety – the 4Es (enforcement, education, engineering, and emergency response). We are utilizing the flex funds to address the other Es beyond engineering," said Utah Director of Traffic and Safety Robert Hull.

UDOT has flexed approximately 10 percent of its HSIP funds each year for an annual investment of approximately $900,000 in safety funds for noninfrastructure programs between FY 2006 and FY 2009. This has enabled UDOT to support its overall safety program – *Zero Fatalities* – and reinforce partnerships with new and existing safety partners through support of their programs. Partners include the Department of Public Safety (DPS); Highway Safety Office (HSO); Utah Department of Health (DOH) Violence and Injury Prevention Program; Utah Safety Council (USC); and Utah Attorney General's Office. Programs were identified by the partner agencies and then reviewed by UDOT as potential HSIP flex projects, considering their link to the Utah's Comprehensive Safety Plan (the State's strategic highway safety plan).

UDOT used flex funds for informational safety and public outreach materials as well as to support the implementation of a multidisciplinary safety summit. One of the projects identified by DPS and DOH was a teen memoriam yearbook, which includes stories from families about teens that have died in crashes. Funding from UDOT pays for the creative development and production while the DOH and DPS work with the families to develop the stories. The book has been used in teen driver education classes for the past two years.

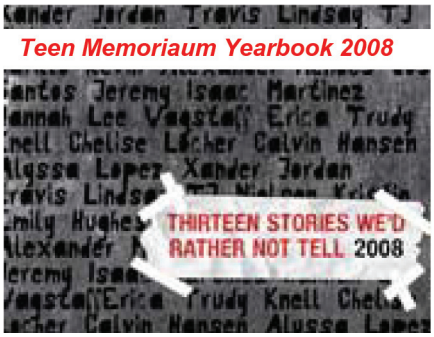
Key Accomplishments

- Strengthened relationships in the safety community through funding partner programs.
- Enabled improved creativity in addressing safety issues.
- Demonstrated greater levels of success through collaboration.

Additional education and outreach programs supported by flex funds include the *Operation Lifesaver* program to reduce pedestrian crashes at rail crossings and support for USC's *Alive@25* program that promotes safe driving among youth. The 14 Safe Kids chapters across the State receive funding to buy car and booster seats that are given away during Safe Kids Week.

UDOT also contributes flex funds to support a Traffic Safety Resource Prosecutor position. This attorney, who is housed in the Attorney General's office, works with county and city prosecuting attorneys to help them handle impaired driving-related court cases. The resource prosecutor provides quarterly reports of their activities to ensure objectives of the program are met.

"Applying for flex funds is not difficult given that all the data needed is assembled in other annual reports, including those on the HSIP program, railroad program, Safe Routes to School, and the 5% Report," said Hull.



Results

Since 2000 Utah has experienced a reduction in fatal crashes of 34 percent. In 2009, fatalities were the lowest in 34 years. Overall, flex funding has been used to strengthen the *Zero Fatalities* Program, the overarching safety effort in Utah. Since *Zero Fatalities* was initiated in 2005, all of the safety campaigns in the State have been branded with the logo. The last market survey in 2009 showed that Utah residents had a 75 percent awareness rate of the *Zero Fatalities* campaign and the related safety programs. In addition, the flex funded Traffic Safety Prosecutor has helped cities and counties without experience in impaired driving-related court cases reduce the number of dismissals or reduced charges.

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U.S. Department of Transportation
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HSIP Highway Safety Improvement Program
Data Driven Decisions

FHWA-SA-11-02

The Focus is Results

HSIP

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HSIP Noteworthy Practice Series

HSIP Project Identification

About the HSIP Noteworthy Practice Series

The Highway Safety Improvement Program (HSIP) is a core Federal-aid highway program with the primary purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. Many states and local agencies are successfully implementing innovative approaches to HSIP planning, implementation and evaluation. The HSIP Noteworthy Practices Series presents case studies of these successful practices organized by specific HSIP topics. The individual case studies provide summaries of each practice, key accomplishments, results, and contact information for those interested in learning more.

HSIP Project Identification

States are required (23 U.S.C. 148) to perform safety project identification and analysis as part of the HSIP. However, the law does not specify the methodologies states shall use. The HSIP Manual (FHWA-SA-09-029) outlines the following steps for project identification: collect and analyze data; identify crash types and contributing factors; establish a crash pattern; conduct field reviews; identify countermeasures; assess countermeasure effectiveness; and use the current science (e.g., crash modification factors) to determine and prioritize project selection. The goal is to use data-driven decision making to identify and prioritize projects with the greatest potential for reducing deaths and serious injuries on all public roadways.

In practice, methods used to identify candidate project locations vary significantly from state to state. Many states identify potential locations for safety improvements based on crash frequency or rate, while some have begun to use more advanced methods that incorporate safety performance functions (SPFs) or the Empirical Bayes (EB) method. In addition, some states are changing focus from "hot spot" improvements to a systemic approach. Qualitative information commonly used to identify candidate safety projects include panel reviews, input from public and law enforcement, field reviews, and road safety audits (RSA).

Some state departments of transportation (DOT) select projects at the state level while others distribute funds to DOT District offices to use at each district's discretion. Many states selecting projects at the state level solicit projects from DOT District offices and local agencies for consideration. States commonly conduct benefit-cost analyses to select and prioritize projects and rank them first using the highest benefit-cost ratio or net present value.

One of the biggest challenges to effective project identification is the lack of data, particularly for local roadways. Even when quality data are available, many states do not have the training, resources, or tools to apply the more advanced and rigorous data analysis methods necessary to use them effectively. In addition, competing political or institutional realities could impose non-data driven factors on the decision-making process, making it difficult to select those HSIP projects with the greatest potential to improve safety.

While many considerations enter into project selection, quantitative analysis should be used whenever possible in the prioritization process (e.g., comparing cost, effectiveness, and lifespan of the project). Quantitative information lends objectivity to the decision making process and helps maximize the safety benefit for the resources invested.

