



Iowa Strategic Highway Safety Plan

2017-2018 Iowa Strategic Highway Safety Plan Update Process Documentation Report

November 4, 2016



SNYDER & ASSOCIATES
Engineers and Planners

PARTNERS



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Project: 2017-2018 Iowa Strategic Highway Safety Plan Update

Topic: Strategic Highway Safety Plan Process Documentation

This memo discusses the process used for the State of Iowa’s Strategic Highway Safety Plan (SHSP) Update prepared during 2016. This process was designed to meet the requirements set forth by the Strategic Highway Safety Plan Guidance FHWA guidance issued March 14th, 2016 and informed by MAP-21 and FAST ACT legislation. The description of the SHSP Update Process follows the outline described in Attachment B of the guidance and is provided as a separate document from the actual 2017-2018 SHSP Update.

Consultative Process:

To develop an update consistent with the process used for the 2013 SHSP, strategies and goals representative of all emphasis areas and the five E’s (Engineering, Education, Enforcement, Emergency medical services, and Everyone) of safety described in the 2013 SHSP were used to set up two stakeholder groups to guide the planning process. The first stakeholder group, the “Update Team” was a working group that provided guidance, data, and input on the document throughout its development. This working group held four meetings during the planning process and consisted of safety stakeholders representative of each of the four specific safety emphasis areas, with all stakeholders representing the fifth E (Everyone):

- Engineering
 - Federal Highway Administration
 - Iowa DOT Office of Traffic and Safety
 - Iowa DOT Office of Local Systems
 - Iowa DOT Office of Systems Planning
- Education
 - Iowa DOT Office of Strategic Communications
 - Institute for Transportation at Iowa State University
 - University of Iowa College of Public Health, Injury Prevention Research Center
- Enforcement
 - Governor’s Traffic Safety Bureau
- Emergency medical services
 - Department of Public Health

The Update Team stakeholders provided updates on programs, policies, and educational campaigns for their respective agencies/organizations in addition to providing data and the latest research for their areas of expertise. Each Update Team meeting involved discussions on new or revised strategies as well the evaluation of progress toward goals and the performance of strategies over the plan period. A list of specific team members is attached in an appendix to this document.

The second stakeholder group, the 2013 SHSP “Implementation Team” holds quarterly meetings throughout the year for continued coordination of the plan. The Implementation Team met three times during the planning process to provide specific data and input, but primarily was a review team for the draft SHSP Update document developed by the Update Team. The Implementation



Team included local and state representatives from multiple areas in addition to those represented by the four E's described above. A list of specific team members and minutes for each of the Implementation Team meetings are provided in the appendix.

The first meeting for the Implementation Team involved a review of the Crash Data Analysis Memo, also provided as an appendix, and progress toward the 15% reduction goals for serious and fatal injuries set in the 2013 SHSP. The meeting also included a review of updated information for the SHSP provided by the working group. All additional data and input provided during this meeting was incorporated by the Update Team prior to the next Implementation Team meeting where the 2017-2018 revised goals and strategies were reviewed and discussed.

An Iowa DOT On-call Traffic Safety Engineering Services consultant, Snyder & Associates, Inc. was utilized by the Iowa DOT to assist in the SHSP Update process including the Crash Data Analysis Tech Memo, meeting minutes, information gathering from various agencies, and draft documentation preparation.

Coordination:

At the writing of this plan, the Iowa DOT was in the process of gathering input for the development of the next long range transportation plan, *Iowa in Motion 2045*. To ensure coordination with the goals of the previous long range transportation plan and the next update, a representative of the Office of Systems Planning was represented on the Update Team. Additionally, representatives responsible for the development of the Highway Safety Plan and Highway Safety Improvement Program were also represented on the Update Team.

Safety is a critical element identified in the 2012 *Iowa in Motion-Planning Ahead* Long Range Transportation Plan. Specifically, that document states that "Transportation safety and security continue to be a primary concern and integral element in the planning and programming processes." This overarching goal is consistent with the intent of the 2017-2018 SHSP Update, where the goal of Zero Fatalities informs the work of all safety professionals and stakeholders. The engineering emphasis area discusses the need to "support evidence-based decision making in highway management and program development," through the incorporation of safety data analysis in project identification, prioritization, selection, and development both locally and statewide.

To coordinate with the Federal Motor Carrier Safety Administration's required Commercial Vehicle Safety Plan (CVSP); representatives of motor vehicle enforcement were included on the SHSP Implementation Team. The CVSP identified the reduction of traffic crashes resulting in "injury and loss of life with coordinated enforcement and educational efforts focused on commercial vehicle operators and other vehicles operating in the vicinity of commercial vehicles" as their goal statement. As a reflection of this coordination, the 2017-2018 SHSP Update has included such enforcement goals including motor vehicle inspections and public education and awareness activities for motor vehicle enforcement as strategies.

To coordinate with the Highway Safety Plan, the Update Team worked closely with the Iowa Governor's Traffic Safety Bureau/Department of Public Safety to identify reduction goals and



targets that coordinate with their methodology for tracking progress. The Update Team aligned those targets to create unified goals for the future SHSP update. Additionally, those representatives helped to inform the strategies aimed at behavioral factors that contribute to fatalities and serious injuries on the roadways. This included the discussion of strategies and programs that have provided successful outcomes, such as special corridor enforcement events.

Data-Driven Process:

To ensure that emphasis areas for the 2017 - 2018 SHSP Update remained consistent with the data-driven process outlined in the guidance and the 2013 SHSP, statewide crash data was analyzed and summarized in the Crash Data Analysis Memo. This data was provided to the Update and Implementation Teams for their review. Statewide crash data was summarized based on the categories defined through the 2013 SHSP to better evaluate performance in each emphasis area and identify any new or emerging emphasis areas. The Crash Data Analysis Memo is provided as an appendix to the 2017 - 2018 SHSP Update.

An overview of crash data trends was provided for the first Update Team meeting, followed by a more detailed crash tech memo at the next Update Team meeting. The revised memo was informed by questions or areas discussed as needing more analysis from that first meeting. This information was provided at the beginning of the planning process to allow for a data-driven discussion of goals and strategies as they relate to each emphasis area discussed in the SHSP. As a result of this process, two emerging emphasis areas (Motorcycles and Older Drivers) were incorporated into the 2017-2018 SHSP Update. Discussing this information during the early stages of the update process allowed both stakeholder groups, the Update Team and Implementation Team, time to discuss these areas and identify strategies designed to bring new stakeholders into the SHSP process.

Performance-Based Approach:

During the development of the 2017-2018 SHSP Update, the Update Team and Implementation Team discussed progress toward goals identified in the 2013 SHSP. As a part of this discussion, the groups discussed not only how to define and document progress achieved during this past plan period, but also how to define goals and strategies to be measured in the next update. As a result of these discussions, specific attention was paid to developing specific and measurable strategies where possible.

The guiding goals set for the 2017 - 2018 SHSP Update include the 15 percent reduction targets for fatalities and serious injuries by 2020 identified in the 2013 SHSP. To measure progress toward these goals and remain consistent with performance tracking established in coordination with the Governor's Traffic Safety Bureau, current (2011-2015) five-year moving averages were analyzed against the baseline five-year averages (2007-2011) for serious injuries and fatalities. Since this was an interim update, and only three years had passed since these goals were set, the targets remained the same.

Due to the additional guidance on performance measures provided since the 2013 SHSP was adopted, two additional targets were established. These targets are set for the same year (2020),



and will also be evaluated on five-year moving averages. These targets include fatality and serious injury rates per 100 million Vehicle Miles Traveled (VMT). These rates were set based on an analysis of five-year moving averages and discussion with safety stakeholders including the Governor's Traffic Safety Bureau.

Strategy Selection:

The goal of reducing fatalities and serious injuries cannot be achieved without strategies that address the key contributing factors to those crashes. To identify strategies that would have the greatest impact, Update Team and Implementation Team members were relied upon to provide information on the latest data, technologies, research and policies in their fields of expertise. Strategy discussions focused on emphasis areas revealed through crash data analysis, relying on a diverse range of perspectives to discuss local and statewide implications of those strategies.

Strategies were discussed and organized throughout the document as they related to the five E's with the movement of some strategies to different sections or the identification of different leaders based on which E the specific strategy corresponded with. To make the SHSP a more relatable document to the public, the phrases "Where We Are Going" and "How We Get There" were used to identify overall strategies and measurable actions or objectives that support those strategies. Making the document relatable to individuals from a diverse range of professional backgrounds was important to both stakeholder groups to ensure ease of use and implementation.

Schedule to Evaluate and Update SHSP:

Development of evaluation tools and performance measures at the beginning of 2017 will be initiated in order to better define the impact of safety-focused strategies. Implementation team members will continue to report progress in quarterly meetings and continue to remain accountable to safety strategy implementation.

APPENDIX A:

UPDATE TEAM LIST



Update Team List SHSP Update (2017-2018)

The list includes representatives that were invited to or attended the Update Team Meetings

FIRST	TITLE	ORGANIZATION
FHWA Iowa Division Office		
Paul LaFleur	Safety Engineer	FHWA Iowa Division Office
Iowa DOT Office of Traffic and Safety		
Jan Laaser-Webb	Safety Engineer	Iowa DOT- Office of Traffic and Safety
Michael Pawlovich	Data Point of Contact	Iowa DOT- Office of Traffic and Safety
Chris Poole	Safety Programs Engineer	Iowa DOT- Office of Traffic and Safety
Iowa DOT Office of Systems Planning		
Sam Sturtz	Transportation Planner	Iowa DOT-Office of Systems Planning
Iowa DOT Office of Local Systems		
Nicole Fox	Secondary Roads Engineer	Iowa DOT- Local Systems
Iowa DOT Office of Strategic Communications		
Andrea Henry	Director	Iowa DOT - Office of Strategic Communications
Iowa Department of Public Safety Governor's Traffic Safety Bureau		
Joanne Tinker	Program Evaluator, GTSB, STRCC	Iowa DPS- Governor's Traffic Safety Bureau
Pat Hoye	Chief, Governor's Traffic Safety Bureau	Iowa DPS- Governor's Traffic Safety Bureau
Iowa State University		
David Veneziano	LTAP Safety Circuit Rider	Iowa State University- LTAP
Keith Knapp	Director of the Iowa Local Technical Assistance Program	Iowa State University- LTAP
University of Iowa		
Cara Hamann	Associate Researcher	University of Iowa-Injury Prevention Research Center
Iowa Department of Public Health		
Kathy Leinenkugel	Program Coordinator	Iowa Dept. Public Health- Occupational Health & Safety
Snyder & Associates, Inc.		
Mark Perington	Project Manager	Planning and Engineering Consultant
Jennifer Roberts	Planner	Planning and Engineering Consultant

APPENDIX B:

IMPLEMENTATION TEAM LIST



Implementation Team List SHSP Update (2017-2018)

The list includes representatives that were invited to or attended the Implementation Team Meetings

FIRST	TITLE	ORGANIZATION
FHWA Iowa Division Office		
Paul LaFleur	Safety Engineer	FHWA Iowa Division Office
Tom Parham	Safety and Operations Engineer	FHWA Iowa Division Office
FMCSA Iowa Division Office		
Shirley McGuire	Division Administrator	FMCSA Iowa Division Office
NHTSA Region 7		
Dean Scott	Program Manager	NHTSA Region 7
Iowa DOT Office of Traffic and Safety		
Steve Gent	Director, Office of Traffic and Safety	Iowa DOT - Office of Traffic and Safety
Jan Laaser-Webb	Safety Engineer	Iowa DOT- Office of Traffic and Safety
Michael Pawlovich	Data Point of Contact	Iowa DOT- Office of Traffic and Safety
Chris Poole	Safety Programs Engineer	Iowa DOT- Office of Traffic and Safety
Willy Sorenson	Traffic and Safety Engineer	Iowa DOT- Office of Traffic Safety
Iowa DOT Office of Systems Planning		
Craig Markley	Director, Office of Systems Planning,	Iowa DOT- Office of Systems Planning
Sam Sturtz	Transportation Planner	Iowa DOT-Office of Systems Planning
Iowa DOT Office of Local Systems		
Nicole Fox	Secondary Roads Engineer	Iowa DOT- Local Systems
Iowa DOT Motor Vehicle Division		
David Lorenzen	Chief, Motor Vehicle Enforcement	Iowa DOT- Motor Vehicle Division
Iowa DOT Office of Traffic Operations		
Scott Marler		Iowa DOT- Traffic Operations
Iowa DOT Office of Driver Services		
Melissa Spiegel	Director	Iowa DOT - Office of Driver Services
Dennis Kleen	Data Point of Contact	Iowa DOT- Office of Driver Services
Iowa DOT Office of Strategic Communications		
Andrea Henry	Director	Iowa DOT - Office of Strategic Communications
Tracey Bramble	Information Specialist	Iowa DOT- Office of Strategic Communications
Iowa Department of Public Safety Governor's Traffic Safety Bureau		
Joanne Tinker	Program Evaluator, GTSB, STRCC	Iowa DPS- Governor's Traffic Safety Bureau
Pat Hoye	Chief, Governor's Traffic Safety Bureau	Iowa DPS- Governor's Traffic Safety Bureau
Iowa Department of Public Safety Iowa State Patrol		
Randy Kunert	Major (Colonel's designee)	Iowa DPS - Iowa State Patrol
Iowa Department of Public Safety Iowa Fire Service Training Bureau		
Randy Novak	Bureau Chief	Iowa DPS- Iowa Fire Service Training Bureau
Marshall County		
Paul Geilenfeldt	Engineer	Marshall County
Montgomery County		
Brad Skinner	Engineer	Montgomery County
Iowa State University		
Zachary Hans	Research Engineer	Iowa State University- CTRE
David Veneziano	LTAP Safety Circuit Rider	Iowa State University- LTAP
Keith Knapp	Director of the Iowa Local Technical Assistance Program	Iowa State University- LTAP
University of Iowa		
Cara Hamann	Associate Researcher	University of Iowa-Injury Prevention Research Center
Iowa Department of Human Rights		
Laura Roeder-Grubb	Information Technology Specialist	Iowa Department of Human Rights- CJJP
Iowa Department of Public Health		
Joe Ferrell	EMS Regulations Manager	Iowa Dept. Public Health- Bureau of EMS
Kathy Leinenkugel	Program Coordinator	Iowa Dept. Public Health- Occupational Health & Safety

APPENDIX C:

IMPLEMENTATION TEAM MINUTES



Meeting Notes

May 5th, 2016 9:00AM – 12:45PM
Strategic Highway Safety Plan Update
Implementation Team
Oran Pape Building, Des Moines, IA

Introductions

Jan Laaser-Webb provided an introduction of the Snyder & Associates team, Jennifer Roberts and Mark Perington. See attached attendance list.

