



Oklahoma Department of Transportation Strategic Highway Safety Plan

October 2023

Table of Contents

INTRODUCTION AND OVERVIEW	2
Vision, Mission, Goal.....	2
Vision.....	3
Mission.....	3
Goal.....	3
Performance Measures and Coordination with other Transportation Plans	3
GUIDING PHILOSOPHY FOR 2023 SHSP	6
Toward Zero Deaths.....	6
Safe System Approach.....	6
Traffic Safety Culture.....	8
The Four “E’s” of Safety (Plus Two)	9
Education.....	9
Emergency Medical Services	10
SAFETY EMPHASIS AREAS FOR 2023 SHSP	14
Lane Departures	20
Impaired Driving	24
Occupant Protection.....	29
Unsafe Speeds.....	35
Intersections.....	39
Commercial Motor Vehicles and Work Zones	43
Motorcycle and All-Terrain Vehicle Crashes	47
Vulnerable Road Users	50
IMPLEMENTATION.....	58
Evaluation	58
Process Evaluation.....	59
Performance Evaluation	59
THANK YOU TO SAFETY PARTNERS FOR COLLABORATION.....	60
ACRONYMS	62
REFERENCES.....	63
APPENDICES – ACTION PLAN FOR EMPHASIS AREAS AND VULNERABLE ROAD USER ASSESSMENT	64



INTRODUCTION AND OVERVIEW



INTRODUCTION AND OVERVIEW

According to the U.S. Department of Transportation, a Strategic Highway Safety Plan (SHSP) is a “statewide coordinated safety plan that provides a comprehensive framework for reducing fatalities and serious injuries on all public roads.” The purpose of the SHSP is to identify effective safety strategies to address areas of greatest need to make roadways safer.

The Federal Highway Administration (FHWA) determines policy guiding the implementation and evaluation of the SHSP. The SHSP describes the process, actions, and potential resources for implementing the strategies in emphasis areas prioritized by each state. The FHWA has partnered with key stakeholders to reinforce a data-driven approach. This includes improving collaboration with a wide range of safety partners and providing transparency for the American public as states set goals, report on safety targets and, most importantly, save lives.

The Oklahoma Department of Transportation (ODOT) fully intends to be a “Top 10 State” in transportation. Objectives from the 2020 - 2045 Oklahoma Long Range Transportation Plan (LRTP) that address safety include:

- Reduce traffic-related fatalities and serious injuries sustained on Oklahoma’s multimodal transportation system.
- Improve design, construction, and maintenance of transportation infrastructure to reduce the number and severity of crashes.
- Increase seat belt usage.
- Improve transportation security and emergency preparedness, response, and recovery.

For the 2023 SHSP, the Executive Committee determined to use the following eight emphasis areas:

- Lane Departures
- Impaired Driving
- Occupant Protection
- Unsafe Speed
- Intersections
- Commercial Motor Vehicle Crashes and Work Zones
- Motorcycle Crashes and All-Terrain Vehicles
- Vulnerable Road Users

The 2023 SHSP includes Action Plans that address how the eight SHSP emphasis areas will be implemented. The Action Plans are listed in the appendix and will be updated each year. For each emphasis area within the SHSP, goals, countermeasures, performance measures, and measurable objectives are included in the Action Plan.

Nationwide developments concerning SHSPs have been summarized as a guiding philosophy for the 2023 SHSP. These four areas are Toward Zero Deaths, Safe System Approach, Traffic Safety Culture, and the Four E’s of Safety (Plus Two)

Vision, Mission, Goal

The American Association of State Highway Transportation Officials (AASHTO) has formally recognized the Toward Zero Deaths (TZD) as the highway safety vision for the United States. TZD advocates for eliminating serious injuries and deaths on our nation’s roadways. Achieving

a target of zero fatalities and zero serious injuries means creating a traffic safety culture that prioritizes safety, encourages safe road user behavior, and facilitates cooperation among stakeholders.

Traffic safety culture focuses on how social factors in a community's culture influence how people prioritize and accept traffic safety strategies. The Safe System Approach encourages engineers to explore the influence of roadway design on traffic safety, attempting to prevent crashes through design and roadway modifications for all users. For these efforts to be effective, stakeholder organizations may need to begin exploring their own internal culture to align it with the Safe System Approach and vision for zero traffic fatalities and zero serious injuries.

Vision

The zero deaths vision acknowledges that even one death on our transportation system is unacceptable. The vision of the Oklahoma SHSP is to provide and promote the safest roadway transportation system for all travelers – zero deaths, zero serious injuries.

Mission

The mission of the ODOT is to provide a safe, economical, and effective transportation network for the people, commerce, and communities of Oklahoma.

The mission of the Oklahoma SHSP is to develop, implement, and evaluate a data-driven, multidisciplinary process to maximize road safety through widespread collaboration.

Goal

The goal for Oklahoma's 5-year SHSP is to achieve reductions in fatalities and serious injuries in all emphasis areas on the path to zero.

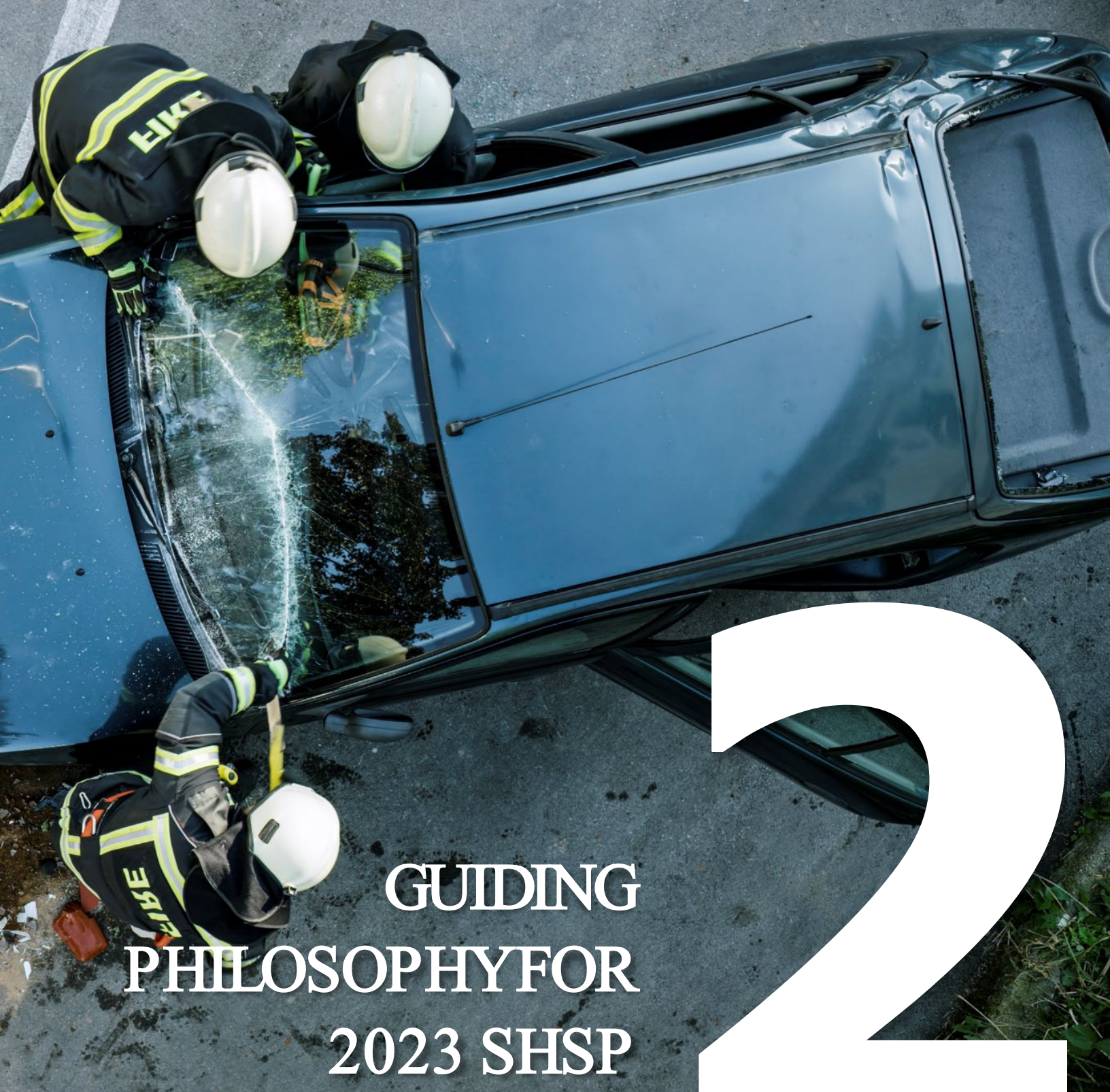
Performance Measures and Coordination with other Transportation Plans

The SHSP Executive Committee provides leadership for SHSP development, implementation, and evaluation. Top management representatives from the stakeholder agencies gain consensus at a high level. Executive committee members have the authority to commit agency resources to the planning process and promote the SHSP within individual agency plans. Other agencies actively participate in the development of the state SHSP, allowing for coordination as highway safety countermeasures are selected for the Action Plan.

Federal law requires the SHSP to serve as a guide for Oklahoma's roadway safety investment decisions, forming a consistent safety program for the state. The SHSP Coordination process ensures that the SHSP, the HSIP, and the state Highway Safety Plan (HSP), as well as the Commercial Motor Vehicle Safety Plan (CMVSP), contain core performance measures and targets in common. In alignment with the other State safety plans, the 2023 SHSP includes the following Performance Measures:

- 1) Number of Fatalities - The number of persons killed in crashes on all public roads in a calendar year.
- 2) Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT) in a calendar year.
- 3) Number of Serious Injuries - The number of persons seriously injured in crashes on all public roads in a calendar year.
- 4) Rate of Serious Injuries per 100 million VMT in a calendar year.
- 5) Number of Non-motorized Fatalities and Non-motorized Serious Injuries on all public roads in a calendar year.

Final Draft



GUIDING
PHILOSOPHY FOR
2023 SHSP

2



GUIDING PHILOSOPHY FOR 2023 SHSP

During the past five years, there have been several developments nationwide concerning SHSPs. These developments have been summarized as a guiding philosophy for the 2023 SHSP. These four areas are:

- Toward Zero Deaths
- Safe System Approach
- Traffic Safety Culture
- The Four E's of Safety (Plus Two)

Toward Zero Deaths

Here in the United States, TZD is a national strategy on highway safety to advocate for eliminating serious injuries and deaths on our nation's roadways. The zero deaths vision acknowledges that even one death on our transportation system is unacceptable.

The AASHTO has formally recognized TZD as the highway safety vision for the United States. Within each state, TZD focuses on coordination through the DOT.



Safety practitioners, researchers, and advocates conceptualized TZD. TZD engagement happens across the country, throughout state and local organizations, and within communities that all focus on the goal of zero traffic-related deaths.

A multi-disciplinary approach encourages involvement from a variety of stakeholders. All TZD stakeholders champion the idea that one death on our nation's roadways is too many, and everyone works together to bring the annual number of roadway deaths down to zero.

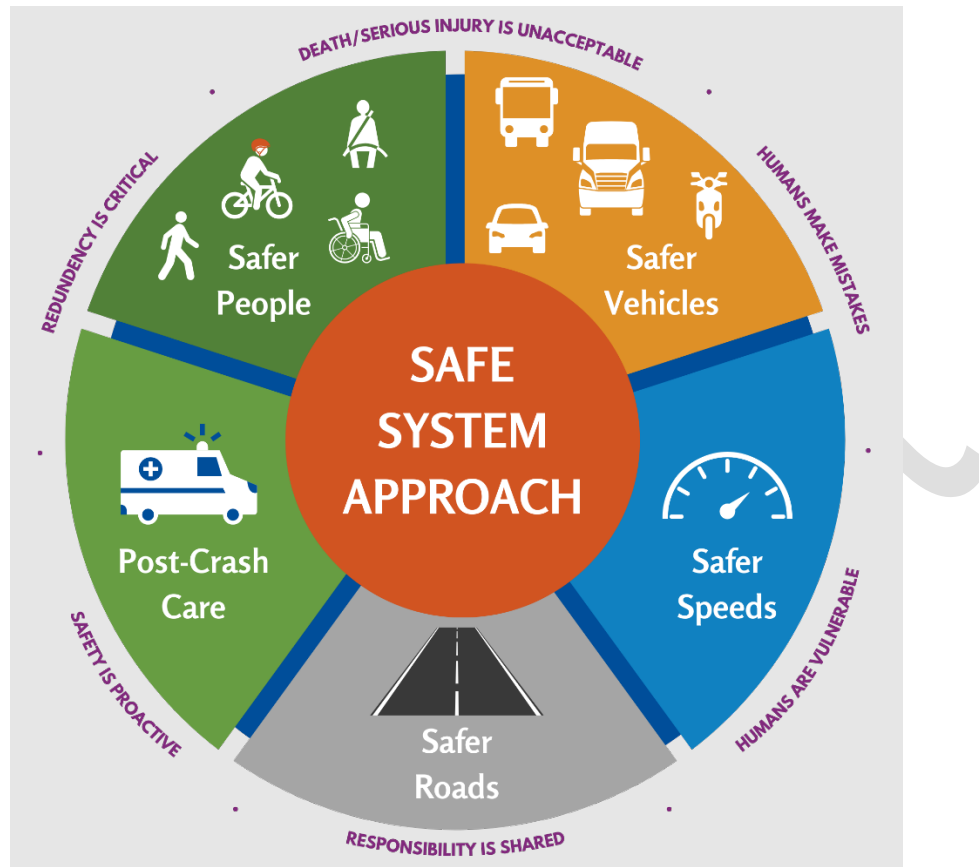
Expanding on the nation's TZD goal, the SHSP's goal encourages setting realistic and achievable steps for Oklahoma to move toward zero fatalities and zero serious injuries. This means demonstrating constant improved performance toward zero deaths. In 2022 ODOT began an agency wide performance measure aiming for an annual 2% reduction in fatalities for the next five years.

Safe System Approach

The Safe System Approach is a worldwide movement that has been in place for more than 30 years. In early 2022 the U.S. Department of Transportation adopted a Safe System Approach. The Safe System Approach places safety first and foremost in road system investment decisions. Applying the Safe System Approach means designing and managing road infrastructure to reduce the risk of human mistakes, including Vulnerable Road Users (VRU) such as bicyclists and pedestrians.

A Safe System requires broad, sustained political commitment. This means establishing a safety culture by adjusting internal agency cultures to align with the Safe System principles and elements:

- The outer ring of the diagram represents the six Safe System principles.
- The inner ring of the diagram represents the five Safe System elements.



As of January 2022, the U.S. Department of Transportation introduced the National Road Safety Strategy to implement the Safe System Approach with a focus on the following approach elements:

- **Safer People:** Encourage safe, responsible behavior by people who use our roads and create conditions that prioritize their ability to reach their destinations unharmed.
- **Safer Roads:** Design roadway environments to mitigate human mistakes and account for injury tolerances, to encourage safer behaviors and to facilitate safe travel by the most vulnerable road users.
- **Safer Vehicles:** Expand the availability of vehicle systems and features that help to prevent crashes and minimize the impact of crashes on both occupants and non-occupants.
- **Safer Speeds:** Promote safer speeds in all roadway environments through a combination of thoughtful, context appropriate roadway design, targeted education and outreach campaigns and enforcement.
- **Post-Crash Care:** Enhance the survivability of crashes through expedient access to emergency medical care, while creating a safe working environment for vital first responders and preventing secondary crashes through robust traffic incident management practices.

Within the Safe System Approach, a culture of safety promotes the expectation that all users of the roadway system, regardless of mode, will be protected and that responsibility is shared with

those who plan, build, maintain, and use the transportation system. This includes planners and engineers as well as elected officials who oversee policy decisions that influence road safety.

The Safe System Approach can be institutionalized through Highway Safety Improvement Plans (HSIP), Strategic Highway Safety Plans (SHSP), local planning efforts, and agency-level policies and practices. Lessons learned and best practices are essential tools for widespread adoption and implementation.

The Safe System Approach does not absolve people driving from their responsibility to operate vehicles safely. Everyone in Oklahoma is encouraged to consider culture change as a new approach to traffic safety.

Traffic Safety Culture

In order to achieve a target of zero fatalities and zero serious injuries a culture must be embraced. Traffic safety culture consists of values and beliefs shared among groups of road users and stakeholders that influence their decisions to behave or act in ways that affect traffic safety.

Part of being human means that people make mistakes. By increasing the awareness and improving culture around traffic safety, the severity of those mistakes can be reduced or eliminated.

Leveraging beliefs, behaviors, and consequences means adopting a behavioral model to guide strategy development. Tips to grow traffic safety culture include:

- Raising concern and hope
- Changing beliefs to change behavior
- Correcting misperceptions of culture
- Engaging in strategies across the social ecology

Public information and education aids in achieving a change in attitudes and behaviors. Encouraging our target audience to adopt safe driving practices reduces traffic collisions and related consequences. Public information and education are primary countermeasures that have been recognized as an effective part of any traffic safety program by acknowledging concerns and raising hope. One simple effort toward culture change is shifting away from the use of the word “accident” as the connotation of the word assumes no accountability. Crashes are preventable, and adjusting this mindset is one move toward culture change.

A key element of the TZD National Strategy on Highway Safety means transforming the traffic safety culture in the United States among all road users, including non-motorized users.

Oklahoma can set a goal of zero fatalities and zero serious injuries by creating a traffic safety culture that:

- Prioritizes safety
- Encourages safe road user behavior
- Facilitates cooperation among stakeholders

Effective strategies leverage values and change beliefs within a specific social group. For example, implementing a focused strategy on pickup drivers in rural Oklahoma who are statistically unlikely to wear their seatbelts.



Statewide traffic safety culture change must be equitable, serving all members of a diverse community. Expanding safety culture throughout Oklahoma cannot be done in a vacuum; it must be adopted and infused across individuals, communities, governments, businesses, and schools.

One example is Successful Approaches for the Development of an Organization Wide Safety Culture in Transportation Agencies supported by the NCHRP.

Developing a strong safety culture provides the foundation for two of FHWA's main priorities – reaching zero traffic deaths and advancing the Safe System Approach. Research shows that real, sustained cultural change within organizations typically takes more than five years. As stakeholder organizations align their organizations with the vision for zero traffic fatalities and zero serious injuries, the changes are likely to last into the future.

The Four “E’s” of Safety (Plus Two)

The Four “Es” of safety refers to those professionals included in education, emergency medical services, enforcement, and engineering. Each discipline has a unique perspective on how to improve traffic safety while also remaining connected to the other disciplines. Through stakeholder engagement, two additional Es were identified for the SHSP, Emerging Technologies and Engagement.

The Oklahoma Highway Safety Office (OHSO) supports highway safety grant projects designed to develop and support educational, enforcement, and engineering programs. The grant programs address impaired driving, occupant protection and child passenger safety, pedestrian and bicycle safety, driver education programs and motorcycle safety.

The 2020 - 2045 Oklahoma LRTP lists improving design, construction, and maintenance of transportation infrastructure to reduce the number and severity of crashes as a goal.

Reaching zero fatalities and zero serious injuries requires the dedication of professionals who represent the four “E’s” of roadway safety.

Education



This “E” involves providing information to road users that help them make good choices. Education consists of prevention specialists, communication professionals, educators, and citizen advocacy groups.

Resources exist that advance traffic safety for children worldwide. This includes a Road Safety Week. Education informs the public concerning laws and safety when driving and navigating the transportation system. A strong memorable message, such as NHTSA's campaign to combat driving under the influence of marijuana "If You Feel Different, You Drive Different", can reinforce the education.

The Oklahoma Highway Safety Office (OHSO) has identified schools as an ideal setting to reach teenagers with prevention education. Throughout Oklahoma, school districts coordinate with local police to offer road safety education to school children.

The ODOT has implemented a program called Oklahoma Work Zone Safe to reach teen drivers aged 15-19 with three key principles in work zone safety: safe drivers, signs & laws, and the

faces that serve us. Teen drivers who successfully complete the course receive a \$500 Oklahoma 529 Educational Scholarship from the Association of Oklahoma General Contractors.

Effective education efforts can lead to a cultural change in road user behavior habits and ultimately a decline in fatalities and serious injuries on roadways.

Emergency Medical Services



This “E” involves the efforts of emergency responders in providing medical services quickly and effectively to individuals involved in crashes. Emergency responders include first responders, paramedics, fire & rescue.

While emergency medical personnel assist those injured in a crash, other emergency responders clear roadways and manage traffic, reducing the risk of secondary crashes due to unexpected traffic conditions.

In Oklahoma, Emergency Medical Services (EMS) oversees regulatory compliance of agencies and personnel providing pre-hospital care in Oklahoma. Trauma and systems development oversees a system of trauma care in Oklahoma involving patient prioritization, transportation, and timely care. Their motto: Getting the patient to the right place, receiving the right treatment in the right amount of time.

The post-crash care component of the Safe System Approach extends beyond emergency services. Quick response by EMS and ensuring timely care for the injured are vital to saving the injured person’s life. Proper incident management is also important to quickly clear the crash scene by removing the road debris and impacted vehicles, documenting crash factors, and providing advance warning of an incident to restore traffic flow as safely as possible. Faster emergency response and incident clearance times significantly reduce the risk of subsequent crashes and can prevent a serious injury leading to a fatality. Under the Safe System Approach, post-crash care is especially important for pedestrians and bicyclists.

Enforcement



This “E” reminds people to follow laws when using our transportation system. Enforcement involves the actions and efforts by the thousands of state and local law enforcement officers throughout Oklahoma who are working to ensure road users follow the law.

State, county, and municipal law enforcement agencies work alongside highway safety partner agencies to enforce traffic laws during regular patrols, as well as during specialized mobilization efforts. The OHSO has identified many local police departments throughout Oklahoma that will conduct high visibility enforcement to reduce fatalities and serious injuries.

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.

The Safe System Approach is especially important for engineers who design and construct roadways to encourage safe speeds and accommodate all road users whether they are driving, walking, biking, or rolling via a mobility device. Furthermore, safe streets are designed and built to be forgiving so that when people make mistakes, the outcomes are less severe.

Transportation engineers use proven design methods and national standards for signs and traffic markings to provide consistency for the traveling public. In addition, engineers continue to research new ways to make transportation safer.

Although the four “E’s” remain connected, the traditional focus on the four “E’s” alone will not reach the target of zero fatalities and zero serious injuries. Therefore, ODOT has added two more “E’s.”

Emerging Technologies



The fifth “E” involves the application of emerging technologies to roadways, vehicles, and road users. Emerging technologies include the Safe System Approach principle of Safe Vehicles.

Emerging technologies such as vehicle & infrastructure technology as well as specialized equipment can potentially reduce the frequency or severity of crashes. Examples of emerging technologies include features in vehicles that monitor speed or blind spots as well as lane keeping assist. It is hoped that emerging technologies will have a positive impact on reducing fatalities and serious injuries within the next thirty years.

Automatic emergency braking can stop vehicles if a crash is imminent or slow them down to reduce the severity. Two new U.S. studies show that automatic emergency braking can cut the number of rear-end automobile crashes in half and reduce pickup truck crashes by more than 40%. One study showed that automatic emergency braking works well in all conditions, even when roadway, weather or lighting conditions were not ideal.

Safety Pilot is an initiative that investigates connected vehicle technology for real-world application during inclement weather driving conditions. Black ice causes numerous crashes on Oklahoma roadways each year. Another example of emerging technology is a prototype decision support system that is an automatic air, water, and ice detection system. One challenge for the prototype is designing the system to be automatic, compact, and low-cost.

Emerging technologies include advanced vehicles that include “active” safety measures to help prevent crashes from occurring and “passive” safety devices providing protection when a crash does occur. While manufacturers are key stakeholders in the continuously evolving automated vehicle safety industry, the interaction and connectivity with road elements and traffic control with multimodal users will also improve safety.

Additional examples of emerging technologies include features in vehicles that monitor speed or blind spots as well as lane keeping assist.

Engagement



Including a sixth “E” of engaging everyone means every person walking, biking, riding, or rolling on Oklahoma’s roadways is responsible to make safe choices.

Engaging everyone is closely related to traffic safety culture and depends on educating the public. The Safe System Approach advocates for shared responsibility between stakeholders and road users for prevention of fatalities and serious injuries. Serious crashes are preventable if everyone does their part. For example, individuals can practice safe driving, riding, and walking behaviors, avoid unnecessary risks, and share the road safely with other users. An educator can promote traffic safety through interactions with their students. An emergency responder can enhance the timeliness of response to crashes and the quality care for crash victims. A vehicle manufacturer can develop and refine vehicle systems to reduce driver error and prevent crashes. An elected official can make safety a high priority through proactive and visible leadership. Everyone in Oklahoma is encouraged to consider culture change as a new approach to traffic safety.

The OHSO reaches their audience by increasing education, generating engagements, and converting their audience into brand advocates. In Oklahoma, encouraging a culture of traffic safety means that everyone ensures their safety as well as the safety of others traveling on the roadway. Engaging everyone is critical.



**SAFETY EMPHASIS
AREAS FOR
2023 SHSP**

3



SAFETY EMPHASIS AREAS FOR 2023 SHSP

The Emphasis Areas section describes the States priority safety problems that will be addressed by the SHSP. Compared to the 2018 SHSP, the 2023 SHSP discusses Toward Zero Deaths, the Safe System Approach, Traffic Safety Culture, and the E's of Safety.

For the 2023 update, Unsafe Driver Behavior from the 2018 SHSP was divided into four sub-categories and added to the previous emphasis areas. Then these were ranked based on number of collisions for each emphasis area. It may be worth noting that behaviors such as unsafe speeds and distraction are often difficult to prove or record and are often under-reported as contributing factors.

The ODOT developed the Statewide Analysis for Engineering & Technology (SAFE-T) database through a partnership between the OHSO and the University of Oklahoma Center for Intelligent Transportation Systems (ITS).

**All data shown is from 2017 – 2021
unless otherwise noted.**

Data driven strategies offer the greatest potential to reduce highway fatalities and serious injuries on all public roads. This meant conducting data analysis for each Emphasis Area, including development of trends such as time of day, day of week, lighting, precipitation, and weather conditions.



**Fatal and injury
crashes occur
more often
between 8:00 p.m.
and 4:00 a.m.**

**...and more often on
Saturday and Sunday
than any other day of
the week.**

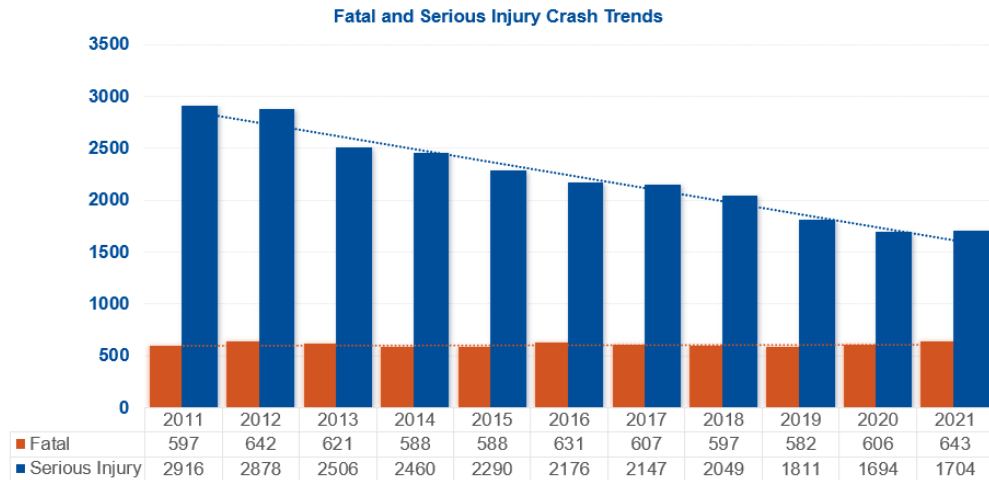


According to NHTSA, nearly 25% of crashes happen during severe weather conditions. In November of 2021, the Oklahoma Transportation Cabinet emphasized “Weather Driving Safety Awareness” in their public education campaign.

