



# VIRGINIA

## 2017-2021 Strategic Highway Safety Plan



Arrive Alive Virginia  
Virginia Strategic Highway Safety Plan





# SHSP Opening Letter from the Governor

There is no place in America quite like the Commonwealth of Virginia. The beauty of our landscape; our vibrant cities and commercial centers; our beautiful and productive rural areas; and the stories of our history make Virginia a unique place to live, work, play and raise our families. To maintain a high standard of health and happiness for our residents, we need a transportation system that safely moves people and goods.

By committing to transportation safety, we save the lives of our friends and loved ones every day. That is why I'm adding my strong support for the Commonwealth's Arrive Alive Strategic Highway Safety Plan (SHSP). Arrive Alive identifies effective strategies and actions to reach zero deaths and serious injuries on Virginia's roads and highways. Reaching a goal of zero deaths and serious injuries is not as impossible as it may sound. It is the same goal we set for ourselves, our families, and our friends every time we drive, walk, or ride.



Envisioning and achieving the reality of zero fatalities and serious injuries is something that needs to happen. Every year over 750 people die, and over 8,000 others are seriously injured on Virginia roadways. Arrive Alive, a statewide plan, is the Commonwealth's roadmap to reduce traffic-related deaths and serious injuries.

This plan is the result of hundreds of diverse safety stakeholders providing their ideas and thoughts on how Virginia can make meaningful reductions in traffic deaths and injuries. I am proud of the work done by the Virginia Department of Transportation (VDOT), the Department of Motor Vehicles Virginia Highway Safety Office (VHSO), the Departments of Health and Education, the State Police, and the many others who have joined forces to identify and implement solutions that show results. Some of the areas of focus include improving roadway safety devices, speed enforcement, educating our communities about safe driving habits, and preparing for the connected and autonomous vehicles of the future.

Arrive Alive and our efforts to achieve zero fatalities and serious injuries is a call to action for all Virginia's citizens and visitors. I encourage you to read this plan and engage in implementing these strategies in your homes and communities. Together we can meet our vision of zero deaths and serious injuries.

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**Governor Terence R. McAuliffe**

# Strategic Highway Safety Plan Executive Committee Charter

WHEREAS, the Commonwealth of Virginia seeks to identify and seize all opportunities to enhance the safety of Virginia's surface transportation system by reducing the risk of fatalities, injuries, and crashes;

WHEREAS, traffic-related crashes in the Commonwealth over the last five years (2011-2015) resulted in 3,735 fatalities and 45,278 serious injuries with a total economic impact of nearly \$5 billion;<sup>2</sup>

WHEREAS, this highway carnage, human suffering, and economic loss is unacceptable to the citizens of Virginia;

WHEREAS, the U.S. Congress has passed laws that require states to develop, implement, update, and evaluate a Strategic Highway Safety Plan (SHSP) that identifies the key safety needs and strategies to address those needs;

WHEREAS, Virginia has an SHSP that creates a positive agenda through this data-driven, results-oriented safety plan that has created an effective, integrated and coordinated transportation safety program;

WHEREAS, Virginia has updated the Arrive Alive SHSP to meet the current safety challenges for the following elements: impaired driving, occupant protection, young drivers, speeding, intersections, roadway departures, and bicyclists and pedestrians; and

THEREFORE, IT IS AGREED THAT, the Virginia Strategic Highway Safety Plan Executive Committee, an interagency, intergovernmental committee is established with an executive leadership from the following:

Department of Education  
Department of Fire Programs  
Department of Health  
Department of Motor Vehicles  
Department of Transportation  
Virginia Alcohol Safety Action Program  
Virginia Association of Chiefs of Police  
Virginia State Police

Federal Partners shall include:  
Division Administrator,  
Federal Highway Administration  
Division Administrator, Federal Motor Carrier  
Safety Administration  
Regional Administrator, National Highway  
Traffic Safety Administration

The committee shall be co-chaired by VDOT and the Department of Motor Vehicles (DMV) Commissioners and shall meet yearly, although the co-chairs may call special meetings as necessary.

The SHSP Executive Committee, which is comprised of Virginia's transportation leaders, supports and is committed to the SHSP because it recognizes the importance of the plan to the Commonwealth and how it provides direction and focus for Towards Zero Deaths. The purpose of this committee shall be to integrate and coordinate all surface transportation safety programs, in particular oversee the implementation and evaluation of the SHSP and ensure the Commonwealth is doing what it can to save lives and prevent injuries on the State's roadways. Specifically, the Committee will:

- » Oversee the establishment of SHSP policies and procedures, review progress, provide advice and guidance, address challenges, and remove barriers;

<sup>2</sup> NHTSA May 2015. *Economic and Societal Impact of Motor Vehicle Crashes*, National Highway Traffic Safety Administration, DOT HS 812 013, May 2015, Washington, DC.

- » Provide support and assistance to specific SHSP strategies;
- » Encourage collaboration among the agencies and stakeholders;
- » Align agency goals with the SHSP's goals and objectives;
- » Communicate information about the Virginia Arrive Alive SHSP within agencies and in public forums; and
- » Share progress on safety initiatives.

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**Charlie Kilpatrick**

Commissioner  
Virginia Department of Transportation

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**Colonel Thierry G. Dupuis**

President  
Virginia Association of Chiefs of Police  
Chesterfield County Police Department

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**Richard D. Holcomb**

Commissioner  
Department of Motor Vehicles

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**Delegate Jackson H. Miller**

Chairman  
Virginia Alcohol Safety Action Program Commission  
City of Manassas/Prince William County

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**Colonel W. Steven Flaherty**

Superintendent  
Virginia State Police

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*Federal Partners*

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**Dr. Marissa Levine**

State Health Commissioner  
Virginia Department of Health

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**Jessie Yung**

Division Administrator  
Federal Highway Administration

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**Melvin Carter**

Executive Director  
Virginia Department of Fire Programs

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**Dr. Elizabeth Baker, Ph.D.**

Region III Administrator  
National Highway Traffic Safety Administration

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**Steven Staples**

Superintendent of Public Instruction  
Virginia Department of Education

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**Craig Feister**

Division Administrator  
Federal Motor Carrier Safety Administration



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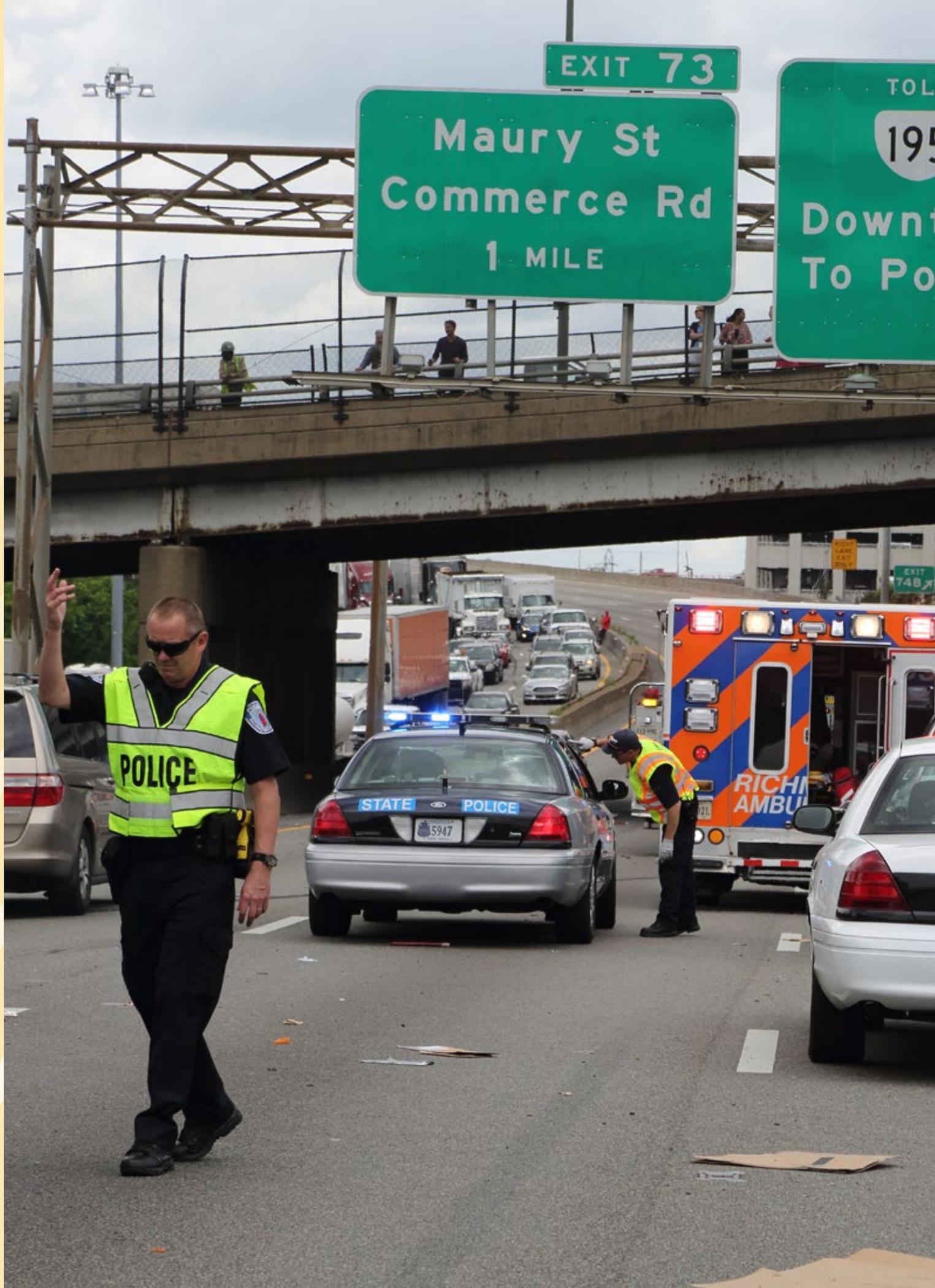
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# Executive Summary

The Arrive Alive SHSP has been Virginia's document guiding the State Toward Zero Deaths since 2006. First developed in 2006, the plan is a multi-agency, comprehensive, data-driven approach to reduce fatalities and serious injuries on all public roads that has evolved and matured with the advancement of safety planning techniques. Through public meetings and outreach, the plan presents a coordinated framework for addressing the most serious traffic safety problems. It includes statewide goals and critical emphasis areas and developed in consultation with Federal, state, regional, and local stakeholders from throughout the Commonwealth who represent the 4 Es of safety - engineering, enforcement, education, and emergency medical services.

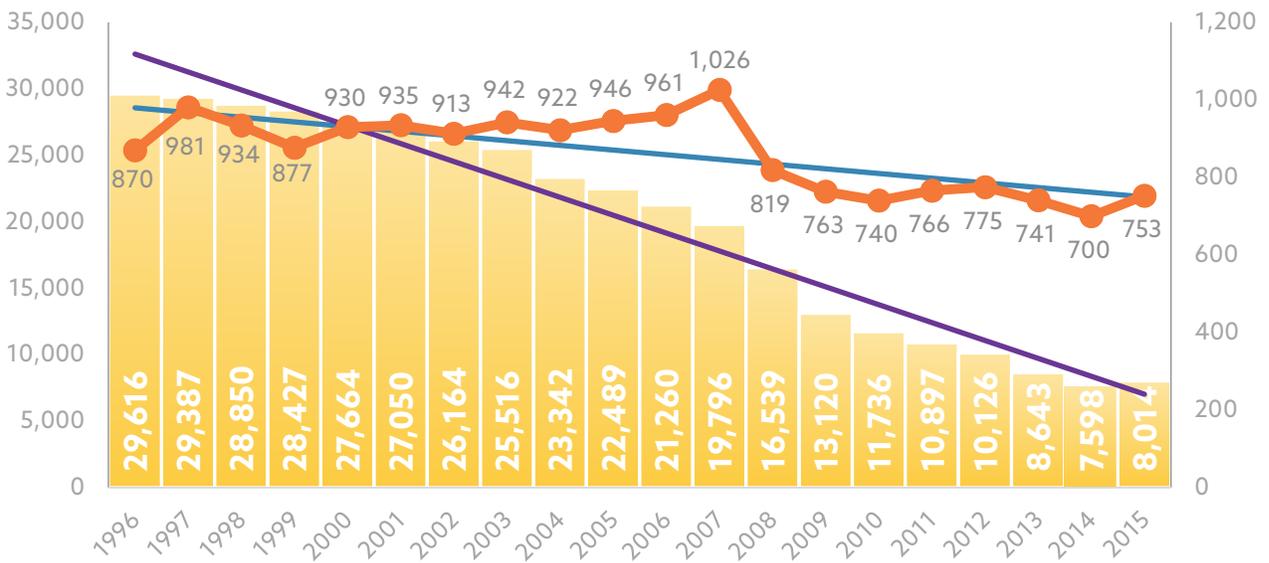
While the purpose is reductions in fatalities and serious injuries on all public roads, the SHSP goes further by identifying and supporting those behaviors and attitudes that promote a positive safety culture. Virginia's motto to achieve Toward Zero Deaths is "Arrive Alive," a goal for almost every road user when they drive, walk, or ride. To meet changes in safety culture and make sure Arrive Alive is a reality, Virginia has added another E for safety - and that is Everyone.

The challenge is great. After a 28 percent decrease in traffic-related fatalities between 2007 and 2010, traffic related fatalities are increasing. Figure ES.1 shows that the trend over the last 20 years for both fatalities and serious injuries does indicate continued decreases. However, to ensure those decreases are not only achieved but surpassed, Virginia is using the SHSP as the roadmap for infrastructure improvements, behavioral changes as it relates to traffic safety and improved incident response.



## Long-Term Trends in Fatalities and Serious Injuries 1996-2015

ES.1



### SERIOUS INJURIES    FATALITIES    TREND SERIOUS INJURIES    TREND FATALITIES

Some factors can impact fatalities and serious injuries, including increases in overall population, vehicle miles traveled, or increases in high-risk populations such as young drivers or aging road users. Overseeing the SHSP is an Executive Committee comprised of transportation leaders who are committed to reducing traffic-related fatalities and serious injuries. These individuals, along with the members of the SHSP Steering Committee, manage the SHSP update process and the subsequent implementation to ensure the plan's strategies and actions are executed promptly and evaluated to determine their effectiveness. The SHSP is a five-year plan that has in place mechanisms for regularly tracking implementation and monitoring progress, which provides Virginia the opportunity to evaluate success over multiple years. A critical first step was the identification and selection of the emphasis areas for the plan in consultation with safety stakeholders. After reviewing the data, the SHSP Steering Committee selected the following emphasis areas for the plan:



IMPAIRED  
DRIVING\*



SPEEDING



OCCUPANT  
PROTECTION



ROADWAY  
DEPARTURE



INTERSECTIONS



YOUNG  
DRIVERS



BICYCLES

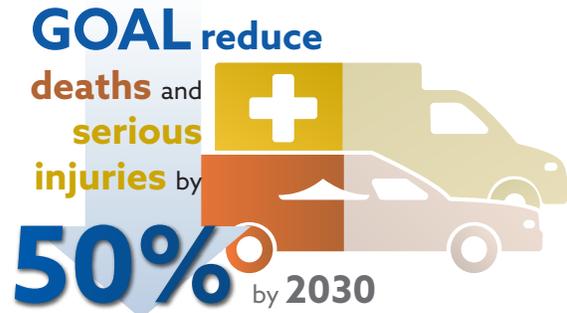


PEDESTRIANS

\* Includes drunk, drugged, drowsy, and distracted driving.

In addition to the emphasis areas, the SHSP also includes three special safety areas where the Commonwealth will continue to focus efforts. These include Data Collection and Analysis which continues the efforts of the Traffic Records Coordinating Committee (TRCC), the Traffic Records Electronic Data System (TREDS) and the Roadway Network System (RNS); Connected and Autonomous Vehicles where efforts will be made to increase awareness of the safety benefits of this new technology; and Emergency Medical Services which is working to develop an effective, consistent, and coordinated incident response program.

The strategies and action steps in each of these areas will help Virginia achieve the TZD vision for the SHSP and the mission "To save lives and reduce motor vehicle crashes and injuries through a data-driven strategic approach that uses enforcement, education, engineering, and emergency response after strategies." The updated plan's goal is to reduce fatalities and serious injuries by half by 2030, which is consistent with the National TZD Strategy on Highway Safety.



To achieve the goal, Virginia has also established measurable fatality and serious injury objectives over the next five years. These objectives will be tracked each year to determine if the SHSP remains on target to achieve the recommended reductions. Since it is a living document, the actions in the plan can be updated if it is not meeting the stated objective.





# Overview

## Arrive Alive: The Commonwealth's Safety Credo

The U.S. has come a long way in the last 50 years when over 50,000 people died on the nation's roads and highways. Traffic safety engineers, transportation planners, law enforcement officers, education and prevention specialists, emergency responders, and medical services personnel worked tirelessly to change traffic safety culture, and their efforts have achieved some success. The number of traffic related fatalities has been cut to approximately 35,000, still an unacceptable number. In Virginia, the number of fatalities each year is more than 700. Again, an unacceptable number.



## The SHSP is the Guide to Arrive Alive

The SHSP is a statewide, comprehensive safety plan that provides a coordinated framework for practitioners to unite in reducing fatalities and serious injuries on all public roads. The plan:

- Identifies the priority emphasis areas Virginia will address over a five-year period;
- Uses data to select critical factors contributing to crashes and the potential solutions;
- Establishes common performance goals for reducing traffic-related fatalities and serious injuries;
- Provides proven strategies and actions to address each of the emphasis areas;
- Complements and urges incorporation into other safety plans at the state, regional, and local levels; and
- Monitors process and performance to determine where Virginia is making progress and where more effort is needed.

In the early 2000s, it was apparent a new approach was needed. Traffic fatalities had remained stagnant for more than a decade prompting Congress to look at the success of other countries such as England, Sweden, and Australia in reducing traffic crashes. What were they doing that the United States was not? The answer was relatively simple. They reviewed data to determine the most serious traffic safety problems and worked collaboratively to solve them.

# Background and History

Reducing the impact of motor vehicle crashes experienced by society is why Congress passed and subsequently included in every transportation bill a requirement for states to develop, update, and evaluate an SHSP. The law is comprehensive (see Federal requirements in the Appendix) regarding who must be involved, the information to be reviewed, and the outreach and activities to be conducted.

Virginia met the requirement to develop a plan a year ahead of the due date of October 2007. The 2006 plan focused on the impact of traffic crashes on individuals, particularly youth, and local communities and how these preventable events can eliminate “dreams and aspirations and replace them with economic burdens, physical disabilities, and mental anguish.” The goal for the 2006 plan was to reduce deaths by 100, which Virginia achieved. The initial plan focused efforts in three main categories and nine subareas, including Human Factors (driver behavior, special users, pedestrian and bicyclist safety), Fundamental (traffic records, transportation safety planning), and Environmental (intersection safety, roadway departure, work zone safety, and pedestrian and bicycle safety).



In 2011, Virginia initiated an update of the plan by obtaining input from stakeholders, identifying leadership for each emphasis area team, selecting effective countermeasures, and ensuring compliance with Federal requirements. A decision was made to reduce the number of emphasis areas to seven: speeding, young drivers, occupant protection, impaired driving, intersections, roadway departure, and data. This document represents a second update of the SHSP. The goal for the 2012 plan was a three percent reduction per year in fatalities and serious injuries. The serious injury objective was exceeded and met by 2013 while fatalities decreased to a record low in 2014 and then increased to previous levels in 2015.

## Moving Toward Zero Deaths

Everyone using the Virginia transportation system views the personal, financial and societal losses for every person killed or injured as unacceptable. Guiding the development, implementation, and update of the SHSP is Virginia’s credo “Arrive Alive,” which is what every road user should expect each time they drive, walk, ride, or bike. It is how the Commonwealth is moving “Toward Zero Deaths” (TZD). TZD and other zero fatality initiatives such as Road to Zero and Vision Zero establish a highway safety vision that the only acceptable

**“ Is it possible to achieve zero fatalities? Absolutely! ”**

target for fatalities is: 0. No longer is it socially acceptable to view deaths and serious injuries as the price to pay for mobility. A safe system approach for the roadway network and the individuals who use it is needed to meet our goals.

Zero is the personal and family goal for everyone who drives, walks, or rides on every trip, every time. Achieving zero deaths and serious injuries will not be easy, but if it is an individual goal, it can be a statewide and even a national goal.

Virginia's has adopted this safe system approach and views the issue from the wider public health perspective. Motor vehicle crashes do not discriminate – they affect all residents and visitors. According to the 2016 AAA Traffic Safety Culture Index, “1 in 5 drivers, has at some point in their lives, been involved in a serious crash in which someone needed to go to the hospital, and nearly 1 in 3 drivers has had a friend or relative seriously injured or killed in a crash.” (AAA Foundation for Traffic Safety, 2017). The National Highway Traffic Safety Administration (NHTSA) and the Centers for Disease Control (CDC) list motor vehicle crashes as one of the leading causes of death in the U.S. Crashes do not just affect the individual. They have a profound effect on families, friends, and work places.

“ It will take the active involvement of **Everyone** for Virginia to “Arrive Alive” and achieve **Zero**. ”

The SHSP involves the 4 Es of safety – engineering, enforcement, education, and emergency medical services (EMS). Given the profound public health implications of traffic-related deaths and serious injuries, Virginia is adding another E – Everyone.

Reaching zero fatalities will require a change in the culture. The public health community was successful in changing the culture

around smoking, and hard work by safety practitioners and citizen activists led to changes in opinions about drunk driving. The U.S. Surgeon General's proclamation on the cancer-causing risks of smoking and the pleas of mothers who lost children in a drunk driving crash led to a paradigm shift in views and substantial reductions in mortality rates.

The same level of effort is needed to give hope to the thousands of Virginians whose lives have been irrevocably changed by a motor vehicle crash. While we have made gains in reducing impaired driving, 32 percent of all fatalities in Virginia involve an alcohol-impaired driving; 42 percent are unrestrained; 41 percent are speed related; and 14 percent involve distracted driving. Crashes are not accidents. In the vast majority of crashes, it is the actions of the road user that cause the crash. Addressing these unsafe travel behaviors will require the same level of effort and commitment that reduced smoking and drunk driving. It is a culture we have changed before and can change again.



In Virginia, the Executive Committee will lead the SHSP implementation effort and provide leadership direction, organize for success, maximize resources, and eliminate roadblocks. The multi-agency Steering Committee will manage the SHSP. Individuals on the Steering Committee include:

- » Engineers and planners;
- » Regional and local transportation planners and officials;
- » State and local law enforcement officers and specialists;
- » Education and prevention specialists and subject matter experts;
- » Data specialists;
- » Medical, health professionals, and emergency medical services personnel;
- » Federal agency representatives; and
- » Many other safety specialists and professionals from every area of the State.

Arrive Alive is more than a slogan. It is a philosophy that believes reaching zero fatalities is not only possible but required. This plan includes the countermeasures that will continue to move Virginia Toward Zero Deaths. To date, Virginia is already making substantial progress as evidenced by the following behavioral, infrastructure, data, and emergency medical services accomplishments. As safety stakeholders implement Arrive Alive ideas, achieving the zero goal will be more difficult. There are no more easy answers or solutions. The trend in fatalities and serious injuries are already flattening out. This means the most effective and promising solutions must be targeted at the most serious problems. Every effort must count if Virginia is to reach the Arrive Alive goal. Meaningful data analysis, deliberate thought, careful planning and a strong commitment to effective strategies are needed to reach the goal of zero deaths for our families and the Commonwealth.

## Recent SHSP Achievements

### Impaired Driving

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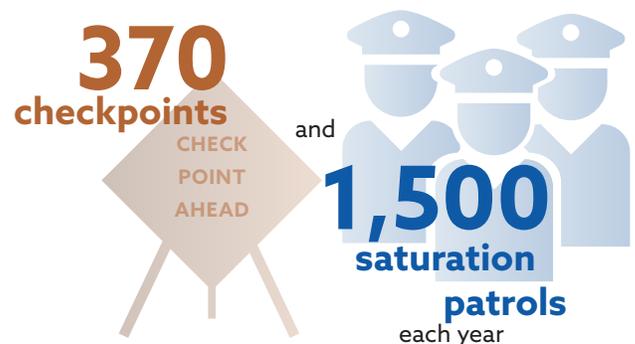
Standardized Field Sobriety Testing (SFST) and Advanced Roadside Impaired Driving Enforcement (ARIDE) trainings conducted to help law enforcement officers recognize alcohol and drug impaired driving behaviors and improve knowledge and skills in detecting the impaired driver.

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Breath alcohol training by the Department of Forensic Science conducted for license breath test operators.

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Driving Under the Influence (DUI) Drug Court training held on best practice standards, juvenile drug court best practices, toxicology, and communication in problem-solving courts.



Annual Checkpoint Strike Force/DUI Enforcement campaign, with TV, radio, digital, cinema, etc. media messaging implemented.

Alcohol compliance checks conducted by the Department of Alcoholic Beverage Control focusing on access to age-restricted products such as alcohol.

Judicial Transportation Safety Conferences held to provide information on legislation, current issues, and successful programs that affect traffic safety.

The Judicial Outreach Liaison program completed its first full year in 2016.

Held a Distracted Driving Summit for the past five years to learn about and address this growing issue.



## Speed

Operation Air, Land, and Speed enforcement campaigns implemented to identify and apprehend speeding and reckless drivers.

Variable Speed Limit (VSL) implementation requirements in place, and VSL activated on I-77 to assist drivers during heavy fog conditions.

Curve warning signs, wider and more visible markings, and roadway traffic calming features in residential and urban areas and at transitions to different speed limit zones implemented.

Enhancements made to traffic signal controllers and timing to harmonize traffic flow and reduce crashes.

Active Traffic Management System installed on I-66 in Northern Virginia.



## Occupant Protection

Law enforcement training on seat belt enforcement conducted and 300 Child Passenger Safety technicians trained each year.

"First Ride, Safe Ride" program conducted at hospitals for new parents.

8,500 child safety seats distributed at checks annually along with 9,000 child safety seats distributed at events for low-income parents.



## Roadway Departure

Roadway Departure Implementation Plan identified segments with countermeasure risk factors and associated crashes for specific systemic focused countermeasures.

Roadway Safety Assessments (RSA) to plan and program improvement projects conducted; RSA spreadsheet tool and training developed to enhance countermeasure selection (an intersection accomplishment as well).

Policy and specifications were developed for shoulder pavement (beveled) to mitigate crashes from edge drop off.

High-friction surface treatment specifications and training developed and implemented; conducted research on the use of continuous friction monitoring equipment to find candidate locations and the impact on safety performance.

Improvements and additions to roadside safety device standards and specifications made; high-tension cable barrier added.



## Intersections

Access Management Regulations implemented and training conducted to reduce conflict points.

Road Design Manual revised to include criteria on roundabouts, diverging diamond interchanges, and alternative intersection design.

Arterial Management Plans that preserve throughput and enhance safety coordinated with local governments implemented.

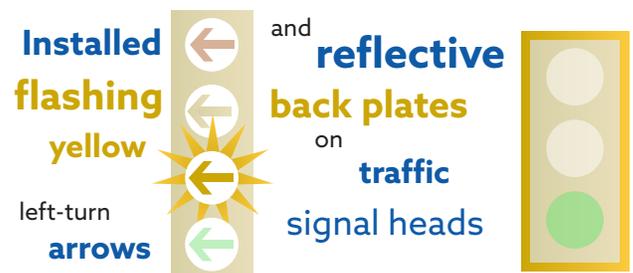
Corridor Preservation effort implemented to enhance current policies related to traffic signals and encourage strategies to preserve capacity and safety.

Methods to assess best practices for systemic improvements to stop controlled intersections, freeway interchanges, and strategies to mitigate angle crashes at intersections developed.

Signing and marking upgrades at stop-controlled intersections and interchanges, with ramp modifications on interstates, conducted.

Advanced signalized intersection timing that adapts to traffic volumes deployed.

Advance warning signs with flashers at unsignalized intersections systematically installed.



## Young Drivers

Youth of Virginia Speak Out about Traffic Safety (YOVASO) conducted peer-to-peer prevention and education programs in high and middle schools.

Parent-Teen Guide revised and 120,000 distributed to teens and parents by the Virginia Department of Education (DOE).

Buckle-Up-Challenge resources revised and distributed by the DOE to all school divisions reaching over 2,000 driver education instructors.

Safe driving campaigns that impacted thousands of students sponsored by YOVASO. YOVASO now in 90 schools statewide.

"Get It Together High School Seat Belt Challenge" conducted by Drive Safe Hampton Roads, increased seat belt use.



## Pedestrians/Bicycles

Pedestrian and bicycle safety enforcement projects conducted in Northern Virginia through Street Smart campaign and the Northern Virginia Regional Commission's (NVRC) "Sharing the Road in Virginia" program which offered materials in English and Spanish.

Training based on the Safe Routes to School pledge conducted by NVRC along with outreach to Hispanic/Latino communities.

Enforcement of bicycle laws and specialized selective enforcement on pedestrian and bicycle safety implemented in Richmond, Roanoke, and Salem.

Bicycle and Pedestrian Awareness Week conducted by Drive Smart Virginia in 2016 to promote awareness and disseminate educational information on bicycle and pedestrian safety.

VDOT issued new instructions on bicycle/pedestrian accommodations to require publishing the new miles added to the state network. Commonwealth Transportation Board policy requires, all highway construction projects will start with the assumption that they will accommodate bicyclists and pedestrians. The list of the new miles will be sorted by locality and include the type of accommodation along with the estimated length and location of sidewalks, bicycle lanes, paved shoulders four feet or greater, and shared use paths.

Traffic engineers and technicians trained on pedestrian/bicycle safety at workshops in Virginia Beach.

Road Conversion projects implemented in Northern Virginia (NOVA), completion of multi-use trails connecting major destinations such as Capitol Trail.



## Data

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Virginia scored 20 points higher than the national average for its statewide crash database; traffic records strategic planning, data use, and integration projects in a 2016 Federal assessment.

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**Electronic submissions  
of crash reports**



**increased**

to

**96%**



The Traffic Records Electronic Database System

(TREDS) enhanced technical software tools, such as

Interactive Crash Location Mapping and Crash Reporting, offers real-time crash and crash location data, multiple system and data integrations and data sharing so users can perform problem identification, enhanced targeted enforcement, roadway engineering planning, and targeting of Federal funds.

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Jurisdiction and Law Enforcement Department Maps, which display clusters of crashes in the selected area, are provided and can be broken down further by safety areas and type of routes (interstate/non-interstate).

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Crash Location Mapping and Data Profiles (“Heat Maps”) for each locality and state program area created for use in the planning, problem identification, target and performance measure setting, and selection of countermeasure strategies and projects.

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A new crash location tool was developed to improve timeliness of geocoding crash locations on urban and locally maintained roadways. This tool is now included in the linear referencing system, which results in full integration of roadway and crash records for safety analysis.

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TREDS Ignition Interlock Case Management System automated for the monitoring of all DUI offenders, including the electronic submission of interlock vendor data.

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Transportation Network Companies, e.g., Uber and Lyft, data fields added to the crash report and will be collected and submitted by law enforcement.

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New web-based Highway Safety Improvement Program (HSIP) project proposal portal created, which streamlines the process for jurisdictions to submit applications to VDOT for funding on highway, bicycle, and pedestrian safety improvements.

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Virginia specific Safety Performance Functions (SPFs) and Potential for Safety Improvement (PSIs) developed to enable a more robust safety planning network screening on road segment and intersection sites. VDOT received a 2015 National Roadway Safety Award for this initiative.

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Crash data filtering, analysis, and mapping of crashes conducted with Tableau software which improved the timeliness and locational assessment of crashes.

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New software system to maintain roadway and roadside element and traffic control devices procured for VDOT.

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## EMS

Virginia Pre-Hospital Information Bridge (VPHIB) data with EMS incidents involving traffic crashes submitted to TREDIS to help facilitate highway safety initiatives.

VPHIB to meet National EMS Information Systems (NEMSIS) standards; Virginia is one of the first states to report under new Federal NEMSIS Version 3 standards.

Statewide Annual Reports for the Trauma Performance Improvement Committee on EMS data with trauma incidents produced, trauma triage criteria analyzed, and transports to trauma centers reported.

Traffic Incident Management (TIM) trained 29.3 percent of all responders, including police, fire/rescue, towing/recovery, EMS, transportation/public works, and others statewide, which makes Virginia among the states with the highest numbers of individuals trained.

Web-based incident management and route detour plans in several metropolitan Interstate corridors developed.



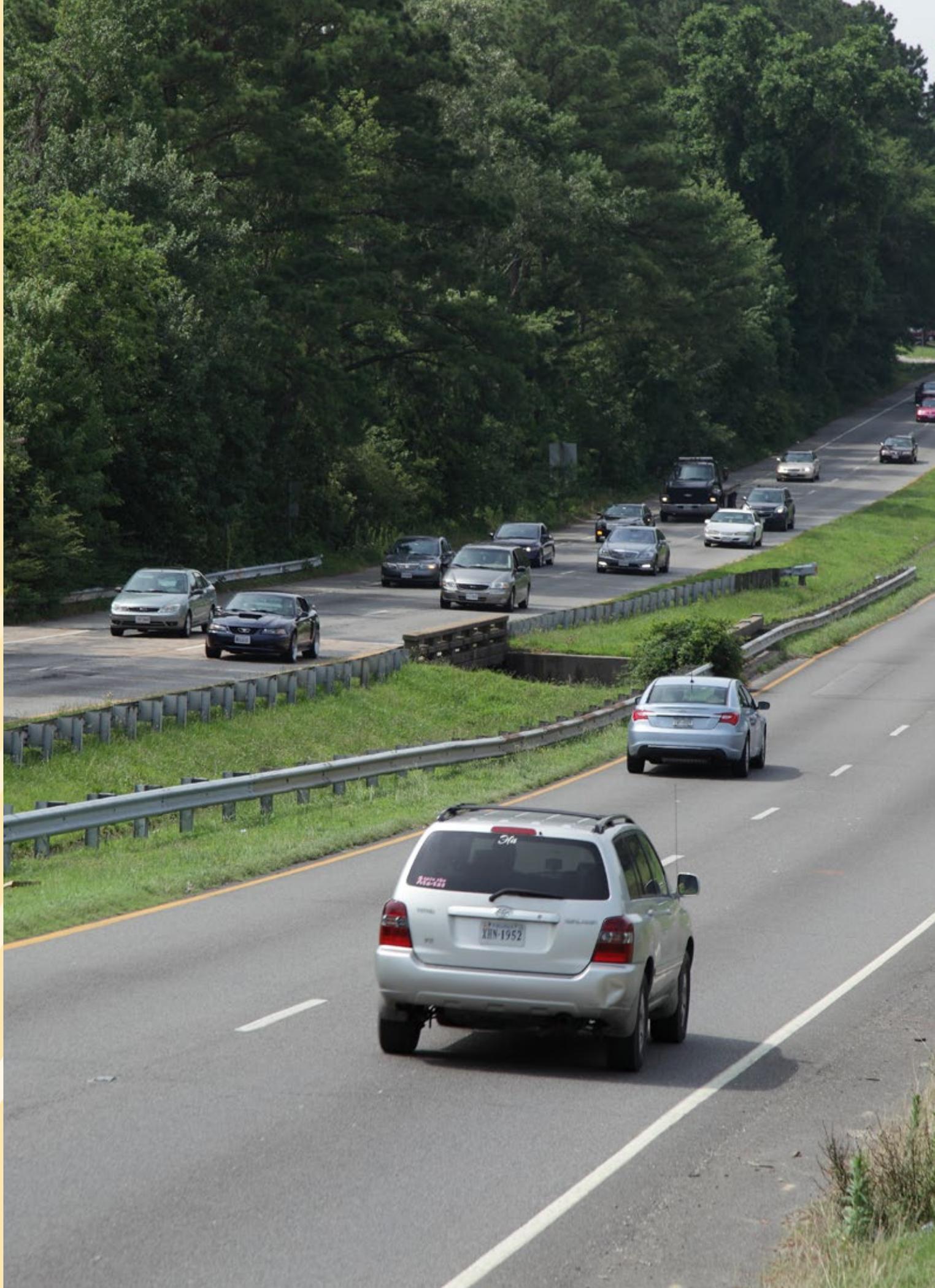
## Connected Vehicle/Autonomous Vehicles

VDOT hired Connected/Autonomous Vehicle (CAV) Program Manager in 2016 and launched its CAV Program. The program includes an executive steering committee that meets regularly to set VDOT's strategic direction and priorities for the CAV Program. This Committee includes representatives from Operations, Research, Traffic Engineering, Strategic Planning, Transportation and Mobility Planning, Maintenance, and Communications with additional advisory support provided by VTTI, DMV, DRPT, Industry Representatives, and the Office of the Secretary of Transportation.



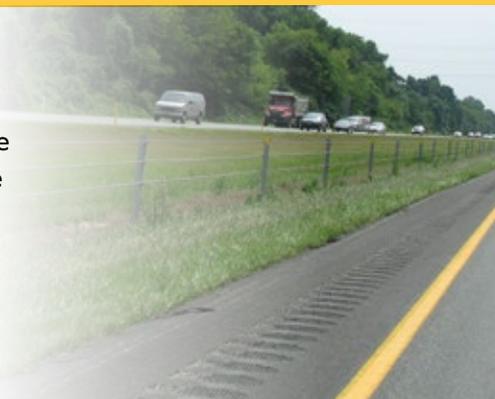
VDOT continues to be actively engaged in national-level CAV committees and workgroups to help guide the national conversation as deployments unfold. This engagement includes leading the Connected Vehicles Pooled Fund Study and participation in working groups and panels led by AASHTO, TRB, NCHRP, the National Center of Operations Excellence, and the V2I Deployment Coalition.

Launched the Virginia Automated Corridors which will streamline the use of Virginia roads and state-of-the-art test facilities for automated-vehicle testing, certification, and migration towards deployment. The initiative is a partnership between VDOT, DMV, and the Virginia Tech Transportation Institute (VTTI). VTTI is also demonstrating a mobile application and studying driver behavior as they were using the automated safety features of the car. <http://www.vtti.vt.edu/elite/>.