Overview of Update Process and Schedule

Jennifer Roberts provided an overview of the Strategic Highway Safety Plan Update Process, tasks and objectives for each Implementation Team meeting, and the overall schedule for the update.

Overview of Goals for the Meeting

Jennifer Roberts provided an overview of the goals for the meeting to the group.

Review Crash Data

Jennifer Roberts began the overview of the draft crash data technical memo. She began by going over the frequencies and five-year moving averages.

Willy Sorenson asked about the color coding for the charts on pages 2 and 3 of the technical memo. Jennifer Roberts responded that the color coding corresponded to High, Medium, and Low opportunity to reduce severe injuries and that this color scheme was carried over from the last plan.

Jennifer Roberts discussed the 15% severe injury reduction goal and mentioned that the state will likely meet that goal with severe injuries, fatalities, and major injuries if current trends continue.



Jennifer Roberts then began discussing the rates of severe injuries and fatalities per 100 million vehicle miles traveled (VMT) calculated for the emphasis areas on Pg. 7 of the technical memo.

Cara Hamman asked if the rates should actually consider the VMT of travel that is specific to the mode as opposed to using the total VMT. I.E. Motorcycle rates with Motorcycle VMT? Michael Pawlovich responded that there was difficulty with a lack of estimates of VMT for various modes.

Willy Sorenson asked if animal-related crashes could be accommodated in the data. Michael Pawlovich and Jan Laaser-Webb responded that these were not previous emphasis areas from the last Strategic Highway Safety Plan.

Jennifer Roberts then began reviewing roadway types and rates for severe and fatal injury related crashes by emphasis area.

Cara Hamman asked if the roadway rates used VMTs that were subtotaled by each roadway system. Jennifer Roberts responded that they were.

Paul LaFleur asked if the rates on page 11 of the technical memo could also be subtotaled to compare state vs. local system rates (combining city and county). Sam Sturtz noted that urban vs. rural rates be calculated as well.

Cara Hamman made a general comment that the calculation of the rate and denominator be noted for all locations displaying rates.

After discussing that motorcycle and older driver severe injuries had increased over the two five-year periods, Jennifer Roberts then provided an overview of the new safety areas generated from the crash data analysis (Older Drivers and Motorcycles). Jennifer went over the Older Driver safety area first.

After Jennifer Roberts reviewed the Older Driver Safety area crash data, Jan Laaser-Webb then asked if the group agreed with adding the older driver safety area and the group agreed.

Then Jennifer Roberts provided an overview of the Motorcycle crash data. Paul LaFleur and Shirley McGuire had questions about the tables on Page 24 and asked



if the percentages for the unhelmeted table indicated a subset of the total motorcyclist severe injuries. After some discussion it was decided to adjust the tables or remove the table indicating age totals for all motorcyclist severe injuries.

Jennifer Roberts then provided a summary of the crash data analysis and finished the review of the Crash Memo.

The rest of the comments/notes were taken in the SHSP Revisions document and provided to the Implementation Team for their review.

Strategic Highway Safety Plan Implementation Team 5-5-2016
Sign-In Sheet

Initials	Phone	Name	Organization	Email
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		Craig Markley	DOT - Office of Systems Planning	Craig.Markley@dot.iowa.gov
		Dave Lorenzen	DOT - Office of Motor Vehicle Enforcement	david.lorenzen@dot.iowa.gov
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<i>KN</i>	515-294-8817	Keith Knapp	Iowa LTAP	kknapp@iastate.edu
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		Randy Novak	Iowa Fire Service Training Bureau	novak@dps.state.ia.us
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JENNIFER ROBERTS "

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Meeting Notes

August 4th, 2016 9:00AM – 12:00PM
Strategic Highway Safety Plan Update

Implementation Team

Iowa DOT Motor Vehicle Building, Ankeny, IA

Introductions

Everyone attending provided introductions. See attached attendance list.

Overview of Update Schedule and Goals for the Meeting

Jennifer Roberts provided an overview of the Strategic Highway Safety Plan Update Process, and discussed the schedule and tasks to be completed within the next few weeks. She discussed that during the meeting, the group would be reviewing draft goals and strategies for the SHSP plan and providing input on those goals and strategies. Additionally major changes to the text in the update section would be considered, however minor word edits would need to be provided outside of the meeting for meeting efficiency.

Jennifer discussed the role of Snyder & Associates for this particular meeting as reviewing changes made to the goals and strategies since the 2013 update, and why those changes occurred. She discussed the role of the implementation team as providing input on whether the goals and strategies should be revised, how they relate to one another, and if they were implementable.

Jennifer also noted several items for the group to keep in mind during review of the goals and strategies. She stated that since it was a two year update to the 2013 plan, the strategies would need to be implemented in that period of time (2017 –2018). Jennifer and Jan Laaser-Webb warned against having too many goals or strategies that depended on outside stakeholder cooperation or influence, and to keep in mind the overarching goals of reducing serious and fatal injuries. Jennifer also provided an overview of some of the highlights from the crash tech memo from the prior team meeting in May.



Review of Goals and Strategies

Before Jennifer Roberts began the review of the goals and strategies, Kathy Leinenkugel noted some suggested changes that needed to be made to the crash tech memo, specifically the rankings on the emphasis area pages.

Jennifer Roberts then began the overview of the goals and strategies, beginning with the introduction page. Jennifer discussed the addition of two new targets as a result of new legislation and the mandated performance measures. These targets included fatality and serious injury rate per 100 million VMT. Laura Roeder-Grubb noted that there needed to be a definition of serious, fatal, and severe injuries included and perhaps a glossary for definitions of terms.

Samuel Sturtz asked if the fatal and serious injury rates were the only rates that needed to be added. Paul Lafleur and Jan Laaser-Webb were unsure if the bicycle-pedestrian rate needed to be included. Paul Lafleur later checked and said that it did not. Laura Roeder-Grubb asked if 2011-2015 data could be incorporated and included in the graphs on the front page. Jennifer responded that it could, but that it may be necessary to then change the entire crash tech memo. The group decided that the SHSP graphs would incorporate the 2011-2015 data, but that the crash tech memo would still use the 2010-2014 data, due to that time frame being the most complete dataset at the time analysis was conducted.

Jennifer Roberts then discussed the multi-media education page along with the goals and strategies. Laura Roeder-Grubb noted that the survey on that page needed to include an N (Total Surveyed), to give the readers context to the percentages. For the “place engagement materials” at public rest areas, Melissa Spiegel noted that Zero Fatalities messages could also be displayed on screens at Driver’s License stations.

It was mentioned that the goals and the strategies seemed flipped. This began a discussion of the definition of goal vs. strategy. Many terms were mentioned as replacements such as objectives, methods, targets, and action items. It was decided for the purposes of the meeting and draft document development, that strategies were the overarching actions that would help achieve the goals, and goals were the measurable component of those strategies as they included targets.



Jennifer then moved on to the “Enhance Driver Education” section and Paul Lafleur mentioned that distracted driving should be incorporated into the public outreach portion of the driver’s education section. Melissa Spiegel also mentioned that a goal could be added discussing the rewrite of the driver’s education curriculum and Jan Laaser-Webb suggested that multidisciplinary input could be included in that rewrite. Jennifer Roberts said she would add that as a goal. Jan Laaser-Webb suggested that the first two goals in the list, “Create parent materials” and “Encourage more behind-the-wheel instruction time” could be removed. Jennifer Roberts also stated that the public outreach related goals could fall under multimedia education as opposed to driver’s education.

Jennifer Roberts then moved on to the “High Visibility Enforcement” section and reviewed the changes made to that section. This included the addition of an annual special corridor enforcement event, increasing seatbelt compliance, and a motor vehicle enforcement inspection number. Jennifer Roberts then asked about a target for the motor vehicle inspections goal. Tom Bruun stated that they have a number of motor vehicle inspections that they perform each year and he could provide those numbers to her. Cara Hamman asked if there could be a goal related to child passenger restraints. The group discussed goals that would be appropriate to include in the High Visibility Enforcement area and Cara Hamman, Joanne Tinker, and Jan Laaser-Webb said that they would come up with a child passenger restraint goal and coordinate with Jennifer on that goal.

The group then moved on to the “Deploy State-of-the Art Technology” goals and strategies. Jennifer Roberts quickly went over the changes for these goals as there weren’t many changes. It was discussed that the goal for LIDAR units for enforcement vehicles would be switched from a percentage of all vehicles to a numerical increase in units. This would be easier to track. Jennifer Roberts would follow up with David Lorenzen and Tom Bruun to get the number for all Motor Vehicle Enforcement and Iowa State Patrol vehicles.

The group then moved on to the “Expand Impaired Enforcement Programs” section and Jennifer Roberts discussed the addition of two goals, maintaining the drug recognition certifications for trained officers and supporting a 100% BAC and Drug (THC) testing for all crashes involving fatalities. Joanne Tinker thought that



the existing target for additional officers trained in ARIDE was too high, and she would check to see if it should be changed to 300.

Jennifer Roberts then moved the group to the “Engineering” goals and strategies, and specifically the engineering countermeasures to prevent lane departure crashes. Jennifer went over the additions that were made to the section including the addition of a goal for four-three lane conversions, developing district road safety plans, development of an HSIP manual and incorporating safety data analysis into the project identification and prioritization process.

Paul LaFleur noted that, given the higher crash rates on county and local systems, there may be a need to include goals and strategies on the local system. Items such as shoulder treatments and rumble strips could be a measurable way of incorporating engineering countermeasures with that local emphasis. Brad Skinner mentioned a need for a study to understand the correlation of risk factors for local and state road lane departure crashes and that perhaps this needed to be included as a goal. Jan Laaser-Webb and Brad Skinner went back and forth discussing this goal, it was decided that they would coordinate on the wording of this goal with Jennifer Roberts.

The group then moved to a discussion of the intersections related goals and strategies for the engineering section. Jennifer Roberts discussed that the only additional goal was the development of an intersection evaluation tool and that the local destination lighting goal was removed. She also noted that specific examples were provided for “innovative intersections”. Steve Gent had asked how many rural expressway intersection improvements would be completed over the next two years as the goal was to complete four. He stated that those improvements typically take a long time and are not completed at that pace. The group discussed what qualified as an “improvement” and decided to expand the definition to include offset turn lanes as those occur more frequently than large scale intersection improvements.

Jennifer Roberts then moved on to the policy safety area and specifically the “Enhance Multi-agency Collaborative Efforts” section. There were few changes to this section with the exception of a completion of a few of the goals. No additional changes were discussed.



The group then moved on to the “Strengthen Legislative Policies” section and Jennifer Roberts discussed the slight wording changes to the goals and strategies related to legislative action. She suggested that it was difficult for safety stakeholders to pass legislation and the 2013 SHSP wording did not accommodate for that. Therefore words such as “enact”, or “modify” for legislative policy would be changed to “encourage”, “promote”, and “permit”. Additionally, the goal was changed from strictly providing reports to also including presentations. No additional legislative priorities were added.

The next area for discussion was the “Data Management and Use” safety area. Jennifer Roberts noted that the primary changes to this area were due to goals being accomplished. There was an addition of two goals to the emphasis area including the addition of a Highway Safety Manual incorporation meeting and working to facilitate connections and integration between justice, licensure, EMS, and traffic-related datasets. Cara Hamman suggested that crash/trauma data should be added to the goal.

Jan Laaser-webb and Dennis Kleen discussed the DQAC meetings as a more measurable goal to replace the facilitate connections and integration goal. Jennifer Roberts noted that the “facilitate connections” goal could be moved to the strategies section, and a more measureable goal for DQAC meetings could replace it. An additional goal was suggested by Chris Poole and Jan Laaser-Webb to complete the curve and intersection database and inventory for accessibility and use by all interdisciplinary professionals.

The final area, “Emerging Trends”, was discussed by the group. Jennifer noted that this area used to be two separate pages but has since been combined. This was due to the fact that some necessary stakeholders for the areas still had not been identified. Therefore the goals and strategies for the areas focused on beginning conversations and identifying stakeholders. Laura Roeder-Grubb suggested the addition of a goal to review and provide data to stakeholders for the specific emphasis areas.

Kathy Leinenkugel also noted that the Department on Aging would be a crucial stakeholder for the older driver emphasis area. Jan Laaser-Webb suggested the addition of two goals that were provided by Melissa Spiegel earlier in the meeting. These goals included “outreach to unlicensed motorcyclists to



encourage training and licensure” and “outreach to families with older family members or friends on how to begin conversations about driving restrictions”. Laura Roeder-Grubb cautioned against the use of adjectives in the document such as “steady”, “slight”, and “small” when describing numbers and percentages.

After reviewing the final section, the group discussed the schedule and process moving forward. Since there were some more substantial edits and revisions, Jennifer Roberts said she would send the revised SHSP out to the group the following Monday with edits incorporated. By August 12th, the Implementation Team would have its final opportunity to provide content edits and changes to Jennifer Roberts and Mark Perington. Mark Perington and Jan Laaser-Webb discussed how the document would progress and move forward through review.

The Implementation Team would see a finalized/formatted version of the document by the November 3rd Implementation Team meeting.