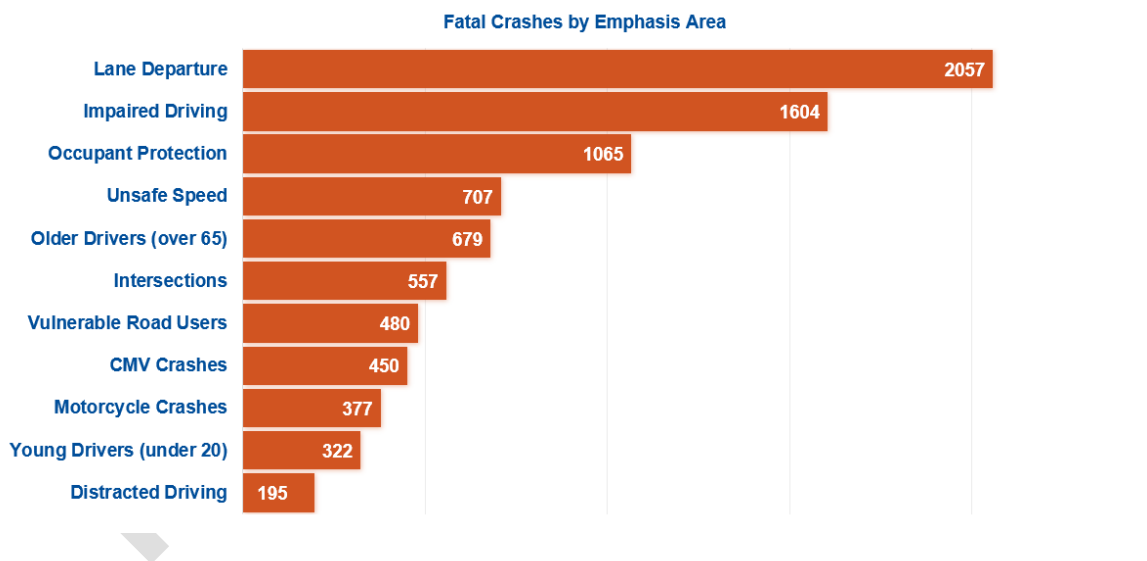


**172 People were killed or seriously injured
due to Severe Weather Conditions.**

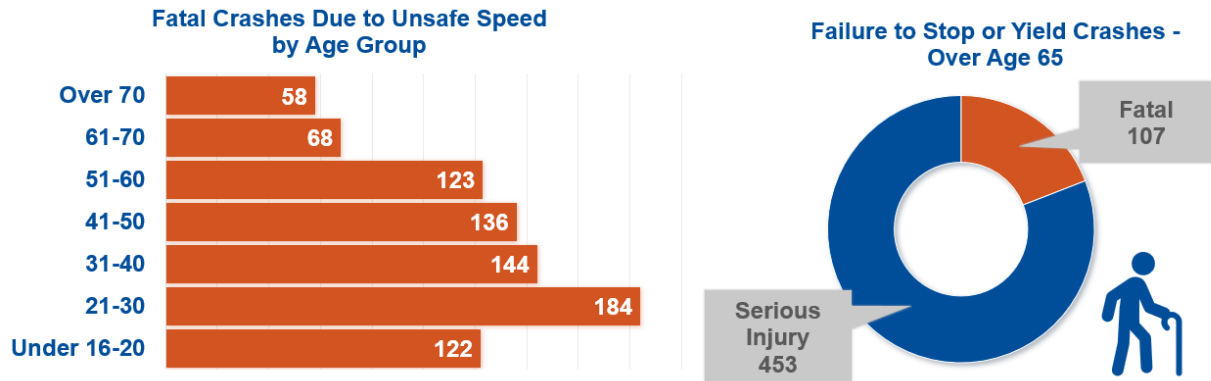
Serious traffic injuries in Oklahoma have continued to decline from 2011 until 2020. However, fatal crashes increased overall.



Due to the increase in fatal crashes, the 2023 SHSP depends on fatal crash rates for determining emphasis areas. Since financial resources are limited, emphasis areas are an important part of the SHSP. Emphasis areas have been prioritized by ranking the number of fatal crashes by each factor, as shown below:



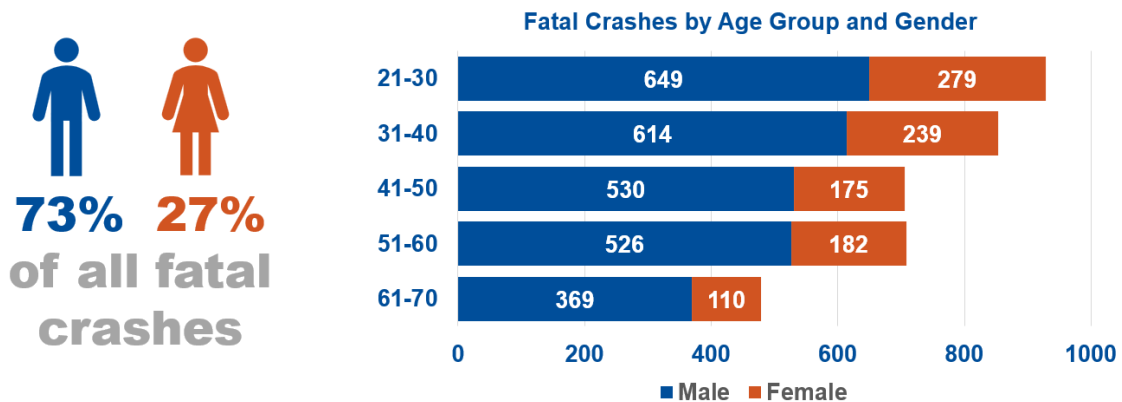
A crash is a complex event that usually cannot be attributed to a single factor. This creates overlaps between the emphasis areas. For instance, during the pandemic speeding related fatalities increased by 17%. Analysis from NHTSA indicates that the main behaviors that drove the increase include impaired driving, speeding, and failure to wear a seat belt. The 2023 SHSP addresses all three of these unsafe behaviors. That said, proposed strategies for one emphasis area may contribute to reducing fatal crashes and serious injuries in another emphasis area.



Another example of overlap often involves older drivers who are prone to be involved in intersection crashes due to their failure to stop or failure to yield. On the other hand, young drivers are often prone to drive at unsafe speeds. From 2017 through 2021, fatal crashes involving unsafe speed were highest for those in the 21 to 30 age group.

Due to overlaps, older drivers and young drivers have been removed from the list of emphasis areas. However, older drivers and young drivers are included within the other emphasis areas such as intersections and unsafe speeds.

Data was also evaluated for trends by gender. Males have been the victims in traffic crashes almost 3 times more often than females. This information can guide education campaigns toward the demographics most likely to be involved in these severe outcomes.

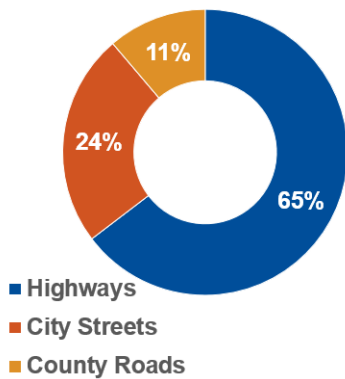


Distracted driving is another unsafe behavior. According to NHTSA, “Distracted driving is any activity that... takes your attention away from the task of safe driving.” Distracted driving activities include things such as eating, talking on a cell phone, or texting. Texting is particularly dangerous because it combines visual, manual, and cognitive distraction.

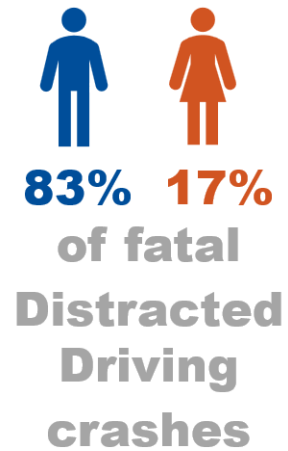
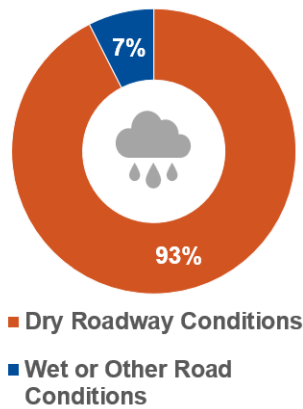


Source: OHSO

Distracted Driving Crashes by Road Type



Distracted Driving Crashes by Precipitation Conditions



The FHWA states that emerging topics such as distracted driving are proving complicated to address in SHSPs when the science is inadequate to allow for the same level of data analysis and countermeasure selection. Distractions are widely recognized as being underreported and effective strategies are often challenging to implement. This is especially true for the crash report form used by police officers in Oklahoma. Even so, NHTSA has partnered with states and local police to pass and enforce laws that address distracted driving.

Highway safety programs often coordinate the use of the “E’s” of Safety. For example, a distracted driving campaign might include education campaigns from OHSO, high visibility enforcement by OHP, and rumble strip installation by ODOT. In January of 2021, the Oklahoma Transportation Cabinet emphasized “Put Away Distractions” in their public education campaign.

The 2023 SHSP identifies Oklahoma’s priority emphasis areas as well as relevant strategies for implementation. Furthermore, the 2023 SHSP is used to coordinate the efforts of all agencies and stakeholders that have a role in highway safety. SHSP leaders evaluate the outcome-based metrics to ensure success. This allows for annual modifications within the Action Plan leading to continual improvement in performance over the next five years.

For the 2023 SHSP, the Executive Committee determined to use the following eight emphasis areas:

- Lane Departures
- Impaired Driving
- Occupant Protection
- Unsafe Speed
- Intersections
- Commercial Motor Vehicle Crashes and Work Zones
- Motorcycle Crashes and All-Terrain Vehicles
- Vulnerable Road Users



Source: ODOT



Lane Departure



Impaired Driving



Occupant Protection



Unsafe Speed



Intersections



**Commercial Motor Vehicles
and Work Zones**



**Motorcycles and
All Terrain Vehicles**



Vulnerable Road Users

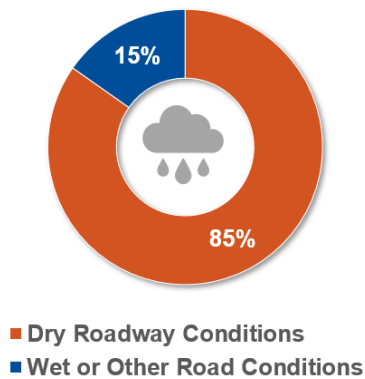
Lane Departures



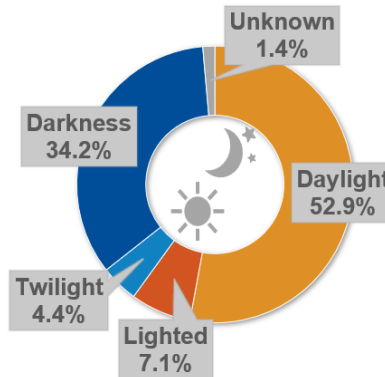
Lane Departures

Lane departures are the most common type of crash in Oklahoma. From 2017 through 2021, there were 2,057 fatal collisions involving lane departures – more than any other emphasis area. A lane departure crash happens when a vehicle crosses an edge line, a centerline, or otherwise leaves the traveled way.

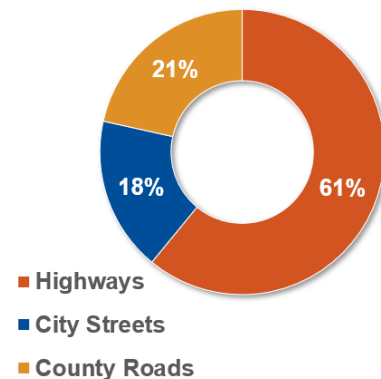
Lane Departure Fatal and Serious Injury Crashes by Precipitation Conditions



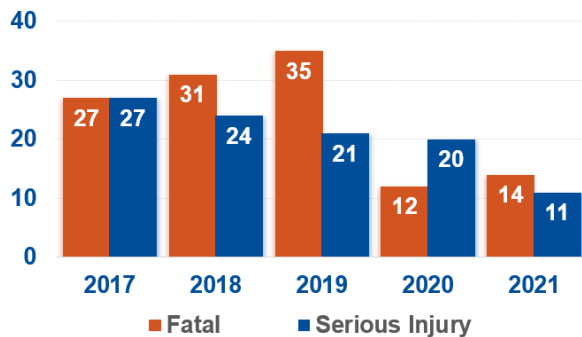
Lane Departure Lighting Conditions for Fatal Crashes



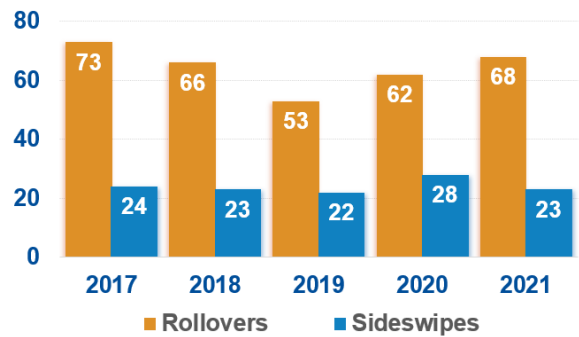
Lane Departure Fatal and Serious Injury Crashes by Road Type



Cross Centerline Head-On Collisions

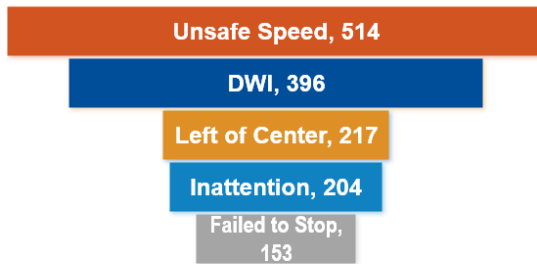


Lane Departure Fatal Crashes

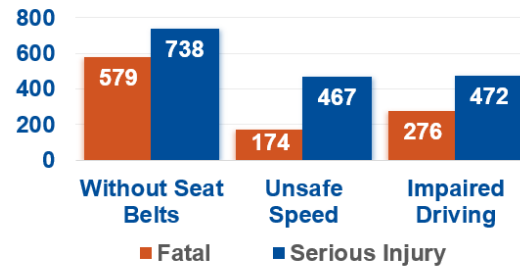




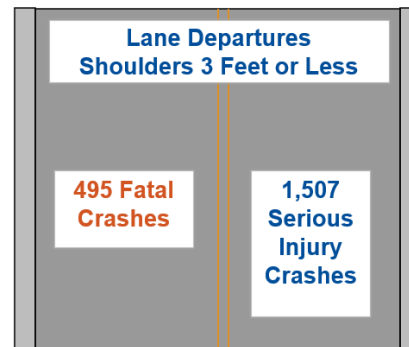
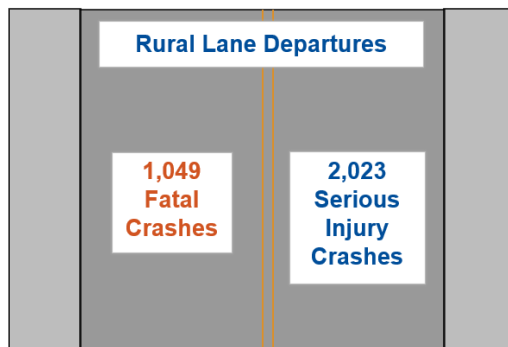
Lane Departure Fatal Crashes Due to Driver Behavior



Rural Lane Departure Crashes by Type



Fatal Lane Departure Crashes
4% Crossover Median
57% Struck a Fixed Object
57% Depart Right
vs. 43% Depart Left



Strategies such as installation of cable barrier and shoulder/centerline rumble strips are proving to have proven to be effective. Since 2016, cross-centerline head-on collisions have significantly improved.

In the SAFE-T database, Lane Departures are divided into categories: Road Departure Right, Road Departure Left, Fixed Object, and Crossover Median. Please note that there are overlaps between the categories so that the overall number of the categories exceeds the number of statewide fatalities due to lane departures. For example, a vehicle may crossover a median and then strike a fixed object.

Lane departure crashes also include rollover and sideswipe. Since 2017, rollover and sideswipe fatal crashes have remained relatively flat. In Oklahoma, 15% all lane departure fatalities are



rollovers. Countermeasures for rollover crashes include delineation treatments, shoulder and edge line rumble strips, friction treatments, as well as safety edge, recoverable slopes, clear zones, and maintenance to control vegetation growth. The majority of rollover crashes are due to unsafe speed and DWI.

Sideswipe collisions are often due to lane changes or attempts to merge in the same direction. Same direction sideswipe collisions are extremely dangerous at speeds greater than 70 mph. One example of a countermeasure for sideswipe collisions are rumble strips between lanes.

Within emerging technology, lane assist on newer vehicles provides hope for the future. A driver who is speeding, impaired, drowsy, or distracted often has difficulty staying in the lane.

Even though 19% of the U.S. population lives in rural areas, nearly half of all fatal crashes occur on rural roads. In Oklahoma, 60% of fatalities occur on rural roads. Lane departure crashes often involve only one vehicle traveling at a high speed and result in fatalities or serious injuries. During the pandemic, increased speeding on rural roads have taken a disproportionate toll on rural residents.

According to the Governors Highway Safety Association (GHSA), more than half of persons killed in rural road crashes were not wearing their seatbelts. Between 2017 and 2021, 579 people who were killed in rural lane departures were driving without a seat belt in Oklahoma.

Road departure issues are a problem for rural areas in Oklahoma. Nationwide, adults 65 and older make up 19% of the rural population but account for 21% of rural road deaths. Even though a 2% difference seems small, the increase in older drivers within the U.S. rural population is reason for concern.

As drivers increase travel speed on rural roads, rates for single-vehicle crashes increase too. Between 2017 and 2021, 174 people were killed in rural lane departures when driving at an unsafe speed in Oklahoma, and 276 people were killed in rural lane departures when driving impaired in Oklahoma.

Over the last five years, nearly 3,000 serious injury and fatal collisions in Oklahoma have occurred on roads with no shoulders. 17% of those collisions had unsafe speed cited as a cause. ODOT recently reported that blind hills and blind curves can be a problem. From 2017 to 2021, there were 253 fatal crashes and 557 serious injuries on rural roadways that curve left or curve right. Using High Friction Surface Treatments (HFST) can reduce lane departures on tight horizontal curves.

Oklahoma Public Safety's most recent Highway Safety Crash Facts Book shows that in 2020 rural crashes in Oklahoma accounted for roughly 25% of total crashes statewide. Oklahoma has taken advantage of the federal Rural Project Initiative that is designed to accelerate rural, two-lane improvement projects such as adding shoulders already in the state's Eight-Year construction plan.

In the case of lane departure crashes, the Safe System Approach emphasizes the predictability of the road course, forgiveness of the roadway environment and driver behavior. Engineers can help prevent lane departures by improving roadway design. Education through public safety announcements can promote traffic safety culture, addressing driver behaviors that contribute to lane departures. Emerging technologies such as data analysis, vehicle & infrastructure technology, specialized equipment, and tech-based solutions can potentially reduce the frequency or severity of crashes. One emerging technology is lane keeping assist that warns



drivers when they begin to depart from the lane. However, it may take up to ten years for lane keeping assist to spread throughout the nation's vehicle fleets and to make a difference.

The Strategic Plan from the FHWA uses a data driven approach to focus on head-on collisions, rollovers, and fixed objects such as trees.

Other fixed objects include signs, poles, signals, and barriers as well as protection from roadside ditches and embankments.

Vehicles can be kept on the roadway by using pavement friction, rumble strips, horizontal curve safety, and nighttime visibility.

Safe Recovery can be achieved with Safety Edge and Clear Zones.

Crash Severity can be reduced through roadside safety hardware eligibility letters, guidance and polices, as well as other resources.



Source: ODOT

There are a variety of proven effective strategies for mitigating roadway departure fatalities and serious injuries. The transportation network should be analyzed to determine areas with the greatest opportunity for improvement. Locations may be identified using a hot spot or systemic approach and utilizing AASHTO Highway Safety Manual principles.

Using the FHWA Crash Modification Factor Clearinghouse allows practitioners to implement treatments that are appropriate and effective under specific circumstances.

The Oklahoma Rural Improvements for Safety Act (House Bill 2352) will add 250 center-lane mile upgrades for rural two-lane highways. The bill will prioritize projects based on historic fatality rates and areas experiencing traffic growth over the past five years.

Reaching the TZD goal means preventing as many lane departures as possible. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.

Impaired Driving

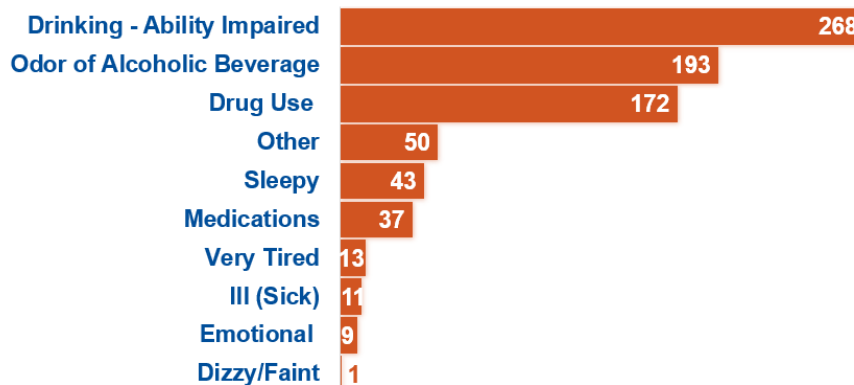


Impaired Driving

Crashes involving occupants who are impaired are the second most common type in Oklahoma. From 2017 through 2021, nearly 56% of fatal crashes and serious injuries involving impaired driving occurred on highways.

While the dangers of drunk driving are relatively well known, impaired driving is not limited to alcohol use. It also consists of drugs, including prescription medications, and physical impairments such as drowsy driving, poor vision, or reduced cognitive capabilities. Using alcohol, drugs, or some medications will affect the driver's ability to perceive danger and react appropriately in a reasonable amount of time to avoid a collision.

Impaired Driving by Category - Fatal Crashes



Oklahoma law defines different levels of impaired driving:

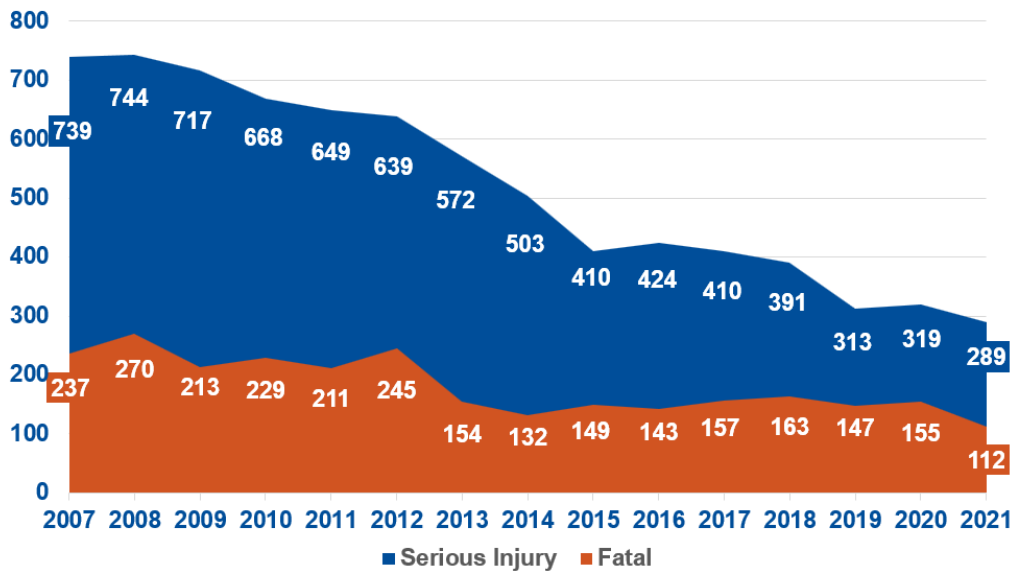
- **Driving While Impaired (DWI)** – Blood or breath alcohol content (BAC) greater than 0.05 percent but less than 0.08 percent and evidence of impaired ability to drive safely
- **Driving Under the Influence (DUI)** – BAC of 0.08 percent or more, any amount of a Schedule I (non-medical) controlled substance detected, under the influence of any other substance or a substance combined with alcohol that renders a person incapable of driving safely
- **DUI under 21** – Any measurable alcohol in the blood or breath, any other intoxicant detected in blood, breath, saliva, or urine, combined influence of alcohol and any other intoxicant
- **Aggravated DUI** – BAC of 0.15 percent or greater



Drug related fatalities are often due to the national opioid crises and increasing usage of marijuana among drivers. On June 26, 2018, Oklahoma voters approved legalization of medical cannabis. Due to medical cannabis and other medications, a driver who is impaired may have difficulty staying in the lane.

For the past several decades, significant strides have been made in addressing drunk driving through a combination of public messaging, tougher laws, and increased enforcement. As a result, the number of fatalities and serious injuries attributed to driving while under the influence of alcohol, drugs, or medications have decreased.

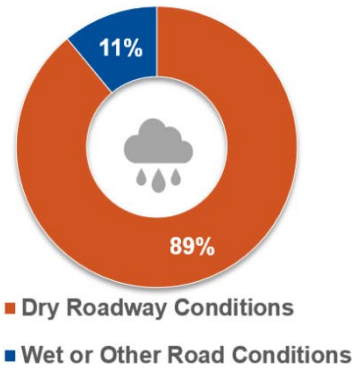
Impaired Driving Crashes



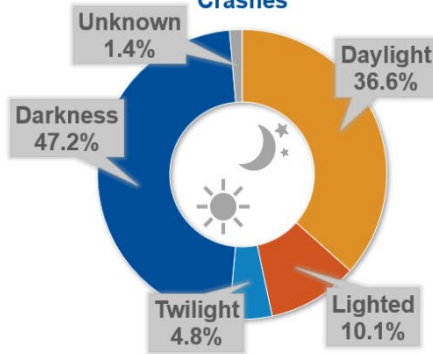


Source: OHSO

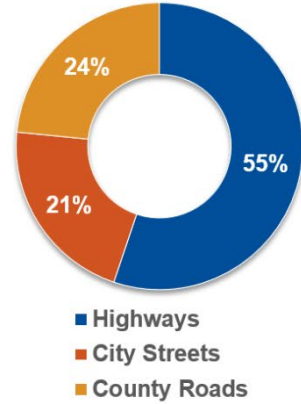
Impaired Fatal & Serious Injury Crashes by Precipitation Conditions



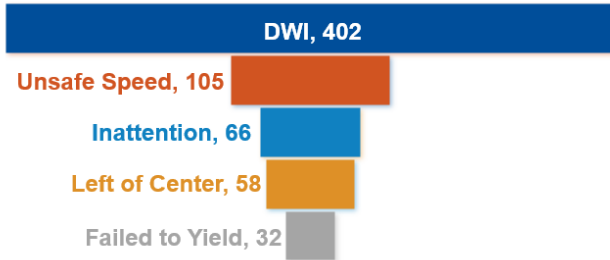
Lighting Conditions of Impaired Driving Fatal Crashes



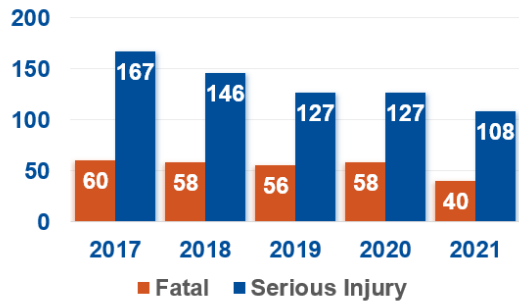
Impaired Fatal & Serious Injury Crashes by Road Type



Impaired Driving Fatal Crashes Due to Driver Behavior



Impaired Driving Crashes Ages 16-30 Years Old



Drivers in the age category 16-30 are involved in more alcohol impaired crashes than any other age group. For many of the younger people in this age group, neuroscience indicates the brain is not yet fully developed, leading to a higher propensity for risk-taking.

The OHSO has identified schools as an ideal setting to reach teenagers with prevention education. The AlcoholEdu for High School program has demonstrated positive outcomes in increasing alcohol-related knowledge, decreasing acceptance of underage drinking, reducing underage drinking, reducing youth riding with an intoxicated driver, and reducing students driving while impaired.



Source: ODOT

In September of 2021, the Oklahoma Transportation Cabinet emphasized “Perils of Impaired Driving” in their public education campaign. During Thanksgiving of 2022, NHTSA partnered with the OHP and local law enforcement to educate drivers that buzzed driving is drunk driving. Enforcement is an important element of Oklahoma’s efforts to address impaired driving.

In Oklahoma, the Department of Public Safety has a Medical Advisory Board that reviews individual fitness to drive. The 2022 Highway Safety Plan from the OHSO describes grants for occupant protection, state traffic safety information system improvements, impaired driving countermeasures, and motorcyclist safety. As of 2022, the SHSP for Oklahoma has adopted guidelines from the FHWA, including adding an annual Action Plan as an appendix.



Source: OHSO

The OHSO provides trained, qualified personnel to develop, monitor, coordinate, and manage the various Impaired Driving Prevention projects.

The OHSO also coordinates judicial education and outreach aimed at educating professionals in the court system.

The goal of judicial education is to reduce impaired driving and increase public safety throughout the state.

The Oklahoma City Police Department trains officers from various areas of the state to become Drug Recognition Experts and increase enforcement of DUI laws.

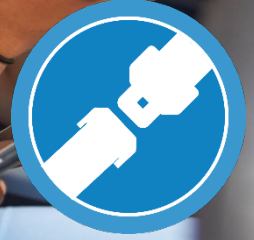
Breath Test Devices (BTD)s are commonly used when testing for the presence of alcohol in a person's system. Oklahoma recognizes results from BTDs as admissible in court proceedings. The BTD is used for impaired driving enforcement and in removing impaired drivers from the roadway. Oklahoma laws require that any driver convicted of DUI must install an ignition interlock device on every vehicle that is registered to them.

The Oklahoma Board of Tests for Alcohol and Drug Influence provides breath alcohol analysis results data on drivers arrested for driving under the influence. The OHSO Data Analyst uses this information to compile crash data statistics.

As a promising development within emerging technology, oral fluid screening is convenient for law enforcement to identify drivers under the influence of drugs. Public education concerning oral fluid screening may help deter impaired driving. It is important for all Oklahomans to understand that it is never okay to drive impaired, regardless of the substance.

Reaching the TZD goal means preventing as many crashes involving impaired drivers as possible. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.

Occupant Protection



Occupant Protection

Crashes involving occupants who are unbuckled or unrestrained are the third most common type in Oklahoma. From 2017 through 2021, nearly 55% of fatal crashes and serious injuries involving unrestrained occupants occurred on highways.

Two of the most effective vehicle safety devices involves the use of seatbelts and child safety seats, particularly when combined with modern vehicle airbags and structural strength. On February 1, 1987, the Oklahoma law requiring automobile drivers and front-seat passengers to buckle up became effective. Oklahoma lawmakers amended the law on February 1, 1989 to require drivers and front-seat passengers of pickup trucks and vans to also wear seat belts.