FHWA-SA-11-02

Noteworthy Practices

The following cases demonstrate noteworthy practices several states are using in HSIP project identification:

- The North Carolina DOT (NCDOT) developed four categories of safety warrants used in the network screening process to identify locations with severe crashes and crash patterns that can be addressed by engineering safety countermeasures. To provide a clear and consistent data-driven process, NCDOT developed a decision support tool to perform the initial prioritization of all candidate safety projects from across the state. (read more)

- The Missouri DOT (MoDOT) made the state's HSIP more proactive through the systemwide implementation of engineering strategies described in Missouri's Blueprint to Arrive Alive (Strategic Highway Safety Plan). Using HSIP funds, MoDOT incorporates the installation of rumble strips/stripes, improved signing and delineation, wider pavement markings, and improved shoulders into pavement resurfacing projects. Since 2007, almost two-thirds of MoDOT's HSIP funds have been allocated to systemic improvements, resulting in a safer system overall. (read more)

- The Minnesota DOT (MnDOT) restructured its HSIP to provide funding for local agencies to address the large proportion of severe crashes occurring on local roadways, and developed funding goals for proactive and reactive improvements. MnDOT developed a "proactive spectrum" to establish safety funding goals for the Metropolitan District (Minneapolis/St. Paul area) and rural districts. Minnesota has successfully increased the proportion of safety funding spent on proactive improvements. Almost 90 percent of projects programmed for fiscal year 2010-2011 are proactive. (read more)

- The Illinois DOT (IDOT), with the assistance of the University of Illinois, developed safety performance functions (SPFs) for all state routes and intersections using the Empirical Bayes (EB) method. IDOT uses the SPFs in the network screening process to identify locations with the highest potential for safety improvement. The use of SPFs in the network screening process enables the state to shift emphasis of the HSIP away from focusing on urban densely populated areas. The resulting broader focus includes low-cost safety improvements or systemic improvements that may not have been identified using previous screening methods. (read more)

- The Colorado DOT (CDOT) developed sophisticated predictive and diagnostic tools that incorporate calibrated SPFs for all public roadway types and intersections in the state. These tools enable CDOT to maximize potential crash reduction in the state within the constraints of available budgets. CDOT institutionalized the use of these tools by applying them to all CDOT projects. Over the seven years of applying these methods on all infrastructure projects, the state has achieved an unprecedented fatal crash reduction of 36 percent. (read more)

To access these full case studies, click on the individual links above or visit the FHWA Office of Safety on-line at: http://safety.fhwa.dot.gov/hsip.

Safety Warrants and Spot Safety Index

North Carolina

The North Carolina Department of Transportation (NCDOT) started to identify shortcomings in its problem identification method in the mid-1990s. The previous method focused on identifying locations with a potential safety issue based on factors such as crash frequency, crash rate, and crash severity. In many cases, the locations identified did not exhibit a correctable crash type and were congestion related issues. For example, NCDOT repeatedly identified signalized intersections exhibiting a high frequency of rear-end collisions, but attributed the collisions to congestion and driver inattention rather than a roadway factor.

Key Accomplishments

- Developed network screening method to identify locations with severe and correctable crash patterns.
- Continued to update network screening process to improve the identification of relevant safety issues and locations.
- Developed systematic project prioritization ranking method that considers benefit-cost analysis, departmental and regional priorities, and ease of constructability.

Intersection Warrants:

I-1: Frontal Impact

I-2: Last Year Increase

I-3: Frequency with Severity Index Min

I-4: Night Location without Streetlight

I-5: Chronic Pattern

Section Warrants:

S-1: Run Off Road- Wet Conditions

S-2: Run Off Road

S-3: Wet Road Conditions

S-4: Non-Intersection Night Location without Streetlight

Bridge Warrant:

B-1: Bridge

Bike/Ped Intersection Warrants:

P-1: Last 3 Years (pedestrians)

P-2: Darkness with Streetlights

P-3: Alcohol Involvement

P-4: Chronic Location

X-1: Last 3 years (bicyclists)

X-2: Darkness with Streetlights

X-3: Alcohol Involvement

X-4: Chronic Location

Beginning with the 1996 HSIP, a set of safety warrants was established for intersections and roadway segments to target locations exhibiting a pattern of correctable crash types or conditions, as well as locations with a significant increase in crash frequency during the past calendar year. NCDOT has continued to expand and modify the safety warrants throughout the years to improve the identification process.

NCDOT initially screens the network (including local roads) for potential safety improvement locations using four categories of safety warrants: intersections, sections, bridges, and bicycle and pedestrian intersections. The safety warrants are analyzed annually using 5 to 10 years of crash data by querying the crash database. The current warrant criteria are based on crash frequency, severity, conditions, and percentage of target crashes. When a location meets the warrant criteria, it is flagged. As an example, an interstate segment would be flagged based on run-off road crashes if a minimum of 30 total crashes occurred on the segment, the crash rate is greater than 60 crashes per mile, and a minimum of 60 percent of the total crashes were run off the road. After a location is flagged, a weighting factor is calculated based on the warrant criteria. The weighting factors are summed for locations meeting multiple warrants and are used to rank locations to determine which will receive priority for further analysis and investigation by the corresponding Regional Traffic Engineering and Highway Division staff. The Regional Traffic Engineers are responsible for identifying potential countermeasures and developing projects.

All safety projects are submitted to North Carolina's Safety Oversight Committee, which was established to help select projects to receive Spot Safety Program funding. To provide clear and consistent data-driven selection process, the Spot Safety Index (SSI) was developed as a decision support tool to perform an initial prioritization of all candidate projects from across the state. It ensures safety investments are focused on locations with the greatest need and potential for improvement. The SSI is calculated based on a 100-point scale and is composed of four parts: Safety Factor (60 points), Constructability (5 points – e.g., ROW acquisition needs), Department Goals (5 points) and Division/Region Priority (30 points). The Safety Factor is based on the benefit-cost ratio, Severity Index, and whether the project is identified in the HSIP List or identified through a Road Safety Audit (RSA). An initial list of prioritized projects is developed by ranking projects based on the SSI. However, the Committee must take other considerations into account to develop the final list, including distribution of funding to the 14 districts and the effectiveness of countermeasures identified in the projects based on results from the state's evaluation group.

Results

The development of the safety warrants for use in the network screening process has enabled NCDOT to focus their analysis on the identification of locations with severe crashes and crash patterns correctable by infrastructure safety countermeasures. NCDOT also has successfully established a clear and consistent data-driven process for selecting and prioritizing projects for funding.