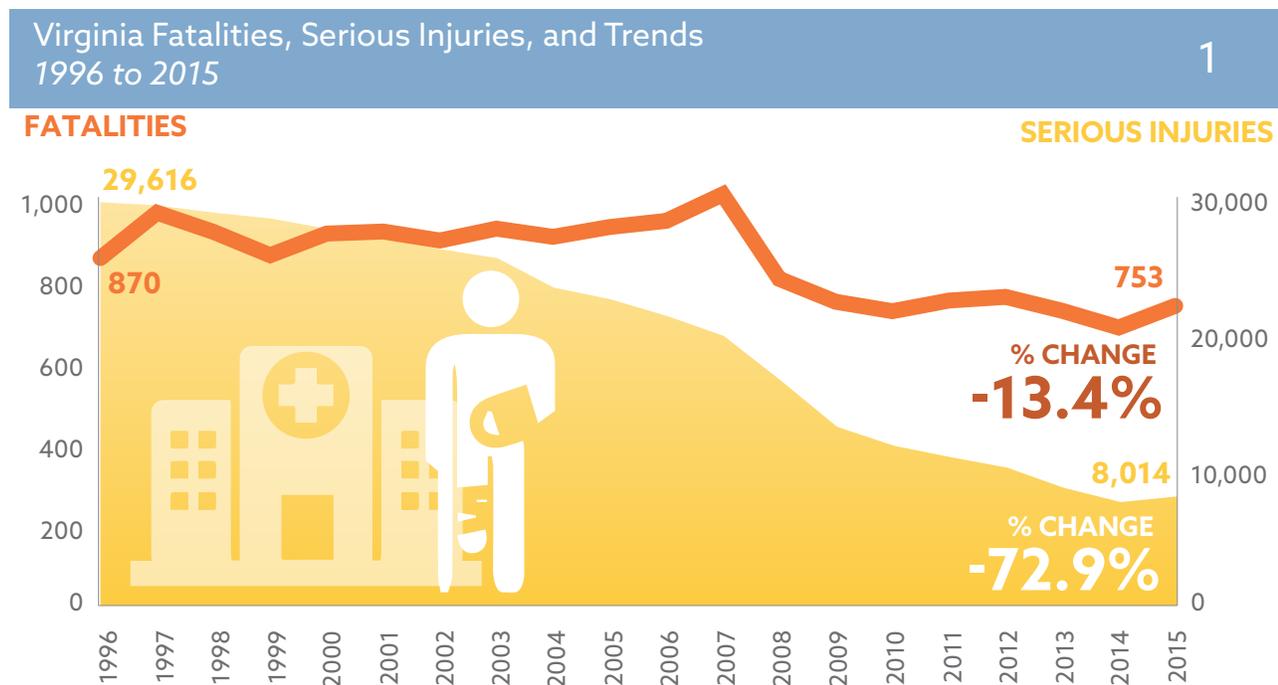


# The State of Traffic Safety

Motor vehicle crashes are viewed mainly as a transportation and mobility issue, which is why deaths and serious injuries are compared using transportation-oriented measures such as the number of vehicle miles traveled (VMT) or the type of facility. According to the Insurance Institute for Highway Safety in 2015, Virginia ranks 11<sup>th</sup> lowest in the nation (tied with Hawaii and Wisconsin) on deaths per 100 million VMT.<sup>2</sup> Overall reductions in the rate of fatalities and serious injuries can be attributed, in part, to increased vehicle miles traveled, which has leveled out in the last few years.

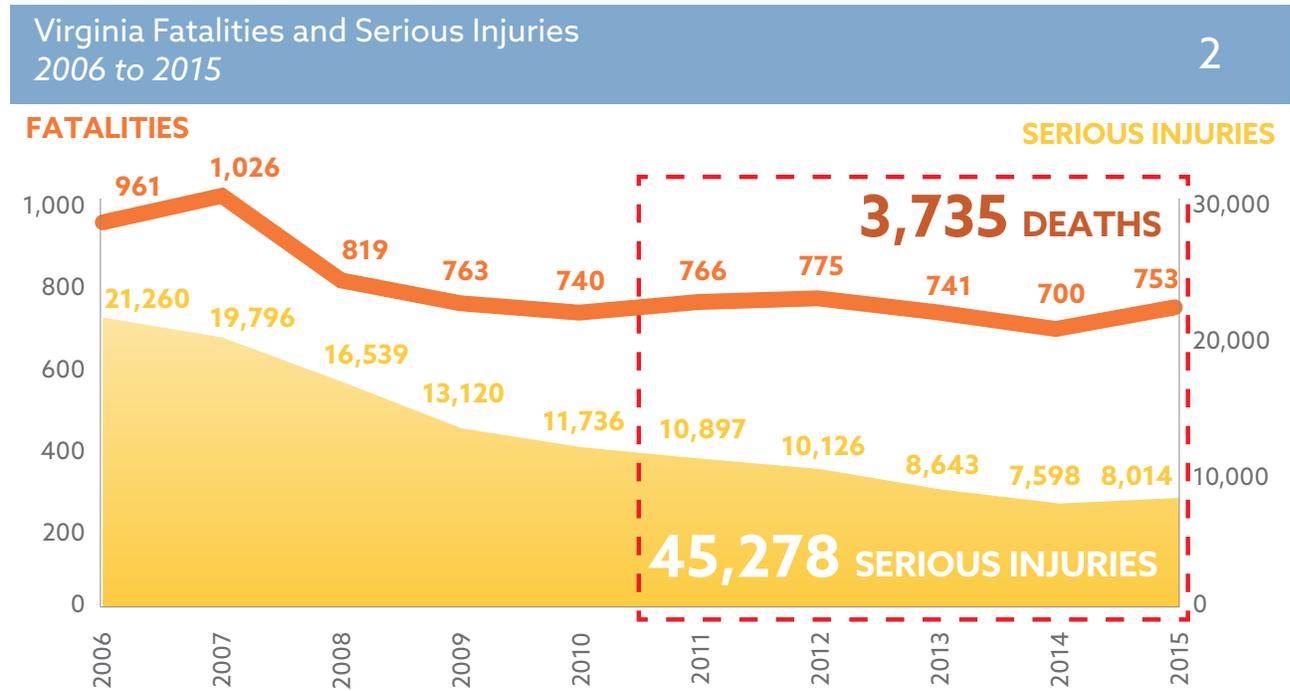


The goal for the SHSP is for every person to Arrive Alive at their destination. Nationally and in Virginia, traffic safety efforts over the last 20 years resulted in a downward trend in fatalities and serious injuries as indicated in Figure 1. As shown, however, fatalities and serious injuries are stagnating. After the reductions from 2007 to 2010 when fatalities decreased to a level not seen in decades, fatalities began to increase and now are staying relatively the same as are serious injuries. Further, 2015 experienced an increase in fatalities for the first time since 2011. Serious injuries declined steeply until 2009, but have since declined to lower levels with an increase in 2015.



<sup>2</sup> Insurance Institute for Highway Safety, General Statistics, 2015, <http://www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/state-by-state-overview>.

In the last five years, 3,735 people have died and 45,278 were seriously injured in more than 600,000 reported traffic crashes on Virginia’s roadways, as shown in Figure 2. These are not just numbers, but actual people who have died or suffered trauma or had a family member, friend, or colleague be involved in a sudden tragedy that happens in every area of Virginia, for all users, and on all types of streets and highways. Elevating highway safety to a top public health concern in the Commonwealth will lead to innovative approaches to solving this problem.



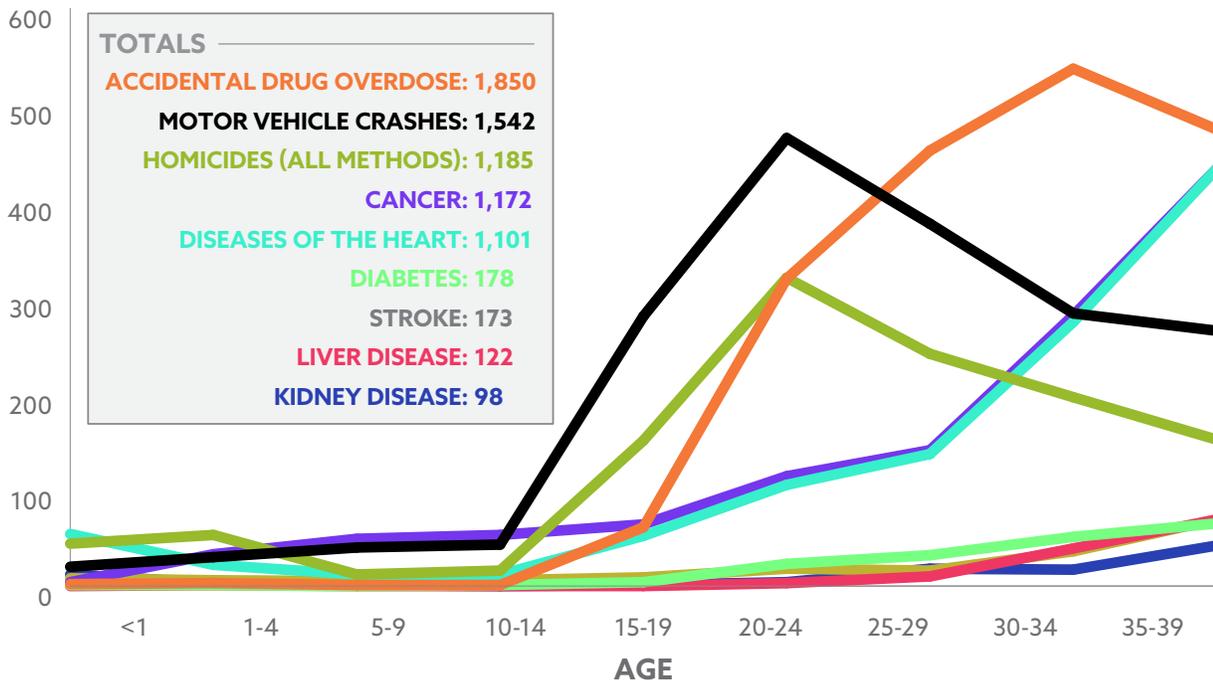
Motor vehicle crashes affect the Commonwealth’s citizens, particularly young people, more than disease or crime. According to NHTSA, motor vehicle crashes are the leading cause of death for children age 10 and under and young people 16 to 23.<sup>3</sup> These crashes take more lives than heart disease, cancer, diseases, homicide, accidental drug overdose, or diabetes as shown in Figure 3. Figure 4 shows the changes in the age of Virginia drivers involved in crashes. Younger drivers (age 25 and younger) show a decrease while aging drivers are showing slight increases.

<sup>3</sup> NHTSA, Summary of Motor Vehicle Crash Facts, Early Edition, 2015 Data, February 2017.

## Leading Causes of Death in Virginia 2010 to 2015

3

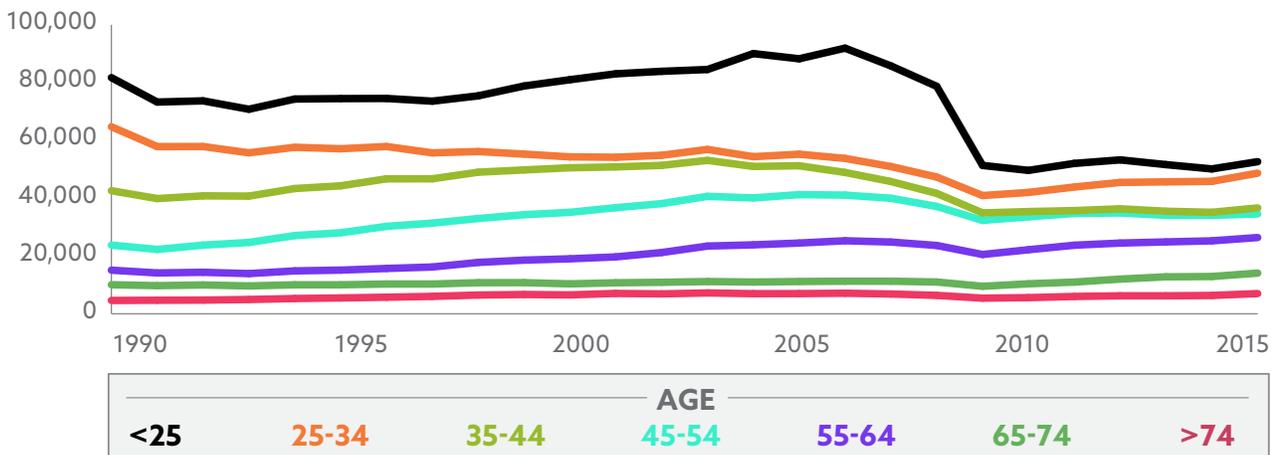
### DEATHS



## Age of Virginia Drivers Involved in Crashes 1990 to 2015

4

### DRIVERS



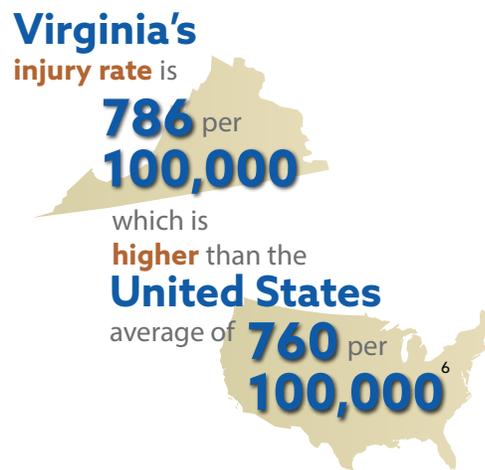
Traffic fatalities and serious injuries also substantially impact the Commonwealth and local communities through increased medical costs, lost wages, insurance costs, taxes, police, fire and emergency services, legal and court costs as well as property damage.<sup>4</sup> Table 1 shows just how costly every crash can be to Virginia residents. Virginia uses this information to help educate policy makers and others of the devastating impact of crashes. According to NHTSA, the economic and societal impact of motor vehicle crashes in the Commonwealth is nearly \$5 billion in 2010 dollars.<sup>5</sup>

Table 1. Cost of Traffic Crashes in Virginia

Crash Severity Level	Crash Cost (\$)
Fatal (K)	\$5,722,300
Disabling Injury (A)	\$302,900
Evident Injury (B)	\$110,700
Possible Injury (C)	\$62,400
Property Damage Only (O)	\$10,100

Note: Costs based on 2015 values and represent a “per crash” cost.

Source: AASHTO Highway Safety Manual (HSM).



<sup>4</sup> AASHTO's Highway Safety Manual references Federal sources to identify the cost of crashes using the KABCO scale.

<sup>5</sup> NHTSA May 2015. Economic and Societal Impact of Motor Vehicle Crashes, National Highway Traffic Safety Administration, DOT HS 812 013, May 2015, Washington, D.C.

<sup>6</sup> NHTSA, Summary of Motor Vehicle Crash Facts, Early Edition, 2015 Data, February 2017.

The following facts demonstrate the public health problem the Commonwealth is facing due to traffic crashes. In Virginia between 2011 and 2015 motor vehicle crashes annually caused:

There are at least  
**two deaths**  
 each day in Virginia

The number of  
**traffic-related serious injuries**  
 would fill nearly  
**90 percent**  
 of Lane Stadium

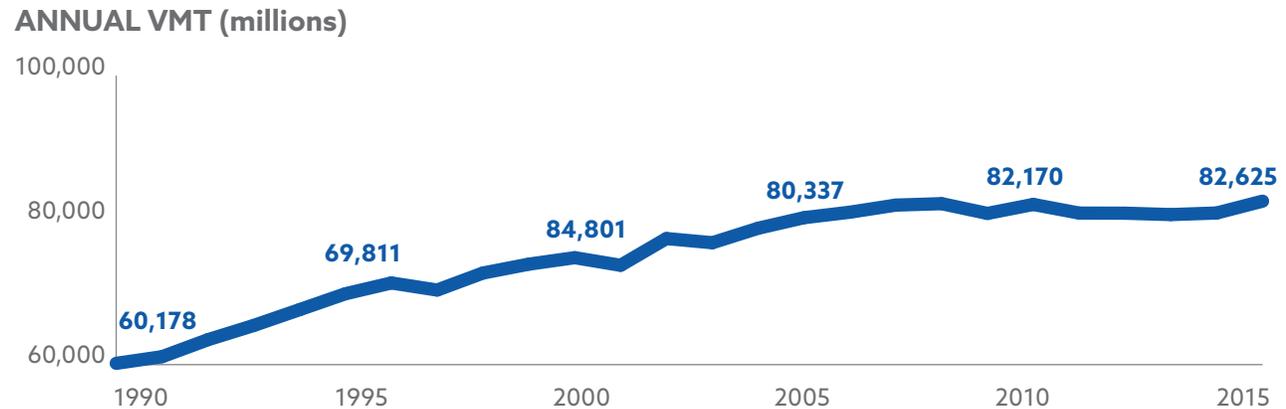
A  
**traffic-related serious injury**  
 happens nearly every  
**12 minutes**

Following are some factors that can impact fatalities and serious injuries.

### VEHICLE MILES TRAVELED

VMT increased steadily until 2007 with some leveling off until 2011 and then a slight decline, which happened when the population and licensed drivers grew on average by one percent annually as shown in Figure 5. Recent flattening of VMT growth is changing with over two percent increase in 2015 which matches increases in fatalities and serious injuries in 2015.

Virginia Vehicle Miles Traveled (VMT) 1990 to 2015 5



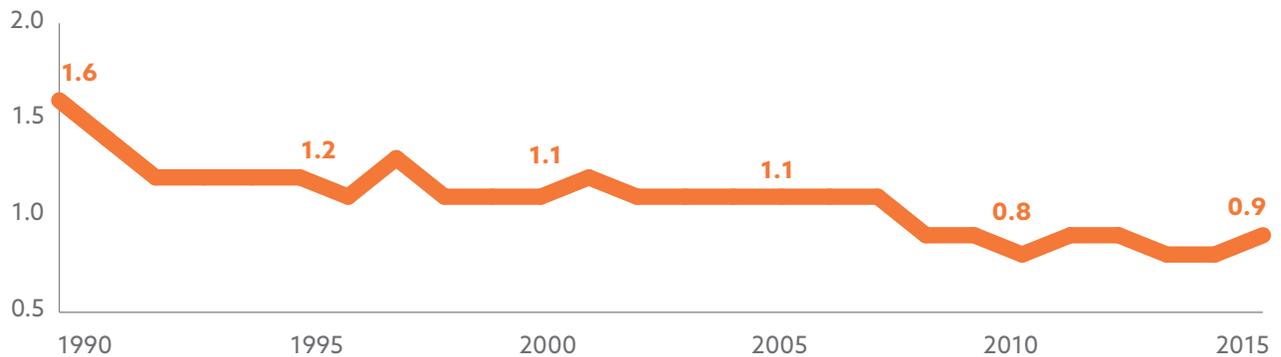
The fatality rate, while showing a steady decline over 25 years, experienced several plateau periods as shown in Figure 6. The same is not true for serious injuries. Figure 7 shows the two periods for the serious injury rate reductions with a steeper trend until 2009 and a flattening trend since then.

Note: Data on serious injury VMT not available until 1996.

Virginia Fatality Rate per 100M VMT  
1990 to 2015

6

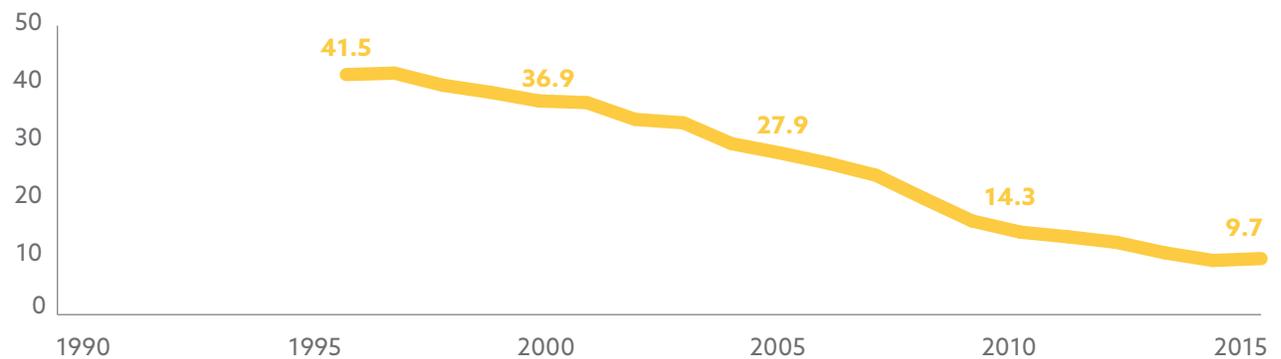
PEOPLE KILLED (per 100 million VMT)



Virginia Serious Injury Rate per 100M VMT  
1990 to 2015

7

PEOPLE INJURED (per 100 million VMT)



URBAN VERSUS RURAL CRASHES

DRIVER AGE

There are **67,257** total miles of public roadways in Virginia

42% are in rural areas and 58% are in urban areas<sup>7</sup>

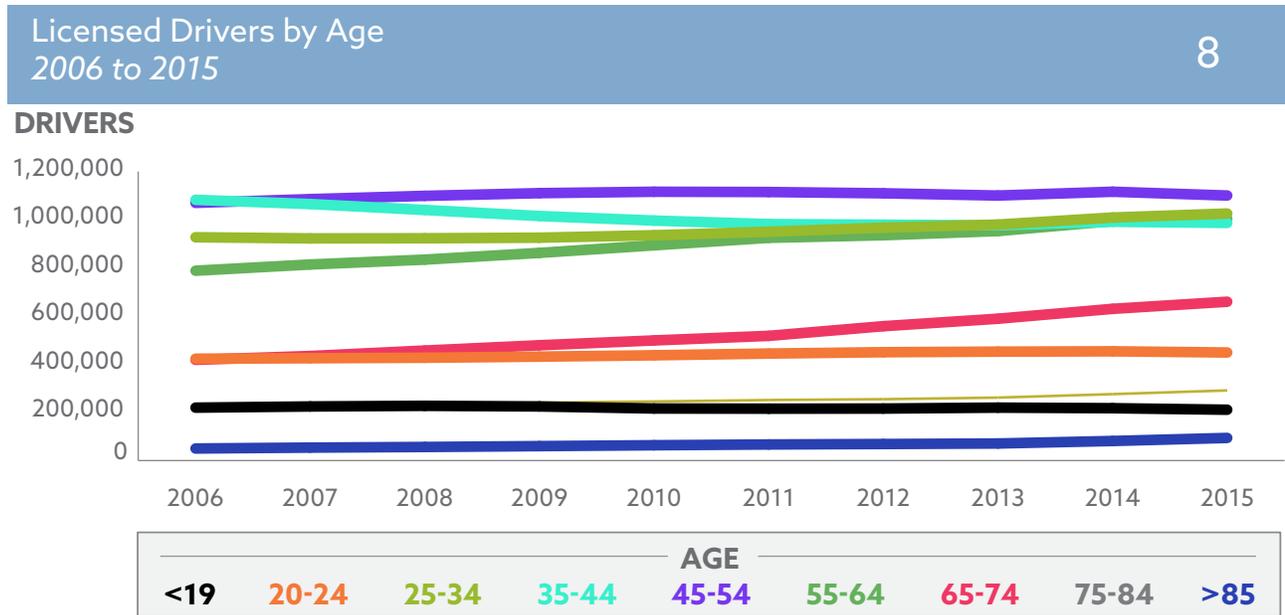
Even though fatalities decreased in rural areas, the rate increased making rural travel riskier. Deliberate examination of the various factors that drive these trends, with consideration of the exposure to risk (VMT), will be necessary to target crashes in both urban and rural areas.

Fatalities in urban areas dropped 14 percent in the last ten years from 564 in 2006 to 485 in 2015. In rural areas during the same period fatalities declined 33 percent from 397 to 268. The fatality rate figures, however, show something different.

The fatality rate in the last 10 years declined 44% in urban areas but in rural areas it increased by 13%

<sup>7</sup> Federal Highway Administration, Highway Statistics, 2015.

Age affects how we drive. Novice drivers crash at higher rates than their older counterparts due mainly to their inexperience and risk-taking behavior. However, the younger driver registrations have declined in recent years. Aging also impacts driving abilities. As we get older, aging affects vision, memory, physical strength, reaction time, and flexibility. Figure 8 shows the changes in licensed drivers over the past decade by age. Those age groups where the number of licensed drivers are increasing are those age 55 to 74. The good news is that aging road users tend to voluntarily limit their driving by not driving at night, staying on familiar roadways, and driving at times when traffic is not as heavy (10 a.m. and 2 p.m.).



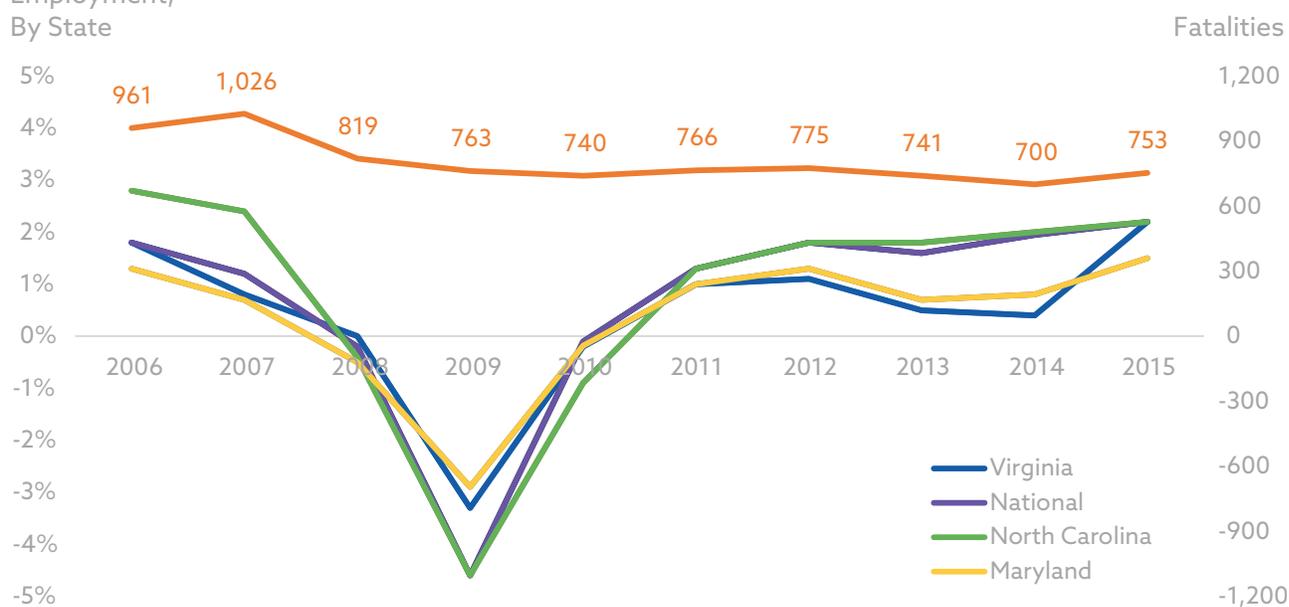
## ECONOMY

According to Virginia Performs, Virginia's Performance Leadership and Accountability System, job growth in the Commonwealth was positive from 2011 to 2014 but lagged behind the U.S. and surrounding states which may be attributable to the reductions in Federal government spending as shown in Figure 9. In 2015, employment growth in the Commonwealth bounced back to 2.2 percent which is above the national average of 2.1 percent and ranking the State 16<sup>th</sup> overall. As evidenced by steep declines in motor vehicle fatalities and serious injuries during the most recent recession, the economy plays a large role in highway safety.

Annual Change in Employment vs Fatality Numbers  
2006 to 2015

9

Annual Change in  
Employment,  
By State

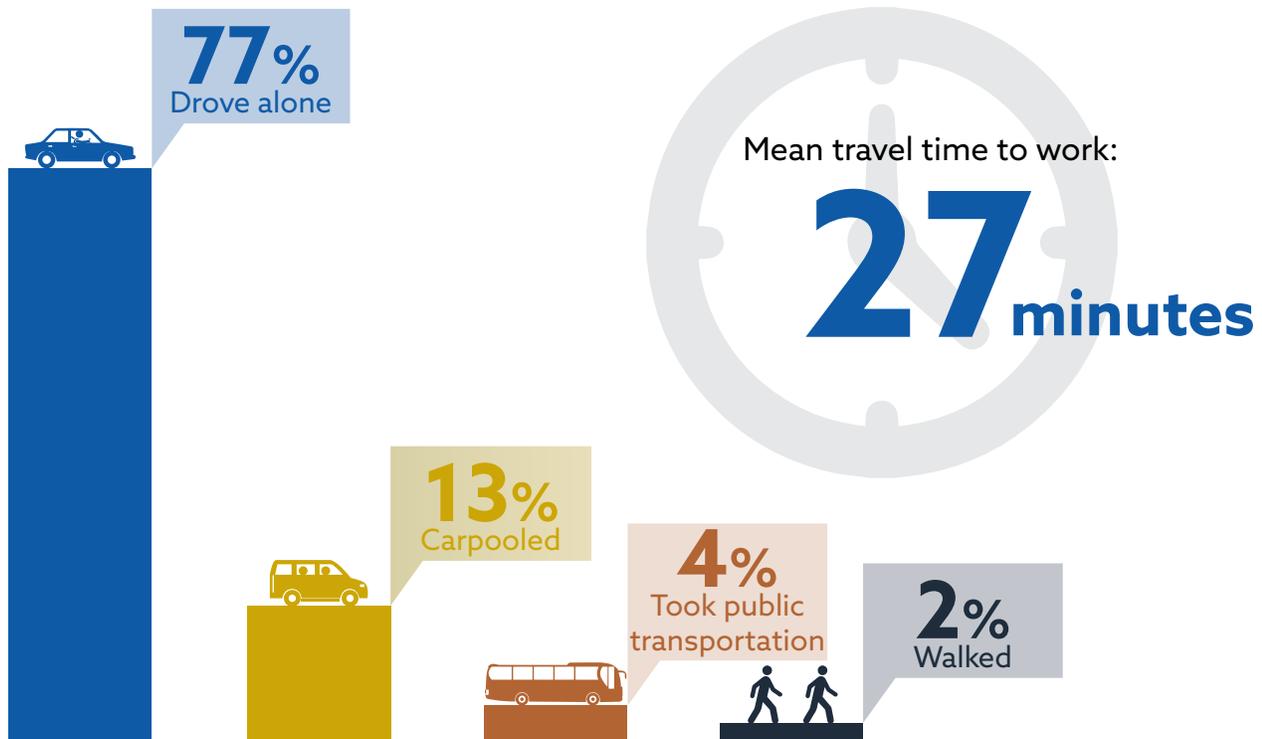


Source: Virginia Performs, <http://vaperforms.virginia.gov/indicators/economy/employmentGrowth.php>.



## COMMUTING HABITS

How we drive to and from work can increase exposure which also increases the risk for people in Virginia.<sup>8</sup>



Source: U.S. Census

The outside factors influencing traffic crashes are as varied as the causes of a traffic crash. Normally there is never just one cause. It is usually a series of things such as a young male driver, who is impaired and speeding which causes him to run off the road where he is severely injured because he was not wearing a seat belt. Consideration of those factors, particularly in light of the impact on public health, will be necessary as we accelerate improvements in designing our roadways and vehicles, make more inroads into changing culture through enforcement and education, and ensure people get medical attention as quickly and efficiently as possible.

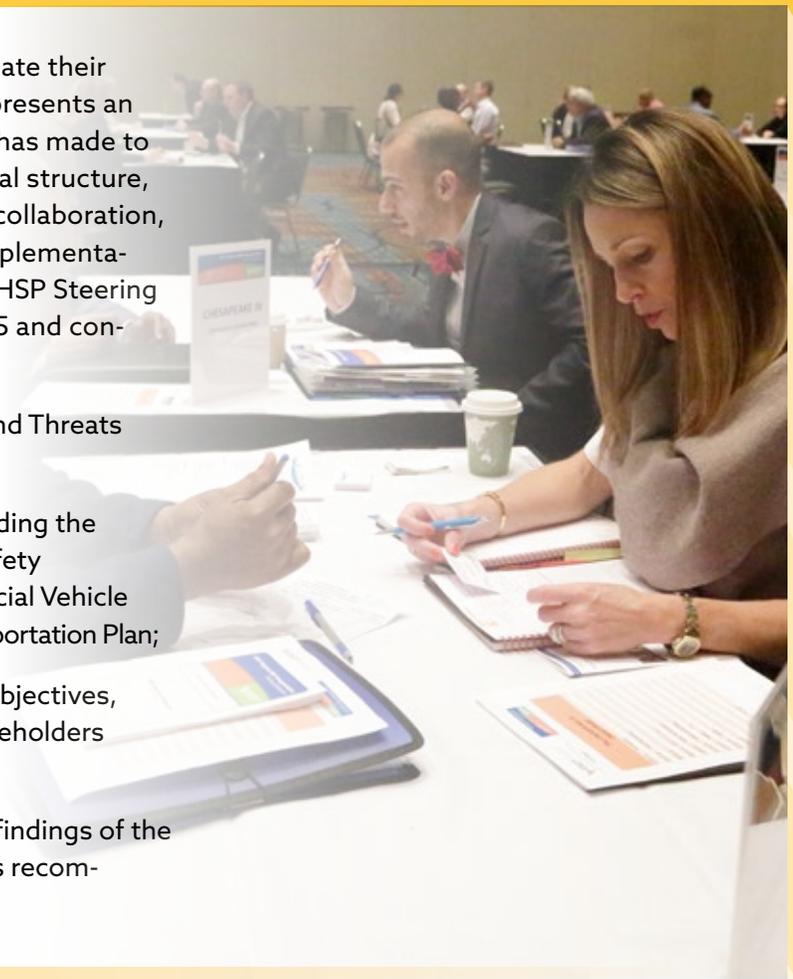
<sup>8</sup> U.S. Census, 2011.



# Updating the Arrive Alive SHSP

The Federal government requires states to update their SHSPs every five years. An update of the plan presents an opportunity to reflect on the progress Virginia has made to date and what can be improved in organizational structure, plan processes and procedures, data analysis, collaboration, stakeholder outreach, partner engagement, implementation, and evaluation. The Virginia Arrive Alive SHSP Steering Committee began an update of the plan in 2015 and conducted the following activities:

- » A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis;
- » A comparison with other safety plans, including the Highway Safety Plan (HSP), the Highway Safety Improvement Program (HSIP), the Commercial Vehicle Safety Plan (CVSP), and the Long Range Transportation Plan;
- » A review of the draft plan emphasis areas, objectives, strategies, and actions by partners and stakeholders at eight regional road show meetings; and
- » A review by the Steering Committee of the findings of the common and unique concerns and revisions recommended during the road show meetings.



## SWOT Analysis

The SWOT process is designed to identify what was successful about the previous plan and what are the opportunities for improvement. In the fall of 2015, the SHSP management team conducted individual interviews with key stakeholders, agencies, and organizations, and completed a survey of safety stakeholders. Survey and interview respondent level of experience with SHSP development and implementation ranged from multiple years of involvement to more recent involvement. Table 2 presents a summary of the perceived strengths and weaknesses as well as future opportunities and threats.

Table 2. SWOT Summary

<b>Strengths</b> <ul style="list-style-type: none"><li>• Road show meetings.</li><li>• Plan document and content.</li><li>• Reductions in fatalities and serious injuries.</li></ul>	<b>Weaknesses</b> <ul style="list-style-type: none"><li>• Lack of follow through.</li><li>• Lack of executive level involvement.</li><li>• Siloed implementation (lack of collaboration).</li><li>• Lack of widespread involvement.</li><li>• No monitoring or evaluation.</li></ul>
<b>Opportunities</b> <ul style="list-style-type: none"><li>• Management and administration.</li><li>• Emerging issues.</li><li>• Regional implementation.</li><li>• Outreach.</li><li>• Evaluation.</li></ul>	<b>Threats</b> <ul style="list-style-type: none"><li>• Link to other plans.</li><li>• Lack of funding.</li><li>• Difficulties involving executives.</li><li>• Territorial issues.</li><li>• Workload and needs of safety partners.</li></ul>

Given the importance of the information, the Steering Committee held a workshop in December 2015 to more fully review the findings and develop specific plans to address each of the major elements. The group determined four major issues were identified in the SWOT and formed working groups that met in early 2016 to discuss each of the concerns. These groups focused on the Leadership for the SHSP (Executive Committee), Maintaining Momentum, SHSP Integration, and Coordination of Goals and Objectives. The Maintaining Momentum and SHSP Integration working groups merged given the similar nature of their discussions. The working groups brought specific recommendations to the Steering Committee resulting in greater coordination between the behavioral and infrastructure partners, and the inclusion of a special focus area on connected and autonomous vehicles.

# Vision, Mission, Goal, and Objectives

The Arrive Alive plan includes a vision, mission, and goal that links to the national Toward Zero Deaths (TZD) initiative. The initiative is supported by the American Association of State Highway Transportation Officials (AASHTO), the Governors Highway Safety Association, the Federal Highway Administration (FHWA), NHTSA, and other national organizations.

Virginia adopts the **VISION** of **Toward Zero Deaths**. All roadway users should arrive **safely** at their destinations.



The **MISSION** of the SHSP is to **save lives** and **reduce** motor vehicle **crashes** and **injuries** through **enforcement, education, engineering, and emergency response strategies**.