In 2020, there were 10,893 unrestrained passenger vehicle occupants killed in crashes in the United States. In 2021, 29 percent of U.S. traffic fatalities involved 12,522 unrestrained occupants of passenger vehicles who were killed in traffic crashes.



Source: ODOT

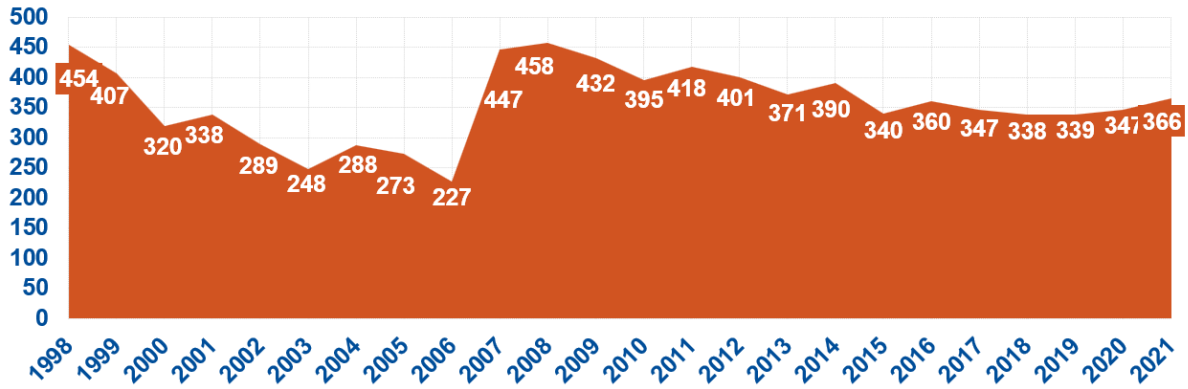
As of 2021, the NHTSA reported the nationwide usage rate for seat belts as 90.4%. Oklahoma ranks 43rd in the nation for seat belt usage.

The OHSO reports that the seat belt use rate in Oklahoma fell from 85.6% in 2018 to 84.7% in 2019. The Click it or Ticket program was released over 15 years ago, and had its greatest influence in 2006. Yet 9.6% of passengers nationwide still do not buckle up.

According to NHTSA, wearing a seat belt reduces the risk of a fatal injury in a crash by nearly 50%.



Unrestrained Occupant Fatal Crashes

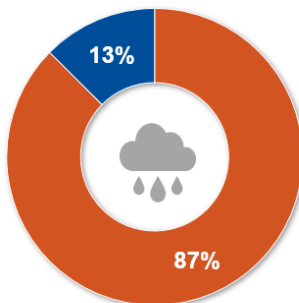


36% of fatalities and serious injuries involved a person who was not wearing a seatbelt.

Unrestrained Occupant Nighttime Crashes

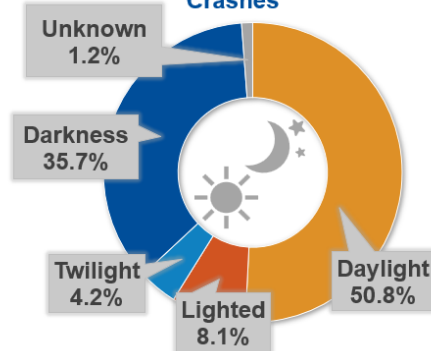


Unrestrained Fatal & Serious Injury Crashes by Precipitation Conditions

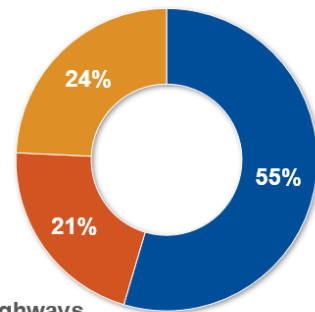


- Dry Road Conditions
- Wet or Other Road Conditions

Lighting Conditions of Impaired Driving Fatal Crashes



Unrestrained Fatal & Serious Injury Crashes by Road Type



- Highways
- City Streets
- County Roads

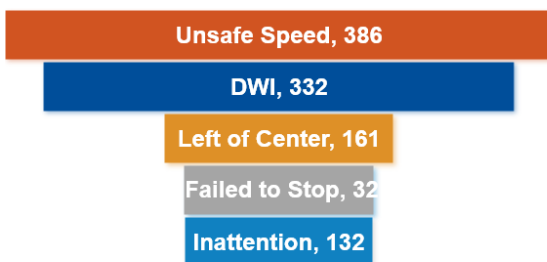
41% of Unrestrained fatal crashes involved pickup truck drivers



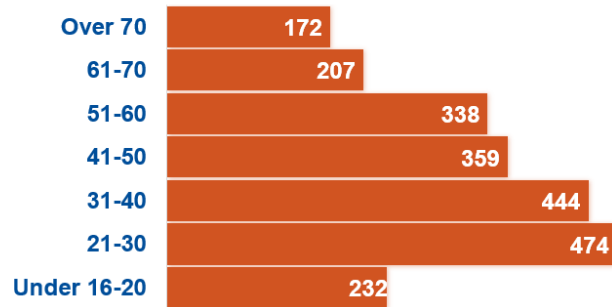
1/3 of Unrestrained fatal crashes were Males under age 30



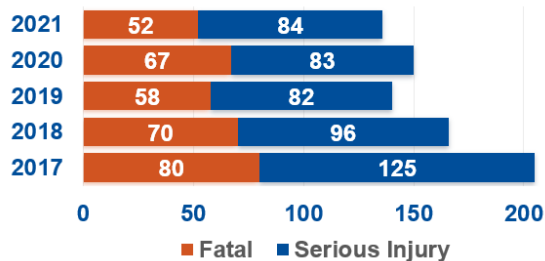
Unrestrained Occupant Fatal Crashes due to Driver Behavior



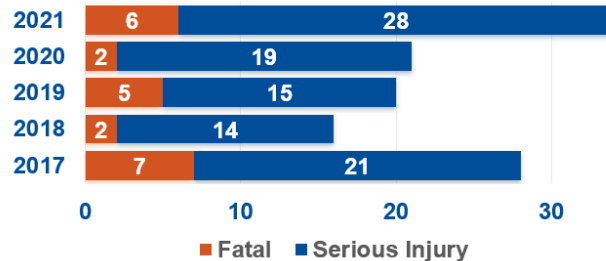
Unrestrained Occupant Fatal Crashes by Age



Unrestrained Occupant DUI Crashes



Unrestrained Occupant Crashes Under Age 16



Failing to wear a seat belt is a behavior that often overlaps with other behaviors that lead to similar severe crash outcomes (e.g., speeding, aggressive driving, and impaired driving).

As teens start driving and gradually gain independence, they may think they are invincible or believe they have the right to drive unbuckled. In 2019, 45% of teen drivers who died were unbuckled. When the teen driver involved in the fatal crash was unbuckled, 90% of the passengers who died were also unbuckled.

Nationwide, seat belt use during 2020 continued to be lower in rear seats (80.0%) than in front seats (90.3%). In 2020, 38% of children under 12 who were killed in crashes nationwide were unbuckled. At this time in Oklahoma, children over the age of 8 are not required to wear a seatbelt when riding in the back seat. Failure to wear a seatbelt or properly restrain young children is one of the most common risky behaviors that increases the severity of a crash.



Source: OHSO

The University of Central Oklahoma uses NHTSA's approved methods to conduct the State's annual occupant protection and child restraint survey. Both nationally and in Oklahoma, motor vehicle crashes are the leading cause of death for children. Most child safety seats are used improperly even though trained child passenger safety technicians are available statewide.

Eligible families may qualify for infant car seats and booster seats free of charge. Booster seats are for children over the age of four but under the age of eight. In the Fall of 2022, the Oklahoma Department of Health held a series of events with technicians throughout the state to evaluate infant car seats and booster seats for children and whether they are tall enough (4'9") to ride in the back seat without a booster seat.

The OHSO reports that proper use of child restraint systems is effective in reducing the number and severity of injuries to children in motor vehicle crashes. Safe Kids Coalitions lead Child Passenger Safety (CPS) efforts in the State of Oklahoma with locations primarily in Oklahoma City and in Tulsa.

As stated earlier, the 2020 - 2045 Oklahoma LRTP lists increasing seat belt usage as a goal. An important step in this direction is Senate Bill 681. The proposed law would require any passenger in the back seat of a car that is under the age of 16 to wear a seat belt.

The Center for Disease Control recommends seat belt laws as being most effective when they cover occupants in all seats of the vehicle. Children whose parents or caregivers buckle up are much more likely to buckle up themselves.

Increasing educational and enforcement strategies are critical to ensuring the current rate of seat belt and child restraint system usage and ensuring their use becomes a habit for the next generation.

An additional unsafe behavior is driving while intoxicated – between 2017 to 2021, seat belt usage for DWIs averaged 41%. In other words, for those who choose to drink and drive, 41% of those who suffer serious injuries or fatalities were unlikely to wear their seat belt.



In 2020, among young adults (nationwide) aged 18 to 34 killed in passenger vehicle crashes, 60% were completely unrestrained — one of the highest percentages for all age groups.

Compared with younger drivers, older drivers usually wear seat belts and do not drive impaired. Even so, due to the force in a crash, the aging driver is more susceptible to injury. Furthermore, fragility of older drivers makes surviving a crash more difficult.

Nationwide, women are more likely to wear seat belts than men. In Oklahoma, 72% of drivers under the age of 30 who chose to drive without a seatbelt were males involved in fatal crashes.

A common misconception is that the larger size of pickup trucks will protect occupants better in a crash. The numbers say otherwise: 62% of pickup truck occupants who were killed in 2020 were not wearing a seatbelt compared to 47% of passenger car occupants.

The OHSO recommends addressing the low usage rates among the occupants of pickup trucks. If more occupants of pickup trucks used their seatbelts, then the state's overall usage rate would significantly improve. Regardless of vehicle type, seat belt use is the single most effective way to stay alive in a crash.

As a proven strategy high-visibility enforcement (HVE) focuses on specific violations such as impaired driving, failure to wear seatbelts, and speeding. Additional HVE strategies may include the use of integrated enforcement during specific times of the day or night where more crashes are occurring as well as increased nighttime seat belt enforcement activities.

OK SAFE is a partnership between students, law enforcement, and traffic safety advocates designed to bring awareness to the importance of wearing seat belts among Oklahoma's high

school students. The project will maintain efforts already established with at least 20 Oklahoma schools and expand the program to new schools that are not currently participating.

Promoting and supporting occupant protection education and enforcement efforts means the OHSO emphasizes the increased risk of death or injury because of ejection from the vehicle. The OHSO oversees the Occupant Protection programs to determine if projected activity milestones are being met, funds are being utilized properly, and assist as needed to facilitate project activities and to meet performance targets.

Oklahoma Governor Kevin Stitt is supporting increased seat belt usage statewide as one of the state's Top Ten initiatives with a goal of increasing usage by 10 percent. Raising seat belt usage from today's 84 percent to 94 percent will bring Oklahoma into the Top Ten nationally, but more importantly it could significantly lower the loss of life on our highways. In March and October of 2021, the Oklahoma Transportation Cabinet emphasized "Seat Belt Safety" in their public education campaign.

Although seatbelts are of utmost importance, emerging technology includes improved safety features such as airbags and other vehicle structural features. Reaching the TZD goal means that everyone needs to buckle their seat belts whenever they drive. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.



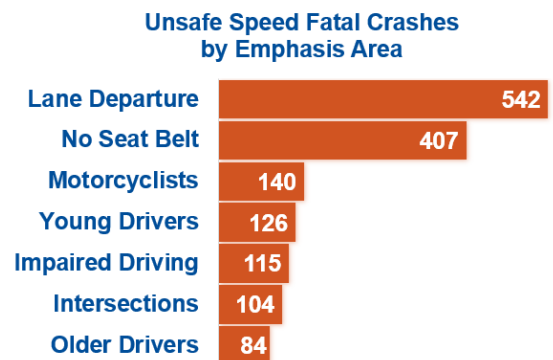
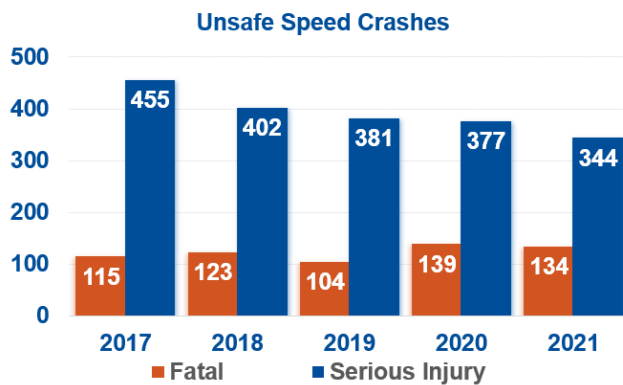
Source: <https://www.drivesafelyoklahoma.com/seat-belt-safety>

Unsafe Speeds

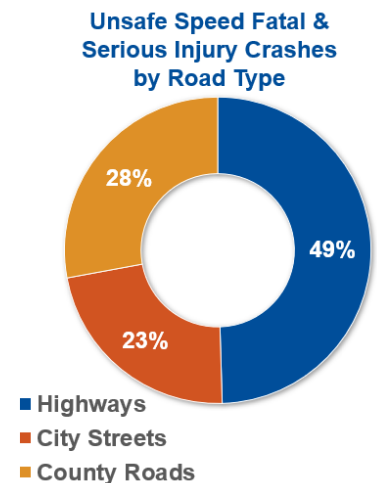
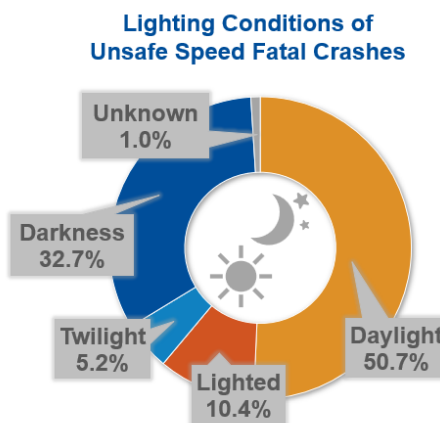
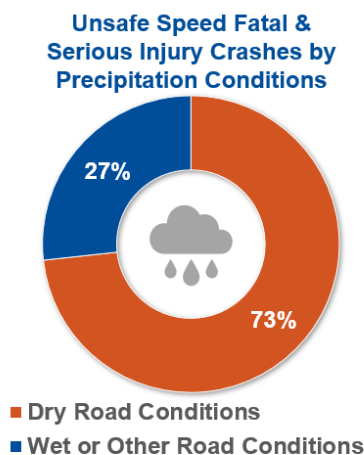


Unsafe Speeds

Crashes involving unsafe speeds are the fourth most common type in Oklahoma. Yet the true impact of unsafe speeds is likely even greater, as unsafe speeds are often under-reported as a contributing factor of a crash. The greater a vehicle's speed, the greater the likelihood of a crash, and the greater the severity of that crash. Speeds can be influenced by enforcement, speed limit laws, engineering design, and education / culture. Each of these influences serve an important role in the outcome of a safe speed that the person driving chooses.

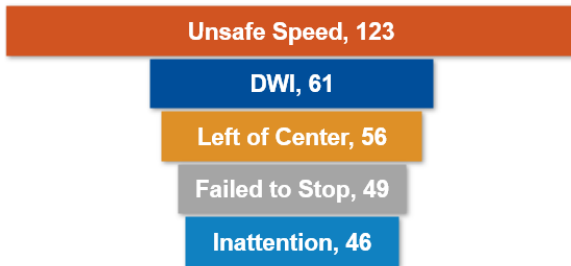


615 of fatal collisions were due to Unsafe Speeds

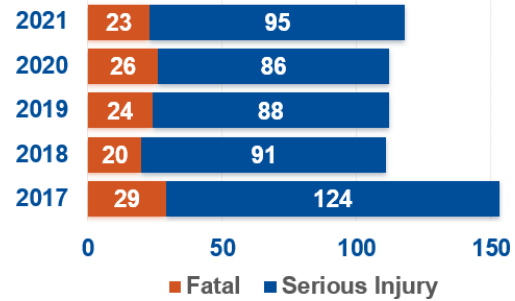




Unsafe Speed Fatal Crashes due to Driver Behavior



Unsafe Speed Crashes of Young Drivers



22% of teen fatal crashes were due to Unsafe Speeds



According to the NHTSA, speeding is defined as “exceeding the posted speed limit or driving too fast for conditions.” Higher vehicle speeds and aggressive driving habits pose an inherent safety risk to all users of Oklahoma’s transportation system.

Aggressive driving includes poor driving behaviors such as disregarding traffic signs, running a red light, exceeding the posted speed limit, driving too fast for conditions, improperly passing, following too close, or operating a vehicle in an erratic, reckless, or careless manner.

Speeding involves public attitudes, road user behavior, vehicle performance, roadway design and characteristics, posted speed limits, as well as enforcement strategies. For more than a decade, fatal crashes related to speed have remained at 32%.

Speed limits are usually regulated by state and local governments in the interest of public safety. Speeding violations are often the most common reason for traffic stops, enabling law enforcement officers to detect impaired drivers, identify occupant protection violations, and address other traffic safety and/or criminal issues.

Source: ODOT

Although speeding is an unsafe driving behavior, most people admit they speed at least some of the time. Nevertheless, speeding is an aggressive driving behavior that increases the chances of a crash becoming more severe.

Fatal crashes that involve very high speeds often occur on rural roads. Furthermore, states with high maximum speed limits tend to have higher per capita rates of fatalities on rural roads than states with lower maximum speed limits. When maximum interstate speed limits are high, even local roads show a higher proportion of rural road fatalities. Out of the 12 states that have the highest fatality rates per capita, 10 have maximum speed limits of at least 70 miles per hour. In Oklahoma, the maximum speed limit for rural roads is 75 mph.

Lane departure crashes often involve only one vehicle traveling at a high speed and result in fatalities or serious injuries. As drivers increase travel speed on rural roads, rates for single-vehicle crashes increase too.

Young drivers tend to have higher crash rates than older more experienced drivers. Inexperience, unsafe driving behaviors, and driving errors contribute to the high rate of collisions among young drivers. Data shows that younger drivers into their twenties are the highest age group to be killed on rural roads. Young and inexperienced drivers may underestimate the effects of speed on crash probability and severity.

According to NHTSA, speeding is a critical safety issue for teen drivers. In 2019, speeding was a factor in 27% of the fatal crashes that involved teen drivers (15-18 years old) of passenger vehicles. Inclement weather, traffic stops, and winding roads can be dangerous for teen drivers who choose to speed. In Oklahoma, 88% of young drivers who were charged with unsafe/unlawful behavior were driving at an unsafe speed.

Driving studies indicate that speeding behavior for teens increases over time, possibly as they gain confidence. As the leading cause of death among young drivers, motor vehicle crashes are recognized nationwide as a serious health issue for young people.

The NHTSA is committed to addressing the dangers of speeding and the importance of obeying posted speed limits by increasing public awareness. The NHTSA offers a Speed Management Program course that uses a multidisciplinary approach to reduce speeding-related fatalities and injuries.

Appropriate speeds are obtained by applying road design and engineering measures, setting speed limits that are safe and reasonable, enforcing them, and influencing culture where speeding is less socially acceptable. Each of these efforts alone is not enough, but together as a whole influence real change to affect safe speeds and save lives.



Source: ODOT

In August of 2021, the Oklahoma Transportation Cabinet emphasized “Hazards of Speeding School Zone Safety” in their public education campaign.

Emphasizing speeding and aggressive driving with the same intensity as seat belt use and impaired driving can contribute to achieving zero deaths and zero serious injuries on our nation's roadways. Ultimately, decisions about safe speed limits depend on societal risk tolerance, valuation of time, and willingness to ensure driver accountability.

A Safe System Approach underscores the important principle of safe travel speed. The Safe System Approach emphasizes that transportation system designers and engineers share responsibility for safe speeds for road users. Research and experience have shown that posted speed limits alone do not have a strong enough influence on drivers to reduce vehicle speeds. Implementing a Safe System Approach means:

- Setting safe speed limits
- Influencing drivers to slow down
- Mitigating crash angles to reduce impacts on the human body

As designers work to create safer roadways, encouraging road users to do their part means practicing safe driving behavior such as following posted speed limits and reducing traveling speeds in certain conditions. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.



Intersections

Intersections

Intersections are a program focus area for the FHWA because each year nearly 25% of traffic fatalities and about 50% of all traffic injuries in the United States are attributed to intersections.

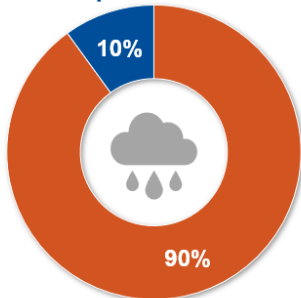
Intersection crashes are common in Oklahoma. From 2017 through 2021, there were 557 fatal crashes involving intersections; nearly 47% of fatal and serious injuries intersection crashes occurred on highway intersections.

Signalized and unsignalized intersections create an abundance of possible vehicle conflict points. Conflict points occur when vehicle paths merge, diverge, or cross within an intersection. Intersections include rail crossings.



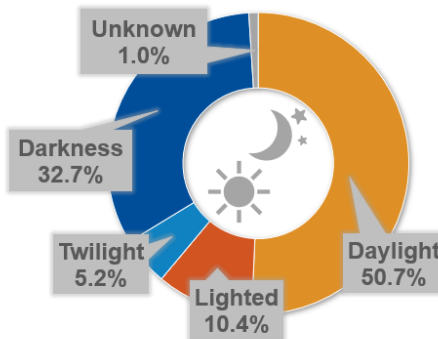
Source: ODOT

Intersection Fatal & Serious Injury Crashes by Precipitation Conditions

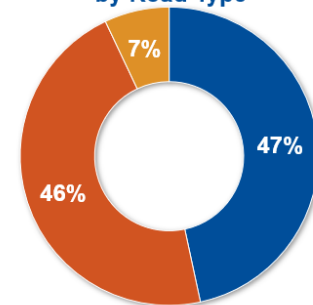


- Dry Road Conditions
- Wet or Other Road Conditions

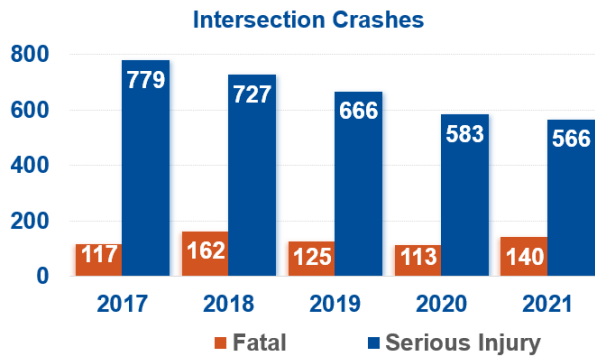
Lighting Conditions of Intersection Fatal Crashes



Intersection Fatal & Serious Injury Crashes by Road Type



- Highways
- City Streets
- County Roads



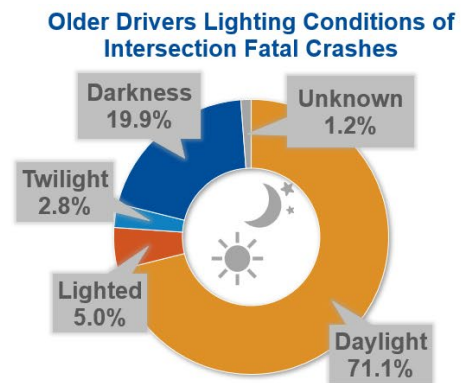
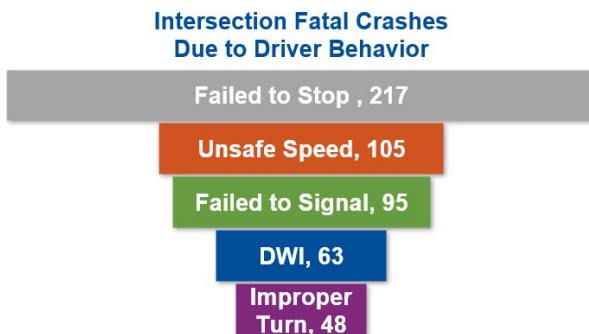
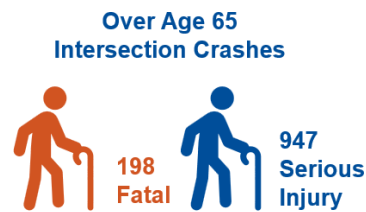
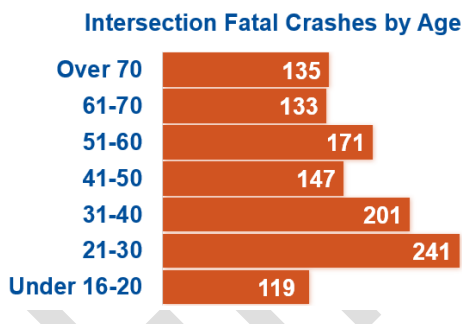
Rail Crossing Crashes

12 Fatal
12 Serious Injury

55% of fatal crashes occurred in urban areas



68% of serious injury crashes occurred in rural areas





Source: ODOT

Although traffic signals involve tradeoffs between safety and mobility, they are often chosen for operational reasons. Nationwide, signalized intersections represent about one-third of all intersection fatalities, including a large proportion that involve red-light running. As conflict points increase, driving conditions become more complex, and drivers are more likely to make mistakes such as failure to stop or failure to signal.

According to the GHSA, more Americans are outliving their ability to drive safely. Impairments such as vision, cognition and motor function affect older drivers who have a higher crash risk than middle aged adults. Secondary driving tasks may contribute to intersection crashes among older drivers.

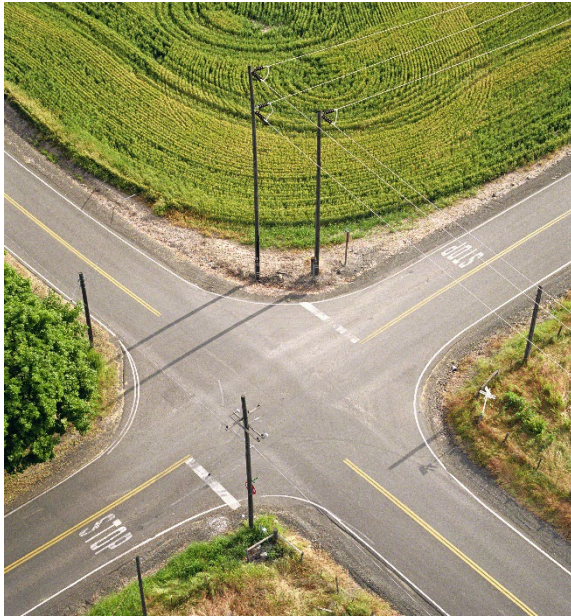
Older drivers are often cited for failure to yield the right-of-way. This means that older drivers are more likely to be involved in intersection crashes. Intersections are a problem for older drivers because aging often makes it difficult to judge the speed and distance of oncoming traffic when making a left turn or crossing a road. Declines in visual, cognitive, or physical abilities can make turning left, changing lanes, and navigating through intersections difficult for older drivers.

Fatalities often take place at intersections. Intersections should be evaluated based on traffic control and the predominant severe crash type to identify potential treatments. Like roadway departures, there are a variety of proven effective strategies for mitigating intersection-related fatalities and serious injuries.

As of 2018, ODOT implemented systemic and policy-driven intersection improvement strategies, including flashing beacons, retroreflective backplates for signals, intersection signalization, intersection traffic control modifications, intersection geometric modifications, and access modification.

A Safe System Approach emphasizes the design of an intersection, considering human behavior especially in terms of potential driver errors. Emphasizing the design of an intersection reduces

risk and, subsequently, death and serious injury related to traffic crashes (vehicle occupants, pedestrians, and bicyclists).



A Safe System Approach can be used to supplement a data-driven, performance-based framework called Intersection Control Evaluation (ICE) that means selecting the best intersection design for a specific location.

Since the Safe System Approach anticipates human errors, it can be used to enhance intersection safety for all road users. A Safe System Approach can include minimizing and modifying conflict points, reducing speed of vehicles, improving visibility at intersections, as well as providing space and protection for pedestrians and bicyclists.

Pursuing the TZD goal means preventing more crashes at intersections in Oklahoma. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.

Commercial Motor Vehicles and Work Zones



Source: ODOT

Commercial Motor Vehicles and Work Zones

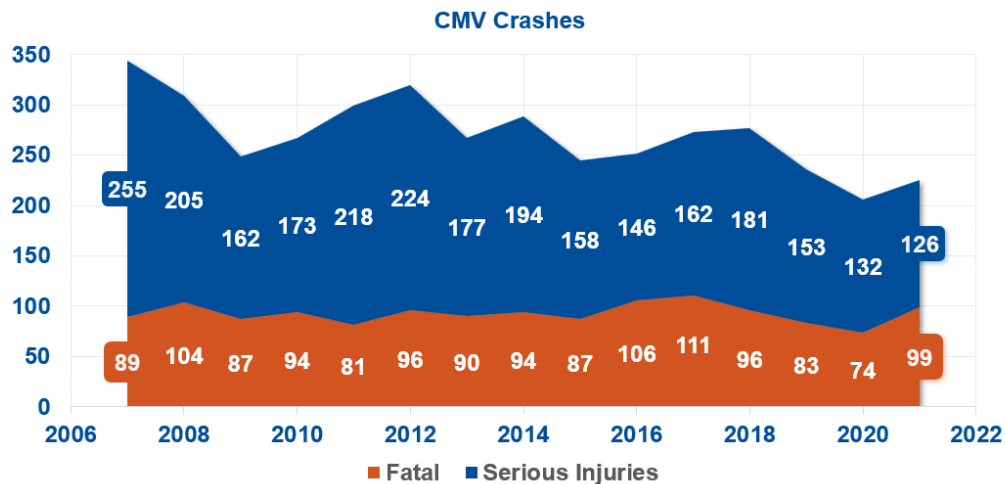
The FHWA, the NHTSA, and the Federal Motor Carrier Safety Administration (FMCSA), use the term Commercial Motor Vehicles (CMV) when referring to large trucks and buses with a gross vehicle weight or gross combination weight of 10,001 pounds or more.