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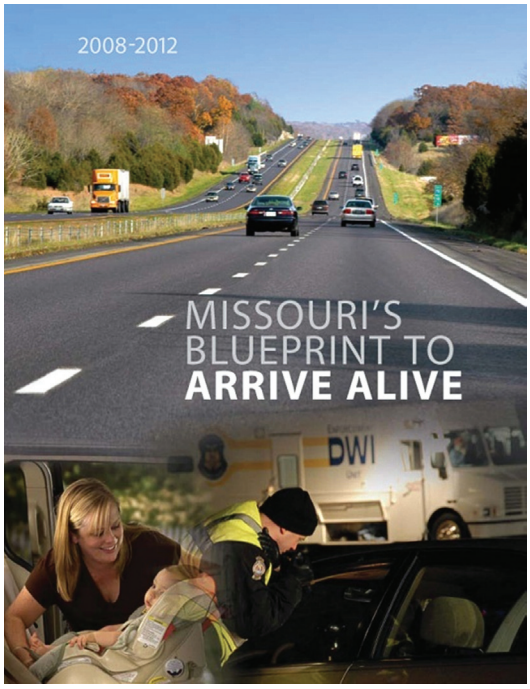
The Focus is Results

Implementation of Systemwide Improvements

Missouri

The Missouri Department of Transportation (MoDOT) has been successfully shifting the focus of its Highway Safety Improvement Program (HSIP) towards a more proactive approach through the implementation of systemwide improvements. Many of these efforts began through the implementation of the Smooth Roads Initiative in 2004. The original initiative included 2,200 miles of resurfacing, installation of reflective pavement markings and signage, improved shoulders with rumble strips/stripes, and safer guardrails. Given the safety benefits realized through these improvements, the state incorporated many of them into Missouri's Blueprint to Arrive Alive (the state's strategic highway safety plan).

Missouri's Blueprint is used to guide HSIP investments. The Blueprint identifies the state's "Targeted 10" strategies in education, enforcement, engineering, and public policy areas. These strategies were selected based on documented evidence supporting their life-saving and injury reduction potential. Six of the strategies are engineering countermeasures being implemented on a systemwide basis, including:



Key Accomplishments

- Allocated almost two-thirds of HSIP funds to systemwide improvements.
- Created a safer roadway system overall.

- Expand the installation of shoulder and centerline rumble strips/stripes;
- Expand, improve, and maintain roadway visibility features (pavement markings, signs, lighting, etc);
- Expand installation and maintenance of roadway shoulders;
- Remove and/or shield fixed objects along roadside right of way;
- Improve and expand intersection safety with the use of innovative engineering designs (e.g., J-turns, roundabouts); and
- Improve curve recognition through the use of signs, markings, and pavement treatments.

The state uses HSIP funding for many of these strategies proactively incorporating the installation of rumble strips/stripes, improved signing and delineation, wider pavement markings, and improved shoulders into pavement resurfacing projects.

Currently the state focuses its funding on the state roadway system since, historically, 77 percent of the fatalities in Missouri occur on state roads. In order to achieve the greatest benefit for the funds invested, Missouri originally focused on incorporating the safety enhancements into resurfacing projects on major roadways (about 5,600 centerline miles) experiencing a disproportionate 45 percent of all fatal crashes. Following positive results from those original efforts, MoDOT is currently considering incorporating two-foot shoulders into future resurfacing projects on less traveled roadways (e.g., minor arterials, major collectors). Missouri also has become a national leader in the installation of cable median barrier to reduce cross-median fatalities on the majority of the interstate system throughout the state.

Results

Since 2007, almost two-thirds of Missouri's HSIP funds have been allocated to systemwide improvements. By focusing more on systemwide improvements, the state has been able to create a safer system overall. Between 2005 and 2010, Missouri has seen a 30 percent drop in overall fatalities and a 41 percent reduction in lane departure fatalities. In addition, the installation of cable median barriers on the interstate system throughout the state resulted in an 80 percent reduction in cross median crash fatalities on Missouri freeways.

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The Focus is Results

Funding Goals for Proactive Improvements

Minnesota

Key Accomplishments

- Implemented proactive approach to the HSIP project selection process.
- Shifted funding to local jurisdictions.

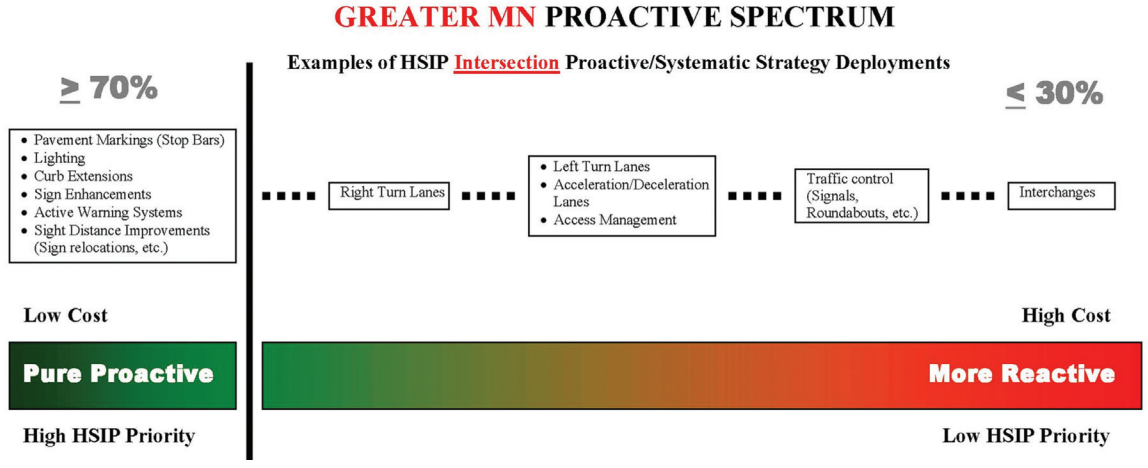
The data analysis conducted for the development of Minnesota's original Strategic Highway Safety Plan (SHSP) in 2004 indicated a large percentage of severe crashes were occurring on local roadways. All Highway Safety Improvement Program (HSIP) funding was managed by eight Area Transportation Partnerships (ATP)[1], and a small portion of the funding was allocated to local road safety improvements. To ensure the state was using HSIP funding in the best way possible, Minnesota restructured the program to provide funding for local agencies in Greater Minnesota (areas not within the Minneapolis-St. Paul metro area) and developed funding goals for proactive and reactive improvements.

Minnesota distributes HSIP funding to each district based on the proportion of fatal and serious injury crashes occurring in the district. The district funds are then allocated to local roads and state highways based on the proportion of fatal and serious injury crashes occurring on the corresponding roadways. The split ranges from 28 percent to state highways and 72 percent to local roadways in the Metropolitan District, to a 50/50 split in District 1 (average across districts is 35 percent to state highways and 65 percent to local roadways).