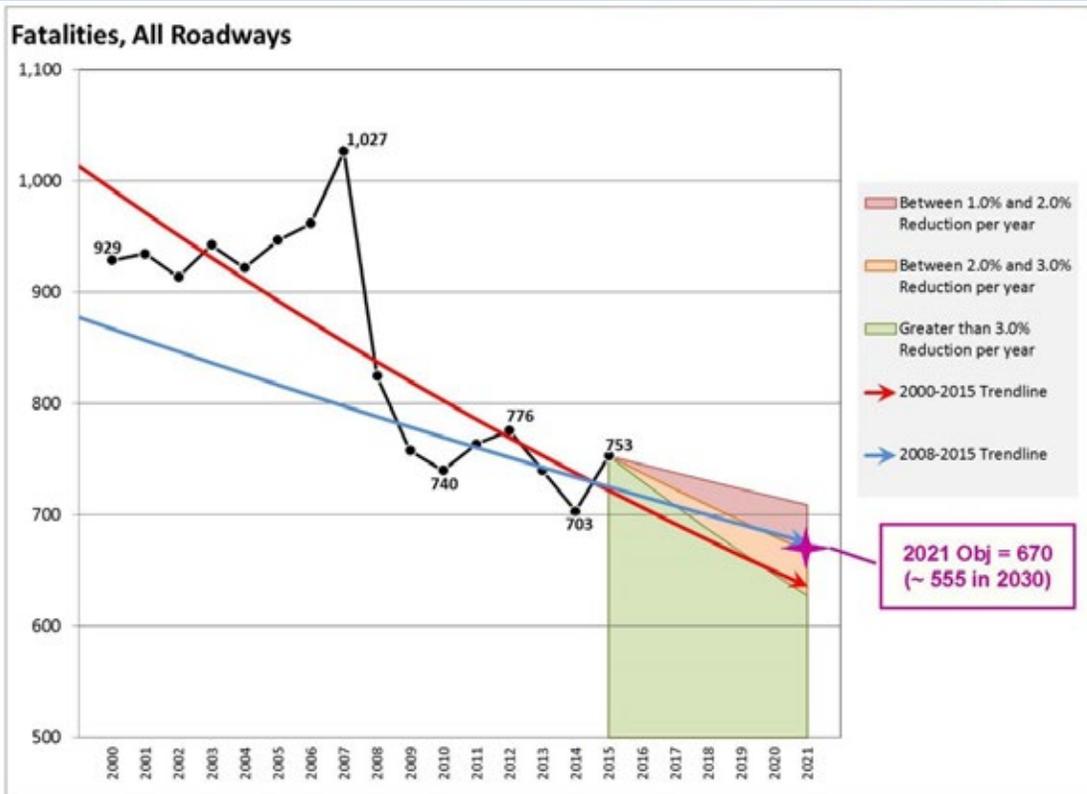


**GOAL** reduce **deaths** and **serious injuries** by **50%** by 2030.



To achieve the goal, Virginia also established measurable fatality and serious injury five-year objectives. In selecting the objectives, the Steering Committee viewed graphs that showed the actual figures for the number of fatalities, the fatality rate, the number of serious injuries, and the serious injury rate. Trend lines were also developed for the past 15 years. The Committee considered several options for each measure, including percent reduction ranges for each performance measure. Figure 10 shows the options considered for the fatality objective.

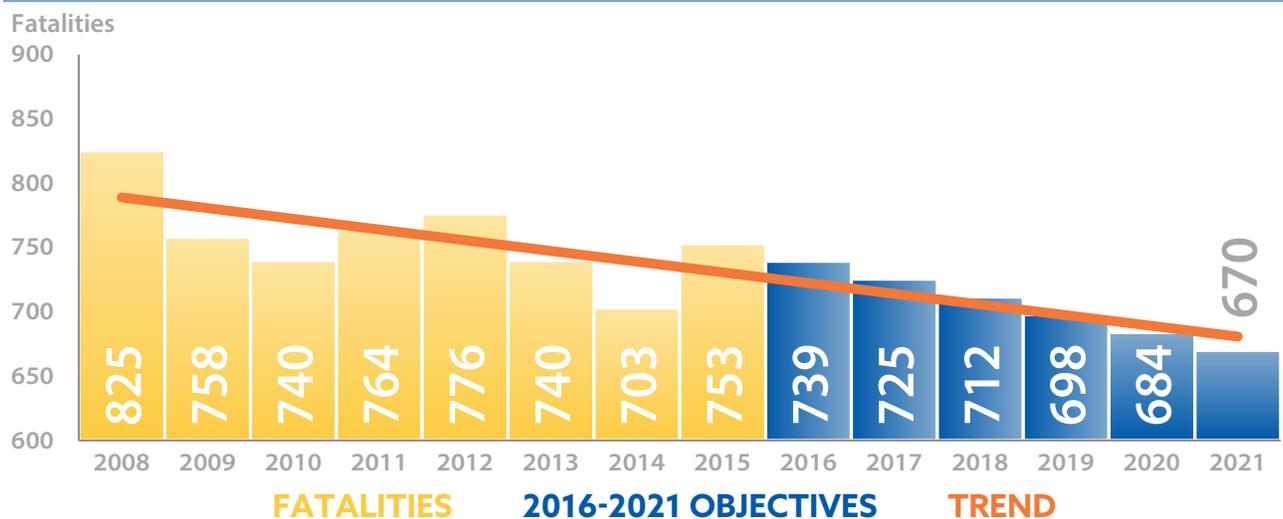
Options for SHSP Fatality Objective 2000 to 2015 10



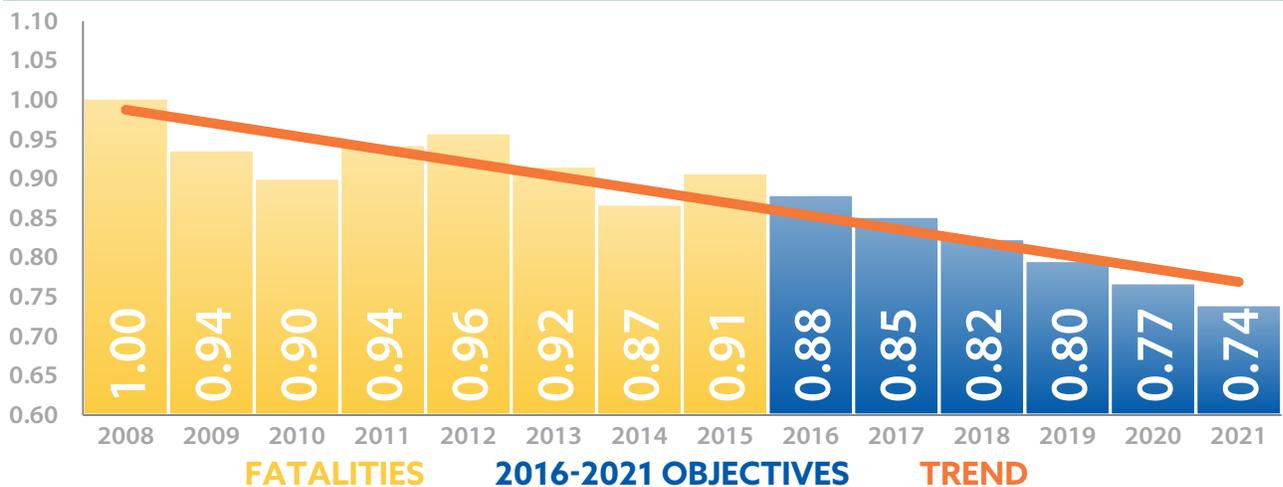
The Committee considered other factors that impact the numbers such as population growth and increases in vehicle miles traveled along with any expected increases in young drivers who tend to have a higher fatality and serious injury rates. Increases for non-motorized users (bicyclists and pedestrians) and motorcyclists also were considered. These objectives will be tracked each year to determine if the SHSP remains on target to achieve the recommended reductions. Since it is a living document, the actions in the plan can be updated if it is not meeting the stated goal.



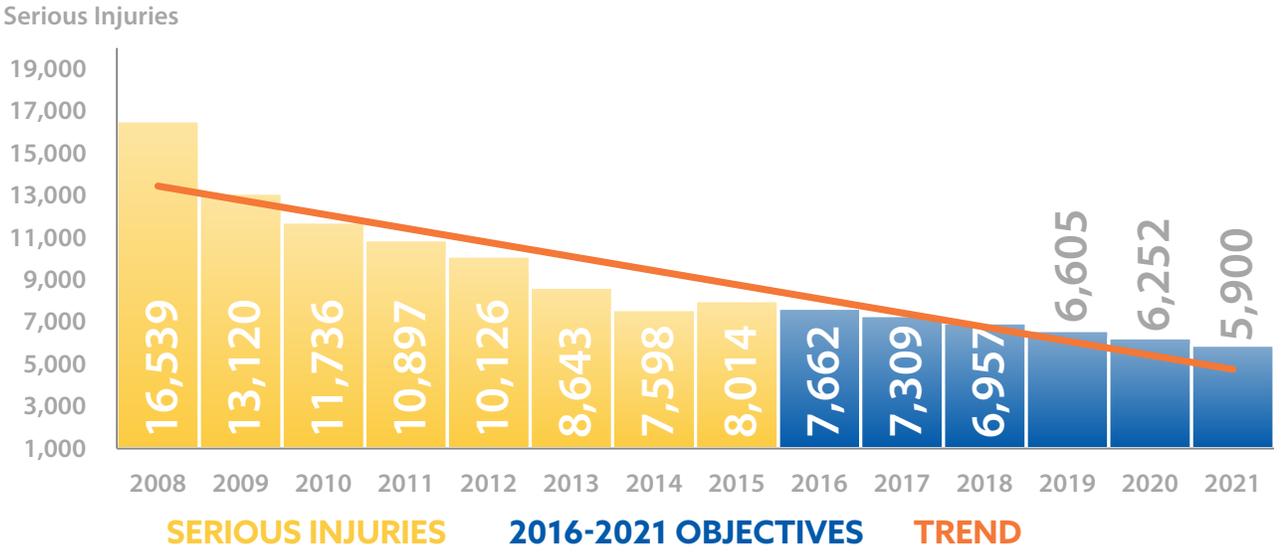
Virginia Fatality Objective 11



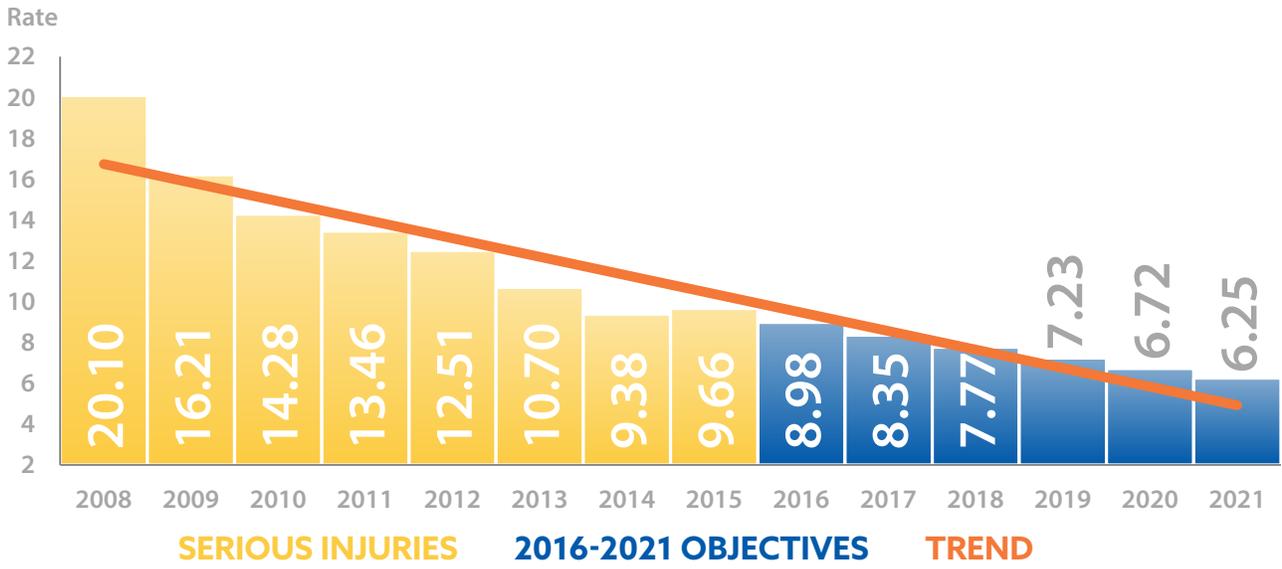
Virginia Fatality Rate Per 100 Million VMT Objective 12



Virginia Serious Injuries Objective 13



Virginia Serious Injury Rate Per 100 Million VMT Objective 14

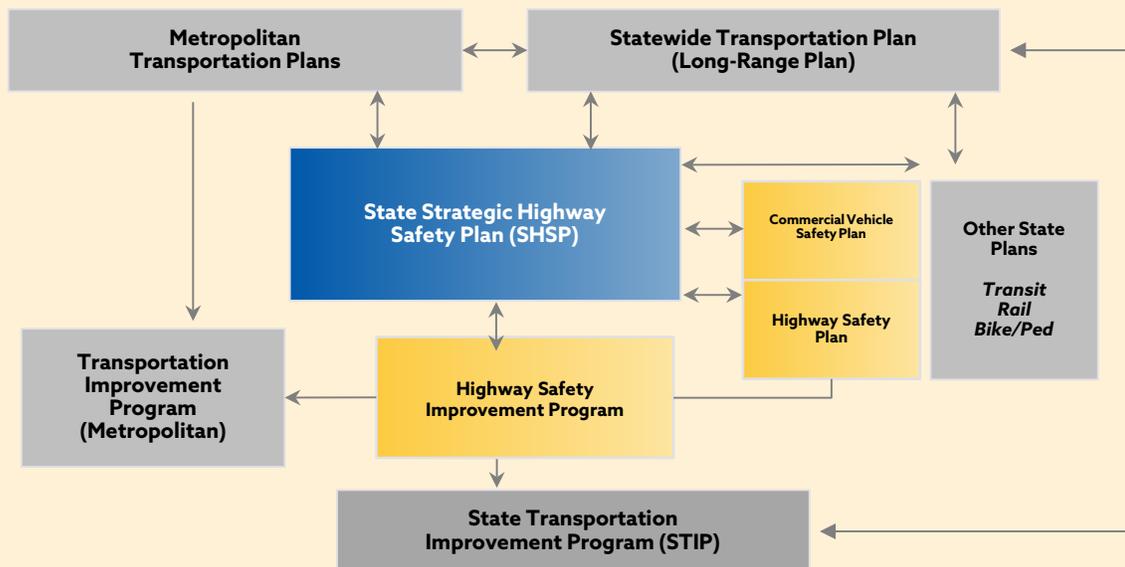


Federal law requires state DOTs to develop annual safety targets for four SHSP measures (number and rate of fatalities and number of serious injuries) plus the number of bicyclist and pedestrian fatalities and serious injuries. Three of these target values must be identical in the HSP and HSIP, but they do not have to match the numbers in the SHSP. The SHSP objectives are not the same as the annual targets since they span multiple years. According to guidance from FHWA, the SHSP multiyear objectives provide an opportunity to drive consistency for the annual targets and encourage the individuals involved in setting the annual targets also to be involved in developing the SHSP objectives.

# Plan Coordination

Effective SHSP implementation leverages the resources of other transportation planning and programming activities, and as such the SHSP serves as the coordinating document for the other plans and programs that involve traffic safety. This coordination involves the statewide long-range transportation plan, the transportation improvement programs developed by metropolitan planning organizations, and three plans that implement parts of the SHSP – the HSP, the HSIP, and the CVSP. This integration is important for improving overall safety coordination and linkages among State, regional, and local agencies leading to a more comprehensive transportation safety planning. Agencies then understand the key safety priorities.

The HSIP funds the various infrastructure projects such as roadway delineation, rumble strips, traffic signal upgrades or roundabouts. In fact, to qualify for funding an HSIP project must be reflected in the SHSP. The HSP funds behavioral safety programs such Drive Sober or Get Pulled Over and Click It or Ticket. The CVSP funds efforts target safety for the trucks and buses that travel our roads and highways. There is consideration of commercial vehicle concerns throughout the plan in all emphasis areas.



## Road Show Meetings

In November and December 2016, the SHSP Management Team held eight regional roadshow meetings in Bristol, Salem, Harrisonburg, Northern Virginia, Richmond, Lynchburg, Charlottesville, and Hampton Roads. Over 140 individuals participated as shown in the Appendix. The objective of the meetings was to decide if anything was missing from the plan and if so, how could it be improved. The groups also decided what elements in the plan could be applied locally and regionally either through an existing program or by starting something new.

Data on traffic-related fatalities and serious injuries in each region broken down by major issues was provided to help participants understand the traffic safety problems in their area. Upon completion of the data review, each group selected the three most serious traffic safety problems in their region and developed recommendations on solutions using the SHSP as the guide. At the conclusion of the meeting, participants walked away with the following:

- » A greater understanding of the SHSP and how implementing coordinated efforts will reduce traffic-related fatalities and serious injuries throughout the Commonwealth;
- » An identification of things to change in the statewide plan; and
- » A determination of the strategies and actions in the statewide plan that could be implemented locally through an existing program or new initiative.

Following the road show meetings, the project conducted two statewide webinars to review the concerns expressed at the regional events along with any recommended changes in the plan. Members of the Steering Committee and emphasis area teams participated in these discussions and made final decisions on the strategies and actions for each of the emphasis areas. A second webinar was conducted to review the final decisions of the Steering Committee.



*Safety stakeholders from the Harrisonburg region learn about the traffic safety problems in their region and what is being done to solve them.*

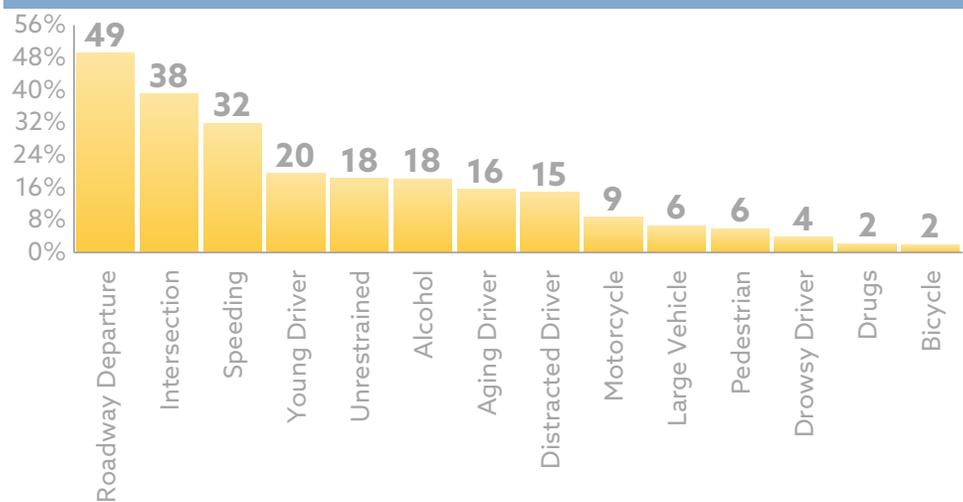


# Emphasis Areas

Emphasis areas (EA) represent the key factors contributing to crashes, which, if addressed, have the greatest potential to reduce fatalities and serious injuries. The EAs for the Arrive Alive SHSP were identified using a data-driven approach and input from committees, stakeholders, and the public. The goal in selecting the EAs was to focus financial and staff resources on the top safety priorities. To reduce fatalities and serious injuries within each EA, strategies and actions were developed to provide specificity on how to achieve the reductions.

The 2011-2015 crash data revealed 14 potential EAs for the Virginia SHSP and the decision was to select 8 for the plan. The EAs are divided into three broad categories to group them by similarities. The Behavior EA category includes impaired driving, speed, and occupant protection and identifies strategies to address unsafe or risky behaviors made by roadway users. The Crash Type/Location EA category includes roadway departures and intersections and identifies infrastructure treatments to make the transportation system safer for all users. The User Groups EA category includes young drivers, bicyclists, and pedestrians and identifies strategies to address vulnerable road users.

Fatalities and Serious Injuries – Contributing Factors to Crashes 2011 to 2015



Special focus areas, including Data, Incident Response and Emergency Medical Services, and Connected and Autonomous Vehicles also are addressed in this plan as these continue to be critical components to lowering fatalities and serious injuries.

Aging road users, motorcycles, and large vehicles are not included as emphasis areas in this SHSP, but remain critical to lower fatalities and serious injuries within the EAs. The Commercial Motor Vehicle Safety Plan identifies strategies and actions for addressing large truck crashes; the Virginia DMV-HSO formed a work group to identify the needs and recommend strategies related to aging drivers; and the impaired driving, speeding, roadway departure, and young driver emphasis areas address motorcycle strategies.

# Virginia SHSP Emphasis Areas

<u>Behavior</u>	<u>Crash Type/Location</u>	<u>User Groups</u>
Impaired Driving ( <i>Alcohol, Drugs, Distracted Driving, and Drowsy Driving</i> )	Roadway Departure Intersection	Young Drivers Bicycles Pedestrians
Speeding		
Occupant Protection		

This chapter provides a description for each EA and special focus area, supporting crash data analysis, and the strategies and actions to lower fatalities and serious injuries in Virginia. The strategies and actions in the plan were selected based on their effectiveness. Emphasis Area teams reviewed the previous plan and whether or not changes were required. The selection of countermeasures for the previous plan and this plan were based on available research. In the behavioral area, Virginia looks to the NHTSA publication Countermeasures That Work<sup>2</sup> that provides specific information on what research says works for areas such as impaired driving, speeding, etc. For the infrastructure strategies and actions under Roadway Departure and Intersections, the plan reviewed information from the National Cooperative Highway Research Program’s Report 500 Series which remains the most comprehensive listing of effective approaches. The Crash Modification Clearinghouse and the Proven Countermeasures from FHWA were also used. Strategies and actions for Pedestrians and Bicyclists were also taken from this research.

To further link the plan to effective approaches, the strategies and actions all focus on the **4 E s of safety**:



**ENGINEERING** This E involves the design of roadways and the surrounding environment using solutions that reduce crashes or minimize the severity of crashes when they occur.



**ENFORCEMENT** This E involves the actions and efforts by the thousands of state and local law enforcement officers throughout the Commonwealth who are working to ensure road users follow the law. Strategies and actions in this area often involve targeted efforts in areas where crashes happen and involve changing road user behavior.



**EDUCATION** This E involves providing information to road users, through public awareness campaigns, media stories, social media, driver’s education, and other avenues, to help them make good choices.



**EMERGENCY MEDICAL SERVICES** This E involves the efforts of emergency responders in providing medical services quickly and effectively to individuals involved in crashes.

<sup>2</sup> [http://www.ghsa.org/sites/default/files/2016-12/812202-CountermeasuresThatWork8th\\_0.pdf](http://www.ghsa.org/sites/default/files/2016-12/812202-CountermeasuresThatWork8th_0.pdf)

Tracking, monitoring, and evaluation of each of the strategies and actions will ensure Virginia is accomplishing what is in the plan and that those efforts are making a difference and contributing to reductions in fatalities and serious injuries.

## High Risk Rural Roads in Virginia

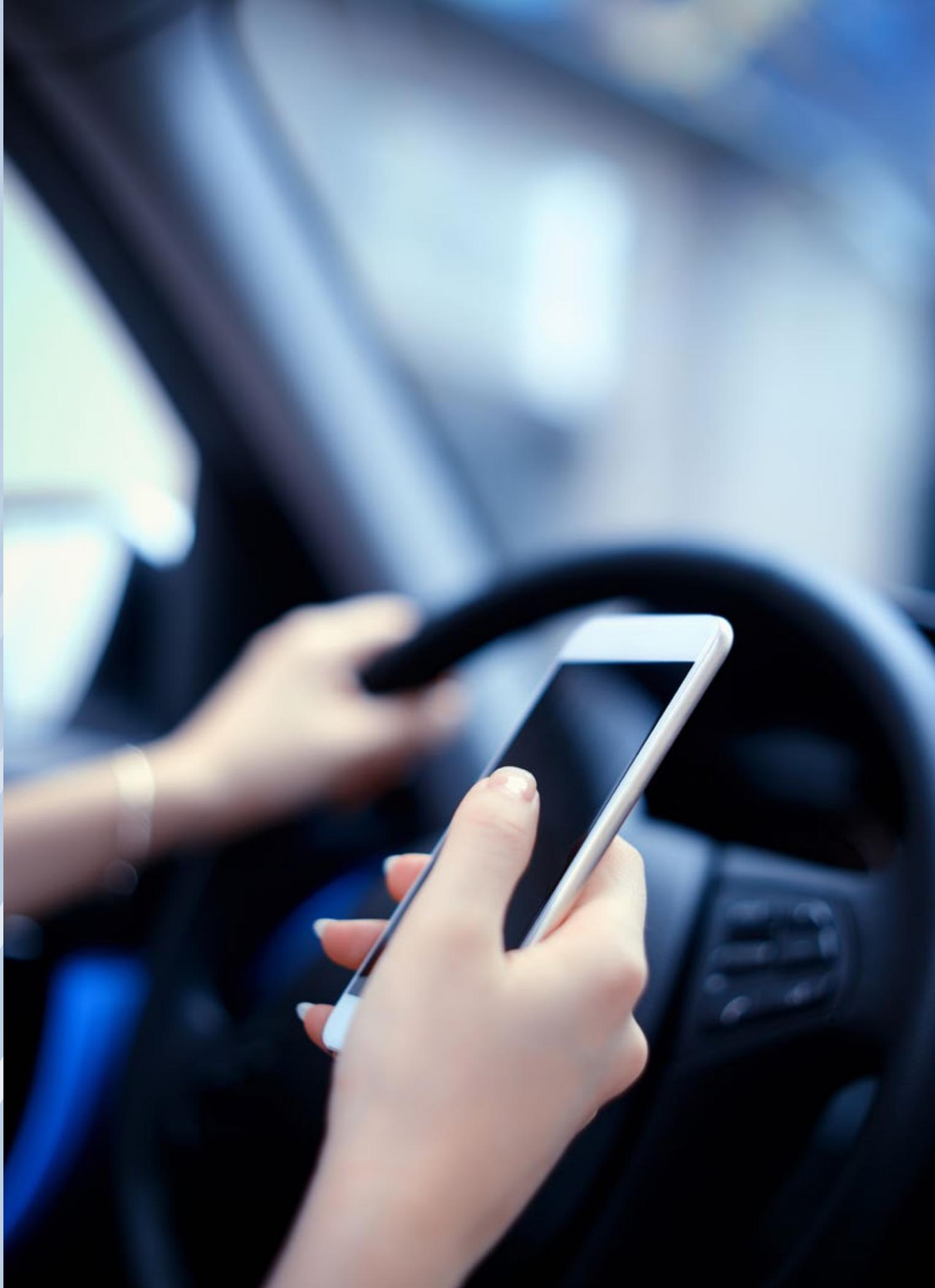
A definition for High Risk Rural Roads (HRRR) is required to be incorporated in the SHSP. Eligible roadways for the HRRR Special Rule include lower volume and width rural roads, which consist of the following functional classifications:

- Rural Major Collector;
- Rural Minor Collector; and
- Rural Local Roads.

Rural road limits are defined after each Federal census based on land-use densities. The definition, which is based on FHWA regulations, identifies the highway segments and intersections on either of the following:

- Only roadways that are classified as rural major collectors, or rural local roads and Fatal and serious injury crash rate per 100 million vehicle miles traveled (VMT) that is higher than roadways of similar functional classification in statewide.
- For any years that Virginia is required to implement the HRRR Special Rule, the State is required to provide funding to match 200% of the Federal allocations that our State received (based on the amount received in 2009). Virginia did not have to implement the HRRR Special Rule for several years, but it will for Fiscal Year 2018. In that year, the HRRR funds will be spent on a project affecting eligible roadways.





## EMPHASIS AREA

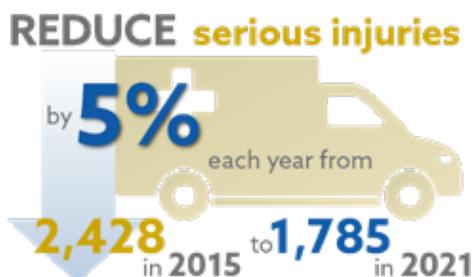
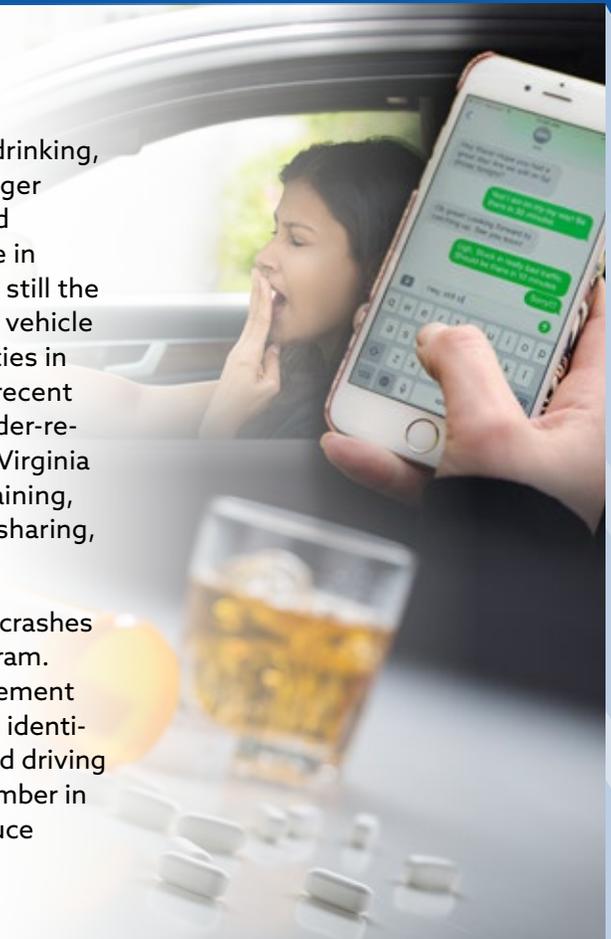
# Impaired Driving



## Overview

Impaired driving encompasses crash statistics for the 4 Ds - drinking, drugs, distracted, and drowsy. The problem is not just passenger vehicle drivers, but also motorcyclists, heavy truck drivers and non-motorized pedestrians and bicyclists. SHSP strategies are in place to address all of these issues, but alcohol impairment is still the most significant issue, representing about a third of all motor vehicle deaths in the U.S. and contributing to 30 percent of the fatalities in Virginia. The other three areas experienced upward trends in recent years and it is likely that distracted and drowsy driving are under-reported, meaning the issue is larger than what the data show. Virginia is implementing programs such as drug recognition expert training, targeted outreach and education, resource and best practice sharing, and crash report training.

A good example of how Virginia is addressing impaired driving crashes is through the evidence-based traffic safety enforcement program. Using a data-driven approach, the program ensures law enforcement are directing resources and manpower to key safety issues and identified problem areas. The Drive Sober or Get Pulled Over impaired driving enforcement campaign, conducted between August and December in Virginia, is one of the successful preventative programs to reduce impaired driving fatal and serious crashes.



## Objectives

Over the previous five years (2011-2015), 1,712 persons died in impaired-related crashes on Virginia roads, and 13,769 were seriously injured. Programs and projects are in place to address the impaired problem and help Virginia reach its future objectives (Figure 15). Virginia's safety partners have been reducing alcohol impaired driving crashes for decades, but in recent years there has been an increase in combined fatalities across the 4 Ds.

Impaired Driver Fatalities and Serious Injuries and Objectives  
2011 to 2015 (Actual), 2016 to 2021 (Projected)

15

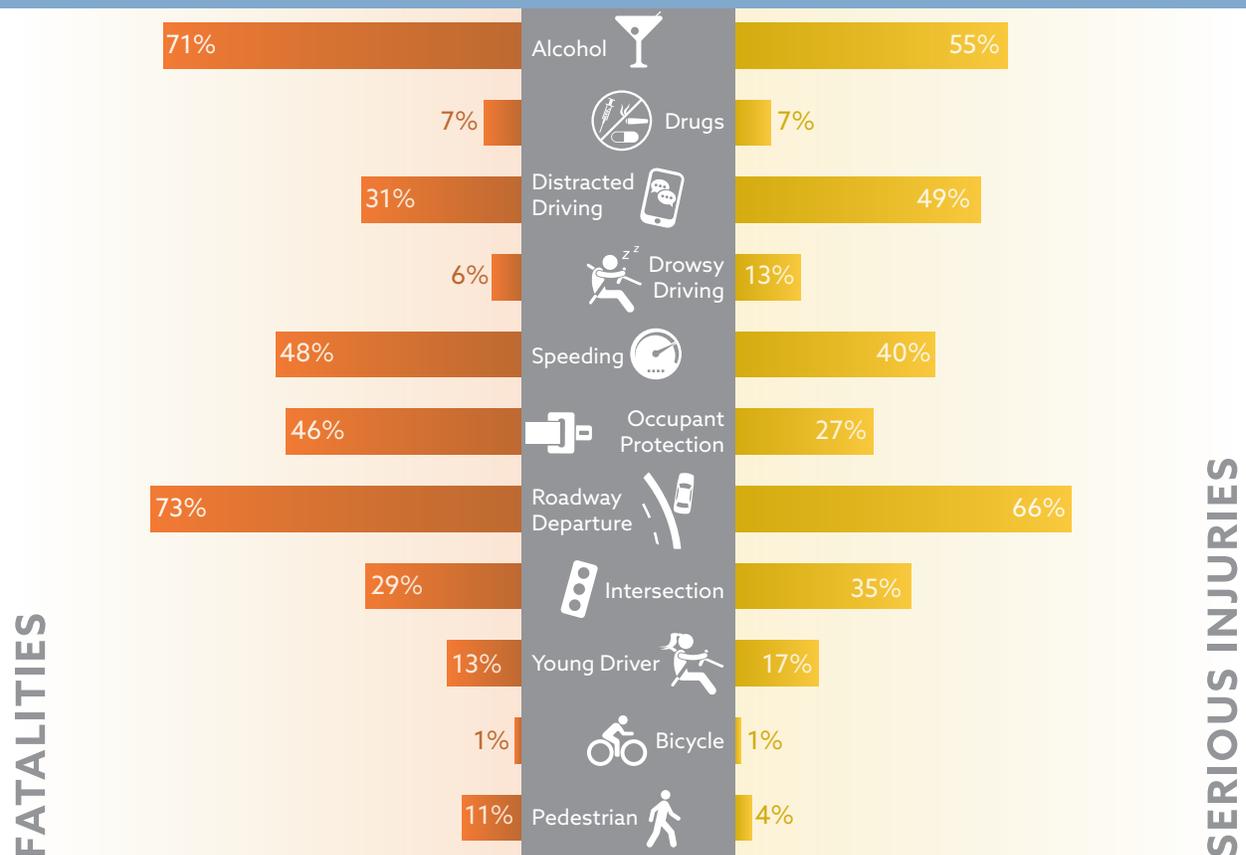


## Contributing Factors

The primary factor contributing to impaired driving fatalities and serious injuries was when a vehicle departed the travel lane and hit a fixed object or another vehicle (Figure 16). Other significant factors in impaired driving fatalities and serious injuries were excessive or inappropriate speed and lack of proper restraint to keep the driver and occupants in place when a crash did occur. The type of impairment that contributes most commonly to fatalities and serious injuries is alcohol, followed by distraction. Drugged and drowsy driving are a smaller proportion of the problem.

Contributing Factors to Impaired Driver Fatalities and Serious Injuries  
2011 to 2015

16



## Who?



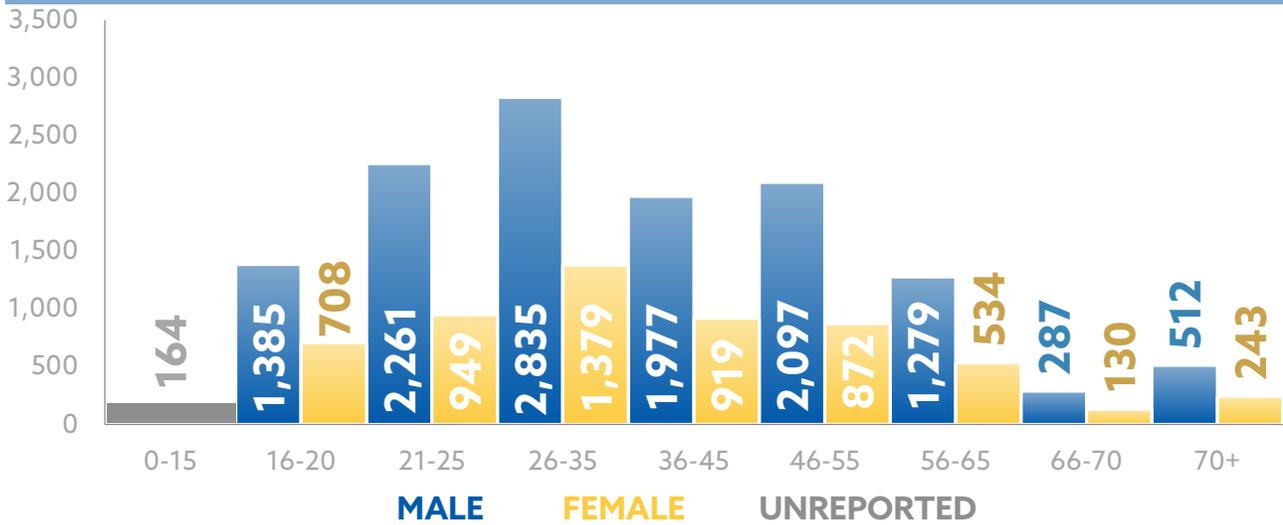
The majority of drivers killed or seriously injured in impaired-related crashes were male drivers between the ages of 26 to 35, closely followed by males, age 21-25 (Figure 17). This is consistent with national trends which show that impaired driving is higher among young males.

## Where?

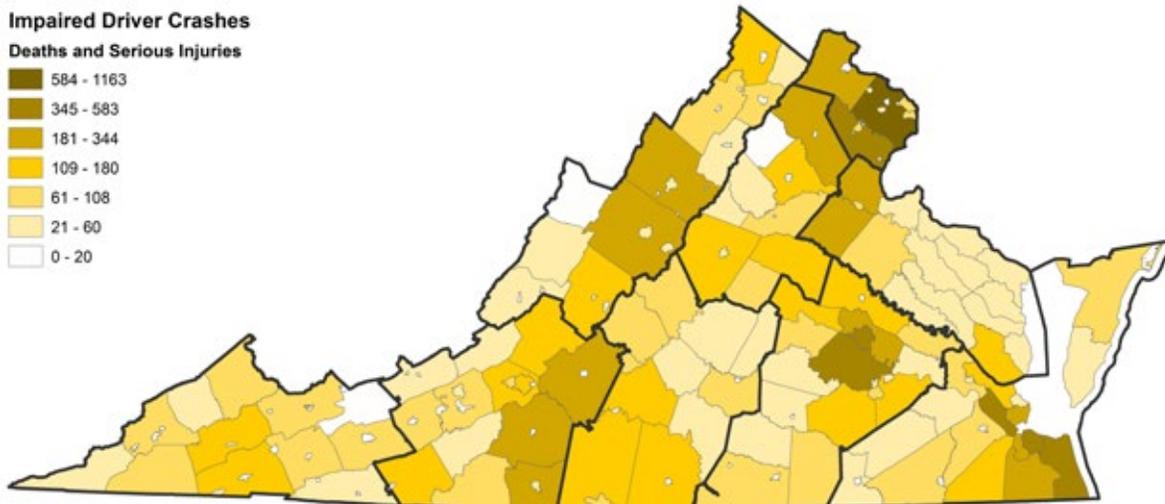


The majority of impaired driver fatalities and serious injuries occurred in Fairfax, Chesterfield, Prince William, and Henrico counties and the cities of Norfolk, Hampton, Newport News, Virginia Beach, and Richmond (Figure 18).