The primary mission of the FMCSA is to reduce crashes, injuries, and fatalities involving large trucks and buses. Oklahoma is committed to FMCSA's traffic enforcement national priority and agrees that driver behavior is the leading cause of all traffic collisions including those involving CMV.

From 2017 through 2021, 85% of fatal crashes and serious injuries involving CMV crashes occurred on highways.

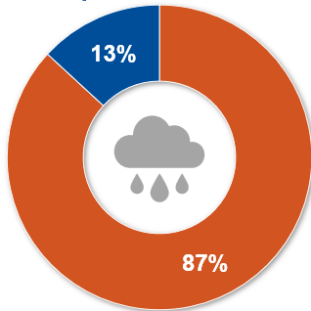
Collisions involving CMV result from CMV driver behavior as well as non-CMV driver behavior. Driver behavior issues include using cell phones, texting, inattention, speeding, unsafe lane changes, left of center, negligent driving and following too close. The State intends to conduct traffic enforcement activities when violations occur around CMV. Traffic enforcement activities will help educate drivers on how their behavior affects everyone around them.

Crashes involving CMV crashes in Oklahoma work zones are among the highest in the nation. A work zone is an area of a roadway where construction, maintenance, or utility work is occurring. During the past ten years, 5.8% of CMV fatal crashes took place within Oklahoma work zones.



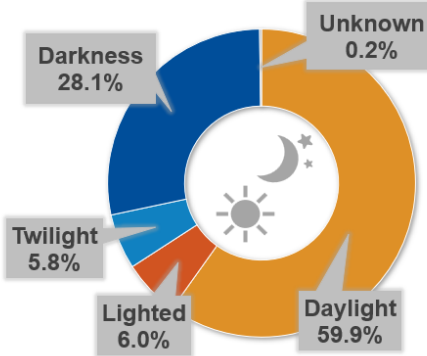


CMV Fatal & Serious Injury Crashes by Precipitation Conditions

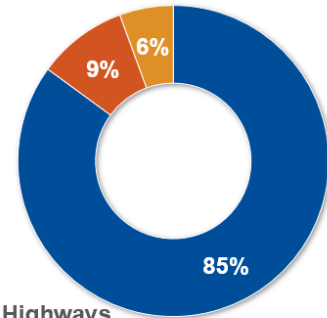


■ Dry Road Conditions
■ Wet or Other Road Conditions

Lighting Conditions of CMV Fatal Crashes

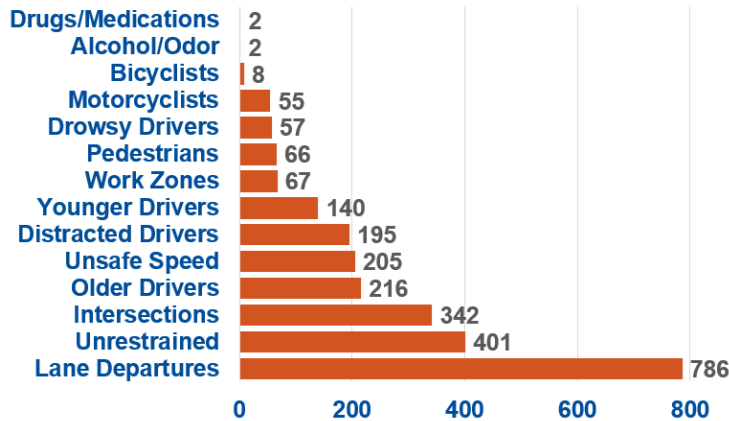


CMV Fatal & Serious Injury Crashes by Road Type



■ Highways
■ City Streets
■ Country Roads

CMV Fatal & Serious Injury Crashes by Emphasis Area

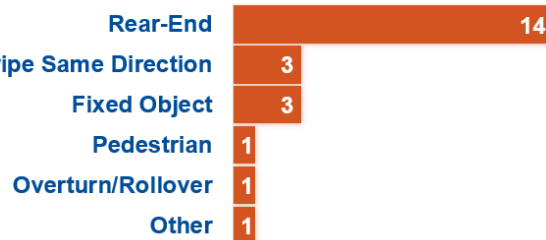


Source: ODOT

25 Fatal & 42 Serious Injury CMV crashes occurred in work zones



Fatal CMV Workzone Crashes by Type of Collision



Distracted driving resulting in fatal crashes remains a problem primarily within Oklahoma City limits and along I-35 south of the OKC Metro.

Between 2017 and 2021, there were three fatal crashes within work zones due to distracted driving within Oklahoma City limits.

Oklahoma's 2015 law prohibits texting while driving, but only novice drivers and bus drivers are prohibited from talking on cell phones while driving.

Other drivers will not be pulled over and ticketed for talking on cell phones or using its GPS navigation unless it is observed by law enforcement to impact the safe driving of the vehicle.

From 2017 through 2021, there were 516 fatal collisions involving young drivers. Fifteen fatal crashes involving young drivers occurred in work zones. The ODOT has implemented a program called Oklahoma Work Zone Safe to reach teen drivers aged 15-19 with three key principles in work zone safety: safe drivers, signs & laws, and the faces that serve us. Teen drivers who successfully complete the course receive a \$500 Oklahoma 529 Educational Scholarship from the Association of Oklahoma General Contractors.

In Oklahoma, a large volume of road construction means increased CMV collisions. Making safety a priority for work zones can be achieved through education of engineers who approve traffic planning on site. Monitoring this aspect of the SHSP can be achieved through the annual Action Plan.



Source: ODOT

The Oklahoma Highway Patrol (OHP) is dedicated to protecting the lives and property of the people of the State of Oklahoma. As part of the OHP, Troop S is dedicated to the goal of reducing the number of CMV collisions. Troop S:

- conducts six levels of roadside inspections
- focuses on CMV traffic enforcement

Troop S has a roadside inspection program with employees that are trained to inspect CMV at ports of entry located in the following counties: Beckham, Kay, Love, and Sequoyah. Troop S conducts education and outreach on a quarterly basis or upon request.

Troop S has set a multi-year goal of reducing collisions involving large trucks and passenger carriers by 2% each calendar year with an overall reduction of 6% at the end of FFY 2021.



Source: ODOT

Although Troop S has put forth a great deal of effort, the pandemic (less traffic led to unsafe speeds) may be a factor in the higher fatalities for 2021. The main culprit for CMV crashes in 2020 and 2021 were pickup trucks and trucks hauling trailers. Most of these collisions took place during the work week.

Troop S has determined to increase the total number of inspections initiated by traffic enforcement stops. Additional enforcement will help change driver behavior, reducing the number of CMV crashes statewide. A public education and outreach program has been designed to provide information on a variety of traffic safety issues related to CMVs and non-CMVs that operate around large trucks and buses.

The Commercial Motor Vehicle Safety Plan (CMVSP) reflects the Motor Carrier Safety Assistance Program (MCSAP). The goal of the MCSAP federal grant program is to reduce CMV involved crashes, fatalities, and injuries through consistent, uniform, and effective CMV safety programs. The online CVSP tool (eCVSP) outlines the State's CMV safety objectives, strategies, activities and performance measures.

As emerging technologies, such as collision avoidance, electronic logging devices, advanced telematics, and increasing levels of driver assistance – are implemented, the number of collisions involving CMV crashes are expected to decrease.

Reaching the TZD goal means preventing as many CMV crashes as possible. For Emphasis Area Action Plan strategies and performance measures, see Appendix A.

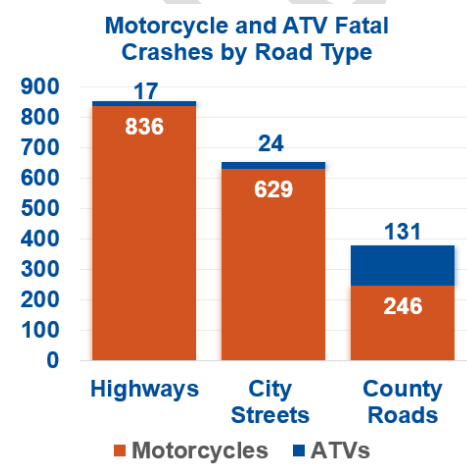
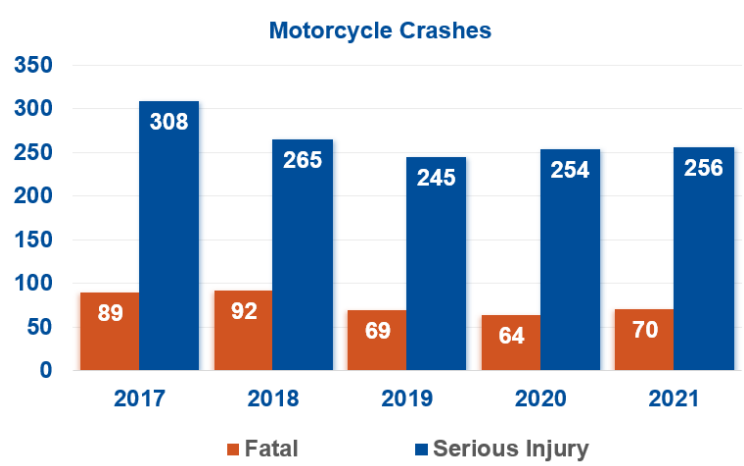


Motorcycle and All-Terrain Vehicle Crashes

Motorcycle and All-Terrain Vehicle Crashes

When it comes to crashes, motorcyclists are no match for cars, trucks, or even curves. Motorcyclists can avoid crashes by reducing speed when approaching curves, especially if the curve is sharp or the roads are wet.

From 2017 through 2021, there were 377 fatal collisions involving motorcyclists and 172 collisions involving ATVs on public roads. This data does not include the number of ATV crashes that occurred on private property.



75% of ATV crashes occurred on County Roads





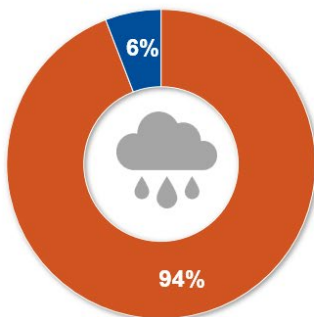
70%
of motorcyclist
fatalities were not
wearing a helmet.



ZERO
ATV drivers
involved in fatal
crashes were
wearing helmets

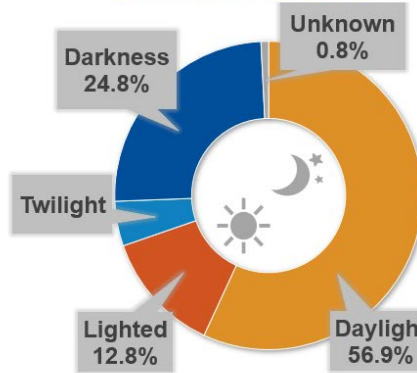


Motorcycle & ATV Fatal & Serious Injury Crashes by Precipitation Conditions

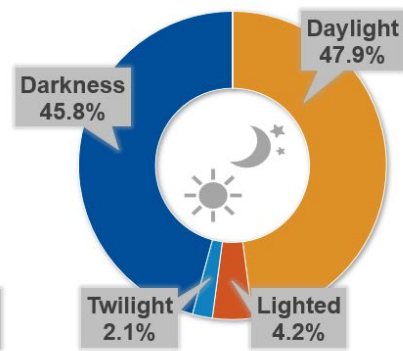


■ Dry Road Conditions
■ Wet or Other Road Conditions

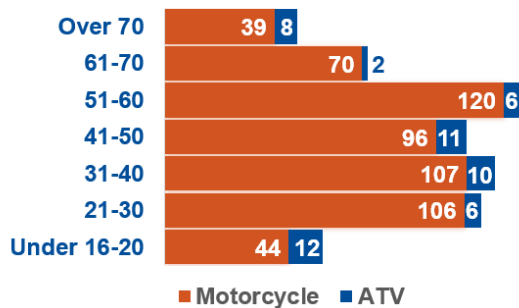
Lighting Conditions of Motorcycle Fatal Crashes



Lighting Conditions of ATV Fatal Crashes



Motorcycle & ATV Fatal Crashes by Age



Fatal crashes were
highest for
motorcyclists
between the
ages of 51 to 60

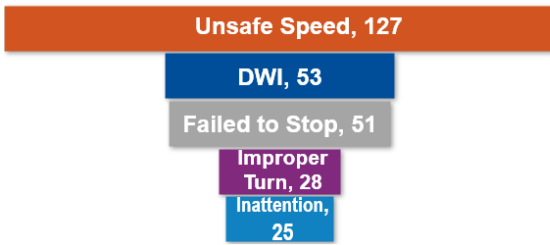


In 2011, OHP received a grant and entered into an agreement with the ODOT to promote Motorcycle Safety Education. The Motorcycle Division offers free classes to the public statewide. The OHSO has implemented motorcycle safety countermeasures through local police departments located in Broken Arrow, Edmond, and Tulsa. Technology centers located in Lawton, Ardmore, Altus, Elk City, and Norman also provide motorcycle rider training. An OHSO Program Manager oversees the selected Motorcycle Safety programs.

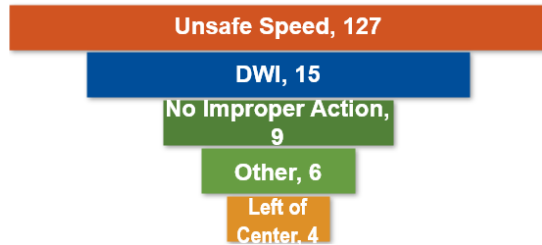


Source: OHSO

Motorcycle Fatal Crashes Due to Driver Behavior



ATV Fatal Crashes Due to Driver Behavior



Source: OHSO

In July of 2021, the Oklahoma Transportation Cabinet emphasized “Share the Road: Truck, Motorcycle Safety” in their public education campaign.

Reaching the TZD goal means preventing as many motorcyclist crashes and ATV crashes as possible. Unsafe speed is the number one factor for motorcyclists as well as ATVs.

For Emphasis Area Action Plan strategies and performance measures, see Appendix A.

Vulnerable Road Users

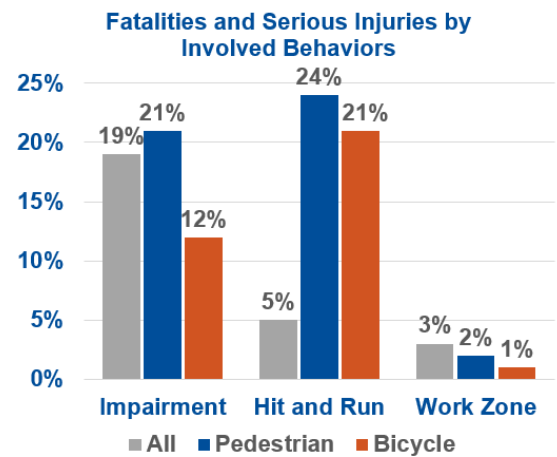
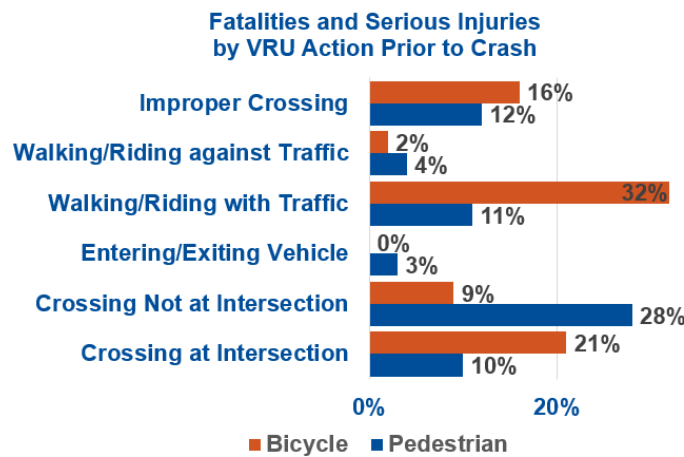


Source: Google Streetview

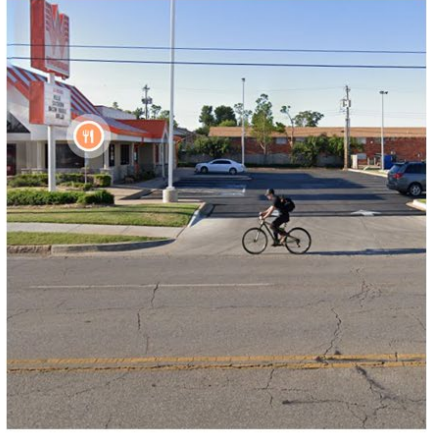
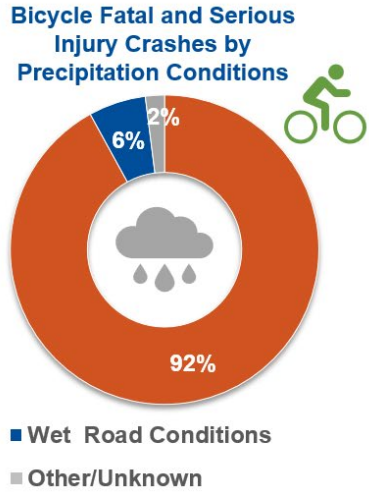
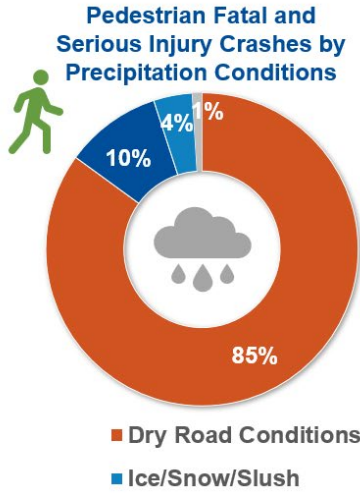
Vulnerable Road Users

The National Safety Council describes VRU as “those unprotected by an outside shield, as they sustain a greater risk of injury in any collision with a vehicle and are therefore highly in need of protection against such collisions. This broad definition can include (but is not limited to): a pedestrian; a roadway worker; a person operating a wheelchair or other personal mobility device, whether motorized or not; a person operating an electric scooter or similar; and a person operating a bicycle or other nonmotorized means of transportation.”

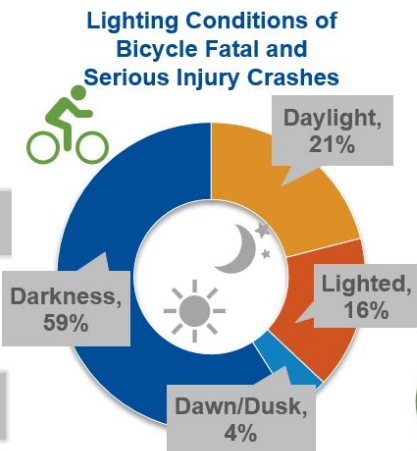
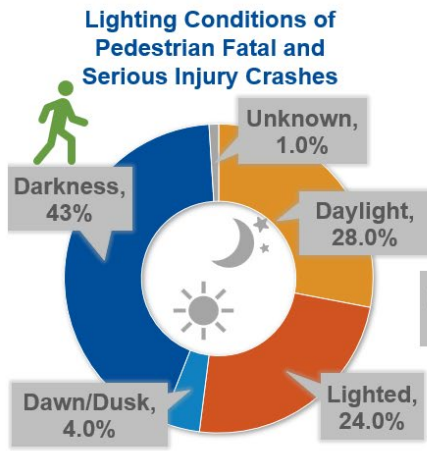
In Oklahoma, VRU deaths have increased and reached the highest number in the last decade. In 2021, alone, 115 people killed while walking, bicycling, or rolling. From 2017 through 2021, there were 476 people fatalities reported involving VRUs.



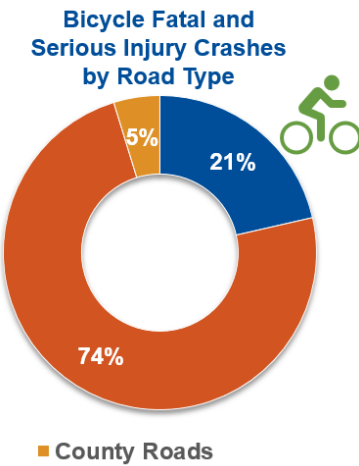
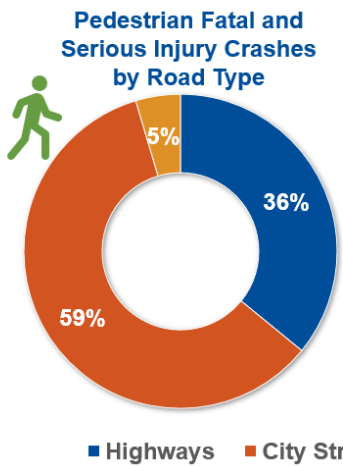
Between 2017 and 2021, pedestrian and bicycle fatalities and serious injuries were most prevalent in the early and late evening hours throughout the week and particularly over the weekend, when many crashes occur after midnight. This trend is consistent with other findings that show a high prevalence of severe pedestrian crashes in dark, unlit conditions. Additionally, an elevated rate of pedestrian crashes was seen during weekday commuting hours, especially in the evenings when many pedestrians will be commuting and dealing with elevated motorist volumes as well.



Source: Google Streetview



Fatal and Serious Injury VRU crashes occur more often between 6:00 p.m. and 12:00 a.m.



...and more often on Wednesdays, Fridays, and Saturdays than other days of the week.





Impairment involvement and hit and run crashes are a major issue for vulnerable road users in the state of Oklahoma. Of all pedestrian fatalities and serious injuries, 21% involved alcohol and/or drug impairment, and 24% of crashes were classified by the reporting officer as hit and run. Bicyclist fatalities and serious injuries exhibit similar but slightly less elevated patterns, with 12% involving impairment and 21% being hit and run. These patterns may relate to the elevated frequencies of vulnerable road user crashes occurring during late evening hours, when motorists may be more likely to be driving while intoxicated.

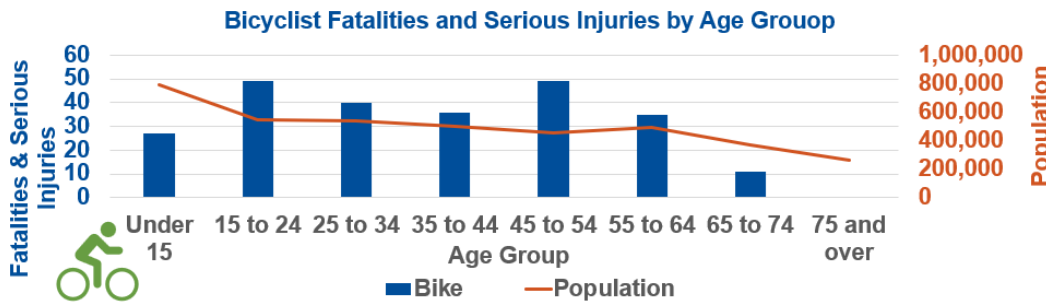
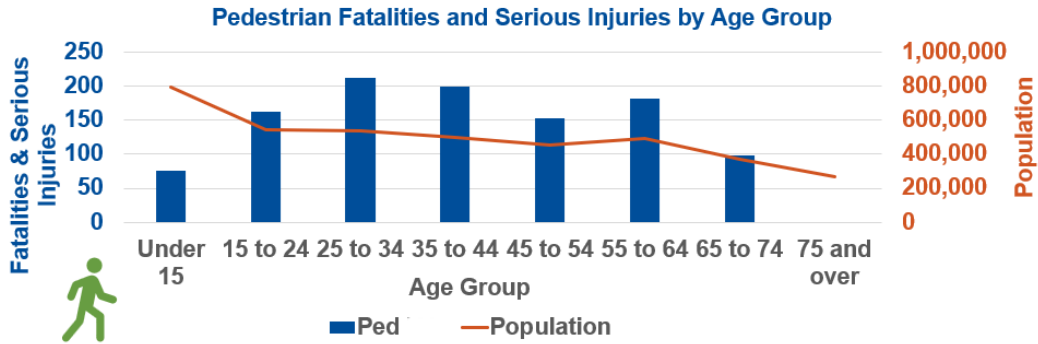
Fatalities and serious injuries occurring within defined work zones was also studied, noting approximately 2% and 1% of all pedestrian and bicyclist injuries occurring within work zones, respectively. Unusual traffic patterns in these work zones may contribute to these events, as well as the presence of workers, classified as pedestrians in the analyzed crash data, in vulnerable positions in work zones.

In Oklahoma, approximately 20% of the population is below the age of 15. Among these young residents, there were 76 pedestrian-related fatalities and serious injuries over the 2017-2021 study period, representing approximately 7% of fatalities and serious injuries across all ages. Though this is a relatively small proportion given their share of the population, it still represents a large number of children who are experiencing poor safety performance. Pedestrians aged 25-65 are consistently overrepresented in all age groups relative to their share of the population, likely reflecting higher numbers of trips traveled by these residents who may make frequent trips for daily commutes, errands, and more.

Similar to pedestrians, there were 27 bicyclist fatalities and serious injuries among children under the age of 15 over the 2017-2021 study period, representing approximately 11% of fatalities and serious injuries across all ages. Though this is a relatively small proportion given their share of the population, it still represents a large number of children who are experiencing poor safety performance as they ride their bikes. Bicyclists aged 45-54 are particularly overrepresented in terms of crash frequency, with 49 fatalities and serious injuries during the study period, making up 20% of all fatalities and serious injuries despite only representing about 11% of Oklahoma's population.

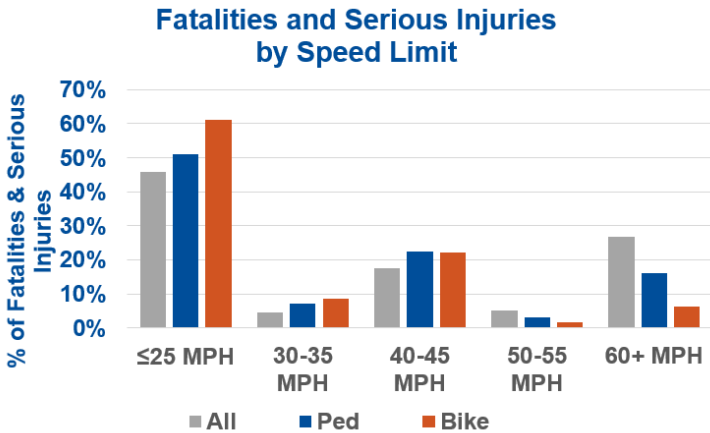


Source: ODOT



SUVs and Pickup Trucks were involved in 53% of pedestrian and 48% of bicycle fatal and serious injury crashes.

The types of vehicles involved in vulnerable road user collisions can have a significant impact on outcomes. Larger, heavier vehicles tend to cause more severe injuries due to increased kinetic energy involved in collisions.



VRU crashes occur most frequently on facilities with speed limits of 25 MPH or lower. However, this represents a large portion of the state's roadway network, including many neighborhood streets that have pedestrian and bicycle facilities. Approximately 20% of pedestrian and bicyclist injuries are also occurring on mid-speed roads with speed limits of 40-45 MPH.

Summary of Key VRU Findings

Oklahoma is experiencing an increase in pedestrian fatalities. Over the study period, a slight increase in pedestrian fatalities and serious injuries was noted, indicating a strong need for additional investment and effective planning. Bicycle fatalities and serious injury were found to be fairly study during the study period. Though this may appear less urgent than the pedestrian safety concern, it is still highly important to invest in improvements to bicycle safety across the state to ensure that the numbers begin decreasing.

Opportunities to improve the safety of vulnerable road users in dark conditions. Analyses found a large number of pedestrian and bicyclist crashes occurring at night, with many occurring in dark, unlit conditions. This points to a need to invest in infrastructure and policies that will help improve safety for these trips.

Many vulnerable road users are killed or seriously injured during hit and run events. Nearly a quarter of all vulnerable road user fatalities and serious injuries were found to involve hit and run crashes. This limits accountability for poor safety behaviors and may correlate to other unsafe behaviors leading up to the crash, such as impaired driving.

Pedestrians are crossing roads at unsafe locations. These unsafe behaviors may be indicative of roadway facilities which are not effectively serving vulnerable road users. Avoiding these behaviors may involve installation of additional crossing locations at busy pedestrian areas where the distance between crossing locations is long, improving motorist compliance with existing uncontrolled crossings, and providing traffic calming or reducing speed limits in pedestrian-heavy areas where these behaviors often occur to reduce the frequency and severity of these crashes when such crossings are made.

Bicyclists are being injured while riding along with traffic. Though this is generally the correct way to maneuver a bike in the presence of vehicular traffic, the prevalence of crashes under these conditions indicates a need for expanded bike facilities on roadways with histories of bicycle crashes or known popular routes.

Pedestrian and bicyclist fatalities and serious injuries are highly overrepresented in disadvantaged communities. Based on definitions in the Justice40 data set, disadvantaged communities represent higher frequencies of pedestrian and bicyclist fatalities and serious injuries. This may relate to lower rates of vehicle ownership and generally higher volumes of necessary active mode trips in these communities. This also means that the impacts of unsafe facilities may have stronger negative economic and social impacts on these communities which already experience other vulnerabilities.

Encouraging an increase in active transportation means addressing safety conditions that often are a deterrent to walking and cycling. An integrated approach that involves the 4 E's (Engineering, Enforcement, Education, and Emergency Medical Services) can improve pedestrian and bicyclist safety. Emerging technologies such as vehicle technology and design play an important role in a Safe System Approach for pedestrians and bicyclists.