In Minnesota approximately 70 percent of all crashes occur in urban areas; however, approximately 70 percent of the fatal crashes occur in rural areas. To address the inherent differences in the safety issues of urban and rural areas, Minnesota has established two separate goals to guide safety investments:

- Metropolitan District (Minneapolis/St. Paul area): at least 30 percent of the safety funds go towards proactive low-cost safety improvements, and
- Greater Minnesota (8 Rural Districts): at least 70 percent of the safety funds go towards the proactive deployment of low-cost strategies.

Minnesota developed a "proactive spectrum" decision support tool for use in project selection, which has been in use since 2007. The spectrum ranges from proactive low-cost projects (e.g. pavement markings, rumble strips, lighting, sign enhancements, etc.) to reactive/high-cost improvements (e.g., interchanges, roadway realignments, etc.). The proactive improvements are focused on improving the safety of the system overall, rather than focusing on a high crash location.



[1] An ATP is a group of traditional and non-traditional transportation partners, including representatives from MnDOT, Metropolitan Planning Organizations, Regional Development Commissions, counties, cities, tribal governments, special interests, and the public, with the responsibility of developing a regional transportation improvement program (TIP) for their area.

Projects are selected for funding through a competitive selection process. Proactive projects are prioritized using a point system based on factors such as whether the project meets the intent of the SHSP, fatal and serious injury crashes per mile, cost per mile or per intersection, and traffic levels. Additional points are awarded if the location was identified in the High Risk Rural Roads Program or the Five Percent report. Reactive projects are prioritized based on the project's benefit-cost ratio and other factors. The objective of this process is to prioritize and fund safety projects with the greatest impact on reducing fatal and serious injury crashes.

Results

Minnesota has successfully shifted the focus of its HSIP to a proactive approach through the development of the "Proactive Spectrum." This enables the state to focus on projects with the greatest potential impact on safety.

The proportion of funding spent on proactive improvements has been increasing over the last few years. Of the projects programmed for fiscal year 2010-2011, almost 90 percent were proactive. Since 2007, Minnesota has funded safety projects on local and state roads to implement over: 6,714 miles of 6-inch wide edge lines; 80 miles of edge line rumble strips; 594 miles of edge line rumble stripes; 236 rural intersections with street lighting; 1,347 curves with chevron signing; and 230 miles of cable median barrier.

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Development of SPFs for All State Routes and Intersections

Illinois

While the development of SafetyAnalyst and the Highway Safety Manual was still underway, Illinois decided to incorporate a new analysis technique to assist the state in moving forward with the implementation of SafetyAnalyst. Within a year, the Illinois Department of Transportation (IDOT), with the assistance of the University of Illinois, developed safety performance functions (SPF) for state routes and intersections throughout the state using the Empirical Bayes (EB) method. The SPFs have been used in the HSIP network screening process since 2008 to identify potential locations for safety improvement projects.

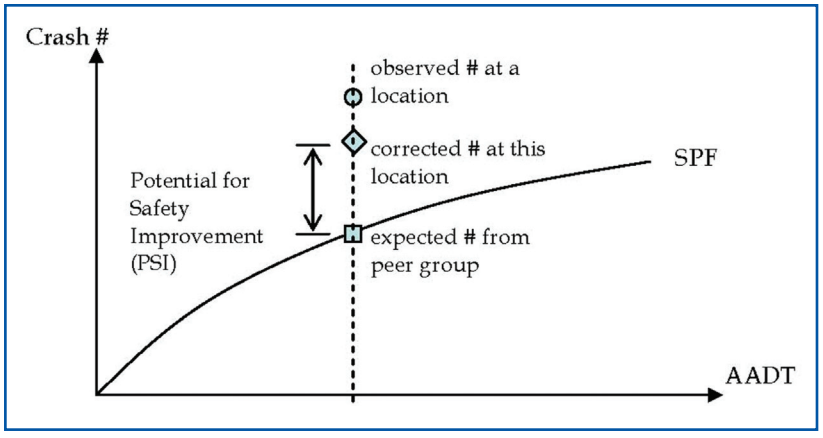
SPF equations were developed for 12 peer groups of roadway segments (e.g., rural two-lane highway, rural multilane undivided highway, rural multilane divided highway, etc.) and eight peer groups for intersections (e.g., rural minor leg stop control, rural all-way stop control, rural signalized, etc.). The SPFs are used in the network screening process to calculate a Potential for Safety Improvement (PSI) for all locations. The PSI is the difference between the corrected crash frequency (calculated using the EB method) and the expected crash experience (based on the SPF) for a given traffic volume within the peer group.

Since the focus of the HSIP is to reduce fatalities and serious injuries, the PSI calculation is weighted to emphasize the most severe crashes. The weighted PSI calculations are then ranked in ascending order by location and peer group to identify locations with the greatest safety need or highest PSI value. Once the sites with the greatest potential for safety improvement are identified, the IDOT Districts review the locations and make recommendations for improvement. Candidate HSIP projects on the state roadway system are selected by the District's Safety Committee and submitted to the Bureau of Safety Engineering.

Key Accomplishments

- Developed SPFs for state routes and intersections throughout the state.
- Expanded knowledge and acceptance of analysis techniques.
- Provided data-driven safety decision making tools.

When the SPFs were originally developed, there was not enough data to develop SPFs for the local roadway system. Illinois has been expanding the crash database for local roadways and, in the near future, the state will begin discussions about the development of SPFs for local roadways, as well as updating the existing SPFs for state roadways. Currently, local roadways are evaluated using an aggregate level analysis to identify potential safety issues (e.g., counties with overrepresentation of a particular crash type, crash severity, behavioral issue, etc.). Local agencies can submit safety improvement projects to the State Safety Committee for funding consideration through the Local Road Program component of the HSIP.



Results

Incorporating SPFs into the network screening process for safety improvement projects has led to several positive outcomes. Although other factors may involved, Illinois has seen a significant reduction in fatalities. In 2009, Illinois had the lowest number of fatalities since 1921. Transportation professionals are embracing the analysis results and making data-driven safety decisions. Using SPFs has helped shift the focus of the state's program away from the urban, densely populated areas and provided a broader focus for safety projects, including low-cost safety improvements or systemic improvements that may not have been identified using previous analysis methods. Engineers throughout the state have become more familiar and comfortable with the use of SPFs through the state's efforts, leading to a greater acceptance of SPFs and appreciation for improved quantitative data.