**Impaired Driver Fatalities and Serious Injuries by Driver Age and Gender 2011 to 2015** 17



**Impaired Driver Fatalities and Serious Injuries by Location 2011 to 2015** 18



## When?

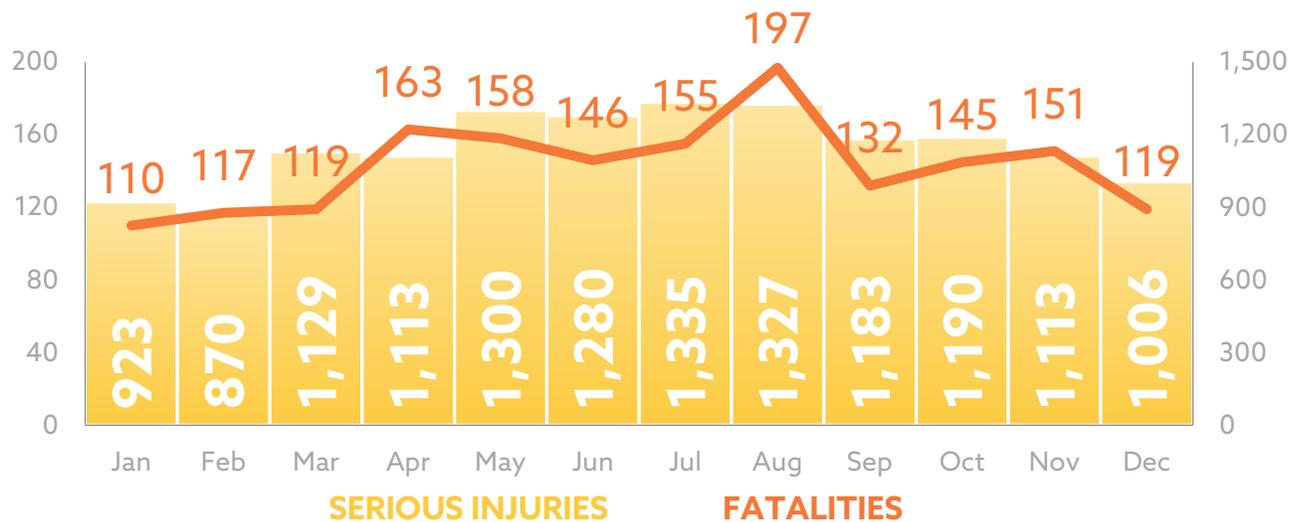
Fatalities and serious injuries involving impaired drivers occurred at similar rates over the months, but experienced slight increases between April and November (Figure 19). The summer month of August experienced the highest number of fatalities and July, the highest number of serious injuries. Virginia State Police conduct the Drive Sober or Get Pulled Over impaired driving enforcement campaign between the months of August and December to curb drinking and driving in the summer and over the holiday season. Impaired crashes resulted in about 42 fatalities and serious injuries a day.

## Why?

The majority of impaired driver fatalities and serious injuries occurred when a vehicle left the roadway and hit a fixed object, such as a tree or telephone pole. Other fatalities and serious injuries involved angle and rear-end collisions, which typically occurred at interchanges, intersections, and driveway locations (Figure 20).

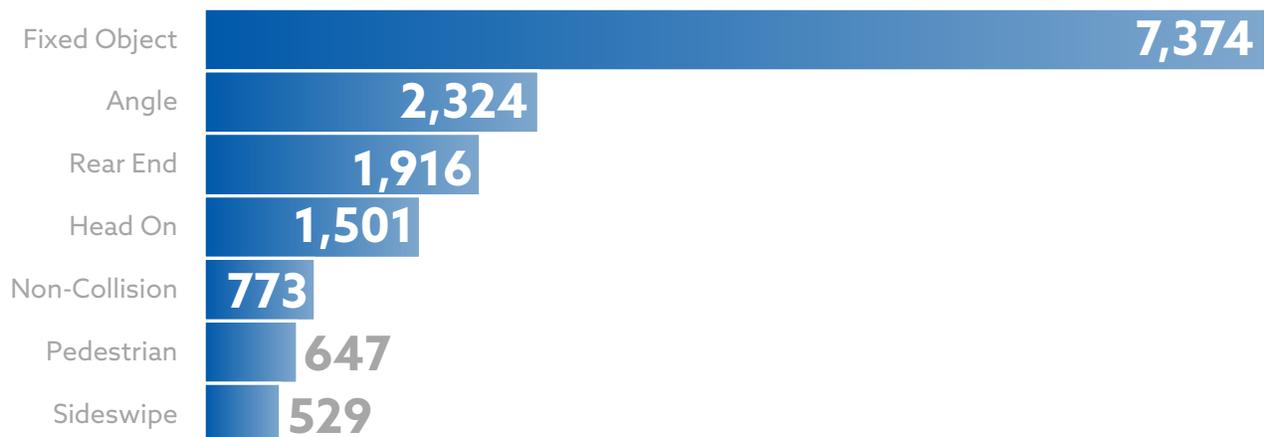
Impaired Driver Fatalities and Serious Injuries by Month  
2011 to 2015

19



Impaired Driver Fatalities and Serious Injuries by Collision Type  
2011 to 2015

20



# The SHSP Solution

Strategy 1. Investigate, evaluate, and foster the use of technologies and best practices to support impaired driving countermeasures.

## Drunk Drivers

-  1.1 Support ignition interlock and discuss new technological strategies.

## Drugged Drivers

-  1.2 Explore the use of technology that would be useful for officers to use roadside to detect drugged impaired drivers.

Strategy 2. Strengthen impaired driving enforcement programs.

## Drunk Drivers

-  2.1 Increase number of law enforcement officers receiving the NHTSA approved SFST and SFST Refresher Courses.
-  2.2 Participate in High-Visibility Enforcement campaigns.
-  2.3 Implement saturation patrols and checkpoint efforts throughout the year.
-  2.4 Develop and implement a Mobile Breath Alcohol testing program that will be deployed across Virginia.
-  2.5 Recognize officers and/or agencies for superb performance.
-  2.6 Continue the enforcement of underage drinking laws through compliance checks and/or other best practices.
-  2.7 Develop and implement a DUI Task Force in selected regions determined by crash data and with the capacity to administer.

## Drugged Drivers

-  2.8 Increase the number of officers receiving ARIDE training.
-  2.9 Increase the number of officers certified as Drug Recognition Experts (DREs).
-  2.10 Raise awareness of the DRE Program through education and outreach to officers.
-  2.11 Recognize officers and/or agencies for superb performance.

## Distracted Drivers

-  2.12 Utilize law enforcement best practices to reduce the number of fatal and serious injury crashes.
-  2.13 Educate officers on the importance of enforcement and endorse best practices.
-  2.14 Recognize officers and/or agencies for superb performance.

## Strategy 2. Strengthen impaired driving enforcement programs (continued).

### *Drowsy Drivers (continued)*

-  2.15 Enforce Commercial Motor Vehicle regulations regarding the work hours/driving times of commercial motor vehicle drivers to reduce the incidence of drowsy driving.
-  2.16 Provide training for officers handling crash reconstruction on the indicators in crashes that identify drowsy driving being a factor in the crash.
-  2.17 Recognize officers and/or agencies for superb performance.

## Strategy 3. Develop and implement strategic and effective outreach initiatives that include but are not limited to education, training, and media campaigns, in order to reduce impaired driving.

### *Drunk Drivers, Drugged Drivers, Distracted Drivers, and Drowsy Drivers*

-  3.1 Ensure alcohol server and seller training is available to on- and off-premise establishments, whether classroom or on-line training (Drunk Drivers specific).
-  3.2 Support High-Visibility Enforcement campaigns with media and outreach.
-  3.3 Increase information sharing of research or programs amongst partners.
-  3.4 Conduct annual training for partners on impaired driving updates, best practices and current efforts.
-  3.5 Implement effective, evidence-based community impaired driving prevention programs.
-  3.6 Conduct DUI Institutes across Virginia.
-  3.7 Develop and implement impaired driving programs focused on the young driver.
-  3.8 Educate the public on the DRE Program through outreach and awareness campaigns (Drugged Drivers specific).
-  3.9 Implement education and outreach programs that raise awareness on the dangers of distracted driving and educate on the various types of distracted driving (Distracted Driving specific).
-  3.10 Increase awareness of drowsy driving through education and outreach (Populations to include but not limited to college students, older drivers, teen drivers, military, and commercial vehicle drivers.) (Drowsy Driving specific).

## Strategy 4. Increase the use, quality, effectiveness, and dissemination of data related to impaired driving.

### *Drunk Drivers, Drugged Drivers, Distracted Drivers, and Drowsy Drivers*

-  4.1 Implement a project to collect information regarding the place of last drink to establish a data set useful for enforcement and education initiatives (Drunk Drivers specific).
-  4.2 Work with law enforcement officers and the toxicology to determine drugs present in drivers (Drugged Drivers specific).

## Strategy 5. Prosecution and adjudication.

### *Drunk Drivers, Drugged Drivers, Distracted Drivers, and Drowsy Drivers*

-  5.1 Educate police on statute changes, new laws, etc.
-  5.2 Conduct training for judges regarding impaired driving topics.
-  5.3 Conduct training for prosecutors regarding impaired driving topics.
-  5.4 Encourage the practice of utilizing DUI Dockets (Drunk Drivers specific).

## Strategy 6. Develop and implement programs to decrease recidivism.

### *Drunk Drivers, Drugged Drivers, Distracted Drivers, and Drowsy Drivers*

-  6.1 Continue to provide information to prosecutors and judges on the value of fully prosecuting DUI offenders.
-  6.2 Monitor high Blood Alcohol Concentration (BAC) and repeat offenders through Virginia Alcohol Safety Action Program (VASAP) and recommend incarceration when appropriate.
-  6.3 Evaluate the effectiveness of DUI Dockets in reducing recidivism and communicate the results to stakeholders (Drunk Drivers specific).
-  6.4 Support ignition interlock efforts (Drunk Drivers specific).

## Strategy 7. Investigate and promote policies and legislation aimed at reducing impaired driving.

### *Drunk Drivers, Drugged Drivers, Distracted Drivers, and Drowsy Drivers*

-  6.1 Analyze the drunk driving laws and policies of neighboring States.
-  6.2 Conduct a review of current drunk driving legislation and policies and determine what is and what is not working.
-  6.3 Ensure that Virginia impaired driving laws are federally compliant.
-  6.4 Pursue legislative improvements and processes for enforcement and adjudication of impaired driving offenses.



## EMPHASIS AREA

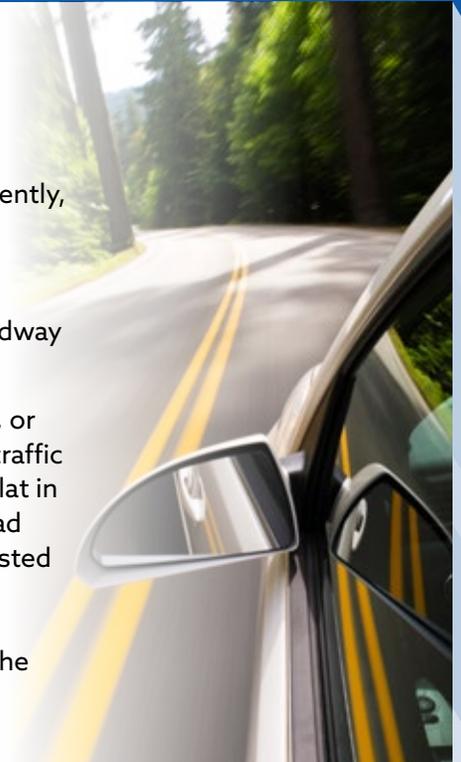
# Speed



## Overview

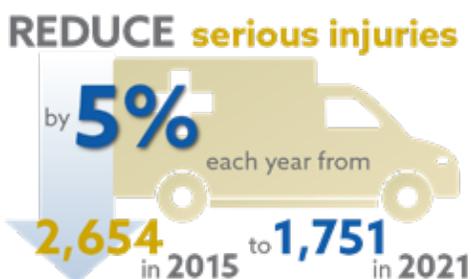
Modern cars include design elements, from suspension and tires to engine efficiency and noise reduction, which can facilitate higher speeds. Consequently, drivers often travel above safe speeds and the outcome of speed involved crashes is often severe. According to the National Highway Traffic Safety Administration, a crash on a road with a speed limit of 65 miles per hour or greater is nearly five times more likely to result in death than a crash on roadway with speed limits of 40 miles per hour or below.

In Virginia, speeding crashes are defined as a driving too fast for conditions, or exceeding the posted speed limit. Speed was involved in 32 percent of the traffic deaths and serious injuries between 2011 and 2015 and has been trending flat in recent years. Speed is a highly complex issue, involving public attitudes, road user behavior, vehicle performance, roadway design and characteristics, posted speed limits, and enforcement strategies. As a result, an interdisciplinary approach involving engineering, enforcement, and education is needed to reduce speeding-related crashes, fatalities, and injuries. Any reductions in the trend may be attributed to vehicle design and technology, driver education, targeted enforcement, and improved highway design.



A highly recognized strategy for reducing speeding is high-visibility enforcement and good education. To address this issue, Virginia State Police and local law enforcement officials use crash data to focus resources and

identify corridors where speed is a major concern. The State Police Drive to Save Lives initiative, which combines education and enforcement initiatives, has been instrumental in safer driving. That effort resulted in 60,000 speed citations that were written between 2013 and 2015. Virginia's approach depends on data collected by officers, so the importance of accurate and consistent crash investigation of speed-related factors is emphasized.



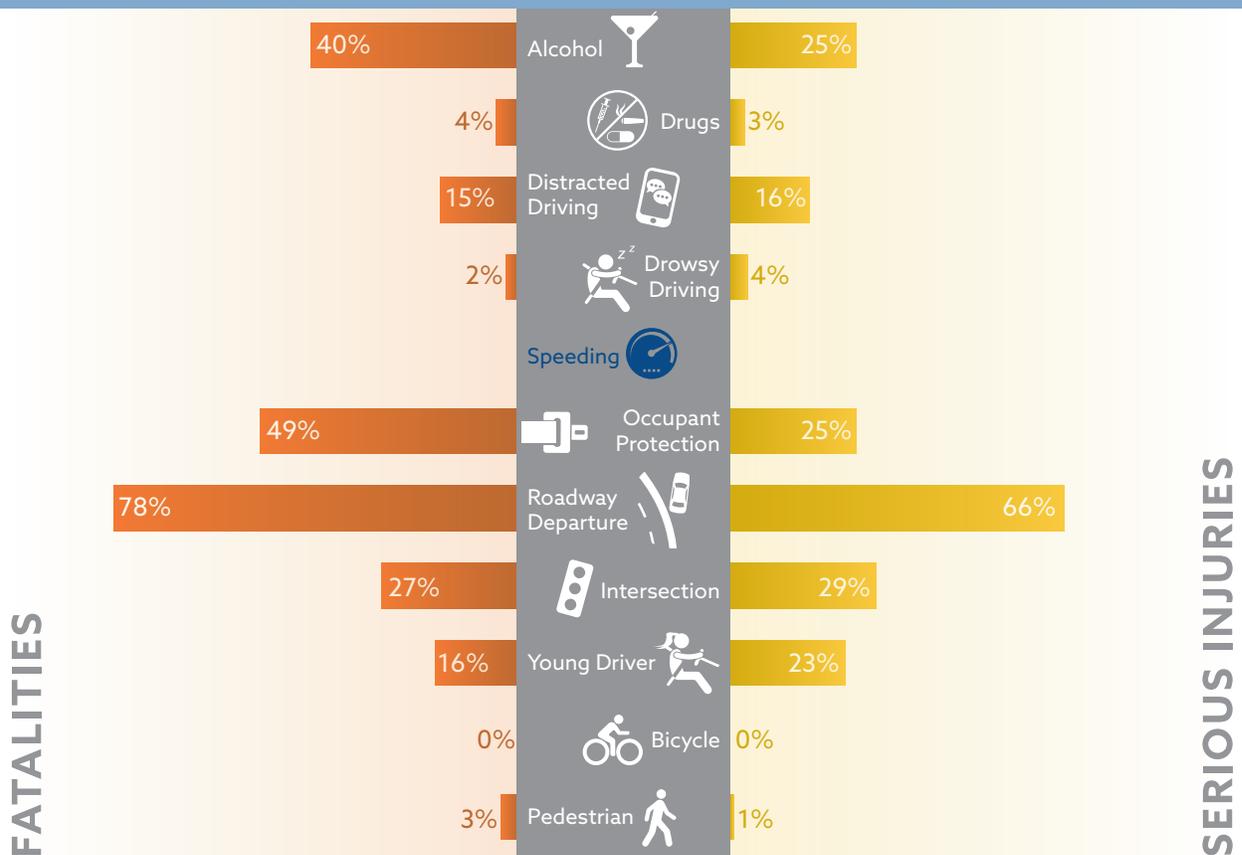
## Objectives

Over the previous five years (2011-2015), 1,547 people died in speeding-involved crashes on Virginia roads, and 14,056 were seriously injured. Programs and projects are in place to address the speeding problem and help Virginia reach its future objectives (Figure 21).



## Contributing Factors

Speed is often the primary factor in crashes, resulting in a fatality or serious injury, however other elements do contribute to speed-related crashes. Another factor that often occurs during a speeding crash is roadway departure, when a driver departs the travel lane and strikes a fixed object (Figure 22). Other issues contributing to speeding fatalities, in order of magnitude, are unrestrained occupants, alcohol impaired drivers, intersections, young drivers, and distracted drivers.



## Who?



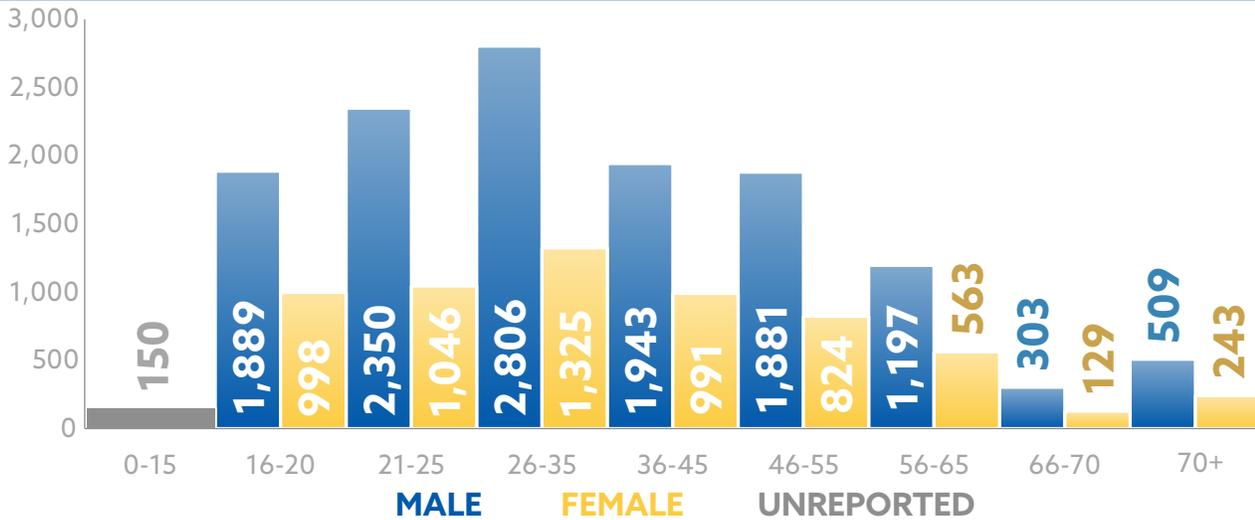
Male drivers age 26 to 35 were involved in the highest number of speed fatality and severe injury crashes. This is a shift from previous years, when males ages 16-20 were the predominant age range involved in crashes. However from 2011 to 2015, 2,887 young drivers (age 16 to 20) still made up a large portion of the speeding deaths and serious injuries as shown in Figure 23.

## Where?

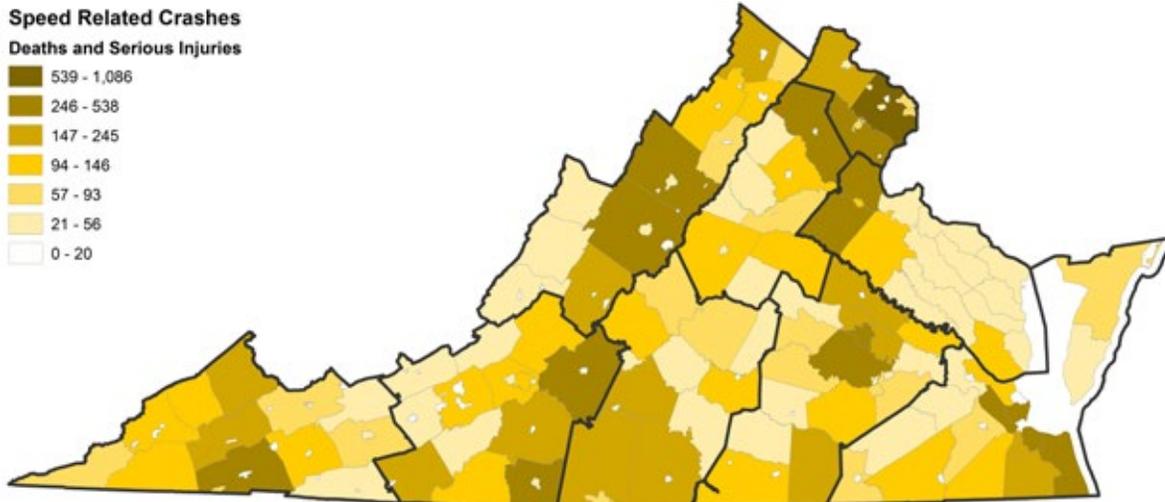


The most populous areas of the State (Northern Virginia, Richmond, and Hampton Roads) have the greatest number of speed-related deaths in serious injuries (Figure 24). However, less dense areas also have higher numbers, including Bedford, Henry, Washington, and Franklin counties. Augusta and Rockingham counties also have high numbers which may be explained by the number of vehicles on I-81 in their areas.

Speeding Fatalities and Serious Injuries by Driver Age and Gender 2011 to 2015 23



Speeding Fatalities and Serious Injuries by Location 2011 to 2015 24



## When?

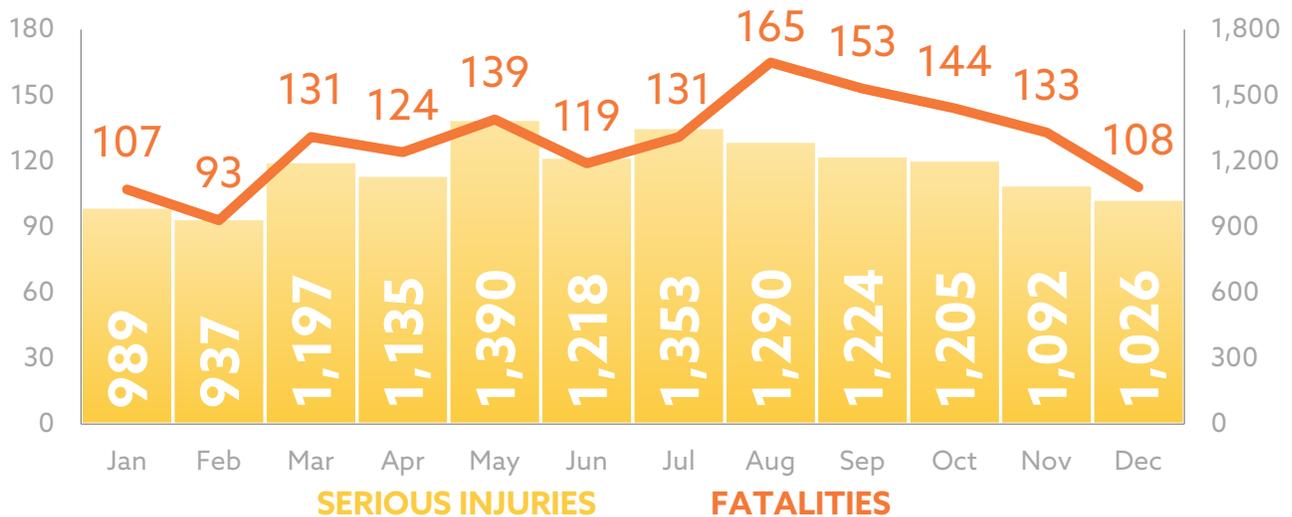
The majority of speeding fatalities and serious injuries occurred in May and from August through October (Figure 25). The month of August had the greatest number of speed-involved deaths and severe injuries, followed by September. Speed involved crashes resulted in about 42 deaths and serious injuries per day.

## Why?

The majority of speed-involved fatalities and serious injuries occurred when a vehicle hit a fixed object, such as a tree or utility pole. Other fatalities and serious injuries involved angle and rear-end collisions, which typically occurred at interchanges, intersections, and driveway locations. Severe crashes at conflict points indicate drivers' difficulty in assessing the location and the distance and speed of approaching vehicles. It also speaks to the need to improve decision-making and maneuvering.

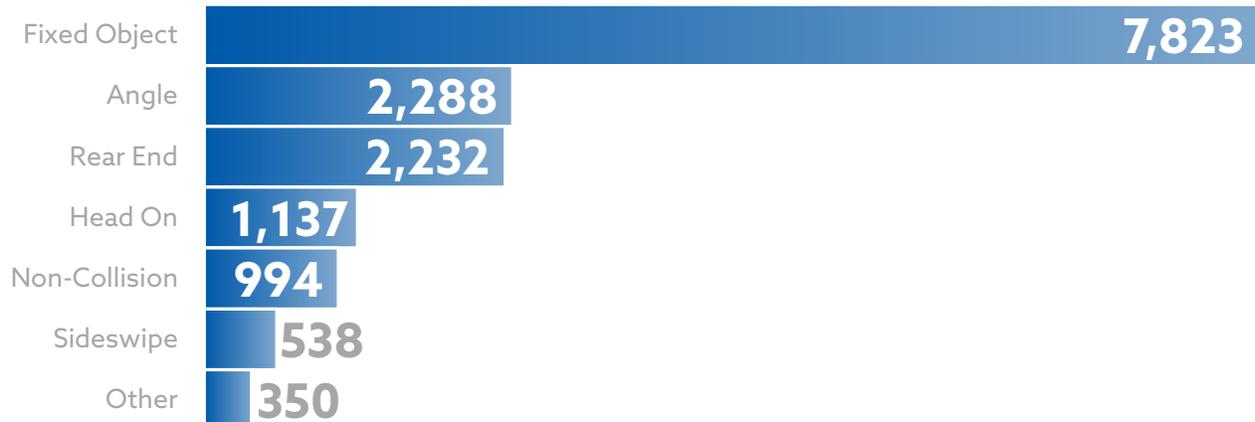
Speeding Fatalities and Serious Injuries by Month  
2011 to 2015

25



Speeding Fatalities and Serious Injuries by Collision Type  
2011 to 2015

26



# The SHSP Solution

**Strategy 1. Implement engineering countermeasures to synchronize traffic flow to prevailing conditions and surroundings with particular attention to high-crash locations.**

-  1.1 Periodically review the appropriateness of posted speed limits on roadways where speed has been identified as a factor in crashes and post appropriate speed limits based on Virginia and national guidance, standards and prevailing conditions.
-  1.2 Install rumble strips and stripes, signing, markings, or other innovations, to enhance user's perception of vehicle speed and reduce speeds where appropriate.
-  1.3 Implement appropriate timing and synchronization of traffic signal systems to minimize stops and starts while harmonizing traffic flow to the prevailing conditions.
-  1.4 Investigate the additional use of the Active Traffic Management System (ATMS) practices on freeway corridors to harmonize speed and prevent queue related crashes.

**Strategy 2. Develop and implement a speed campaign incorporating media, enforcement, education, and evaluation where speed-related deaths and severe injuries are elevated.**

-  2.1 Identify, publicize, and implement enforcement countermeasures in areas where speeding is a problem. Educate drivers about the effects of weather and traffic conditions on appropriate speed.
-  2.2 Promote engineering and public safety partner's collaboration on speed limit setting, including within work zones, and associated enforcement and response to related incidents.
-  2.3 Determine the most effective messages targeting individuals most involved in speed-related crashes through research, literature reviews, and focus groups. Assess attitudes toward speeding through focus groups and segment messaging to reach all types of people.
-  2.4 Teach children rules of road through public school system, tie into science curriculum.
-  2.5 Educate the judicial community on the need for consistent application of the law on speed-related offenses.
-  2.6 Enhance the education of police officers on the need for speed enforcement and speed compliance.
-  2.7 Provide grant funding for speed enforcement in areas where data indicate a speeding or speed-related crash problem.

**Strategy 3. Identify and implement effective speed management measures.**

-  3.1 Identify and evaluate advanced tools and techniques to reduce speeding and where necessary, work with the General Assembly to explore the use of these tools.
-  3.2 Implement variable speed limits (VSL) where permitted and feasible and where a safety benefit is predicted.



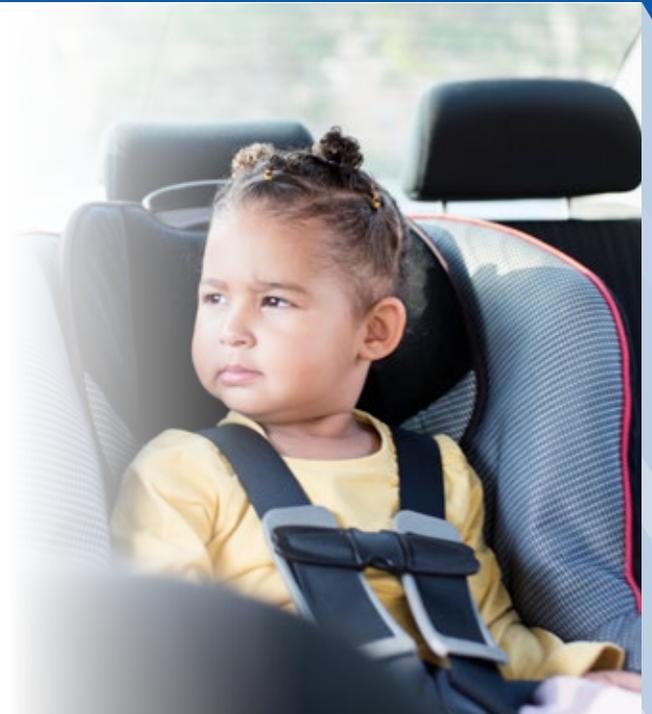
## EMPHASIS AREA

# Occupant Protection



## Overview

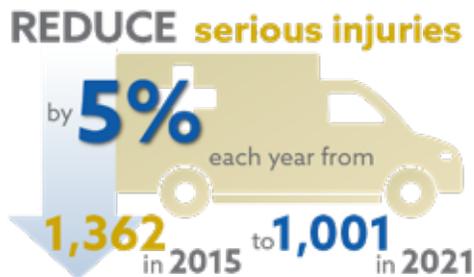
Seat belts and child car seats are two of the most effective in-vehicle safety devices to prevent death and serious injury during a crash. According to National Highway Traffic Administration, seat belts saved an estimated 13,941 lives in 2015. In Virginia, cultural norms around seat belt compliance and current laws have contributed to an 80.9 percent seat belt use rate (2015). In comparison, the national seat belt use rate for the same year was 87 percent. Fifty-four percent of the unbelted fatalities involved persons between the ages of 21-50. The primary actions that cause death and serious injury amongst unbelted drivers and occupants in Virginia are running off the road and hitting an object, losing control of the vehicle, and speeding. These deaths may have been prevented if seat belts were used.



Observed Seat Belt Use Rate Survey	Baseline Data						2017 Target
	2010	2011	2012	2013	2014	2015	
	80.5	81.8	78.3	79.7	77.3	80.9	84.0

Source: 2017 Virginia Highway Safety Plan.

A number of preventative programs and measures, such as the DRIVE SMART occupant protection public education campaign, Click It or Ticket mobilizations, targeted enforcement (10,719 citations were issued in 2014), safety seat distributions, and others are in place to reduce fatal and serious crashes in this area.



## Objectives

Over the previous five years (2011 to 2015), 1,465 unrestrained people died in crashes on Virginia roads, and 7,555 were seriously injured. Programs and projects are in place to address the unrestrained problem and help Virginia reach its future objectives (Figure 27).

## Contributing Factors

The primary action contributing to both unrestrained fatalities and serious injuries is drivers departing the travel lane, hitting a fixed object, and being jostled or thrown from the vehicle, due to improper restraint (Figure 28). Other significant factors in unrestrained fatalities and serious injuries are speeding and impairment, predominately by alcohol. Unrestrained occupants in rural areas, who are speeding or impaired, have less ability to control their vehicles on two-lane roadways so the crashes tend to be more severe, especially without proper restraint.



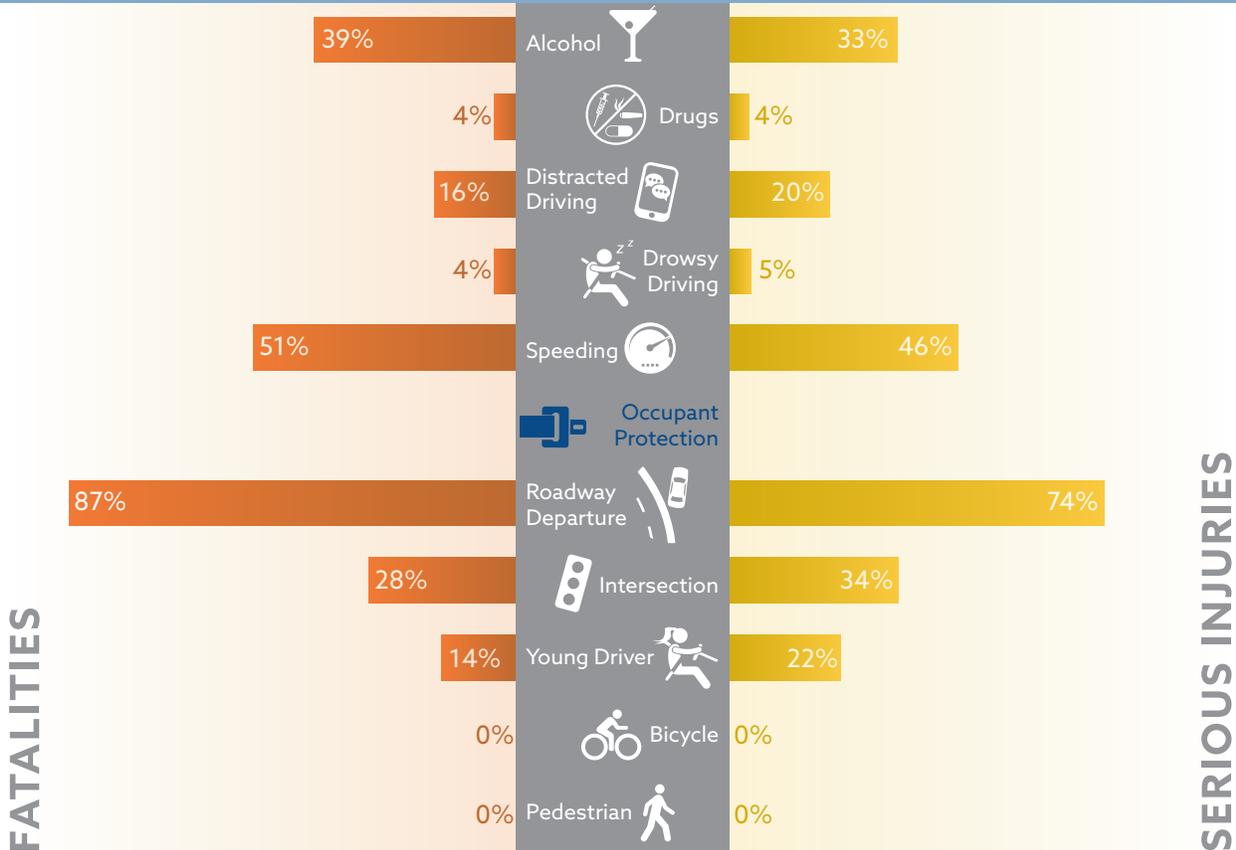
Occupant Protection Fatalities and Serious Injuries and Objectives  
2011 to 2015 (Actual), 2016 to 2021 (Projected)

27



Contributing Factors to Occupant Protection Fatalities and Serious Injuries  
2011 to 2015

28



## Who?



The majority of unrestrained occupants killed or seriously injured were male drivers between the ages 26 to 35, closely followed by males, age 21-25 (Figure 29). This is consistent with national trends which show that safety belt use is lowest among young males and drivers who have consumed alcohol.

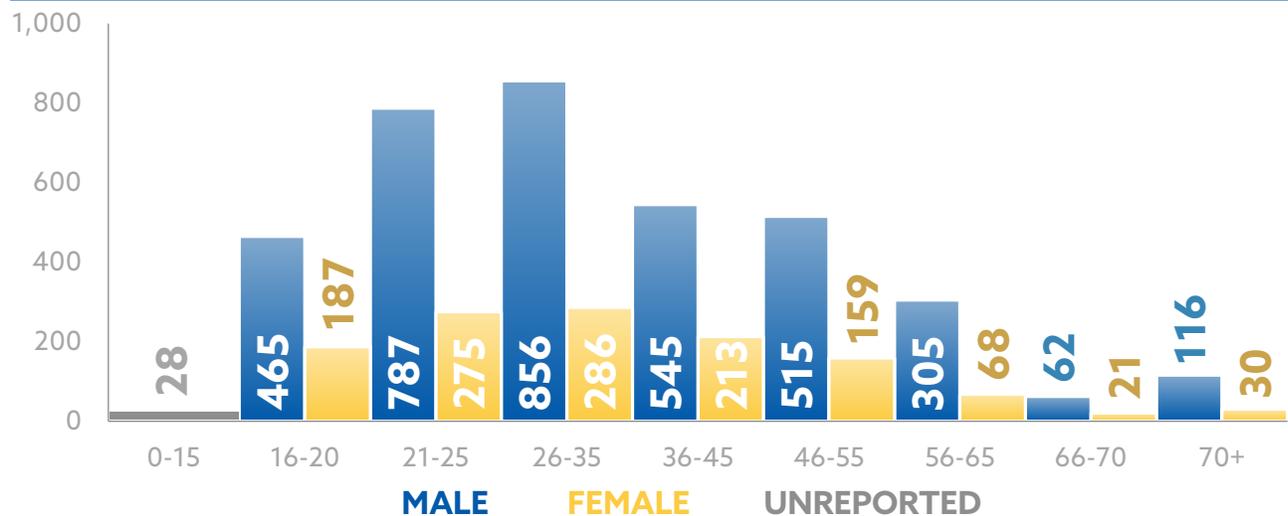
## Where?