In January of 2021, the ODOT and the Oklahoma Turnpike Authority launched a new, year-round safety education effort. The Make Safety Stick: Everybody Click initiative focused on a different highway safety topic each month. In May of 2021, the Oklahoma Transportation Cabinet included "Bicycle, Pedestrian Safety" in their public education campaign.

The OHSO sponsors programs through ACOG and INCOG to enhance safety for pedestrians and bicyclists. Oklahoma City uses the Watch for Me OKC program to provide:

- Information pertaining to laws and regulations for pedestrians and bicyclists
- Tips for driving, walking, and cycling in a safe manner
- Encouragement for increasing the number of people using active means of transportation

The OHSO also identifies Safe Kids Oklahoma (SKO) as a resource that uses qualified, experienced employees, contract labor and community partners to implement pedestrian and bicyclist safety education through events and activities such as:

- Walk This Way
- International Walk to School Day
- Spot the Tot
- Bike Rodeos
- Bike to School Day
- Other related events/activities targeting children who walk, or bike to school



In Oklahoma, the Transportation Alternatives program funds projects that prioritize the safety, comfort, and connectivity to destinations for pedestrians and bicyclists. An environment that separates people traveling at different speeds prevents the potential conflict that can lead to crashes and is in alignment with the Safe System Approach.

A VRU Assessment, compliant with the FHWA guidelines is provided in Appendix B.

Final Draft



IMPLEMENTATION

4



IMPLEMENTATION

Implementation and evaluation of the SHSP means regarding the SHSP as a living document that evolves as goals, strategies, and safety data change. The FHWA determines policy guiding the implementation and evaluation of the SHSP.

The implementation process has been customized according to the needs of Oklahoma. SHSP implementation for Oklahoma is based upon the Safe System Approach and traffic safety culture with TZD as the final goal.



Source: ODOT

Implementation consists of four fundamental elements: leadership, collaboration, communication, as well as data collection and analysis.

- Establishing SHSP leadership through the Governor's office communicates the importance of highway safety for the public. (See Executive Summary)
- Collaboration between stakeholders and safety partners builds trust and understanding. (See Thank You to Safety Partners for Collaboration)
- Effective communication means identifying stakeholders dedicated to safety and transparency who support sharing information to facilitate decision-making.
- Data collection and analysis is essential because the SHSP is a data driven process critical for prioritizing countermeasures and for developing effective safety programs.

Evaluation

The FHWA requires evaluation of the Strategic Highway Safety Plan to help confirm the validity of the emphasis areas, the effectiveness of strategies, and identify any issues related to the SHSP process, implementation, and progress.

Multidisciplinary stakeholders are necessary for evaluating results and updating the emphasis area action plans. Coordinating with stakeholders and safety partners for alignment of goals, objectives, and strategies strengthens SHSP implementation and evaluation efforts. These efforts lead to more efficient and effective road safety practices. An effective marketing strategy informs the public concerning transportation safety issues and encourages active participation among safety partners.

The FHWA developed the SHSP Evaluation Process Model (EPM) to assist States with conducting a program evaluation of their SHSP. An EPM helps answer important questions concerning the effectiveness of the SHSP. SHSP program evaluation is composed of two equally important components – process evaluation and performance evaluation.

Process Evaluation

Process evaluation assesses the procedural, administrative, and managerial aspects of the SHSP (such as leadership, SHSP structure, partners, collaboration, and communication, etc.). Process evaluation identifies opportunities to improve the overall SHSP process.

The SHSP process reflects organizational structure, multidisciplinary collaboration, methods for setting goals and objectives, data driven emphasis areas, as well as aligned agency priorities. A memorandum of understanding can be useful for institutionalizing the collaborative multidisciplinary nature of the SHSP process. The evaluation process should be documented, serving as a reference for new staff members.

Performance Evaluation

Performance evaluation measures progress and productivity, keeping the SHSP process open to feedback, change, and improvement. Performance evaluation examines the outputs and outcomes resulting from SHSP implementation. It tracks performance measures and assesses the degree to which the SHSP is meeting goals and objectives. Important methods of evaluating outcome are trend analysis, attitude and behavior analysis, benefit/cost analysis, survey, and other data.

For more information, see The Strategic Highway Safety Plan Implementation Process Model - Safety | Federal Highway Administration (dot.gov)

https://safety.fhwa.dot.gov/shsp/epm/pdf/shsp_epm_report.pdf

<https://safety.fhwa.dot.gov/shsp/guidebook/ch5.cfm#ch52>

Reviewing the previous year's accomplishments and determining the current years anticipated work plan will ensure continual implementation of strategies and completion of the various Emphasis Area action plans. Each year, the Action Plan will report progress. Annual federal reporting requirements such as the HSIP Annual Report and the HSP will also report progress.

Effective strategies and effective allocation of resources depend on continued evaluation of the SHSP. This means reviewing fatality and serious injury crash data on an annual basis. The data analysis will identify progress towards achieving SHSP objectives for each emphasis area.

Reviewing evaluation results mean staff members can identify and document ways to improve SHSP process and performance. Results of process and performance evaluation increases necessary commitment and improves the SHSP, laying the foundation for the new SHSP cycle.



THANK YOU TO SAFETY PARTNERS FOR COLLABORATION

The 2023 SHSP coordinated the efforts of all agencies and stakeholders that have a role in highway safety. ODOT recognizes the agencies and organizations listed here for their contributions to this plan and continued commitment to improving traffic safety across Oklahoma. These include, but are not limited to:

SHSP Executive Committee

ODOT- Secretary of Transportation Tim Gatz

Oklahoma DPS- Commissioner Tim Tipton

OHP- Chief of Highway Patrol Pat Mays

OHSO- Director Paul Harris

OTA- Deputy Director Joe Echelle

EMS- Program Manager Dale Adkerson

FHWA- Division Administrator Basharat Siddiqi

NHTSA- Region 6 Administrator Maggi Gunnels

FMCSA- OK Administrator Larry Ramsey

SHSP Implementation Team Agencies

Association of Central Oklahoma Governments (ACOG)

Frontier Metropolitan Planning Organization (Frontier MPO)

Indian Nation Council of Governments (INCOG)

Lawton Metropolitan Planning Organization (Lawton MPO)

Local Technical Assistance Program (LTAP)

National Safety Council (NSC)

Northern Oklahoma Regional Transportation Planning Organization (NORTPO)

Oklahoma Association of County Commissioners

Oklahoma Association of County Engineers

Oklahoma Department of Health

Oklahoma Department of Public Safety (DPS)

Oklahoma Highway Patrol (OHP)

Oklahoma Turnpike Authority (OTA)

South Central Oklahoma Regional Transportation Planning Organization (SCORTPO)
Southwest Oklahoma Regional Transportation Planning Organization (SORTPO)
Tribal Technical Assistance Program (TTAP)

Final Draft

ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
ATV	All-Terrain Vehicle
BAC	Breath Alcohol Content
BTD	Breath Test Device
CDL	Commercial Driver License
CMV	Commercial Motor Vehicle
CPS	Child Passenger Safety
CVSP	Commercial Vehicle Safety Plan
DPS	Department of Public Safety
DUI	Driving Under the Influence
DWI	Driving While Impaired
EMS	Emergency Medical Services
EPM	Evaluation Process Model
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
GHSA	Governors Highway Safety Association
HFST	High Friction Surface Treatment
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
HVE	High-Visibility Enforcement
ITS	Intelligent Transportation Systems
LRTP	Long Range Transportation Plan
LTAP	Local Technical Assistance Program
MPO	Metropolitan Planning Organization
NHTSA	National Highway Traffic Safety Administration
ODOT	Oklahoma Department of Transportation
OHP	Oklahoma Highway Patrol
OHSO	Oklahoma Highway Safety Office
RTPO	Regional Transportation Planning Organizations
SAFE-T	Statewide Analysis for Engineering & Technology
SHSP	Strategic Highway Safety Plan
SKO	Safe Kids Oklahoma
TZD	Toward Zero Deaths
VMT	Vehicle Miles Traveled
VRU	Vulnerable Road User

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APPENDICES – ACTION PLAN FOR EMPHASIS AREAS AND VULNERABLE ROAD USER ASSESSMENT

Action plans identify specific action steps for each countermeasure, responsible agency or agencies, timelines, etc. For the Oklahoma 2023 SHSP, the Action Plan is separate from the SHSP because Action Plans will be developed on an annual basis to facilitate modifications.

Emphasis Area Teams develop Action Plans to implement the SHSP. This includes developing interim goals, performance measures, measurable objectives, strategies, and countermeasures.

Oklahoma has identified SIX core implementation areas to ensure each Safe System principal is considered and each of the five elements are addressed in all projects that have an impact on safety. The action plans shown in the Appendix identify the primary implementation area for the listed strategies and actions.

- Engineering and Infrastructure
- Education and Communication
- Funding and Collaboration
- Enforcement and Legislation
- Data Collection and Analysis
- Emergency Response and Incident Management

Action Plan Strategies for Emphasis Areas



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Transportation

Cross-Cutting, applicable to all Emphasis Areas

Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Establish Criteria to Incentivize HSIP Funding			
Establish criteria to incentivize HSIP funding on strategies and or locations prioritized in the SHSP Action Plan	Criteria established and published	ODOT	FHWA
Increase Driver Education			
Pursue funding opportunities to subsidize driver education costs	- Funding or sponsorship pursued - Criteria established to disperse funds if received	Service Oklahoma	DPS, ODOT, FMCSA
Pursue legislation change to require all newly licensed OK drivers regardless of age to receive minimal safety education and revisit parent taught requirements for minors.	- Department heads meet with potential legislators - Draft potential legislation -Legislation introduced to committee in OK House or Senate - Legislation passed to increase min fines	DPS	DPS, ODOT, FMCSA, Service Oklahoma
Implement House Bill 4100 Operation Work Zone Awareness	Operation Work Zone Awareness program established and published online by DPS	DPS	OHP, OHSO, DPS

Final



Lane Departure

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Identify and upgrade at-risk roads for roadway departures.

Prioritize roadway segments to address for roadway departure crashes	- Criteria established to identify and prioritize roadside and cross median crash segments - Segment lists created and tracked	ODOT	FHWA
Establish/formalize policies for systemic roadside safety improvements (warrants/conditions to implement) -cable median barrier -rumble strips/stripes -shoulder widening -curve warning signs -Safety Edge	Policies Established	ODOT	FHWA
Implement systemic roadside safety improvements as applicable on priority corridors	-Number of priority segments with systemic improvements	ODOT	FHWA
Monitor and track objects in Clear Zone and right-of-way to improve roadway departure safety.			
Create training program for Transportation Managers on how to identify and locate objects and encroachments within clear zone and right-of-way.	Training course established	ODOT	FHWA
Work with districts and locals to remove natural objects currently inside right-of-way/clear zone.	Objects removed from Clear Zone/Right-Of-Way	ODOT	County and Local Right of Management Agencies



Impaired Driving

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Sustain a data-driven and high visibility impaired driving enforcement program

Conduct highly visible alcohol impaired driving enforcement activity at strategic times throughout the year including required blitzes and the national campaign based on local fatal/serious injury crash problem identification.	- Number of overtime hours worked annually - Number of impaired driving citations	DPS/OHSO	OHP, County and Local Law Enforcement Agencies
Conduct overtime enforcement focused on drug impaired drivers using ENDUI or Advanced Roadside Impaired Driving Enforcement (ARIDE) certified officers.	- Number of overtime hours worked annually - Number of impaired driving citations	OHP	County and Local Law Enforcement Agencies
Conduct Advanced Roadside Impaired Driving Enforcement ARIDE courses for law enforcement officers.	Number of trainings offered	NHTSA	
Train more officers as ENDUI, ARIDE and Drug Recognition Experts (DRE)	- Number of certified ENDUI, ARIDEs, DREs - Number of DRE call-outs annually	OHP	County and Local Law Enforcement Agencies
Train and certify law enforcement across the state on new instruments to ensure consistency and establish competency.	Number of law enforcement trained annually	Department of Health	State, County and Local Law Enforcement Agencies

Implement an impaired driving paid mass media campaign and outreach effort using delivery methods that reach specific segments of the targeted population.

Review crash data to identify population/demographics at higher risk for impaired driving behaviors	Target audience(s) identified	OHSO	ODOT
Complete market research to develop fresh effective (evoke emotion with a call to action) marketing campaign to target higher risk populations prone to impaired driving for both alcohol and marijuana use.	Market research completed	OHSO	ODOT Strat Comm, NHTSA
Implement paid media campaign and outreach	- Annual number of gross impressions (number of people reached) - Number of outreach events held annually	OHSO	ODOT Strat Comm, NHTSA, Health Department



Occupant Protection

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Pursue State Legislation changes to encourage Occupant Protection

<p>Pursue Legislation change to adjust minimum fines in accordance with inflation rates for failure to wear required seat belts/occupant protection</p> <ul style="list-style-type: none"> - from \$20 to \$60 for adults - from \$50 to \$100 for children 	<ul style="list-style-type: none"> - Department heads meet with potential legislators - Draft potential legislation - Legislation introduced to committee in OK House or Senate - Legislation passed to increase minimum fines 	<p>DPS</p>	<p>Department of Health</p>
<p>Pursue Legislation change to require that all minor children over the age of 8 years old be required to use seat belts/occupant restraints (<i>currently not required in back seat</i>) check status of SB 681?</p>	<ul style="list-style-type: none"> - Legislation passed to require all minor children to utilize occupant restraints 	<p>DPS</p>	<p>Department of Health, Injury Prevention Services, Safe Kids Oklahoma</p>
<p>Pursue Legislation change to require all motorcyclists to wear helmets</p>	<ul style="list-style-type: none"> - Department heads meet with potential legislators - Draft potential legislation - Legislation introduced to committee in OK House or Senate - Legislation passed to require all motorcyclists to wear helmets 	<p>OHSO</p>	<p>Department of Health</p>
<h4>Deploy high visibility seat belt-related enforcement in jurisdictions at times with disproportionate number of unrestrained occupant-related fatalities and serious injuries.</h4>			
<p>Revitalize highly visible enforcement activities at strategic times throughout the year consistent with the NHTSA Communications Calendar including required blitzes and the national campaign, and based on local fatal/serious injury crash problem identification.</p>	<ul style="list-style-type: none"> - Number of overtime hours worked annually - Number of seat belt citations annually 	<p>OHP, County and local law enforcement agencies</p>	
<p>Continue to provide grant funding for enforcement overtime hours</p>	<p>number of grants administered annually</p>	<p>OHSO</p>	<p>NHTSA</p>



Occupant Protection

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Implement mass media campaigns and outreach efforts using delivery methods that reach specific high-risk segments of the population to encourage seat belt use.

Review crash data to identify population/demographics not utilizing seat belts	Target audience(s) identified	DPS/OHSO	ODOT, NHTSA
Complete market research to develop fresh effective (evoke emotion with a call to action) marketing campaign to target higher risk populations prone to not using seat belts	Market research completed	DPS/OHSO	ODOT Strat Comm, NHTSA
Implement paid media campaign and outreach	- Annual number of gross impressions (number of people reached) - Number of outreach events held annually	DPS/OHSO	ODOT Strat Comm, NHTSA, Health Department

Continue Car Seat Awareness/Education

Promote child safety seat installation check events, with opportunities for car seat giveaways.	- Number of child safety seats inspections annually - Child safety seats distributed annually	Department of Health	Injury Prevention Service, Safe Kids Oklahoma
Pursue potential sponsors to expand existing child safety seat giveaways	Sponsor Secured	Department of Health	Injury Prevention Service, Safe Kids Oklahoma

Final Draft



Unsafe Speeds

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Update and Publish Speed setting process based on national best practices.			
Establish a Speed Committee comprised of FHWA, State, County, and Local representatives.	Committee Established	ODOT	FHWA, County and Local Agencies
Committee to review national best practice procedures for setting speed limits based on highway or street characteristics. Include work zone speed limit setting with advisory speeds for curves and transitions.	<ul style="list-style-type: none"> - Recommendations made for updated speed setting process - ODOT to publish updated process for state controlled routes - Publish recommendations for speed limit setting for local/county routes 	ODOT, County and Local Agencies	FHWA
Review and recommend new statewide curve advisory speeds	Publish new curve advisory speeds	ODOT	County and Local Agencies, FHWA
Identify and upgrade roadway corridors with speed related crashes			
Prioritize roadway segments to apply road design and/or engineering measures to obtain safe and reasonable speeds	<ul style="list-style-type: none"> - Criteria established to identify and prioritize corridors - Corridor lists created and tracked 	ODOT	County and Local Agencies
Establish Criteria for road diets or lane reallocation	Criteria established	ODOT	FHWA, County and Local Agencies
Implement road design and engineering measures on priority corridors (road diets, medians, bump - outs, roundabouts, signal timing, lane narrowing, etc.)	<ul style="list-style-type: none"> - Corridors identified - Number of corridors implemented, or in progress toward implementation (studied, in design) 	ODOT	FHWA, County and Local Agencies
Conduct high visibility speed enforcement linked with paid and earned media at the state, county and local levels.			
Provide crash and/or speed data to jurisdictions for corridor enforcement based on speed related fatal and serious injury crashes.	<ul style="list-style-type: none"> - Develop list of top corridors for locals 	ODOT	OHSO, DPS
Provide funding to enforce speeds within specified high speed fatal and serious injury corridors including work zones	<ul style="list-style-type: none"> - Reduction in crash frequency - Reduction in crash severity - Amount of funding provided 	OHSO	NHTSA, DPS



Unsafe Speeds

Countermeasures

Outcomes/ performance measure(s)

Primary Agency

Supporting Agencies

Pursue State Legislation changes to encourage Safe Speeds

Pursue Legislation change to adjust speeding fines/fees/court costs: - 11 mph over speed limit <i>lower</i> than current \$267 - increased penalties for repeat and excessive speeding offenders - expand law for driver education course in lieu of fees and fines for first time offenders beyond work zone	<ul style="list-style-type: none"> - Department heads meet with potential legislators - Draft potential legislation - Legislation introduced to committee in OK House or Senate - Legislation passed to adjust speeding fines 	DPS, OHP, ODOT	County and Local Agencies
Pursue Legislation change to allow for automated/camera speed enforcement -start with schools zones and/or work zones	<ul style="list-style-type: none"> - Department heads meet with potential legislators - Draft potential legislation - Legislation introduced to committee in OK House or Senate - Legislation passed to permit automated/camera enforcement 	DPS, OHP, ODOT	OHSO, FMCSA, OHP, Work Zone Safe, AOGC, NHTSA
<h4>Implement a Safe Speeds paid mass media campaign and outreach effort using delivery methods that reach specific segments of the targeted</h4>			
Review crash data to identify population/demographics at higher risk for speeding	Target audience(s) identified	OHSO	ODOT, NHTSA
Complete market research to develop fresh effective (evoke emotion with a call to action) marketing campaign to target higher risk populations prone to speed related crashes <i>educate public that excessive speeding in work zone can lead to \$10K fine</i>	Market research completed	OHSO	ODOT Strat Comm, NHTSA
Implement Campaign	Number of impressions, audience reached	DPS/OHSO	ODOT Strat Comm, NHTSA



Intersection Improvements

Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Identify priority intersections for safety improvements			
Establish criteria for prioritizing signalized and unsignalized intersections for improvements	-Criteria established to prioritize signalized and unsignalized intersections - intersection lists created and tracked	ODOT	FHWA
Implement proven, low-cost systematic safety improvements to reduce intersection crashes			
Implement Enhanced Signing and Striping Standards to use on priority intersections; including considerations for Vulnerable Road Users	- Enhanced Standards identified - Number of priority intersections treated with enhanced signing or striping	ODOT	FHWA, County and Local Agency Transportation Depts
Implement Signal Back plate Standards	- Number of priority intersections upgraded with signal back plates	ODOT	FHWA, County and Local Agency Transportation Depts
Analyze and update signal timing, and include evaluation of pedestrian facilities during signal timing field work. Expand scope to include evaluation of phase changes (protected turns) based on field observations of queues and crash data.	- Number of priority intersections retimed	ODOT	FHWA, County and Local Agency Transportation Depts
Develop and implement a comprehensive plan to address angle and left crashes at intersections.			
Realign Offset Left Turn Lanes	Number of priority intersections with realigned offset left turn lanes	ODOT	FHWA, County and Local Agency Transportation Depts
Finalize Intersection Control Evaluation (ICE) policy to systematically screen intersections for both operational and safety performance including consideration of roundabouts	ICE Process Published	ODOT	FHWA
Utilize ICE screening on State-owned/ managed priority intersections to determine where geometric and/or signal improvements should be prioritized	Number of priority intersections studied with ICE	ODOT	FHWA
Pursue intersection geometric and/or signal improvements	Number of priority intersections in process for improvement (design, construction)	ODOT	FHWA, County and Local Agency Transportation Depts
Complete an Access Management Policy	policy completed and published	ODOT	FHWA
Evaluate and manage driveway access near priority intersections	Number of priority intersections with improved access management	ODOT	County and Local Agency Transportation Departments



Commercial Motor Vehicle (CMV) Crashes and Work Zones

Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Maintain a CMV inspection program			
Continue roadside inspection program to evaluate the safety of the drivers and vehicles of CMV carriers operating in Oklahoma	Inspections conducted and reported in the national database annually	OHP	FMCSA
Implement a percentage of roadside inspections on pickup trucks hauling trailers	% of inspections include pickup trucks pulling trailers	OHP	FMCSA
Provide CMV safety education and awareness activities to carriers, commercial drivers and the public.			
Promote the Federal Motor Carrier Safety Administration (FMCSA) Our Roads, Our Safety	Information presented/distributed	FMCSA	OHP, OHSO, DPS
Set up a State Fair display and provide information to the public on commercial vehicle safety.	Information presented/distributed	FMCSA	OHP, OHSO, DPS
Improve commercial motor vehicle safety in work zones.			
Review statewide standards and policies for accommodating CMVs in work zones.	- Current policies reviewed - Recommendations distributed	ODOT	FHWA
Create and disseminate educational materials on the importance of giving CMVs more space in work zones.	Materials developed and distributed	FMCSA	OHP, OHSO, DPS
Targeted speed enforcement to both CMVs and passenger vehicles to discourage speed differentials	Increase warnings and citations given in work zones	OHP	Local Law Enforcement
Continue and promote the Work Zone Safe Education Safety Corridor Program for teen drivers	Number of teens completing the course annually	Work Zone Safe	OHP, ODOT, DPS, OTA



Motorcycle and All-Terrain Vehicle (ATV) Crashes

Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Provide training to motorcycle riders on skills related to crash causation			
Identify additional incentives to encourage motorcycle riders to attending existing motorcycle safety training courses	Identify and implement incentives	DPS	OHSO
Increase annual attendance of motorcycle and ATV training courses	- Number of attendees increases annually - Number of YOUNG attendees (under age 25) annually	DPS	OHSO
Implement paid media and outreach programs with data-driven safety messages to motorcyclists and motorists.			
Work with the media buyer to reach both the motorcyclist with a safety message and the general public with a motorcycle awareness message	- Annual number of gross impressions (number of people reached) - Number of outreach events held annually	OHSO	ODOT Strat Comm, Department of Health, Injury Prevention Service, Safe Kids Oklahoma
Public education regarding the legal requirements for ATVs and side by sides to be street legal (lighting, mirrors) o Not letting children drive ATVs	- Annual number of gross impressions (number of people reached) - Number of outreach events held annually	OHSO	ODOT Strat Comm, Department of Health, Injury Prevention Service, Safe Kids Oklahoma

Final

Vulnerable Road User Safety Strategies



Countermeasures	Outcomes/ performance measure(s)	Primary Agency	Supporting Agencies
Ensure vulnerable road user safety programs and projects are funded where need and impact are greatest across Oklahoma.			
Per the 23 U.S.C. 148(g)(3) Vulnerable Road User Special Rule, if the total annual fatalities of vulnerable road users in a State represents not less than 15 percent of the total annual crash fatalities in the State, at least 15% of Highway Safety Improvement	15% of HSIP funding allocated to VRU safety projects	ODOT	
Coordinate and integrate the use of road safety and active transportation funding especially HSIP, Transportation Alternatives, and Oklahoma Highway Safety Office (OHSO) programs, to ensure vulnerable road user safety is prioritized and	Increase in funding spent on VRU programs	ODOT	OHSO
Create a list/toolkit of effective vulnerable road users safety countermeasures and develop design guidance and trainings for use by state, regional, and local agencies.	Toolkit available and used by agencies	ODOT	
Expand the Watch for Me OK campaign efforts to educate the public on the rules of the road for all users.	Watch for Me OK campaign continuation	OHSO	ODOT
Annually report vulnerable road user safety statistics, key road safety improvements, new programs and laws, and efforts found effective in preventing pedestrians and bicyclists from being killed and severely injured.	Reports available to track VRU collision data trends	ODOT	
Require education on how to look out for vulnerable road users in novice driver education and adjudication programs for drivers with multiple tickets for unsafe driving such as speeding and red-light running that puts vulnerable road users at risk.	Legislation requiring education to multiple offenders	OHSA	ODOT
Expand vulnerable road user's safety educational programming through programs such as Safe Routes to School and integration of safety and awareness efforts in HSIP Emphasis Areas and OHSO programs.	Increased amount of education programs related to bicycle and pedestrian safety	OHSO	ODOT

Vulnerable Road User Assessment



OKLAHOMA
Transportation

VULNERABLE ROAD USER SAFETY ASSESSMENT

October 20, 2023

CONTENTS

Introduction.....	4
Toward Zero Vulnerable Road User Deaths and Serious Injuries.....	8
VRU Safety and Equity	11
Background.....	13
Overview of Vulnerable Road User Safety Performance.....	35
Summary of Quantitative Analysis	56
Summary of Consultations	67
Vulnerable Road User Safety Strategies	73
Conclusions.....	74

FINAL DRAFT

Disclaimers

Information contained in this document is for planning purposes and should not be used for final design of any project. All results, recommendations, and commentary contained herein are based on limited data and information and on existing conditions that are subject to change. Further analysis and engineering design are necessary prior to implementing any of the recommendations contained herein. Geographic and mapping information presented in this document is for informational purposes only, and is not suitable for legal, engineering, or surveying purposes. Data products presented herein are based on information collected at the time of preparation. Toole Design Group, LLC makes no warranties, expressed or implied, concerning the accuracy, completeness, or suitability of the underlying source data used in this analysis, or recommendations and conclusions derived therefrom.

Federal law 23 United States Code Section 409 governs use of the data in this report. Under this law, data maintained for purposes of evaluating potential highway safety enhancements "...shall not be subject to discovery or admitted into evidence in a federal or state court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data." If you should attempt to use the information in this report in an action for damages against City, the State, or any other jurisdiction involved in the locations mentioned in the data, these entities expressly reserve the right, under Section 409, to object to the use of the data, including any opinions drawn from the data.

INTRODUCTION

Purpose

A vulnerable road user (VRU) is defined as a person walking, bicycling, or rolling, using a mobility assistance device, or a roadway worker or first responder on foot per the Code of Federal Regulations, and are coded as a Pedestrians, Pedestrian Conveyance, Bicyclist, and Other Cyclist on the Oklahoma SAFE-T Database.^{1, 2, 3}

In 2021, 115 people were killed while walking, bicycling, or rolling across all roads in Oklahoma, reaching the highest number in the last five years. From 2017 through 2021, 85% of VRU deaths were pedestrians (326 of 385 lives lost). Figure 1 below shows the annual VRU fatalities based on the mode used by the person killed.