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The Focus is Results

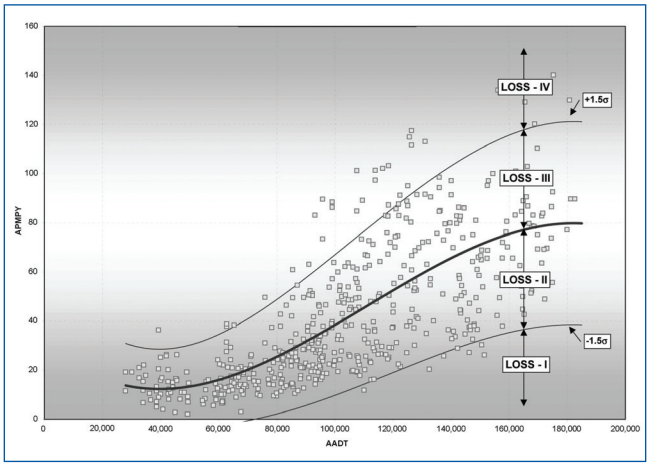
Level of Service of Safety and Diagnostic Analysis

Colorado

The Colorado Department of Transportation (CDOT) uses two methods for identifying locations with potential for safety improvement: Level of Service of Safety (LOSS) and Diagnostic Analysis. LOSS is based on the concept of Safety Performance Functions (SPF), while Diagnostic Analysis is developed around the idea of statistical pattern recognition.

Design engineers at CDOT pioneered development of the LOSS concept to quantify the magnitude of the safety problem. A crash rate implies a linear relationship between safety and exposure. While crash rates are commonly used to measure safety, they are often misleading since rates change with Annual Average Daily Traffic (AADT). To capture how this rate change takes place, CDOT engineers began calibrating SPFs in the late 1990s based on the work of Dr. Ezra Hauer. By 2001, CDOT had calibrated SPFs for all public roadways in Colorado, which were stratified by the number of lanes, terrain, environment, and functional classification. In 2009, in collaboration with consultants, CDOT developed SPFs for all intersection types.

Development of SPFs supports the conceptual formulation of the LOSS concept. It uses qualitative measures to characterize the safety of a roadway segment in reference to its expected performance. If the number of crashes predicted by the SPF represents normal or expected crash frequency at a specific level of AADT, then the degree of deviation from the norm can be stratified to represent specific levels of safety. To describe road safety from the frequency and severity standpoint, two different SPFs were calibrated: one for the total number of crashes and the other for injury and fatal crashes. When the magnitude of the safety problem is assessed, it is described from the frequency and severity standpoint. The figure (Kononov and Allery, 2003) illustrates the LOSS concept using an SPF calibrated for total crashes expected on the 6-lane urban freeways. The delineated boundary line is located 1.5 standard deviations from the mean, reflecting a Negative Binomial error structure. Four LOSS categories were introduced:



- LOSS-I - Indicates low potential for crash reduction;
- LOSS-II - Indicates low to moderate potential for crash reduction;
- LOSS-III - Indicates moderate to high potential for crash reduction; and
- LOSS-IV - Indicates high potential for crash reduction.

Key Accomplishments

- Calibrated SPFs for all highways.
- Developed sophisticated predictive and diagnostic tools to maximize crash reduction in the state within budget constraints.
- Institutionalized use of these tools throughout the state of Colorado.
- Achieved unprecedented fatal crash reduction of 36 percent over the seven years of sustained application of these advanced methods on all infrastructure and behavioral projects at CDOT.
- Provided substantive conceptual and analytical input for the development of the Highway Safety Manual (HSM).

LOSS reflects how the roadway segment is performing in regard to its expected crash frequency and severity at a specific level of AADT. However, it only describes the magnitude of the safety problem; it does not provide any information related to the nature of the problem itself. To investigate the nature of the problem, Colorado uses Direct Diagnostics and Pattern Recognition techniques.

A comprehensive methodology was developed to conduct diagnostic analyses of safety problems. The Direct Diagnostics and Pattern Recognition methods calculate a cumulative binomial probability of the crash types and related characteristics to identify overrepresented elements in the crash data (e.g., dark conditions, overturning vehicles) that may be related to abnormal crash patterns and crash causation. Direct Diagnostics is used for intersection analysis, and Pattern Recognition is used for roadway segments.

CDOT initially used the combination of LOSS and Direct Diagnostics and Pattern Recognition to identify sites with potential for safety improvement only on safety motivated projects. Beginning in 2001, they are applied to all projects at CDOT, including resurfacing, reconstruction, realignment, widening, Environmental Assessments (EA) and Environmental Impact Statements (EIS). CDOT conducts a statewide analysis using Direct Diagnostics and Pattern Recognition and recalibrates SPFs about every five years.

Results

CDOT developed sophisticated predictive and diagnostic tools to maximize potential crash reduction in the state within constraints of available budgets and institutionalized use of these tools throughout the state of Colorado. Over the seven years of application of the advanced methods on all infrastructure and behavioral projects at CDOT, the state has achieved an unprecedented fatal crash reduction of 36 percent, without reduction in travel or increase in safety expenditures. Additionally, these efforts provided substantive analytical and conceptual input for development of the Highway Safety Manual.

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HSIP Noteworthy Practice Series

SHSP Stakeholder Involvement

U.S. Department of Transportation
Federal Highway Administration

About the HSIP Noteworthy Practice Series

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SHSP Stakeholder Involvement

Legislation (23 U.S.C. 148) and Federal Highway Administration (FHWA) guidance is quite specific as to the recommended stakeholder representatives for developing a statewide strategic highway safety plan (SHSP). Those recommendations include the state department of transportation (DOT), the Governor's Representative for Highway Safety, metropolitan planning organizations, regional planning organizations, representatives of the major modes of transportation, state and local traffic enforcement officials, persons responsible for administering 23 USC Section 130 (Highway Rail Grade Crossing Program), Operation Lifesaver, motor carrier safety, and other major state and local safety stakeholders.

Stakeholder involvement is necessary for an effective SHSP process because of the wide range of programs and disciplines necessary for improving transportation safety on all public roads. Establishing collaborative arrangements where partners regularly work together builds trust, understanding, and coordinated solutions. Working together to examine data and identify appropriate safety improvement strategies can help break down jurisdictional and programmatic barriers and foster widespread understanding and support for common safety priorities. Collaboration among a wide variety of stakeholders results in a wiser use of limited resources and provides opportunities to leverage resources to achieve a broader range of program objectives. Collaboration can also result in new and innovative safety strategies that may not otherwise be realized through the traditional program silos.

