South Dakota

Strategic Highway Safety Plan

Every Life Counts:

Partnering to Save Lives

South Dakota DOT
Connecting South Dakota and the Nation

Department of Transportation
United States of America

SOUTH DAKOTA
DEPARTMENT
OF PUBLIC SAFETY
prevention ~ protection ~ enforcement

South Dakota

Strategic Highway Safety Plan

Lead Agency:

South Dakota Department of Transportation

February 2014

Contents

Section Page

Acronyms ..... **iv**

Definitions ..... **v**

Acknowledgements ..... **vi**

Executive Summary ..... **viii**

South Dakota's Safety Vision and Goal **1**

Background **3**
- Accomplishments, Challenges, and Future Direction 3
- Consultation with Partner Agencies and Stakeholders 8
- Development Process for the SHSP 9

Data Analysis **11**
- Driver-Behavior-Related Crashes 11
- Roadway-Related Crashes 12

Safety Emphasis Areas **18**
- Safety Emphasis Area Selection 18
- Safety Emphasis Area Goals and Performance Measures 23
- Proposed Safety Strategies 23
- South Dakota Safety Emphasis Areas 25
- Roadway Departure Crashes 26
- Intersection Crashes 29
- Motorcycle Crashes 32
- Unbelted Vehicle Occupant Crashes 34
- Speeding-Related Crashes 36
- Drug- and Alcohol-Related Crashes 39
- Young Driver Crashes 41

Implementation **43**
- Education 44
- Enforcement 48
- Engineering 49
- Emergency Medical Services 53
- Project Planning Partnerships 54
- Research and Data 55

Performance Measures and Evaluation **56**
- National Performance Measures 57
- Emphasis Area Performance Measures 59
- Monitoring and Evaluation Methods 60

MAP-21 Special Rules: High Risk Rural Roads and Older Drivers **61**
- SHSP Development Process 61
- Safety Performance Measures 62
- Crash Data (Safety Emphasis Areas) 62

Safety Fund Investment (Safety Strategies) 62
Safety Program Implementation and Evaluation 62
SHSP Stakeholder Involvement and Transparency 63
Older Drivers and Older Pedestrians 63
High Risk Rural Road Safety Program 63
Penalty without an Approved/Updated SHSP 64

References 65

Appendix

A Detailed Discussion of Safety Strategies and Effectiveness Measures

Acronyms

4Es	Education, Enforcement, Engineering, and Emergency Medical Services
AASHTO	American Association of State Highway and Transportation Officials
BAC	Blood Alcohol Concentration
CHSP	Comprehensive Highway Safety Plan
DUI	Driving Under the Influence
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FY	Fiscal Year
GDL	Graduated Driver Licensing
HRRR	High Risk Rural Road
HSIP	Highway Safety Improvement Program
MAP-21	Moving Ahead for Progress in the 21st Century
MMUCC	Model Minimum Uniform Crash Criteria
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
RSA	Road Safety Audit
RSI	Road Safety Improvement
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SDARS	South Dakota Accident Records System
SDDOT	South Dakota Department of Transportation
SDDPS	South Dakota Department of Public Safety
SHSP	Strategic Highway Safety Plan
TraCS	Traffic and Criminal Software.

Definitions

Fatal Crash – Motor vehicle crash resulting in at least one death

Serious Injury – Motor vehicle crash resulting in at least one incapacitating injury

State Highway – Highway maintained by the state of South Dakota

Local Road – Highway or road which is maintained by a local jurisdiction such as a county, township, town or city

Five Year Crash Rate – average previous five years of crash rate to normalize current year crashes

Vehicle Miles Traveled – the total number of vehicle miles traveled per year

High Risk Rural Road – A road classified as local or major/minor collector which through information gathered by field reviews, safety assessments, road safety audits, or local knowledge has experienced a history or potential for fatal or serious crashes. These roads may also be anticipated to have an increase in traffic volumes that are likely to create fatal and serious injury crash rate that exceed the statewide average for this type of roadway.

Safety Emphasis Area – type of vehicle crash in which there is an overrepresentation of serious injury and fatality crashes

Acknowledgements

South Dakota SHSP Steering Committee

South Dakota Department of Transportation (SDDOT)
South Dakota Department of Public Safety (SDDPS)
South Dakota Municipal League
South Dakota Association of City Commissioners
South Dakota Association of County Commissioners
South Dakota Association of Towns and Townships
South Dakota Tribal Representation
Federal Highway Administration

Safety Partners in SHSP Update

South Dakota State Agencies

Governor's Office
Office of the Attorney General
Board of Regents
Department of Education
Department of Game, Fish and Parks
Department of Health
Department of Public Safety
- Emergency Management
- Highway Patrol
- Office of Emergency Medical Services
- Office of Highway Safety
- Driver Licensing Program

Department of Revenue and Regulation
Department of Social Services
Department of Tourism
Department of Transportation
- Executive Team
- Operations
- Office of Research
- Project Development
- Road Design

Department of Tribal Government Relations
Legislative Research Council
Local Transportation Assistance Program
Parents Matter (South Dakota Department of Public Safety)
Sanford School of Medicine, University of South Dakota
South Dakota Bureau of Administration, Office of Risk Management
South Dakota House and Senate Transportation Committees
South Dakota Impaired Driving Task Force
South Dakota Kids Count
South Dakota Local Transportation Assistance Program (LTAP), South Dakota State University
South Dakota State University, Civil and Environmental Engineering Department

Unified Judicial System
University of South Dakota, Department of Mathematical Sciences

Federal Agencies

Bureau of Indian Affairs (BIA), Crow Creek Agency Transportation Planning
Federal Highway Administration
South Dakota Urban Indian Health
Federal Motor Carrier Safety Administration, U.S. Department of Transportation
National Highway Traffic Safety Administration
Office of the Secretary of Transportation, Transportation Planning Department
U.S. Forest Service

Local and Private Agencies, Organizations, and Officials

AAA of South Dakota
AARP (formerly American Association of Retired Persons)
A.B.A.T.E. of South Dakota Inc. (A Brotherhood for Awareness, Training and Education)
American Public Works Association (APWA)
Association of General Contractors (AGC)
CH2M Hill®
Cheyenne River Sioux Tribe Transportation Planning
City Engineers/Public Works Directors
City of Rapid City
Drug Abuse Resistance Education (DARE)
Emergency Education
Emergency response agencies
Flandreau Sioux Tribe Transportation Planning
Lower Brule Sioux Tribe Transportation Planning
Mothers Against Drunk Driving (MADD)
Rapid City Metropolitan Planning Organization
Rosebud Sioux Tribe Transportation Planning
School Administrators of South Dakota
Sioux City Metropolitan Planning Organization
Sioux Falls Metropolitan Planning Organization
Siouxland Interstate Metropolitan Planning Council
Sisseton-Wahpeton Oyate Transportation Planning
South Dakota Association of County Highway Superintendents
South Dakota Bicycle Coalition
South Dakota Coalition of Citizens with Disabilities
South Dakota Engineering Society
South Dakota Fraternal Order of Police
South Dakota Police Chiefs Association
South Dakota Safety Council
South Dakota Voices for Children
Standing Rock Sioux Tribe Transportation Planning
Sturgis City Planning Commission
Sturgis Motorcycle Rally
Volunteers of America
Yankton Sioux Tribe Transportation Planning

Executive Summary

The mission of the South Dakota Department of Transportation (SDDOT) is to provide a safe and efficient transportation system. In order to provide a safe transportation system, the SDDOT and the South Dakota Department of Public Safety, in partnership with the Federal Highway Administration (FHWA), found it necessary to update the 2007 Strategic Highway Safety Plan (SHSP). The updated plan, guided by the safety vision statement of: **Every Life Counts: Partnering to Save Lives,** identifies various strategies and options intended to reduce the fatal and serious injury crash rate 15% by 2020.

To develop/update the plan, SDDOT and its' safety partners used the 2007 SHSP, as a template for the update process. The 2007 SHSP identified nine safety emphasis areas to focus efforts on reducing the number of fatal crashes. The South Dakota traffic safety community worked together to address the issues associated with these emphasis areas and set a short-term goal of less than 144 fatalities in 2010. As shown in Figure ES-1, there were 140 fatalities in 2010, which decreased to a low of 111 fatalities in 2011. Although the number of fatalities increased to 133 in 2012, with a significant increase from 2000 through 2006, the overall trend shows a considerable reduction in fatalities since 1995. The traffic fatality rate goal of 1.55 fatalities per million vehicle miles traveled in 2010 was not met (Figure ES-2). However, recent fatality rates have shown a decrease.

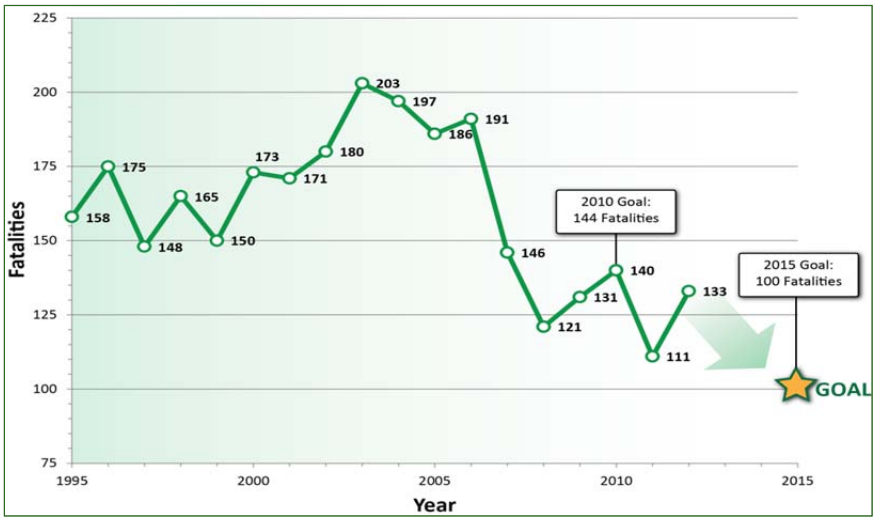


Figure ES-1. South Dakota Traffic Fatality Trend and 2007 SHSP Goal

Safety Vision

Every Life Counts: Partnering to Save Lives

Traffic Safety Goal

Reduce the fatal and serious-injury crash rates 15 percent by 2020

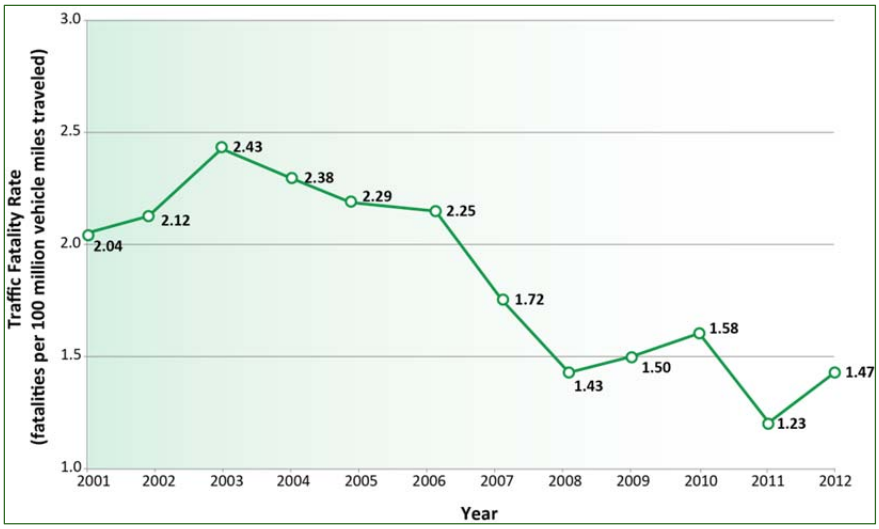


Figure ES-2. South Dakota Traffic Fatality Rates

The revision of the Strategic Highway Safety Plan (SHSP) will provide the state and safety stakeholders the opportunity to further refine safety emphasis areas and strategies to reduce the number of fatal and serious injury crashes throughout the state. An update of the plan is also mandated by federal legislation through Moving Ahead for Progress in the 21st Century Act (MAP-21). This SHSP describes key safety strategies that will be implemented and sets targets to move toward the 2020 goal (reduce the 5-year fatal and serious injury crash rate by 15 percent). SDDOT and statewide safety partners will implement the SHSP through a data-driven safety planning process that stresses the 4Es of roadway safety: engineering, education, enforcement, and emergency medical services.

The development process for South Dakota's 2014 SHSP addressed the following key considerations:

- Establish a common mission, vision, and goal for all traffic safety partners in South Dakota
- Follow a transparent process, incorporate input from safety partners representing state, local, and private safety advocacy groups throughout the process
- Follow a comprehensive process that considers all users on all roads
- Use data-driven process based on detailed crash statistics to identify the primary factors contributing to fatal and serious injury crashes.
- Identify priority areas and countermeasures to address crash factors

- Develop an SHSP which guides future safety investments and integrates other safety partners' plans
- Describe performance measures and the evaluation process for implemented safety initiatives
- Make the SHSP readily available to the public
- Maintain consistency with federal guidance contained in MAP-21

To identify safety emphasis areas for the 2014 SHSP, data was analyzed for the years 2007 through 2011. Figure ES-3 shows the ranking of identified emphasis areas related to fatal crashes in South Dakota. Seven emphasis areas, colored red in ES-3, were selected based on the data analysis.

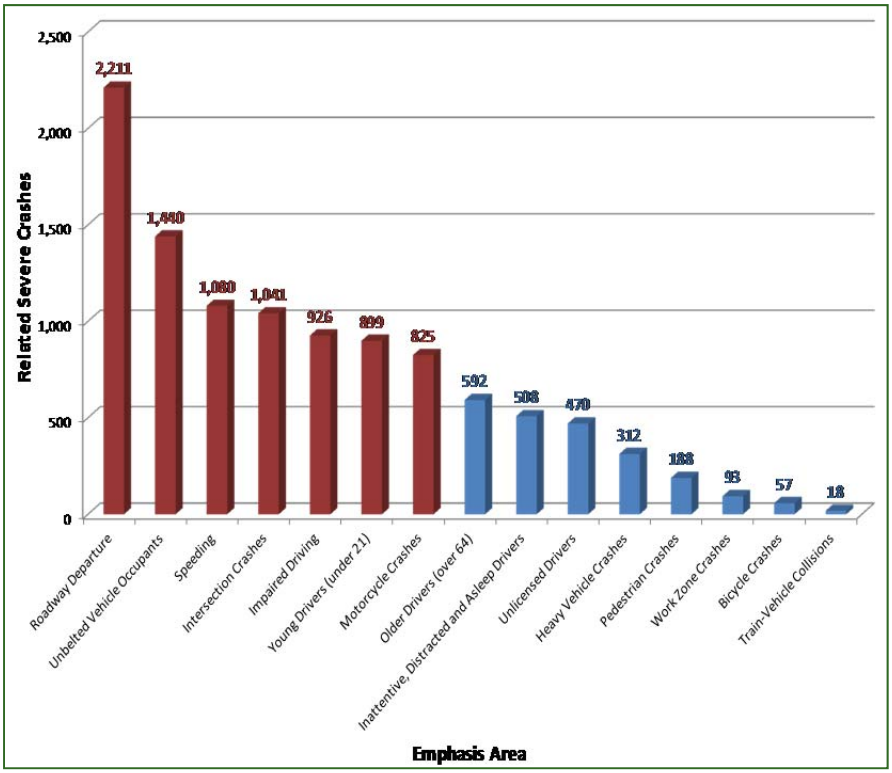


Figure ES-3. South Dakota Emphasis Areas (Contributing Factors)

The emphasis areas are roadway departure, intersections, motorcycles, unbelted vehicle occupants, speeding-related, drug- and alcohol-related, and young drivers. This plan identifies strategies for each emphasis area that may assist with achieving the ultimate safety goal of a 15-percent reduction in the fatal and serious injury crash rate by 2020.

South Dakota's Safety Emphasis Areas

1. Roadway Departure
2. Intersections
3. Motorcycles
4. Unbelted Vehicle Occupants
5. Speeding-Related
6. Drug- and Alcohol-Related
7. Young Drivers

South Dakota is committed to the development of a comprehensive statewide highway safety program that best supports the implementation of high-priority safety strategies for locations determined to be at-risk. The basic components of this comprehensive program include:

- **Education:** improving driver education and awareness
- **Enforcement:** enforcing traffic safety laws and supporting effective arrest and prosecution of offenses
- **Engineering:** implementing infrastructure safety improvements that have demonstrated effectiveness at reducing and preventing lane-departure and intersection-related crashes
- **Emergency Medical Services:** providing timely and professional emergency response and trauma care to crash victims
- **Project Planning Partnerships:** capitalizing on multidisciplinary safety knowledge at the federal, state, local and tribal government levels to develop safety projects
- **Research and Data:** improving crash data analysis for more complete problem identification

South Dakota's Safety Vision & Goal

In order to guide safety investment and reduce fatalities and serious injuries on the state's roadways, the South Dakota Department of Transportation (SDDOT) and statewide safety partners have developed a safety vision statement – **Every Life Counts: Partnering to Save Lives**.

Traffic Safety Goal

Through partnering with safety groups in South Dakota the Department of Transportation's traffic safety goal was developed by reviewing previous safety investments, recent crash trends, and future anticipated revenue. South Dakota has over 80,000 miles of roadway, and in 2012 there were 16,261 reported motor vehicle crashes. Of those crashes, approximately 740 were either serious injury or fatality crashes. When averaged with the previous four years, the average fatal and serious injury crash rate was 8.68 per 100,000,000 vehicle miles traveled. SDDOT and its' safety partners will focus efforts on reducing Fatal and Serious Injury crash rates at least 15 percent by 2020 (using a 5 year moving average).

In order to achieve a 15 percent reduction in the crash rate throughout the state, partnerships with transportation safety stakeholders will be enhanced. Recent safety trends have identified areas of needed focus which span across the typical brick and mortar highway safety improvement projects. Some of the recent noteworthy crash trends are listed below:

- Since 2002-2003, the fatality rate and number of fatalities have trended downward
- Vehicle improvements have occurred
- Improved signing and pavement markings
- An unfortunate trend is a higher incidences of distracted driving

Safety Vision

Every Life Counts: Partnering to Save Lives

Traffic Safety Goal

Reduce the fatal and serious-injury crash rates by 15 percent by 2020

TBG053013004230ABQ

The intent of the South Dakota SHSP is to reduce serious injury and fatal crashes. This will be accomplished through broad interagency and partnership cooperation and support to align priorities and leverage the state's resources to improve safety. The outcome of setting a vision and goal is to reduce the most recent 5-year fatality and serious injury crash rate at least 15 percent by 2020. The SHSP identifies South Dakota's state traffic safety needs, helping to guide investments to save lives.

TBG053013004230ABQ

Background

Beginning in 2011, the South Dakota Department of Transportation (SDDOT) and Department of Public Safety (SDDPS), and representatives from the state's safety community in partnership with the Federal Highway Administration (FHWA), have been working to update South Dakota's strategic highway safety plan. The process began by reviewing the progress made with the previous plan, acknowledging the many challenges associated with highway safety, and developing an updated plan to keep South Dakota roads safe well into the future.