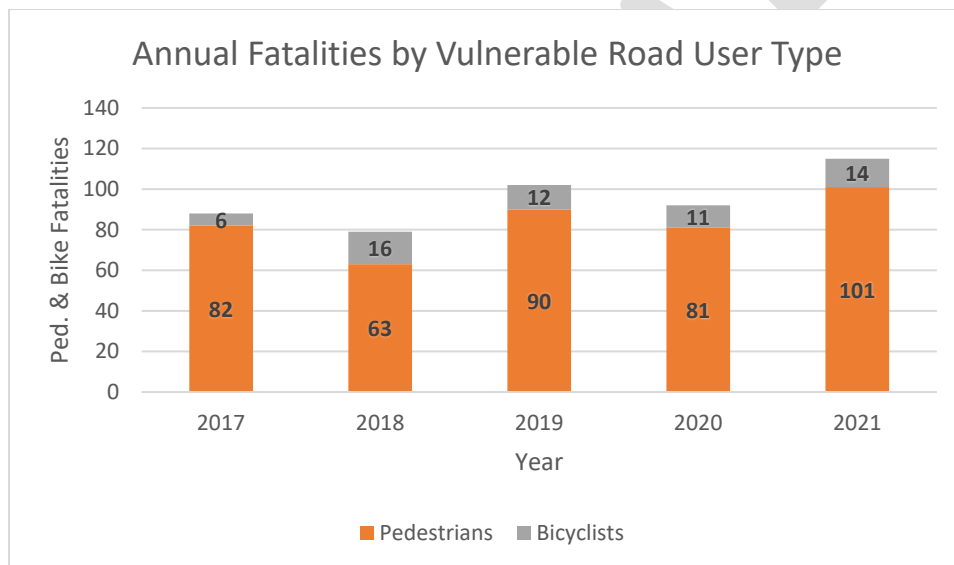


Figure 1. Annual fatalities by mode across Oklahoma (Source: SAFE-T Database 2017-2021)

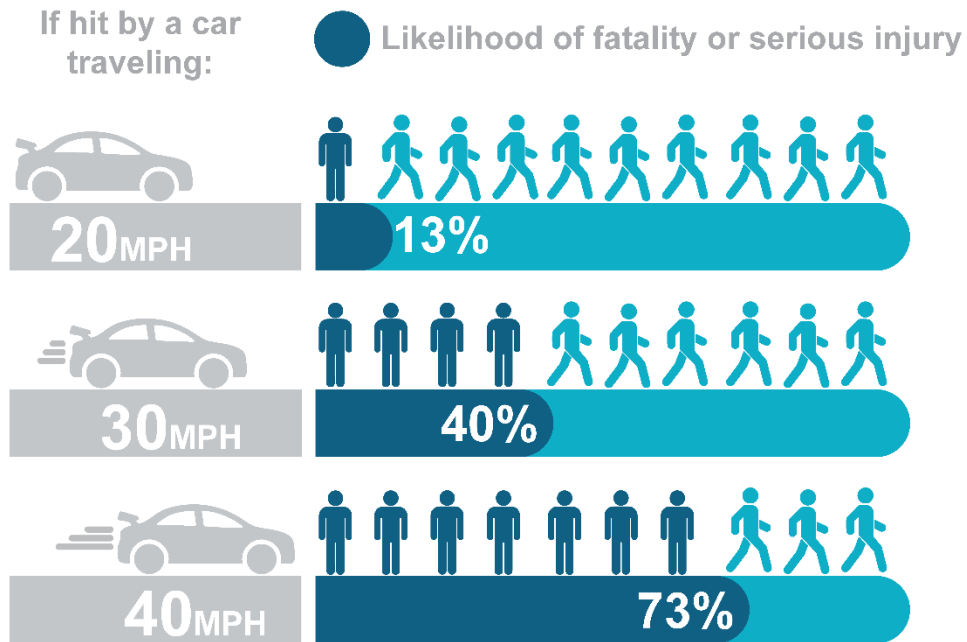
The first Oklahoma Department of Transportation (ODOT) VRU Safety Assessment (the “Assessment”) and new Vulnerable Road Users Emphasis Area in the 2023-2028 Strategic Highway Safety Plan (SHSP) are focused on understanding historical factors of reported crashes impacting VRU deaths and serious injuries to inform future safety strategies and processes across all roads in Oklahoma. Preventing deaths

¹ <https://highways.dot.gov/safety/hsip/hsip-special-rules>

² <https://www.odot.org/traffic/files/safe-t-training.pdf>

³ Motorcycles are not included as a VRU per the Federal Code of Regulations.

and serious injuries to people walking, bicycling, and rolling is critically important, especially as speeds and impact forces increase per Figure 2 below.⁴



Data Citation: Tefft, B.C. (2011). Impact Speed and a Pedestrian's Risk of Severe Injury or Death (Technical Report). Washington, D.C.: AAA Foundation for Traffic Safety.

Figure 2. Fatality or serious Injury risk compared to vehicle speeds (Figure source: Toole Design Group)

This Assessment meets the Federal Highway Administration (FHWA) VRU Safety Assessment Guidance, requirements that:

As part of the Vulnerable Road User Safety Assessment, the State shall use a data-driven process to identify areas of high-risk for vulnerable road users. (23 U.S.C. 148(l)(2)(A)). The State must consult with local governments, metropolitan planning organizations (MPOs), and regional transportation planning organizations that represent a high-risk area (23 U.S.C. 148(l)(4)(B)) and develop a program of projects or strategies to reduce safety risks to vulnerable road users in areas identified as high-risk (23 U.S.C. 148(l)(2)(B)).⁵

The State of Oklahoma participates in various Federal road safety programs to receive funding for roadway safety projects that help prevent fatal and serious injury crashes across Oklahoma, including the FHWA Highway Safety Improvement Program (HSIP) and National Highway Traffic Safety Administration (NHTSA) funding. As part of the new HSIP requirements in the Infrastructure Investment and Jobs Act/Bipartisan Infrastructure Law (IIJA/BIL), "All states are required to complete an initial

⁴<https://aaafoundation.org/impact-speed-pedestrians-risk-severe-injury-death/>

⁵ https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf

Vulnerable Road User Safety Assessment by November 15, 2023,” and then update it every five years. The Assessment must be done on all roads across Oklahoma, not just State routes. Since ODOT is also updating the SHSP this year on the required five-year HSIP cycle, this Assessment will be made a part of Oklahoma’s 2023 SHSP and a VRU Safety Emphasis Area will be included in the SHSP.

The IJA/BIL also created a new 15% VRU Special Rule under the HSIP.⁶ It requires that states must obligate at least 15% of their HSIP project funds for the following fiscal year toward improving safety for people walking, bicycling, and rolling if the total annual VRU fatalities is equal to or greater than 15% of the total annual crash fatalities in that state. States must also report on how the 15% VRU Special Rule funding is used annually until the VRU fatality rates are below 15%. Because Oklahoma had more than 15% VRU fatalities in 2022 and falls under VRU Special Rule, this Assessment should serve as a roadmap for where and how the VRU project funds are used to improve the safety of people walking, biking, and rolling across Oklahoma. The 15% VRU Special Rule funding projections are shown in Table 1 below.

Table 1. OK HSIP Annual Report Obligated Funding used to project 15% VRU Special Rule Obligated Funding (Source: FHWA OK 2022 HSIP Annual Report⁷)

Fiscal Year	OK HSIP Annual Report Obligated Funding	Projected 15% VRU Special Rule Obligated Funding
FY2022	\$33,290,446	\$4,993,567
FY2023	\$48,025,927	\$7,203,889

While the ODOT SHSP is focused on surface transportation improvements for all modes, the Oklahoma Highway Safety Office (OHSO) develops a Highway Safety Plan (HSP) annually focused on road safety behavioral and education programs that reduce traffic-related fatalities and serious injuries.^{8,9} The OHSO HSP includes a Non-Motorized (Pedestrian and Bicycle) Program Area that should be coordinated with this Assessment and the new HSIP VRU Safety Emphasis Area. In addition, ODOT is also completing its first statewide ATP this year.

The VRU Safety Assessment and Emphasis Area should be coordinated with other agencies involved in VRU safety and maximize resources across the HSIP, SHSP, HSP, and ATP as noted in the *Vulnerable Road User Safety Strategies* section. Additionally, the VRU Safety Assessment and Emphasis Area should be used to inform where VRU safety improvements can be implemented and how safety programs can best implemented to prevent people walking, bicycling, or rolling from being killed or seriously injured across all roads in Oklahoma.

⁶ https://safety.fhwa.dot.gov/hsip/rulemaking/docs/Section148_SpecialRule_Guidance.pdf

⁷ <https://highways.dot.gov/sites/fhwa.dot.gov/files/2023-08/OK-HSIP-2022.pdf>

⁸ <https://ohso.ok.gov/>

⁹ <https://ohso.ok.gov/strategic-planning-results>

VRU Safety Projections

As noted in the vision, mission, and goal section of the 2023 SHSP, “the vision of the Oklahoma SHSP is to provide and promote the safest roadway transportation system for all travelers” and the goal is to “achieve reductions in fatalities and serious injuries in all Emphasis Areas on the path to zero.” The 2023 SHSP notes that in 2022, ODOT began a goal of “annual 2% reduction in fatalities for the next five years” and below is a chart of what that would look like for the VRU Safety Emphasis Area over the next 5 years.

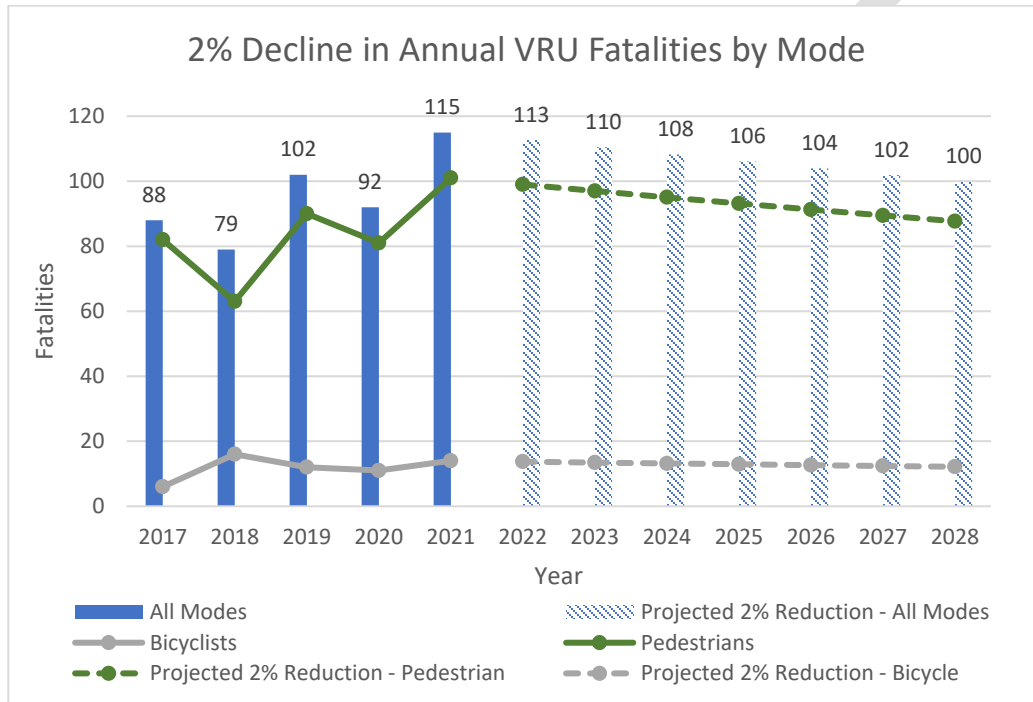


Figure 3. Projected annual fatalities with a 2% reduction by mode across Oklahoma (Source: SAFE-T Database 2017-2021)

TOWARD ZERO VULNERABLE ROAD USER DEATHS AND SERIOUS INJURIES

As noted in the 2023 SHSP, Toward Zero Deaths is a goal of achieving zero roadway deaths and serious injuries together on all roads and for all road users across Oklahoma.¹⁰ Vision Zero is the goal to eliminate all traffic fatalities and serious injuries while increasing safety, health, and equitable mobility for all.¹¹ As FHWA states, Vision Zero is the goal, and the Safe System Approach is how we get there.



Figure 3. Vision Zero and the Safe System Approach phrase (Source: FHWA.)

We can do this by applying the Safe System Approach to policies, practices, and most importantly project decisions.¹² We must also advance programs that create a positive road safety culture through shared responsibility, as mentioned in the *Guiding Philosophy for 2023 SHSP* section of the 2023 SHSP.¹³

The Safe System Approach

The Safe System Approach takes a **comprehensive** and **holistic** approach to eliminating fatal and serious injuries for all road users. The Safe System Approach is **proactive** and provides **layers of protection**. It focuses on creating one transportation system that is safe for all road users. This must be done in such a way that should a crash occur, it cannot result in fatal or serious injury to the most vulnerable road user. It recognizes that **humans make mistakes** but that it takes **shared responsibility** to prevent people from being killed and seriously injured on our roadways.^{14,15} Implementing a Safe System Approach across Oklahoma means focusing on infrastructure to reduce fatal and serious injury crashes, especially for

¹⁰ Also called Vision Zero or Road to Zero in the United States.

¹¹ <https://visionzeronetwork.org/about/what-is-vision-zero/>

¹² <https://highways.dot.gov/safety/zero-deaths#:~:text=Applying%20the%20Safe%20System%20approach,a%20fatality%20or%20serious%20injury.>

¹³ <https://www.towardzerodeaths.org/traffic-safety-culture/>

¹⁴ https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/FHWA_SafeSystem_Brochure_V9_508_200717.pdf

¹⁵ safety.fhwa.dot.gov/zerodeaths

pedestrians and bicyclists, and may be a way to further reduce VRU deaths and serious injuries beyond the projected 2% annually.

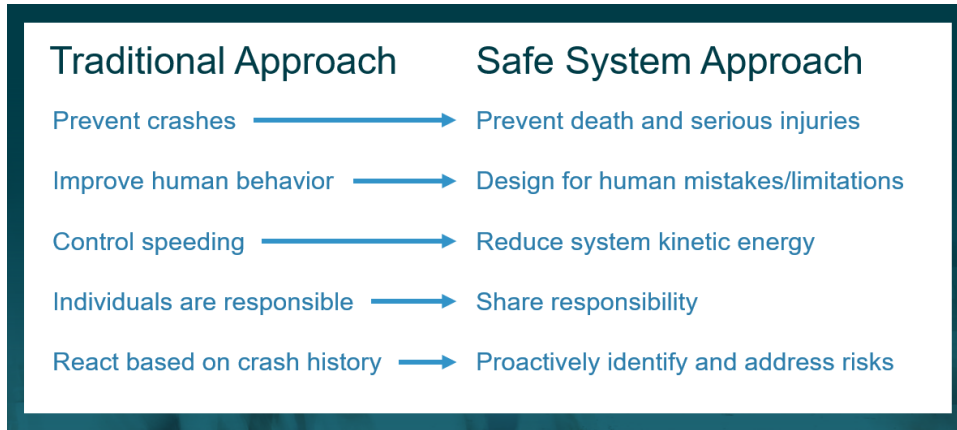


Figure 4. Comparison of the Traditional Approach and the Safe System Approach to Road Safety (Source: FHWA)

THE SAFE SYSTEM APPROACH FRAMEWORK

The Safe System Approach Framework is the lens through which all road safety decisions should be made.¹⁶ In every road safety decision, the Framework should be used to ensure that policies are adopted, practices are followed, and streets are designed to ensure the safety of all road users. Especially on road design, the Framework should be used to ensure that decisions prevent people being killed or seriously injured should a crash occur.

Using the Framework flowchart shown in Figure 5, the more frameworks applied to each decision creates redundancy in the system to prevent fatal and serious injury crashes. How can you separate users in space and time, reduce speeds and impact forces, and increase attentiveness and awareness to decisions and projects? For example, if you cannot reduce speeds down to a level that is safe for all road users, you must separate them in space at a level that protects the most vulnerable road user that those speeds from being killed or seriously injured. This may require a separated bicycle lane with vertical separation at a level that prevents a motor vehicle from hitting a bicyclist should a crash occur, especially if vehicle speeds exceed the safe kinetic energy forces and injury tolerances of bicyclists.

¹⁶ <https://www.ite.org/pub/?id=C8B1C6F9-DCB5-C4F3-4332-4BBE1F58BA0D>

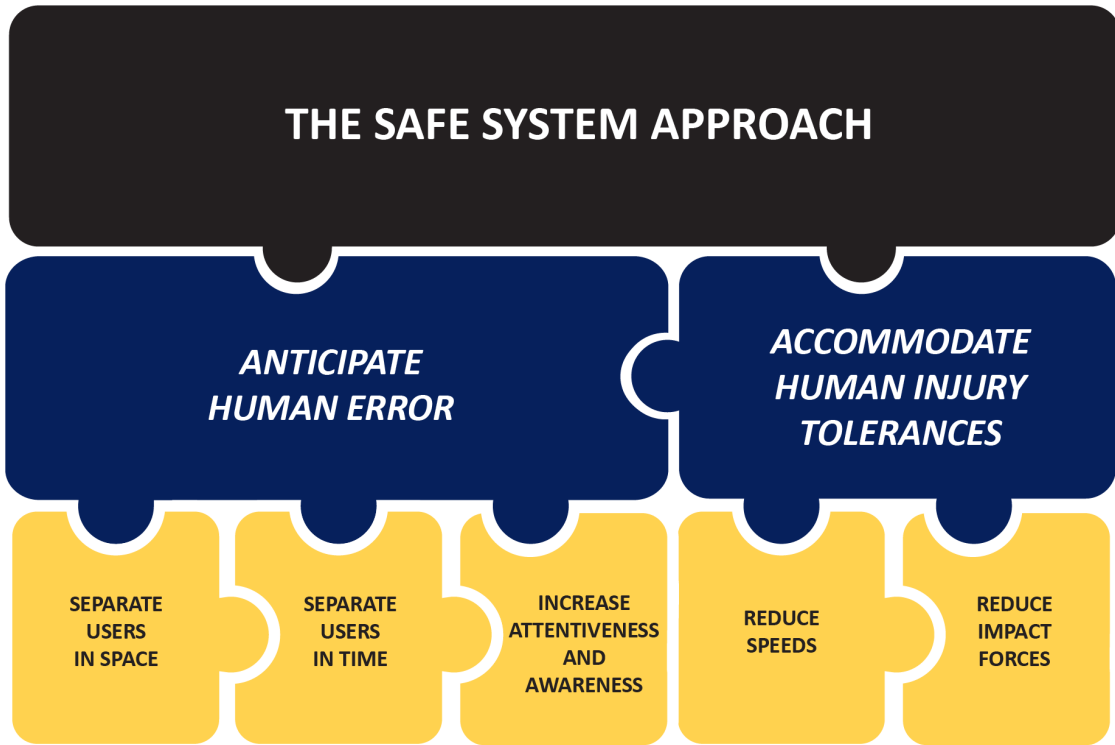


Figure 5. Flowchart of the Safe System Approach Framework (Source: Toole Design Group adapted from ITE)

VRU SAFETY AND EQUITY

Vulnerable road user safety and active transportation can also address equity issues due to transportation poverty. An equity analysis is one component of understanding social demographic vulnerabilities as they relate to transportation safety. Advancing safe and equitable transportation outcomes usually starts by understanding areas where higher fatal and serious injury crash risk and underserved populations both exist through demographic mapping. An analysis of areas where VRU safety risk and transportation poverty overlap often indicate the greatest need and should be prioritized. Transportation poverty includes both social demographic vulnerability and transportation disadvantage as shown in Figure 6 below.

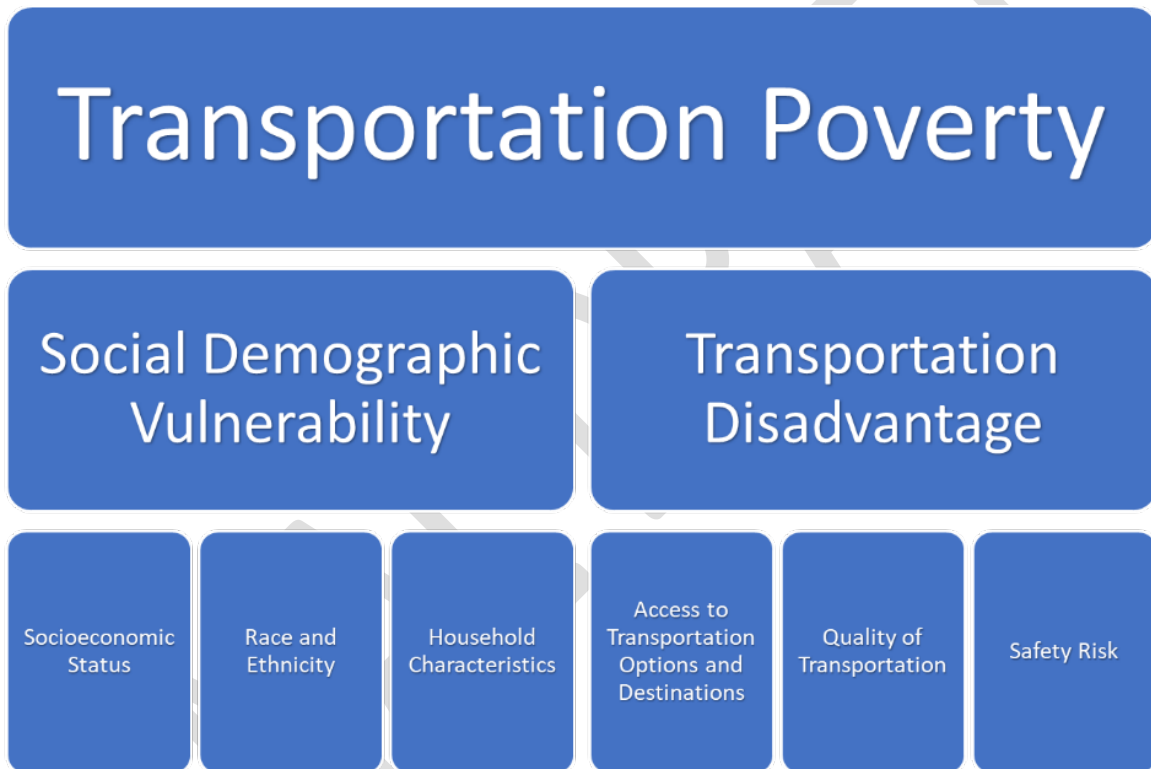


Figure 6. Transportation poverty is the confluence of sociodemographic vulnerability and transportation disadvantage; this transportation poverty framework shows how these two components can be characterized and the factors this analysis uses to quantify them.

There are other transportation impacts that have real and substantial effects on equity and a person's lived experiences. Impacts such as elevated safety risk, limited access to transportation options to desired destinations, and low quality of transportation can signify transportation disadvantage. When transportation disadvantage is paired with sociodemographic vulnerability, it creates a state of transportation poverty. Transportation disadvantages exist where people cannot reach basic necessary resources to meet their needs and their health, safety and welfare is at risk. Transportation disadvantages may limit access to work, healthcare, food, education, or social networks, and leads to social exclusion and diminished quality of life. Lack of sidewalks in a community that can only afford to walk to work or bus stops with long wait times on unsafe streets limiting people from accessing basic

community services are examples of transportation disadvantage. This Assessment provides a high-level overview of fatal and serious injury crash risk to underserved communities through the demographic mapping, however better understanding the relationship of transportation disadvantage and crash risk factors in the high-risk areas should be a future VRU Safety Emphasis Area strategy. A key strategy of the VRU is to implement VRU safety improvements in locations where low-income and persons of color, including Native Americans, are overrepresented in fatal and serious injury crashes and/or where people do not have access to a car or transit.

FINAL DRAFT

BACKGROUND

This section provides background on efforts to improve pedestrian and bicyclist safety in Oklahoma to date. It includes a summary of any mentions of pedestrian and bicyclist safety in the State’s 2045 Long Range Transportation Plan (LRTP), the first ATP, HSIP and SHSP, regional safety efforts and more.¹⁷ This section discusses the relationship between these documents and programs that aim to help prevent pedestrian and bicyclist fatal and serious injury crashes in Oklahoma.

Long Range Transportation Plan

The LRTP is a policy document that will guide ODOT in the development, management, and operation of a safe and efficient transportation system for the next 25 years.

A vibrant multimodal transportation system is vital to Oklahoma’s future economic viability and competitiveness. To meet this challenge, it is imperative to have a vision for Oklahoma’s 21st century transportation system that will support user needs for improved safety, infrastructure conditions, and system reliability to drive statewide economic investments.

As of 2018, Oklahoma’s active transportation system included about 520 miles of multi-use trails, bicycle routes, and sidewalks, the majority of which are in the Oklahoma City and Tulsa metropolitan regions. Bicycle and pedestrian facilities are supported by federal and state legislation, policies, and practices, but many are owned by local partners. ODOT ensures that all state and federally funded projects comply with the Public Right-of-Way Accessibility Guidelines (PROWAG) and the Americans with Disabilities Act (ADA).

LRTP VRU Safety Strengths
Continue to pursue opportunities to bring state highways in small communities into compliance with PROWAG and ADA.
Develop a statewide bicycle plan that emphasizes safety and builds and expands upon the work of MPOs.
Improve modal choices and safety by incorporating pedestrian and bicyclist facilities in accordance with approved design standards.
Continue to provide pedestrian signals, warning beacons, signage, striping, and lighting at intersections of state routes with high-volume pedestrian crossings.
Support efforts by local governments, public transit providers, passenger rail systems, and others to expand and improve bicycle ways and walkway connections.

¹⁷

<https://static1.squarespace.com/static/5cd1d280f9df7d00015c6297/t/5f5b5bbb6785a5f69c44e3d04/1599847366823/Oklahoma+2045+LRTP+Final+August+2020.pdf>

Assess and respond to needs for pedestrian and bicycle infrastructure on or adjacent to state highways concurrent with related highway improvements, and as a part of the project development process.
Promote and support public information outreach and education regarding safe and accessible transportation routes for bicyclists and pedestrians.
Continue to educate communities about sidewalk and trail requirements associated with the Americans with Disabilities Act.
Promote statewide and local-area education programs to make transportation users aware of pedestrian and bicyclist rights and responsibilities.
Support efforts by health departments, educational facilities, and public safety agencies to provide bicycle and pedestrian safety lessons/workshops.

L RTP VRU Safety Opportunities
Adopt a goal of zero VRU deaths and serious injuries in Oklahoma by a target year and chart a path to reaching that goal.
Install proactive pedestrian safety countermeasures, such as high visibility continental style crosswalks and leading pedestrian intervals, where pedestrians may be present.
Evaluate the presence of VRU when setting safe speed limits.

Active Transportation Plan

The first-ever ATP is currently under development with input from stakeholders and the public from across Oklahoma. The purpose of the ATP is to build a foundation for greater opportunities to safely and comfortably walk, bicycle, and use active modes of transportation in communities across the state. This plan recommends policies, programs, design tools, and other resources that will lead to more proactive consideration of active transportation needs in the planning and design of roadways and will help support local communities in active transportation planning, design, and implementation efforts.

ATP VRU Safety Strengths
Use a systemic approach to VRU safety that identifies and prioritizes sites for appropriate safety countermeasures based on crash risk factors.
Support expansion of active transportation networks in both urban and rural areas.
Work with local communities to eliminate gaps and barriers in the active transportation network.
Add shoulders on portions of the state highway system that lack them or have deficient shoulders.

<p>Improve active transportation data collection (user volumes, exposure, facility inventories) to establish baselines for improvements to safety and connectivity.</p>
<p>Use the prioritization system in the ODOT ADA Self-Evaluation and Transition Plan to implement sidewalk, ramp, and marked crossing improvements at controlled and uncontrolled locations throughout the state.</p>
<p>Cross-reference findings and recommendations from this VRU Assessment and ADA prioritization system to create a comprehensive prioritization plan for all ODOT pedestrian safety projects.</p>
<p>Continue to provide pedestrian signals, warning beacons, signage, striping, and lighting at intersections of state routes with high-volume pedestrian crossings.</p>
<p>Institutionalize the consideration of active transportation users into the ODOT planning, design, project delivery and maintenance process through strategies such as:</p> <ul style="list-style-type: none"> • Checklists/memos • Documentation of project delivery process • Monthly or Quarterly cross division meetings • Greater integration of active transportation in District 8-year plans
<p>Institutionalize and facilitate best practices in active transportation design at both the state and local level. Examples:</p> <ul style="list-style-type: none"> • Development/Provision of Design resources/toolkits • Review and update DOT existing manuals such as: <ul style="list-style-type: none"> – Roadway Design Standards & Specifications – Traffic Engineering Standards & Specifications – 2009 Special Provisions – Roadway Design Manual • Trainings for staff, consultants, local partners
<p>Develop maintenance guidelines that address active transportation user needs.</p>
<p>Coordinate with partners to disseminate safety educational information to the public.</p>
<p>Build capacity at the state and local level to leverage federal active transportation funding sources and deliver high-quality active transportation facilities across the state through the provision of trainings, webinars, toolkits, and other resources to a variety of audiences.</p>
<p>Work with ODOT legislative liaison to consider changes to state law to improve active transportation user safety and acceptance.</p>

ATP VRU Safety Opportunities

Incorporate the VRU Safety Assessment into the SHSP, HSP, and ATP.

Incorporate safety of all road users into roadway programs, policies, practices, and projects.

Highway Safety Improvement Program

The FHWA HSIP is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads.¹⁸ States are required to report annually on the progress being made to advance HSIP implementation and evaluation efforts. HSIP reports consists of five sections: program structure, progress in implementing highway safety improvement projects, progress in achieving safety outcomes and performance targets, and effectiveness of the improvements and compliance assessment.

2018 STRATEGIC HIGHWAY SAFETY PLAN

The SHSP is a collaborative plan between ODOT, the Oklahoma Highway Safety Office, the OK Highway Patrol, and the Oklahoma Department of Public Safety developed to harmonize the highway safety goals and strategies among these agencies; the SHSP is required by FHWA and includes projects funded by HSIP.

The 2018 SHSP notes that OK Safe Transportation for Every Pedestrian (STEP) was developed in 2017 to develop cost-effective countermeasures with known safety benefits.¹⁹ Additionally, a Statewide Active Transportation Committee with representatives from local governments and MPOs was created.

2023 STRATEGIC HIGHWAY SAFETY PLAN

The 2023 SHSP (currently in draft form) was developed through a data-driven, comprehensive, multidisciplinary process that establishes statewide performance measures, goals, objectives, and several safety emphasis areas, including the new VRU Safety Emphasis Area. The SHSP describes a program of strategies to reduce or eliminate safety hazards using federal aid highway funds. Refer to the *Coordination with Other Transportation Plans* section of the 2023 SHSP draft.

2020-2022 HSIP ANNUAL REPORTS AND SAFETY PERFORMANCE TARGETS

States are required to report annually on the progress being made to advance HSIP implementation and evaluation efforts. States are additionally required to set annual safety performance targets in the HSIP annual report for the number of fatalities, rate of fatalities per 100 million vehicle miles traveled (VMT), number of serious injuries, rate of serious injures per 100 million VMT, and number of non-motorized fatalities and serious injuries. The safety performance targets are based on 5-year rolling averages. States have the flexibility to use the methodology they deem most appropriate when establishing safety

¹⁸ <https://highways.dot.gov/safety/hsip>

¹⁹ <https://oklahoma.gov/content/dam/ok/en/stic/Documents/stic-funded-reports/safe-transportation-for-every-pedestrian/PRINT-VERSION-step-innovation-report.pdf>

performance targets. The safety performance targets should be data-driven, realistic, and attainable and should align with the performance management framework and legislative intent.