For many states, developing the original SHSP involved broad-based collaboration among safety agencies and organizations engaged in safety. States have established a myriad of ways to implement their SHSPs in partnership with these stakeholders, and in some cases have reached out to new participants. Some local entities have also developed and are implementing safety plans akin to statewide SHSPs. Agencies facilitate internal collaboration through policies and procedures and support external collaboration through a variety of interagency communication strategies and organizational frameworks. Combinations of various practices have proven most effective at garnering and maintaining SHSP stakeholder involvement.

However, following the heightened levels of enthusiasm during the initial SHSP development phase, some states have found it difficult to maintain or broaden stakeholder involvement on a regular basis while implementing and updating their plans.

FHWA-SA-11-02

Noteworthy Practices

The following cases demonstrate noteworthy practices several states are using in revisiting SHSP emphasis areas:

- A key element of Missouri's SHSP, titled *Blueprint for Safer Roadways* (now the *Blueprint to Arrive Alive*) involved organizing 10 regional safety coalitions designed to work in concert with the Missouri Coalition for Roadway Safety (MCRS) to deploy targeted strategies at both the state and regional level. Together, the MCRS and Regional Coalitions have embraced the elements of the *Blueprint* and implemented a comprehensive, coordinated, and focused effort to reduce fatalities and disabling injuries on Missouri roads. Regional Coalitions have expanded the number of partners and the regional safety plans include a wider variety of localized safety programs. (read more)

- In April 2010, the Nevada Departments of Transportation and Public Safety conducted a series of road show meetings across the state in an effort to further engage safety stakeholders and educate them about the SHSP, provide an opportunity for input into the SHSP update, and market the October SHSP Summit. Combined, the four road show meetings engaged over 100 stakeholders representing different disciplines and levels of government. Participants learned about the SHSP process, their interest was piqued, and it created opportunities for potential synergies among the various safety groups. (read more)

- Washington State actively engaged tribes in discussions and safety planning, which has resulted in explicit consideration of Native American traffic safety issues in the update of Washington State's *Target Zero* SHSP. The State held a Tribal Traffic Safety Summit, carried summit results forward in the SHSP update process, included strategies from the national Strategic Highway Safety Plan for Indian Lands, and consulted tribes to develop and review the draft *Target Zero* update. (read more)

- The Cheyenne Metropolitan Planning Organization (MPO) in Wyoming independently developed and is implementing a Transportation Safety Management Plan (TSMP) akin to statewide SHSPs. The MPO has built and sustained safety stakeholder engagement in the process through MPO leadership, identifying and funding safety projects, and working with partners on project implementation. Safety stakeholders have been involved in six emphasis areas, a law enforcement summit, a legislative briefing, and other projects. (read more)

To access these full case studies, click on the individual links above or visit the FHWA Office of Safety on-line at: http://safety.fhwa.dot.gov/hsip.

Statewide and Regional SHSP Coalitions

Missouri

In November 2004, Missouri's SHSP, titled *Blueprint for Safer Roadways,* was developed in consultation with many safety advocates, including engineers, law enforcement, educators, and emergency responders. Prior to the *Blueprint,* Missouri never had a statewide safety goal. The *Blueprint* established the fatality reduction goal of 1,000 or fewer fatalities by 2008.

One of the key principles guiding development of the 2004 *Blueprint* was deploying targeted strategies at both the state and regional level. The document outlined a strategy to organize 10 regional safety coalitions designed to work in concert with the Missouri Coalition for Roadway Safety (MCRS). As soon as the *Blueprint* was published, champions pushed very hard to sell the goal and promote shared responsibility through individual meetings within each region. Presentations promoted the "Essential Eight" strategies Missouri must implement to make significant progress in reaching the projected goal. The Champions helped establish regional coalitions and provided the coalitions with safety planning toolkits, including data packages, copies of the *Blueprint*, and copies of the National Cooperative Research Program (NCHRP) 500 Series.

Before the *Blueprint*, no forum existed for regional multidisciplinary discussions on safety. Purpose and procedural guidelines now document the organizational structure and activities of the MCRS and Regional Coalitions. The 10 regional coalitions are charged to:

- Assist with the implementation of the *Blueprint*;
- Conduct regional data analysis to guide highway safety activities;
- Expand regional safety network and partnerships;
- Actively participate in MCRS meetings, campaigns, and promotions;
- Develop a localized safety plan for the region; and
- Facilitate the expenditure of allocated funds.

Key Accomplishments

- Established collaborative, multidisciplinary, regional partnerships pursuing common safety goals.
- Funded localized safety programs addressing *Blueprint* priorities via 10 annual regional safety plans.

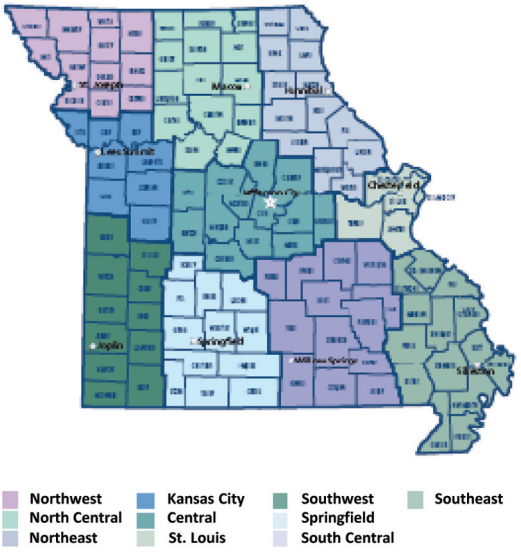
Participation in the coalitions is open to any national, state, regional, or local organization and any individual. The MCRS includes an Executive Committee with representatives from over a dozen agencies and organizations, and is presided over by a chair and vice chair. Nine subcommittees were also established to effectively address the mission of the Coalition on a statewide level, including: Commercial Motor Vehicle, Elder Mobility and Safety, Enforcement, Impaired Driving, Infrastructure, Legislative, Public Information, Strategic Planning and Implementation, and Traffic Records Coordinating.

In each regional coalition, the corresponding Missouri Department of Transportation (MoDOT) district office and Missouri State Highway Patrol troop help facilitate meetings, expand coalition membership, develop and implement regional strategic highway safety plans, and distribute funding. In addition, MoDOT trained a representative from each district to provide data analysis support to each regional coalition.