Strategic Highway Safety Plan Implementation Team Meeting

8-4-2016 Sign-in Sheet

Initials	Name	Office	Email
	Andrea Henry	Iowa DOT- Office of Strategic Communications	Andrea.Henry@dot.iowa.gov
BS	Brad Skinner	Montgomery County	bskinner@montgomerycoia.us
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APPENDIX D:

STATEWIDE CRASH DATA ANALYSIS MEMO

Project: 2017-2018 Strategic Highway Safety Plan Update

Topic: Statewide Crash Data Analysis Memo

EXECUTIVE SUMMARY

The information referenced in this Crash Data Analysis Memo includes data from the previous 2013 Strategic Highway Safety Plan (SHSP) Update as well as information provided by the Iowa DOT. The 2010-2014 data referenced in this memo was also provided by the Iowa DOT and was used to inform this crash tech memo as it was the latest data available at the time this memo was written. Several tables were reviewed to produce the analysis in this document. This included statewide crash and severe injury frequency tables, 5-year moving average injury frequency tables, and statewide crash and injury rates.

Data Trends:

Overall, severe injuries and fatalities are down across all major emphasis areas and categories when 2010-2014 numbers are compared to the numbers for the last update period (2007-2011). The state is also making progress toward the 15% reduction goal in all categories, severe injuries (fatal and serious combined), fatalities, and serious injuries. However, two emphasis areas have increased in total numbers and percentage change since the last update; Motorcycles and Older (65 or older) Drivers. These areas may need to be addressed with goals and strategies for this update, given their recent increase.

Rates and Roadways:

Severe injury and fatality rates are 6.01 severe injuries and 1.10 fatalities per 100 million Vehicle Miles Traveled (VMT). For roadways, all categories have seen reductions in crashes including urban/ rural roads, and state, city, and county roadways. State and City roadways experienced the largest decrease in crashes, with county roadways having the lowest decrease in crashes over the three year period. Additionally, the local road system, and more specifically county roadways, appears to have the highest rate of crashes involving severe injuries per 100 million VMT.

Emphasis Area Summary:

Safety emphasis areas that have the highest amount of crossover with other categories, in order of highest percentage in most categories include: Local roads, lane departures, speed-related, unprotected persons, roadside collisions, younger drivers (14-24 yrs), intersections, motorcycles, and impaired (under the influence of alcohol or drugs) driving. Road types that have the highest contribution to all emphasis area-related crashes resulting in severe injuries are urban and rural two lane roadways and secondary paved roadways. The exception is intersection related crashes which correspond highest with expressway/multi-lane road types in addition to two-lane roadways. Based on the roadway analysis, two lane roadways have the highest number of crashes across all categories by far. Younger drivers also have a high proportion of expressway/multi-lane crashes that result in severe injuries.

FREQUENCIES

The table below displays severe (fatal + serious) injury, fatal injury and serious injury frequencies for the 2010-2014 five-year period. This table also displays the percentage of all severe injuries represented by each emphasis area. The emphasis areas with the highest number of severe injuries included lane departures, local roads, speed-related, unprotected persons, younger drivers, roadside collisions, and intersections in the order of highest to lowest. Additionally, the emphasis areas were organized into topic areas and colored to indicate high opportunity (>30%), medium opportunity (<30%, >10%), and low opportunity (<10%) to reduce severe injuries. To better compare the numbers for each category against the numbers provided for the 2013 SHSP Update, the tables were organized in the same format.

2007-2011 Five-Year Total Frequencies						
Category/ Safety Emphasis Area		Severe Injury Rank	Severe	Fatalities	Serious	% of Total
Statewide Totals		N/A	10,575	1,977	8,598	100%
Drivers	Speed-related	3	5,126	991	4,135	48%
	Unprotected Persons	4	3,971	1,044	2,927	38%
	Younger Drivers	5	3,862	607	3,255	37%
	Impaired Driving	8	1,902	492	1,410	18%
	Older Drivers	9	1,723	431	1,292	16%
	Inattentive/ Distracted Driving	14	477	66	411	5%
Highway	Lane Departures	1	5,609	1,332	4,277	53%
	Local Roads	2	5,521	931	4,590	52%
	Roadside Collisions	6	3,485	752	2,733	33%
	Intersections	7	3,210	425	2,785	30%
	Winter Road Conditions	11	1,244	213	1,011	12%
	Work Zones	16	159	35	124	2%
	Train	17	47	13	34	0%
Special Users	Pedestrians	13	561	112	449	5%
	Bicycles	15	227	27	200	2%
Vehicles	Motorcycles	10	1,491	257	1,234	14%
	Heavy Trucks	12	1,209	371	838	11%
	Other Special Vehicles	16	193	47	146	2%

2010-2014 Five-Year Total Frequencies						
Category/ Safety Emphasis Area		Severe Injury Rank	Severe	Fatalities	Serious	% of Total
Statewide Totals		N/A	9611	1,753	7,858	100%
Drivers	Speed-related	3	4,746	901	3,845	49%
	Unprotected Persons	4	3,517	896	2,621	37%
	Younger Drivers	5	3,350	497	2,853	35%
	Impaired Driving	8	1,893	515	1,378	20%
	Older Drivers	9	1,761	395	1,366	18%
	Inattentive/ Distracted Driving	14	469	59	410	5%
Highway	Lane Departures	1	5,153	1,177	3,976	54%
	Local Roads	2	5,072	885	4,187	53%
	Roadside Collisions	6	3,277	651	2,626	34%
	Intersections	7	2,888	384	2,504	30%
	Winter Road Conditions	12	906	159	747	9%
	Work Zones	17	152	31	121	2%
	Train	18	47	15	32	0.49%
Special Users	Pedestrians	13	494	107	387	5%
	Bicycles	15	236	23	213	2%
Vehicles	Motorcycles	10	1,515	243	1,272	16%
	Heavy Trucks	11	1,106	329	777	12%
	Other Special Vehicles	16	176	52	124	2%

- = high opportunity to reduce severe injuries
- = medium opportunity to reduce severe injuries
- = low opportunity to reduce severe injuries
- = Increase from 2007-2011 5-year period

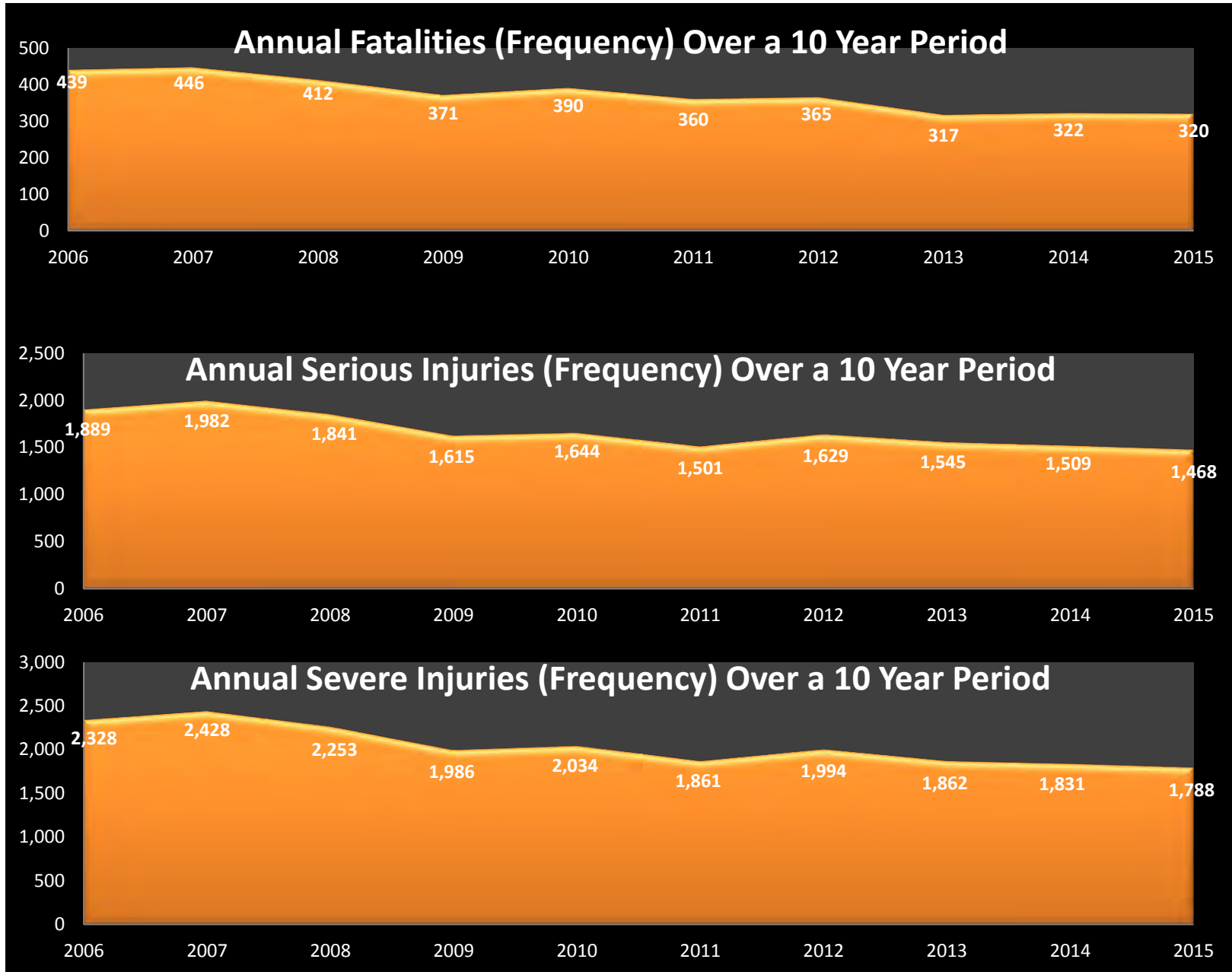
* Numbers in this table do not add up to the statewide crash numbers due to one crash having the potential to be categorized into multiple emphasis areas.

According to the tables above, total numbers for crashes and injuries have been reduced across nearly all categories from the 2007-2011 period. The categories that were not reduced had one category or other increase, either in fatalities or serious injuries. Those categories that did have an increase included older drivers, impaired driving, bicycles, train, other special vehicles and motorcycles.

The distribution of the emphasis area percentage of total for severe injuries did not change significantly between the two time periods. There were increases or decreases of a percentage point in one emphasis area or another; however, the majority remained nearly the same. The one exception was winter road conditions, which decreased by three percentage points.

The charts on the following page display Fatalities and Serious Injuries over the last 10 year period (2006-2015). The graphs show the variations in frequency from year to year, but also display a general trend of declining frequencies as the year's progress for both Fatalities and Serious Injuries.

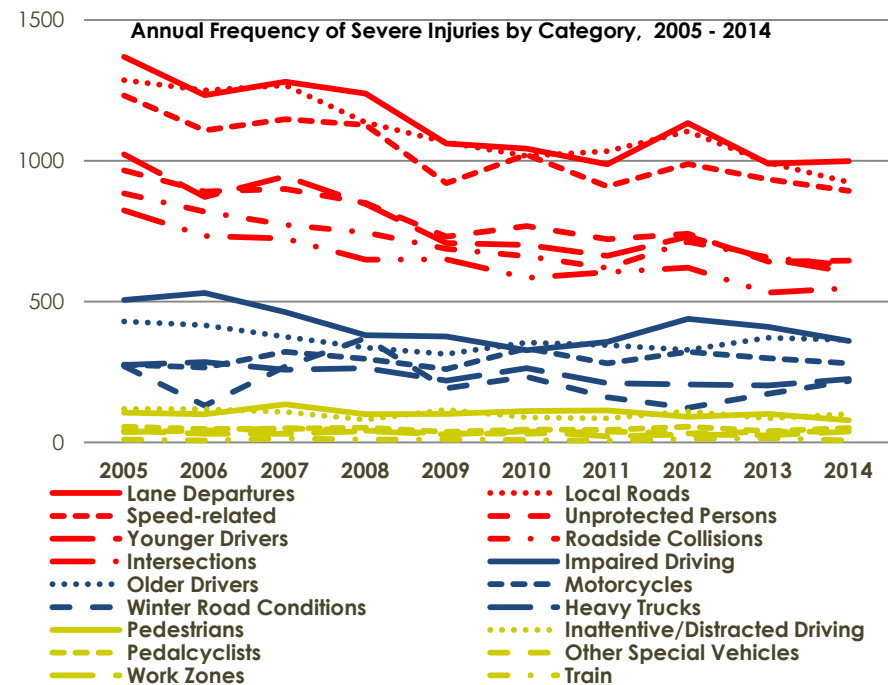
This overall decline can also be seen for severe injuries over the 10 year period, which combines fatal and serious injuries together.



STATEWIDE FIVE-YEAR MOVING AVERAGES

When reviewing the total number averages and average percentage change for the 5-year spans, severe injuries have been gradually decreasing during the 2006-2010, 2007-2011, & 2008-2012 periods. The level of total percentage change averaged approximately -4% each year during that time span. However, the percentage decline for the last two 5-year averages was -3.81% and -1.55%. This would seem to indicate that the steady downward trend has begun to slow and level off over the past two five-year averages.