The 2021 Safety Performance Targets and the 2022 HSIP Annual Report show the number of non-motorized fatalities and serious injuries was 278, using a five year average.^{20, 21} The five-year average target for 2021 was 251, so this target was not met. However, the five-year average is better than the 2015-2019 baseline of 284 and the 5-year averages are trending down.

SHSP VRU Safety Strengths
2018 SHSP
Prioritize pedestrian crossing improvement locations.
Improve signs, signals, and pavement markings at pedestrian crossing locations.
Improve road geometry (narrow lanes, reduce curb radii, provide refuge islands) to improve pedestrian safety.
Promote establishment of pedestrian safety zones on busy urban streets.
Implement sidewalk, trails, and lighting infrastructure improvements as part of the Transportation Alternatives Program.
Encourage local communities to implement STEP plan and/or policies.
Identify high pedestrian crossing locations and prioritize for adding crosswalks.
Improve driver, pedestrian, and bicyclist awareness of safety issues by conducting pedestrian and bicyclist safety campaigns.
Promote shared road behaviors through the adoption of safe passing laws.
Establish criteria for prioritizing signalized and unsignalized intersections for safety improvements.
Implement proven, low-cost systemic safety improvements to reduce intersection crashes.
Implement enhanced signing and striping standards to use on priority intersections, including considerations for VRUs.
Analyze and update signal timing, including pedestrian signal timing, and evaluate phase changes like protected turns to improve pedestrian safety.
Finalize Intersection Control Evaluation policy to systematically screen intersections for both operational and safety performance, including consideration of roundabouts.

²⁰ <https://www.fhwa.dot.gov/tpm/reporting/state/safety.cfm?state=Oklahoma>

²¹ <https://highways.dot.gov/sites/fhwa.dot.gov/files/2023-08/OK-HSIP-2022.pdf>

2023 Draft SHSP
Establish criteria to incentivize HSIP funding on strategies, and or locations, prioritized in the SHSP Action Plan.
Implement systemic roadside safety improvements as applicable on priority corridors.
Create training program for Transportation Managers on how to identify and locate objects and encroachments within clear zone and right-of-way.
Work with districts and locals to remove natural objects currently inside right-of-way/clear zone.
Establish criteria for prioritizing signalized and unsignalized intersections for improvements.
Implement Enhanced Signing and Striping Standards to use on priority intersections; including considerations for VRUs.
Analyze and update signal timing and include evaluation of pedestrian facilities during signal timing field work. Expand scope to include evaluation of phase changes (protected turns) based on field observations of queues and crash data.
Realign Offset Left Turn Lanes.
Finalize Intersection Control Evaluation (ICE) policy to systematically screen intersections for both operational and safety performance.
Utilize ICE screening on State-owned/ managed priority intersections to determine where geometric and/or signal improvements should be prioritized.
Pursue intersection geometric and/or signal improvements.
Complete an Access Management Policy.
Evaluate and manage driveway access near priority intersections.
Committee to review national best practice procedures for setting speed limits based on highway or street characteristics. Include work zone speed limit setting with advisory speeds for curves and transitions.
Prioritize roadway segments to apply road design and/or engineering measures to obtain safe and reasonable speeds.
Establish criteria for road diets or lane reallocation.
Implement road design and engineering measures on priority corridors (road diets, medians, bump – outs, roundabouts, signal timing, lane narrowing, etc.).
Provide crash and/or speed data to jurisdictions for corridor enforcement based on speed related fatal and serious injury crashes.

Provide funding to enforce speeds within specified high speed fatal and serious injury corridors including work zones.

Pursue Legislation changes to allow for automated/camera speed enforcement, starting with school zones and/or work zones.

SHSP VRU Safety Opportunities

Move away from using a five-year rolling average to calculate HSIP safety performance targets that estimate increases in fatal and serious injuries to another proven method that outlines reducing and eventually preventing vulnerable road user deaths and serious injuries.

Provide pedestrian crossings at a reasonable walking distance apart when there are long distances between intersections or land uses that require pedestrians to cross.

Per the 15% VRU Special Rule, if the total annual VRU fatalities in a state exceeds 15% of the total annual crash fatalities in the state, at least 15% of HSIP funding must be allocated to VRU safety projects.

Prioritize vulnerable road user safety projects that have the greatest need and impact first based on data and community driven metrics.

Integrate road safety and active transportation funding to ensure VRU safety prioritized and maximized, especially HSIP, Transportation Alternatives, and OHSO programs.

Install pedestrian safety countermeasures on all road projects in Oklahoma where pedestrians may be present, both in VRU safety high-risk areas and proactively when road improvements are made.

Report key vulnerable road user safety statistics, key road safety improvements, new programs, and what is working to prevent pedestrians and bicyclists from being killed at least annually.

Integrate vulnerable road user safety education and awareness in other HSIP Emphasis Areas and OHSO programs.

Conduct systemic safety analysis to understand interconnected factors resulting in vulnerable road user fatal and serious injury crashes in Oklahoma.

Conduct project before and after crash analysis to understand effectiveness of vulnerable road user safety countermeasures across Oklahoma.

Collect additional data needed to conduct other vulnerable road user analysis, such as collecting pedestrian and bicycle volumes to do exposure analysis.

Oklahoma Highway Safety Office

The OHSO was established in 1967 by the Oklahoma Legislature, as a direct result of the National Highway Safety Act of 1966, to combat the alarming increase in the number and severity of traffic crashes and fatalities.²² The OHSO is under the umbrella of the Department of Public Safety. The OHSO works closely with local governmental organizations, state agencies, law enforcement agencies, and others to develop the State Highway Safety Plan and programs to address highway safety issues. The programs are federally funded through the NHTSA. Most programs and activities fall into the areas of traffic safety education, training, and enforcement enhancement.

FY2021-2023 HIGHWAY SAFETY PLANS

OHSO has primary responsibility for managing safety programs designed to reduce traffic-related fatalities and serious injuries. The OHSO partners with NHTSA, FHWA, Federal Motor Carrier Safety Administration (FMCSA), and other national and local traffic safety partners to develop and fund statewide and community-level strategies and projects that will have the greatest impact on reducing fatalities and serious injuries resulting from roadway crashes. These strategies and projects are encompassed in annual OHSO HSP.²³ ODOT develops a multi-year SHSP that focuses on all surface transportation modes, including highway, rail, transit, bicycle/pedestrian.

As part of the ongoing process of ensuring coordination between Oklahoma's HSP, HSIP, and the SHSP, OHSO participates in the development and updating of these plans. Oklahoma's HSP includes National Program Areas identified by NHTSA and FHWA, including Impaired Driving, Occupant Protection, Police Traffic Services, Motorcycle Safety, Pedestrian and Bicyclist Safety, and Traffic Records.

The 2021-2023 HSPs include two countermeasure strategies related to VRUs. The first is the Pedestrian and Bicycle Public Information and Education Countermeasure Strategy relates to public information and education through paid or earned media. Through this strategy, information is shared at community events, training is provided to law enforcement officers, and a network of child restraint inspection stations is being set up across the state.

The second is the Pedestrian Safety Conspicuity Enhancement Countermeasure Strategy. This strategy relates to NHTSA's child education program including information about conspicuity messages. Through this strategy, OHSO is raising awareness of the benefits of retroreflective gear for pedestrians and bicyclists.

ANNUAL REPORT

NHTSA required OHSO to produce an Annual Report for the Federal Fiscal Year 2021 (October 1, 2020, through September 30, 2021).²⁴ This report contains a variety of crash data statistical references. The latest crash data currently available from the NHTSA Fatality Analysis Reporting System (FARS) database

²² <https://ohso.ok.gov/>

²³ https://ohso.ok.gov/sites/g/files/gmc751/f/ok_fy23_hsp.pdf

²⁴ https://ohso.ok.gov/sites/g/files/gmc751/f/ok_fy2021_ar.pdf

is from Calendar Year 2020 and the latest finalized crash data available from the State of Oklahoma crash database is FY2020. Due to corrections made in the FARS database not reflected in the Oklahoma database, occasional statistical differences related to actual numbers, use rates, and percentages appear. Except for the number of Serious Injuries (A) and the Seat Belt Use Rate, all the Core Performance Measures addressed in the report are FARS data.

The annual report outlines the Bicycle/Pedestrian Safety Program which includes the following programs:

- INCOG Pedestrian/Bicyclist Safety Program: Travel With Care Tulsa campaign is a safety educational campaign about the rules of the road.
- Watch for Me OK: a public awareness campaign to improve the safety of bicyclists and pedestrians in the ACOG region.²⁵
- Oklahoma City Pedestrian Safety: an awareness campaign, done in partnership with ACOG, for the safety of cyclists, pedestrians, and drivers who share the road.
- SKO Bicyclist/Pedestrian Safety Program: Safe Kids Oklahoma is a program that hosts educational campaigns during back-to-school.

CRASH FACTS

The purpose of the OHSO Crash Facts is to provide a description of Oklahoma traffic crash, injury, and fatality data.²⁶ This document is a resource for local transportation, law enforcement, health, and other agencies charged with the responsibility of coping with the increasing number and cost of traffic crashes.

The document shows that pedestrian fatalities have generally increased in the past 10 years, from 67 fatalities in 2012 to 104 fatalities in 2021. Similarly, bicyclist fatalities have generally increased in the past 10 years, from five fatalities in 2012 to 13 fatalities in 2021. The highest number of bicyclist fatalities in a single year was 16 fatalities in 2018.

ANNUAL PERFORMANCE MEASURE SURVEY

In order to comply with NHTSA, OHSO commissions an annual performance measure survey to be conducted during the late spring/early summer months among licensed drivers over the age of 18 in the state of Oklahoma.²⁷ The survey does not include information specific to VRUs.

OHSO VRU Safety Strengths

The 2021-2023 HSPs include two countermeasure strategies related to VRUs.

- The first is the Pedestrian and Bicycle Public Information and Education Countermeasure Strategy relates to public information and education through paid or earned media. Through this strategy,

²⁵ <https://www.watchformeok.org/>

²⁶ https://ohso.ok.gov/sites/g/files/gmc751/f/2021_s4_nonmotorists.pdf

²⁷ https://ohso.ok.gov/sites/g/files/gmc751/f/ohso_nhtsa_performance_measures_report_2021.pdf

<p>information is shared at community events, training is provided to law enforcement officers, and a network of child restraint inspection stations is being set up across the state.</p> <ul style="list-style-type: none"> • The second is the Pedestrian Safety Conspicuity Enhancement Countermeasure Strategy. This strategy relates to NHTSA’s child education program including information about conspicuity messages. Through this strategy, OHSO is raising awareness of the benefits of retroreflective gear for pedestrians and bicyclists.
<p>Incorporation of regional safety programs into the 2021 Annual Report that captures some of the VRU safety related efforts around the state.</p>

OHSO VRU Safety Opportunities
<p>Expand the annual performance measure survey to include questions specific to VRUs and consider expanding the survey participants to include people who do not drive.</p>
<p>Correct the differences between the FARS database and the Oklahoma database, that have resulted in occasional statistical differences related to actual numbers, use rates, and percentages appear in OHSO Crash Facts.</p>
<p>Whenever vulnerable road users could be present, use the Safe System Approach framework-- separating users in space and time, reducing speeds and impact forces, and increasing attentiveness and awareness--to all road design decisions in a way that prevents a vulnerable road user from being killed or seriously injured should a crash occur.</p>
<p>Consider vulnerable road user safety using the Safe System Approach elements and principles when establishing road safety policies, programs, and practices.</p>
<p>Ensure vulnerable road users safety improvements are made where low-income and persons of color, including Native Americans, are overrepresented in fatal and serious injury crashes and/or where people do not have access to a car or transit.</p>
<p>Create and maintain a list of effective vulnerable road user safety countermeasures.</p>
<p>Develop design details, specifications, and installation training for new vulnerable road user safety countermeasures for state, regional, and local agencies to use across Oklahoma.</p>
<p>Improve nighttime lighting conditions and retroreflective signs and markings where vulnerable road users are present.</p>
<p>Determine safety countermeasures that will prevent vehicle going straight, pedestrian uncontrolled/mid-block crossings, and bicyclists riding with traffic crashes resulting in vulnerable road users fatal and serious injuries.</p>
<p>Create incentive programs and partner with insurance companies to encourage safe walking, bicycling, and driving.</p>

Encourage Safe Routes to School (SRTS) programs that teach the rules of the road and ensure children can walk and bicycle to school safely.

Oklahoma Title 47. Motor Vehicle Statutes

A summary of the most relevant laws affecting vulnerable road user safety is provided below and are also provided in the ATP along with others more broadly related to active transportation.

- **Pedestrian Right-of-Way in Crosswalks (47 OK Stat § 11-502 (2022))**
 - When traffic-control signals are not in place or not in operation, the driver of a vehicle shall yield the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk. Whenever a vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.
- **Pedestrians crossing at locations other than crosswalks (47 OK Stat § 47-11-503 (2016))**
 - Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway. Between adjacent intersections at which traffic-control signals are in operation pedestrians shall not cross at any place except in a marked crosswalk.
- **Pedestrians on roadways or bridges (47 OK Stat § 11-506 (1986))**
 - Where sidewalks are provided, it shall be unlawful for any pedestrian to walk along and upon an adjacent roadway. Where sidewalks are not provided, any pedestrian walking along and upon a highway shall, when practicable, walk only on the left side of the roadway or its shoulder facing traffic which may approach from the opposite direction and shall yield to approaching vehicles.
- **Safe Passing Laws (47 OK Stat § 47-11-1208 (2014))**
 - When overtaking and passing a bicycle proceeding in the same direction, a person driving a motor vehicle shall exercise due care by leaving a safe distance between the motor vehicle and the bicycle of not less than three (3) feet until the motor vehicle is safely past the overtaken bicycle.
- **Mandatory Use of Separated Facilities (47 OK Stat § 47-11-1205 (2018))**
 - Every person operating a bicycle or motorized scooter upon a roadway at less than the normal speed of traffic at the time and place and under the conditions then existing shall ride as close as is safe to the right-hand curb or edge of the roadway, except under specified conditions.
- **“Idaho Stop” and Vehicle Detection Errors (47 OK Stat § 11-202 (2022))**
 - A person operating a bicycle approaching a stop sign shall slow down, if required to avoid an immediate hazard, stop at the stop sign before entering the intersection, and cautiously enter the intersection and yield the right-of-way to pedestrians within an adjacent crosswalk and to other traffic using the intersection. If a person operating a

- bicycle determines there is no immediate hazard, he or she may cautiously make a right or left turn or proceed through the intersection without stopping at the stop sign.
- A person operating a bicycle approaching a steady red traffic-control signal shall make a complete stop at the steady red traffic-control signal before entering the intersection and yield the right-of-way to all oncoming traffic that constitutes an immediate hazard during the time that he or she is moving across or within the intersection. If a person operating a bicycle determines there is no immediate hazard, he or she may proceed through the steady red traffic-control signal with caution.

In January of 2021, the ODOT and the Oklahoma Turnpike Authority launched a new, year-round safety education effort, declaring May Bicycle, Pedestrian Safety Month.²⁸ It is important for any safety education effort concerning VRUs to recognize the problems for those who walk or bike.

Motor Vehicle Statues VRU Safety Strengths
The Safe Passing Laws (47 OK Stat § 47-11-1208 (2014)) establishes how a person driving a motor vehicle must pass a bicyclist going the same direction, including due care, moving over into another travel lane if possible, or providing at least 3 feet if single lane.
The “Idaho Stop” and Vehicle Detection Errors (47 OK Stat § 11-202 (2022)) establishes that if a person operating a bicycle determines there is no immediate hazard, he or she may cautiously make a right or left turn or proceed through the intersection without stopping at the stop sign. At a steady red traffic-control signal, a person operating a bicycle may proceed through the steady red traffic-control signal with caution if he or she determines there is no immediate hazard.

Motor Vehicle Statues VRU Safety Opportunities
Analyze the effects of new vulnerable road user safety laws, such as House Bill 1770 allowing bicyclists to treat stop signs as yield signs and stop lights as stop signs.
Pedestrian Right-of-Way in Crosswalks (47 OK Stat § 11-502 (2022)): change from “vehicles shall yield” to “vehicles shall stop” for pedestrians.
Pedestrians crossing at locations other than crosswalks (47 OK Stat § 47-11-503 (2016)): this statute may be impractical in locations where marked crosswalks do not exist. Instead, prioritize marking crosswalks where pedestrians are crossing mid-block, or at unmarked locations, at high rates.
Implement vulnerable road user safety features for state, regional, and local agency fleet vehicle purchasing standards, such as smaller vehicles, side guards, sensors and cameras, pedestrian avoidance, high vision cabs, and blind spot detection.
Require education on how to look out for vulnerable road users in novice driver education and adjudication programs.
Create remedial training programs for drivers with multiple unsafe driving tickets that put vulnerable road users at risk, such as speeding or red light running.

²⁸ <https://oklahoma.gov/odot/citizen/newsroom/2021/may/spinning-into-spring--bike-and-pedestrian-safety-main-focus-of-m.html>

Increase enforcement and penalties for impairment and hit-and-run crashes resulting in vulnerable road users being killed or seriously injured.

Safety Awareness Programs

DEPARTMENT OF HEALTH MOTOR VEHICLE SAFETY INJURY PREVENTION

The Motor Vehicle Safety Injury Prevention program is housed within Oklahoma Department of Health Injury Prevention Service program.²⁹ Since its inception in 1987, the Injury Prevention Service has maintained a comprehensive injury prevention program guided by the following purpose: all people deserve lives free from injury and violence. The Motor Vehicle Safety program includes information related to ATVs, car seats, and teen drivers.

WATCH FOR ME OK

In 2020, Oklahoma ranked 16 for pedestrian fatalities per 100,000 people.³⁰ While local governments are working to provide safer infrastructure for bicyclists and pedestrians, there is a long way to go, and the high number of pedestrian deaths are a major concern. In the last five years, there were nearly 450 fatal and serious injuries to pedestrians and bicyclists traveling on Oklahoma roads. The Watch for Me OK education campaign was created to help raise awareness of all road users and educate the public on how to stay safe and prevent collisions.³¹ The campaign outlines Oklahoma laws and safety tips for drivers, pedestrians, and bicyclists such as ceding the right-of-way, where to walk, and where to ride a bicycle.

Safety Awareness Programs VRU Safety Strengths

The Motor Vehicle Safety Injury Prevention program recognizes the interconnectedness of health, transportation, and roadway safety.

Watch for Me OK is raising awareness of VRU safety related statutes.

Safety Awareness Programs VRU Safety Opportunities

Expand the Safety Awareness Program to include safety information specific to VRUs.

Expand the Watch for Me OK education campaign efforts to watch out for each other and follow the rules of the road.

²⁹ <https://oklahoma.gov/health/health-education/injury-prevention-service/motor-vehicle-safety.html>

³⁰ <https://www.fars.nhtsa.dot.gov/states/statespedestrians.aspx>

³¹ <https://www.watchformeok.org/>

Regional Safety Efforts

Oklahoma Department of Transportation is the Governor's designee to administer the transportation planning process for the MPOs, creating a connection between state and regional transportation coordination and reporting requirements to the Federal government. Oklahoma Department of Transportation currently coordinates planning efforts with four MPOs. In addition to the MPOs, several cities have VRU safety strategies of their own.

ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS (ACOG)

The ACOG includes 37 cities and the 4 counties (Canadian, Cleveland, Logan, and Oklahoma) in the Central Oklahoma region.³² The general purpose of ACOG is to encourage and facilitate local governments in the region to cooperate with one another, with other levels of government, and with the private sector to plan development of the region, and thereby improve the health, safety, and general welfare of Central Oklahoma citizens.

The ACOG has Transportation Planning Services (TPS), which manages a \$10 billion long-range transportation plan, as well as over \$20 million in annual federal grants for local transportation improvements. ACOG, through TPS, supports active transportation through development of the Regional ATP, organizing area Bike Month events, and administering the Transportation Alternatives Program (TAP).

INDIAN NATIONS COUNCIL OF GOVERNMENTS (INCOG)

The INCOG serves Creek, Osage, Rogers, Tulsa, and Wagoner counties, more than 50 cities and towns located in those counties, and the Cherokee, Muscogee, and Osage Nations.³³ INCOG is the MPO for the Tulsa area. As such, INCOG facilitates a cooperative effort with federal, state, and local governments and other transportation agencies to assess the area's transportation requirements and to develop comprehensive, multi-modal plans and programs that address the needs and goals of the region.

The INCOG published a Local Road Safety Plan (LRSP) in 2022 to address safety on local roads in the INCOG region.³⁴ The LRSP incorporates the Safe System Approach and provides a data-driven framework to focus safety efforts. The goal of the LRSP is to reduce fatal and serious injury crashes by 25% by 2030. The LRSP includes crash data analysis for 2010-2019, including percentages for fatal and serious injury crash types, locations, and risk factors; stakeholder-identified Emphasis Areas; stakeholder-identified strategies and actions; and stakeholder-identified priority intersections and corridors for potential project locations for implementing strategies and actions.

The GO Plan is a Bicycle/Pedestrian Master Plan which provides a comprehensive regional plan for pedestrian and bicycle improvements; provides connectivity to the existing regional trail network using on-street treatments; improves pedestrian and bicycle safety; provides a more strategic approach to

³² <https://www.acogok.org/>

³³ <https://www.incog.org/>

³⁴ <https://www.incog.org/Transportation/Documents/INCOG%20LRSP%20Final.pdf>

competing for pedestrian and bicycle funding; and identifies barriers, with solutions, for residents to safely access destinations using walking or bicycling modes within the Tulsa region.³⁵ An update to this plan is expected in 2024.

The Tulsa Bicycle/Pedestrian Advisory Committee advises INCOG and the city governments in the INCOG area on projects, policies, and programs that improve and/or affect bicycling and pedestrian conditions in Tulsa.

LAWTON METROPOLITAN PLANNING ORGANIZATION (LMPO)

The LMPO's planning and program management functions are administered and implemented by the City of Lawton's Planning Division, which provides staff, technical and clerical support.³⁶

The MPO is mandated by the state to increase the safety and security of the transportation system for motorized and nonmotorized users, but otherwise does not appear to have resources specifically related to VRU safety.

FRONTIER METROPOLITAN PLANNING ORGANIZATION (FMPO)

The FMPO serves as the regional transportation planning organization for the Fort Smith urbanized area in western Arkansas and eastern Oklahoma.³⁷ The FMPO is governed by the Technical Committee and Policy Board. The Technical Committee is comprised of local city planners, street department heads, and elected officials of each of the communities served. The Policy Board is comprised of local elected and city officials. The FMPO published a Regional Bicycle and Pedestrian Plan in 2016.³⁸

Regional Safety VRU Safety Strengths
The ACOG published a Regional Active Transportation Plan in 2021 which includes crash statistics for the region, existing conditions, and planned network. ³⁹
The INCOG published a Local Road Safety Plan in 2022 which incorporates the Safe System Approach and provides a data-driven framework to focus safety efforts to reduce fatal and serious injury crashes by 25% by 2030. ⁴⁰

³⁵ https://www.incog.org/Transportation/transportation_bikeped.html

³⁶ <https://www.lawtonmpo.org/>

³⁷ <https://www.frontiermpo.org/>

³⁸ <https://www.frontiermpo.org/wp-content/uploads/2017/08/Complete-Frontier-MPO-Regional-Bicycle-and-Pedestrian-Plan-2016.pdf>

³⁹ <https://www.acogok.org/wp-content/uploads/2021/05/OCARTS-Regional-Active-Transportation-Plan.pdf>

⁴⁰ <https://www.incog.org/Transportation/Documents/INCOG%20LRSP%20Final.pdf>

The INCOG published the GO Plan: Tulsa Regional Bicycle/Pedestrian Master Plan in 2015 which includes community plans, existing conditions, and prioritization.⁴¹

The FMPO published the Regional Bicycle and Pedestrian Plan in 2016 which includes the active transportation vision for the region, existing conditions, and proposed routes.⁴²

Regional Safety VRU Safety Opportunities

Create a resource page, either through ODOT's website or OHSO's website, to share regional safety efforts so that regional agencies beginning their safety journey have a pool of resources to refer to.

Ensure that the Oklahoma ATP under development aligns with and builds upon ACOG's Regional ATP, INCOG's GO Plan for the Tulsa Regional Bicycle/Pedestrian Master Plan, and FMPO's Regional Bicycle and Pedestrian Plan.

Local Safety Efforts

CITY OF EDMOND

The City of Edmond adopted a Vision Zero resolution in December 2022, committing to eliminating fatal and serious injury crashes by 2033.⁴³ Edmond has also published many resources for VRU safety, including EdmondShift, a document that provides bicycle and pedestrian toolboxes of quick build solutions to improve bicyclist and pedestrian safety.⁴⁴

OKLAHOMA CITY

In partnership with ACOG and OHSO, the Watch for Me OK safety campaign was adapted to Watch for Me OKC.⁴⁵ As Oklahoma City grows and changes, more cars, pedestrians, and bicyclists are using city streets and the need to safely share the roadway increases.

In addition to Watch for Me OKC, Oklahoma City launched the Better Streets, Safer City package.⁴⁶ On Sept. 12, 2017, Oklahoma City voters approved 13 bond propositions and two sales tax initiatives known as the Better Streets, Safer City projects. Projects include roadway resurfacing, sidewalk construction,

⁴¹ https://www.incog.org/Transportation/transportation_bikeped.html

⁴² <https://www.frontiermpo.org/wp-content/uploads/2017/08/Complete-Frontier-MPO-Regional-Bicycle-and-Pedestrian-Plan-2016.pdf>

⁴³ <https://www.edmondok.gov/1745/Safety>

⁴⁴ <https://www.edmondok.gov/DocumentCenter/View/8589/EdmondShift-Ped-Toolkit?bidId=>

⁴⁵ <https://www.okc.gov/departments/planning/current-projects/watch-for-me-okc>

⁴⁶ <https://www.okc.gov/residents/better-streets-safer-city-projects>

trail construction, street enhancements, bicycle lane construction, intersection improvements, and road widening.

Oklahoma City is currently updating the bikewalkokc plan, the comprehensive bicycle and pedestrian plan originally adopted in 2018.⁴⁷ The 2018 bikewalkokc has been very successful as a tool for directing the city's capital investment programs into bicycle and pedestrian improvements across the city. The 2023 update of bikewalkokc addresses new issues that were identified in the process of implementation of the original plan. The update focuses on continuing the work by identifying the next set of priority projects. With the incorporation of a new round of public input and a new advisory board, the updated 2023 plan proposes the addition of new pedestrian priority areas, the reprioritization of bicycle and trail network, and many other improvements.

Finally, in late 2023 Oklahoma City will launch its Safe Streets and Roads for All (SS4A) Comprehensive Safety Action Plan which will include safety analysis, identification of a high-injury and high-risk network, and detailed safety countermeasure recommendations.

CITY OF TULSA

The City of Tulsa has five strategies that are relevant to VRUs. The first is Tulsa's Complete Streets resolution (2012) and procedural manual (2013).⁴⁸ The vision for Tulsa places an emphasis on coordinating transportation facilities' design with the land uses or context they serve. The second is Safely Moving and Riding Together, a compilation of safety and mobility tools curated by Walk Bike Tulsa, Vision Tulsa, INCOG, and Travel with Care.⁴⁹ The third is Tulsa's Work Zone Safety Program, an education program aimed toward drivers navigating construction zones.⁵⁰ The fourth is the transportation chapter of PlaniTulsa, which includes information on pedestrian and bicyclist infrastructure such as actions from the 2015 GO Plan.⁵¹ Lastly, the Tulsa Bicycle and Pedestrian Advisory Committee hosted a series of Walk Audits in 2022 to identify issues that make walking, riding a bicycle, or driving unsafe or uncomfortable.⁵² The issues will be documented, prioritized, and submitted to the City of Tulsa for repair or improvement.

In addition, INCOG will launch studies to update both the GO Plan and the Local Road Safety Action Plan in late 2023 or 2024.

Local Safety VRU Safety Strengths

⁴⁷ <https://www.okc.gov/departments/planning/bikewalkokc>

⁴⁸ <https://www.cityoftulsa.org/government/departments/public-works/streets/complete-streets-program/>

⁴⁹ <https://www.cityoftulsa.org/safety-mobility-resources/>

⁵⁰ <https://www.cityoftulsa.org/government/departments/public-works/streets/work-zone-safety/>

⁵¹ <https://tulsaplanning.org/docs/planitulsa/Chapter-3--Transportation.pdf>

⁵² <https://tulsawalks.org/>

The City of Edmond adopted a Vision Zero resolution in December 2022, committing to eliminating fatal and serious injury crashes by 2033. ⁵³
Edmond has published resources for VRU safety like EdmondShift, which provides quick build solutions to improve bicyclist and pedestrian safety. ⁵⁴
Watch for Me OKC launched a local safety campaign for the Oklahoma City metro area. ⁵⁵
Oklahoma City's bikewalkokc plan (2018) directs the city's capital investment programs into bicycle and pedestrian improvements across the city. ⁵⁶
Tulsa's Safely Moving and Riding Together, compiles safety and mobility tools curated by Walk Bike Tulsa, Vision Tulsa, INCOG, and Travel with Care. ⁵⁷
INCOG has ongoing planning and safety studies underway including updates to the GO Plan and the Local Road Safety Action Plan
Tulsa's Work Zone Safety Program, educates drivers navigating construction zones. ⁵⁸
Tulsa Bicycle and Pedestrian Advisory Committee hosted a series of Walk Audits in 2022 to identify issues that make walking, riding a bicycle, or driving unsafe or uncomfortable. ⁵⁹

Local Safety VRU Safety Opportunities
Create a resource page, either through ODOT's website or OHSO's website, to share local safety efforts so that local agencies beginning their safety journey have a pool of resources to refer to.
Perform walk audits in other cities similar to what Tulsa Bicycle and Pedestrian Advisory Committee did in Tulsa.
Encourage cities to adopt a Vision Zero resolution.