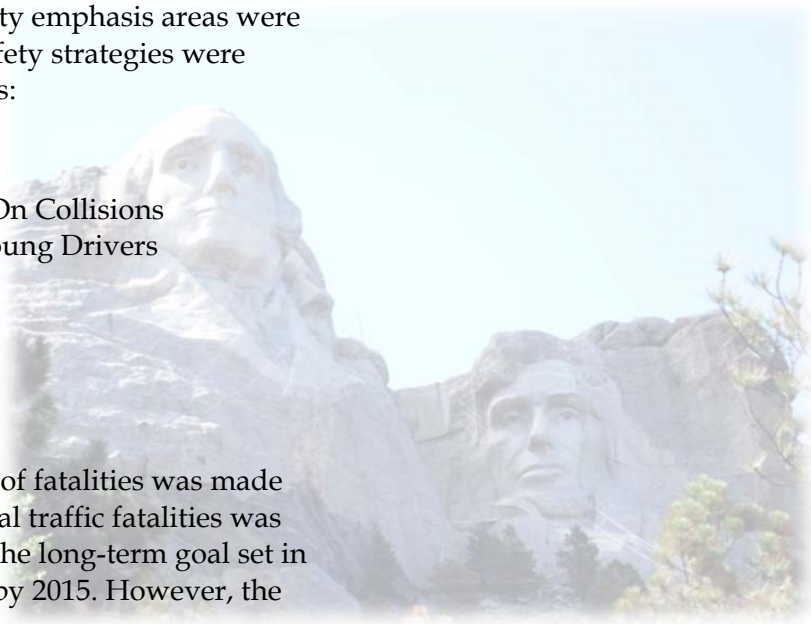
Accomplishments, Challenges, and Future Direction

Accomplishments

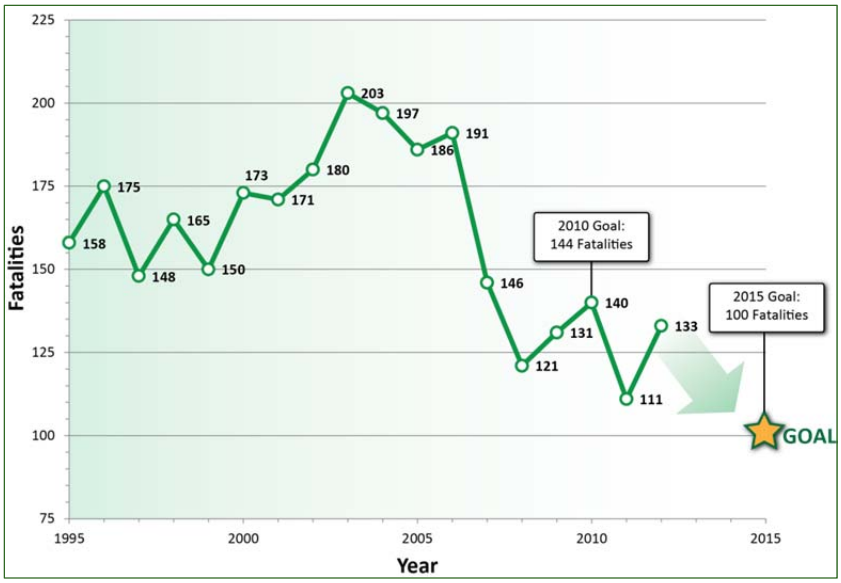
In 2007, SDDOT developed the state's first strategic highway safety plan with the help of safety stakeholders from across the state. The plans goal was to reduce the number of fatal crashes occurring on public traveled roads in South Dakota through 2015. Due to the relatively low number of fatal crashes occurring in the state and the challenge of identifying a statistically valid trend, the most recent 5 year average of fatalities was used.

Using crash data, stakeholder input, and by drawing heavily on past safety efforts and plans such as the annual *Highway Safety Plan(s)* developed by the SDDPS, nine safety emphasis areas were identified for the 2007 SHSP. Goals and safety strategies were developed for each of these emphasis areas:

1. Impaired Drivers
2. Vehicle Occupant Protection
3. Run-Off-the-Road Crashes and Head-On Collisions
4. Preventing Fatalities and Injuries of Young Drivers
5. Speed Management
6. Emergency Response Services
7. Preventing Deer-Auto Crashes
8. Improving Data Collection
9. Improving Data Analysis



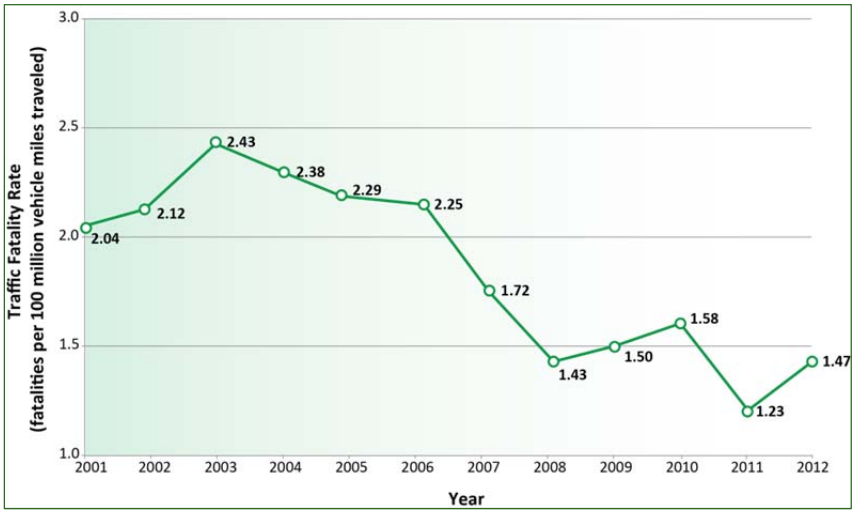
Significant progress to reduce the number of fatalities was made as shown in Figure 1. The number of annual traffic fatalities was reduced to 111 in 2011—nearly achieving the long-term goal set in the 2007 SHSP of fewer than 100 fatalities by 2015. However, the number of fatalities rose to 133 in 2012.



Source: Fatality Analysis Reporting System (FARS), National Highway Traffic Safety Administration (NHTSA)

Figure 1. South Dakota Traffic Fatality Trend

The traffic fatality rate as identified in Figure 2, which is based on miles traveled and traffic volume, had a pattern similar to the number of traffic fatalities (Figure 1). There was a general decrease in vehicle fatalities from 2006 - 2008 with increased fatality rates in both 2009 and 2010. The 2010 goal of 1.55 fatalities per 100 million vehicle miles traveled (VMT) was not met and was slightly higher at 1.58.



Source: *2012 South Dakota Motor Vehicle Traffic Crash Summary*

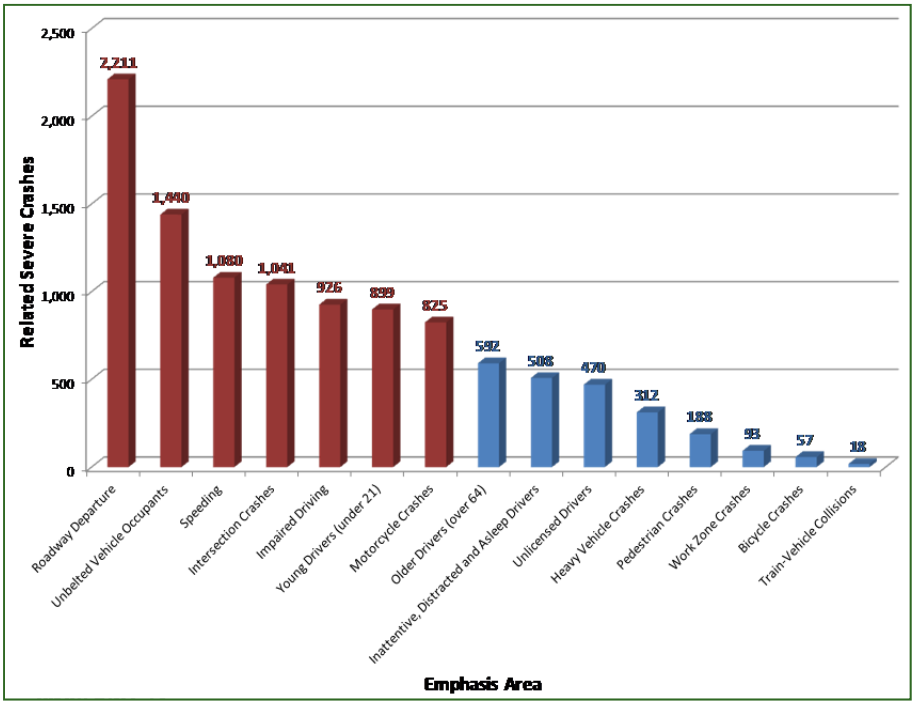
Figure 2. South Dakota Traffic Fatality Rates

As shown in Figure 2, from 2003 to 2008, a general downward trend was noted in annual fatal crashes and fatality rates on a statewide basis. It should be noted that through development of tribal crash reporting partnerships, additional crash data became available. The expanded data partnership resulted in additional crash reports provided for analysis and has also provided for a

more complete data set. From 2008 to 2012, a relatively flat trend has been observed for both the number of fatalities and fatal crash rate. Through partnership with our tribal partners, we have been able to reestablish a trend with a more complete data set.

Challenges

The challenges to improve safety on South Dakota's roadways are varied. As noted in Figure 3, roadway departure crashes are the number one contributing factor in serious injury and traffic deaths with crashes of unbelted vehicle occupants ranking number two. Speeding is the number three contributing factor in South Dakota's serious injury and deaths.



Source: 2007-2011 SDARS crash data

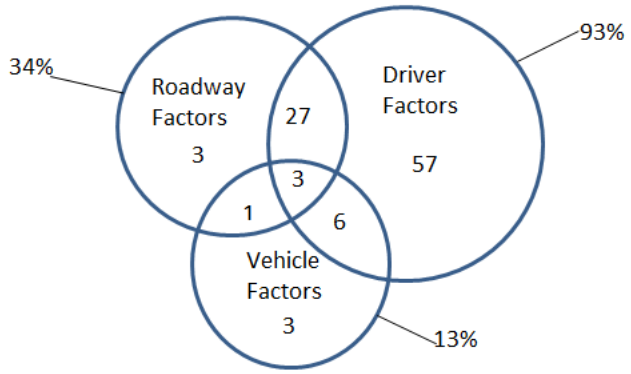
Figure 3. South Dakota Emphasis Areas (Contributing Factors in Fatal & Serious Injury Crashes)

Overall 60 percent of fatal crashes and 51 percent of fatal and serious injury crashes occurred on SDDOT maintained roads as identified in Table 1. South Dakota county and township roads have the second highest proportion of fatal crashes. For fatal and serious injury crashes, county and township roads and city streets have almost the same proportion of crashes. Identification of spot improvements on the county and township roadway system is difficult due to the relatively low traffic volume and significant mileage of the system.

Table 1. Fatal and Serious Injury Crashes on South Dakota- Roads

Jurisdiction	Fatal Crashes		Serious Injury Crashes		Fatal and Serious Injury Crashes	
	Percent	Number	Percent	Number	Percent	Number
State Roads (Interstate, U.S., South Dakota)	60%	342	50%	1,628	51%	1,970
County and Township	33%	191	23%	754	25%	945
City Streets, Other	7%	42	27%	901	24%	943
Statewide Total		575		3,283		3,858

Due to the wide range of crashes and substantial mileage of public road, it became critical to identify the contributing factors in vehicle crashes. If for example, emphasis is placed only in roadway features a large proportion of crashes would be overlooked. Figure 4 provides a national relationship to the contributing factors in vehicle crashes and reinforces the safety vision of: **Every Life Counts, Partnering to Save Lives.**



SOURCE: Treat 1979

FIGURE 4. CONTRIBUTING FACTORS TO VEHICLE CRASHES

Future Direction

South Dakota's short-term traffic safety goal is to achieve a reduction of the fatal and serious-injury crash rate by at least 15 percent by 2020. This goal can only be accomplished through the efforts of all safety partners and implementation of the SHSP through a data-driven safety planning process that stresses the 4Es of roadway safety: engineering, education, enforcement, and emergency medical services. These efforts will be strategic and coordinated. Partners will work together on the implementation of known safety strategies. This plan increases the level of

engagement and implementation efforts of state, local, and tribal entities.

This SHSP describes key safety strategies that will be implemented and sets targets to move toward the 2020 goal. Efforts to improve safety will be based on the documented distribution of crashes involving fatality or serious injuries across the state. A combination of implementing improvements at locations with a known crash history and a proactive safety approach based on systemic implementation of safety strategies will be used.

Consultation with Partner Agencies and Stakeholders

South Dakota state agencies have long worked to improve roadway design and safety. SDDOT and SDDPS have worked together in traffic engineering and law enforcement efforts. The Attorney General's Office and Departments of Health, Social Services, Education, Unified Judicial System, State Universities, and Revenue and Regulation promote highway safety. Tribes, counties, cities, metropolitan planning organizations, townships, schools, and various law enforcement agencies plan and take actions within their jurisdictions. These organizations work together toward the goal of preventing traffic fatalities and serious injuries.

It is through the efforts of these partnerships formed over time that fatal and serious injury crashes on South Dakota's roadways have been reduced. The 2007 SHSP was a significant start in the mission to reduce motor vehicle fatalities and serious injuries in the state.

The opportunity to engage and facilitate cooperative efforts by the many safety partners is one of the greatest benefits of developing a SHSP. These safety partners represent the 4Es of safety – engineering, education, enforcement, and emergency medical services. (See Acknowledgements for a complete list of partnering agencies and safety stakeholders involved in the development of the 2014 SHSP.)

To guide the development of South Dakota's 2014 SHSP, a Steering Committee was assembled. These team members represent a diverse set of partners playing key roles in the administration of traffic safety programs and policies in South Dakota.

The Steering Committee selected the seven key safety emphasis areas from the crash data analysis and related safety needs, along with input from safety partners. The next step determined the most cost-effective strategies to reach the safety goals in the 2014 SHSP. Each team member also worked within their respective organization to build consensus and support for the 2014 SHSP.

Safety partners also played a key role in identifying safety improvement strategies and prioritizing those strategies. A broader range of safety partners were engaged through meetings, all-day stakeholder workshops, and presentations at statewide safety conferences, as listed in Table 2.

The 4Es of Traffic Safety

Engineering: Traffic safety begins with the application of best safety practices in designing and building safe roadways. This includes roadway design, traffic flow, and operating, maintaining, and constructing the state's roadways.

Education: Safety education plays a key role in promoting safe driving best practices and behavior. State and national campaigns such as *Buzzed Driving is Drunk Driving* and *Click It or Ticket* encourage drivers to make safer driving choices. Citizen safety advocacy groups also play key role in helping educate and improving driver behavior.

Enforcement: Enforcement is a key to remind people of safe driving practices, facilitate changes in behavior, driving habits, and implement laws associated with the safe use of the state's roadways. State, tribal, local, and federal law enforcement agencies work together to enforce South Dakota's traffic laws during regular patrols as well as specialized mobilization efforts (such as sobriety checkpoints).

Emergency Medical Services: Prompt response from emergency responders (police, paramedics, fire, and rescue) and the availability of appropriate treatment facilities can help save lives and reduce the severity of injuries by providing assistance to those involved in a crash. Incident management may also reduce the possibility of more crashes occurring.

Table 2. Safety Partner and Stakeholder Meetings

Date	Meeting
April 3, 2012	Stakeholder meeting to review emphasis areas and strategies
April 4, 2012	Presented and discussed South Dakota SHSP Update process at 2012 South Dakota Transportation Safety Conference
April 4, 2012	SHSP Steering Committee Meeting
November– December 2012	Series of stakeholder meetings to review strategies
December 2012	Steering Committee Meetings
February 1, 2013	Workshop to further define emphasis areas and strategies
March 6, 2013	Presented and discussed South Dakota SHSP and MAP-21 safety guidance at 2013 Transportation Safety Conference
March 6, 2013	Steering Committee Meeting to review safety strategies and performance measures

Development Process for the SHSP

The development process for South Dakota's 2014 SHSP addressed the following key considerations:

- Establish a common mission, vision, and goal for all traffic safety partners in South Dakota
- Follow a transparent process incorporating input from safety partners representing state, local, and private safety advocate groups throughout the process
- Follow a comprehensive process that considers all users on all roads
- Using a data-driven process based on crash and roadway data to identify the primary factors contributing to fatal and serious injury crashes on the South Dakota roadway system
- Identify priority areas and countermeasures to address crash factors
- Develop an SHSP that guides future safety investments and integrates other safety partners' plans
- Maintain consistency with federal guidance contained in MAP-21

Figure 5 shows an example of a coordinated, integrated safety process.

At the onset of the planning process, three key activities began: (1) the collection and analysis of crash records; (2) a literature review; and (3) discussions with safety partners. Each of these activities provided a unique way to understand and assess the past safety efforts in South Dakota, helping to develop the plan for the future. The literature review gathered information from previous SHSP, other agency safety plans, safety emphasis areas, and related safety strategies. Discussions with safety partners from various agencies representing the 4Es were conducted to assess current programs. Finally, crash analysis revealed areas of greatest need in South Dakota. These needs became the safety emphasis areas described in more detail later in this document.

The bulk of the planning process was centered on gathering input and prioritizing safety efforts. After determining the safety emphasis areas, a comprehensive list of safety countermeasures was developed for each emphasis area. During the series of SHSP stakeholder meetings listed in Table 2, stakeholders reviewed the lists of countermeasures, offered additional solutions, and began the prioritization process. The SHSP Steering Committee then identified critical safety strategies contained in the 2014 SHSP.

The final steps in this process included publishing the SHSP and implementing the safety strategies identified in the plan. Only through implementation and evaluation of traffic safety programs will the goals adopted in the SHSP become reality.

Safety Commitment and Future Updates

The SHSP will be reviewed annually and updated as needed consistent with MAP-21 to ensure that the top crash types are being addressed and crashes on South Dakota roads are being mitigated in the most effective manner possible. These reviews and updates will be conducted in coordination with SDDPS, tribal, and local agencies.