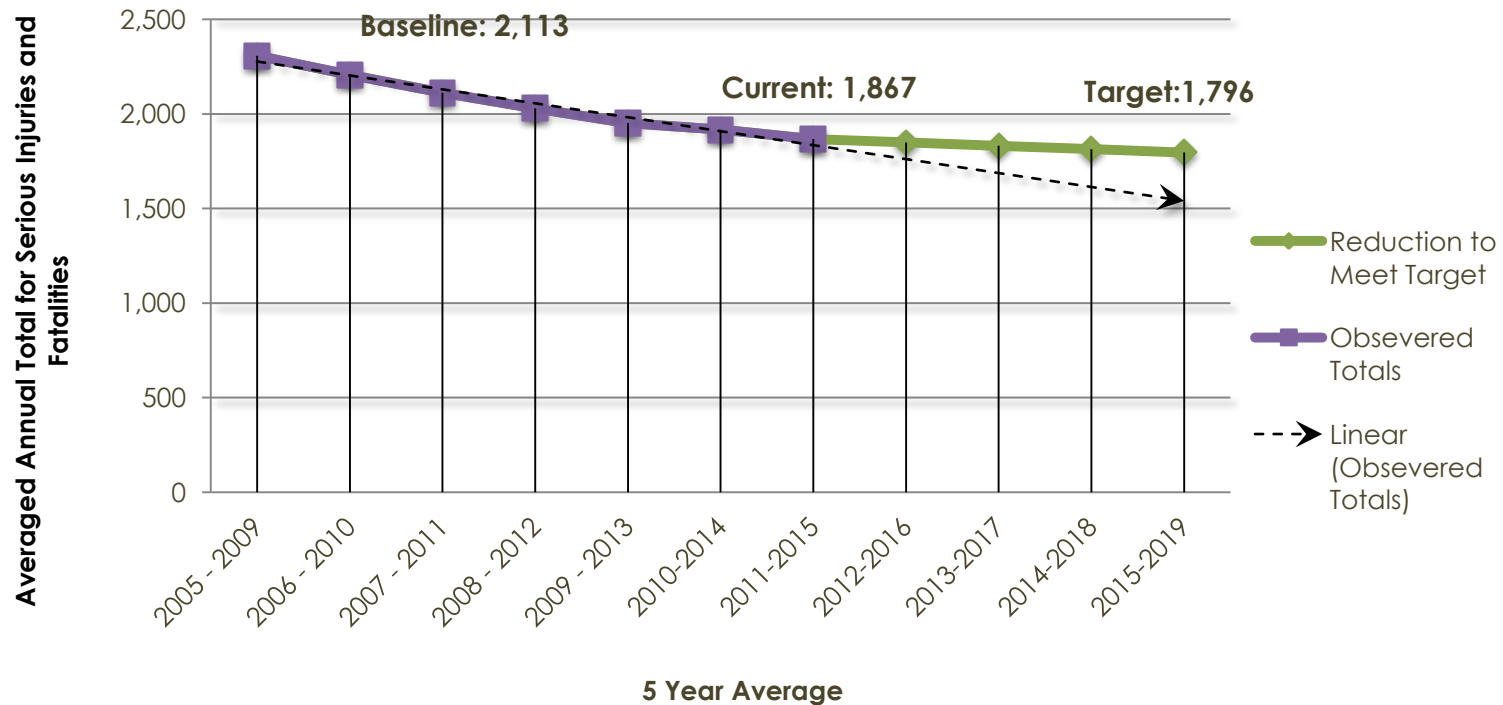
	2006 – 2014 5-year Moving Average Frequency Annual Percentage Change for Severe Injuries				
	2006 - 2010	2007 - 2011	2008 - 2012	2009 - 2013	2010 - 2014
Totals	-4.37%	-4.15%	-4.02%	-3.81%	-1.55%
Younger Drivers	-7.33%	-5.14%	-5.52%	-5.32%	-3.01%
Older Drivers	-4.01%	-3.96%	-2.73%	2.09%	2.92%
Speed-related	-3.81%	-3.74%	-3.10%	-3.89%	-0.57%
Impaired Driving	-7.90%	-8.38%	-1.21%	1.60%	-0.84%
Inattentive/Distracted Driving	-5.73%	-6.47%	0.42%	1.04%	-3.10%
Unprotected Persons	-4.56%	-4.11%	-4.01%	-5.46%	-2.39%
Train	-2.00%	-4.08%	-2.13%	8.70%	-6.00%
Lane Departures	-5.27%	-4.20%	-2.62%	-4.54%	-1.19%
Roadside Collisions	-5.71%	-5.43%	-1.75%	-2.57%	-1.77%
Intersections	-6.70%	-3.86%	-3.24%	-3.77%	-3.41%
Work Zones	-0.59%	-5.92%	-1.26%	-9.55%	7.04%
Local Roads	-4.48%	-3.77%	-2.97%	-2.67%	-2.72%
Winter Road Conditions	-3.01%	2.51%	-12.01%	-18.29%	2.95%
Pedestrians	0.92%	2.38%	-7.86%	0.19%	-4.45%
Bicycles	-4.56%	-1.30%	3.08%	-5.13%	6.31%
Motorcycles	4.09%	1.02%	0.00%	0.20%	1.34%
Heavy Trucks	-0.85%	-5.81%	-4.36%	-5.34%	0.55%
Other Special Vehicles	-2.48%	-2.03%	-9.33%	-2.86%	3.53%



The trend charts on the following pages show observed and target totals for 5-year moving averages of severe injuries, fatalities, and serious injuries. These charts specifically were updated after the memo was written to include 2011-2015 data in an effort to provide more updated charts for the performance measures included as a part of the SHSP. These charts were updated toward the end of the planning process when the 2011-2015 crash data became available; therefore the rest of the crash tech memo includes 2010-2014 data.

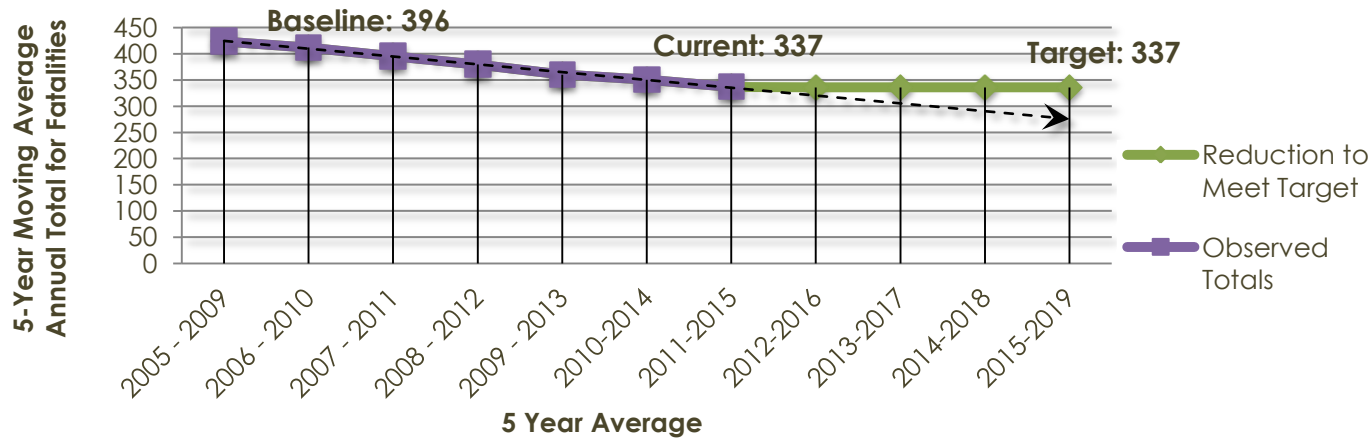
When the past 5 years of percentage change are reviewed using the 2007-2011 average as a baseline, severe injury frequencies have decreased by approximately 12%. These totals cover the 2005-2009 period through the 2015-2019 (target year) period. As can be seen by the chart below, these graphs display observed totals for each 5-year moving average, using a linear fit to identify the trend for observed totals (2005-2009 average; 2011-2015 average). If severe injuries continue to decline at the same rate they have over the past decade of data collection, then the state will exceed its 2020 goal for reducing severe injuries by 15%.

2020 15% Severe Injuries Reduction Target

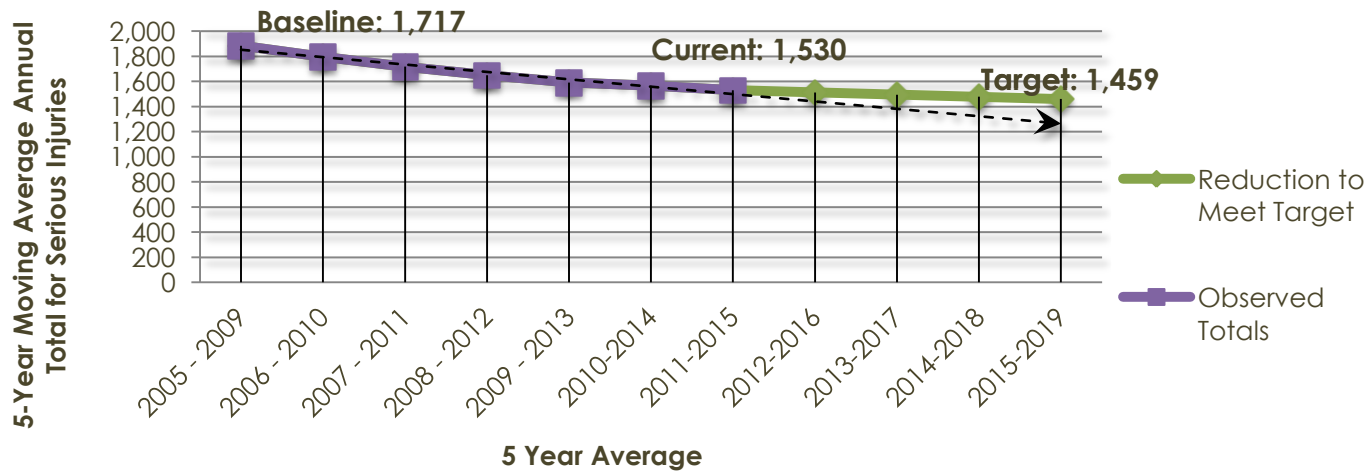


When looked at separately, fatalities and serious injuries are also independently on track to reach the 15% reduction goal by 2020. In fact, the 15% reduction target for fatalities has been achieved with a 15% reduction in fatalities since the target was set in 2013. For serious injuries, an 11% reduction has been achieved from the baseline period.

2020 15% Fatalities Reduction Target



2020 15% Serious Injuries Reduction Target



Across all the different categories, overall percentage changes have remained negative over the last two 5-year periods. However, most categories vary on the level of negative change, with some categories even having positive percentage change for particular years or for the past two five-year averages. Only two categories have had consistent positive percentage change for the past two five-year periods consecutively, **older driver** and **motorcyclist** severe injuries. Although these categories are still not the highest in terms of the percentage of total severe injuries, their increase warrants discussion as new emphasis areas and it may be important to develop new strategies to address these increases. Specific trends for each emphasis area will be discussed in more detail in the emphasis areas section.

RATES & ROADWAY FACTORS

Although comparing frequencies and trends can provide a picture of the progress the State has made meeting goals and reduction targets, a comparison of rates for severe injuries and fatalities can provide a better context in which to evaluate those goals and emphasis areas. The discussion and charts in the following pages will cover rates as well as roadway location and type to provide a more complete picture of crashes in Iowa. The table below displays five-year totals for each emphasis area, the percentage of overall totals for each emphasis area, ranking, average crashes/year, and the rate/100 million Vehicle Miles Traveled (VMT)*. For severe injuries, rates range from .03 injuries to 3.22 injuries per 100,000,000 VMT. As for fatalities, the rates range from .01 fatal injuries to .74 fatal injuries per 100,000,000 VMT. According to the table, rankings for emphasis areas differ slightly between fatal injuries and severe injuries.

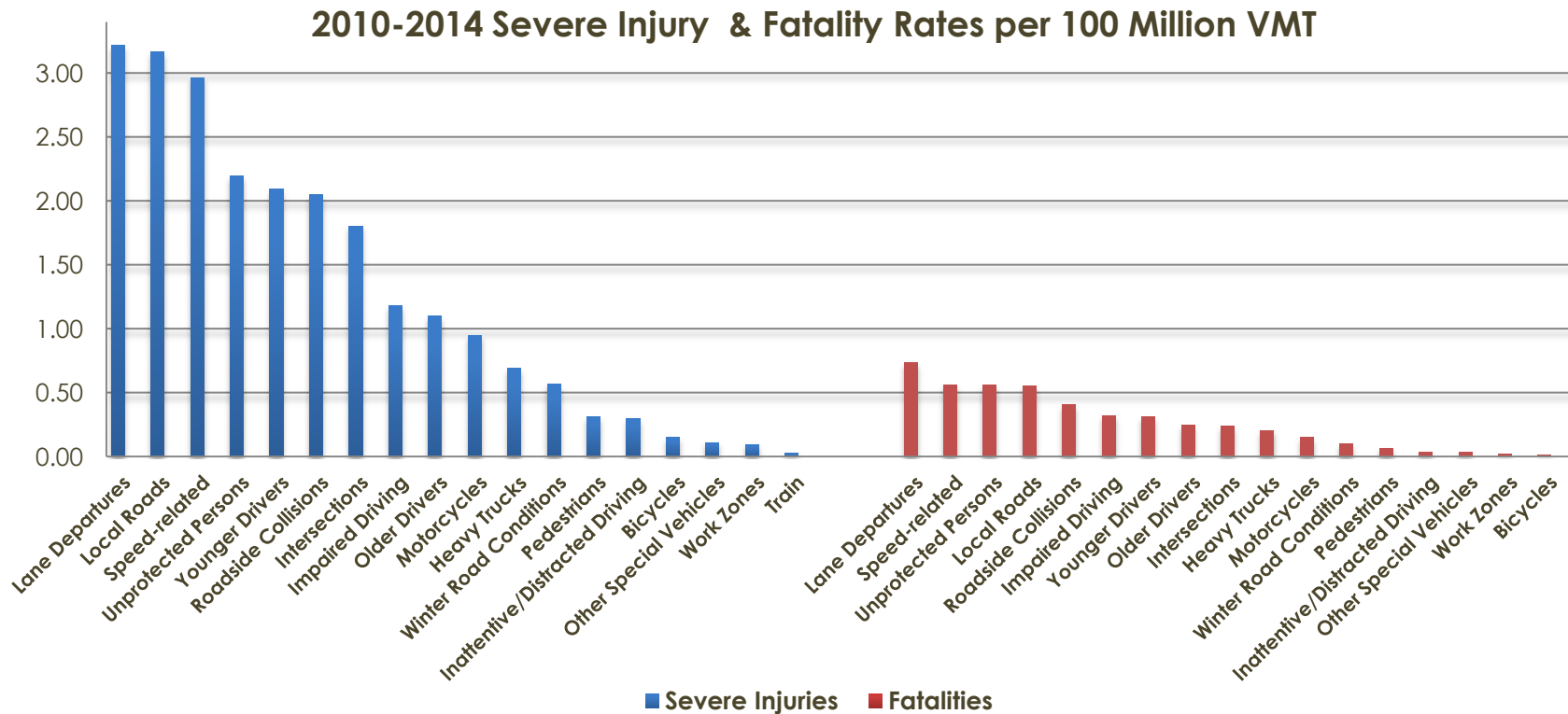
**VMT is calculated for total motor vehicles only, not broken down by subcategories, such as VMT for younger drivers or older drivers. Therefore, the comparison of rates per VMT is limited, and should be interpreted with caution. This is especially problematic for the comparison vulnerable user groups rates, for which we do not have exposure data and for which VMT is a poor measure.*