Two-million dollars of state road funds are offered each year to support regional safety plans activities. Annual grant applications are submitted to MoDOT for enforcement and education programs supporting *Blueprint* priorities. Previously, such programs had been supported exclusively through Federal Section 402 funds with project selection by the MoDOT Highway Safety Office. Regional safety plans developed by local stakeholders can provide more targeted programs. MoDOT also utilizes district safety funds to support regional engineering projects.

The MCRS meets quarterly, including an Executive Committee meeting and discussion with regional coalition contacts before an afternoon meeting with the broader statewide coalition. Every other year the MCRS holds a Blueprint Conference and uses state funds to bring up to 10 representatives from each regional coalition. The conferences combine presentations with participatory working groups. Statewide and regional coalition members played an active role in the 2008 update, *Blueprint to Arrive Alive,* which, among other changes, expanded the original "Essential Eight" to the "Targeted Ten" strategies to improve safety. The *Blueprint* appendices include data for each coalition, which are updated annually. MCRS also sends out a weekly e-mail with updated statewide and regional fatality counts. All of the above activities are designed to keep safety on the forefront and to maintain regular communication and collaboration among safety stakeholders.

Regional Coalitions



Results

Together, the MCRS and Regional Coalitions have embraced the elements of the *Blueprint* and implemented a comprehensive, coordinated, and focused effort to reduce fatalities and disabling injuries on Missouri roads. Missouri's original fatality reduction goal of 1,000 or fewer fatalities by 2008 was met one year early. Regional Coalitions have expanded their number of partners and regional safety plans include a wider variety of localized safety programs.

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The Focus is Results

SHSP Road Shows

Nevada

HSIP Noteworthy Practice Series

SHSP Stakeholder Involvement

The Nevada Departments of Transportation and Public Safety published the State's first Strategic Highway Safety Plan (SHSP) in September 2006. In April 2010, the Departments conducted a series of road show meetings across the state in an effort to further engage safety stakeholders and educate them about the SHSP, provide an opportunity for input into the SHSP update, and market the October 2010 SHSP Summit.

Nevada has created a master SHSP e-mail list that includes engineers, law enforcement officers, transportation planners, education specialists, health care providers, injury prevention practitioners, emergency responders, citizen activists, and anyone else concerned about traffic safety. In April 2010, more than 100 people attended the meetings held in four locations. The format for each of the Road Show meetings involved presentations from the two state leaders of the SHSP and a facilitated discussion with participants.

During the meetings, Road Show participants learned about Nevada's new zero fatality goal. They were also given an opportunity to describe existing programs that address the critical emphasis areas of the SHSP. This exercise in enumerating programs was also used as an opportunity to promote the Nevada Big Book of Safety and identify programs not documented in this clearinghouse for Nevada's traffic safety-related projects and programs. The Big Book of Safety is on-line and intended to be a quick-access, searchable list for agencies and the public to use as-needed for research, contact information, and details on Nevada's traffic safety initiatives. The Big Book is a living document and will be updated as feedback is received from participating agencies and stakeholders about program details, additions, removals, or corrections.

Key Accomplishments

- Engaged over 100 stakeholders representing 4Es of safety and different levels of government.
- Held 4 road show meetings to collect stakeholder input to inform SHSP update process.
- Renewed enthusiasm for the statewide safety efforts.

Road Show participants provided ideas and suggestions for safety programs and activities that could be included in the SHSP update. Finally, participants heard about funding and other resource opportunities.

Results

Presenters and attendees agreed the meetings were a success and accomplished the objectives – stakeholders learned about the SHSP process, their interest was piqued, and it created opportunities for potential synergies among the various safety groups. It was also a good way to get people energized and interested in the upcoming Traffic Safety Summit. Not one of the meetings ended early and most people wanted to continue to talk. The press attended two meetings, including a local Las Vegas television station.

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The Focus is Results

Engaging Native American Tribes in the SHSP

Washington

Washington Traffic Safety Commission (WTSC) and Washington Department of Transportation (WSDOT) have led the development, implementation, and update of Washington's SHSP (*Target Zero*) in collaboration with Washington State Patrol (WSP), the Department of Licensing, and others state and local agencies. More recently, these SHSP leaders have made efforts to garner additional participation from more local agencies, private industry, nonprofit groups, and Native American Tribes.

There are 29 Federally Recognized Tribes located within the borders of Washington State. The fatality rate for Native Americans in the State is 3.3 times higher than for non-Native Americans and data from 1999 through 2008 shows Native American fatalities are high across all types of motor vehicle crashes. Native American reservations in Washington often include a mix of Tribal, state, county, and city roads, which creates jurisdictional complexities with law enforcement, collision reporting, road maintenance, and capital safety projects.

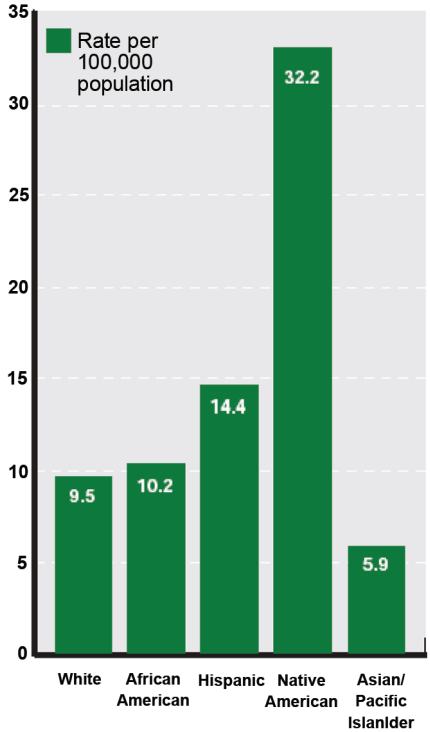
Several steps led to increased attention on these Tribal safety issues in the most recent update of *Target Zero*. Through the annual Centennial Accord (CA), the State of Washington and Tribes have formally committed to working together on a government-to-government basis. Issues addressed by the CA include transportation. During the October 2008 Tribal/State Transportation Conference, Tribal planners and representatives of WSDOT and WTSC discussed traffic safety concerns and partnership opportunities. This led to a larger role for tribes in the update of *Target Zero* than they had in previous editions.