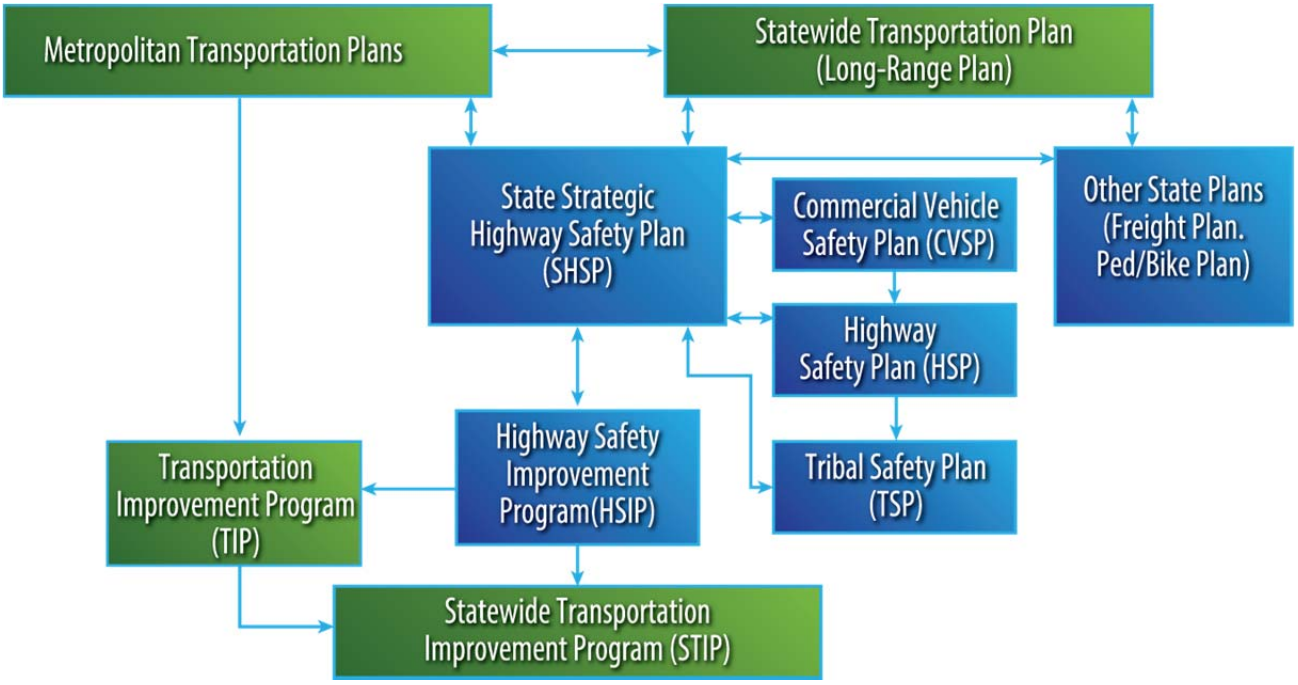


Figure 5. South Dakota Coordinated Safety Process

Data Analysis

The initial step in the data-driven analytical process that supports the development of the SHSP involved adopting fatal and serious injury crashes as the primary performance measure consistent with the guidance provided in MAP-21. This initial step also includes documenting information about these fatal and serious injury crashes that assists the efforts to prioritize types of crashes, safety strategies and roadway facility types across the entire network of roads in South Dakota. Five years of crash data (2007 through 2011) were obtained from the South Dakota Accident Records System (SDARS) database. These data were analyzed to identify the types of crashes (crash characteristics and number of crashes) that represent the greatest opportunity to reduce fatal and serious injury crashes; the types of safety strategies that would be the most effective at reducing the targeted types of crashes; and the types of roadway facilities that should be the focus for safety investment.

The data revealed that 3,858 fatal and serious injury crashes had been reported on South Dakota's roadways during the 5-year period. Of these crashes, 52 percent recorded a driver behavior (not using a seat belt, speeding, driving under the influence, etc.) as the primary factor contributing to the crash and 48 percent where the primary contributing factor was roadway related (roadway departure and intersection crashes).

South Dakota Crashes

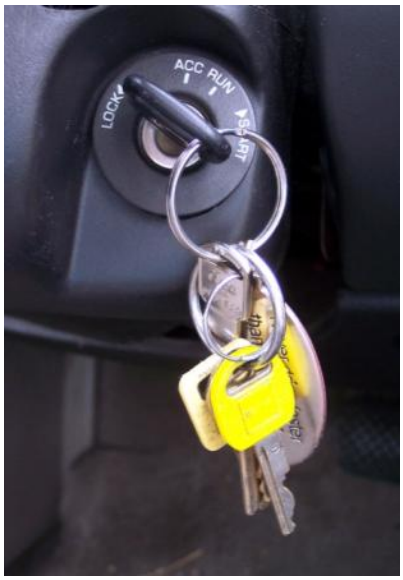
From 2007 to 2011, 3,585 fatal and serious injury crashes were reported on South Dakota's roadways:

- 52 percent were attributed to driver behavior
- 48 percent were attributed to roadway characteristics

Driver-Behavior-Related Crashes

The crash data indicate that the majority of fatal and serious injury crashes in South Dakota have driver behavior as the primary contributing factor. This distribution of crashes is consistent with national trends and supports the national guidance that requires state Strategic Highway Safety Plans to comprehensively address the 4Es of traffic safety. The driver-behavior-related crashes were almost equally divided between state and local road systems (51 percent versus 49 percent, respectively), with two exceptions: almost 60 percent of fatal and serious injury crashes involving young drivers and impaired drivers occurred on the local system.

In South Dakota, driver-behavior-related crashes were not equally distributed among the various categories of roadways. Approximately 67 percent of the behavior-related crashes occurred along conventional (two-lane) roadways, with 27 percent on interstates and 6 percent on expressways (other divided 4 lane rural highways).



On the local system of roadways, driver-behavior-related crashes were almost evenly distributed between county roads (rural) and city streets (urban). However, there were several noticeable trends. Fatal and serious injury crashes involving younger and older drivers occurred more frequently on city streets and fatal and serious injury crashes involving speeding, impaired driving, and not using a seat belt occurred more frequently on county and township roads.

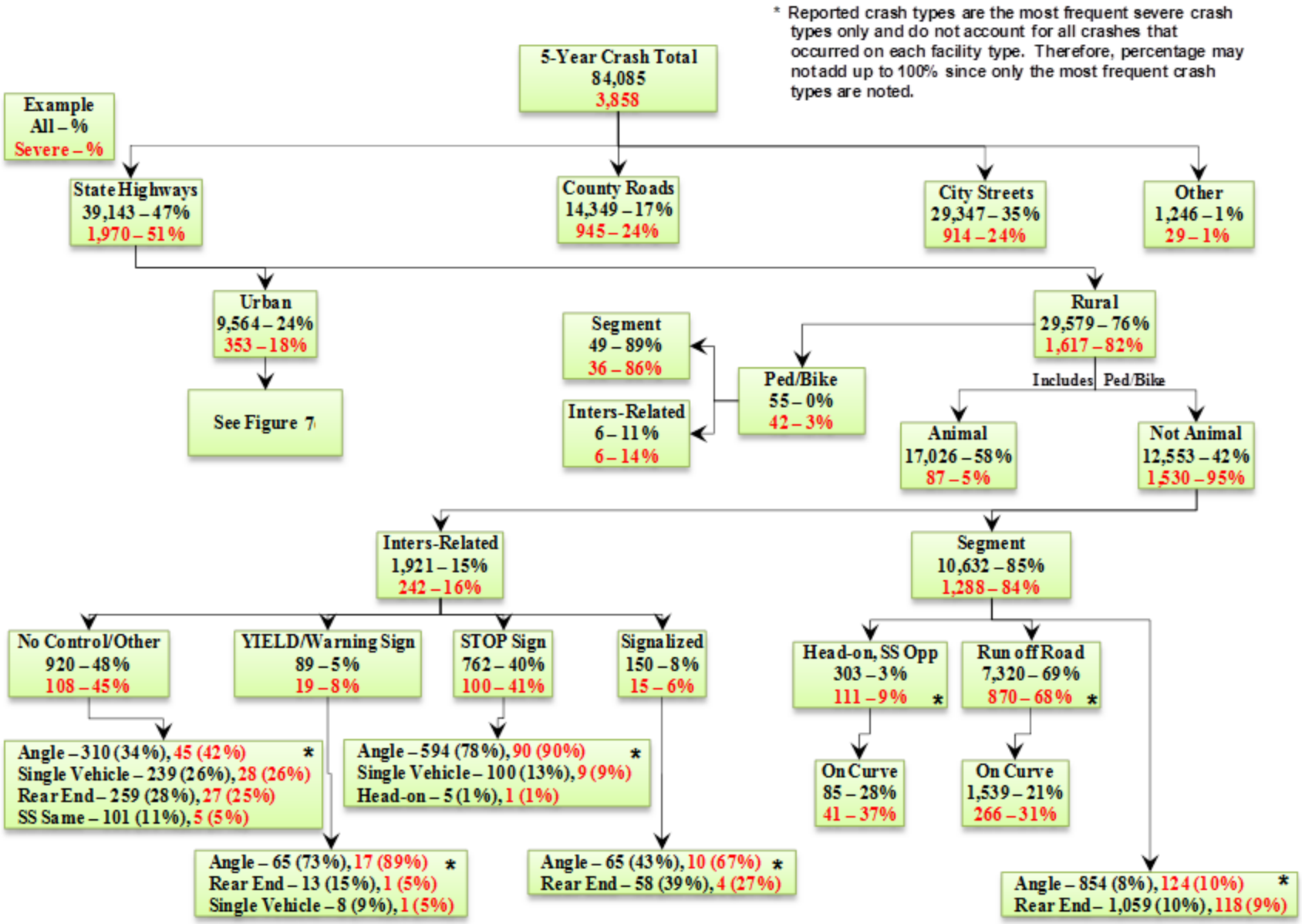
Roadway-Related Crashes

Fatal and serious injury roadway-related crashes were almost equally divided between the state (1,676 crashes) and local (1,687 crashes) road systems. These data appear to be representative of two key facts:

1. Approximately 67 percent of the vehicle miles traveled in South Dakota occurred on the state maintained roads
2. State maintained roads account for only 9 percent of all of the road miles in South Dakota

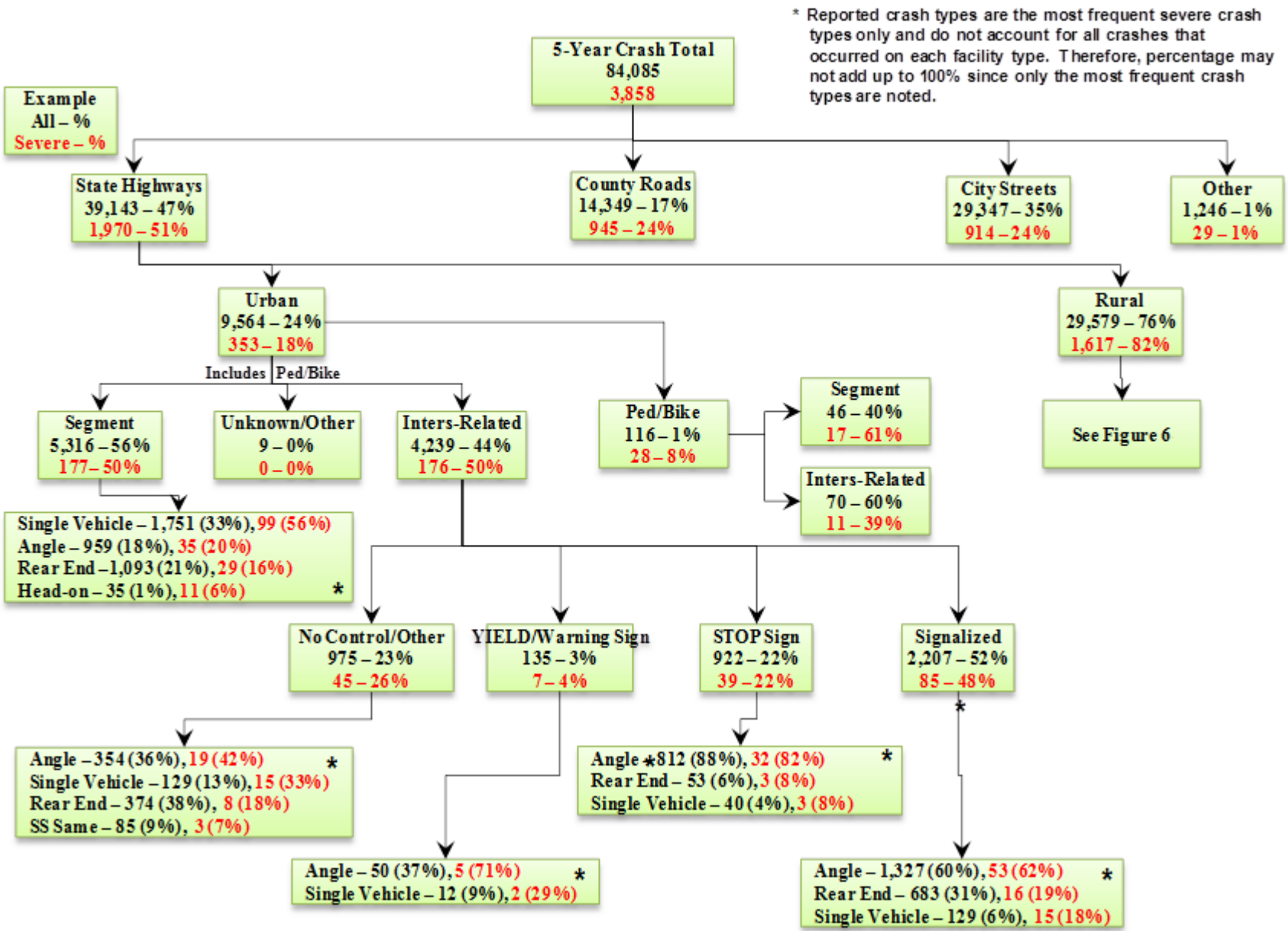
A detailed review of the 1,970 fatal and serious injury crashes along state roads (Figures 6 and 7) revealed several key points:

- 82 percent of fatal and serious injury crashes occurred in rural areas:
  - Only 5 percent of these rural crashes involved a vehicle striking a deer
  - 84 percent of the rural crashes occurred on a roadway segment (non-intersection)
  - 68 percent involved a single vehicle running off the road, and 31 percent of these occurred within a horizontal curve
- 18 percent of fatal and serious injury crashes occurred in urban areas:
  - 50 percent of these urban crashes occurred at an intersection
  - 48 percent of these crashes occurred at intersections with traffic signals
  - The most common type of fatal and serious injury crash at signalized intersections was an angle crash



Source: South Dakota Accident Records System, 2007-2011

Figure 6. South Dakota Rural State Highway Crash Tree



Source: South Dakota Accident Records System, 2007-2011

Figure 7. South Dakota Urban State Highway Crash Tree

The detailed review also found:

- 68 percent of the roadway-related fatal and serious injury crashes on the state system occurred on conventional (two-lane) roads, 5 percent on expressways, and 26 percent on freeways
- 76 percent of fatal and serious injury crashes occurred on dry pavement and 16 percent during adverse (winter) weather conditions—and the majority of winter weather crashes occurred on freeways

A similar review of fatal and serious injury crashes on county and township roads (Figure 8) and city streets (Figure 9) identified the following facts:

County and Township Roads

Of the 945 fatal and serious injury crashes that were reported on county and township roads (rural areas):

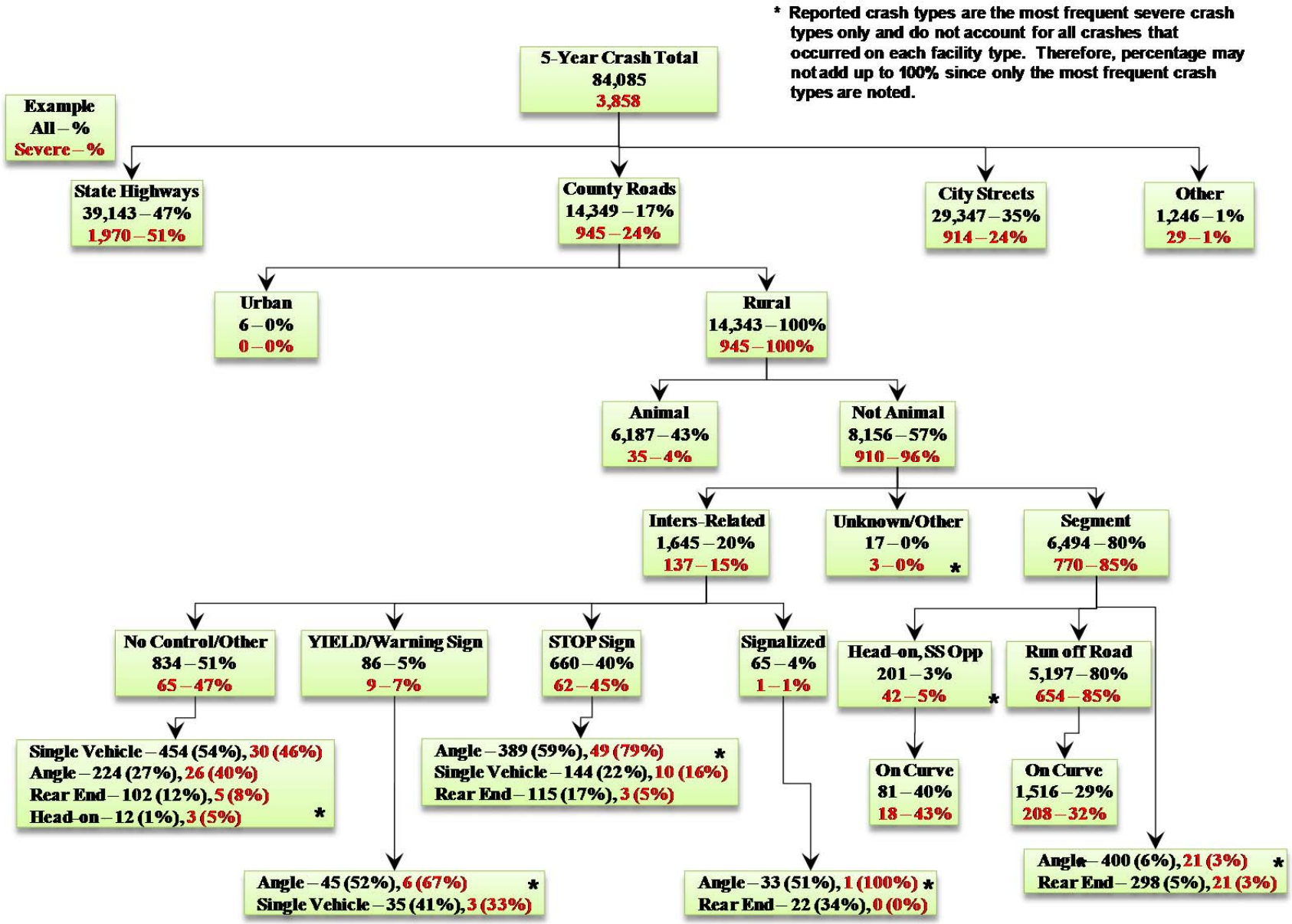
- Only 4 percent of the crashes involved a vehicle striking a deer
- 85 percent of the crashes occurred on a roadway segment
- 85 percent of the crashes involved a single vehicle running off the road, with 32 percent of these occurring within a horizontal curve
- 62 percent of these fatal and serious injury crashes occurred on the 12 percent of the system that is paved (per mile, 14 times more crashes occurred on paved roads than on gravel county and township roads)

City Streets

Of the 913 fatal and serious injury crashes that were reported on city streets (urban areas):