2010-2014										
	Severe Injuries					Fatalities				
	Frequency	Proportion/Percentage	Rank	Average Crashes/year	Rate/100 million* VMT	Frequency	Proportion/Percentage	Rank	Average Crashes/year	Rate/100 million* VMT
Total	9,611	100%	N/A	1,922.2	6.01	1,753	100%	N/A	350.6	1.10
Younger Drivers	3,350	35%	5	670	2.09	497	28%	7	99.4	0.31
Older Drivers	1,761	18%	9	352.2	1.10	395	23%	8	79	0.25
Speed-related	4,746	49%	3	949.2	2.97	901	51%	2	180.2	0.56
Impaired Driving	1,893	20%	8	378.6	1.18	515	29%	6	103	0.32
Inattentive/Distracted Driving	469	5%	14	93.8	0.29	59	3%	14	11.8	0.04
Unprotected Persons	3,517	37%	4	703.4	2.20	896	51%	3	179.2	0.56
Train	47	0%	18	9.4	0.03	15	1%	18	3	0.01
Lane Departures	5,153	54%	1	1,030.6	3.22	1,177	67%	1	235.4	0.74
Roadside Collisions	3,277	34%	6	655.4	2.05	651	37%	5	130.2	0.41
Intersections	2,888	30%	7	577.6	1.80	384	22%	9	76.8	0.24
Work Zones	152	2%	17	30.4	0.09	31	2%	16	6.2	0.02
Local Roads	5,072	53%	2	1,014.4	3.17	885	50%	4	177	0.55
Winter Road Conditions	906	9%	12	181.2	0.57	159	9%	12	31.8	0.10
Pedestrians	494	5%	13	98.8	0.31	107	6%	13	21.4	0.07
Bicycles	236	2%	15	47.2	0.15	23	1%	17	4.6	0.01
Motorcycles	1,515	16%	10	303	0.95	243	14%	11	48.6	0.15
Heavy Trucks	1,106	12%	11	221.2	0.69	329	19%	10	65.8	0.21
Other Special Vehicles	176	2%	16	35.2	0.11	52	3%	15	10.4	0.03

*Rates were calculated by dividing severe injury and fatality five-year averages for each emphasis category by the five-year average of total statewide VMT, and multiplying by 100 million

In terms of emphasis area rankings between fatal and severe injuries, fatalities for speed-related and unprotected are ahead of local roads in the rankings at positions two and three, respectively. Additionally, impaired driving fatalities are ahead of younger drivers and intersection fatalities, when compared with severe injury rankings. The heavy truck emphasis area ranks higher than motorcycles in the number of fatal injuries, as opposed to the severe injury ranking where motorcycles are higher. For older drivers, the fatality ranking (8) is higher than the severe injury ranking (9). Overall, the ranking distribution does not differ drastically between severe and fatal injuries. The two exceptions are impaired driving (+2) and local roads (-2), which moved two ranking spots among fatalities.

Below is a chart displaying the severe and fatal injury rates per 100 million VMT by category, ordered from highest to lowest. The categories with the highest rates for fatalities and severe injuries do not follow the same order, meaning that some categories have a higher proportion of fatalities than other categories.

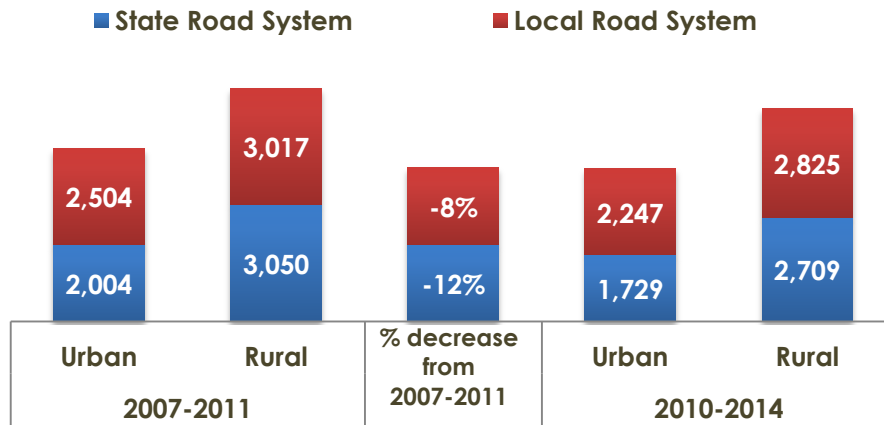


Although driver behavior can play a large part in crashes, roadway factors can also contribute to the severity or cause of the crash. Therefore, it is important to understand where severe injury-related crashes are occurring for the top emphasis areas and which

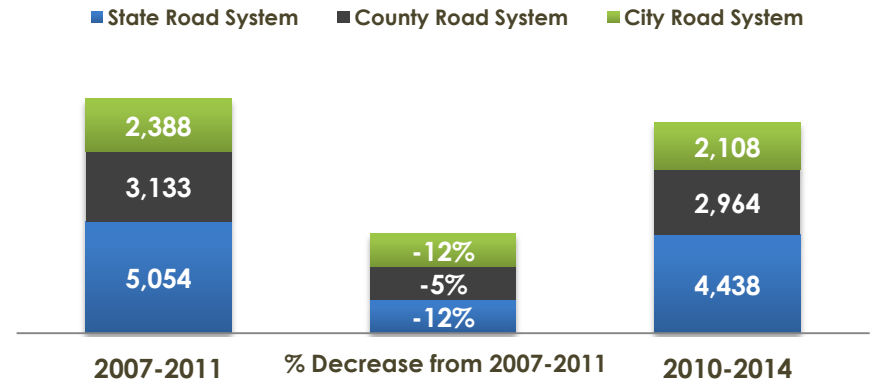
roadway types to target for engineering-related solutions. On the next page are a series of graphs showing the distribution of severe injuries for the 2007-2011 period and the 2010-2014 period.

As can be seen by the graph below, for the 2010-2014 period, severe injuries occurring on state roads decreased by 12%, and severe injuries occurring on the local road system (county and city roads) decreased by 8%. Similarly, severe injuries on urban (within corporate limits) and rural (outside of corporate limits) roads decreased by 12% and 9%, respectively. According to the graph comparing state, county, and city road systems; county roads had the smallest level of decrease at 5% compared to city and state road systems for which both decreased by 12%.

5 Year Total Comparison of Severe Injuries by Urban and Rural and Road System



5 Year Total Comparison of Severe Injuries by Road System

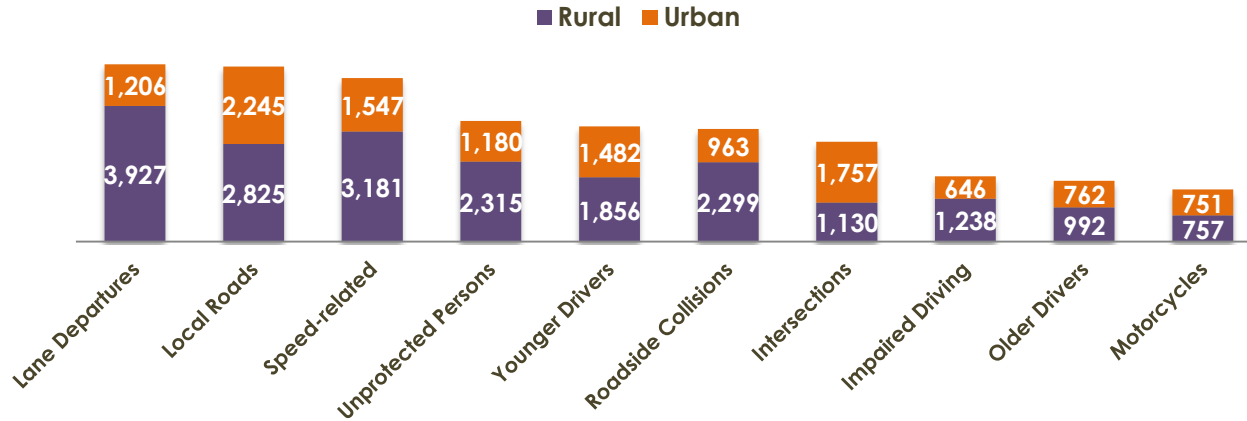


The charts on the next page display similar information to the two charts above, with two primary exceptions. The charts on the next page reflect severe injuries for the 2010-2014 period only, and categorize the data by emphasis area. These charts organize the severe injuries by urban and rural areas and by state, county or city road system. As can be seen by the graph displaying severe injuries by rural and urban areas on the next page, most severe injury-related crashes are primarily in rural areas. With the exception of the intersections emphasis area, either half or a majority of the crashes in each of the emphasis areas are on rural roads. For the severe injuries by road system graph, one can see that the distribution of crashes between road systems varies by emphasis area.

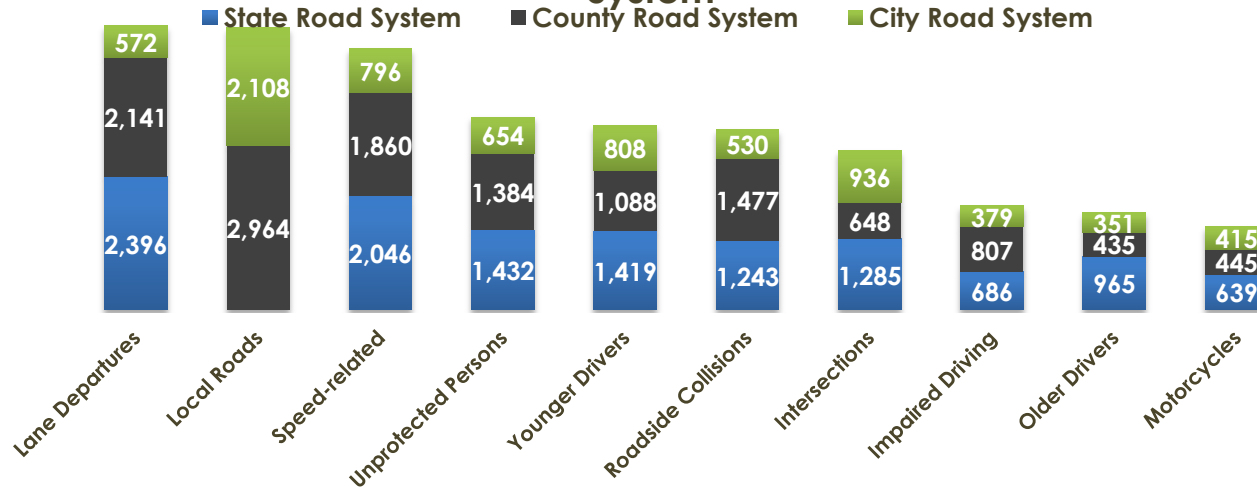
Specifically, for the younger and older driver categories, crashes appear to be evenly split between urban/rural and state/ local. For the lane departure, roadside collisions, speed-related, unprotected persons, and impaired driving categories, rural settings appear to have the highest percentage of crashes. Impaired driving and roadside collisions have a larger percentage of crashes on the local system, with the other categories (lane departure, speed-related, and unprotected persons) fairly evenly split between the state and

the local system. The only emphasis area with a higher percentage in the urban category was the intersection category in which crashes were approximately split between the state and local system. However, the intersection density in urban areas is higher than rural areas, so this is likely due to exposure. It is also true that the majority of Iowa roadways are in rural areas, so the finding showing the majority of crashes as rural is likely exposure-driven. Motorcyclists are split between rural and urban, state and local for crashes. It should be noted that the local roads emphasis area precludes any state road system crashes due to the definition of the emphasis area being 'local roads' and not in the state's jurisdiction.

2010-2014 Severe Injuries by Rural and Urban Area



2010-2014 Severe Injuries by Emphasis Area and Road System



In addition to looking at totals, severe and fatal injury crash rates per 100 million VMT were analyzed by road system types in the following tables. The first table breaks the rates down by primary and local road system. As can be seen by the table below, the severe and fatal injury rates for the local road system is higher.

2010-2014 Severe and Fatal Injury Rates per 100 million VMT by Road System		
Type of Injury	State Road System	Local Road System (City and County)
Severe Injury	4.55	8.14
Fatality	0.88	1.42

Note* (Rates were calculated by dividing severe and fatal injury five year averages for each system type them by five year averages for total system VMT, and multiplying by 100 million.)

The next table breaks down the rates per 100 million VMT by state, county, and city road system. As can be seen by the table, county roadways have the highest severe and fatal injury rates per 100 million VMT. It appears that, of the local road system, county roads share the highest proportion of severe and fatal injuries per 100 million VMT.

2010-2014 Severe and Fatal Injury Rates per 100 million VMT by Road System			
Type of Injury	State Road System	County Road System	City Road System
Severe Injury	4.55	11.08	5.93
Fatality	0.88	2.50	0.61

Note* (Rates were calculated by dividing severe and fatal injury five year averages for each system type by five year averages for total system VMT, and multiplying by 100 million.)