The majority of unrestrained fatalities and serious injuries occur in Fairfax, Chesterfield, Prince William, Augusta, Spotsylvania, Henrico, and Henry counties, the cities of Virginia Beach, Norfolk, Franklin and Richmond, and the Town of Bedford (Figure 30).

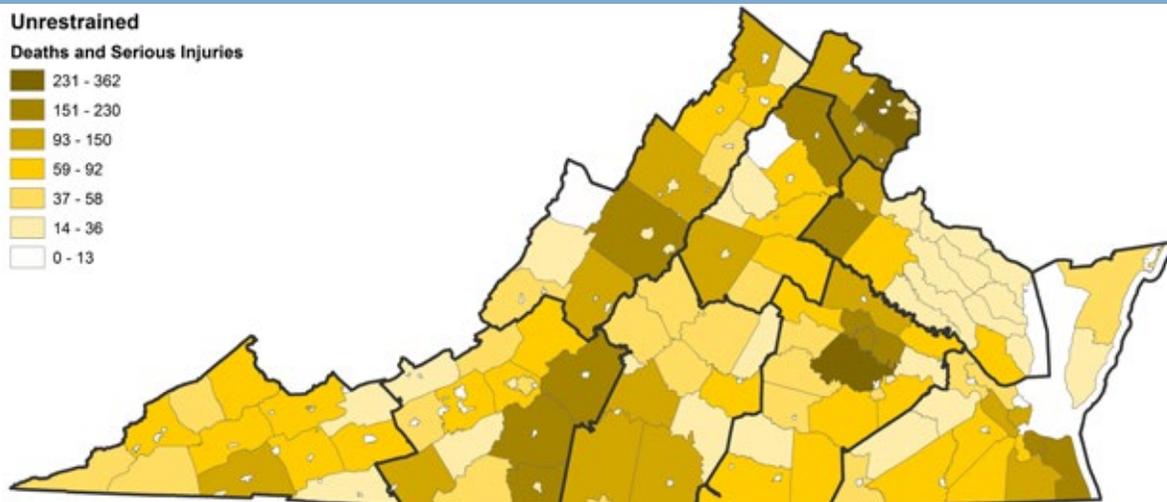
Occupant Protection Fatalities and Serious Injuries by Driver Age and Gender 2011 to 2015

29



Occupant Fatalities and Serious Injuries by Location 2011 to 2015

30



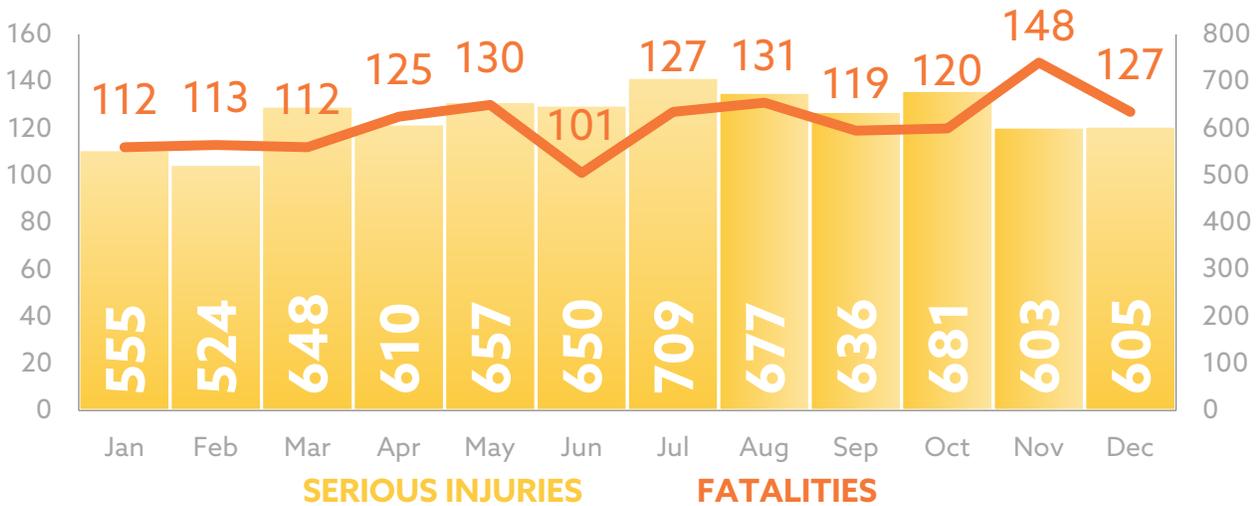
## When?

Unrestrained occupant fatalities and serious injuries occurred at similar rates over the months, but experienced slight increases in November and May (Figure 31). Virginia State Police conduct the Click It or Ticket seatbelt enforcement campaign in late May (full mobilization) and a Mini-Mobilization in late November to curb unrestrained occupants. Unrestrained crashes resulted in about 25 fatalities and serious injuries a day.

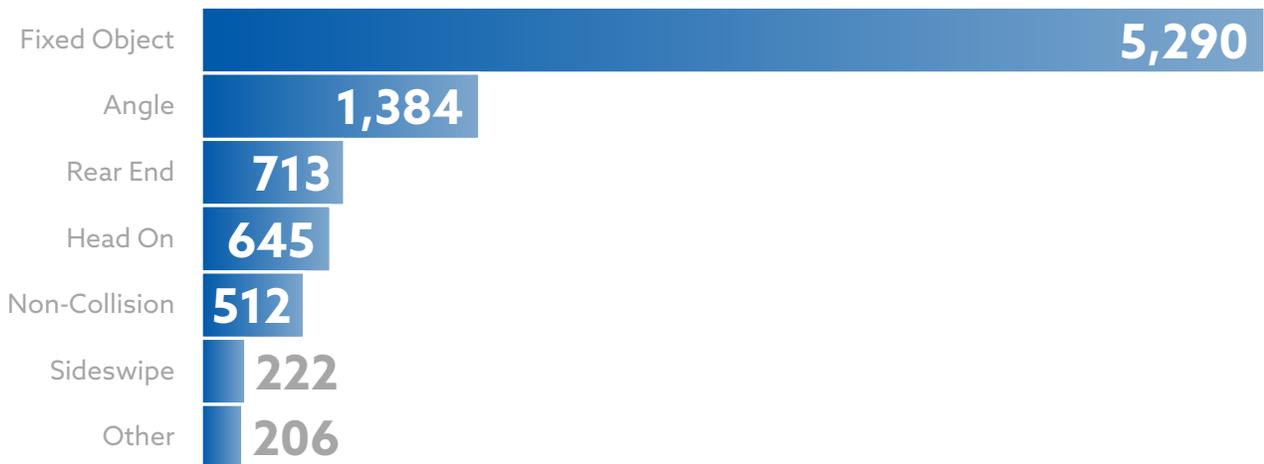
## Why?

The majority of unrestrained occupant fatalities and serious injuries occurred when a vehicle hit a fixed object, such as a tree or utility pole. Other fatalities and serious injuries involved angle and rear-end collisions, which typically occurred at interchanges, intersections, and driveway locations (Figure 32).

Occupant Protection Fatalities and Serious Injuries by Month 2011 to 2015 31



Occupant Protection Fatalities and Serious Injuries by Collision Type 2011 to 2015 32



# The SHSP Solution

## Strategy 1. Educate and persuade the public and the private sector on the importance of using safety belts.

-  1.1 Use data to determine which population groups are at highest risk for not wearing safety belts, determine why if possible.
-  1.2 Explore public education and outreach to increase awareness of the benefits of safety belt use among low-use groups.
-  1.3 Publicize safety belt use and the expected fatality and severe injury reductions that could be achieved with higher belt use (DMV). Moving toward Zero Deaths; entire media strategy including all media channels.

## Strategy 2. Conduct sustained high-visibility safety belt enforcement campaigns.

-  2.1 Conduct Click It or Ticket (CIOT) year-round.
-  2.2 Partner with law enforcement on high visibility enforcement strategies.
-  2.3 Increase LE agency participation in May and November CIOT mobilizations.
-  2.4 Develop and implement best practices (e.g., New Kent County's high school program).

## Strategy 3. Improve child occupant protection through education, outreach, and enforcement.

-  3.1 Identify locations with low adult and child occupant restraint use, and target education, outreach and persuasion efforts in those areas.
-  3.2 Advocate enforcement of secondary occupant protection laws and promote zero tolerance of child occupant protection violations. Encourage LE to enforce secondary law through awarding OP grant funds.
-  3.3 Continue and increase child occupant protection education programs, such as "First Ride, Safe Ride" and "Make it Click."
-  3.4 Continue to operate and promote the expansion of safety seat check stations and publicize child occupant protection inspection events statewide; assure stations are in areas where there's a low unrestrained rate; ensure properly placed.
-  3.5 Increase the number of certified child passenger safety technicians/instructors, especially at mother/infant units, neo-natal intensive care units, pediatric units, etc. in hospitals to provide staff education.
-  3.6 Continue and promote programs and services aimed at increasing occupant protection among low-income populations, specifically in communities with low child safety seat use; expand low-income distribution sites to mother/infant units in hospitals; must include education component with certified technicians; increase number of hospitals that are low-income sites.

## EMPHASIS AREA

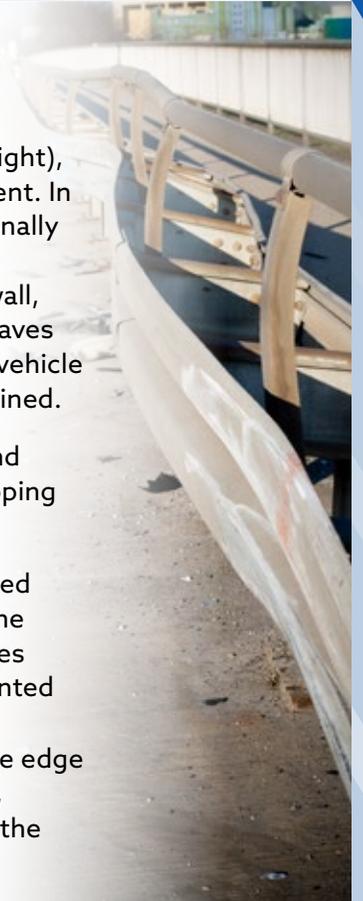
# Roadway Departure

## Overview

Roadway departure crashes involve vehicles leaving the travel lane (to the left or right), encroaching into the opposite lanes, or onto the shoulder and roadside environment. In essence, departure crashes are the result of vehicles inappropriately or unintentionally leaving the proper and intended travel lanes. The result of these maneuvers is the vehicle overturns, hits an oncoming vehicle, or hits a fixed object such as bridge wall, pole, embankment, guardrail, parked vehicle, or tree. In Virginia, when a vehicle leaves the road, individuals often sustain injuries because the driver loses control of the vehicle due to inappropriate speed, impairment, or because they were not properly restrained.

While roadway departure fatalities have decreased by 6 percent between 2011 and 2015 and serious injuries by 30 percent, recent increases coupled with the overlapping effects of driver and occupant behavior, make it a significant area of concern.

A data-driven approach, including the VDOT Roadway Departure Plan, and advanced Roadway Safety Assessment analysis tools provide planners and engineers with the resources to address intersections and segments where roadway departure crashes have the most potential to be reduced. A countermeasure that has been implemented systemically throughout Virginia, with good results, are rumble strips. These are grooves cut in the road shoulder, which alert drivers when they are too close to the edge of the road, reducing the chances of departing the road. Often shoulder widening, shoulder improvements, and curve signage are effective safety improvements on the transportation system.



### REDUCE fatalities



### REDUCE serious injuries

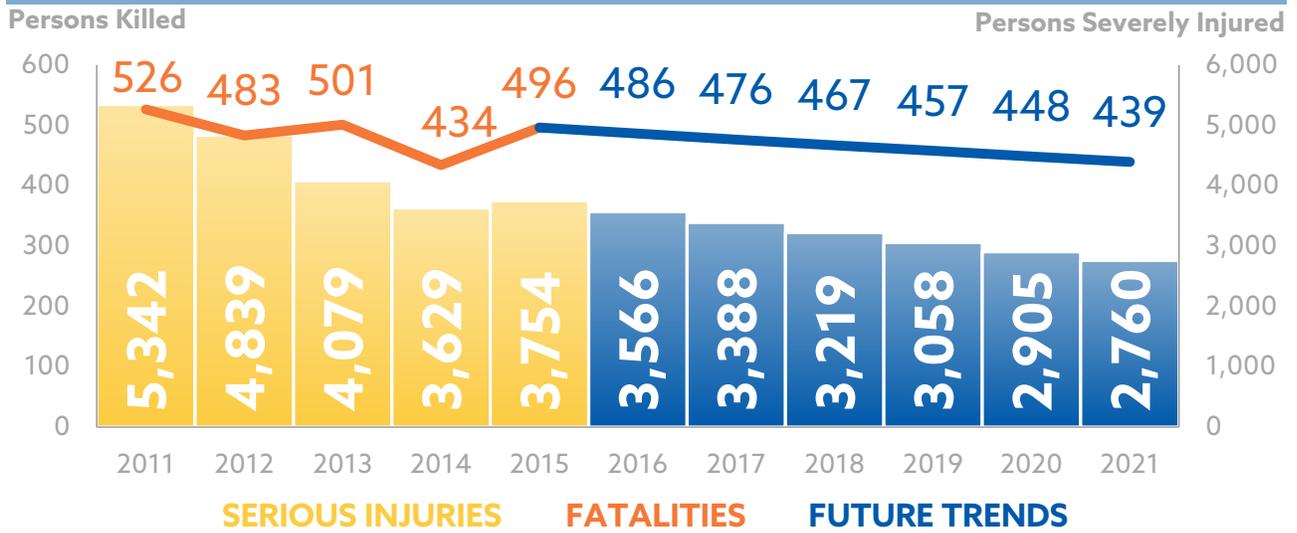


## Objectives

Over the previous five years (2011-2015), 2,240 people died in roadway departure crashes on Virginia roads, and 21,643 were seriously injured. Programs and projects are in place to address the roadway departure problem and help Virginia reach its future objectives (Figure 33).

## Roadway Departure Fatalities and Serious Injuries and Objectives 2011 to 2015 (Actual), 2016 to 2021 (Projected)

33

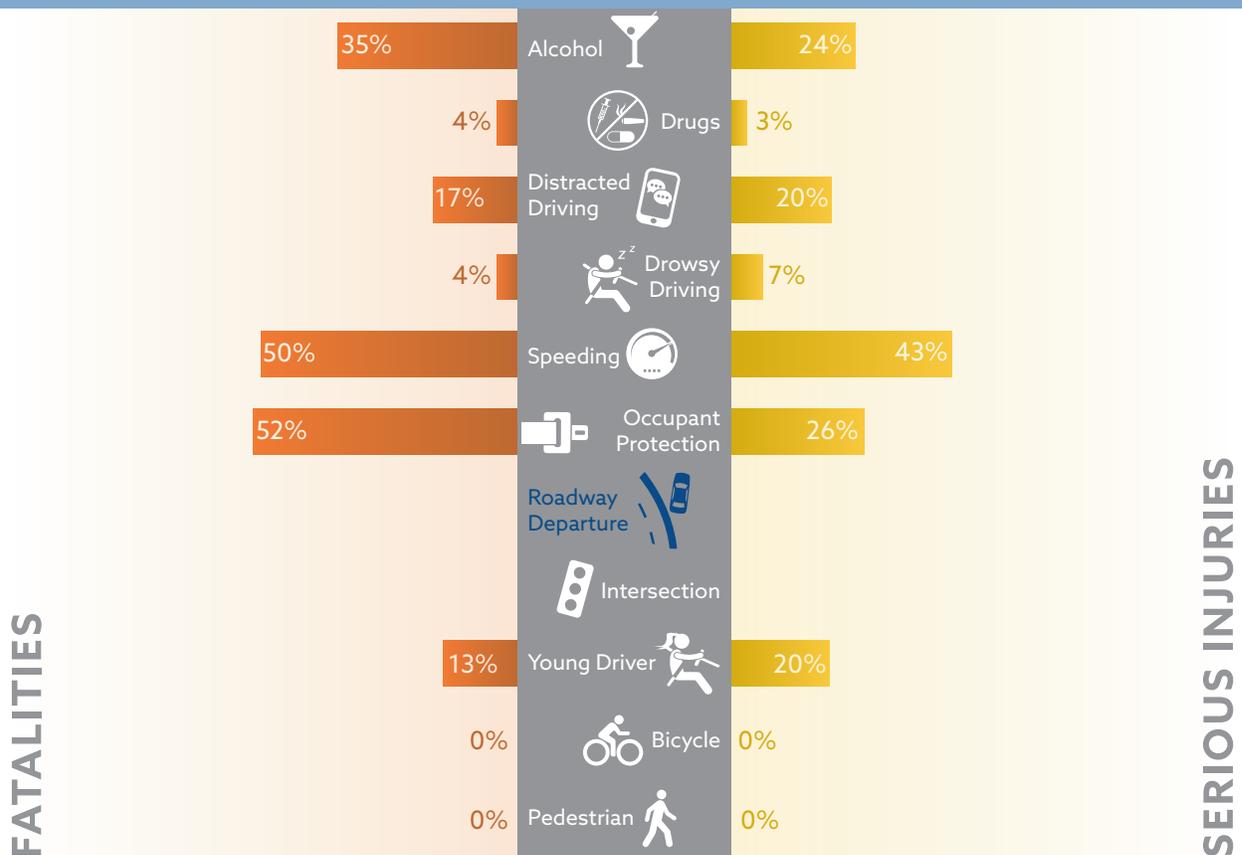


## Contributing Factors

The primary factors contributing to roadway departure fatalities and serious injuries are drivers departing the travel lane due to excessive or inappropriate speed or being jostled or thrown from the vehicle when departing the road because of a lack of proper restraint (Figure 34). Other significant factors in roadway departure fatalities and serious injuries are alcohol impairment, followed by distraction.

## Contributing Factors to Roadway Departure Fatalities and Serious Injuries 2011 to 2015

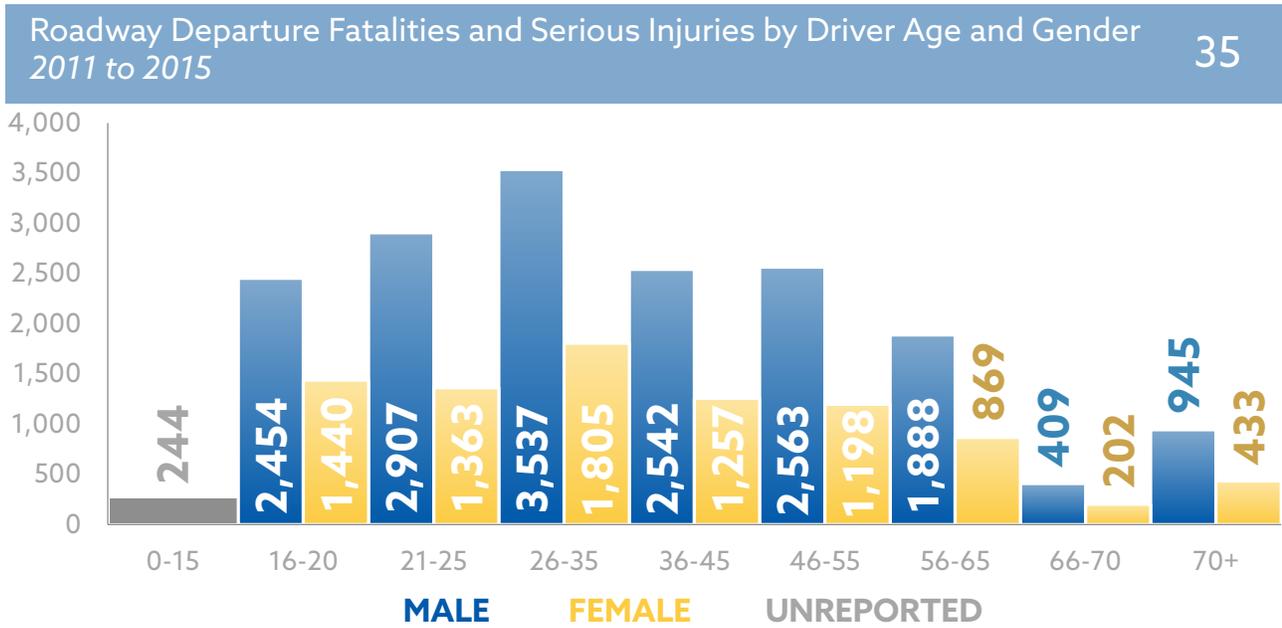
34



## Who?



The majority of roadway departure fatalities and serious injuries involved male drivers between the ages 26 to 35, but the 16-25 and 36-55 age groups also showed significant numbers (Figure 35). The statistics differ from previous years, when the 16-20 male age group, experienced the most fatalities and serious injuries. However, young drivers (ages 16-20) are still over-represented and will be a focus for education and outreach.



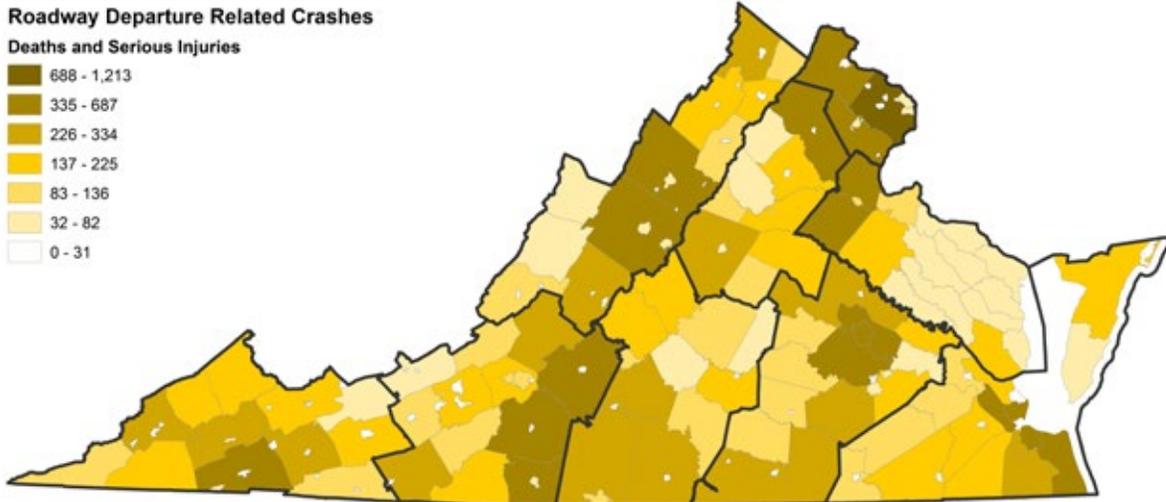
## Where?



Roadway departures are primarily a rural issue, but are still prevalent across all jurisdictions. Studies have shown that roadway departure crashes are related to traffic volumes but also are dispersed over more than 60,000 miles of local roadways (county secondary and city-owned roads). Rural roadway departure crashes disproportionately occur on curves, which are a smaller portion of the transportation network, but also can occur on straight segments in large numbers. Significant proportions of roadway departures can be seen in the rural areas, including Rockingham and Fauquier counties, the towns of Washington and Bedford, and the City of Franklin where roadway geometry, speeds, and roadway type contribute to this type of crash (Figure 36).

While a large number of fatalities and serious injuries occur in rural locations, urban areas, most notably, Northern Virginia, experience roadway departure crashes due to the number of vehicles on the roadway, speed, vehicle miles traveled, and to some extent the roadway types.

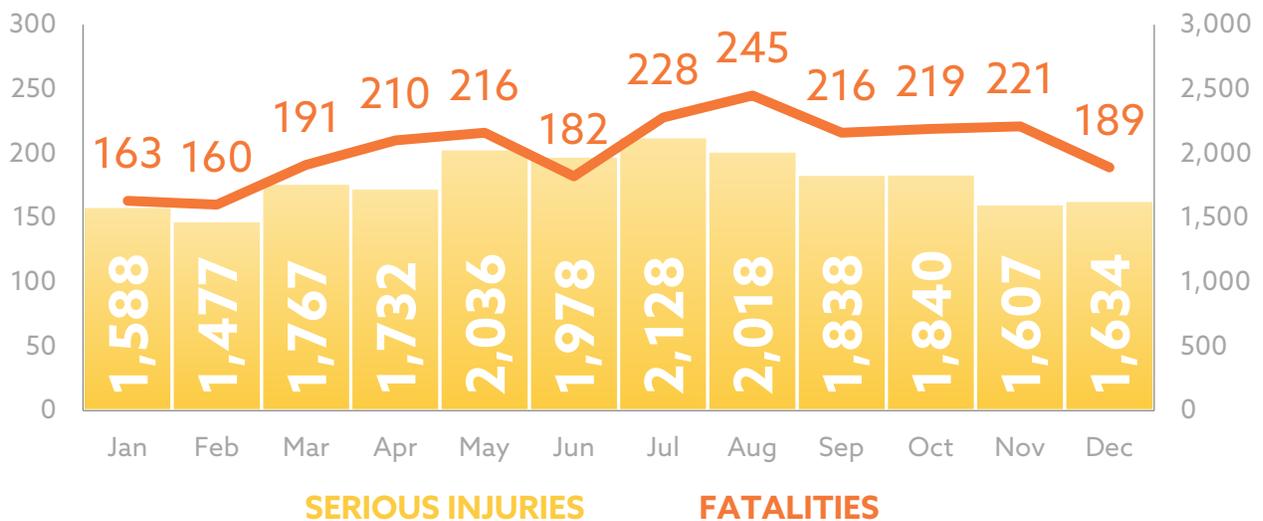
Regardless of location, mitigation solutions have been identified for all types of roadway departure crashes.



### When?

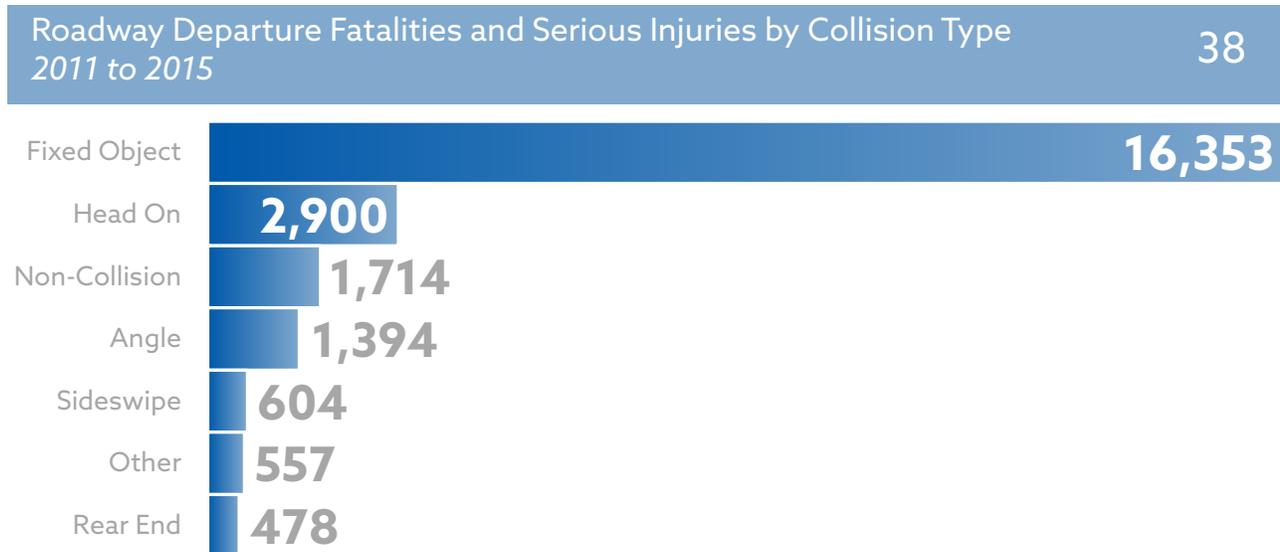


Roadway departure fatalities and serious injuries occurred at similar rates over the months, but experienced slight increases during the summer, especially July and August (Figure 37). Roadway departure crashes resulted in about 65 fatalities and serious injuries a day.



## Why?

The majority of roadway departure fatalities and serious injuries occurred when a vehicle hit a fixed object, such as a tree or telephone pole. Another severe and significant crash type, head on, is caused when a vehicle departs the travel lane and collides with an oncoming vehicle from the opposite direction. Emerging vehicle technologies are likely to have a positive impact on roadway departure safety. Devices that keep vehicles in lanes and warn drivers of adjacent or on-coming vehicles should minimize roadway departure crashes (Figure 38).



# The SHSP Solution

**Strategy 1. Reduce the likelihood of vehicles leaving the travel lane(s) at locations with a history of or higher potential for roadway departure crashes by improving the roadway, the roadside, and traffic control devices.**

-  1.1 Update the VDOT Roadway Departure Plan and identify routes and segments with previous, or the potential for, roadway departure crashes. From the identified locations, develop risk factors to assist engineers in identifying segments that exhibit certain qualities that may produce a greater incidence of roadway departure-related crashes. For identified routes and segments, review roadway operations, maintenance, and construction projects during the project development process to identify safety treatments to reduce roadway departure crashes.
-  1.2 Institute the use of and provide training on HSM analyses, Human Factors Guide, and Road Safety Assessments to assess and review the operations and safety of roadways experiencing a higher incidence of roadway departure crashes and recommend appropriate treatments.
-  1.3 Post appropriate speed limits for roadway geometric and traffic conditions that considers the area type (urban/rural) in addition to the roadway and roadside design elements. Ensure speed limit and warning signs are installed and visible at appropriate intervals. Consider variable speed limits, advisory speeds, and speed feedback devices, as well as human factors approach measures to reduce speeding and speed variance.
-  1.4 Review and improve related engineering and traffic control device standards and specifications. Expand the use of and maintain existing roadway and bridge delineation and visibility features, which include pavement markings, markers, signs, and other devices. Consider the use of highway lighting and ITS technology where cost effective, appropriate, and practical.
-  1.5 Review and improve related engineering and traffic control device standards and specifications. Expand the use of and maintain existing roadway and bridge delineation and visibility features, which include pavement markings, markers, signs, and other devices. Consider the use of highway lighting and Intelligent Transportation Systems (ITS) technology where cost effective, appropriate, and practical.
-  1.6 Upgrade and improve shoulders to provide pavement, particularly on the Primary System, where possible. Maintain shoulders to reduce debris and edge drop offs. Use beveled pavement wedges, particularly on higher speed roadways with limited shoulders. Identify opportunities to widen shoulders to the maximum extent possible while keeping right-of-way impacts and construction costs low but still achieving a reasonable safety benefit.
-  1.7 Improve roadway geometry (cross section, alignment, and sight distance) where data has identified a crash issue or potential for roadway departures and is cost effective and practical.
-  1.8 Continue to research advances in pavement designs to enhance pavement friction. Revise and re-deploy a pavement friction monitoring program to support the development of pavement designs for maintenance and construction projects. Develop a network screening process to identify candidate sites and seek opportunities to install high-friction surface treatments (HFST) where appropriate, cost effective, and practical.
-  1.9 Identify opportunities and suitable locations to implement roadway conversions/road diets, medians, and other complete streets principals where practical to separate turning traffic, provide space for pedal cyclists, and moderate travel speeds.

**Strategy 2. Minimize the adverse consequences of leaving the roadway by improving the roadside, safety equipment and traffic control devices.**

-  2.1 Review and identify routes and segments with previous, or the potential for, roadway departure-related crashes. For any construction or maintenance project in the development phase that has a route or segment identified in the review, incorporate the use of roadside safety devices in the design, where appropriate.
-  2.2 Promote improving ditch and back slope designs to minimize crash severity. Modify roadside clear zones and/or cross slopes particularly near obstacles.
-  2.3 Remove, relocate, shield, or delineate trees, utilities, and other fixed objects as appropriate taking into consideration the surrounding environment.

## EMPHASIS AREA

# Intersections



## Overview

Intersections and grade separated interchanges are locations where two or more roads cross or merge, which creates the inherent possibility for conflict between all road users (vehicles, pedestrians, bicyclists, transit users, and freight travel). Crashes may be attributed to an illegal maneuver, inattention or poor gap acceptance while crossing over or turning, or obstructed view while turning, or speeding. While serious injuries have been holding steady, fatalities at intersections have increased in recent years, particularly in 2015 following the overall severe crash trend. A major goal is to reduce the number of conflict points and the severity of intersection crashes when they occur.

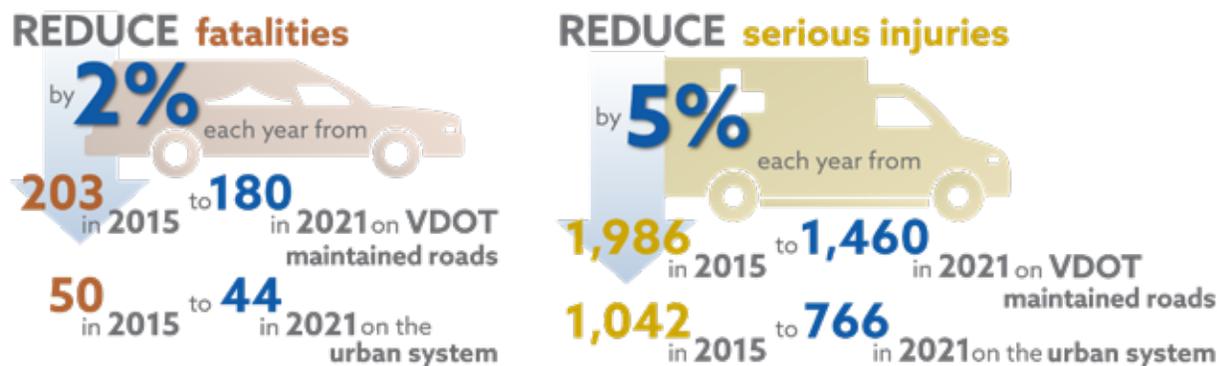


In Virginia, planners and engineers will continue to utilize state-of-the-art crash analysis methods to identify intersections with the greatest potential for fatality and serious injury reductions and mitigate the problem through the implementation of proven countermeasures. Successful safety treatments at Virginia intersections have included the implementation of roundabouts; existing signals improvements; flashing yellow arrows, which offer better recognition for vehicles to turn left when opposing vehicles have the right-of-way; reflective backplates which improve the visibility and conspicuity of signal heads; and changes to signal timing. Strides also have been made to improve the signing, marking and signals for pedestrians and bicyclists at intersections.

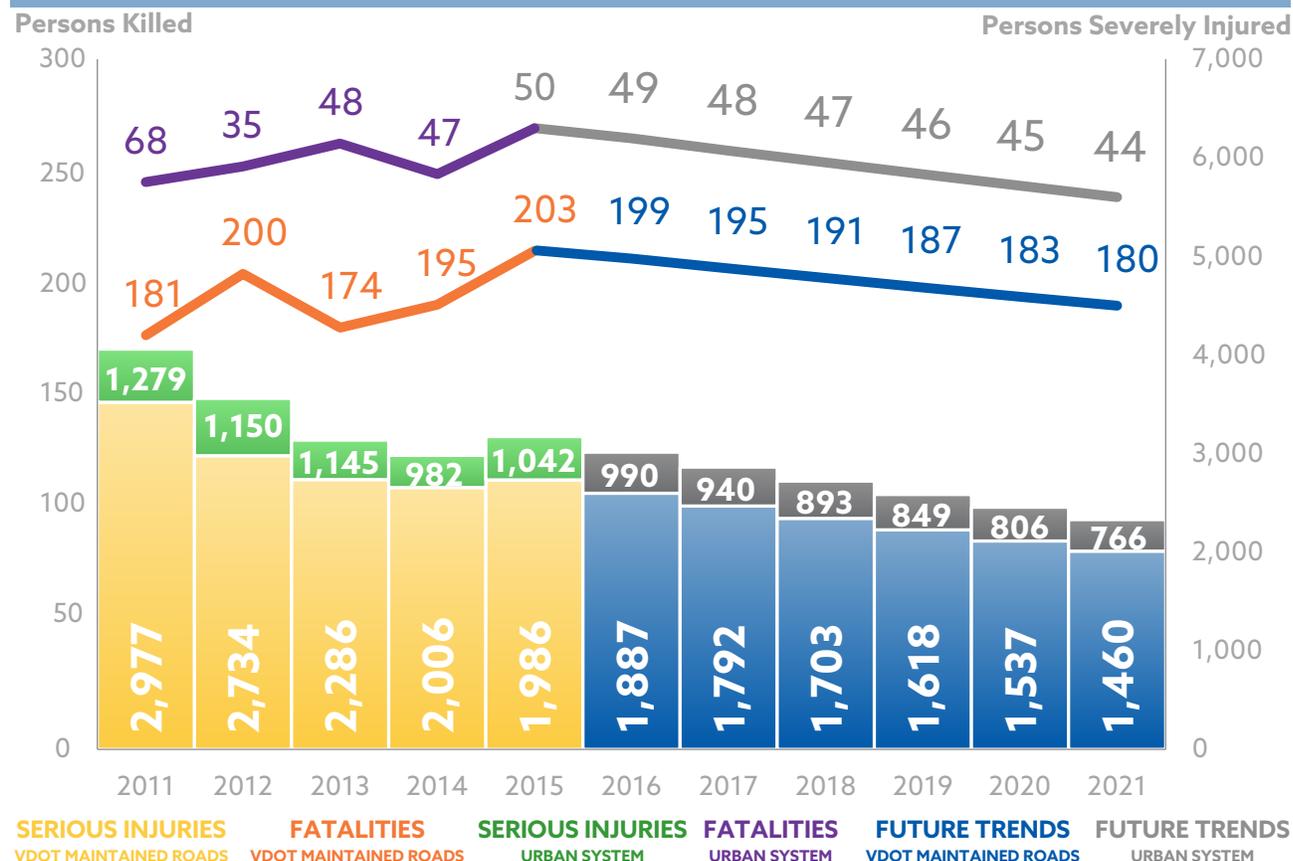
Another important component to intersection safety in Virginia is education, ensuring drivers understand existing traffic control devices and new technology, such as flashing yellow (turn) arrows, where implemented.