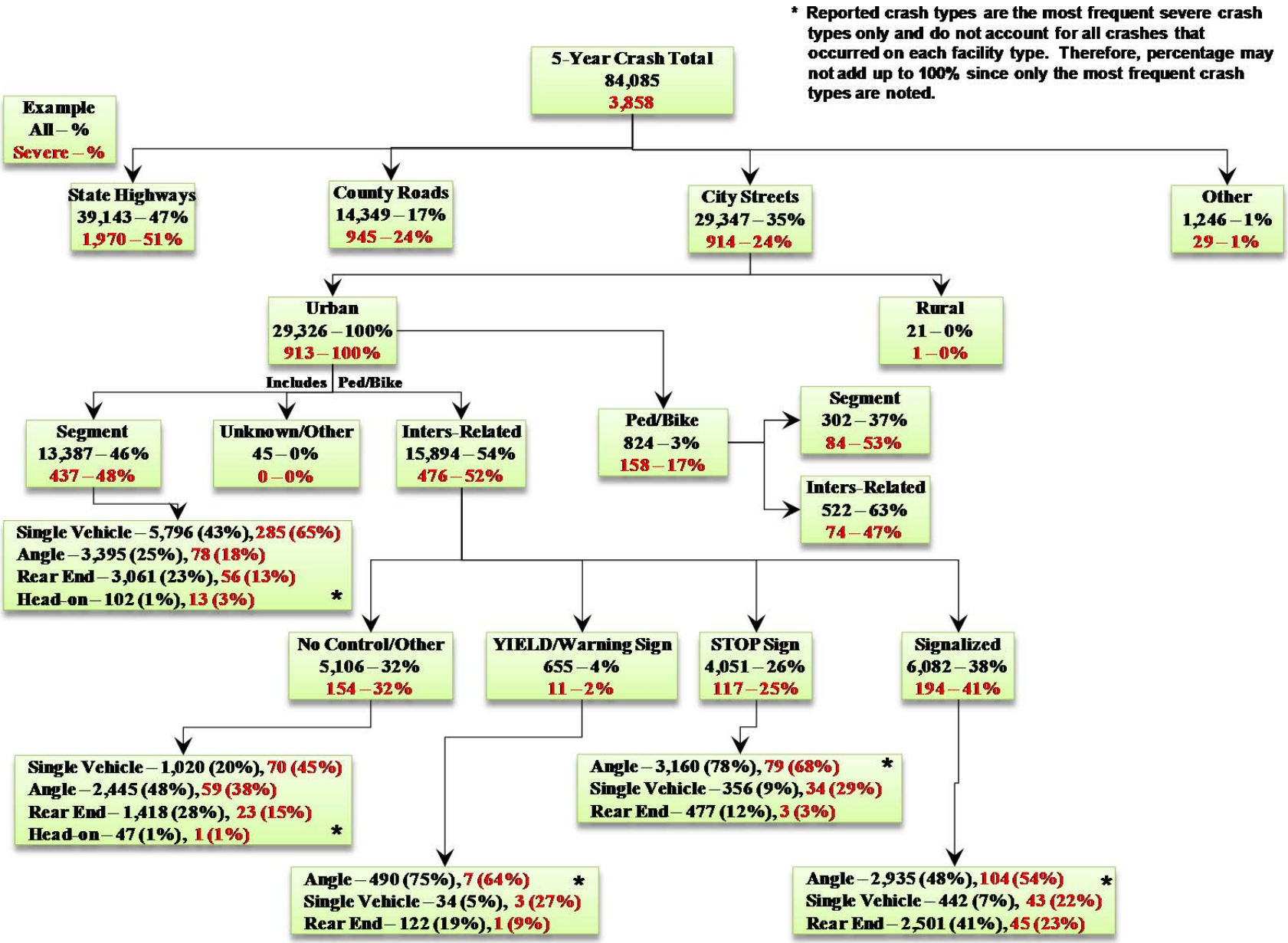
- 52 percent of these crashes occurred at an intersection
- More fatal and serious injury crashes occurred at intersections with traffic signals (41 percent) than any other type of control
- The most common type of fatal or serious injury crash at the signalized intersections was an angle crash
- 63 percent of the fatal and serious injury crashes on city streets occurred on collectors and arterials
- 62 percent of the fatal and serious injury crashes occurred on undivided roadways, regardless of street classification
- Five cities (Sioux Falls, Rapid City, Aberdeen, Watertown, and Mitchell) accounted for 80 percent of the fatal and serious injury crashes on city streets

(Photo: South Dakota Department of Tourism website)



Source: South Dakota Accident Records System, 2007-2011

Figure 8. South Dakota County & Township Road Crash Tree



Source: South Dakota Accident Records System, 2007-2011

Figure 9. South Dakota City Street Crash Tree

Safety Emphasis Areas

The purpose of identifying safety emphasis areas is to determine where an overrepresentation of serious crashes is occurring on South Dakota's public roads. In order to accomplish this task, the SHSP team has reviewed South Dakota's available safety data and relied upon input from safety partners. In addition, the team reviewed national statistics in regards to highway safety. Although a direct comparison of highway safety across various states can be difficult due to a wide variety of factors such as: daily traffic volume, average number of miles driven, design standards, commuting patterns/transit availability, etc. A broad comparison can be drawn by reviewing the fatality rate, which is a ratio of the number of fatalities on a given states public roads and the average number of miles driven.

When South Dakota's fatality rate is compared nationally to other states, South Dakota fatality rate is higher the national average of 1.19 fatalities per 100,000,000 vehicle miles traveled. According to the 2007 - 2011 FHWA Highway statistics, South Dakota's fatality rate was 1.49 Fatalities per 100 Million annual vehicle miles traveled.

The South Dakota SHSP has identified safety emphasis areas based on an analysis of available safety data and input from safety partners based on a 4Es approach. This step represents one of the primary objectives in updating South Dakota's SHSP - identifying groups of crashes by severity, types, and characteristics (known collectively as safety emphasis areas or emphasis areas). Addressing the crashes identified by emphasis area represents one of the best opportunities to significantly reduce fatalities and serious (incapacitating) injuries on South Dakota roads.

Safety Emphasis Area Selection

Using the 23 emphasis areas identified in the American Association of State Highway and Transportation Officials (AASHTO) *Strategic Highway Safety Plan* as a model, the South Dakota SHSP update categorized the fatal and serious injury crashes recorded in the state's crash database. The emphasis areas with the highest frequency of fatal and serious injuries would provide the greatest opportunity for safety improvement, since these represent areas where safety strategies should be developed and where resources should be allocated.

Table 3 lists South Dakota's 18 emphasis areas, sorted by category and using available crash data that was included in the data analysis for this update process. These 18 emphasis areas encompass most of the AASHTO SHSP categories. However, related crash patterns could not be identified for a few AASHTO categories, and some emphasis areas were combined in Table 3. The categories which are excluded from Table 3 are Enhancing Emergency Capabilities (EMS), Information and Decision Support Systems (Management), and More Effective Processes (Management). A suggested potential area (Train-Vehicle Collisions) was added by the Steering Committee. The Roadway Departure emphasis area, consistent with the current definition by FHWA, represents a combination of three emphasis areas for which similar strategies are applicable.

AASHTO's Safety Emphasis Areas

The *AASHTO Strategic Highway Safety Plan* is one of the primary traffic safety resources that has been adopted nationally as the blueprint for providing states with guidance in the preparation of SHSPs. This document identifies 23 safety emphasis areas and categorizes them into six groups: drivers, special users, vehicles, highways, emergency medical services (EMS), and management. Separating crash data into these emphasis areas, such as "young drivers" or "lane-departure," helps agencies and stakeholders to more concise identify safety priorities. The data indicate which emphasis areas have the highest frequency of fatal and serious injury crashes.

Identifying key safety emphasis areas helps safety stakeholders develop appropriate safety strategies that will be the focus of the state's SHSP and safety programs and initiatives. This process also assists in prioritizing those strategies that have the greatest potential to reduce the number of fatalities and serious injuries, and to develop and identify a deployment and investment plan focusing available funds where the most positive impact is possible.

Although the emphasis areas of run-off-the-road crashes, consequences of leaving the road, and head-on/sideswipe-opposing crashes were considered separately, the Steering Committee chose to combine these three categories into one due to commonalities and the interrelationship between the three topics. As an example, for a fixed object collision to occur, a vehicle must also run-off-the-road.

South Dakota's crash data was separated into each of these 18 emphasis areas to determine which have the highest frequency of fatal and serious injury crashes, as shown in Table 3. Note that column numbers in the table do not add up to the statewide crash numbers because one crash may be categorized into multiple emphasis areas. For example, there could be a run-off-the-road crash with serious injuries involving an impaired young driver.

There were 3,858 fatal and serious injury crashes reported in South Dakota between 2007 and 2011. The Roadway Departure emphasis area (in the Highway category) had the highest number of fatal and serious injury crashes, representing 57 percent of the statewide total. With less than 1 percent of the total fatal and serious injury crashes, the Train-Vehicle Collisions emphasis area represents the lowest percentage in the Highway category, as well as among all the emphasis areas. Unbelted Vehicle Occupants, the highest in the Driver category, account for 37 percent of the total fatalities and serious injuries statewide, with speeding making up 28 percent statewide. Motorcycle Crashes accounted for over one-fifth of the total fatal and serious injury crashes statewide. Due to the wide variety of crash types which occur, increased emphasis will be placed on categories which represent a large proportion of fatal and serious injury crashes.

(Photo: South Dakota Department of Tourism website)

Table 3. South Dakota Fatal and Serious Injury Crash Data by Safety Emphasis Area

Safety Emphasis Area	Statewide		State Highways		County/Township Roads		City Streets		Other	
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
Statewide Totals (Fatal and Serious Injury Crashes)	**3,858**		**1,970**		**945**		**914**		**29**	
Drivers										
Unbelted Vehicle Occupants	37%	1,440	36%	706	50%	475	27%	251	28%	8
Speeding-Related	28%	1,080	29%	573	28%	267	25%	227	45%	13
Drug- and Alcohol-Related	24%	926	20%	386	37%	345	20%	184	38%	11
Young Drivers (age 20 and younger)	23%	899	18%	350	27%	257	31%	286	21%	6
Unlicensed Drivers	12%	470	9%	183	19%	175	12%	108	14%	4
Older Drivers (age 65 and older)	15%	592	19%	373	10%	96	13%	121	7%	2
Inattentive, Distracted, and Asleep Drivers	13%	508	14%	271	12%	109	14%	125	10%	3
Other Users										
Pedestrians	5%	188	3%	53	2%	19	12%	114	7%	2
Bicycles	1%	57	1%	14	0%	1	5%	42	0%	0
Vehicles										
Motorcycles	21%	825	26%	504	19%	175	15%	134	41%	12
Heavy Vehicles	8%	312	12%	236	5%	50	3%	26	0%	0
Highways										
Roadway Departure (includes run-off-the-road, head-on, and sideswipe-opposing crashes)	57%	2,211	60%	1,175	81%	767	27%	248	72%	21
Intersections	27%	1,041	21%	419	14%	137	52%	477	28%	8
Train-Vehicle Collisions	0%	18	0%	7	1%	6	1%	5	0%	0
Run-off-the-Road	52%	2,021	53%	1,048	76%	721	25%	231	72%	21
Consequences of leaving the road *(run-off-the-road crashes involving a fixed object or overturn)*	52%	1,994	53%	1,036	75%	713	25%	225	69%	20
Head-On and Sideswipe-Opposing	5%	190	6%	127	5%	46	2%	17	0%	0
Work Zones	2%	93	4%	75	1%	7	1%	11	0%	0

Notes:
Yellow highlighted rows indicate that the safety emphasis area is one of the seven selected by SDDOT for the updated SHSP.
Some crash reports stated more than one emphasis area contributing to the crash. Therefore, the sum of the numbers in individual cells do not equal the total for that column.
Related crashes could not be identified for several categories and data for these are not shown in the table. These categories include Enhancing Emergency Capabilities (EMS); Information and Decision Support Systems (Management), and More Effective Processes (Management).
Source: 2007-2011 SDARS Crash Data

The yellow highlighted rows in Table 3 depict the seven emphasis areas selected based on the analysis of crash types, location, and severity of crashes. These emphasis areas were included in the South Dakota SHSP update effort because they appear to present the "best" opportunity for a rural state like South Dakota to reduce the number of fatal and serious injury crashes. The distribution of the number and percentage of crashes is consistent with similar states that have successfully addressed these crash types and related fatal and serious injury crashes.

Table 4 shows the distribution of fatal and serious injury crashes in each of the selected emphasis areas by jurisdiction (road system). Overall, half of these crashes occur on state highways, with the remaining occurring nearly equally on county/township roads and city streets. Intersection crashes occur predominately on state highways and city streets, whereas motorcycle crashes occur primarily on the state highway system. Drug, alcohol, and young driver-related fatal and serious injury crashes occur predominately on local (county/township and city) roads.

South Dakota's Safety Emphasis Areas

- Roadway Departure
- Intersections
- Motorcycles
- Unbelted Vehicle Occupants
- Speeding-Related
- Drug- and Alcohol-Related
- Young Drivers

Table 4. Distribution of Fatal and Serious Injury Crashes by Jurisdiction for Selected Emphasis Areas

Safety Emphasis Area	Statewide	State Highways	County/Township Roads	City Streets	Other
Statewide Totals	**3,858**	**1,970 (51%)**	**945 (24%)**	**914 (24%)**	**29 (1%)**
Roadway Departure	2,211	1,175 (53%)	767 (35%)	248 (11%)	21 (1%)
Unbelted Vehicle Occupants	1,440	706 (49%)	475 (33%)	251 (17%)	8 (1%)
Speeding-Related	1,080	573 (53%)	267 (25%)	227 (21%)	13 (1%)
Intersections	1,041	419 (40%)	137 (13%)	477 (46%)	8 (1%)
Drug- and Alcohol-Related	926	386 (42%)	345 (37%)	184 (20%)	11 (1%)
Young Drivers (age 20 and younger)	899	350 (39%)	257 (29%)	286 (32%)	6 (1%)
Motorcycles	825	504 (61%)	175 (21%)	134 (16%)	12 (1%)

Note:
Percentages indicate percent of total number of fatal and serious injury crashes statewide.

Safety Emphasis Area Goals and Performance Measures

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires the adoption of strategic and performance-based goals that provide the opportunity to track the status of SHSP implementation efforts and monitor progress in each emphasis area. Performance measures are established as a means to monitor progress toward meeting the goal. Where possible goals were established for each emphasis area during the SHSP update process. Performance measures that have been developed are discussed in detail in the Performance Measures and Evaluation chapter.

Proposed Safety Strategies

A key objective of South Dakota's SHSP update process was to identify a list of high-priority safety strategies that will become the focus of future safety investments and implementation for South Dakota roadways. These safety strategies will help South Dakota achieve the goals set for each emphasis area and facilitate the accomplishment of the overall safety goal. These high-priority safety strategies were selected from dozens of potential safety strategies by stakeholders.

There is a substantial amount of research regarding the identification, effectiveness, and ease of implementation of potential safety strategies based on crash data and South Dakota and national experience. All of the possible safety strategies underwent a screening process and were then prioritized based on several criteria (effectiveness, cost, input from a variety of safety partners, and consistency with the missions and practices of the state departments that are stakeholders in the SHSP). This screening process was biased toward certain safety strategies in recognition of several important facts:

- No single safety strategy is likely to mitigate all crash types.

Traffic Safety Goals

Goals for each safety emphasis area are set based on traffic safety data and South Dakota's safety vision – **Every Life Counts: Partnering to Save Lives**. The key to achieving the state's traffic safety goals is strong safety partnerships.

Traffic Safety Performance Measures

Performance measures are required for each state's traffic safety activities. Safety performance measures should be relevant to the safety issues and policy/strategy initiatives in a jurisdiction.

Performance measures are indicators that enable decision-makers and other stakeholders to monitor changes in system condition and performance against established visions and goals. Typical safety performance measures relate to the number and rate of fatalities and/or crashes and incidents, emergency response times, public perceptions of safety, etc., for the relevant transportation modes.

Performance measures are different from evaluation criteria, which relate to assessing the relative safety benefits or costs of specific projects or for prioritizing alternative safety strategies. The level of detail associated with evaluation criteria is greater than that associated with performance measures.

- The implementation of safety strategies that have demonstrated an ability to consistently reduce particular crash types (designated as "proven effective") provides safety program managers in South Dakota the highest level of confidence that similar crash reductions may be achieved.
- A focus on the use of low-cost strategies would allow for the widest possible deployment. This approach effectively addresses the documented low density of fatal and serious injury crashes on South Dakota's system of highways.

The seven selected emphasis areas and their corresponding performance measures provided direction for identifying potential safety strategies that would allow South Dakota's agencies to reduce fatal and serious injury crashes. Potential strategies from the 4Es of safety and their effectiveness were identified using the NCHRP *Report 500* series of guides and NHTSA's *Countermeasures That Work*. The initial list of 212 safety strategies included possible strategies for South Dakota's seven safety emphasis areas:

- 17 possible strategies for Roadway Departure
- 77 possible strategies for Intersections
- 33 possible strategies for Motorcycles
- 13 possible strategies for Unbelted Vehicle Occupants
- 32 possible strategies for Speeding-Related
- 21 possible strategies for Drug- and Alcohol-Related
- 19 possible strategies for Young Drivers

These proposed strategies were screened based on input from a stakeholders workshop, input from SDDOT staff, and a final consideration of the strategy's effectiveness. The objective of the stakeholder workshop was to present the infrastructure and non-infrastructure related strategies that pertained to all emphasis areas. During the workshop, participants discussed the proposed strategies to identify those with the greatest potential to reduce or eliminate fatal and serious injury crashes in the selected emphasis areas. Participants shared their perspective on the challenges facing each emphasis area and the merits of the initial list of potential strategies. The discussion concluded with a prioritization exercise for the preferred infrastructure-related strategies identified.

South Dakota Safety Emphasis Areas

The following pages detail each of the seven selected safety emphasis areas for South Dakota and include:

- Identification of the need and significance of each emphasis area
- The goals established to address fatal and serious crashes related to the emphasis area
- Performance measures established to monitor progress
- Key strategies selected to address the emphasis area

The strategy information lists available crash modification factors (CMFs), which document the anticipated effectiveness of implementing various strategies.

Crash Modification Factors

Expected countermeasure effectiveness is also commonly expressed as a crash modification factor (CMF). A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

The CMF is multiplied by the expected crash frequency without treatment (base condition). A CMF greater than 1.0 indicates an expected increase in crashes, while a value less than 1.0 indicates an expected reduction in crashes after implementation of a given countermeasure. For example, a CMF of 0.8 indicates an expected safety benefit; specifically, a 20-percent expected reduction in crashes. A CMF of 1.2 indicates an expected degradation in safety; specifically, a 20-percent expected increase in crashes.

The AASHTO Highway Safety Manual (HSM) provides as set of high quality CMFs and FHWA's CMF Clearinghouse houses a web-based database of CMFs along with supporting documentation to help transportation engineers identify the most appropriate countermeasure for their safety needs.

(Photo: South Dakota Department of Tourism)

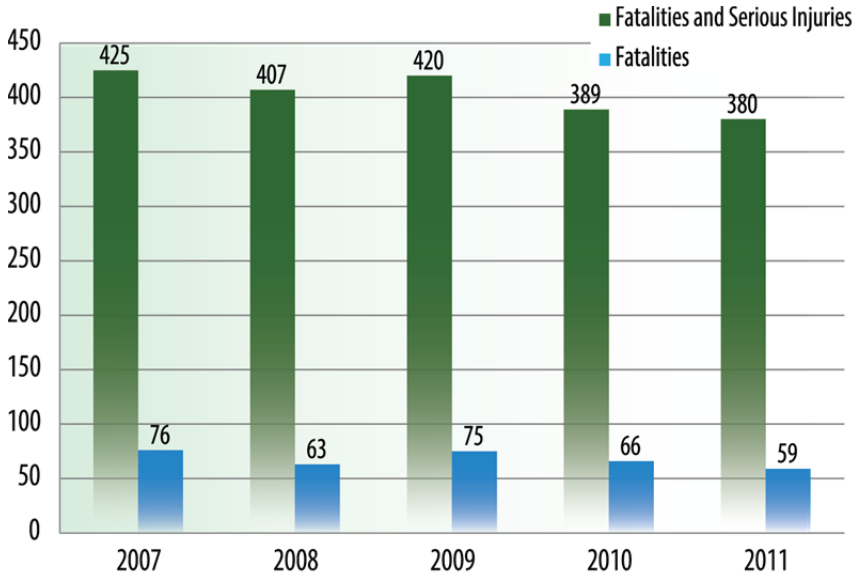
Roadway Departure Crashes

(Photo: South Dakota Department of Public Safety website)

Issue

On South Dakota roadways, there were 2,211 fatal and serious injury roadway departure crashes between 2007 and 2011. This number includes 2,021 run-off the road crashes and 190 head-on or sideswipe-opposing crashes. This average of 442 fatal and serious injury crashes per year represented 57 percent of all fatal and serious injury crashes during the 5-year period.