In May 2009, the state held the Tribal Traffic Safety Summit (sponsored by the FHWA Office of Federal Lands Highway), where WSDOT, WTSC, FHWA, Washington State Patrol (WSP), Northwest Tribal Technical Assistance Program (TTAP), Tribal Transportation Planning Organization (TTPO), Bureau of Indian Affairs (BIA), and National Highway Traffic Safety Administration (NHTSA) joined many tribes to discuss reducing traffic fatalities and serious injuries on reservation roads and among Native Americans in the state. During this summit, tribal, state, Federal staff, and partners focused on the 4 Es of traffic safety (engineering, enforcement, education, and emergency response) and made recommendations on how to elevate Native American priorities within the *Target Zero* process, as well as recommendations for immediate next steps at the tribal level for stakeholders to take charge of safety issues.

Key Accomplishments

- Held a Tribal Traffic Safety Summit.
- Reinforced relationship between State of Washington and Tribes provides context for addressing critical safety data challenges.
- SHSP *Target Zero* explicitly addresses tribal traffic safety issues.

Washington Traffic Fatality Rate
By Race/Ethnicity, 1999-2007



Source: Fars, OFM.

Note: Ethnic classification are per the U.S. Census Bureau and are Mutually exclusive.

Leadership involved in the summit carried forward the results from that discussion for consideration during the annual CA on June 23, 2009. Four CA action items resulted, including focusing efforts of WTSC and TTAP to increase tribal involvement in the update and implementation of *Target Zero*. In addition to carrying forward recommendations from the summit, the new *Target Zero* update includes strategies from the national *Strategic Highway Safety Plan for Indian Lands*.

WSDOT circulated draft *Target Zero* strategies to tribal transportation planners in January 2010 for comment. WSDOT and WTSC then released a preliminary version of the plan in April 2010 for formal tribal consultation, before presenting it to the Governor's office in May 2010.

Results

Actively engaging tribes in discussions and planning has resulted in explicit consideration of Native American traffic safety issues in the update of Washington State's *Target Zero* SHSP. The new plan includes an entire section focused specifically on Native American Tribes. In addition, some recommended strategies from the Tribal Traffic Safety Summit are included under the respective emphasis area sections. WSDOT has also offered to collaborate with tribes on the reauthorization of the Federal surface transportation act.

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The Focus is Results

MPO Safety Management Planning

Cheyenne, Wyoming

In 2008, the Cheyenne Metropolitan Planning Organization (MPO) completed its first Transportation Safety Management Plan (TSMP), an MPO level plan akin to statewide SHSPs. The MPO has successfully engaged partners in developing and implementing the TSMP through a combination of activities.

As part of plan development, the MPO convened the first safety summit in the region, involving 60 stakeholders from multiple disciplines. The TSMP defined six emphasis areas requiring focus in the region: impaired driving, occupant protection, distracted driving, older drivers, younger drivers, and intersections. The plan also identified strategies in each area.

Following completion of the TSMP, the MPO developed grant applications seeking funding from the Wyoming Highway Safety Office (HSO) for two safety strategies: a summit for law enforcement personnel to increase enforcement of the secondary occupant protection statute, and development of an intersection safety analysis. These efforts maintained engagement of the law enforcement community in preparation for the summit and the engineering community as they completed the safety study. The MPO submitted a second round of grant applications to the HSO for FY 2010. Activities proposed included a briefing of state legislators on safety issues and a Battle of the Belts competition to increase safety belt use among teens.

In the fall of 2009, the MPO convened meetings of all six emphasis area teams, inviting individuals who had participated in the summit as well as new stakeholders. Each team reviewed the strategies in the TSMP, identified new ideas, and discussed implementation of the two planned efforts for FY 2010. The MPO convened a second set of team meetings in the spring of 2010. The teams developed action plans that are updated on an ongoing basis. HSO staff frequently attend events and are represented on most of the emphasis area teams.

The legislative briefing addressed issues from three of the emphasis areas and engaged a number of stakeholders in its planning. Specifically, the briefing addressed a primary safety belt law, alternative transportation to reduce DUI, and a medical advisory board. Organization of the briefing resulted in engaging a new safety stakeholder, the Wyoming Seatbelt Coalition, which helped the group frame the case for a primary safety belt law at the legislative summit. The MPO has been invited to serve as a member of the coalition, ensuring ongoing communication about the issue. A private sector company in favor of a safety belt law was engaged for the legislative briefing to present the economic benefits of increasing safety belt use through passing a primary safety belt law and demonstrate support for such a change. The American Association of Retired Persons (AARP) served as a speaker given their support of the Medical Advisory Board proposal. A public safety officer from the Casper Police Department, which started a successful alternative transportation program, also served as a speaker and became engaged in sharing information with the Cheyenne Police Department on how to start such a program.

Key Accomplishments

- Engaged safety stakeholders in six emphasis areas, a law enforcement summit, a legislative briefing, and other projects.
- Implemented four major safety projects in under two years with help from new stakeholders.

A second effort undertaken in the community in May 2010 was Battle of the Belts, a campaign to increase the rates of safety belt use in high schools. Each school held a contest to increase safety belt use and the winning school received a cash prize. Planning this event engaged members of the younger driver and occupant protection teams. The students on the Mayor's Youth Council became highly involved in event planning and promotion of the competition at their schools. The project allowed the MPO to develop a strong relationship with the principals of the three high schools in town. The Wyoming Safety Council became involved by delivering Alive@25 assemblies at the schools to kickoff the program. Community businesses donated prizes that were distributed to students during the week of the event to reward those students wearing safety belts. The Mayor and Police Chief presented the award to the winning school demonstrating their support of these efforts and helping to continue to build a culture of safety in Cheyenne.

Plans for FY 2011 involve developing a year-round alternative transportation program. This effort will involve the Cheyenne Regional Medical Center's Injury Prevention Program and the Cheyenne Police Department, which is in the initial stages of configuring an alternative transportation program in Cheyenne.

Moving forward, the MPO is developing grant applications for safety projects to be conducted in FY 2012 based on ideas developed by the emphasis area teams. Smaller-scale safety efforts are also implemented on an ongoing basis, such as developing a fact sheet for law enforcement on the importance of issuing citations for violations by older drivers instead of warnings to ensure an accurate driving record is captured.

Results

In Cheyenne, safety stakeholder engagement has been built and sustained through MPO leadership – identifying and funding safety projects and working with partners on project implementation. Based on the needs of each project, new safety stakeholders become engaged in the process. Stakeholder interest is sustained when partners have been involved hands-on in implementing a project and see the results. Safety belt use among high school students increased by 10 to 15 percent at each of the schools with the Battle of the Belts Program. An eight-fold increase in citations for nonuse of safety belts followed the safety belt law enforcement summit.

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