# Objectives

Over the previous five years (2011-2015), 953 people died in intersection crashes on VDOT maintained roads and 248 at intersections on the urban (locally maintained) system.<sup>2</sup> During the same timeframe, 11,989 were seriously injured at intersections on VDOT maintained roads and 5,598 at intersections on the urban system. Programs and projects are in place to address the intersection problem and help Virginia reach its future objectives (Figure 39).



Intersection Fatalities and Serious Injuries and Objectives 2011 to 2015 (Actual), 2016 to 2021 (Projected) 39



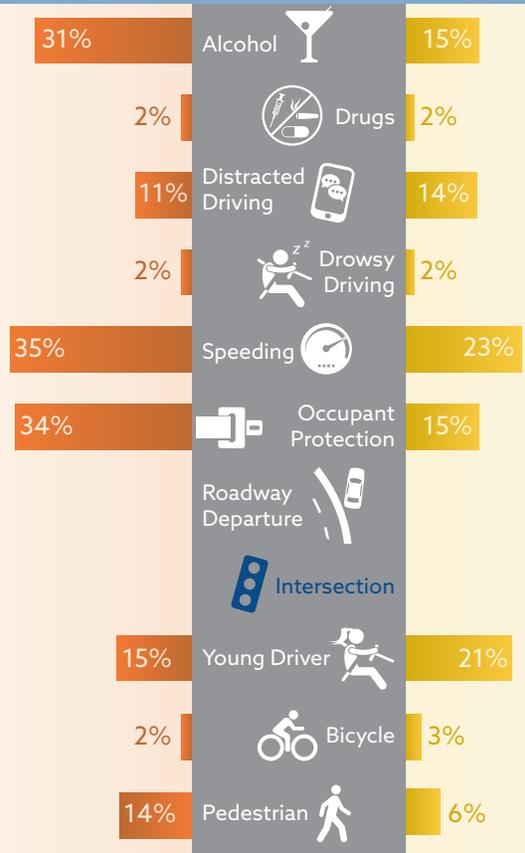
<sup>2</sup> For the 2017-21 SHSP urban intersection related crashes were identified from the police completed crash report (FR300). For VDOT roadways a buffer of 250 feet around the intersection was used to define related crashes. Within the 250 feet on an urban system roadway, the reporting officer may have noted another roadway feature. Thus, the urban reported intersection related crashes may be under-identified.

# Contributing Factors

Three primary factors contribute to intersection fatalities, including unrestrained occupants, impairment, and speeding (Figure 40). While speed also is a significant factor in serious injury crashes at intersections, young drivers are involved to a large extent. While lower in comparison to the other contributing factors, non-motorized (bicycle and pedestrian) severe crashes occur most frequently at intersections, so actions have been identified to mitigate this crash type.

Contributing Factors to Intersection Fatalities and Serious Injuries 2011 to 2015 40

FATALITIES



SERIOUS INJURIES



## Who?



Male drivers age 26 to 35 were involved in the highest number of intersection-related fatalities and serious injury crashes (Figure 41). Also significant is the number of male drivers between the ages of 46-55 and female drivers between the ages of 26-55 involved in intersection crashes. While young drivers (under age 20) and older drivers (65 and older) still make up a portion of the crash totals, both age groups represent lower percentage than all the other age groups.

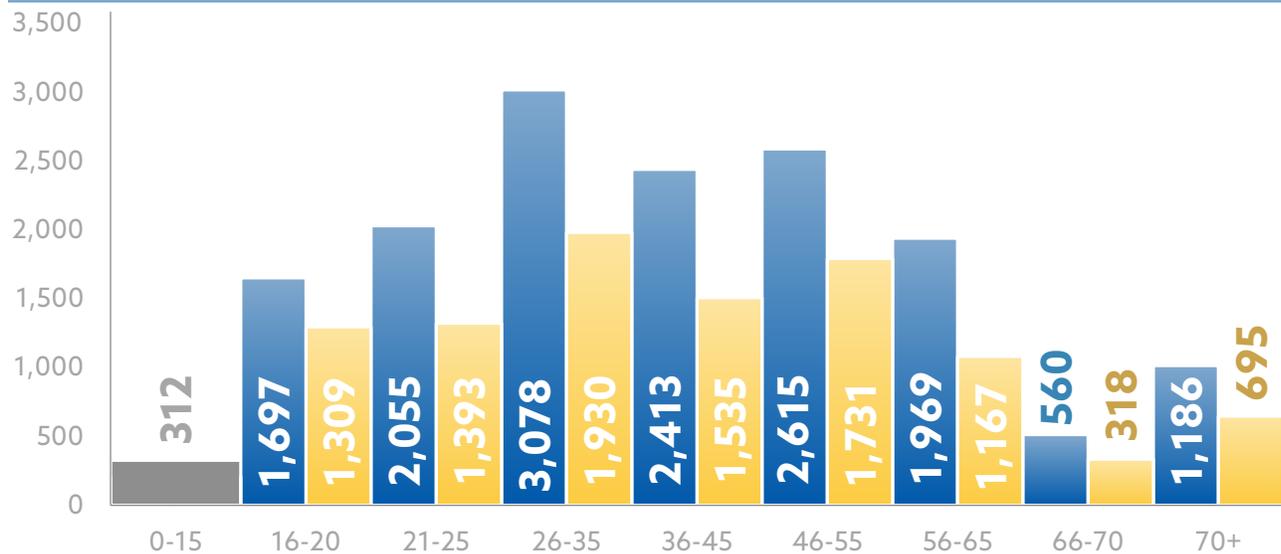
## Where?



Intersection crashes are primarily an urban issue so it is expected that the most populous areas of the State have the greatest number of intersection-related fatalities and serious injuries. Chesterfield, Fairfax, and Prince William counties and the cities of Norfolk, Richmond, Hampton, and Virginia Beach reported the highest number of intersection-related fatalities and serious injuries (Figure 42).

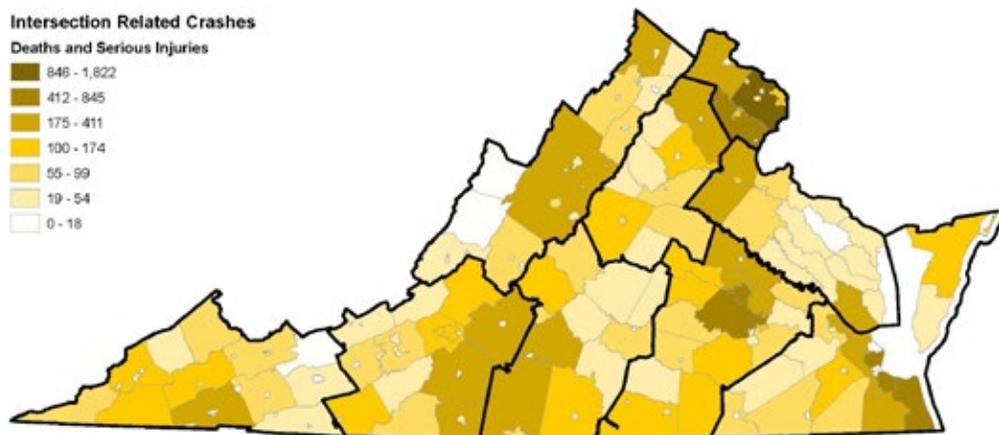
Intersection Fatalities and Serious Injuries by Driver Age and Gender  
2011 to 2015

41



Intersection Fatalities and Serious Injuries by Location  
2011 to 2015

42



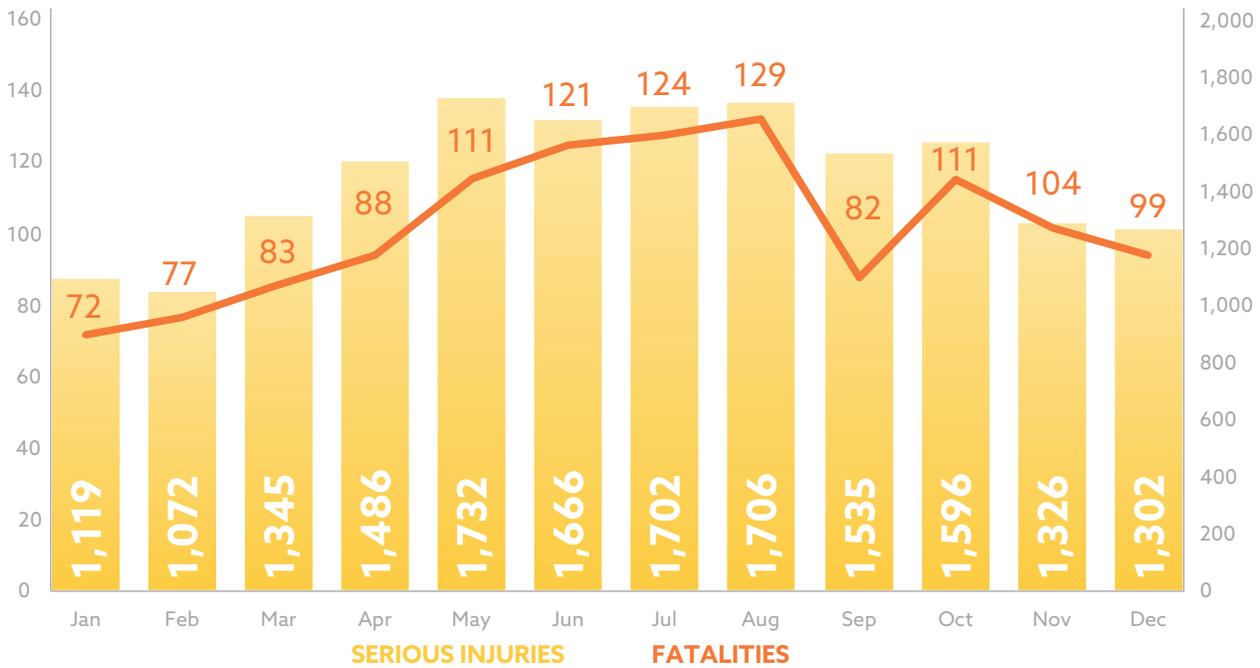
## When?

The majority of intersection fatalities and serious injuries occurred from June through August (Figure 43). Similar to previous years, the summer months experience the highest numbers. Intersection-related crashes resulted in about 51 deaths and serious injuries per day.

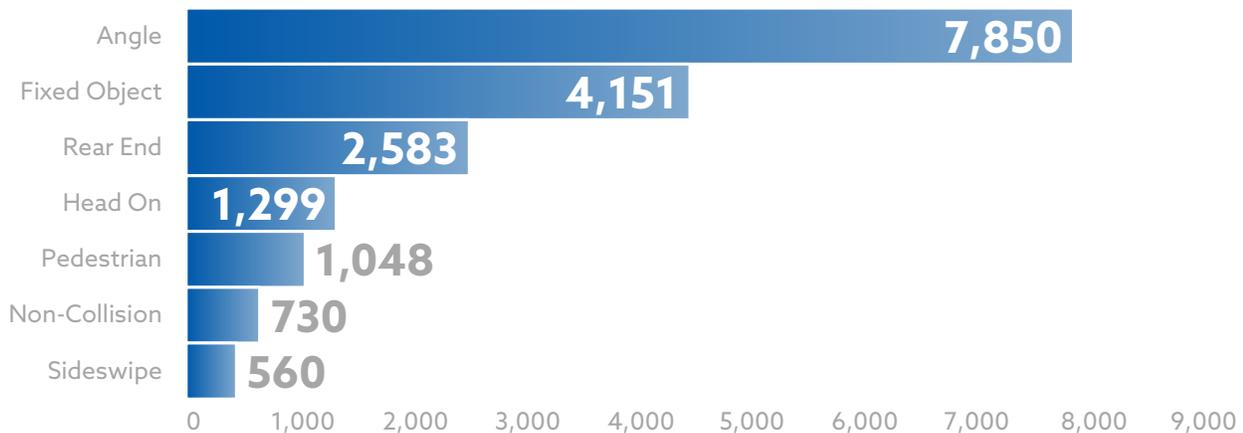
## Why?

The majority of intersection-related fatalities and serious injuries were the result of angle crashes, when a vehicle collides with another vehicle during a turning (typically left-hand turns) or merging maneuver. VDOT is undertaking a rigorous review of angle crashes, particularly at unsignalized intersections, to determine the factors involved and identify the best treatments. Other fatalities and serious injuries involved a driver hitting a fixed object at an intersection, such as a telephone pole or sign, and rear-end crashes (Figure 44).

Intersection Fatalities and Serious Injuries by Month 2011 to 2015 43



Intersection Fatalities and Serious Injuries by Collision Type 2011 to 2015 44



# The SHSP Solution

**Strategy 1. Reduce the frequency and severity of crashes at intersections and interchanges through geometric design, traffic control, and operational improvements while considering the context of the surrounding environment.**

-  1.1 Deploy enhanced traffic signal control technologies and appurtenances that enable real-time signal monitoring and control of timing parameters to improve traffic operations for all users along corridors and at isolated intersections.
-  1.2 Institute a review program to assess signalized intersections, starting with those having high Potential for Safety Improvement (PSI), crash rates, or red-light running violations, for adjustment to signal timing, including yellow change and all-red clearance intervals in accordance with VDOT and national guidance and pedestrian change and clearance intervals.
-  1.3 Apply state-of-the-art access management practices through standards and ordinances. Conduct corridor studies to identify improvement alternatives. Review median cross-over/openings for spacing, sight distance, and traffic control improvements.
-  1.4 Institute the use and provide training on HSM, Human Factors Guide, and Roadway Safety Assessments to assess and review the operations and safety for all intersection users and recommend appropriate treatments.
-  1.5 Deploy a review program to assess interchanges and unsignalized intersections having high PSI or crash rates for alternative geometric design and traffic control. Improvements to consider for implementation may include roundabouts, traffic signalization, sight distance and geometric improvements, and ITS enhancements. Other improvements for consideration may include those found in the Unsignalized Intersection Improvement Guide – <http://www.ite.org/uiig/treatments.asp>.
-  1.6 Develop or enhance policies and procedures to reduce conflict risks at intersections and interchanges. Institutionalize alternative analyses for the consideration of traditional and alternative/innovative intersection and interchange designs and technology, such as lengthening acceleration and deceleration lanes, diverging diamonds, offset left and right turn lanes, channelized right turn yield designs, roundabouts, directional openings, advanced traffic management systems, and advanced vehicle-warning systems.
-  1.7 Develop or enhance policies, procedures, and guidelines to ensure that intersections are designed for all users by providing the appropriate accommodations. Provide pedestrian and bicycle infrastructure such as marked crosswalks, pedestrian countdown signals, pedestrian refuge islands, and bicycle lanes or paths when adjacent land uses, crash history, or local input indicate the presence of pedestrians, cyclists, or transit users.

**Strategy 2. Improve user comprehension of and compliance with intersection and interchange traffic control devices.**

-  2.1 Partner with stakeholders to improve the knowledge and comprehension of all users on new and existing traffic control devices for intersections through regular publications and the use of web sites, brochures, and updates to the Virginia driver's manual.
-  2.2 Improve the visibility of conflict points and decision points so all users can navigate the intersection/interchange. Provide systemic enhances to intersections/interchanges through the use of signs, signals (e.g., retroreflective backplates and flashing yellow arrow), markings, and markers, rumble strips/stripes, lighting, and ITS enhancements.
-  2.3 Develop protocol and promote corridor reviews of intersections and interchanges for the appropriate traffic control devices to reduce driver distraction and information overload while improving traffic control device conspicuity.
-  2.4 Investigate alternate strategies to reduce red-light running and promote reviews of signalized intersections where change and clearance intervals have been updated in accordance with prevailing VDOT guidance that continue to experience high incidence of red-light running related crashes or violations. Work with law enforcement to initiate targeted enforcement activities to reduce red-light running.
-  2.5 Assess best practices and develop an action plan for passive and active public railroad-highway grade crossings, including grade separations, intersection warning and signing, gating, and signalized intersection interconnection.
-  2.6 Support enforcement and incident management planning by providing information to state and local police regarding high-crash intersections and interchanges.

## EMPHASIS AREA

# Young Drivers

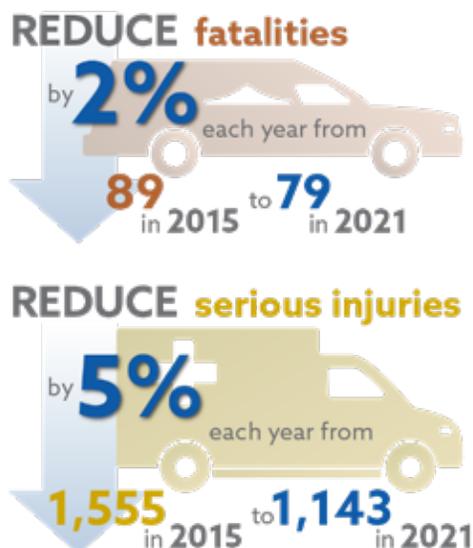


## Overview

According to the Center for Disease Control (CDC), motor vehicle fatalities were the single largest cause of death in America for persons aged 15-24 (6,709 fatalities) in 2014. This was 32 percent higher than the next leading cause of death, suicide. Similarly, motor vehicle crashes in Virginia are the leading cause of unintentional death for young people ages 16- 25. In Virginia's SHSP, young drivers are defined as persons between the ages of 15 and 20. The good news is between 2001 and 2015, young driver fatalities decreased 18 percent and serious injuries by 35 percent.

Due to inexperience behind the wheel, this age group is not as adept at quick decision-making and may have a skewed perception of risk. The primary causes of young driver crashes in Virginia are failing to maintain control of the vehicle, running off the road, and speeding. Distracted driving also is a prevalent national issue amongst young drivers and can be seen on Virginia's roadways.

A number of preventative programs and measures, specifically young driver and parental education programs that provide guidance on impaired driving, occupant protection, distracted driving, and speeding, are in place to reduce fatal and serious crashes in this area.



## Objectives

Over the previous five years (2011-2015), 509 people died in crashes involving young drivers on Virginia roads, and 9,094 were seriously injured. Virginia is making progress; however, 2015 shows slight increases in fatalities and serious injuries. Programs and projects are in place to address the speeding problem and help Virginia reach its future objectives (Figure 45).



## Contributing Factors

The primary event for young driver fatalities and serious injuries is drivers departing the travel lane, striking a fixed object (Figure 46). Significant factors contributing to young driver fatalities are speed, no restraint used, and alcohol use. Intersections are also a problem location for young drivers. However, when combined, drugs, distracted driving, and drowsy driving essentially contribute the same proportions to severe crashes. Serious injuries at intersections also are an issue for young drivers, likely due to their inexperience in judging conflicts with opposing vehicles and judging their speed and distance.

Young drivers are delaying getting their license, but inexperience and immaturity increase crash risk. Studies indicate that risk perception and appropriate response is lacking for new and young drivers. Additionally, adolescent brain development is an associated factor in risk taking and decision-making while driving. Judgment, decision-making, and deferred gratification (or reward) are not matured until about age 25.

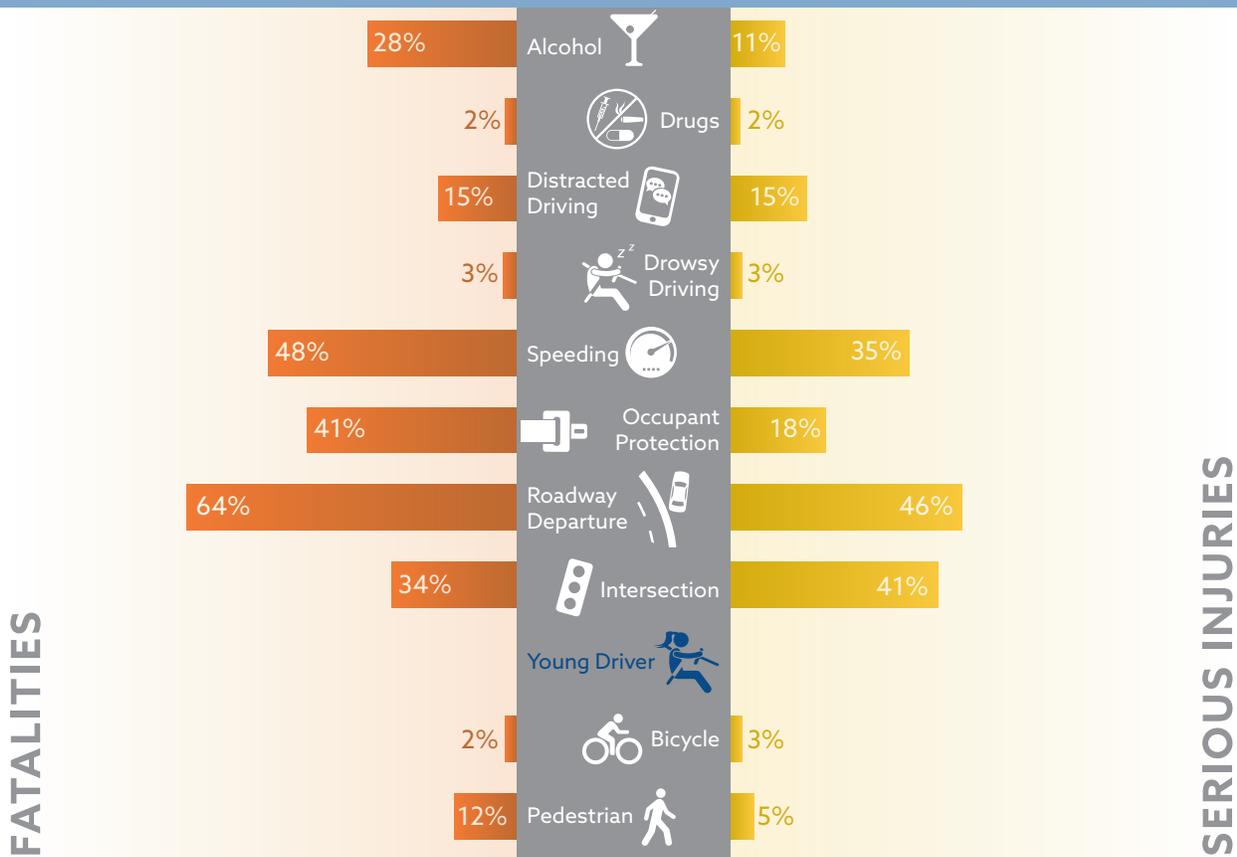
### Where?



Four counties in Virginia, including Fairfax, Chesterfield, Prince William, and Spotsylvania, had the highest number of young driver deaths and severe injuries (Figure 47), indicating issues in suburban areas with higher traffic volumes and speeds. Five cities also reported a high number of young driver deaths and severe injuries, including Norfolk, Newport News, Hampton, Virginia Beach, and Richmond.

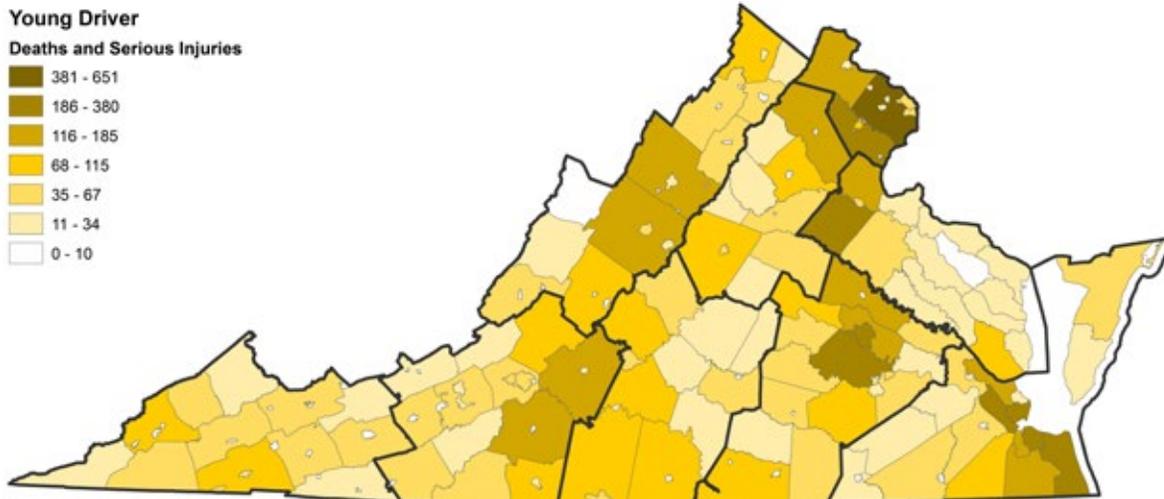
## Contributing Factors to Young Driver Fatalities and Serious Injuries 2011 to 2015

46



## Young Driver Fatalities and Serious Injuries by Location 2011 to 2015

47



## When?

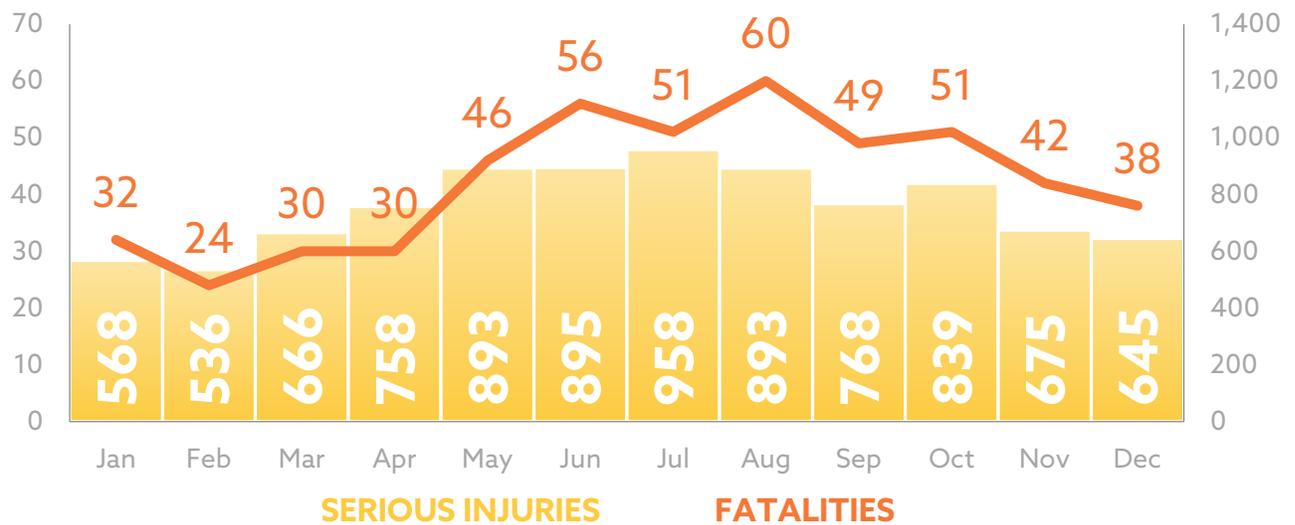
Young driver deaths and serious injuries begin to increase towards the end of the school year and through the summer months (Figure 48). The months with the highest numbers of deaths and serious injuries are June, July, and August. Young driver crashes resulted in about 26 deaths and serious injuries a day.

## Why?

The majority of young driver deaths and serious injuries occurred when a vehicle hit a fixed object, such as a tree or telephone pole. Other deaths and serious injuries involved angle and rear-end collisions, which typically occurred at interchanges, intersections, and driveway locations (Figure 49).

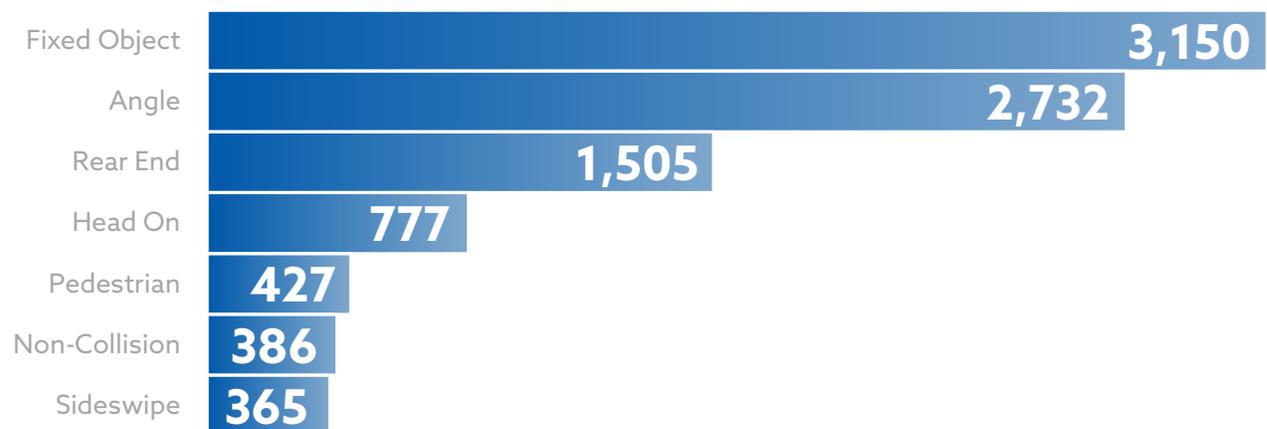
Young Driver Fatalities and Serious Injuries by Month  
2011 to 2015

48



Young Driver Fatalities and Serious Injuries by Collision Type  
2011 to 2015

49



# The SHSP Solution

## Strategy 1. Educate and make recommendations as necessary to improve Virginia's Graduated Driver Licensing (GDL) law.

-  1.1 Educate about the length of the learner's permit and the amount of supervised hours.
-  1.2 Make recommendations about the length of the learner's permit and the amount of supervised hours.
-  1.3 Educate as necessary on the elements of passenger and nighttime restrictions, and the prohibition on teen driver cell phone use.
-  1.4 Make recommendations as necessary on the elements of passenger and nighttime restrictions, and the need for a primary prohibition on teen driver cell phone use.
-  1.5 Educate parents, teens, law enforcement and traffic safety partners on the Provisional Driver's License.

## Strategy 2. Review and recommend changes to enhance the effectiveness of Virginia's driver education process.

-  2.1 Driver Education Curriculum a) Educate highway safety partners on Driver Education Curriculum content, and b) Continuously monitor and update the driver education curriculum as needed.
-  2.2 Continue to examine driver education instructor training and certification (endorsements) to determine the need for improvement.
-  2.3 Evaluate the content and delivery of driver's education classroom curriculum by all providers, including on-line, to determine the level of consistency and quality and make recommendations based upon findings.
-  2.4 Evaluate all in-car/behind-the-wheel road skills testing best practices. Report findings and make recommendations as necessary.

## Strategy 3. Develop and implement strategic and effective education and outreach to improve attitudes and behaviors.

-  3.1 Continuously review research for best practices and data to identify top target areas to develop effective educational messages.
-  3.2 Identify evidence-based programs for changing youth behaviors and attitudes, taking diverse populations into consideration. Develop, implement, and evaluate initiatives as appropriate: a) target 15- to 18-year-old drivers; and b) target 19- to 20-year-old drivers.
-  3.3 Identify evidence-based approaches to increase parental involvement in young driver safety, taking diverse populations into consideration. Develop, implement, and evaluate initiatives as appropriate.
-  3.4 Use bicycle, pedestrian, and passenger safety as a way to promote traffic safety early in the education process. Develop and implement initiatives prior to formal driver's education.

## Strategy 4. Provide information to judges on young driver issues.

-  4.1 Review judicial licensing ceremony and determine strategies for improving resources and materials.
-  4.2 Develop suggested best practices for judicial licensing ceremony and disseminate.



## EMPHASIS AREA

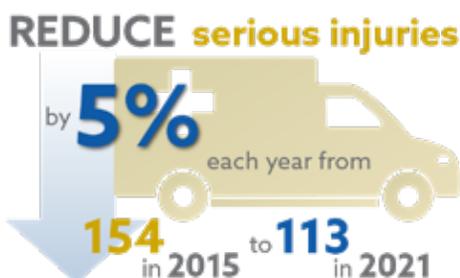
# Bicycles



## Overview

Bicyclists are more vulnerable than motorists and thus more likely to suffer severe injuries when involved in traffic crashes. National trends show more commuters traveling to and from work using bicycles and recreational cycling continues to become more popular. According to NHTSA, between 2000 and 2012, bicycle commuters increased by 64 percent. To accommodate this growth, bicycle infrastructure has been added in the urban areas of Northern Virginia, Richmond, Hampton Roads, and university communities. In rural areas of Virginia, shoulders have been widened or added to accommodate bicycle ridership.

To improve safety for bicyclists, Virginia will use a combination of engineering, enforcement, and education techniques. Specifically, bicycle crashes will be further analyzed to explore the implementation of effective safety countermeasures, dangerous behaviors such as red light running will be enforced, and share the road type education materials will be shared widely.

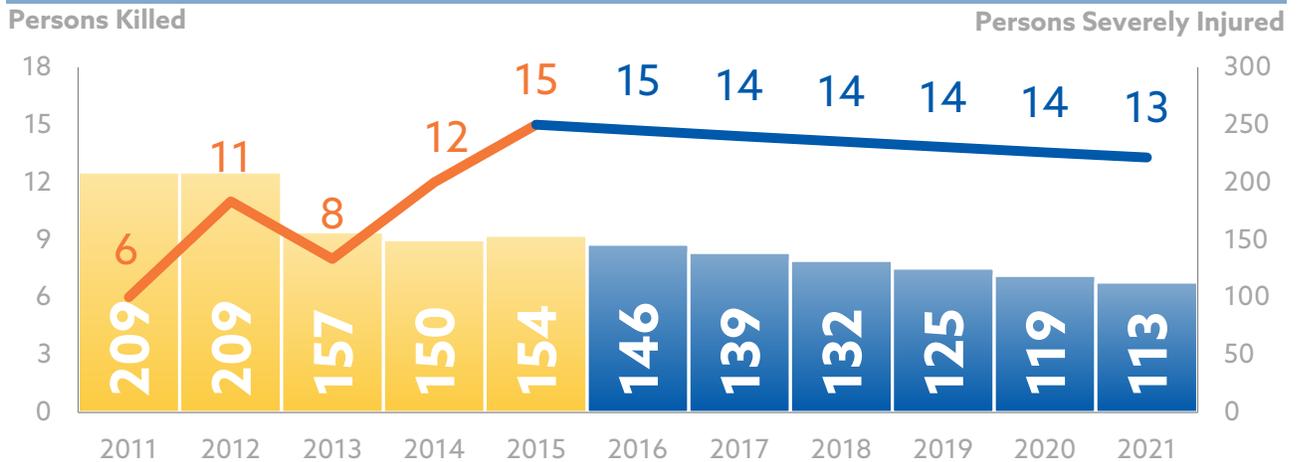


## Objectives

Over the previous five years (2011-2015), 52 people died in bicycle crashes on Virginia roads, and 879 were seriously injured. While serious injuries have declined they have plateaued with an increase in fatalities in recent years. Programs and projects are in place to address the bicycle problem and help Virginia reach its future objectives, while understanding the difficulties with venerable users (Figure 50).

Bicycle Fatalities and Serious Injuries and Objectives  
2011 to 2015 (Actual), 2016 to 2021 (Projected)

50



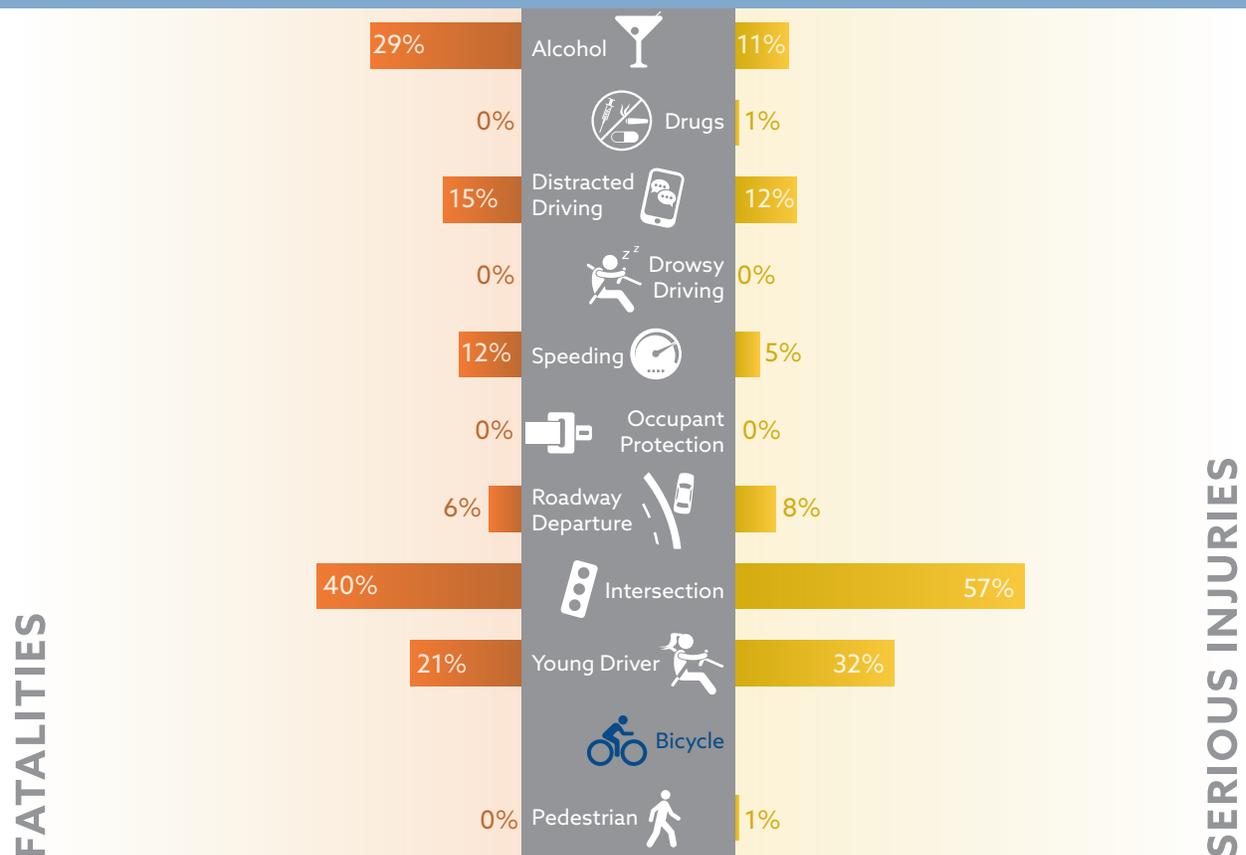
SERIOUS INJURIES FATALITIES FUTURE TRENDS

## Contributing Factors

The primary factors contributing to bicycle fatalities are driver or bicyclist impairment as well as vehicle/bicycle conflicts between young, inexperienced drivers (Figure 51). Another significant factor contributing to bicycle fatalities and serious injuries is related to incidents occurring at intersections when the interactions between bicyclists and vehicles are heightened. Vehicle speed is critical factor in the outcome of bicyclist involved crashes. Most crashes involving cyclists occur at locations where the posted speed limit of the roadway is greater than 30 miles per hour.