The last table displays severe and fatal injury rates by urban and rural road systems. According to the table below, the rural road system has a slightly higher severe injury rate than the urban rate. The fatality rate for the rural road system was also higher than the urban road system rate.

2010-2014 Severe and Fatal Injury Rates per 100 million VMT by Road System		
Type of Injury	Urban Road System	Rural Road System
Severe Injury	5.80	6.12
Fatality	0.73	1.37

Note* (Rates were calculated by dividing severe and fatal injury five year averages for each system type by five year averages for system VMT, and multiplying by 100 million.)

EMPHASIS AREA CATEGORIES

For each of the emphasis areas, five-year moving averages were analyzed for their degree of percentage change from the previous five year period. Although the moving averages are based on numbers that were averaged over the five year period, the percentage changes identify the annual change. Also, five-year (2010-2014) severe injury totals were analyzed to determine which emphasis areas have the highest crossover with the emphasis area being analyzed, e.g. what percentage of lane departure severe injuries also fall into the 'young drivers' category? The emphasis areas with percentages of 30% or over were colored red in the tables and were also ranked based on those percentages.

Additionally, the same five year totals were analyzed by where they occurred on the roadway system. The road types are organized into 'Freeway' (Freeway Interstate and Non-Interstate), 'Expressway and Multi-lane' (Multi-lane divided and undivided), 2-Lane '(Two Thru Lanes)', 'Secondary (City and County) paved' and 'unpaved', and 'other' which includes the interstate ramp category. For the emphasis areas, all analyses were conducted on severe injuries (fatal and serious injuries combined).

It should be noted that data for each of the emphasis areas were defined as crashes and injuries that involved that emphasis area topic. This means that the crash includes severe or fatal injuries that were involved in the same crash, but may not necessarily have been affiliated with the topic being discussed, e.g., a crash involves an older driver and a younger driver resulting in severe injuries for both. Therefore, this crash produces 2 severe injuries in the older driver emphasis area, even though one of those severe injuries is a younger driver.

For the emphasis areas with a percentage increase over the past two five-year moving averages (Motorcyclists, Older Drivers), the data were analyzed further to identify additional factors contributing to crashes. Additionally, the data were organized to only include statistics related to severe and fatal injuries for that specific emphasis area as opposed to injuries that involved that area. Example: To gather a more accurate representation of the amount of motorcyclists involved in crashes with severe injuries that are unhelmeted, we did not use motorcyclist-involved crashes, but instead looked at motorcyclists themselves that received severe injuries as a result of the crash.

LANE DEPARTURES

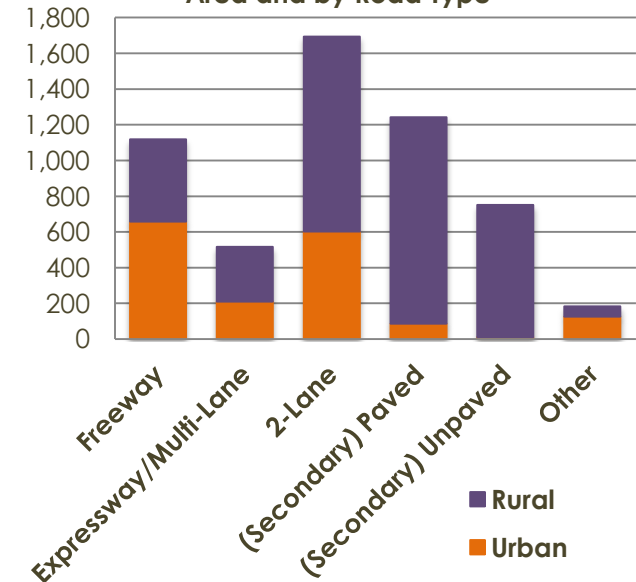
5-Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
.60%	.42%	-3.62%	-5.27%	-4.20%	-2.62%	-4.52%	-1.19%

2010-2014 Lane Departure-Related Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe*	Fatalities	Serious	Severe*		
Total	1,061	3,091	4,152	1,177	3,976	5,153		
Speed-related	652	2,144	2,796	719	2,695	3,414	1	66.25%
Local Roads	552	1,714	2,266	595	2,118	2,713	2	52.65%
Roadside Collisions	510	1,738	2,248	551	2,096	2,647	3	51.37%
Unprotected Persons	584	1,095	1,679	658	1,522	2,180	4	42.31%
Younger Drivers	294	1,053	1,347	334	1,421	1,755	5	34.06%
Impaired Driving	358	750	1,108	408	994	1,402	6	27.21%
Older Drivers	218	405	623	241	560	801	7	15.54%
Intersections	150	491	641	160	626	786	8	15.25%
Winter Road Conditions	119	395	514	135	529	664	9	12.89%
Motorcycles	129	434	563	136	498	634	10	12.30%
Heavy Trucks	189	301	490	204	388	592	11	11.49%
Inattentive/Distracted Driving	33	241	274	36	305	341	12	6.62%
Other Special Vehicles	19	45	64	22	56	78	13	1.51%
Work Zones	13	25	38	18	39	57	14	1.11%
Pedestrians	14	23	37	17	33	50	15	0.97%
Bicycles	6	2	8	6	2	8	16	0.16%
Train	1	4	5	1	4	5	17	0.10%

2010-2014 Severe Injuries Involving Lane Departures by Urban and Rural Area and by Road Type



Lane Departure severe injuries have been steadily trending down according to the five-year moving averages. Most averages have decreased by two percentage points over the previous year with the exception of the first two 5-year periods (2003-2007 & 2004-2008) and the last one (2010-2014). The table above indicates that the emphasis areas that have the highest correspondence with lane departures are speed-related, local roads, roadside collisions, unprotected persons, and younger drivers. The roadways with the highest number of lane departures are rural two-lane roadways and secondary paved roads, followed by rural and urban freeways.

LOCAL ROADS

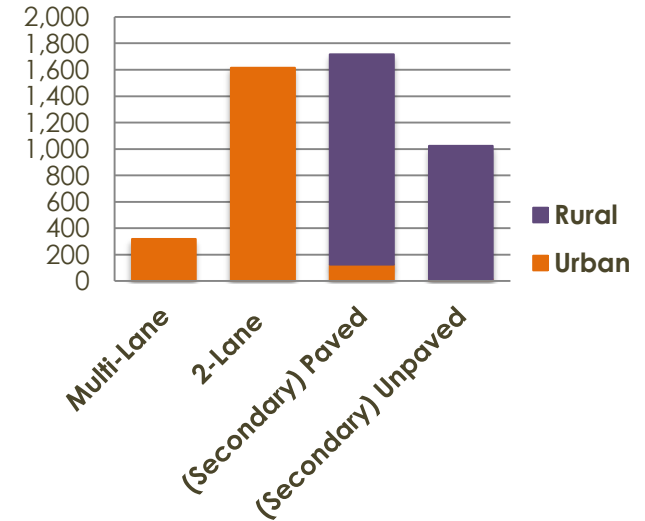
5-Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-2.16%	-3.23%	-5.97%	-4.53%	-3.77%	-2.97%	-2.67%	-2.72%

2010-2014 Local Roads Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe*	Fatalities	Serious	Severe*		
Total	822	3,523	4,345	885	4,187	5,072		
Lane Departures	552	1,714	2,266	595	2,118	2,713	1	53.49%
Speed-related	471	1,772	2,243	513	2,143	2,656	2	52.37%
Unprotected Persons	464	1,209	1,673	499	1,539	2,038	3	40.18%
Roadside Collisions	373	1,351	1,724	396	1,611	2,007	4	39.57%
Younger Drivers	228	1,320	1,548	258	1,638	1,896	5	37.38%
Intersections	192	1,160	1,352	204	1,380	1,584	6	31.23%
Impaired Driving	287	679	966	318	868	1,186	7	23.38%
Motorcycles	132	649	781	134	726	860	8	16.96%
Older Drivers	155	508	663	164	622	786	9	15.50%
Winter Road Conditions	52	294	346	60	362	422	10	8.32%
Pedestrians	59	258	317	59	273	332	11	6.55%
Heavy Trucks	81	186	267	87	216	303	12	5.97%
Inattentive/Distracted Driving	23	131	154	25	166	191	13	3.77%
Bicycles	15	139	154	15	149	164	14	3.23%
Other Special Vehicles	37	49	86	38	60	98	15	1.93%
Train	13	27	40	15	30	45	16	0.89%
Work Zones	8	25	33	8	28	36	17	0.71%

2010-2014 Severe Injuries Involving Local Roads by Urban and Rural Area and by Road Type



Five-year moving averages for local roads have been in a continuing state of decline for the past several five year periods. However, their rate of decrease indicates a degree of leveling off, similar to the overall trend of severe injuries. The emphasis areas corresponding with the highest percentages of local road severe injuries are lane departures, speed-related, unprotected persons, roadside collisions, younger drivers, and intersections. Road types for this category will differ from the other categories due to local roads being a part of the secondary system. Therefore, freeway and expressway categories will not be present for this emphasis area. The road types with the highest number of severe injury-related crashes are two-lane and paved secondary roads.

SPEED-RELATED

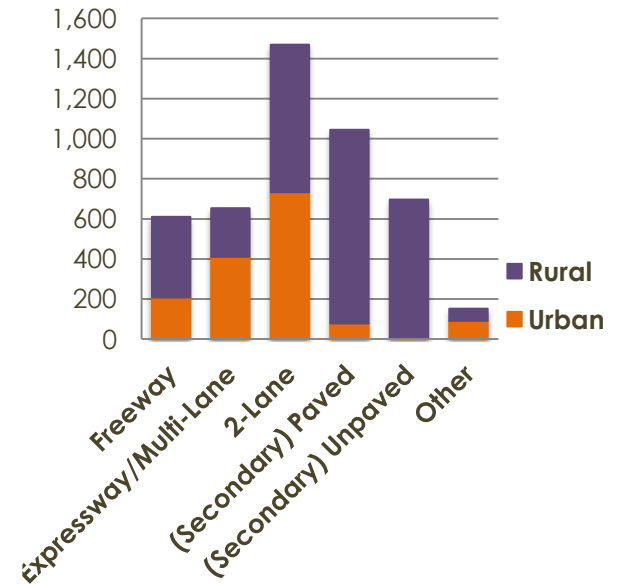
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
.93%	-.60%	-4.60%	-3.81%	-3.74%	-3.10%	-3.85%	-.57%

2010-2014 Speed-Related Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe*	Fatalities	Serious	Severe*		
Total	809	3,120	3,929	901	3,845	4,746		
Lane Departures	652	2,144	2,796	719	2,695	3,414	1	71.93%
Local Roads	471	1,772	2,243	513	2,143	2,656	2	55.96%
Roadside Collisions	410	1,574	1,984	443	1,893	2,336	3	49.22%
Unprotected Persons	491	1,177	1,668	550	1,515	2,065	4	43.51%
Younger Drivers	229	1,122	1,351	267	1,439	1,706	5	35.95%
Impaired Driving	314	815	1,129	354	1,025	1,379	6	29.06%
Motorcycles	147	583	730	151	651	802	7	16.90%
Intersections	95	515	610	101	620	721	8	15.19%
Winter Road Conditions	111	444	555	130	582	712	9	15.00%
Older Drivers	131	337	468	140	448	588	10	12.39%
Heavy Trucks	91	257	348	107	318	425	11	8.95%
Inattentive/Distracted Driving	14	138	152	21	158	179	12	3.77%
Work Zones	11	51	62	12	69	81	13	1.71%
Other Special Vehicles	19	36	55	21	55	76	14	1.60%
Pedestrians	13	42	55	16	53	69	15	1.45%
Bicycles	4	15	19	4	22	26	16	0.55%
Train	1	1	2	1	1	2	17	0.04%

2010-2014 Severe Injuries Involving Speed-Related by Urban and Rural Area and by Road Type



The five-year moving averages for severe injuries in the speed-related categories had moderate percentage decline for the first two periods with a sudden drop in the 2005-2009 period. The level of decline remained consistently above 3% for five periods and then declined at a smaller rate (-.57%) for the 2010-2014 period. According to the table above, lane departures, local roads, roadside collisions, unprotected persons, and younger drivers correspond the most with speed-related severe injuries. Speed-related severe injuries occur most frequently on two-lane and paved secondary roads.

UNPROTECTED PERSONS

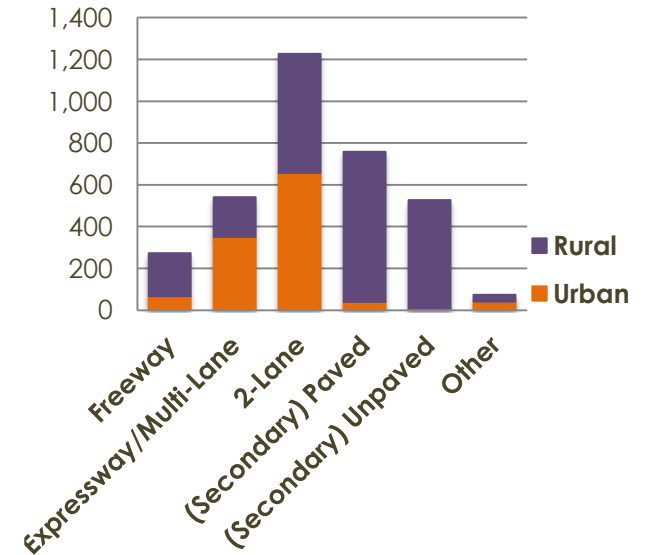
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-5.8%	-1.08%	-5.41%	-4.57%	-4.11%	-4.01%	-5.43%	-2.39%

2010-2014 Unprotected Persons Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	797	2,000	2,797	896	2,621	3,517		
Lane Departures	584	1,095	1,679	658	1,522	2,180	1	61.98%
Speed-related	491	1,177	1,668	550	1,515	2,065	2	58.71%
Local Roads	464	1,209	1,673	499	1,539	2,038	3	57.95%
Roadside Collisions	366	772	1,138	401	990	1,391	4	39.55%
Younger Drivers	224	726	950	264	1,026	1,290	5	36.68%
Motorcycles	192	814	1,006	200	937	1,137	6	32.33%
Impaired Driving	306	505	811	348	704	1,052	7	29.91%
Intersections	162	552	714	172	724	896	8	25.48%
Older Drivers	139	219	358	158	305	463	9	13.16%
Heavy Trucks	90	117	207	103	170	273	10	7.76%
Winter Road Conditions	49	103	152	60	154	214	11	6.08%
Inattentive/Distracted Driving	16	70	86	25	102	127	12	3.61%
Other Special Vehicles	32	51	83	35	63	98	13	2.79%
Work Zones	12	30	42	15	42	57	14	1.62%
Pedestrians	5	24	29	5	30	35	15	1.00%
Bicycles	1	5	6	1	11	12	16	0.34%
Train	6	3	9	7	4	11	17	0.31%

2010-2014 Severe Injuries Involving Unprotected Persons by Urban and Rural Area and by Road Type



The unprotected persons safety emphasis area has also been trending down according to the five-year moving averages. The table above indicates that the safety emphasis areas that have the highest crossover with unprotected persons are lane departures, speed-related, local roads, roadside collisions, younger drivers, and motorcycles. By far, the majority of severe injuries involving unprotected persons occur on two-lane roads, with the next highest being secondary paved roads.