These crashes primarily occurred in rural areas on roadway segments. Nearly one-third of the fatal and serious injury roadway departure crashes occurred in horizontal curves. There were 2,466 drivers involved in these crashes, 71 percent of whom were male. The most common crash type was an overturn/rollover. One-third of these crashes occurred in dark driving conditions. Fatal and serious injury roadway departure crashes occurred most often between noon and 6:00 pm.



Roadway Departure Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

Goals

- Keep vehicles from encroaching on the roadside
- Improve roadway segments and horizontal curves to help keep vehicles in the travel lane
- Minimize the likelihood of crashing into an object or overturning
- Reduce the likelihood of a head on vehicle collision
- Improve winter road conditions and driver advisory capabilities

Leaders

South Dakota Department of Transportation

South Dakota Department of Public Safety

TBG053013004230ABQ

Priority Safety Strategies

Engineering

Keep vehicles from encroaching on the roadside

- Install edge lines "profile marking," edge line rumble strips/stripes, or modified shoulder rumble strips on sections with narrow or no paved shoulders, especially local roads [CMF = 0.6 for run-off-the-road crashes]*
- Provide enhanced shoulder or delineation such as Chevrons and pavement markings for sharp curves [CMF = 0.78 to 0.94 for rural curve crashes]
- Provide improved highway geometry and elements for horizontal curves [CMF = 0.3 for all crashes]
- Provide enhanced pavement markings [CMF = 0.7 to 0.89 for all rural crashes]
- Provide skid-resistant pavement surfaces on identified locations. Also need to address rutting and water ponding since hydroplaning is a major cause of wet roadway crashes in South Dakota. [CMF = 0.6 for wet road crashes]
- Apply shoulder treatments [CMF = 0.81 for all rural crashes with shoulders]
  - Eliminate shoulder drop-offs
  - Widen and/or pave shoulders
- Implement roadway safety improvement strategies and allocation of safety funds, as determined by the SDDOT Safety Module
- Support the Annual Tribal Safety Summit, including the 4 Es of Safety to reduce fatalities and injuries; promote and increase seat belt use and the use of child safety seats; enforce Tribal Traffic Codes, and improve safety education through schools, PSAs, sharing of safety strategies; and coordinate roadway improvements

Minimize the likelihood of crashing into an object or overturning if the vehicle travels off the shoulder

- Design/construct slopes and ditches to help prevent rollovers [CMF = 0.8 for all crashes]
- Remove/relocate objects along the side of the road in high-risk locations [CMF = 0.99 for all crashes]
- Install/update roadway signing and delineation
- Promote the Department of Public Safety's use of its' rollover simulator to show the impact on belted and unbelted vehicle occupants in a vehicle rollover

Actions

- Annually review the top 10% of state locations above the average state fatal and serious injury crash rate based on 5 years of crashes and improve segments as needed.
- Annually review horizontal curves with higher than average state fatal and serious injury crash rate based on 5 years of crashes and improve curves as needed. This includes reviewing the top 10% of locations on both state and local road systems.
- Use the HRRRP module to review high-risk local locations (segments with two or more fatal and serious injury crashes in 5 years) and improve segments as needed. (This performance measure is planned for the future.)
- Implement or continue roadway improvements and public education campaigns

Performance Measure

- Reduce fatal and serious injury crash rates resulting from roadway departure 15% by 2020

* A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

Reduce the likelihood of a head-on vehicle collision

- Install centerline rumble strips for two-lane roads in identified locations [CMF = 0.6 for head-on/sideswipe-opposing crashes]
- Confirm No Passing Zones locations after reconstruction projects
- Install climbing/passing lane where needed to prevent head-on and passing-related collisions

Pedestrian crash strategies

- Fund pedestrian pathways adjacent to roads in or between populated areas [CMF = 0.11 to 0.35 for vehicle/pedestrian crashes]
- Provide 4-foot shoulders, when possible, as a minimum for bicyclists and pedestrians [CMF = 0.81 for all rural crashes]

Weather and environment related strategies

- Consider snow fences and other practices to reduce drifting on roadways, where sheltered areas remain slippery and contribute to crashes, and specialized and localized plow operator training
- Implement strategies (such as dynamic warning systems) for winter storm warnings to warn drivers of roadway conditions
- Implement intelligent transportation system (ITS), such as dynamic message boards to advise drivers of traffic, operational, regulatory, warning or guidance information on roads ahead and to proceed with caution.

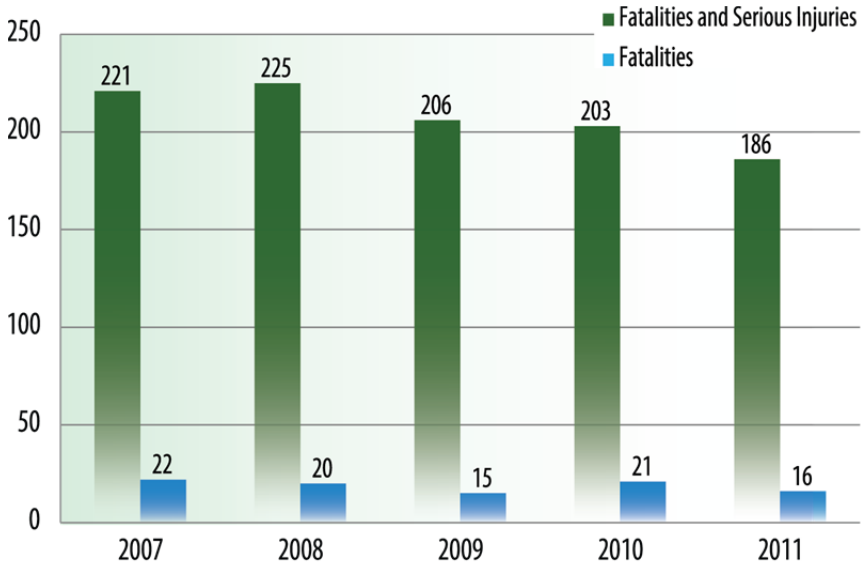
Research and Education

- Purchase equipment to allow the measurement and recording of edge drop offs.
- Develop a list of rural road curves from counties to identify highest-priority areas where delineation, Chevrons, and advance warning signing can be installed.
- Implement new and continue existing public safety campaigns such as *Stay in Your Lane*, *Don't Crowd the Plow*, and DUI campaigns. Identify education opportunities in the SHSP so that funding can be leveraged. Ask SDDOT offices and Highway Patrol districts to identify the three top problem areas they see with existing driver's education. Create public service announcement (PSA) videos, including web and other media, to address those areas. Use the Traffic Safety Website as a possible educational tool.

Intersection Crashes

Issue

On South Dakota roadways, there were 1,041 fatal and serious injury intersection crashes between 2007 and 2011. This average of 208 fatal and serious injury crashes per year represented nearly 27 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily occurred in urban areas on city streets. There were 1,920 drivers involved in these crashes, 63 percent of whom were male. Angle crashes, which represented 58 percent of these crashes, occurred twice as often as the next most common intersection crash type (single-vehicle). Fatal and serious injury intersection crashes occurred most often between noon and 6:00 pm. More than half of the fatal and serious injury intersection crashes occurred in Minnehaha, Pennington, and Brown counties.



Intersection Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

Goals

- Reduce frequency and severity of signalized intersection crashes through traffic control and operational improvements
- Reduce frequency and severity of intersection conflicts through geometric improvements
- Improve sight distance at signalized and unsignalized intersections
- Improve intersection pedestrian safety
- Improve intersection signing and signals on all roads

Leaders

South Dakota Department of Transportation

South Dakota Department of Public Safety

TBG053013004230ABQ

Priority Safety Strategies

Engineering

Reduce frequency and severity of signalized intersection conflicts through traffic control and operational improvements

- Employ multiphase signal operation (change from permissive to protected phasing or permissive to protected/permissive phasing)
- Optimize clearance intervals [CMF = 0.6 to0.8]*
- Restrict or eliminate turning maneuvers – left turns and U-turns
- Restrict right turns on red
- Employ signal coordination along a corridor
- Use adaptive traffic signals
- Employ emergency vehicle preemption
- Remove unwarranted signal
- Install back plates with reflective borders [CMF = 0.85 to 0.9 for all crashes]

Reduce frequency and severity of intersection conflicts through geometric improvements

- Provide left-turn lane/improve channelization – urban [CMF = 0.8 for fatal and injury urban crashes]
- Provide left-turn lane/improve channelization (rural, all approaches, 4-way intersection)
- Provide right-turn lane/improve channelization [CMF = 0.92 for all crashes]
- Provide for positive offset left turn lane [CMF = 0.2 for left-turn and rear-end injury crashes]
- Along four-lane divided roadways, deploy innovative designs and mitigation options (such as RCUTs, median narrowing, etc.) to minimize conflicts [CMF = 0 for angle crashes]
- Implement intersection safety improvement strategies determined by the SDDOT Intersection Module [CMF varies by strategy]
- Realign intersection approaches to reduce or eliminate intersection skew
- Revise geometry of complex intersections
- Install roundabouts [CMF = 0.5 to 0.8 for all crashes]
- Improve access management in a corridor, including closing or restricting of access locations or implementing a "road diet" on roadways with high levels of access [CMF is a function of the number of accesses closed]

* A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

Actions

- Annually review intersections on the rural state system identified through the Intersection Module and improve intersections as needed.
- Continue to support improvement of rural local intersections through continuation of the Countywide Signing Program.
- Identify which urban areas account for the greatest number of fatal and incapacitating injury crashes. Develop intersection crash rates (5 years of fatal and incapacitating injury crashes) to be used to identify state and local intersections as locations for RSI inspections and improvements as needed.
- Identify areas of needed research and education

Performance Measure

- Reduce fatality and serious injury crash rates of intersection crashes 15% by 2020
-

Improve sight distance at signalized and unsignalized intersections

- Redesign intersection approaches to improve sight distance [CMF = 0.52 to 0.63 for serious injury crashes]
- Clear sight triangles in the medians of divided highways near intersections
- Consistent with the design speed of roadways and context, modify horizontal and/or vertical alignment of approaches to provide appropriate sight distance
- Eliminate sight distance restrictions
- Provide improvements including signs, markings, street lighting, etc. at rural intersections [CMF = 0.62 for nighttime serious injury crashes]

Intersection pedestrian strategies

- Install pedestrian refuge islands in urban and growing areas with divided highways [CMF = 0.54 for vehicle/pedestrian crashes]
- Install Pedestrian crossing, beacon, or signal for high volume pedestrian crosswalks [CMF = 0.31 for vehicle/pedestrian crashes]

Education

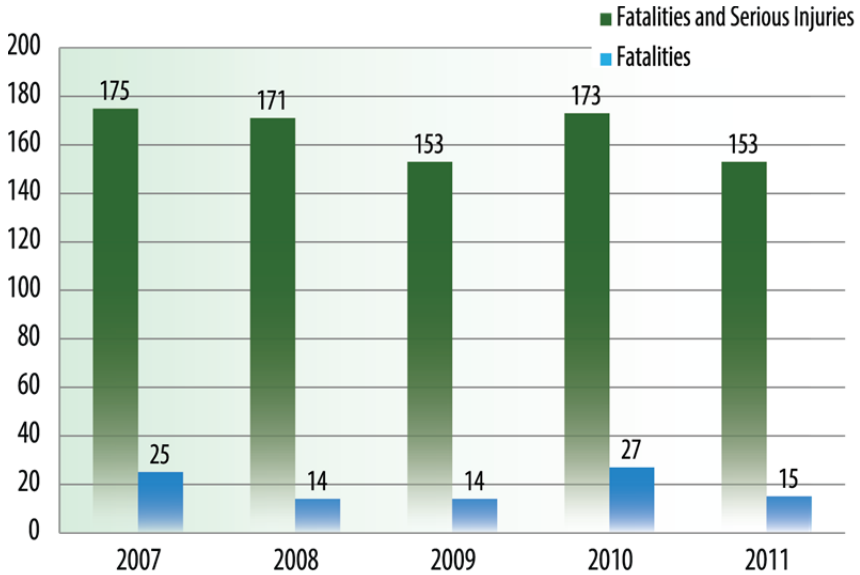
- Provide outreach and education on new/updated traffic control devices including outreach to local groups

Motorcycle Crashes

(Photo: South Dakota Department of Tourism)

Issue

On South Dakota roadways, there were 825 fatal and serious injury motorcycle crashes between 2007 and 2011. This average of 165 fatal and serious injury crashes per year represented 21 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily involved single vehicles in rural areas, and predominately occurred on roadway segments along state highways. Half of the 825 fatal and serious injury crashes occurred in Pennington, Lawrence, and Minnehaha counties. There were 929 motorcyclists involved in these crashes, 91 percent of whom were male. The top contributing factors were running off the road, failure to stay in lane, driving too fast for conditions, and exceeding the posted speed limit. The most common harmful event resulting from the contributing factors was the motorcycle overturning/rolling over.



Motorcycle Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

Goals

- Increase motorcycle rider education
- Incorporate motorcycle-friendly roadway design, traffic control, construction, and maintenance policies and practice
- Increase non-motorcycle rider education awareness of motorcycles, such as the Share the Road campaign

Leaders

South Dakota Department of Public Safety

South Dakota Department of Transportation

Priority Safety Strategies

Engineering

Incorporate motorcycle-friendly roadway design, traffic control, construction, and maintenance policies and practice

- Major motorcycle events preparation – sweeping roads, cleaning pavement markings, and providing advance warning signs and oversize signs where needed
- Provide full paved shoulders to accommodate roadside motorcycle recovery and breakdowns [CMF = 0.81 for all rural crashes]*
- Training for highway engineers and maintenance personnel relating to motorcycle issues and incorporate motorcycle safety considerations into routine roadway inspections, design, and construction projects

Education

Perform education and outreach regarding motorcycle safety

- Review locations that experience higher than the statewide average of motorcycle crashes on rural major or minor collectors or rural local roads, and address identified safety improvements
- Motorcycle awareness and education effort – SDDPS and SDDOT work to enhance education effort related to motorcycle-specific roadway concerns such as reduced traction, irregular roadway surfaces, and changes in roadway surface elevation
- Provide rider information (such as road closures, chip seals, lane closures, etc.) that affect rideability to media outlets including 511, Safe Travel USA, and southdakotarides.com. Use a public information campaign to promote the use of this information by motorcycles rides and related events
- Provide a media education campaign to increase the awareness of other drivers' towards motorcycle riders

Actions

- Identify the fatality and serious injury crash rate of motorcyclists
- Perform education and outreach regarding motorcycle safety
- Develop a ratio of unhelmeted motorcyclist fatalities and serious injuries compared to helmeted
- Identify the number of fatalities and serious injuries in crashes involving a driver or motorcycle operator with a BAC of 0.08 or above
- Identify and annually review the top 10% of locations that are above average state fatal and serious injury crash rates for motorcycle crashes and improve as needed.
- Increase motorcycle rider education through campaigns to increase helmet use and the use of southdakotarides.com.

Performance Measures

- Reduce motorcycle fatal and serious injury crash rate 15% by 2020

* A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

Unbelted Vehicle Occupant Crashes

Goals

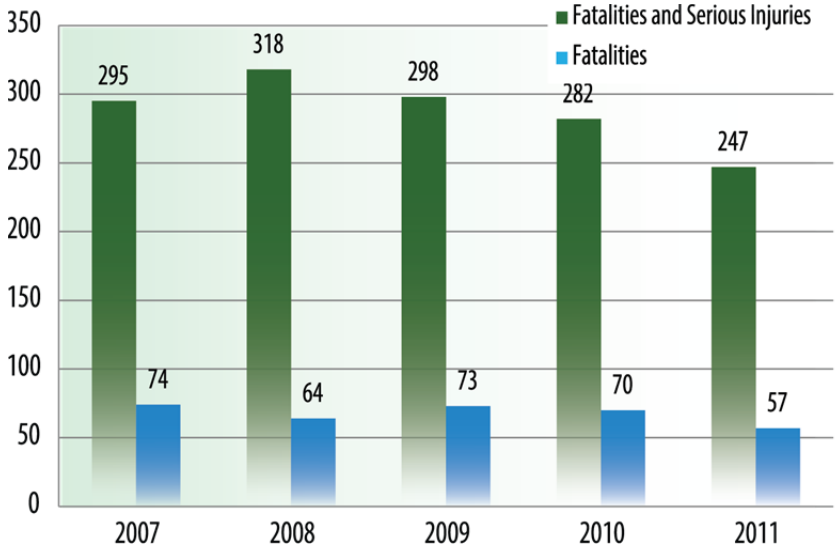
- Increase seat belt use through education and enforcement

Leaders

South Dakota Department of Public Safety

Issue

On South Dakota roadways, there were 1,440 fatal and serious injury crashes between 2007 and 2011 involving an unbelted vehicle occupant. This average of 288 fatal and serious injury crashes per year represented nearly 37 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily involved single vehicles in rural areas on roadway segments. There were 1,656 seriously or fatally injured unbelted vehicle occupants involved in these crashes, 63 percent of whom were male. The top contributing circumstances to these crashes were drinking, running off the road, and failure to yield to a vehicle. The most common harmful event resulting from the contributing circumstances was the vehicle overturning/rolling over. According to Bureau of Indian Affairs data for 2006 to 2008, 75 percent of Native American vehicle occupant fatalities were unbelted.