Contributing Factors to Bicycle Fatalities and Serious Injuries  
2011 to 2015

51



## Who?



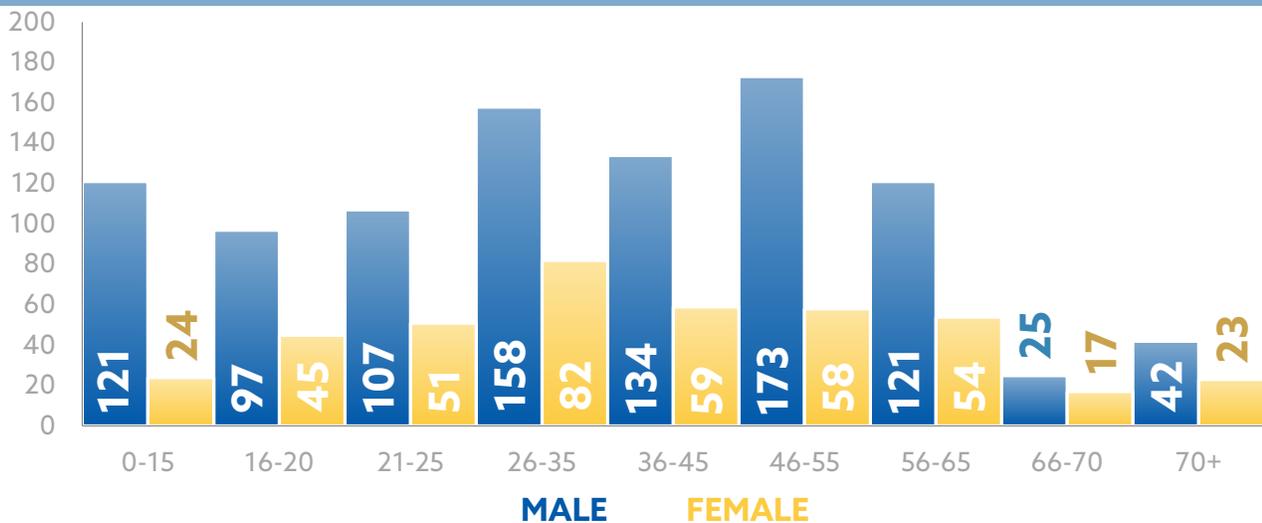
Males age 26 to 55 were involved in the highest number of bicycle death and serious injury crashes. Males in the 46-55 age are involved in crashes most often, but also significant is the number of females in the 26-35 range who are killed or seriously injured while on their bicycles.

## Where?

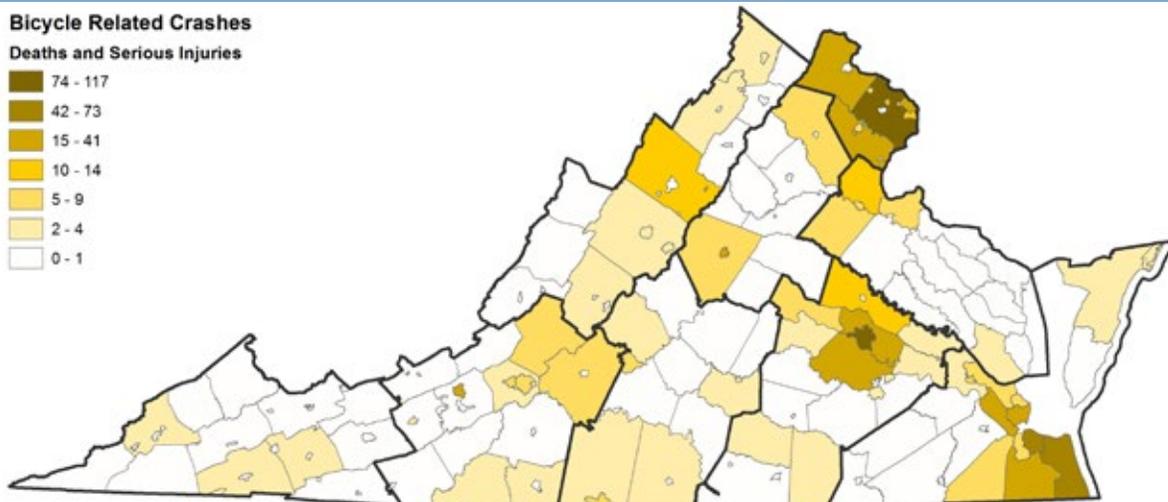


Bicycle fatalities and serious injuries are clustered around the larger urban and suburban areas of Virginia as well as the beach and university communities, where there are more riders, increasing the risks associated with exposure. Fairfax County and the cities of Newport News, Norfolk, Richmond, and Virginia Beach reported the highest number of bicycle fatalities and serious injuries.

**Bicycle Fatalities and Serious Injuries by Driver Age and Gender** 2011 to 2015 52



**Bicycle Fatalities and Serious Injuries by Location** 2011 to 2015 53



## When?

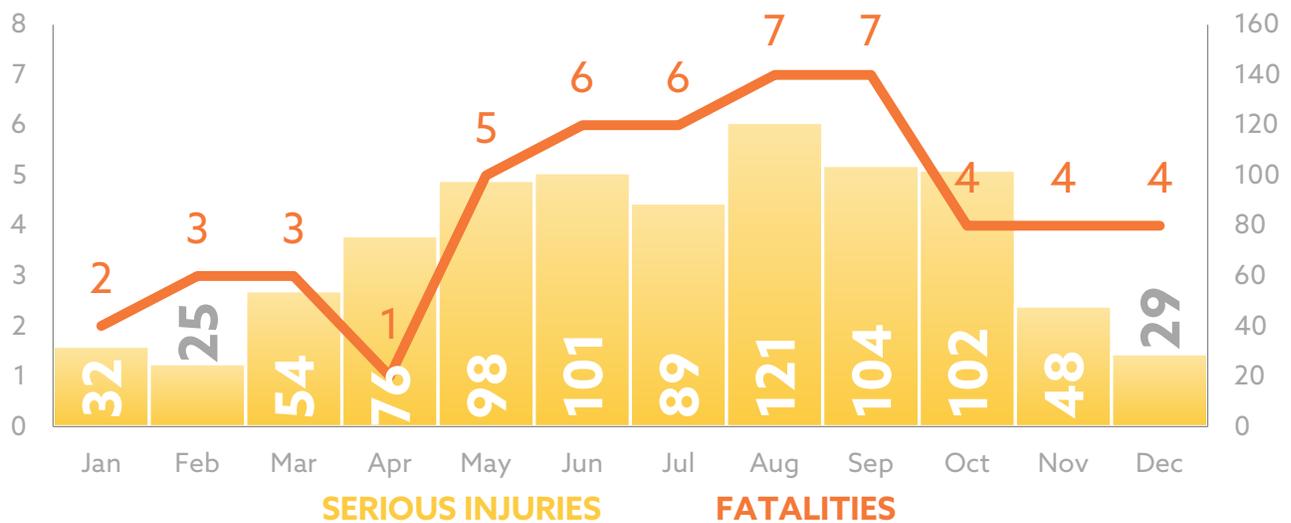
The majority of bicycle fatalities and serious injuries occurred consistently throughout the year with the exception of January through March, when the weather is colder (Figure 54). The months of August, September, and October had the greatest number of serious injuries, but October, November, and December had the greatest number of fatalities, with December being the highest. Bicycle involved crashes resulted in about 10 fatalities and serious injuries per day.

## Why?

The majority of bicycle fatalities and severe injuries occurred when a vehicle and a bicycle collided at an angle. This type of crash occurs primarily at intersections or driveways when the vehicle or motorist fails to yield (Figure 55).

Bicycle Fatalities and Serious Injuries by Month  
2011 to 2015

54



Bicycle Fatalities and Serious Injuries by Collision Type  
2011 to 2015

55



# The SHSP Solution

**Strategy 1. Identify corridors and locations having concentrations of bicycle activity or the potential for crashes to apply proven bicycle safety countermeasures.**

-  1.1 Improve collection and use of data needed for bicycle safety planning and programming. Develop a comprehensive database of bicycle-related crashes and identify bicycle crash corridors and “hotspots” to disseminate to localities across the Commonwealth.
-  1.2 Work with localities to develop a data-driven, risk-based approach to identify and prioritize bicycle infrastructure needs and target improvements in areas with existing and anticipated bicycle travel based on land-use mixes that support bicycle activity.
-  1.3 Formalize procedures in the project development process to include the installation of paved shoulders, bike lanes, shared use paths, or trails where connectivity to bicycle facilities currently does not exist.
-  1.4 Reduce bicycle exposure to auto traffic and motor vehicle speeds through providing geometric and traffic signal improvements during project development process. This would include providing, where appropriate, paved shoulders, shared-use paths, trails, bicycle lanes or separated bike lanes; implementing traffic calming techniques; improving signal timings and markings for bicyclists to cross; and installing lighting and bicycle detectors.
-  1.5 Collaborate with localities to develop bicycle action plans and to submit bicycle projects (or as components of larger projects) for state and Federal program funding (e.g., HSP, Bicycle and Pedestrian Safety (BPS), Transportation Alternatives Program (TAP), and Safe Routes to Schools (SRTS), Revenue Sharing, SMART SCALE).

**Strategy 2. Educate bicyclists and motorists on improving personal safety while on shared roadways.**

-  2.1 Prepare materials and conduct outreach to advise and educate bicyclists to use head lamps and flashing beacons, apply reflective material on self and bicycle, wear light-colored clothing and practice proper helmet use.
-  2.2 Promote the information contained within and distribute “Sharing the Roads in Virginia” pocket guides about the Commonwealth’s bicycling laws to targeted at-risk groups and motorists. Initial distribution to focus on jurisdictions with the highest percentage of bike commute trips, including Alexandria, Charlottesville, Williamsburg, Blacksburg, Arlington, and Harrisonburg (VDOT State Bicycling Policy Plan, 2011).
-  2.3 Utilize and provide resources (such as state and Federal Section 402 and Safe Routes to School Programs) that partner to educate and implement biking to schools. Enhance and implement other cycling training to equip school-age children with knowledge and practice to enable them to cycle safely in environments with traffic and other safety hazards.

**Strategy 3. Partner with local and state police to enforce bicycle traffic laws and to increase compliance with existing laws.**

-  3.1 Enforce dangerous behavior of both motorists and bicyclists, such as red light running. Develop and provide targeted bicycle safety information to educate ticketed or non-compliant motorists and cyclists.
-  3.2 Create or adapt short videos on bicycle laws that serve for both police training and public education across Virginia.



## EMPHASIS AREA

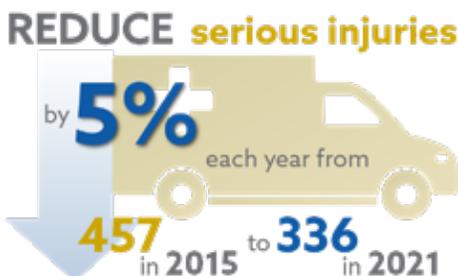
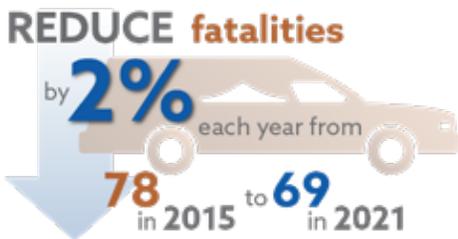
# Pedestrians



## Overview

Almost all Virginians are pedestrians for a portion of their daily travel. For a growing number, walking is the preferred means of transportation and a preferred type of exercise. The NHTSA's safety facts show that pedestrian fatalities across the country have been increasing in recent years after a downward trend for almost two decades. In Virginia, pedestrian deaths have fluctuated over the last five years while serious injuries have remained flat, with around 400 pedestrians who are seriously injured each year. Initial 2016 results indicate a 53 percent increase in pedestrian deaths over 2015 numbers in Virginia. In recent years, the public; especially in cities, towns, and suburbs; have demanded more active transportation options and land development to support those desires. As a result, Virginia must work to ensure a safe transportation system exists for all travelers, including pedestrians. This is critically important since pedestrian crashes tend to be severe, especially when the crashes occur at higher travel speeds.

To make Virginia's roads safer for pedestrians, Virginia will use a combination of engineering, enforcement, and education techniques. Specifically, pedestrian crashes will be further analyzed to explore and implement effective safety countermeasures, dangerous behaviors such as speeding or jay-walking will be enforced, and education materials will be disseminated widely to help raise awareness of pedestrian safety issues of most importance.



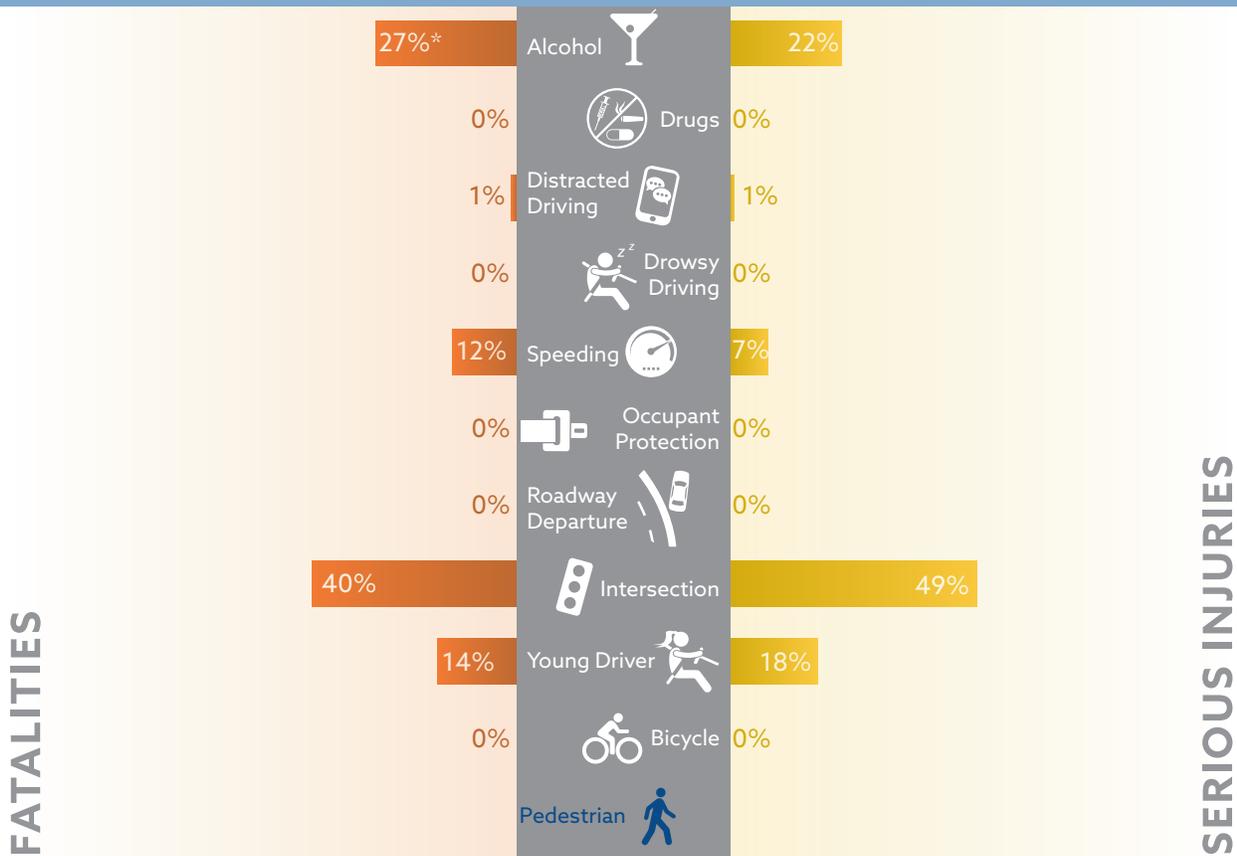
## Objectives

Between 2011 and 2015, 422 pedestrians died in crashes on Virginia roads, about 12 percent of total highway deaths, and 2,352 people were seriously injured. The growing proportion of pedestrian deaths among total highway deaths highlights the need for Virginia to target our resources and efforts as much as possible with the goal of reducing the frequency and severity of pedestrian crashes. Programs and projects are in place to help improve pedestrian safety in the Commonwealth (Figure 56).



## Contributing Factors

Many variables are involved in pedestrian crashes. To have an impact on reducing the severity and frequency of crashes, a variety of approaches and factors must be considered. A primary factor contributing to crashes that result in pedestrian fatalities and serious injuries is limited visibility. An in-depth analysis of Virginia's pedestrian crashes between 2012 and 2014 revealed that, similar to national trends, about 74 percent of crashes that resulted in pedestrian deaths occurred during limited light conditions. Additionally, no marked crosswalk was available at 86 percent of locations where a crash resulted in a pedestrian death. Land uses adjacent to the roadway will determine whether pedestrian travel will occur and, if pedestrian travel is anticipated, pedestrian infrastructure such as crosswalks should be provided to indicate the safest location for pedestrian crossings to occur. Further, over 60 percent of pedestrian deaths occurred when a pedestrian was crossing the street not at an intersection. Speed of the vehicle at time of crash also plays a major role as to whether a pedestrian will survive a collision. In Virginia, between 2012 and 2014, a majority of fatal crashes occur on roadways with speed limits greater than 35 miles per hour while the vast majority of pedestrian injury crashes occur on roadways with speed limits less than or equal to 35 miles per hour which highlights the increased probability of a pedestrian surviving a lower-speed crash. Finally, while the majority of pedestrians who die on Virginia's roadways are not drinking, driver and pedestrian impairment continue to be issues that need to be addressed (Figure 57). Another significant factor contributing to pedestrian fatalities and serious injuries is related to incidents occurring at intersections when the interactions and complexity of maneuvers between pedestrians and vehicles are heightened.



\*Fatal alcohol data is from FARS (Pedestrian having a BAC of 0.08 or greater).

### Who?



Males and females, age 26 to 35, were involved in the highest number of pedestrian death and serious injury crashes (Figure 58). Also significant are the numbers of males and females involved in pedestrian crashes from ages 21-25 and from 36-65. Pedestrian-related crashes are not identifiable with a single age range.

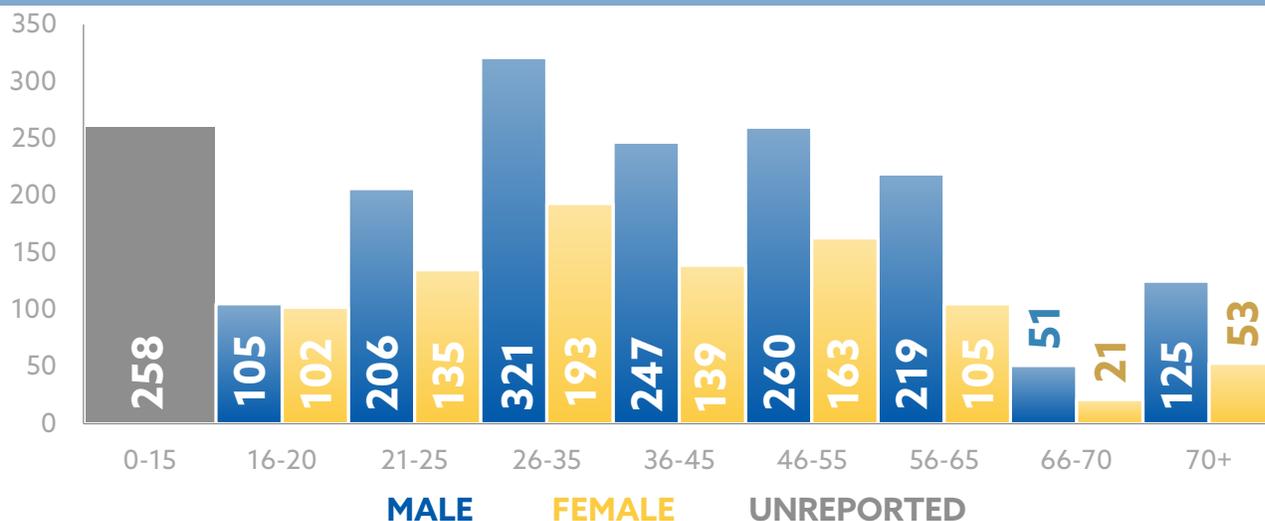
### Where?



Pedestrian fatalities and serious injuries are primarily clustered around larger urban and suburban areas, as well as the university and beach communities, where there are more pedestrians, increasing the risks associated with exposure. Arlington, Fairfax, Henrico, and Prince William counties and the cities of Newport News, Norfolk, Richmond, Hampton, Portsmouth, and Virginia Beach reported the highest number of pedestrian fatalities and serious injuries (Figure 59).

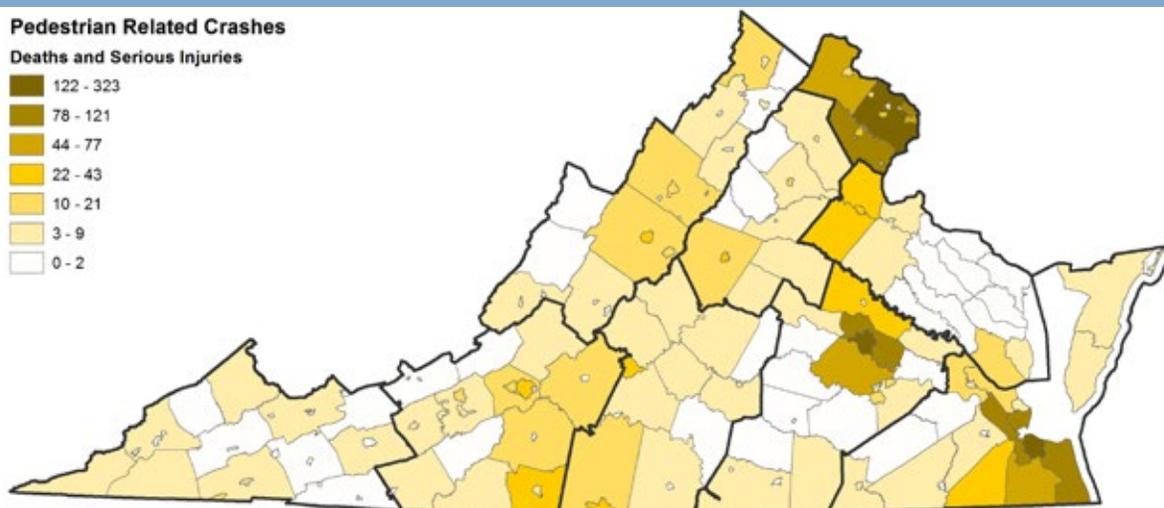
## Pedestrian Fatalities and Serious Injuries by Driver Age and Gender 2011 to 2015

58



## Pedestrian Fatalities and Serious Injuries by Location 2011 to 2015

59



### When?

The majority of pedestrian-related serious injuries occurred consistently throughout the year while fatalities spike between the months of August through December, with December being the highest month for both fatalities and serious injuries (Figure 60). Almost 75 percent of pedestrian fatalities occur during limited light conditions (dusk, dawn, or darkness). The increase in the fall and winter months could coincide with increased darkness and students going back to school as well as wet weather conditions. Pedestrian involved crashes resulted in about 8 fatalities and serious injuries per day throughout Virginia.

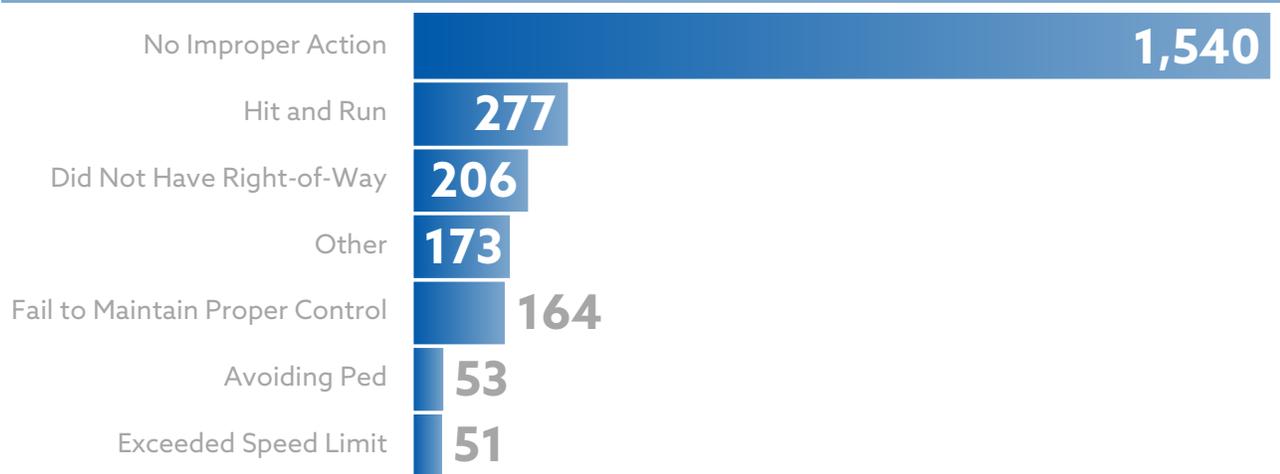
### Why?

Pedestrian fatalities and serious injuries can be caused by unsafe actions caused by either the driver or the pedestrian. When the driver is at fault, the primary contributing factors include hit and runs, failure to properly yield to a pedestrian in a crosswalk, or the inability to react to a pedestrian crossing due to factors such as speed, distraction, or impairment (Figure 61). When pedestrians are at fault it is due to illegal actions such as crossing where there are no crosswalks or crossing when they do not have the right of way. (Figure 62).

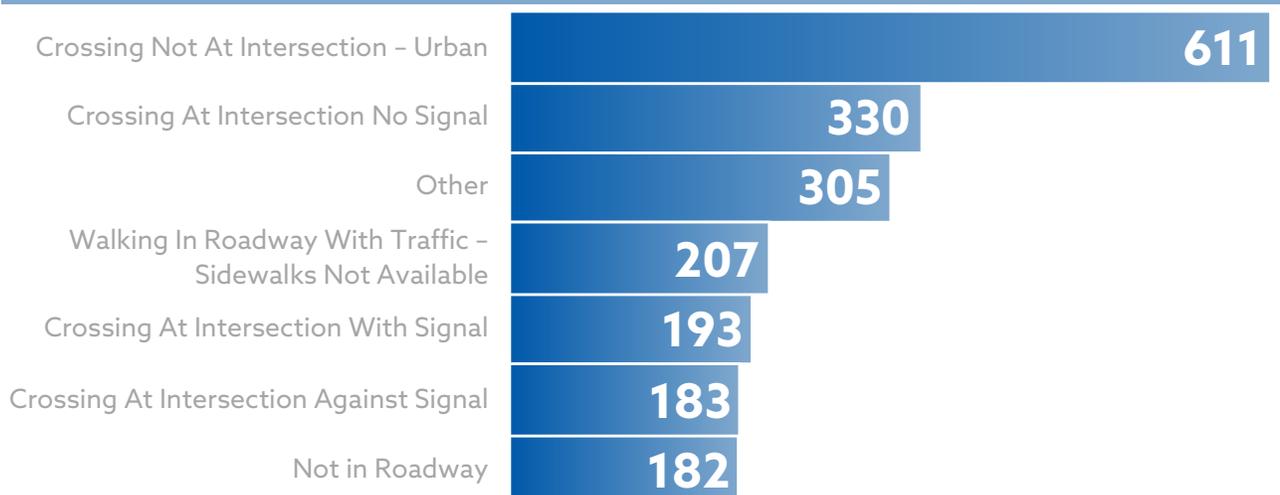
**Pedestrian Fatalities and Serious Injuries by Month  
2011 to 2015** 60



**Pedestrian Fatalities and Serious Injuries by Driver Action  
2011 to 2015** 61



**Pedestrian Fatalities and Serious Injuries Pedestrian Action  
2011 to 2015** 62



# The SHSP Solution

## Strategy 1. Identify corridors and locations having concentrations of pedestrian activity or the potential for crashes to apply proven pedestrian safety countermeasures.

-  1.1 Improve collection and use of data needed for pedestrian safety planning and programming. Develop a comprehensive database of pedestrian-related crashes and identify pedestrian crash corridors and “hotspots” to disseminate to localities across the Commonwealth.
-  1.2 Work with localities to develop a data-driven, risk-based approach to identify and prioritize pedestrian infrastructure needs and target improvements in areas with existing and anticipated pedestrian travel based on land-use mixes that support pedestrian activity.
-  1.3 Formalize procedures in the project development process to include the installation of paved shoulders, sidewalks, shared use paths, or trails where connectivity to pedestrian facilities currently does not exist.
-  1.4 Enhance and deploy guidance in the project development process that reduces pedestrian roadway crossing exposure by implementing geometric or physical roadway modifications in project designs to include complete street projects, smaller radii at crosswalks, curb bulb-outs, median and refuge island improvements, and narrowing of general purpose lane widths.
-  1.5 Enhance and deploy policy guidance to encourage new signalized intersections be designed for all users. Review locations and provide pedestrian accommodations or enhancements at new and existing signalized intersections to include high visibility markings, installing pedestrian countdown signals, lengthening pedestrian clearance times and other signal timing approaches, or installing Pedestrian Hybrid Beacons or Rectangular Rapid Flashing Beacons (RRFB) where complete traffic signals are not warranted.
-  1.6 Collaborate with localities to develop pedestrian action plans and to submit pedestrian projects (or as components of larger projects) for state and Federal program funding (e.g., HSP, BPS, TAP, SRTS, Revenue Sharing, SMART SCALE).

## Strategy 2. Educate roadway users on driver and pedestrian awareness and appropriate behavior.

-  2.1 Develop or enhance and disseminate outreach materials to educate roadway users on the factors associated with pedestrian crashes, compliance with traffic control devices, and providing proper right-of-way to all road users.
-  2.2 In collaboration with schools, community groups, or local pedestrian advocacy groups, conduct pedestrian safety outreach and education to targeted populations.
-  2.3 Utilize and provide resources (such as Section 402 and Safe Routes to School Programs) that partners to educate and implement safer walking to schools. Enhance and implement pedestrian training to equip school-age children with the knowledge and practice to enable them to walk safely in environments with traffic and other safety hazards.

## Strategy 3. Partner with local and state police to enforce traffic laws and to increase compliance with existing laws.

-  3.1 Conduct targeted enforcement of dangerous behaviors (such as speeding, j-walking, midblock crossing) to increase compliance with appropriate traffic laws by both pedestrians and motorists. Share successful initiatives with and through other safety stakeholders.
-  3.2 Create or adapt short videos on pedestrian laws that serve for both police training and public education across Virginia.

# Special Areas

Highway safety stakeholders understand that a wide variety of expertise, experience, and resources are needed to reduce severe crashes. Engineering, enforcement, and education are only part of the effort.

To work towards reducing crashes and their consequences requires detailed and robust analysis and diagnosis of our highway, traffic, and crash data. Improved incident response and emergency medical services also will minimize secondary crashes and the consequences of crashes.

Finally, connected and autonomous vehicle technology is an emerging area that must be considered in planning our roadway network system and safety programs to meet our objectives and goals in the future.



DATA



INCIDENT RESPONSE AND  
EMERGENCY MEDICAL  
SERVICES



CONNECTED VEHICLE/  
AUTONOMOUS VEHICLES





## SPECIAL AREA

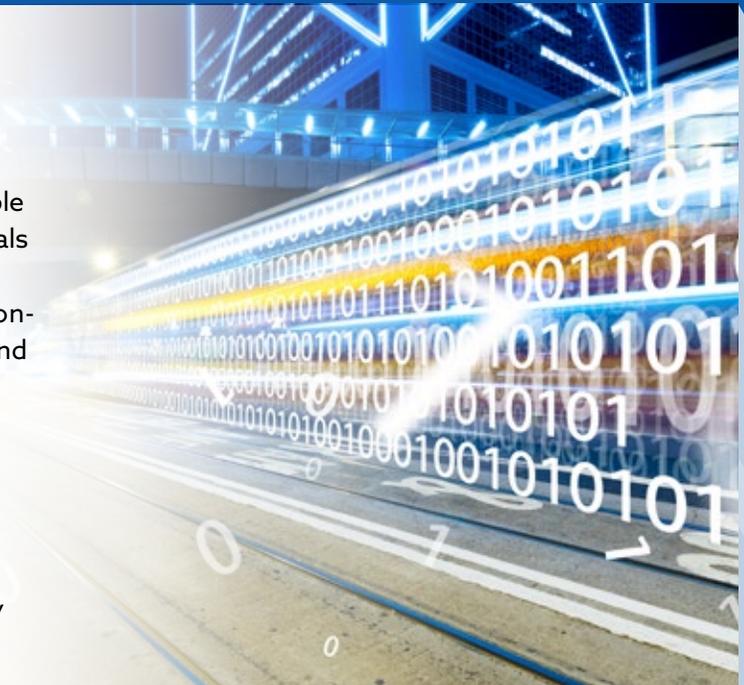
# Data



## Overview

The emphasis areas, strategies, and actions in the Virginia SHSP were developed using the best available highway safety data. To meet our objectives and goals analysis, diagnosis, assessment, evaluation and reporting are critical to success by helping decision-making for engineering, enforcement, education and incident response and EMS.

A data-driven approach is the basis of all the Federally funded safety programs to maximize the return on investment for safety funds. State-of-the-art predictive safety analysis methods are used to prioritize HSIP projects and Virginia Highway Safety Office uses crash mapping tools to target Federal funds for education and enforcement.



The latest Federal regulation requires VDOT and the DMV-HSO to set annual safety performance targets and coordinate with the MPOs to do the same. Performance measures, primarily the number and rate of fatalities and serious injuries, provide information on how effective projects and programs are helping meet the State's goals and objectives.

Tracking performance for the emphasis areas over the SHSP period provides encouragement and accountability for wise use of the resources and identifies true progress.

## Data Systems Supporting the SHSP

Information systems that capture, store, analyses, and transmit data are maintained by SHSP partners as follows:

- Crash
  - TREDS (DMV)
  - RNS (VDOT)
- Roadway (VDOT and Virginia Geographic Information Network (VGIN))
- Driver (DMV)
- Vehicle (DMV)
- Citation (VSP)
- Adjudication (DOJ)
- Injury (VDH)

To meet our objectives, Virginia's highway safety and SHSP-related data systems must provide complete, accurate, integrated, accessible, and timely information. Data is foundational to focusing resources and monitoring progress.

To ensure highway, traffic and crash data is continually enhanced and made accessible, Virginia's Traffic Records Coordinating Committee (TRCC) provides oversight and assists agencies with the use of crash and highway safety-related data for analysis purposes. The TRCC is a collaboration of Federal and state agencies from transportation, law enforcement, and criminal justice and health fields.

The TRCC has developed strategies and action steps designed to provide a more complete picture of Virginia's traffic safety situation.

## The SHSP Solution

**Strategy 1. Maintain the Traffic Records Coordinating Committee (TRCC) with a multidisciplinary membership representing the six core data systems and other data collectors and users.**

- 1.1 Review and update the Annual TRCC Strategic Plan to reflect specific activities, projects, and designated personnel for the timely completion.

**Strategy 2. Continue Traffic Records Electronic Data System (TREDS) enhancements for data integration. Continue to improve data reporting and mapping. Continue to train and update training materials on TREDS enhancement and changes.**

- 2.1 Continue to enhance mapping that includes street names, addresses, and route numbers. Enhance ease and accuracy of the front-end mapping of crash locations by reporting officers.

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- 2.2 Continue to improve the extent and accessibility of ad hoc queries, reports, and mapping tools to partner agencies, their contractors, other safety partners, and researchers.

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- 2.3 Coordinate with partner agencies to develop legislation to allow for TREDS to have access to summons information. With the proper Code of Virginia provisions, complete the E Summons pilot project and continue with full integration into TREDS.

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- 2.4 If E-summons is fully implemented, then investigate data integration needs and requirements for integrating crash, citation, conviction, and treatment data into a single repository.

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- 2.5 Complete VDH data warehouse development to permit merging of Emergency Medical Services data incident reporting and trauma registry data to be available for TREDS consumption. Complete the EMS/Trauma Registry and crash data integration project in TREDS.

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- 2.6 Continue to enhance electronic data transfer to populate additional fields to the Fatality Analysis Reporting System (FARS/EDT) from TREDS provided to FARS.

---

- 2.7 Provide training to local and state law enforcement agencies on all crash report data fields and data collection processes as well as electronic submissions to TREDS. Provide improved training methods and materials on the crash report, as well as on enhancements to TREDS reporting and analysis tools.

**Strategy 3. Monitor and maintain Federal Motor Carrier Safety Administration (FMCSA) objectives and measures for information regarding the commercial vehicle crash reporting system (SafetyNet) and continue to obtain good state data quality ratings.**

- 3.1 Continue to monitor and enhance as necessary the FMCSA reportable commercial motor vehicle crashes recorded in TREDS. Continue to enhance the TREDS electronic reporting to FMCSA and VSP.

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- 3.2 Work with local and state police to monitor data submitted on the police reports and provide the requisite training to enhance reporting.

**Strategy 4. Implement improved tools and methodologies for highway safety analysis and research incorporating highway inventory, traffic, crash, and related data for all public roads.**

- 4.1 Integrate HSM methods into VDOT information systems, software, policies, and procedures. Investigate software tools for highway safety planning, including SafetyAnalyst and like tools, and for project development analysis, including Interactive Highway Safety Design Model (IHSDM), to determine needs and requirements for data translation, software functionality, results, and reporting. Procure and implement safety software deemed effective.