YOUNGER DRIVERS

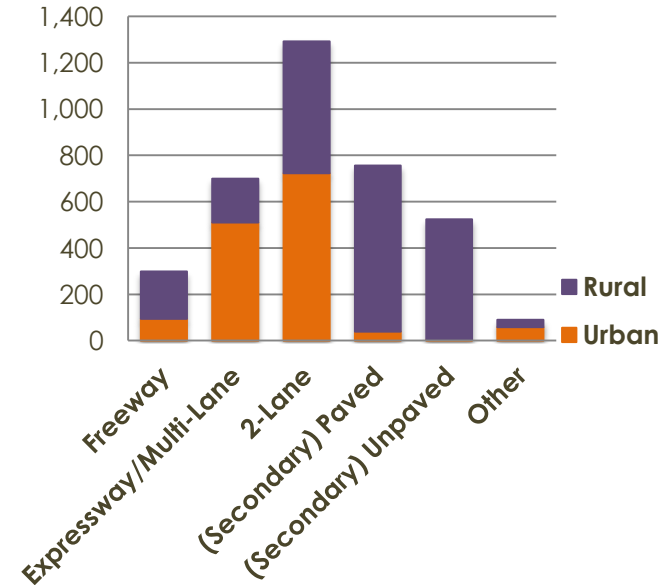
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-3.54%	-2.87%	-5.83%	-7.33%	-5.14%	-5.52%	-5.29%	-3.01%

2010-2014 Younger Driver Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	436	2,240	2,676	497	2,853	3,350		
Local Roads	228	1,320	1,548	258	1,638	1,896	1	56.60%
Lane Departures	294	1,053	1,347	334	1,421	1,755	2	52.39%
Speed-related	229	1,122	1,351	267	1,439	1,706	3	50.93%
Unprotected Persons	224	726	950	264	1,026	1,290	4	38.51%
Intersections	112	795	907	122	994	1,116	5	33.31%
Roadside Collisions	158	700	858	177	904	1,081	6	32.27%
Impaired Driving	145	371	516	178	523	701	7	20.93%
Motorcycles	51	277	328	55	317	372	8	11.10%
Older Drivers	40	193	233	43	272	315	9	9.40%
Winter Road Conditions	30	174	204	35	216	251	10	7.49%
Heavy Trucks	68	131	199	79	171	250	11	7.46%
Inattentive/Distracted Driving	15	126	141	23	170	193	12	5.76%
Pedestrians	23	105	128	23	110	133	13	3.97%
Work Zones	4	27	31	7	38	45	14	1.34%
Bicycles	2	38	40	2	42	44	15	1.31%
Other Special Vehicles	8	29	37	8	34	42	16	1.25%
Train	2	8	10	3	10	13	17	0.39%

2010-2014 Severe Injuries Involving Younger Drivers by Urban and Rural Area and by Road Type



Five-year moving averages for the younger driver category indicate a decline over the past several periods, with the level of percentage change decreasing in recent years (e.g., -7.33% vs. -3.01%). The emphasis areas with the largest percentage of young driver-related severe injuries include local roads, lane departures, speed-related, unprotected persons, intersections, and roadside collisions. The road types with the highest proportion of young driver severe injuries are rural and urban two-lane roads followed by secondary paved roadways.

ROADSIDE COLLISIONS

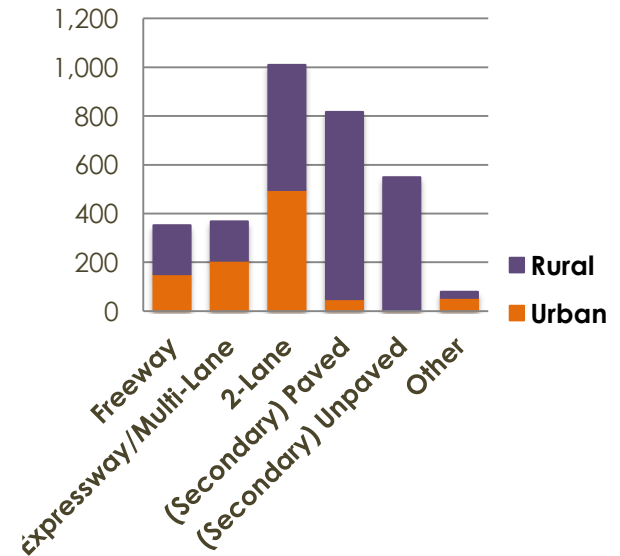
5-Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-2.35%	-2.91%	-4.07%	-5.71%	-5.43%	-1.75%	-2.57%	-1.77%

2010-2014 Roadside Collision Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	600	2,182	2,782	651	2,626	3,277		
Lane Departures	510	1,738	2,248	551	2,096	2,647	1	80.78%
Speed-related	410	1,574	1,984	443	1,893	2,336	2	71.28%
Local Roads	373	1,351	1,724	396	1,611	2,007	3	61.25%
Unprotected Persons	366	772	1,138	401	990	1,391	4	42.45%
Younger Drivers	158	700	858	177	904	1,081	5	32.99%
Impaired Driving	235	598	833	261	742	1,003	6	30.61%
Intersections	103	422	525	112	522	634	7	19.35%
Older Drivers	110	261	371	115	324	439	8	13.40%
Motorcycles	93	312	405	96	343	439	9	13.40%
Winter Road Conditions	35	218	253	39	263	302	10	9.22%
Heavy Trucks	57	131	188	59	155	214	11	6.53%
Inattentive/Distracted Driving	17	161	178	17	190	207	12	6.32%
Other Special Vehicles	12	18	30	12	24	36	13	1.10%
Work Zones	3	18	21	3	25	28	14	0.85%
Pedestrians	5	16	21	5	18	23	15	0.70%
Train	4	7	11	5	8	13	16	0.40%
Bicycles	1	1	2	1	1	2	17	0.06%

2010-2014 Severe Injuries Involving Roadside Collisions by Urban and Rural Area and by Road Type



Five-year moving averages indicate that severe injuries involving roadside collisions have been trending down with percentage change leveling off in recent five-year periods. The areas corresponding highest with roadside collisions are lane departures, speed-related, local roads, unprotected persons, younger drivers, and impaired driving. The roadway types with the highest number of roadside collisions are urban and rural two-lane roadways and paved and unpaved secondary roadways.

INTERSECTIONS

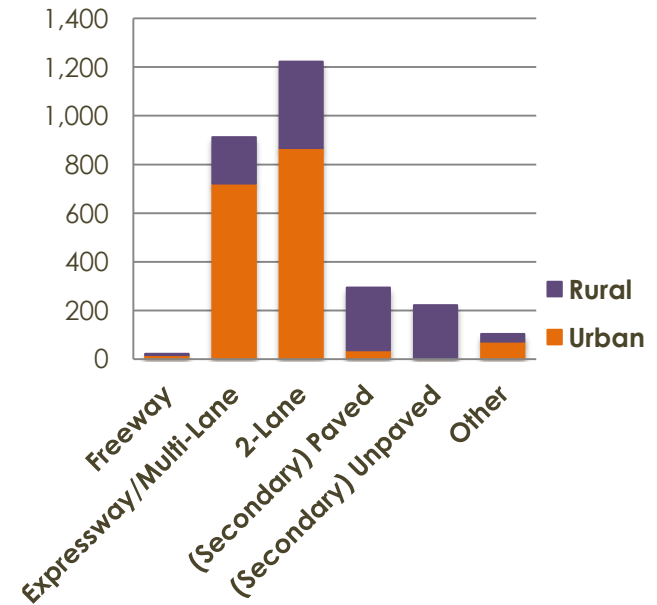
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-5.43%	-5.59%	-6.19%	-6.71%	-3.86%	-3.24%	-3.73%	-3.41%

2010-2014 Intersection Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	359	2,056	2,415	384	2,504	2,888		
Local Roads	192	1,160	1,352	204	1,380	1,584	1	54.85%
Younger Drivers	112	795	907	122	994	1,116	2	38.64%
Unprotected Persons	162	552	714	172	724	896	3	31.02%
Lane Departures	150	491	641	160	626	786	4	27.22%
Speed-related	95	515	610	101	620	721	5	24.97%
Older Drivers	118	467	585	126	593	719	6	24.90%
Roadside Collisions	103	422	525	112	522	634	7	21.95%
Motorcycles	68	327	395	69	386	455	8	15.75%
Impaired Driving	80	226	306	90	309	399	9	13.82%
Heavy Trucks	85	217	302	91	263	354	10	12.26%
Pedestrians	25	107	132	25	111	136	11	4.71%
Pedalcyclists	4	100	104	4	105	109	12	3.77%
Winter Road Conditions	8	84	92	8	96	104	13	3.60%
Inattentive/Distracted Driving	8	42	50	9	58	67	14	2.32%
Other Special Vehicles	11	24	35	11	28	39	15	1.35%
Work Zones	4	20	24	4	24	28	16	0.97%
Train	0	0	0	0	0	0	17	0.00%

2010-2014 Severe Injuries Involving Intersections by Urban and Rural Area and by Road Type



According to the percentage change table, intersection-related severe injuries have been on a steady decline over the past several five-year periods. The emphasis area categories that correspond the highest with this area are local roads, younger drivers, and unprotected persons. The roadway types with the largest number of intersection-related crashes are expressway/multi-lane and two-lane roadways. It should be noted that intersections generally are more prevalent in urban areas; therefore intersection related crashes in urban areas are more likely to be overrepresented in the crash data.

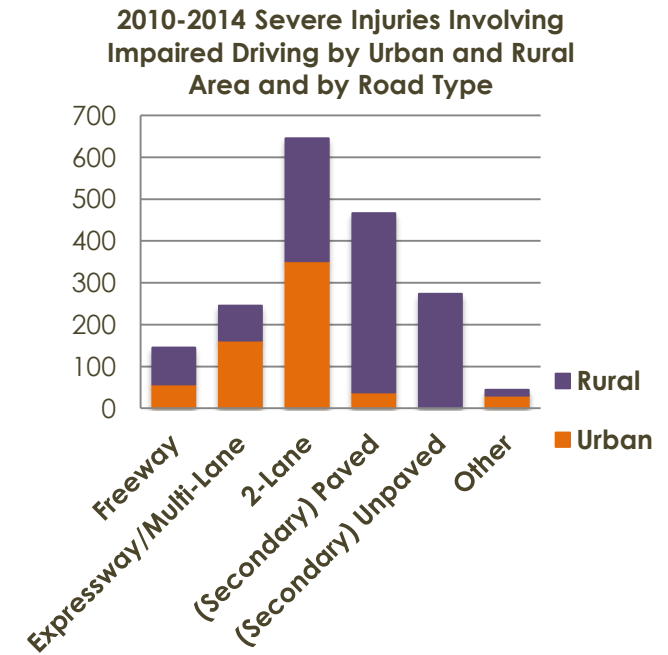
IMPAIRED DRIVING

5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-0.75%	-5.33%	-5.34%	-7.90%	-8.39%	-1.21%	1.65%	-0.84%

2010-2014 Impaired Driver Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Seriou s	Severe	Fatalities	Serious	Severe		
Total	452	1,057	1,509	515	1,378	1,893		
Lane Departures	358	750	1,108	408	994	1,402	1	74.06%
Speed-related	314	815	1,129	354	1,025	1,379	2	72.85%
Local Roads	287	679	966	318	868	1,186	3	62.65%
Unprotected Persons	306	505	811	348	704	1,052	4	55.57%
Roadside Collisions	235	598	833	261	742	1,003	5	52.98%
Younger Drivers	145	371	516	178	523	701	6	37.03%
Intersections	80	226	306	90	309	399	7	21.08%
Motorcycles	86	169	255	90	206	296	8	15.64%
Winter Road Conditions	21	57	78	24	79	103	9	5.44%
Heavy Trucks	38	35	73	43	55	98	10	5.18%
Older Drivers	26	45	71	27	67	94	11	4.97%
Inattentive/Distracted Driving	8	29	37	9	46	55	12	2.91%
Pedestrians	8	31	39	8	33	41	13	2.17%
Work Zones	7	11	18	10	17	27	14	1.43%
Other Special Vehicles	7	3	10	7	3	10	15	0.53%
Pedalcyclists	1	6	7	1	8	9	16	0.48%
Train	2	1	3	2	1	3	17	0.16%



Five-year moving averages for impaired driving-related severe injuries have had varying levels of percentage decrease over the past several periods. Overall, most periods have seen a negative percentage change with the exception of the 2009-2013 period which had a 1.6% increase over the 2008-2012 period. The table above indicates that lane departures, speed-related, local roads, unprotected persons, roadside collisions, and younger drivers have the highest crossover with impaired driving-related crashes. Most impaired driving crashes that result in severe injuries occur on urban and rural two-lane and paved secondary roadways.