Unbelted Vehicle Occupant Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

TBG053013004230ABQ

Priority Safety Strategies

Education

- Maximize use of occupancy restraints by all vehicle occupants
- Fund seat belt public awareness campaigns, including, but not limited to, grass roots school events, poster campaigns to increase awareness, state police school education campaigns, and simulator demonstrations
- Provide legislature's transportation committee information about seat belt use and related fatalities
- Support Tribal efforts to use rollover simulator to show the impact on belted and unbelted vehicle occupants in the event of a vehicle rollover
- Support the Annual Tribal Safety Summit, including the 4 Es of safety, to reduce fatalities and injuries; promote and increase seat belt use and the use of child safety seats; enforce Tribal Traffic Codes, and improve education through school, PSAs and information sharing and coordinated roadway improvements

Research

- Conduct research to identify regions and populations that have low seat belt usage

Actions

- Identify the number of unrestrained passenger vehicle occupant fatalities and serious injury crashes
- Research populations with low seat belt usage and develop public awareness campaigns
- Monitor seat belt use in areas/ demographics of lower than average seat belt usage
- Observe seat belt use for passenger vehicles, front seat outboard occupants

Performance Measures

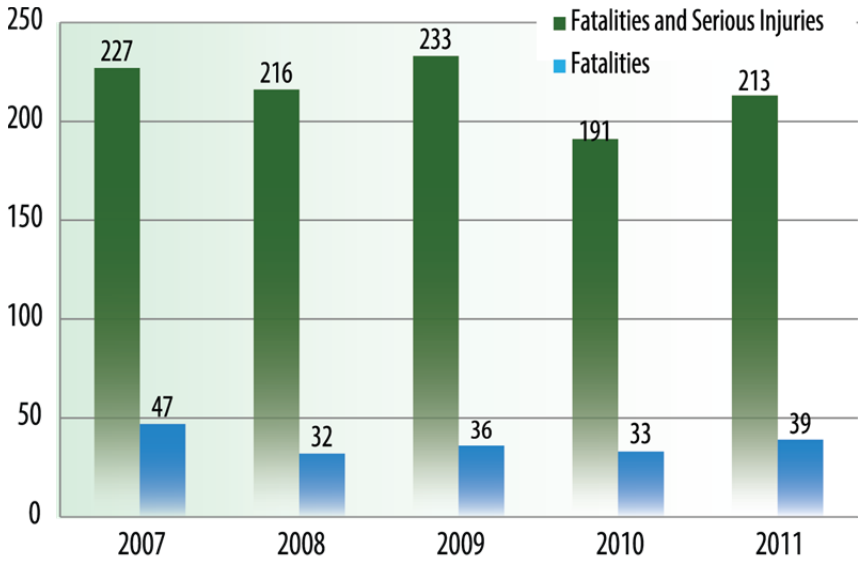
- Reduce unbelted vehicle occupant fatalities15% by 2020

Speeding-Related Crashes

(Photo: South Dakota Department of Public Safety website)

Issue

On South Dakota roadways, there were 1,080 fatal and serious injury crashes between 2007 and 2011 involving a speeding driver. This average of 216 fatal and serious crashes per year accounted for nearly 28 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily involved single vehicles in rural areas on roadway segments. There were 1,107 speeding drivers involved in these crashes, 69 percent of whom were male. The most common harmful event resulting from speeding was the vehicle overturning/rolling over. According to Bureau of Indian Affairs data for 2006 to 2008, 35 percent of Native American motor vehicle fatalities occurred in speed-related crashes.



Speeding-Related Fatalities and Serious Injuries

(Source: 2007-2011 SDARS crash data)

Goals

- Improve driver education regarding speeding
- Communicate appropriate speeds through use of traffic control devices
- Provide roadway design and traffic control elements that support appropriate and safe speeds

Leaders

South Dakota Department of Public Safety

South Dakota Department of Transportation

Priority Safety Strategies

Engineering

Communicate appropriate speeds through use of traffic control devices

- Improve speed limit signage
- Purchase active speed warning signs/speed trailers; also can be used for speed limit change requests from the public, providing real-time information and the opportunity to educate the public about speed studies
- Use in-pavement measures to communicate the need to reduce speeds [CMF = 0.68 for all urban crashes]*
- Implement variable message signs (high speed only) [CMF = 0.34 for all crashes]

Provide roadway design and traffic control elements that support appropriate and safe speeds

- Improve intersections as identified by the SDDOT intersection module including roundabouts for speed reduction [CMF = 0.5 to 0.8 for all crashes]
- Use combinations of geometric elements to manage speeds consistent with the context of the roadway function, anticipated design speed, and immediate environment (horizontal and vertical curves, cross section), including providing design consistency along an alignment [CMF varies by strategy]
- Design safe speed transitions through design elements and on approaches to lower speed areas such as raised medians and lane narrowing [CMF = 0.8 for fatal and injury crashes]
- Provide appropriate intersection design for speed of roadway
- Provide adequate sight distance for expected speeds
- Provide warning signs for locations without adequate sight distances as an interim solution until road geometrics are addressed [CMF = 1.1 for all crashes]
- Install lighting at high-speed intersections (high speed only) [CMF = 0.62 for nighttime serious injury crashes]
- Research the effectiveness and liability of variable speed limits during winter driving conditions [CMF = 0.9 for all crashes]

Enforcement

- Cooperatively fund statewide and local speeding campaigns (enforcement and media) with SDDPS [CMF = 0.97 per campaign]

Actions

- Implement education programs to remind drivers of the dangers of speeding
- Monitor the number of fatalities and serious injuries involving speeding
- Identify and annually review the top 10% of locations that are above average state fatal and serious injury crash rates for speeding and/or overdriving road condition crashes and improve as needed
- Monitor changes in speeding-related fatal and serious injury crashes and as needed, develop driver education programs in response.

Performance Measure

- Reduce fatality and serious injury crash rate 15% resulting from speeding by 2020

* A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

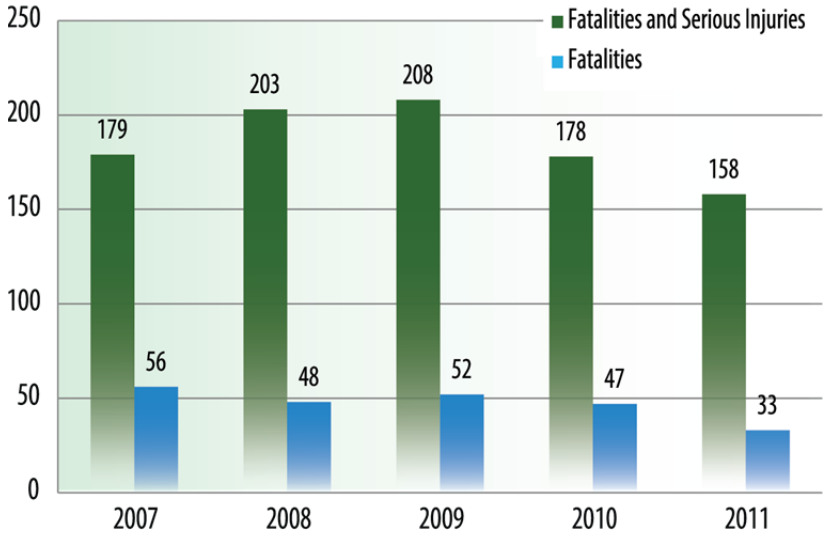
Education

- Cooperatively fund statewide and local speeding campaigns (enforcement and media) with SDDPS [CMF = 0.97 per campaign]
- Fund *Don't Crowd the Plow*, *Give 'em A Brake*, and *Move Over* campaigns as a majority of these crashes are due to impatient drivers; motorists overdriving road conditions; impatience through construction zones and around vehicles using flashing amber lights; following too closely; and misjudging speed of the maintenance or other emergency vehicle in front of them.

Drug- and Alcohol-Related Crashes

Issue

On South Dakota roadways, there were 926 fatal and serious injury drug- and alcohol-related crashes between 2007 and 2011. Drug and Alcohol related crashes accounted for the third highest number of fatalities when compared to other contributing circumstances. The average of 185 fatal and serious injury crashes per year represented nearly 24 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily involved single vehicles in rural areas on state highways and county roads. There were 953 drug- and alcohol-related drivers involved in these crashes, 75 percent of whom were male. The top contributing factors were drinking, running off the road, and exceeding the posted speed limit. The most common harmful event resulting from the contributing factors was the vehicle overturning/ rolling over.



Drug- and Alcohol-Related Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

buzzed driving is drunk driving
designate a sober driver

South Dakota Office of the Attorney General 24/7 Sobriety Program

Goals

- Enforce driving under the influence (DUI) laws
- Reduce impaired-driving fatal and serious injury crashes through impairment identification, education, enforcement, and treatment.

Leaders

South Dakota Department of Public Safety

South Dakota Department of Transportation

South Dakota Unified Judicial System

TBG053013004230ABQ

Priority Safety Strategies

Enforcement

Enforce DUI laws

- Cooperatively fund with SDDPS a chemist position to test DUI blood samples at the state health lab
- Review options to create a Tribal Law Enforcement or Traffic Liaison position with SDDPS to address tribal drinking and driving issues
- Cooperatively fund with DPS a mobile courtroom and blood testing facility (For example, a "BAT [Blood Alcohol Testing] Mobile," especially used during the Sturgis Rally in August.) This would keep the court system from being bogged down with extra DUI cases.
- Consider the possibility of the use of safety funds to support additional prosecutors for DUI cases
- SDDPS to collaborate with South Dakota Unified Judicial System (UJS) to expand DUI courts [CMF = 0.75]*
- Cooperatively fund statewide and local DUI *Don't Drink and Drive* campaigns (enforcement and media) with SDDPS [CMF = 0.90]

Education/Outreach

- Work with Lakota Circles of Hope, and similar tribal programs in their efforts to teach middle and high school students about the importance of safe driving and resisting destructive decisions (Lakota Circles of Hope also collects extensive data on drinking and smoking)

Provide safe ride options

- Provide access to transit options focused on providing rides home to individuals that have been drinking (for example, Safe Rides)

Actions

- Identify areas in need of safe ride options
- Monitor the number of fatality and serious injury crashes involving a driver or motorcycle operator with a BAC of 0.08 or greater

Performance Measures

- Reduce impaired-driving fatality and serious injury crash rate 15% by 2020

DRIVE SOBER OR GET PULLED OVER

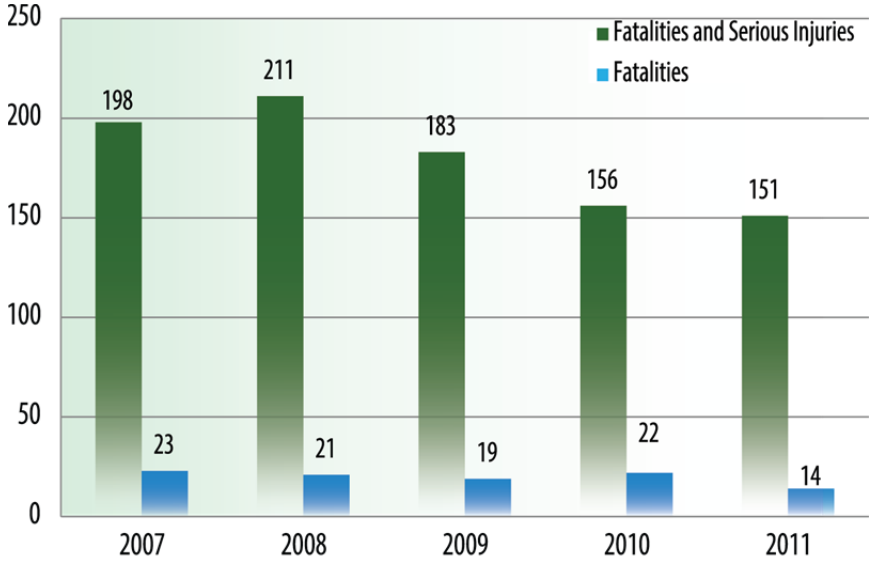
* A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

Young Driver Crashes

Photo: South Dakota Department of Public Safety website

Issue

On South Dakota roadways, there were 899 fatal and serious injury crashes between 2007 and 2011 involving a driver age 20 or younger. This average of 180 fatal and serious injury crashes per year represented nearly 23 percent of all fatal and serious injury crashes during the 5-year period. These crashes primarily involved single vehicles in rural areas. There were 954 young drivers involved in these crashes, 58 percent of whom were male. Just over half of the young drivers involved in fatal and serious injury crashes were between the ages of 18 and 20. The top contributing factors to these crashes were failure to yield, running off the road, driving too fast for roadway conditions, and exceeding the posted speed limit.



Young Driver Fatalities and Serious Injuries
(Source: 2007-2011 SDARS crash data)

Goals

- Improve education for young drivers and their parents
- Reduce the rate of fatal and serious injury crashes for young drivers

Leaders

South Dakota Department of Education

Priority Safety Strategies

Engineering

- Review transportation plans for new/expanding high school sites. Also, include a review of elementary and middle school sites.
- Provide or update School Zone signs

Education

- Work with Department of Education to establish a Driver Education coordinator; standardize drivers education curriculum, and facilitate the re-certification of instructors and the testing/passing of students
- Develop and maintain a website with safe driving information, including winter driving information from safetravelusa.com
- Work with Department of Public Safety to create a "parent kit" for student drivers, including explanation of selected crash reports and education on how to drive in different road conditions
- Develop with Department of Public Safety driver educational videos that would be posted on a traffic safety website
- Work with Department of Public Safety to develop public safety campaigns that educate drivers on how to address different driving conditions such as do not overcorrect when driving off the road, *Don't Veer for Deer*, *Stay in Your Lane*, *Stop means Stop* campaign, etc.
- Bring campaigns into schools for *Give 'em a Brake*, *Work Zone Awareness*, and *Don't Crowd the Plow*, among other safety educational campaigns
- Work with Department of Public Safety to fund driver simulators
- Work with Lakota Circles of Hope, and similar Tribal programs, in their efforts to teach middle and high school students about the importance of safe driving and resisting destructive decisions

Actions

- Identify options to improve driver safety information for young drivers
- Monitor the number of motor vehicle occupants age 20 or younger involved in fatal crashes

Performance Measures

- Reduce fatality and serious injury crash rate 15% for drivers age 20 and younger by 2020

Implementation

South Dakota has adopted the goal of reducing fatal and serious injury crashes by 15 percent over a 5-year period, a reduction of approximately 22 fatal/serious-injury crashes per year. The development of this data-driven SHSP and adopting a crash reduction goal is only the first step – simply developing a safety plan does nothing to prevent or reduce the number of fatal and serious injury crashes and save lives, the implementation of safety improvements and programs does. Therefore, to achieve the adopted crash reduction goal, South Dakota safety partners realizes the importance of developing and implementing a comprehensive statewide highway safety program that supports high-priority safety strategies along roadway systems and facilities determined to be at-risk.

The basic components of this comprehensive program include implementing safety strategies and programs aimed at reducing crashes that result in fatalities and serious injuries based on:

- **Education:** better educating drivers and promoting safe driving
- **Enforcement:** enforcing traffic safety laws and supporting effective arrest and prosecution of offenses
- **Engineering:** implementing infrastructure safety improvements that are effective at reducing and preventing lane-departure and intersection-related crashes
- **Emergency Medical Services:** providing timely and professional emergency response and trauma care to crash victims
- **Project Planning Partnerships:** capitalizing on multidisciplinary safety knowledge at the federal, state, local and tribal government level to develop safety projects.
- **Research and Data:** improving the crash data analysis from all entities for more complete identification of crash issues

SHSP evaluation included a comprehensive screening of all possible safety strategies, which resulted in the selection of the higher-priority safety strategies for implementation. As a result, all potential safety strategies are not included in the 2014 SHSP.

South Dakota's Comprehensive Traffic Safety Program

To reduce fatal and serious injury crashes on all South Dakota roads, safety strategies are implemented based on:

- Education
- Enforcement
- Engineering
- Emergency Medical Services
- Planning
- Research and data

Safety Commitment and Future Updates

The SHSP will be reviewed annually and updated as needed consistent with MAP-21 to make sure that the top crash types are being addressed and crashes on South Dakota roads are being mitigated in the most effective manner possible. These reviews and updates will be conducted in coordination with SDDPS and tribal and local agencies.

Education

South Dakota's SHSP recognizes that driver behavior is a significant factor contributing to a majority of the fatal and serious injury crashes on South Dakota's state and local roadways. Traffic crashes may result from any combination of overlapping crash factors, such as the roadway, the vehicle, and driver behavior. Research supports and experts agree that in most cases driver behavior—risky decisions, driver error, lapses of attention, and driver limitations—is a chief factor contributing to traffic crashes (Lerner et al., 2010). Fatal and serious injury crashes in South Dakota can be largely prevented and reduced if motorists were persuaded to engage in key safe driving practices to buckle up, wear safety riding gear, drive or ride at safe speeds, and plan ahead to avoid impaired driving or riding.

South Dakota's techniques or strategies to change driver behavior include two primary categories: (1) *education* or public information outreach, media, and training; and (2) *enforcement* of the South Dakota's traffic safety laws. These two behavioral safety strategies work together to have the greatest impact on changing risky driver behavior. The degree of effectiveness of any one strategy on behavioral change depends not only on how effectively the strategy is implemented, but also on how both education and enforcement are working together.

For example, a region of the state that is seeking to increase motorists' seat belt use may decide to use a "buckle up" public information campaign (behavioral change strategy). The effectiveness of the campaign not only depends on the quality of the education or public information campaign (relevance to target group, duration, saturation of the messaging), but also on the degree of seat belt use enforcement (coverage, intensity, visible by the public).

A key challenge in influencing driver behavior is that most drivers know what they are supposed to do to drive safely, yet due to successfully driving with risky patterns with no incidence of crash, drivers underestimate the risk of their choices. For this reason, research supports that education, coupled with saturated enforcement, will have the strongest impact in changing driver behavior (NHTSA, 2013). However, when implemented effectively, public education and information outreach strategies, separate from enforcement, can be effective when the following conditions are met (Williams, 2007):

- Focused messaging for a target group
- Longer-term programs delivering messages of sufficient intensity over time

- Messages communicating new information not previously well known
- Messages that are part of a broader-based, longer-term community program with similar messaging coming from multiple sources
- Using behavior change models including interactive methods teaching skills to resist social pressure (such as role playing, group discussion)

South Dakota's SHSP education safety strategies serve as a cornerstone to the plan as they are incorporated into each of the SHSP's seven critical emphasis areas.

Table 5 reflects the education-related safety strategies chosen to promote safe driver behavior.

Table 5. Education – Safety Investment Approach on the State and Local Highway Systems

Safety Emphasis Area	Education Safety Strategy
Roadway Departure	
Responsible Agency	South Dakota Departments of Transportation and Public Safety
Facility	• State and local rural highways
Objective	• Reduce roadway departures through enhanced education and outreach
Safety Strategies	• Public safety campaigns – *Stay in Your Lane*, *Don't Crowd the Plow*, and DUI campaigns. Identify education opportunities in the SHSP so that funding can be leveraged. • Ask DOT offices and HP districts to identify the three top problem areas they see with driver education, and then create web and PSA videos to address those areas. Use the Traffic Safety Website as possible Educational Tool.
Goals for Deployment	• Annually review the top 10% of state locations above the average state [fatal and serious injury] crash rate based on 5 years of crashes and improve segments as needed. • Utilize the HRRRP module to review high-risk local locations (currently segments with two or more fatal and serious injury crashes in 5 years) and improve segments as needed. • Annually review horizontal curves with higher than average state [fatal and serious injury] crash rate based on 5 years of crashes and improve curves as needed. This includes reviewing the top 10% of locations on both state and local systems.
Intersection	
Responsible Agency	South Dakota Department of Transportation
Facility	• State system/rural two-lane; expressways and urban multi-lane
Objective	• Reduce intersection crashes from review of state system and with support from local entities
Safety Strategies	• Provide outreach and education on new/updated traffic control devices including outreach to local groups
Goals for Deployment	• Annually review intersections on the rural state system identified through the Intersection Module and improve intersections as needed. • Continue to support rural local intersections through continuation of the Countywide Signing Program. • Identify which urban areas account for the greatest number of fatal and serious injury crashes. Develop intersection crash rates (5 years of fatal and serious injury crashes) to be used to identify state and local intersections as locations for RSI inspections and improvements as needed.