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- 4.2 Through a multidisciplinary working group, develop an implementation plan for including HSM methods and supporting software tools into VDOT project development policy and procedures, and complete the priority elements of the plan.

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- 4.3 Develop a HSM methods and software training plan for internal and external safety partners.

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- 4.4 Build on existing data sources and develop a consistent inventory of traffic and safety assets on state-maintained roads. Adopt a common data dictionary for core data elements. Provide analytical, reporting, and mapping capabilities to support asset maintenance, upgrade, and replacement decisions.

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- 4.5 Work towards meeting the Federal Regulation Model Inventory of Roadway Elements (MIRE) data collection requirements and creating a safety data mart integrating available roadway, roadside, and traffic control device asset and condition data with crash and traffic data to support safety analysis, mapping, and reporting needs.

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- 4.6 Complete the urban roadway system linear referencing system and mapping project. Consider an effort to populate the roadway and traffic engineering asset data required for safety planning methods on locally maintained roadways.

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- 4.7 Provide coordinated statewide Safety Performance data to MPO/Planning District Commissions (PDC) and locality planning partners for internal, state, and Federal target setting and evaluation. Provide annual outreach and training on crash data and performance planning to organizations.

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- 4.8 Provide enhanced analysis of behavioral programs and develop additional innovative software tools to promote highway safety in the Commonwealth.

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## SPECIAL AREA

# Incident Response and Emergency Medical Services



## Overview

Emergency responders and those supporting traffic incident management operations are committed to providing quality emergency care in Virginia to reduce the severity of vehicle crashes when they do occur.

Virginia's emergency medical services, designated trauma centers, and community hospital emergency departments work together with responders to ensure appropriate care for injured people. Providing EMS care as quickly as possible helps Virginia meet our highway safety goals and objectives.



Virginia's Stateside Traffic Incident Management Program coordinates efforts between state and local fire, EMS, law enforcement, and incident response personnel to support the development of incident management plans, track and monitor the rate of secondary crashes, and share best practices. One of the priority areas in Virginia is quick clearance, which is the practice of rapidly and safely removing temporary obstructions from the roadway. The program, "Instant Tow" is currently being pilot tested throughout Virginia. When a crash occurs, law enforcement personnel and a tow truck are dispatched to the scene at the same time, which serves to protect the safety of incident responders, reduce the probability of secondary incidents, and relieve overall congestion.

A well-coordinated response system ensures that severely injured patients arrive at the most appropriate level trauma center in the optimum time with the best supporting data. Many health provider groups must coordinate and collaborate to improve the level of care. Ongoing analysis of prehospital data submitted to the Virginia Patient Care Information System by on scene EMS personnel is necessary for decision making and evaluation of responses.

Virginia is leading in collecting prehospital data. Virginia became National EMS Information System (NEMSIS) Version 3 compliant in January 2017. With a new required information system all licensed agencies submit a completed patient care report within 12 hours of the event. By Code, all Virginia hospitals are required to submit trauma data to our registry. However, Emergency Department discharge data collection is lacking, so a segment of information related to the less injured trauma victim is missing. Linking the data will help health care providers continually improve the outcome of injured people. Work has begun on a data warehouse that will permit linkage of not only EMS and Trauma Registry data, but also other related VDH and Commonwealth databases.

The SHSP recognizes and supports incident response and EMS efforts to reduce first responder and secondary crashes and to improve the injury outcomes from crashes.

# The SHSP Solution

**Strategy 1. Develop an effective, consistent, and coordinated incident response program in accordance with the National Incident Management System (NIMS) and Virginia's Traffic Incident Management (TIM) program at the State and local level to ensure timely response and incident clearance to reduce time to access emergency services and reduce secondary crashes.**

-  1.1 Work with state and local fire, EMS, law enforcement, and incident response personnel to develop localized incident management plans consistent with the Code of Virginia. Within the next 5 years, develop, implement, and refine statewide incident management detour plans.
-  1.2 Work with state and local fire, EMS, law enforcement, and incident response personnel to track and monitor the rate of secondary incidents through improved crash reporting and investigate opportunities to reduce secondary incidents.
-  1.3 Work with state and local fire, EMS, law enforcement, and incident response personnel to promote and emphasize the benefits of internal and multiagency after action reviews and reports for crashes using best practices and sharing any lessons learned.
-  1.4 Continue to support work with state and local fire, EMS, law enforcement, and incident response personnel to promulgate the Statewide TIM (STIM) committee initiatives by sharing information and garnering input through maintaining the STIM web site, to propose quick clearance policy for consideration and implementation and implement associated training (e.g., SHRP 2 training).
-  1.5 Investigate the opportunity to and integrate where cost-effective local law enforcement computer aided dispatch (CAD) information into VDOT Traffic Operation Centers (TOC) to provide enhanced response times, situational awareness, and provide timely motorist information to reduce the potential for secondary crashes.
-  1.6 Improve incident information provided to TOCs and other responders including tow operators. Develop, disperse, and train responders on appropriate information to provide adequate descriptions so that proper equipment is dispatched. Investigate technologies, legal issues, and funding opportunities to provide early information for quick clearance and removals.
-  1.7 Expand the use of VDOT's pilot program of quick notification of towing operators to incidents. Investigate zoned-based towing contracts best practices and consider a pilot implementation.
-  1.8 Pilot and evaluate towing incentive programs based on best practices to improve incident clearance times.
-  1.9 Investigate the legal, policy, procedural and financial considerations to pilot expedited VDOT emergency relocation of disabled vehicles.
-  1.10 Pilot rural VDOT Incident Response Teams (IRT) and report on feasibility and resources to expand statewide.
-  1.11 Investigate best practices and equipment and identify resources to provide mobile crash investigation teams with necessary equipment to efficiently and effectively collect information resulting from severe crash investigation (e.g., Total Station equipment).

**Strategy 2. Reduce crash injury severity outcomes through timely EMS response and appropriate data to improve medical care.**

-  2.1 Continue to fund Virginia State Police Med-Flight operations.
-  2.2 Monitor the local approved EMS response plans as they relate to incident responses.
-  2.3 Ensure that the Virginia EMS and Trauma Care System continue to utilize statewide comprehensive, robust prehospital data system with standard definitions.
-  2.4 Ensure 100 percent compliance of EMS agencies submit NEMSIS version 3 reporting data to the Virginia Patient Care Information System.
-  2.5 Ensure that Virginia EMS and Trauma Care System collects, integrates, links, and analyzes data from all system components.

## SPECIAL AREA

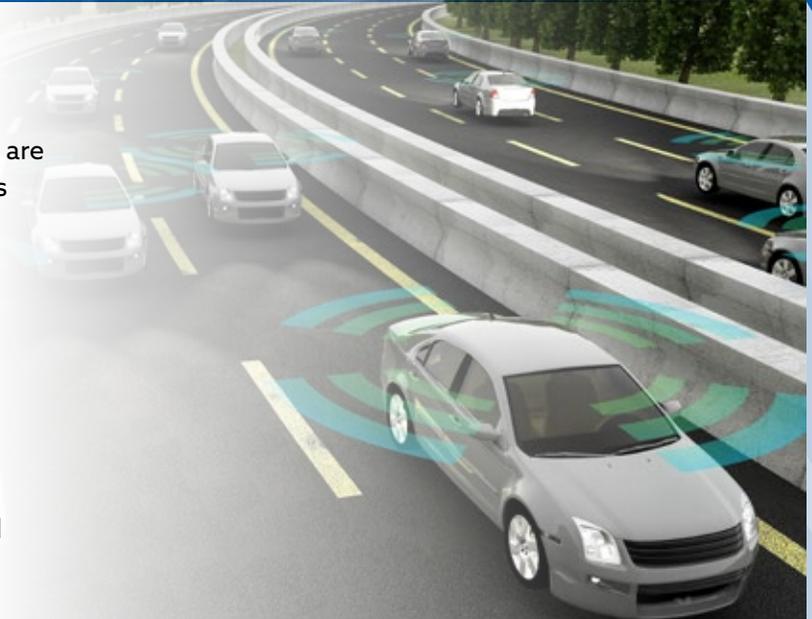
# Connected Vehicle/ Autonomous Vehicles



## Overview

Many vehicle crash avoidance systems already are in newer vehicles. Alerts or actual autonomous operations include:

- » Frontal crash avoidance systems;
- » Lane departure alert and control systems;
- » Lane change/merge warning systems;
- » Adaptive headlights;
- » Backup cameras and parking systems; and
- » Self-driving vehicles.



Connected vehicles are equipped with technology to communicate with other vehicles and transportation infrastructure to reduce the likelihood of crashes. Autonomous vehicles are another forward thinking safety technology where driving functions are handled by the car or truck. According to the National Traffic Highway Safety Administration, 94 percent of crashes can be tied to human decisions, so both connected and autonomous vehicles can reduce the likelihood of speeding, distracted driving, roadway departure, and other types of crashes. This technology is gradually being integrated into the vehicle fleet and the transportation network and a number of research efforts and pilot studies are underway in Virginia.

Connections using wireless technology in ITS, known as vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications are coming into the marketplace to warn of potential risks such as:

- » Approaching intersections or interchanges;
- » Lane changes;
- » Another driver losing control;
- » Approaching stationary or parked vehicles; and
- » Changing traffic patterns.

Autonomous connected vehicles, also known as autonomous or self-driving vehicles, use advanced control systems with supporting data to sense and react to the driving environment, including the

non-motorized users, with little or no driver input. Manufacturers envision use by more of the driving public and private transportation providers by 2020.

These advances will generate new safety strategies and approaches over the next five years. Virginia agencies are piloting, promoting, and tracking progress with transportation technology to consider opportunities to develop and apply highway safety priorities. The SHSP recognizes and supports ongoing work in this area, which is reflected in the strategies and actions.

## The SHSP Solution

**Strategy 1. Ensure that future connected and autonomous vehicle (CAV) technology deployments maximize potential safety benefits for all users by supporting necessary planning and research activities.**

- 1.1 Work with connected and autonomous vehicle developers to determine near-term actions that can be performed to enhance the ability of connected and autonomous vehicles to interact safely with all road users. Examples of potential actions might include changes to pavement markings to support detection by connected and autonomous vehicles, improvements in signing, and better mapping of VDOT assets.
- 1.2 Work with connected and autonomous vehicle developers and university researchers to develop, test, and deploy vehicle to infrastructure (V2I) applications with the potential to improve safety. This will include developing plans and specifications for the deployment of equipment necessary to support V2I applications, such as roadside equipment (RSE) and necessary communications upgrades. Potential applications to be investigated may include items like red light violation warnings, curve speed warnings, stop sign gap assist, and detection of pedestrians in crosswalks.
- 1.3 Develop plans and processes for how to store and analyze connected vehicle data to improve the identification of intersections and segments with potential safety problems. Explore the use of basic safety message data as a tool for proactive screening of sites with possible problems, including examination of speed, braking, and acceleration/deceleration, and pavement friction data.
- 1.4 Explore public education and outreach opportunities to increase awareness of and the benefits associated with connected and autonomous vehicle technologies.



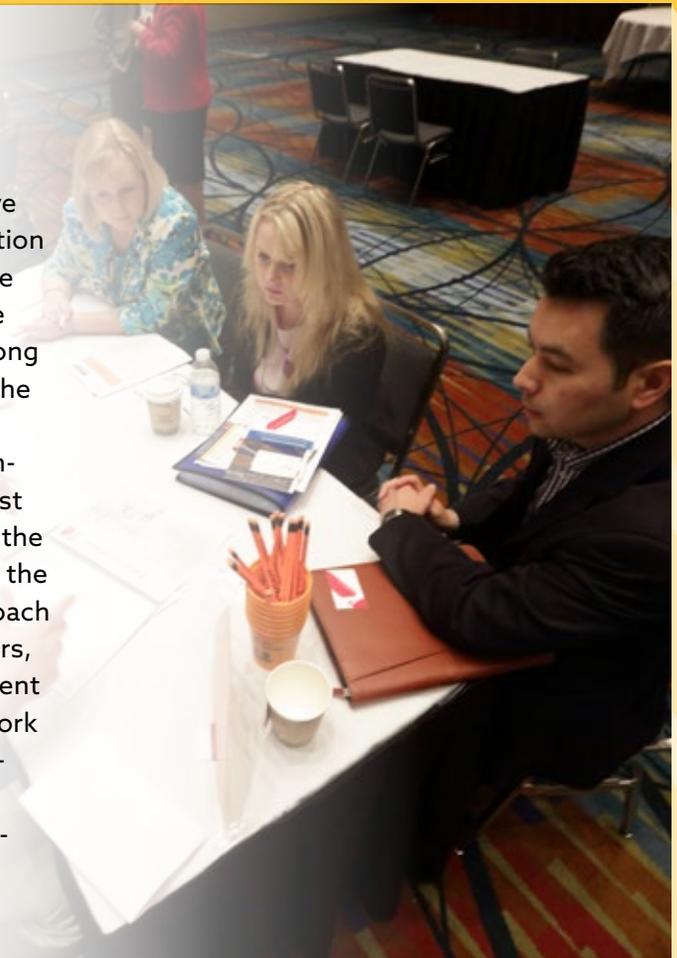




# Leadership, Implementation, Evaluation

## Leadership

The update process, particularly given the more intensive SWOT analysis, provided valuable information and direction for the Arrive Alive SHSP. Effective implementation of the plan's vision, mission, and goal requires strong executive support and constant coordination and cooperation among the variety of safety partners. Executives who make up the Virginia Strategic Highway Safety Plan Executive Committee, the interagency, the intergovernmental committee overseeing the SHSP, will continue to meet at least once a year to provide their ideas and guidance on ways the Commonwealth can enhance the collaborative nature of the Arrive Alive SHSP and not divide into silos. The 4 E approach to safety works when engineers, law enforcement officers, transportation planners, education specialists, and incident response with emergency medical services personnel work together on the common goal of creating a safe and efficient roadway system for all users. The charter at the beginning of this plan sets forth how executives will continue to guide this effort and provide the essential leadership that spells success.



## Implementation

Virginia is approaching implementation of the Arrive Alive SHSP with an improved understanding of the issues facing the Commonwealth and the steps needed to make real progress in reducing fatalities and serious injuries. The SHSP represents how Virginia will continue moving Toward Zero Deaths. The Steering Committee and Emphasis Area teams evaluated the data and developed the measurable objectives, strategies, and actions for each emphasis area. As implementation moves forward, these safety stakeholders, with oversight from the Executive Committee, will implement the plan by:

- » Providing regular updates on SHSP-related campaigns, initiatives, training, and programs;
- » Identifying barriers or problems to implementation;

- » Providing guidance on future programs, activities;
- » Tracking implementation progress in each of the Emphasis Areas;
- » Evaluating the effectiveness of the overall plan; and
- » Determining the approach to future SHSP Updates.

The Steering Committee will continue to meet regularly each year throughout implementation to provide direction and direct assistance to the Emphasis Area Teams and any of the stakeholders who are working to implement the strategies and actions. Emphasis Area Teams also will continue to meet as needed to:

- » Discuss action step implementation progress and coordinate next steps;
- » Identify problems or barriers and report to the Steering Committee;
- » Suggest new actions or modify existing actions as needed;
- » Continually track and report progress; and
- » Evaluate the effectiveness of strategies and actions to ensure they are contributing to decreases in fatalities and severe injuries.

The Road Show activity during the update process also revealed opportunities for a regional approach to SHSP implementation. Some of the regions were enthusiastic about forming or expanding their collaborative efforts on safety. The SHSP Management Team will continue to look for opportunities to assist regional safety partners in their efforts to address safety problems in their own areas by coordinating with the statewide Arrive Alive SHSP effort.

## Evaluation

Evaluation is critical to understand what is working and should continue and what is not working and should be modified or discontinued. That is how Virginia will ensure the best use of limited resources. Virginia will develop an evaluation plan that assesses both process and performance. The process evaluation will examine roles, responsibilities, and process activities as well as establish a timeline for monitoring, evaluating and communicating SHSP update performance data. This process evaluation will optimize the data collection and management process to ensure decisions consider the benefits, limitations, and level of effort required.

On the performance side, an SHSP Evaluation Plan will be developed before implementation takes place to ensure all aspects of the SHSP implementation can be properly evaluated and tracked. The measurable objectives for the SHSP will remain the same throughout the five-year life of the plan, but will be reviewed annually to see if they track with the annual HSIP and HSP performance targets. Additionally, it will be important to determine whether safety partners incorporated elements of the SHSP in their plans, including the HSIP, HSP, and CVSP. The SHSP will be updated in 2021, but will be reviewed on an annual basis.

# Appendices

## Steering Committee Members

The Virginia SHSP Steering Committee provides ongoing guidance to ensure the plan is effectively and efficiently developed, managed and implemented. Committee members were a vital part of the update process participating in all aspects of the process and will continue to manage the effort going forward. They are safety professionals who have demonstrated a dedication and commitment to ensure the people of the Commonwealth Arrive Alive at their destinations.



Bill Anderson, Federal Motor Carrier  
Safety Administration

George Bishop, Department of Motor Vehicles

Heather Board, Department of Health

Frank Cheatham, Department of Health, EMS

Mark Cole, Department of Transportation

Angela Coleman, Virginia Alcohol Safety Action Program

Bud Cox, Virginia State Police

Angelisa Jennings, Department of Motor Vehicles

Robin Grier, Department of Transportation

Dwight Jenkins, Department of Motor Vehicles

Timothy Hansbrough, Department of Fire Programs

Raymond Khoury, Department of Transportation

Karen King, Federal Highway Administration

John Messina, Department of Motor Vehicles

Bill Naff, National Highway Traffic Safety Administration,  
Region III

Keith Nichols, Hampton Roads Transportation Planning  
Organization

Stephen Read, Department of Transportation

Lori Rice, Department of Motor Vehicles

Dana Schrad, Virginia Association of Chiefs of Police

John Saunders, Department of Motor Vehicles

Melanie Stokes, Department of Motor Vehicles

Vanessa Wigand, Department of Education

Kimberly Winn, Virginia Municipal League

# Thank You to Safety Partners

The update of the SHSP would not have been possible without the active participation and involvement of hundreds of safety stakeholders throughout Virginia. These individuals attended meetings, offered their views, and committed to assisting on implementation of the plan's strategies and actions. The SHSP Management Team expresses their sincere thanks and appreciation to each of these individuals and look forward to continuing working with them in the future.

## SWOT Interviews

George Bishop, DMV  
Heather Board, Department of Health  
Janet Brooking, DriveSmart  
Gary Brown, Office of Emergency Medical Services  
Frank Cheatham, Office of Emergency Medical Services  
Mark, Cole, VDOT  
Angela Coleman, VASAP  
Bud Cox, State Police  
Wayne Fedora, FHWA  
Craig Feister, FMCSA  
Angelisa Jennings, DMV  
Karen King, FHWA  
Raymond Khoury, VDOT  
Butch Letteer, DMV  
Keith Nichols, Hampton Roads TPO  
Camelia Ravanbakht, Hampton Roads, TPO  
Stephen Read, VDOT  
Lori Rice, DMV  
Eric Rhoades, Department of Education  
John Saunders, DMV  
Dana Schrad, Virginia Assn. of Chiefs of Police  
Melanie Stokes, DMV  
Vanessa Wigand, Department of Education

## Richmond Road Show

Paul Agnello, FAMPO  
Jasmine Amanin, VDOT  
Justin Aronson, Chesterfield PD  
Danny Baden, VDOT  
Joe Bahen, National Motorists Association  
Mark Bittner, Crater PDC  
Kimberly Burt, DMV/HSO  
David Christoph, VDOT Ashland  
Steve Chumley, VSP  
Doug Diedrichsen, Middle Peninsula PDC  
Chessa Faulkner, Chesterfield  
Emmanuel Gayot, Power of Wisdom Inc.  
Kathy Graham, VDOT  
Angelisa Jennings, DMV  
Ray Khoury, VDOT  
Eric Mead, Chesterfield Fire & EMS  
Michael Nash, DMV/HSO  
Kevin Reichert, VDOT  
Iris Rodriguez, FHWA  
Greta Ryan, RRTPO  
John Simkins, FHWA  
Tien Simmons, VDOT  
Barb Smith, Chesterfield  
Sharad Uprety, VDOT  
Ben Williams, Virginia Randolph Drivers Education

## Northern Virginia

Asma Ali, T3 Design  
 Brittany Comer-Mathis, PWC DOT  
 Gina Dobestani, VDOT - TP  
 Pete Elias, Vienna PD  
 Cindy Engelhart, VDOT  
 Bob Felt, ATSSA  
 Michelle Gore, Loudoun County Public Schools  
 Ivan Horodyskyj, VDOT  
 Karen King, FHWA  
 Carol Lew, Loudoun County Sherriff's Office  
 Greg Linenfelser, Transurban  
 Bobby Mangcleth, VDOT  
 Richard McEaglin, Fairfax County PD  
 Allen Muchnick, Active Prince William  
 Sree Nampoothiri, NVTa  
 Waqas Siddiqui, VDOT  
 Aleksandra Tuliszka, VDOT  
 Bob Weakley, DMV/HSO  
 Kelley Westenhoff, RA MTAC  
 Alan Young, FABB  
 Jessie Yung, FHWA

## Harrisonburg

Cliff Balderson, VDOT, Edinburg  
 Chris Bruce, Virginia Dept. of Emergency Management  
 Adam Campbell, VDOT, Staunton  
 Ed Carter, VDOT, Edinburg  
 Frank Cheatham, Office of Emergency Medical Services  
 Matt Dana, VDOT, Staunton  
 Charles Dodge, Skyline High School  
 Josh Dunlap, VDOT, Harrisonburg region  
 Matthew Ernst, CCHS  
 Mack Frost, FHWA  
 Mike Henry, VDOT  
 Donald Jones, Virginia State Police  
 Kevin Jones, FHWA  
 Karen King, FHWA  
 Don Komara, VDOT, Harrisonburg Region  
 Burgess Lindsey, VDOT, Harrisonburg  
 Donald Logan, VDOT  
 John Madera, NSVRC  
 Jeff Monroe, Skyline High School  
 David Morris, VDOT  
 Ian Pike, Harrisonburg Public Works  
 Brad Reed, VDOT, Staunton  
 Abi Santiago, CCHS  
 Stacy Sayer, VDOT, Staunton  
 Matthew Shiley, VDOT  
 Ken Slack, VDOT, Staunton  
 Doug Stader, DMV, Highway Safety Office  
 Tiffany Tollver, VDOT  
 Lindsay Walker, VDOT, Staunton  
 Erin Yancey, City of Harrisonburg



## Hampton Roads

Luke Beasley, Norfolk Naval Shipyard PAO  
Sam Belfield, HRTPO  
David Benn, VB/TE  
Leo Blades, City of Hampton  
April Brown, Norfolk Naval Shipyard PAO  
Georjeane Blumling, AAA  
Dempsey Bruton, VB/TE  
Doug Carper, USF/VDOT  
Ed Diehl, VBCPS  
Steve Froncillo, Chesapeake TE  
Brenda Fuller, VBCPS  
Reggie Garrett, Newport News Behind the Wheel  
Curtis Hardison, VSP  
Valeri Henchel, VB/TE  
Darrick Person, Norfolk Public Schools  
William Irving, Chesapeake Safe Routes to School  
Dwight Jenkins, DMV/VAHSO  
Kurt Krauso, Tito Main  
Dan Mott, FHWA  
Ken Muhleman, VDOT  
Keith Nichols, HRTPO  
David Norman, Prince Edward Reserve Squad  
Brian Proctor, Prince William County Traffic Engineering  
Steve Scott, USDOT/FMCSA  
James Stanley, VDOT  
John Stevenson, Norfolk/PW  
Ira Swartz, Nansemonk Suffolk Volunteer Fire Squad  
Paula Swartz, Nansemonk Suffolk Volunteer Fire Squad  
Robert Weber, VDOT

## Lynchburg

Don Austin, VDOT  
Brian Dunevbl, City of Danville  
Cindy Morris, Town of Farmville  
Bill Wilienech, EPR for City of Charlottesville  
Anne Booker, VDOT  
Melody Foster, CRC  
Siavash Mousavizadeh, VDOT  
Steve Williams, DMV/VAHSO  
Darren Bolling, Campbell County Sherriff's Office  
Spencer Hall, VDOT  
Lee Newland, City of Lynchburg  
Joe Bonanno, West Piedmont PDC/Danville MPO  
Gerry Harter, VDOT  
Rashmi Patel, VDOT  
Mike Bouserman, Lynchburg PD  
Samuel Hayes, VDOT  
Scott Shippee, VDOT  
Christopher Bush, VDOT  
Paula Jones, VDOT  
Ronnie Sitler, Lynchburg PD  
Matthew Conner, VDOT  
Brian Lovelace, South Boston PD  
Scott Smith, Central VA MPO  
David Cooper, Virginia State Police  
Kenneth Martin, VDOT  
Dale Totten, VDOT  
Maggie Cossman, Lynchburg  
Danny McCormick, Town of South Boston  
Sharon White, VDOT

## Salem

Matthew Bouacci, VDOT Salem  
 Dave Hobacy, WPPDC  
 Elijah Sharp, NRVRC  
 Anne Booker, VDOT Salem  
 Alora Kissee, Danville Public Schools  
 Josh Shelber, Salem PD  
 Seth Chamberland, Salem PD  
 Jay Knight, VDOT Salem  
 Kevin Slough, Roanoke County PD  
 Frank Cheatham, OEMS  
 Carol Linkenhoker, VDOT Salem  
 Ben Wiese, Bedford County Schools LHS  
 Rick Clark, VA HSO  
 John Noel, VSP  
 Steve Williams, VA HSO  
 Mark Cole, VDOT Central Office  
 Kris Phillips, Bath County Public Schools  
 Scott Woodrum, VDOT  
 Cristina Finch, RVARC  
 Rachel Ruhlen, RVARC  
 Anthony Ford, VDOT Salem  
 Alicia Schneider, Bedford County Schools LHS

## Bristol

Jimmy Adkins, Lenowisco PDC  
 Jay Detrick, City of Bristol  
 Joseph Mullins, VDOT  
 Bill Albright, Kingsport MPO  
 John Dew, Town of Abingdon  
 Michael Musser, VSP  
 Matthew Anderson, Tazwell County  
 Troy Ebbert, Kingsport MPO  
 Donny Necessary, VDOT  
 Tonya Atwell, VSP  
 Tim Estes, Washington County Department of  
 Emergency Management  
 Brett Randolph, VDOT  
 Jim Baldwin, CPPDC  
 Lindsey Hodger, VDOT  
 Robert Ratliff, LTD Bristol  
 Angela Beavers, Cumberland Plateau PDC  
 Darrel Johnson, VDOT  
 Jeff Russell, VDOT  
 Kevin Blankenship, Town of Richlands  
 Matthew Justice, VDOT  
 Paul Sleeper, DMV/HSO  
 Frank Cheatham, OEMS  
 Karen King, FHWA  
 Rocky Warren, MRPDC  
 Rick Clark, DMV/HSO  
 Wallace McCulloch, City of Bristol  
 George West III, Town of Richlands  
 Mark Cole, VDOT  
 Rex Montgomery, Bristol MPO  
 Matthew Cox, VDOT  
 Laura Mullins, Town of Wise





## Charlottesville

Mohammed Ali, City of Charlottesville

James Glass, VDOT

Emily Parkeny, Citizen

Troy Austin, VDOT

Lou Hader, VDOT

Charles Proctor, VDOT

Roger Baldino, Charlottesville Fire Department

Wood Hudson, CA-MPO

Lucy Carter Smith, VDEM, Region 3

Samuel Bryant, Amherst County Public Safety

Jill Jefferson, Shenandoah County

Doug Stader, DMV/HSO

Will Cockrell, TJPDC

Young-Jun Kweon, VDOT

Nathan Umberger, VDOT

Mark Cole, VDOT

Linda LaSut, VDOT

David Cooper, VSP

In-Kyu Lim, VDOT

Jay Davis, Charlottesville Fire Department

John Miller, VTRC

Joel DeNunzio, VDOT

Peter Ohlms, VDOT

# Glossary of Terms and Acronyms

ARIDE	Advanced Roadside Impaired Driving Enforcement
BAC	Blood Alcohol Concentration
BPS	Bicycle/Pedestrian Safety
CDC	Centers for Disease Control
CIOT	Click It or Ticket
CVSP	Commercial Vehicle Safety Plan
DMV	Department of Motor Vehicles
DRE	Drug Recognition Expert
DUI	Driving Under the Influence
EA	Emphasis Area
EMS	Emergency Medical Services
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
HRRR	High Risk Rural Roads
HSM	Highway Safety Manual
HSIP	Highway Safety Improvement Program
HSO	Highway Safety Office
HSP	Highway Safety Plan
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
NEMIS	National EMS Information System
NHTSA	National Highway Traffic Safety Administration
PDC	Planning District Commission
PSI	Potential Safety Improvement
RSA	Roadway Safety Assessments
SFST	Standardized Field Sobriety Test
SHSP	Strategic Highway Safety Plan
SPF	Safety Performance Function
SRTS	Safe Routes to Schools
STIM	Statewide Traffic Incident Management
SWOT	Strengths, Weaknesses, Opportunities, Threats
TAP	Transportation Alternatives Program
TIM	Traffic Incident Management
TOC	Traffic Operations Center

TRCC	Traffic Records Coordinating Committee
TRED	Traffic Records Electronic Database System
TZD	Toward Zero Deaths
VASAP	Virginia Alcohol Safety Action Program
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation
VGIN	Virginia Geographic Information Network
VMT	Vehicle Miles Traveled
VSL	Variable Speed Limits
YOVASO	Youth of Virginia Speak Out

## Federal Requirements

Two major federal laws influence the content and implementation of the Arrive Alive SHSP: Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21) Act and the Fixing America's Surface Transportation (FAST) Act. Under these laws, the FHWA sets policy that guides the implementation and evaluation of the SHSP. FHWA published their HSIP Final Rules (Code of Federal Regulations - CFR) with an effective date of April 14, 2016. These regulations implement the HSIP requirements established in MAP-21 and the FAST Act, and establish clear requirements for updating the state's SHSP.

The HSIP is a core federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The HSIP regulation under 23 CFR 924 establishes the FHWA's HSIP policy, as well as program structure, planning, implementation, evaluation, and reporting requirements which state must follow to successfully administer the HSIP. In addition to clarifying other programs, the HSIP CFR contains performance management requirements for SHSP updates.

The law requires all states to have an updated, approved SHSP which is consistent with specific requirements under 23 USC Section 148. The updated SHSP must be submitted to the FHWA Division Administrator, who will ensure that the state has followed a process that meets these requirements. The FHWA provides an SHSP Process Approval Checklist, which is a tool to help Division Offices assess the process and completeness of the SHSP update. The requirements outlined in the Process Approval Checklist include detailed specific Indicators and Considerations which must be met by the state. Virginia's plan met all requirements in the past and is sure to meet the requirements with this updated plan. Specific elements of the checklist include the following:

- » Consultation with appropriate stakeholders and traffic safety partners during the update process.
- » Comprehensive use of data to develop plan emphasis areas and safety improvement strategies, including safety data from non-state-owned public roads and Tribal land.
- » Performance management and adoption of performance-based goals which are consistent with established safety performance measures.
- » Employing a multi-disciplinary approach which addresses engineering, management, operations, education, enforcement, and emergency services elements of highway safety as key features when determining SHSP strategies.
- » Coordination with other state, regional, local, and Tribal transportation and highway safety planning processes; a demonstration of consultation among partners in the development of transportation safety plans; and an SHSP which provides strategic direction for other transportation plans.
- » An implementation focus which describes process, actions, and potential resources for implementing the strategies in the emphasis areas.
- » Requirements to evaluate the SHSP as part of the HSIP update process, including confirming the validity of the emphasis areas and strategies based on analysis of safety data, and identifying issues related to the SHSP's process, implementation, and progress.
- » Special rules which require including the state's definition of HRRR and strategies to address the increases in older driver and pedestrian traffic fatalities and serious injuries, if applicable.
- » A detailed description of the SHSP update process, included as a section, chapter, or appendix in the SHSP.
- » A requirement to complete the SHSP update no later than five years from the date of the previous approved version.
- » A requirement that the SHSP be approved and signed by the Governor of the state or a state official that is delegated by the Governor.
- » Approval by the FHWA Division Administrator.



# Data Sources and Definitions

Virginia has a state-of-the-art data system, TREDIS, which automates and centralizes all crash data from across the state. This system, maintained by DMV HSO, allows for the accurate analysis of motor vehicle-related crashes to develop the most effective safety improvements for all public roads. TREDIS staff assesses and submit fatality data to NHTSA maintained Fatality Analysis Reporting System (FARS) which was used for behavioral emphasis area development and reporting. TREDIS data is transmitted to VDOT for roadway inventory locational analysis in a GIS based database called Roadway Network System (RNS). The serious injury crash data from RNS, compared to TREDIS where appropriate, was used for the emphasis areas. For certain data sets from DMV, the SHSP management team was provided with police completed form document numbers which enabled data to be identified and extracted from crash reports. To compare various categories of areas, jurisdictions and roadways highway safety statistics are most commonly represented as a rate or ratio per 100 million vehicle miles traveled (VMT). VDOT's RNS has a module called Traffic Monitoring System that compiles and summarizes traffic volume data collected on segments to represent all public highways. VMT estimates for Virginia, reported annually to FHWA, and available for various highway systems and functional classifications (i.e., urban and rural) were used for the SHSP. The data follows the KABCO Injury Classification Scale: K-fatality; A-serious injury; B-injury; C-possible injury; and O-no injury.



Data	Source	Comments
All K and A crash document numbers	RNS	List of document numbers
Number of total Ks and As by crash	RNS	Number of Ks and As for each document number
Roadway departure crashes	RNS	List of document numbers
Intersection crashes	RNS+DMV	List of document numbers; DMV crashes indicated as intersection crashes on urban streets were added to the intersection crashes indicated in RNS, which are only captured on VDOT roads
Alcohol-related crashes	DMV	List of document numbers
Distracted driver crashes	DMV	List of document numbers
Drowsy Driver crashes	DMV	List of document numbers
Drugged driver crashes	DMV	List of document numbers
Bicycle Ks and As	RNS	Number of Ks and As for each document number
Pedestrian Ks	RNS	Number of Ks and As for each document number
Pedestrian As, 2006-2008	DMV	Number of Ks and As for each document number
Pedestrian As, 2009-2015	RNS	Number of Ks and As for each document number
Large truck crashes	RNS	List of document numbers; At least one commercial vehicle body type code not equal to 1, 2, 99 (unknown), or null; vehicle number in the commercial vehicle table that matched this criterion was joined to its vehicle table, which was joined to its crash table; this produced a list of document numbers that were matched to the list of K and A crashes
Young driver crashes	RNS	List of document numbers
Aging Drivers	RNS	List of document numbers

Data	Source	Comments
Motorcycle Ks and As	RNS/DMV	<p>Number of Ks and As for each document number;</p> <p>Only Ks and As where the driver or passenger was on a motorcycle (vs in another vehicle in a crash where a motorcycle was involved) were counted in the RNS query; comparing with DMV, three crashes did not match because of coding errors in RNS (two were on private property, one was incorrectly coded as a passenger vehicle); these errors are being corrected in RNS, resulting in a one-to-one match between RNS and DMV</p>
Speed-related crashes	DMV	List of document numbers
Unrestrained Ks and As	RNS	<p>Number of Ks and As for each document number;</p> <p>A special query counted only Ks and As where individual passengers or drivers of passenger cars, and only drivers of certain commercial vehicles, were unbelted; Ks and As in the driver and passenger tables were counted for each vehicle where each driver or passenger both a K or A and unbelted; vehicle types 1 (passenger car), 2 (pickup), 3 (van), and 22 (SUV) included both drivers and passengers; vehicle types 4 (single-unit), 14 (Church bus, etc), 15 (Commercial bus), 23 (3-axle single-unit), and 25 (Tractor Trailer) included only drivers; other vehicle types were ignored</p>



# References and Resources

## Virginia Resources

Data <https://www.treds.virginia.gov/UI/Security/Login.aspx>

DMV HSO <https://www.dmv.virginia.gov/safety/>

HSIP [http://www.virginiadot.org/business/ted\\_app\\_pro.asp](http://www.virginiadot.org/business/ted_app_pro.asp)

VDOT HSIP Crash Analysis Tool [https://public.tableau.com/profile/publish/Crashtools8\\_2/Main#!/publish-confirm](https://public.tableau.com/profile/publish/Crashtools8_2/Main#!/publish-confirm)

Virginia Performs <http://vaperforms.virginia.gov/indicators/economy/employmentGrowth.php>

## National Resources

2016 Traffic Safety Culture Index <https://www.aaafoundation.org/2016-traffic-safety-culture-index>

AASHTO Highway Safety Manual <http://www.highwaysafetymanual.org/Pages/default.aspx>

Centers for Disease Control, Motor Vehicle Safety <https://www.cdc.gov/motorvehiclesafety/index.html>

Countermeasure That Work <http://www.ghsa.org/resources/countermeasures2015>

Crash Modification Factors (CMF) Clearinghouse <http://www.cmfclearinghouse.org/>

Data <https://cdan.nhtsa.gov/STSI.htm>

FARS <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>

FHWA, Highway Statistics, 2015 <https://www.fhwa.dot.gov/policyinformation/statistics/2015/>

FHWA SHSP Guidance <https://safety.fhwa.dot.gov/shsp/>

FHWA SHSP Communities of Practice [https://rspcb.safety.fhwa.dot.gov/shsp\\_cop.aspx](https://rspcb.safety.fhwa.dot.gov/shsp_cop.aspx)

FHWA Proven Countermeasures <https://safety.fhwa.dot.gov/provencountermeasures/>

Insurance Institute for Highway Safety, General Statistics, 2015 <http://www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/state-by-state-overview>

NCHRP Report 500 Series <http://www.trb.org/Main/Blurbs/152868.aspx>

NHTSA, Summary of Motor Vehicle Crash Facts, Early Edition, 2015 Data, February 2017 <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812376>

NHTSA Research and Data <https://www.nhtsa.gov/research-data>

NHTSA Risky Driving <https://www.nhtsa.gov/risky-driving>

NHTSA Road Safety <https://www.nhtsa.gov/road-safety>

U.S. Census <https://www.census.gov/>







## Virginia Department of Transportation

1401 East Broad Street  
Richmond, VA 23219



**Arrive Alive Virginia**

Virginia Strategic Highway Safety Plan