OLDER DRIVERS

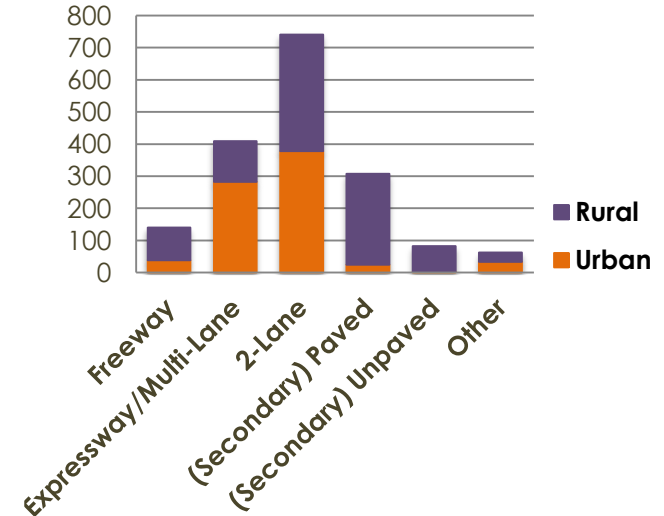
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
-2.65%	-6.06%	-6.46%	-4.01%	-3.96%	-2.73%	2.09%	2.92%

2010-2014 Older Driver Related Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	361	1,061	1,422	395	1,366	1,761		
Lane Departures	218	405	623	241	560	801	1	45.49%
Local Roads	155	508	663	164	622	786	2	44.63%
Intersections	118	467	585	126	593	719	3	40.83%
Speed-related	131	337	468	140	448	588	4	33.39%
Unprotected Persons	139	219	358	158	305	463	5	26.29%
Roadside Collisions	110	261	371	115	324	439	6	24.93%
Younger Drivers	40	193	233	43	272	315	7	17.89%
Heavy Trucks	88	141	229	97	188	285	8	16.18%
Motorcycles	21	133	154	21	154	175	9	9.94%
Winter Road Conditions	34	77	111	38	124	162	10	9.20%
Impaired Driving	26	45	71	27	67	94	11	5.34%
Inattentive/Distracted Driving	11	64	75	12	78	90	12	5.11%
Pedestrians	14	37	51	14	46	60	13	3.41%
Other Special Vehicles	23	31	54	25	35	60	13	3.41%
Work Zones	9	22	31	10	32	42	14	2.39%
Pedalcyclists	1	31	32	1	31	32	15	1.82%
Train	4	4	8	4	5	9	16	0.51%

2010-2014 Severe Injuries Involving Older Drivers by Urban and Rural Area and by Road Type



As was noted in the five-year moving average section, Older Drivers was one of the emphasis areas that had positive percentage change over the last two five-year periods (2009-2013 & 2010-2014). As can be seen by the table above, the emphasis areas that correspond the highest with the older drivers category are lane departures, local roads, intersections, and speed-related. For the older drivers category, most of the severe injury-related crashes occurred on both urban and rural two lane roads, secondary paved roads, and urban expressway/multi-lane roads.

Since older drivers had a positive percentage change over the past two five-year averages, a per capita rate for older adult (drivers and pedestrians with severe injuries over the age of 65) was calculated per the Older Drivers and Pedestrians rule provided by the FHWA. This rule states that if a state sees an increase in older driver and pedestrian severe injuries consecutively over two years, they must examine the per capita rate of severe injuries to determine whether additional strategies should be considered for this emphasis area. This calculation yielded the rates in the table below which indicate that the rule does not apply, however the group will still consider additional strategies for older drivers to address the percentage increase.

Rates Per 1,000 Capita for Older Driver and Pedestrian Severe Injuries				
2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
0.6	0.6	0.5	0.5	0.5

No rate increase over the two five-year averages.

To gain a better understanding of the factors influencing the percentage increase in older driver severe injuries, a more in-depth analysis of crash statistics was undertaken. Below is a table showing days of the week and time of day for older driver severe injuries during the 2010-2014 period. Totals over 200 are colored red to identify times of the day and week with a larger frequency of severe injuries.

2010-2014 Older Driver-Involved Crashes by Day of Week and Time of Day

Time of Day	Midnight to 1:59am	2:00am to 3:59am	4:00am to 5:59am	6:00am to 7:59am	8:00am to 9:59am	10:00am to 11:59am	Noon to 1:59pm	2:00pm to 3:59pm	4:00pm to 5:59pm	6:00pm to 7:59pm	8:00pm to 9:59pm	10:00pm to 11:59pm	Total	% of total
Sunday	12	10	8	18	72	136	160	146	129	66	24	15	796	9.43%
Monday	8	3	17	76	168	206	223	265	198	71	47	20	1302	15.42%
Tuesday	5	7	14	79	148	213	266	266	215	87	42	14	1356	16.06%
Wednesday	3	1	10	60	152	216	229	264	219	87	45	13	1299	15.38%
Thursday	7	8	11	69	133	187	249	250	205	101	47	20	1287	15.24%
Friday	8	8	13	53	138	240	254	250	241	89	56	32	1382	16.36%
Saturday	8	9	11	37	103	167	182	206	135	89	40	36	1023	12.11%
Total	51	46	84	392	914	1365	1563	1647	1342	590	301	150	8445	100%
% of total	0.60%	0.54%	0.99%	4.64%	10.82%	16.16%	18.51%	19.50%	15.89%	6.99%	3.56%	1.78%	100%	

According to the table, the largest amount of severe injuries for older drivers occurs between 2pm-4pm, followed by noon-2pm. Although the time periods appear clustered, primarily severe injuries are fairly evenly distributed between 10am-6pm, Monday through Friday (yellow highlighting).

MOTORCYCLES

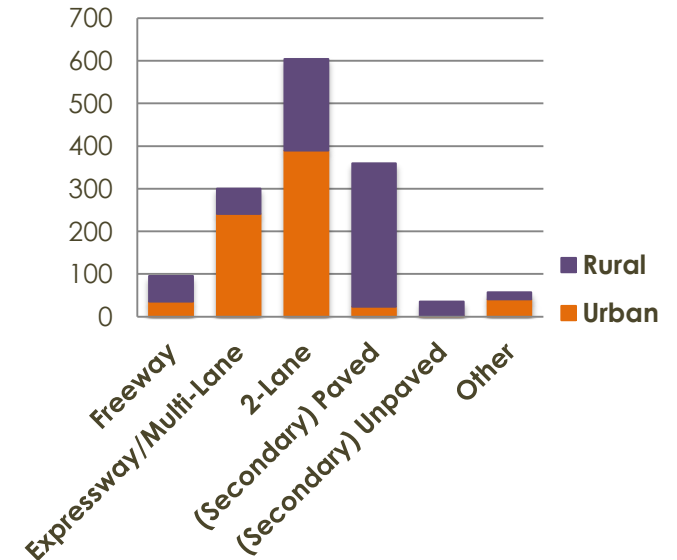
5 Year Moving Average Percentage Change

2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014
6.97%	2.15%	-.56%	4.09%	1.02%	.00%	.27%	1.34%

2010-2014 Motorcycle Related Crashes

	Crash			Injury			Severe Injury Rank	Percentage of Severe Injuries
	Fatal	Serious	Severe	Fatalities	Serious	Severe		
Total	233	1,122	1,355	243	1,272	1,515		
Unprotected Persons	192	814	1,006	200	937	1,137	1	75.05%
Local Roads	132	649	781	134	726	860	2	56.77%
Speed-related	147	583	730	151	651	802	3	52.94%
Lane Departures	129	434	563	136	498	634	4	41.85%
Intersections	68	327	395	69	386	455	5	30.03%
Roadside Collisions	93	312	405	96	343	439	6	28.98%
Younger Drivers	51	277	328	55	317	372	7	24.55%
Impaired Driving	86	169	255	90	206	296	8	19.54%
Older Drivers	21	133	154	21	154	175	9	11.55%
Heavy Trucks	12	25	37	13	34	47	10	3.10%
Work Zones	9	21	30	12	27	39	11	2.57%
Other Special Vehicles	4	9	13	4	10	14	12	0.92%
Pedestrians	0	9	9	0	12	12	13	0.79%
Inattentive/Distracted Driving	1	8	9	1	9	10	14	0.66%
Pedalcyclists	0	3	3	0	5	5	15	0.33%
Train	0	0	0	0	0	0	16	0.00%
Winter Road Conditions	0	0	0	0	0	0	16	0.00%

2010-2014 Severe Injuries Involving Motorcycles By Urban Area and Rural Area and by Road Type



Five-year moving averages for severe injuries related to motorcyclists have increased over the past two periods and have not seen a decrease for any of the past five periods. This is a troubling statistic given that most categories have seen a decrease for at least one of the five year averages. According to

the table, the areas that correspond highest with motorcyclist severe injuries are unprotected persons, local roads, speed-related, lane departures, and intersections. The roadway types corresponding with the most motorcyclist severe injuries are two-lane, paved secondary roadways, and urban expressway/multi-lane roadways.

Unprotected persons are by far those with the highest correspondence, indicating that un-helmeted motorcycle drivers and passengers are especially vulnerable to severe injuries on the roadway. However, the data above reflect motorcycle-involved crashes, meaning that vehicles involved in a crash with a motorcycle could also be counted in the unprotected category as well (no seat belt).

To get a better sense of which factors cause severe injuries for motorcyclists, the data were separated into categories correlated with severe and fatal injuries for motorcyclists only. According to the data, unprotected (unhelmeted)-associated severe injuries accounted for approximately 74% of all motorcyclist severe injuries. Even more troubling, unprotected associated fatalities accounted for 82% (200 of 243) of all motorcyclist fatalities.

Motorcyclist-involved crashes account for 16% all severe injury crashes in the state. This is concerning since motorcyclists make up less than .5 of the total VMT for overall road users. Additionally, motorcyclists only use the roadways approximately 8 months out of the year. To better understand when injuries are occurring, below is a table showing days of the week and time periods for motorcyclist severe injuries during the 2010-2014 period. Totals over 100 are colored red to identify times of the day and week with a larger proportion of severe injuries.

2010-2014 Motorcycle-Involved Crashes by Day of Week and Time of Day

Time of Day Day of Week	Midnight- 1:59am	2:00am- 3:59am	4:00am- 5:59am	6:00am- 7:59am	8:00am- 9:59am	10:00am- 11:59am	Noon- 1:59pm	2:00pm- 3:59pm	4:00pm- 5:59pm	6:00pm- 7:59pm	8:00pm- 9:59pm	10:00pm- 11:59pm	Total	% of total
Sunday	53	24	9	8	22	84	118	137	155	118	97	35	860	16.39%
Monday	5	9	10	31	22	47	69	77	115	91	63	27	566	10.79%
Tuesday	9	13	14	39	32	30	64	94	137	87	60	34	613	11.69%
Wednesday	15	8	12	43	27	42	68	86	110	86	81	44	622	11.86%
Thursday	23	14	16	41	24	52	62	92	138	105	60	57	684	13.04%
Friday	28	9	11	28	32	57	92	129	135	128	108	61	818	15.59%
Saturday	47	22	9	13	32	94	148	179	196	155	114	74	1083	20.64%
Total	180	99	81	203	191	406	621	794	986	770	583	332	5246	100%
% of total	3.43%	1.89%	1.54%	3.87%	3.64%	7.74%	11.84%	15.14%	18.80%	14.68%	11.11%	6.33%	100%	

2010-2014 Motorcyclist Crashes Resulting in Severe or Fatal Injury

Injured Age	Severe Injuries	Severe Injury %	Fatal	Fatal %
13 and Under	12	0.74%	0	0.00%
14-24	237	14.63%	37	13.03%
25-35	317	19.57%	54	19.01%
36-46	346	21.36%	64	22.54%
47-64	605	37.35%	115	40.49%
65 and over	89	5.49%	12	4.23%

According to the table, the time of day with the most severe injuries for motorcyclists is 4pm-6pm, followed by 2-4pm and 6pm-8pm. The days of the week accounting for the most severe injuries are, in order from highest to lowest, Saturday, Sunday, and Friday. Saturday from 4pm-6pm accounts for the largest amount of severe injuries followed by a tie between Saturday 6pm-8pm and Sunday from 4pm-6pm.

In terms of age, 47-64 year olds account for the largest proportion of motorcyclist severe injuries and fatalities (see adjacent table). This age category is followed by 36-46 year olds, however proportionally 47-64 year olds maintain a much higher percentage. The 25-35 year-

old category percentages are fairly close to the 36-46 year old percentages. As the table shows, 47-64 year olds have a much higher incidence of crashes resulting in severe or fatal injuries and may require additional emphasis in the motorcyclist safety strategies.

Due to the high incidence of unprotected (unhelmeted) persons in motorcyclist crashes resulting in severe or fatal injuries, unprotected persons-related motorcycle crashes were also broken down by the same age categories. The table below represents the unprotected subset of all categories as an effort to identify any age categories that are overrepresented in the unhelmeted category.

2010-2014 Unhelmeted Motorcyclist Crashes Resulting in Severe or Fatal Injury				
Injured Age	Severe Injuries	Severe Injury %	Fatal	Fatal %
13 and Under	9	0.75%	0	0.00%
14-24	176	14.59%	27	11.44%
25-35	244	20.23%	48	20.34%
36-46	280	23.22%	57	24.15%
47-64	441	36.57%	94	39.83%
65 and over	46	3.81%	9	3.81%

Although the distributions of percentages differ slightly between age categories, the overall distribution is fairly similar to that of all crashes. This is not surprising due to the high incidence of unprotected persons in all crashes. However, it is hard to determine what relationship unprotected persons have on the outcome or incidence of crashes resulting in severe or fatal injuries and may be a topic that should be researched further.