Table 5. Education – Safety Investment Approach on the State and Local Highway Systems

Safety Emphasis Area	Education Safety Strategy
Motorcycle	
Responsible Agency	South Dakota Departments of Public Safety and Transportation
Facility	• State road system/rural highways
Objective	• Strengthen motorcycle safety through enhanced education and outreach
Safety Strategies	• Motorcycle awareness and education effort – SDDPS and SDDOT work to enhance education effort related to motorcycle specific roadway concerns such as reduced traction, irregular roadway surfaces, and changes in roadway surface elevation • Provide rider information (such as road closures, chip seals, lane closures, etc.) that impact rideability to media outlets including 511, Safe Travel USA, and southdakotarides.com. Use a public information campaign to promote the use of this information by motorcycles riders and related events • Provide a media education campaign to increase the awareness of other drivers' towards motorcycle riders
Goals for Deployment	• Identify and annually review the top 10% of locations that are above average state [fatal and serious injury] crash rates for motorcycle crashes and improve as needed. • Increase Motorcycle rider education through campaigns to increase helmet use and the use of Southdakotarides.com. • Increase non-motorcycle rider education awareness of motorcycles, such as the “Share the Road” campaign
Unbelted Vehicle Occupants	
Responsible Agency	South Dakota Department of Public Safety
Facility	• State and county road system, rural highways
Objective	• Maximize use of occupancy restraints by all vehicle occupants
Safety Strategies	• Fund seat belt public awareness campaigns, including, but not limited to, grass roots school events, poster campaigns to increase awareness, state police school education campaigns, and simulator demonstrations • Provide legislature’s transportation committee information about seat belt use and related fatalities
Goal for Deployment	• Change behavior for seat belt use in areas/demographics for lower than average seat belt use.
Speeding	
Responsible Agency	South Dakota Department of Public Safety
Facility	• State road system, rural highways
Objective	• Reduce unsafe speed through education and outreach
Safety Strategies	• Co-fund statewide and local speeding campaigns (enforcement and media) with SDDPS. • Fund *Don’t Crowd the Plow*, *Give ‘em A Brake*, and *Move Over* campaigns as a majority of these crashes are due to impatient drivers, motorists overdriving road conditions, impatience through construction zones and around vehicles using flashing amber lights, following too closely and misjudging speed of the maintenance or other emergency vehicle in front of them.
Goals for Deployment	• Identify and annually review the top 10% of locations that are above average state [fatal and serious injury] crash rates for speeding and/or overdriving road condition crashes and improve as needed. • Monitor changes in speed related fatal and serious injury crashes and as needed, develop driver education programs in response.

Table 5. Education – Safety Investment Approach on the State and Local Highway Systems

Safety Emphasis Area	Education Safety Strategy
Drug- and Alcohol-Related	
Responsible Agency	South Dakota Department of Public Safety
Facility	• County and state road system, rural highways
Objectives	• Reduce impaired driving through providing ride options.
Safety Strategy	• Provide access to transit options focused on providing rides home to individuals that have been drinking (for example, "Safe Rides" program)
Goal for Deployment	• Reduce Impaired Driving fatal and serious injury crashes through impairment identification, education, enforcement and treatment.
Young Drivers	
Responsible Agency	South Dakota Departments of Transportation and Public Safety
Facility	• City streets/urban roadways, state and county road system/rural highways
Objective	• Strengthen young driver safety through enhanced education and training
Safety Strategies	• Work with Department of Education to establish a Driver Education coordinator; standardize drivers education curriculum, and facilitate the re-certification of instructors and the testing/passing of students • Develop and maintain a website with safe driving information, including winter driving information from safetravelusa.com • Work with Department of Public Safety to create a "parent kit" for student drivers, including explanation of selected crash reports and education on how to drive in different road conditions • Develop with Department of Public Safety driver educational videos that would be posted on a traffic safety website • Work with Department of Public Safety to develop public safety campaigns that educate drivers on how to address different driving conditions such as do not overcorrect when driving off the road, *Don't Veer for Deer*, *Stay in Your Lane*, *Stop Means Stop* campaign, etc. • Bring campaigns into schools for *Give 'em a Brake*, *Work Zone Awareness*, and *Don't Crowd the Plow*, among other safety educational campaigns • Work with Department of Public Safety to fund Driver Simulators
Goal for Deployment	• Enhance education and training to young drivers and their parents.

Enforcement

Enforcement of traffic safety laws is a proven-effective behavioral strategy to promote driver compliance and improve road safety. South Dakota's well-publicized, highly visible enforcement campaigns serve as a deterrent for high-risk driver behavior due to drivers' perception of the likelihood of being stopped, cited, and/or arrested for noncompliance.

(Photo: South Dakota Department of Public Safety website)

High-visibility enforcement consists of multiple jurisdictions and/or multiple squads patrolling a segment of roadway at the same time, often using brightly colored vests and signs. Planned enforcement is publicized extensively through community outreach events involving the local media and public education campaigns about the enforcement.

To more effectively crack down on impaired-drivers, the South Dakota SHSP enforcement strategies serve to support the effective arrest, prosecution, and the intensive supervision of DWI offenders.

Table 6 shows the safety strategies chosen to enhance impaired driving enforcement.

Table 6. Enforcement – Safety Investment Approach on the State and Local Highway Systems

Safety Emphasis Area	Enforcement Safety Strategy
Drug- and Alcohol-Related	
Responsible Agency	South Dakota Departments of Transportation and Public Safety
Facility	• County and State road system, rural highways
Objectives	• Enforce DWI laws.
Safety Strategies	• Cooperatively fund with SDDPS a chemist position to test DUI blood samples at the state health lab • Review options to Create a Tribal Law Enforcement or Traffic Liaison position with SDDPS to address drinking and driving issues on tribal lands • Cooperatively fund with DPS a mobile courtroom and blood testing facility (For example, a "BAT [Blood Alcohol Testing] Mobile," especially used during the Sturgis Rally in August. This would keep the court system from being bogged down with extra DUI cases. • Consider the possibility of the use of safety funding to support additional prosecutors for DUI cases • SDDPS to collaborate with South Dakota Unified Judicial System (UJS) to expand DUI courts • Cooperatively fund statewide and local DUI *Don't Drink and Drive* campaigns (enforcement and media) with SDDPS
Goal for Deployment	• Reduce Impaired Driving fatal and serious injury crashes through impairment identification, education, enforcement and treatment.

Engineering

Along South Dakota's approximately 8,000 miles of state and U.S. highways, the most common types of infrastructure related crashes involving fatalities and serious injuries are associated with single vehicles departing their travel lane (lane-departure) and multiple vehicle collisions at intersections. The majority of these crashes occur along thousands of miles and at thousands of intersections on two-lane, rural highways. As a result, the average density of fatal and serious injury lane-departure and intersection crashes is very low; 0.04 fatal/serious injury lane-departure crash per mile per year and 0.04 fatal/serious injury crash per intersection per year.

This low density of fatal and serious injury crashes along the state road system supports consideration of the deployment safety improvements across the system of rural, two-lane highways, and intersections to maximize the number of fatal and serious injury crashes reduced. Low crash density also points to the need to consider and include (as appropriate) a systemic component to the Highway Safety Improvement Program (HSIP). This component could include a system-wide risk assessment to identify high-priority candidate locations for safety investment. It is recommended that this approach be assessed in more detail in upcoming years.

In line with the need to consider a focus on implementing safety improvements across more miles of highway and more intersections, the safety program should consider a greater focus on deploying low-cost safety improvements, as feasible. This approach to safety investment would allow current funding levels to treat more locations in the future than have been treated in the past. In fact, highly effective techniques for addressing both lane-departure and intersection crashes include a number of strategies that can be implemented for approximately:

- $3,000 to $8,000 per mile (road edge enhancements including edge line rumble strips or stripes and embedded wet-reflective pavement markings)
- $3,000 per curve (enhanced delineation with Chevrons)

With respect to implementation, South Dakota's approach to identifying candidates for safety investment and deploying safety strategies is summarized in Table 7.

Table 7. Engineering – Safety Investment Approach on the State Highway System

Safety Emphasis Area	Engineering Safety Strategy
Roadway Departure	
Responsible Agency	South Dakota Department of Transportation
Facility	• State road system/rural highways
Safety Strategies	• Centerline and edge line rumble strips • Shoulder treatments • Enhanced curve delineation • Enhanced pavement markings (such as embedded wet-reflective markings)
Goals for Deployment	• Annually review the top 10% of locations above the state average crash rate
Intersections	
Responsible Agency	South Dakota Department of Transportation
Facility	• State road system/rural two-lane • Expressways and urban multi-lane
Safety Strategies	• Innovative intersection designs (such as reduced conflict U-turns, off-set turn lanes, roundabouts) • Traffic signal modifications at urban intersections (such as multi-phase operation, optimize clearance intervals, coordination
Goals for Deployment	• Annually review rural intersections using the Intersection Module and Roadway Module • Identify urban intersections with unusual numbers of fatal and serious injury crashes
Motorcycles	
Responsible Agency	South Dakota Department of Transportation
Facility	• State road system/rural two-lane
Safety Strategies	• Review locations that experience higher than the statewide average motorcycle crashes on rural major or minor collectors • Incorporate user friendly roadway design, traffic control, construction and maintenance polices and practice
Goals for Deployment	• Annually review progress
Speeding-Related	
Responsible Agency	South Dakota Department of Transportation
Facility	• State road system/rural two-lane • Expressways and urban multi-lane
Safety Strategies	• Communicate appropriate speed though use of traffic control devices • Provide roadway design and traffic control elements that support appropriate speeds
Goals for Deployment	• Annually review progress

Table 7. Engineering – Safety Investment Approach on the State Highway System

Safety Emphasis Area	Engineering Safety Strategy
Young Drivers	
Responsible Agency	South Dakota Department of Transportation
Facility	• State road system/rural two-lane • Expressways and urban multi-lane
Safety Strategies	• Review transportation plans for new/expanding high school sites • Provide or update School Zone signs
Goals for Deployment	• Annually review progress

Approximately half of the crashes involving serious injuries in South Dakota occur on roads under the jurisdiction of local governments. These crashes are almost equally divided between rural county roadways and urban municipal arterials. Along the rural county roads, the most common type of fatal/serious injury crash involves a single vehicle running off the road. On the urban arterials, the most common type of crash involves two vehicles at an intersection.

As was the case on the state road system, the density of these fatal and serious injury crashes is very low: 0.003 fatal/serious injury crash per mile of county roadway or urban intersection per year. A potentially effective approach to reducing and preventing fatal and serious injury crashes on the local road system involves widely deploying highly effective, low-cost strategies at high-priority locations.

An investment analysis completed for South Dakota indicates that an effective way to deal with a low density of crashes is to implement a safety program that covers as many miles or intersections as possible thought the deployment of low-cost strategies.

The fact that the number of fatal and serious injury crashes on the local road system is almost equal to the number on the state road system suggests that the level of engagement of local agencies in statewide safety planning efforts needs to be increased. To that end, SDDOT should consider exploring an initiative to assist local agencies in identifying their high-priority locations, and develop safety projects that focus on the use of proven-effective and low-cost safety strategies. This might be accomplished by providing technical assistance to counties and cities.

Low-cost strategies for reducing and preventing fatal and serious injury lane-departure and intersection crashes on local systems are summarized in Table 8.

Table 8. Engineering – Priority Safety Strategies for Reducing Fatal and Serious Injury Crashes on the Local Road System

Safety Emphasis Area	Engineering Safety Strategy for Local Road System
Local Roads	
Responsible Agencies	Technical and funding assistance – South Dakota Department of Transportation Project development – county and city road agencies
Facility	• County roadways – paved roadway segments and horizontal curves • City arterials – signalized intersections
Safety Strategies	• Lane-departure – enhanced edge lines, edge line rumble strips, enhanced curve delineation • Intersections – traffic signal upgrades, street lighting, and pedestrian amenities • County roadways – paved roadway segments and horizontal curves • City arterials – signalized intersections
Goals for Deployment	• Annual review of progress

(Photo: South Dakota Department of Tourism website)

Emergency Medical Services

Emergency medical services, once the newest component of a comprehensive traffic safety management system, continues to strengthen its role as an integrated partner with education, enforcement, and engineering to reduce South Dakota's fatal and serious injury crashes.

The Centers for Disease Control and Prevention (CDC) concludes that a severely injured victim who received care at a "Level I" trauma center within 1 hour had a 25-percent reduced risk of death. The South Dakota safety partners recognize the critical difference in crash injury outcomes when the state's emergency care system functions in an optimal manner, particularly in its rural communities. In addition, South Dakota has identified a number of infrastructure strategies to support effective EMS services.

Table 9 reflects the safety strategies supporting South Dakota emergency medical services.

Table 9. Emergency Medical Services – Safety Investment Approach on the State and Local Highway Systems

Safety Investment Area	Emergency Medical Services Safety Strategy
Rural EMS	
Responsible Agency	South Dakota Departments of Public Safety and Transportation
Facility	• State and local rural highways
Objective	• Support South Dakota's EMS structure
Safety Strategy	• Support rural emergency response to maintain staff level resources and training • Provide adequate signing for local roads to enhance/sustain response time
Goal for Deployment	• Enhanced rural EMS resources and training

Project Planning Partnerships

The South Dakota SHSP is supportive of an interdisciplinary approach to reducing fatal and serious injury crashes through convening groups of stakeholders from engineering, education, enforcement, and emergency medical services to learn from each other and work collaboratively across disciplines as well as across state, local, and tribal jurisdiction.

South Dakota's SHSP project planning safety strategies work to integrate and connect the agendas of its transportation safety stakeholders through establishing cooperatively developed transportation project plans to improve roadway safety.

Table 10 reflects the strategies chosen to strengthen safety project planning partnerships.

Table 10. Project Planning Partnerships – Safety Investment Approach on the State and Local Highway Systems

Safety Investment Area	Project Planning Partnerships Safety Strategy
Safety Project Planning	
Responsible Agency	South Dakota Department of Transportation
Facility	• Statewide, all roads
Objective	• Strengthen safety project planning partnerships • Improve driver information
Safety Strategies	• Fatal Crash Investigation Team – Have a multidisciplinary team investigate a fatal crash scene as soon as crash information and report is available, information is reviewed while the evidence and facts are still fresh. • Tribal Partnerships – Including and not limited to the following: Work with Federal Lands and SDDPS to assist Tribes in preparing tribal safety plans. SDDOT, BIA and SDDPS work together to fund enforcement activities on reservations. Partnership with Tribes and DOT in conducting Regional Roadway Safety Inspections (RSI), Roadway Safety Audits (RSAs), county signing projects and tribal safety summits to develop and enhance safety initiatives • Federal/State Planning Partnership – Plan a multi-state peer exchange for DOT, LTAP, and FHWA traffic safety personnel to exchange ideas of how projects are planned, selected, and constructed, including the best uses of HSIP money. States might include North and South Dakota, Nebraska, Montana and Wyoming. • Local Safety System Partnerships – 1) Funding an employee to assist with local safety concerns; 2) Use safety funds to collect roadway data and determine data collection system; 3) County Signing Programs; 4) Local entity safety engineering services; and 5) Provide options for assisting local entities in safety planning such as county safety plans • Utilize Safetravelusa.com/511 to provide data feeds to Dynamic Message Signs • Develop aps for additional mobile devices • Provide more environmental sensor/cameras for traveler information • Develop alternate methods of reporting roadway conditions
Goal for Deployment	• Increase traffic safety partnerships to prepare traffic safety plans.

Research and Data

Traffic safety research and data serves to support the implementation of safety strategies and more precisely identify at-risk roadways, drivers, and behaviors. Traffic safety data is a foundation for problem identification and South Dakota seeks to further understand through research and crash data analysis the shared attributes of its fatal and serious injury crashes and of low-seatbelt use populations as well as understand the public's attitudes about traffics safety and policy initiatives.

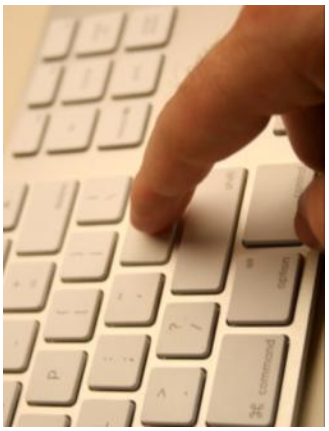


Table 11 shows the safety strategies chosen to help increase belt use and reduce fatal and serious injury crashes by strengthening its research and data analysis.

Table 11. Research and Data – Safety Investment Approach on the State and Local Highway Systems

Safety Investment Area	Research and Data Safety Strategy
Unbelted Vehicle Occupants	
Responsible Agency	South Dakota Department of Public Safety
Facility	• State and county road system, rural highways
Objective	• Maximize use of occupancy restraints by all vehicle occupants
Safety Strategies	• Conduct research to identify regions and populations that have low seat belt use
Goals for Deployment	• Change behavior for seat belt use in areas/demographics for lower than average seat belt use
Crash and Public Analysis	
Responsible Agency	South Dakota Departments of Public Safety and Transportation
Facility	• Statewide, all roads
Objective	• Strengthen fatal and serious injury crash problem identification and crash factors
Safety Strategies	• Conduct research and data to identify common attributes of crash casual factors related to crashes and their severity. Examples include interrelationships with alcohol crashes. • Conduct factual research related to public attitudes towards safety issues and legislative initiatives.
Goals for Deployment	• Improved data analysis and awareness of public attitudes

Performance Measures and Evaluation

Performance evaluation is an important component of the SHSP because it provides the opportunity to assess if the SHSP is meeting South Dakota's established traffic safety goals. The evaluation monitors progress toward implementing safety strategies (output) and assesses the effectiveness of the implemented strategies toward reducing crashes (outcome). Thus, SHSP evaluation results help determine whether current efforts should be retained, replaced, or modified to develop safety programs that will continue to prevent and reduce fatal and serious injury crashes on South Dakota's roadways. Communicating evaluation results is important to encourage agencies to incorporate the SHSP and related safety efforts into their daily activities, and to promote stakeholder and public support for continuing SHSP efforts. Results of monitoring and evaluation activities provide the opportunity to strengthen the SHSP and safety management process.

A performance measure is a criterion used to measure progress and effectiveness toward achieving SHSP goals. To streamline the SHSP evaluation process, performance measures must be able to be tracked so relevant data can be gathered and reporting methods consistently used from one evaluation period to the next. Ideally, performance measures are quantitative to facilitate data collection and comparison to planned implementation levels against baseline crash statistics. However, performance measures may also be qualitative in nature depending on the goal. Output measures are shorter-term, quantitative measures that indicate the level of implementation activity or effort associated with the strategy. They can also be used to track cost and productivity.

Examples of output measures that help determine implementation status are the number of local speeding campaigns conducted and the miles of centerline rumble strips installed. Longer-term outcome measures provide an indication of the overall effectiveness of the SHSP and its priority strategies to move South Dakota toward its traffic safety vision. Examples of outcome measures that help determine the impact of the SHSP toward reducing serious injuries are annual safety belt observations and the frequency and severity of crashes in each safety emphasis

Federal & State Agency Performance Measures

1. Number of traffic fatalities
2. Number of serious injuries
3. Rural and urban fatality rates (rural fatalities per 100 million vehicle miles traveled)
4. Number of unrestrained passenger vehicle occupant fatalities
5. Number of fatalities in crashes involving a driver or motorcycle operator with a BAC of 0.08 or greater
6. Number of speeding-related fatalities
7. Number of motorcyclist fatalities
8. Number of unhelmeted motorcyclist fatalities
9. Number of motor vehicle occupants age 20 or younger involved in fatal crashes
10. Number of pedestrian fatalities
11. Observed seat belt use for passenger vehicles, front seat outboard occupants
12. Number of seat belt citations issued during grant-funded enforcement activities (grant activity reporting)
13. Number of impaired driving arrests made during grant-funded enforcement activities (grant activity reporting)
14. Number of speeding citation issued during grant-funded enforcement activities (grant activity reporting)

TBG053013004230ABQ

area. Federal legislation and guidance encourages states to include both "output" and "outcome" measures in their SHSPs to best monitor shorter-term SHSP implementation activity, as well as longer-term outcomes of the SHSP efforts.

National Performance Measures

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires states to annually report fatal and serious injury data for monitoring the use of federal funds and to assess national traffic safety performance. Safety performance requirements of MAP-21 highlight the need to strengthen traffic safety coordination between the SD DPS Office of Highway Safety and the SDDOT.

The DPS Office of Highway Safety's annual Highway Safety Plan (HSP) is required (23 USC 402) to contain 14 performance measures as stipulated in the report entitled *Traffic Safety Performance Measures for States and Federal Agencies* (DOT HS 811 025, August 2008). States are required to report three- to five-year moving averages of these data, to determine annual performance targets for each measure and to annually report progress made. (A 3- or 5-year moving average is used to account for possible random fluctuations that may obscure crash trends.) The DPS Office of Highway Safety establishes annual performance targets on a calendar-year basis for the following core behavioral outcome, performance, and activity measures. The SDDOT and DPS will compile the data related to these measures annually as part of their federal reporting process.

Core Outcome-Based Performance Measures

1. Number of traffic fatalities
2. Number of serious injuries
3. Number of fatalities per VMT/fatality rate (fatalities per 100 million vehicle miles traveled)
   a. Rural fatality rate (rural fatalities per 100 million vehicle miles traveled)
   b. Urban fatality rate (urban fatalities per 100 million vehicle miles traveled)
4. Number of unrestrained passenger vehicle occupant fatalities
5. Number of fatalities in crashes involving a driver or motorcycle operator with a BAC of 0.08 or greater
6. Number of speeding-related fatalities
7. Number of motorcyclist fatalities
8. Number of un-helmeted motorcyclist fatalities
9. Number of drivers age 20 or younger involved in fatal crashes
10. Number of pedestrian fatalities

Traffic Safety Performance Measures

Several types of performance measures were developed to satisfy different needs:

- *Outcome measures* – used to set national and State goals, allocate resources and measure overall progress (may include crashes, injuries, or fatalities, and may be presented as numbers, rates, percentages, or ratios).
- *Behavioral measures* – provide a link between specific activities and outcomes by assessing whether the activities have influenced behavior (may include observed behavior on the road such as direct observations of seat belt use or vehicle speed, or self-reported behavior, program awareness, and attitudes obtained through surveys).
- *Activity measures* – document program implementation and measure specific actions taken to reduce crashes, injuries and fatalities (a variety of actions taken by law enforcement, courts, media, education, and others).

Core Behavioral Performance Measure

11. Observed seat belt use for passenger vehicles, front seat outboard occupants

Core Behavioral Activity Measures

12. Number of seat belt citations issued during grant-funded enforcement activities (grant activity reporting)
13. Number of impaired driving arrests made during grant-funded enforcement activities (grant activity reporting)
14. Number of speeding citations issued during grant-funded enforcement activities (grant activity reporting)

Separately, under MAP-21 (23 USC 148), state DOTs must set Highway Safety Improvement Program (HSIP) performance targets for the following four safety measures, of which the first three are also required for state Highway Safety Plans:

1. Total number of fatalities
2. Total fatality rate (fatalities per VMT)
3. Total number of serious injuries
4. Total serious injury rate (serious injuries per VMT)

(Photo: South Dakota Department of Tourism website)

Emphasis Area Performance Measures

The SHSP update process included the development of output and process-oriented performance measures for each emphasis area. These measures are in addition to the federal outcome-based performance measures that are applicable to five of the seven South Dakota emphasis areas. While these particular output and process-oriented measures are generally not quantifiable, indicators could be developed in the future to gauge the advancement of these performance measures.

The output- and process-oriented performance measures for each safety emphasis area are provided in Table 12.

Table 12. Performance Measures for South Dakota's Safety Emphasis Areas

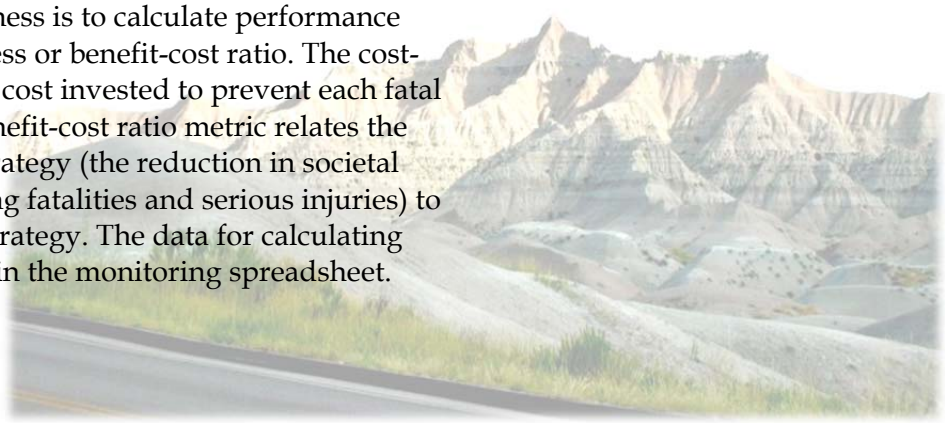
Safety Emphasis Area	Performance Measures
Roadway Departure	• Reduce fatal and serious injury crash rates resulting from roadway departure 15% by 2020
Intersections	• Reduce fatality and serious injury crash rates of intersection crashes 15% by 2020
Motorcycles	• Reduce motorcycle fatal and serious injury crash rate 15% by 2020
Unbelted Vehicle Occupants	• Reduce unbelted vehicle occupant fatalities15% by 2020
Speeding-Related	• Reduce fatality and serious injury crash rate 15% resulting from speeding by 2020
Drug-and Alcohol-Related	• Reduce impaired-driving fatality and serious injury crash rate 15% by 2020
Young Drivers	• Reduce fatality and serious injury crash rate 15% for drivers age 20 and younger by 2020

Monitoring and Evaluation Methods

During the SHSP update process, a monitoring spreadsheet was developed for documenting the safety strategies to be implemented, storing collected data, and recording monitoring activities. The SDDOT will gather and enter data relative to performance measures into the spreadsheet annually to assist with reporting performance measures and assessing progress toward SHSP goals. For outcome measures, data collection activities would ideally begin prior to implementing the safety strategies to provide the ability to monitor the impact—or change in safety performance—due to the implemented strategy. Data should be collected for a minimum of 3 years after a strategy is implemented to obtain a sample size sufficient for evaluating strategy effectiveness. With the data stored in the monitoring spreadsheet, statistical tests can be performed on individual safety strategies to test their effectiveness and to calculate crash reduction factors.

Alternative evaluation methods are applicable for South Dakota's seven safety emphasis areas. The method selected to quantify strategy effectiveness will depend on the performance measure and data availability. A trend analysis is a method to track progress toward reducing fatal and serious injury crashes over time. For a trend analysis, the numbers of fatal and serious injury crashes related to a safety emphasis area are recorded on an annual basis. Simple charts can be prepared to display this data to the public and stakeholders in an easy-to-understand format. Since trend analysis is typically conducted at the emphasis area level, impacts of specific safety strategies may not be quantifiable if several strategies were implemented. For example, if installation of street lighting at unsignalized intersections on state highways is accompanied with increased enforcement to reduce speeding, a reduction in intersection crashes could not be attributed solely to the lighting strategy. The data for generating these trend lines would be stored in the monitoring spreadsheet.

Another evaluation method to assess an individual safety strategy or the SHSP's overall effectiveness is to calculate performance metrics such as cost effectiveness or benefit-cost ratio. The cost-effectiveness metric relates the cost invested to prevent each fatal or serious injury crash. The benefit-cost ratio metric relates the benefit of implementing the strategy (the reduction in societal costs associated with preventing fatalities and serious injuries) to the cost of implementing the strategy. The data for calculating these metrics would be stored in the monitoring spreadsheet.



MAP-21 SHSP Process and Special Rules

The current federal highway legislation, Moving Ahead for Progress in the 21st Century (MAP-21), was signed into law in July 2012. This law funds surface transportation programs for federal fiscal years 2013 and 2014 (through September 30, 2014) and continues and encourages efforts for the Highway Safety Improvement Program (HSIP) to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned public roads and roads on tribal lands. The law contains important guidance relating to national, state, local, and tribal efforts to improve traffic safety. Key provisions of the law, related to safety, include:

- SHSP development process and content
- Safety performance measures
- Crash data (safety emphasis areas)
- Safety fund investment (safety strategies)
- Safety program implementation and evaluation processes
- Stakeholder involvement and transparency
- Older drivers and older pedestrians
- High Risk Rural Road Safety Program
- Penalty to have an approved/updated SHSP

SHSP Development Process

Every state is required to develop a Strategic Highway Safety Plan (SHSP) that identifies strategies to address key safety deficiencies. The SHSP process emphasizes a data driven and strategic approach that addresses serious injury and fatal crashes on all roads in the state. The SHSPs must be coordinated with NHTSA's *Highway Safety Plan* (HSP) and other state plans to address both infrastructure and driver behavioral related crashes.

South Dakota and MAP-21

The South Dakota SHSP follows the guidance provided in MAP-21:

It is a comprehensive document, involving stakeholders from both private and public agencies throughout the state representing the 4Es of traffic safety. The key safety emphasis areas were selected based on an analysis of crash data from 2007 to 2011 (the most recent previous 5 years). Safety strategies were developed that would be the most effective in reducing fatal and serious injury crashes in a manner that meets South Dakota's needs. The South Dakota SHSP addresses all roadways in the state – state highways, county roads, and city streets.

Safety Performance Measures

According to FHWA performance measure requirements, states must set targets for both the number and rates of fatalities and serious injuries across all public roads and then annually monitor progress toward meeting the adopted goals. If a state fails to make progress towards its safety targets, they may be required to devote a portion of their formula obligation to their safety program and submit an annual implementation plan on how they will adjust their safety program to meet performance targets.

(Photo: South Dakota Department of Public Safety website)

Crash Data (Safety Emphasis Areas)

SHSPs identify the number of traffic-related fatalities and serious injuries on all roads in a state. These plans are intended to establish priorities and be an investment guides for the states that helps focus resources on areas of greatest needs. SHSPs document the adopted strategic and performance based short- and long-term goals that include behavioral- and infrastructure-related crashes on all public roads.

Safety Fund Investment (Safety Strategies)

To obligate Highway Safety Improvement Program (HSIP) funds, a state must develop and implement an SHSP, produce a program of safety strategies/projects to address identified target crash types, and evaluate the SHSP on a regular basis. HSIP funding is expected to support implementation of proven, effective strategies.

Safety Program Implementation and Evaluation

Highway safety-improvement projects should be identified based on crash experience, crash potential, or crash rate using either a site analysis or systemic approach. These improvement projects are required to be consistent with a state's SHSP. All highway safety- improvement projects should contribute to a reduction in fatal and serious injury crashes on all public roads and the achievement of state safety targets. Highway safety funds may be obligated to implement safety improvement projects to correct a high-crash location or address a high-risk feature on any public road. SHSPs should document an adopted evaluation process, or at least initiate the process to conduct evaluations.

SHSP Stakeholder Involvement and Transparency

The SHSP is a coordinated plan developed in cooperation with a broad range of multidisciplinary stakeholders at the federal, state, tribal, and local level. The stakeholder process must be transparent and comprehensive in nature and include coordination with NHTSA and the Federal Motor Carrier Safety Administration (FMCSA), and ultimately be available to the public (No specific techniques for communicating are identified.)

Older Drivers and Older Pedestrians

According to MAP-21, if fatalities and serious injuries per capita for drivers and pedestrians who are 65 years of age or older increases during the most recent 2-year period for which data are available, older driver strategies (refer to *Highway Design Handbook for Older Drivers and Pedestrians*, FHWA, Publication No. FHWA-RD-01-103, May 2001) must be identified and evaluated. Furthermore, additional funds must be allocated for this group for safety initiatives. A review of the crash rate data from 2005 – 2009 and from 2007 – 2011 did not show an increase in the fatality and serious injuries for older drivers and pedestrians.

High Risk Rural Road Safety Program

High-risk rural roads are classified as local or major/minor collector which through information gathered by field reviews, safety assessments, road safety audits, or local knowledge and has experienced a history or potential for fatal or serious crashes. These roads may also be anticipated to have an increase in traffic volumes that are likely to create fatal and serious injury crash rate that exceed the statewide average for this type of roadway.

Under MAP-21, the HRRR Program is no longer addressed. However, if fatality rates on rural major or minor collectors or on rural local roads with significant safety risks (as identified in a state's updated SHSP) increase over a 2-year period, the state must obligate at least 200% of their fiscal year 2009 HRRR set-aside for projects on the high-risk rural road system.

Penalty without an Approved/Updated SHSP

If a state does not have an updated SHSP with a process approved by the Secretary of the U.S. Department of Transportation by August 1 of the fiscal year beginning after the date of the establishment of the HSIP final rule, the state will not be eligible to receive additional obligation limitation during the annual redistribution of funds.

(Photo: South Dakota Department of Tourism website)

References

Federal Highway Administration (FHWA), 2001. *Highway Design Handbook for Older Drivers and Pedestrians*. Publication No. FHWA-RD-01-103. May.

Lerner, Neil, Jeremiah Singer, and James Jenness, 2010. "Safer Drivers." White Papers for: *Toward Zero Deaths: A National Strategy on Highway Safety*. White Paper No. 3. July 12.

National Highway Traffic Safety Administration (NHTSA), 2013. *Countermeasures that Work: A Highway Safety Countermeasure Guide for Sate Highway Safety Offices*. 7th Edition. Report No. DOT HS 811 727. Washington DC. April.

Williams, Allan F., 2007. *Public Information and Education in the Promotion of Highway Safety*. Research Results Digest 322. National Cooperative Highway Research Program (NCHRP). Washington DC. August.

(Photo: South Dakota Department of Tourism website)

APPENDIX A

Detailed Discussion of Safety Strategies and Effectiveness Measures

Some of the effectiveness information for the safety strategies is approaching 10 years old, and more recent research is available. Therefore, effectiveness information was updated using crash modification factors (CMFs) included in the *Highway Safety Manual* or contained in the CMF Clearinghouse prior to presenting the preferred strategies to the Steering Committee. The Steering Committee selected the final infrastructure-related high-priority safety strategies from those identified during the workshop.

The Steering Committee and other stakeholder meetings with SDDOT safety partners added strategies related to enforcement, education, and emergency medical services to the list of infrastructure-related strategies to produce the final set of high-priority safety strategies included in the South Dakota SHSP Update.

Although extensive research is available to assess the effectiveness of behavioral safety strategies,[1] there are many complexities and limitations in assessing the effectiveness (CMFs) of behavioral strategies. For example, some strategies are most effective when combined with other strategies (public outreach combined with enforcement). The effectiveness of behavioral strategies that are the same (such as high-visibility enforcement) can be widely different due to their implementation variances (for example, duration, saturation/intensity, quality of media, etc.). Therefore, CMFs for behavioral strategies are limited. However, when CMFs are available, they have been incorporated into the strategy assessment and benefit/cost calculations. If no CMF has been scientifically established for a proposed behavioral strategy, then effectiveness was determined through available research results, key expert judgment and experience, and strategy program performance.

In addition to the high-priority strategies included in the SHSP, SDDOT will implement several safety-related strategies on an on-going basis. These include recommendations from road safety

Crash Modification Factors

Expected countermeasure effectiveness is also commonly expressed as a crash modification factor (CMF). A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

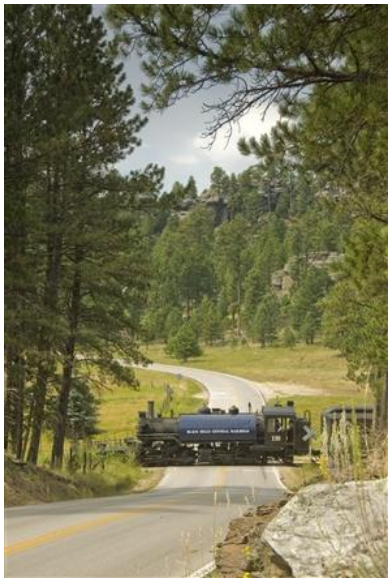
The CMF is multiplied by the expected crash frequency without treatment (base condition). A CMF greater than 1.0 indicates an expected increase in crashes, while a value less than 1.0 indicates an expected reduction in crashes after implementation of a given countermeasure. For example, a CMF of 0.8 indicates an expected safety benefit; specifically, a 20-percent expected reduction in crashes. A CMF of 1.2 indicates an expected degradation in safety; specifically, a 20-percent expected increase in crashes.

The AASHTO HSM provides as set of high quality CMFs and FHWA's CMF Clearinghouse houses a

[1] Refer to NCHRP Report 622: *Effectiveness of Behavioral Highway Safety Countermeasures*

audits (RSAs) road safety inspections (RSIs), railroad safety initiatives, and SDDOT traffic safety office modules. Traffic safety modules have been developed by SDDOT and provide for the detailed safety analysis of roadways using inventory data combined with infrastructure data crash data and crash modification factors.

In addition, RSA and RSI findings will be collectively analyzed to identify common strategy recommendations for potential systemic improvements. According to MAP-21, all RSAs and RSIs and their recommended improvements are eligible for safety funding.



(Photo: South Dakota Department of Tourism website)

Railroad safety strategies are implemented through the Railroad Crossing Improvement Program (RCIP). SDDOT receives about $2.3 million annually for the RCIP for the implementation of safety improvements at locations where a public roadway intersects active railroad tracks. Currently, approximately 1,884 public at-grade intersections and 127 separation structures statewide are eligible for this financial assistance. Funds are made available for this program with a match ratio of 90-percent federal to 10-percent local. Total funding or a cash incentive is available for crossing consolidation projects. RCIP projects can include the installation of new or the upgrading of active highway-rail grade crossing signal systems; interconnection of crossing signals with a traffic signal; crossing approach and surface improvements; improvement for pedestrian/bicycle paths; visibility and geometry improvement; grade crossing elimination or consolidation; signing and pavement markings; illumination; and grade separation or replacement of grade separation.

An inventory of all railroad crossings on public roads is maintained by SDDOT. Information collected for the inventory is used to calculate a crossing hazard index that is used to help identify potential projects for the RCIP. Potential projects are also identified by crash history (crash reports are requested each year and reviewed by SDDOT) and through requests from road authorities, railroads, and SDDOT personnel that have knowledge of driver behavior, changes necessary for pedestrian movements, need for interconnection or changes in highway or railroad operations. Once potential projects have been identified, projects are prioritized according to the hazard index, type of project, and available funding. As required by 23 USC 130, at least 50 percent of the funds are to be used for installation of safety devices for the locations on the list of recommended projects.