⁵³ <https://www.edmondok.gov/1745/Safety>

⁵⁴ <https://www.edmondok.gov/DocumentCenter/View/8589/EdmondShift-Ped-Toolkit?bidId=>

⁵⁵ <https://www.okc.gov/departments/planning/current-projects/watch-for-me-okc>

⁵⁶ <https://www.okc.gov/departments/planning/bikewalkokc>

⁵⁷ <https://www.cityoftulsa.org/safety-mobility-resources/>

⁵⁸ <https://www.cityoftulsa.org/government/departments/public-works/streets/work-zone-safety/>

⁵⁹ <https://tulsawalks.org/>

Background Key Findings

The following section outlines the strengths and opportunities identified in the Background Key Findings section.

Background Section VRU Safety Strengths
Build capacity at the state and local level to leverage federal active transportation funding sources and deliver high-quality active transportation facilities across the state through the provision of trainings, webinars, toolkits, and other resources to a variety of audiences.
Establish criteria to incentivize HSIP funding on strategies and or locations prioritized in the SHSP Action Plan.
Provide funding to enforce speeds within specified high speed fatal and serious injury corridors including work zones.
Improve driver, pedestrian, and bicyclist awareness of safety issues by conducting pedestrian and bicyclist safety campaigns.
Create training programs for agencies across the state on how to identify, locate, and remove objects and encroachments within clear zone and right-of-way.
Use a systemic approach to VRU safety that identifies and prioritizes sites for appropriate safety countermeasures based on crash risk factors.
Improve active transportation data collection (user volumes, exposure, facility inventories) to establish baselines for improvements to safety and connectivity.
Prioritize pedestrian crossing improvement locations.
Establish criteria for prioritizing signalized and unsignalized intersections for safety improvements.
Implement proven, low-cost systemic safety improvements to reduce intersection crashes.
Analyze and update signal timing, including pedestrian signal timing, and evaluate phase changes like protected turns to improve pedestrian safety.
Finalize ICE policy to systematically screen intersections for both operational and safety performance.
Utilize ICE screening on State-owned/ managed priority intersections to determine where geometric and/or signal improvements should be prioritized.
Complete an Access Management Policy that evaluates and manages driveway access near priority intersections.
Establish criteria for road diets or lane reallocation.

Provide crash and/or speed data to jurisdictions for corridor enforcement based on speed related fatal and serious injury crashes.
Institutionalize and facilitate best practices in active transportation design at both the state and local level.
Work with ODOT legislative liaison to consider changes to state law to improve active transportation user safety and acceptance.
Pursue Legislation change to allow for automated/camera speed enforcement, starting with school zones and/or work zones.
Implement sidewalk, trails, and lighting infrastructure improvements as part of the Transportation Alternatives Program.
Encourage local communities to implement STEP plan and/or policies.
Establish a committee to review national best practice procedures for setting speed limits based on highway or street characteristics. Include work zone speed limit setting with advisory speeds for curves and transitions.
Continue to pursue opportunities to bring state highways in small communities into compliance with PROWAG and ADA.
Develop a statewide bicycle plan that emphasizes safety and builds and expands upon the work of MPOs.
Add shoulders on portions of the state highway system that lack them or have deficient shoulders.
Continue to provide pedestrian signals, warning beacons, signage, striping, and lighting at intersections of state routes with high-volume pedestrian crossings.
Implement road design and engineering measures on priority corridors (road diets, medians, bump-outs, roundabouts, signal timing, lane narrowing, etc.).

Background Section VRU Safety Opportunities
Integrate road safety and active transportation funding to ensure vulnerable road use safety prioritized and maximized, especially HSIP, Transportation Alternatives, and OHSO programs.
Integrate vulnerable road user safety education and awareness in other HSIP Emphasis Areas and OHSO programs.
Develop design details, specifications, and installation training for new vulnerable road user safety countermeasures for state, regional, and local agencies to use across Oklahoma.

Encourage SRTS programs that teach the rules of the road and ensure children can walk and bicycle to school safely.
Require education on how to look out for vulnerable road users in novice driver education and adjudication programs.
Expand the Watch for Me OK education campaign efforts to watch out for each other and follow the rules of the road.
Evaluate the presence of vulnerable road users when setting safe speed limits.
Move away from using a five-year rolling average to calculate HSIP safety performance targets that estimate increases in fatal and serious injuries to another proven method that outlines reducing and eventually preventing vulnerable road user deaths and serious injuries.
Provide pedestrian crossings at a reasonable walking distance apart when there are long distances between intersections or land uses that require pedestrians to cross.
Per the 23 U.S.C. 148(g)(3) Vulnerable Road User Special Rule, if the total annual fatalities of vulnerable road users in a State represents not less than 15 percent of the total annual crash fatalities in the State, at least 15% of HSIP funding must be allocated to vulnerable road user safety projects.
Prioritize vulnerable road user safety projects that have the greatest need and impact first based on data and community driven metrics.
Install pedestrian safety countermeasures on all road projects in Oklahoma where pedestrians may be present, both in VRU Safety High-Risk Areas and proactively when road improvements are made.
Report key vulnerable road user safety statistics, key road safety improvements, new programs, and what is working to prevent pedestrians and bicyclists from being killed, at least annually.
Conduct project before and after crash analysis to understand effectiveness of vulnerable road user safety countermeasures across Oklahoma.
Collect additional data needed to conduct other vulnerable road user analysis, such as collecting pedestrian and bicycle volumes to do exposure analysis.
Create and maintain a list of effective vulnerable road user safety countermeasures.
Analyze the effects of new vulnerable road user safety laws, such as House Bill 1770 allowing bicyclists to treat stop signs as yield signs and stop lights as stop signs.
Pedestrian Right-of-Way in Crosswalks (47 OK Stat § 11-502 (2022)): change from “vehicles shall yield” to “vehicles shall stop” for pedestrians.
Incorporate the VRU Safety Report into both the SHSP and ATP and incorporate safety of all road users into roadway programs, policies, practices, and projects.

Expand the annual performance measure survey to include questions specific to VRUs and consider expanding the survey participants to include people who do not drive.

Whenever vulnerable road users could be present, use the Safe System Approach framework-- separating users in space and time, reducing speeds and impact forces, and increasing attentiveness and awareness--to all road design decisions in a way that prevents a vulnerable road user from being killed or seriously injured should a crash occur.

Consider vulnerable road user safety using the Safe System Approach elements and principles when establishing road safety policies, programs, and practices.

Ensure vulnerable road users safety improvements are made where low-income and persons of color, including Native Americans, are overrepresented in fatal and serious injury crashes and/or where people do not have access to a car or transit.

FINAL DRAFT

OVERVIEW OF VULNERABLE ROAD USER SAFETY PERFORMANCE

As a first step toward understanding the safety of vulnerable road users across Oklahoma, it is crucial to study the high-level patterns of VRU crashes and persons injured on all roads across the state with a descriptive crash analysis. This section will explore crash causes, contexts, behaviors, demographics, and other factors contributing to vulnerable road users being killed or seriously injured. The FHWA VRU Safety Guidance requires this assessment to be done on all roads, not just state routes, and focused on fatal and serious injury crashes through the Safe System Approach.⁶⁰ The analysis for this Assessment was to understand reported crashes resulting in VRU being killed or seriously injured from 2017 through 2021.

Data and Methodology Overview

The descriptive analysis and crash mapping were both conducted using the most recent five-years of available crash data of reported crashes from 2017 through 2021, provided by ODOT. The historical crash data is derived from Collision Report Forms completed by responding law enforcement for all crashes reported to authorities.⁶¹ Per Statute Title 47 Motor Vehicles Chapter 10 - Accidents and Reports Relating to Accident, the Oklahoma Department of Public Safety is responsible for collecting, tabulating, and analyzing crash reports, from which ODOT and OHSO provide further crash analysis related to FHWA HSIP and NHTSA FARS reporting.⁶² Data was used as-is and interpreted based on provided documentation. All data sources used in the analysis are listed below:

- Historical Crash Data, 2017-2021, provided by ODOT (provided August 30, 2023)
- Equitable Transportation Communities Explorer Data, provided by United States Department of Transportation (accessed September 14, 2023)⁶³
- Open Street Maps Roadway Inventory Data, provided by Open Street Maps (accessed September 7, 2023)⁶⁴
- Oklahoma City Boundaries Layer, provided by ODOT GIS Open Data Portal (accessed September 7, 2023)⁶⁵

⁶⁰ https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf

⁶¹ <https://oklahoma.gov/dps/forms/computer-fillable-collision-report-form.html>

⁶² <https://www.oscn.net/applications/oscn/index.asp?level=1&ftdb=STOKST47#Chapter10-AccidentsandReportsRelatingtoAccidents>

⁶³ <https://experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/Homepage/>

⁶⁴ <https://www.openstreetmap.org/relation/161645#map=6/35.335/-101.470>

⁶⁵ <https://gis-okdot.opendata.arcgis.com/>

Figures included in this chapter break out fatalities (K) and serious injuries (A) by mode per the Safe System Approach. For the purposes of these figures, pedestrians include all persons involved in crashes which were reported with a unit type of pedestrian or pedestrian conveyance while bicyclists include those reported with a unit type of bicyclist or other cyclist. Figures which display all modes include both motor vehicles, motorcycles, pedestrians, bicyclists, and other forms of conveyance. K and A injury values are based on reported injury severities between time of emergency response and 30 days of the collision. Further details on the definitions of crash severity using the KABCO scale are summarized in the table below which is based on FHWA’s KABCO Injury Classification Scale and Definitions document.⁶⁶

Severity Code	KABCO Rating	Description
5 – Fatal Injury	K	If the person is fatally injured (death occurs within 30 days of the date of the collision).
4 – Incapacitating Injury	A	Any injury, other than a fatal injury, which prevents the injured person from walking, driving or normally continuing the activities the person was capable of performing before the injury occurred. <i>Note: Also referred to as serious injury</i>
3 – Non-incapacitating Injury	B	Any injury, other than a fatal injury or an incapacitating injury, which is evident to observers at the scene of the accident in which the injury occurred.
2 – Possible Injury	C	An injury reported or claimed which is not a fatal injury, incapacitating injury or non-incapacitating evident injury.
1 – No Injuries	O	If the person has no injuries.
9 – Unknown	U	If injury severity is unknown.
0 – Not applicable		

Vulnerable Road User Crashes during the Study Period

Across the United States, VRU crashes have increased in recent years, representing an ongoing national tragedy.^{67, 68, 69} According to the Governors Highway Safety Association (GHSA) 2022 Pedestrian Traffic

⁶⁶ https://safety.fhwa.dot.gov/hsip/spm/conversion_tbl/pdfs/kabco_ctable_by_state.pdf

⁶⁷ <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813405>

⁶⁸

<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813322#:~:text=In%202020%20there%20were%2093%20pedalcyclists%20killed%20in%20traffic%20crashes,percent%20from%20859%20in%202019>

⁶⁹

<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813322#:~:text=In%202020%20there%20were%2093%20pedalcyclists%20killed%20in%20traffic%20crashes,percent%20from%20859%20in%202019>.

Fatalities by State report, pedestrian fatalities have increased nationally from 6,075 in 2017 to 7,624 in 2021, an increase of over 25%.⁷⁰ Similarly, Oklahoma has seen an increase in pedestrian fatalities, from 82 in 2017 to 101 in 2021, an increase of 23%.

From 2017 through 2021, on all roads across Oklahoma there was an overall increase in annual fatalities for all modes, from 652 fatalities in 2017 up to 715 in 2021. Similarly, there was an increase in pedestrian fatalities occurred, from as low as 63 in 2018 up to 101 in 2021. This is somewhat consistent with the overall increase in fatalities seen. Bicyclist fatalities fluctuated over the five-year period but maintained a relatively steady average of around 12 fatalities per year.

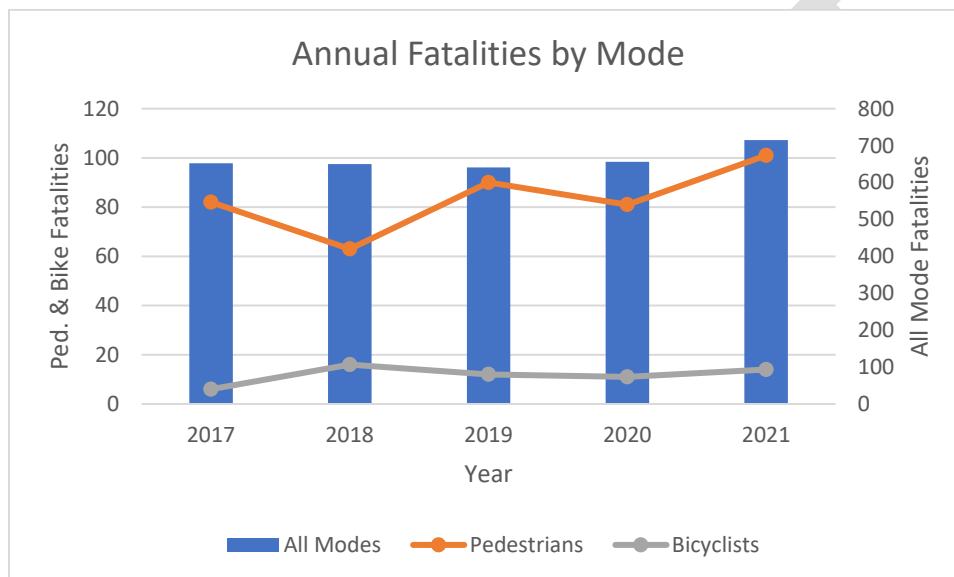


Figure 7. Annual fatalities by mode (Source: SAFE-T Database 2017-2021)

Expanding our view to include fatalities as well as serious injuries, there was a slight overall decrease for all modes across Oklahoma for the five-year study period, going from 3,300 in 2017 down to 2,788 in 2021. Despite this, a slight increase in pedestrian fatal and serious injury crashes was observed. From as low as 194 fatal and serious injury crashes in 2018, there were 250 fatal and serious injury pedestrian crashes in 2021 across Oklahoma. This contradicts the overall decrease seen across all modes. Bicyclist fatalities fluctuated over the five-year period with a peak of 67 in 2019 but maintained a relatively steady average of about 50 crashes per year.

⁷⁰ <https://www.ghsa.org/sites/default/files/2023-06/GHSA%20-%20Pedestrian%20Traffic%20Fatalities%20by%20State%2C%202022%20Preliminary%20Data%20%28January-December%29.pdf>

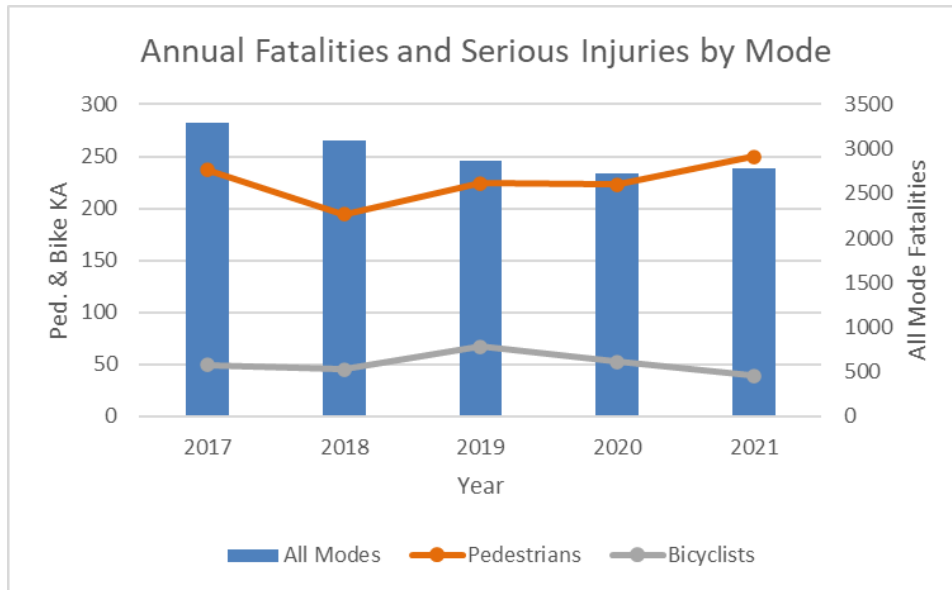


Figure 8. Annual fatalities and serious injuries by mode (Source: SAFE-T Database 2017-2021)

Crash Characteristics

CRASH TYPE

Understanding the actions of vulnerable road users is key to understanding what safety countermeasures would most appropriately address the hazards at hand. Looking at pedestrian fatal and serious injury crashes, the most prevalent pre-crash movement was crossing at an uncontrolled intersection, making up 28% of all pedestrian fatal and serious injury pre-crash actions. Other common actions included improper crossings (12%), walking with traffic (11%), and crossing at intersections (10%). Bicyclists were more frequently involved in fatal and serious injury crashes when riding with traffic, with that making up 32% of bicycle fatal and serious injury crashes. Other common actions include crossing at intersections (21%) and improper crossings (16%).⁷¹

⁷¹ Due to incomplete data, selection of priority attribute values, and the varying number of units involved in each collision, percentage values may not add up to 100%.

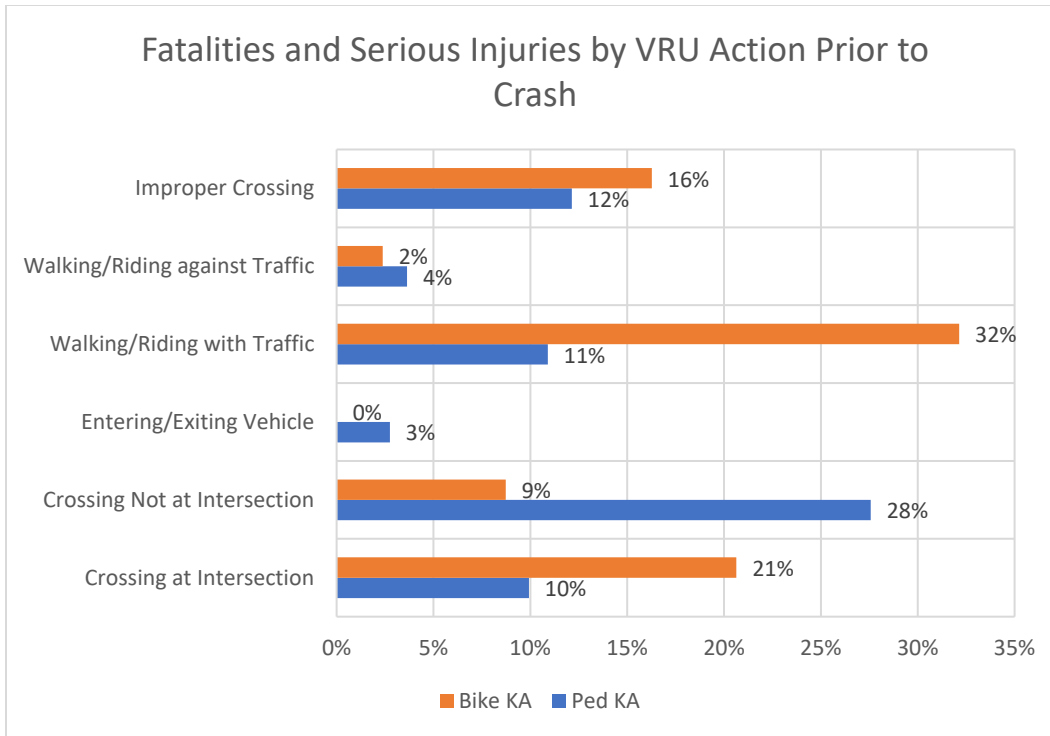


Figure 9. Fatalities and serious injuries by vulnerable road user action prior to crash (Source: SAFE-T Database 2017-2021)

Similarly, understanding patterns in actions of vehicles prior to a crash can provide additional valuable insights. The figure below illustrates the relative prevalence of common vehicle maneuvers prior to a crash. Notably, both pedestrians and bicyclists are most commonly hit by vehicles moving straight ahead.

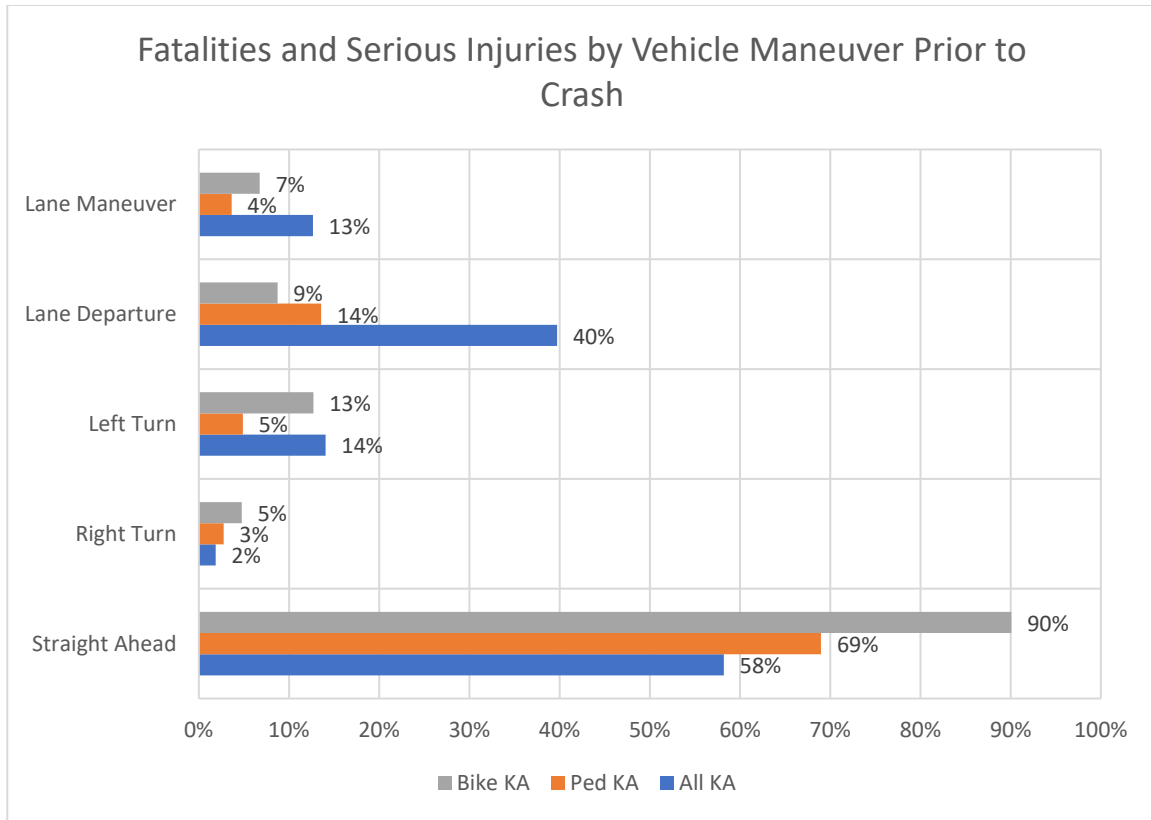


Figure 10. Fatalities and serious injuries by vehicle maneuver prior to crash (Source: SAFE-T Database 2017-2021)

ROAD USER BEHAVIORS

Impairment involvement and hit and run crashes are a major issue for vulnerable road users in the state of Oklahoma. Of all pedestrian fatalities and serious injuries, 21% involved alcohol and/or drug impairment, and 24% of crashes were classified by the reporting officer as hit and run. Bicyclist fatalities and serious injuries exhibit similar but slightly less elevated patterns, with 12% involving impairment and 21% being hit and run. These patterns may relate to the elevated frequencies of VRU being killed or seriously injured during late evening hours shown in the *Time and Day* section.

Fatalities and serious injuries occurring within defined work zones were also studied, noting approximately 2% and 1% of all pedestrian and bicyclist injuries occurring within work zones, respectively. Unusual traffic patterns in these work zones may contribute to these events, as well as the presence of workers, classified as pedestrians in the analyzed crash data, in vulnerable positions in work zones.

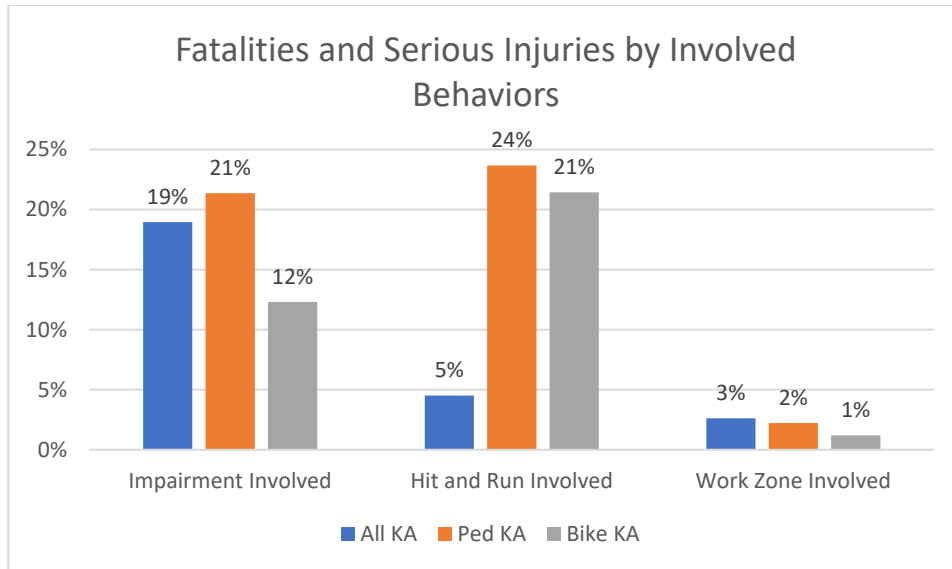


Figure 11. Fatalities and serious injuries by involved behaviors (Source: SAFE-T Database 2017-2021)

VEHICLE TYPE

The types of vehicles involved in VRU crashes can have a significant impact on outcomes. Larger, heavier vehicles tend to cause more severe injuries due to increased kinetic energy involved in crashes. For VRU crashes across Oklahoma, 44% involved passenger vehicles, even across both pedestrian and bicycle modes. Larger vehicles with a higher hood, such as SUVs, were involved in 26% of pedestrian fatalities and serious injuries, compared to 21% for bicyclists. Pickup trucks and motorcycles were involved in 27% and 1% of VRU crashes respectively. Heavy vehicles were involved in 8% of pedestrian fatalities and serious injuries and 5% for bicyclists.

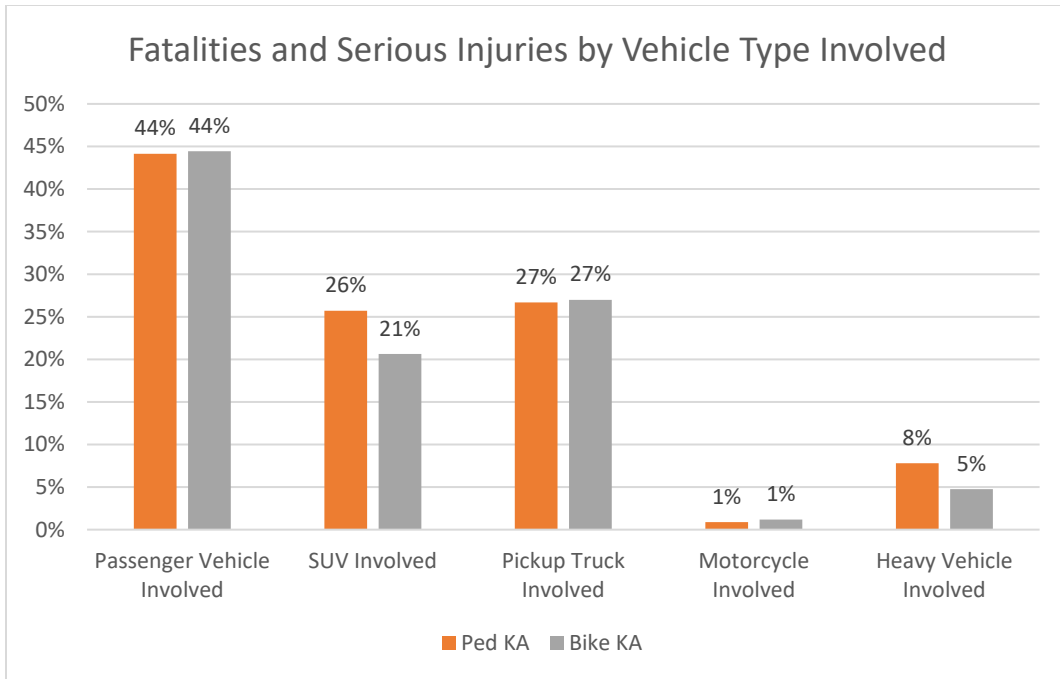


Figure 12. Fatalities and serious injuries by vehicle type involved (Source: SAFE-T Database 2017-2021)

VULNERABLE ROAD USER VICTIM AGE

In Oklahoma, approximately 20% of the population is below the age of 15. There were 76 children under the age of 15 killed or seriously injured during the 2017-2021 study period, representing approximately 7% of VRU fatalities and serious injuries across all ages. Though this is a relatively small proportion given their share of the population, it still represents a large number of children being killed or seriously injured while walking, bicycling, or rolling on roads in Oklahoma. Vulnerable road users aged 25-65 are consistently overrepresented in all age groups relative to their share of the population, likely reflecting higher numbers of trips traveled by these residents who may make frequent trips for daily commutes, errands, and more.

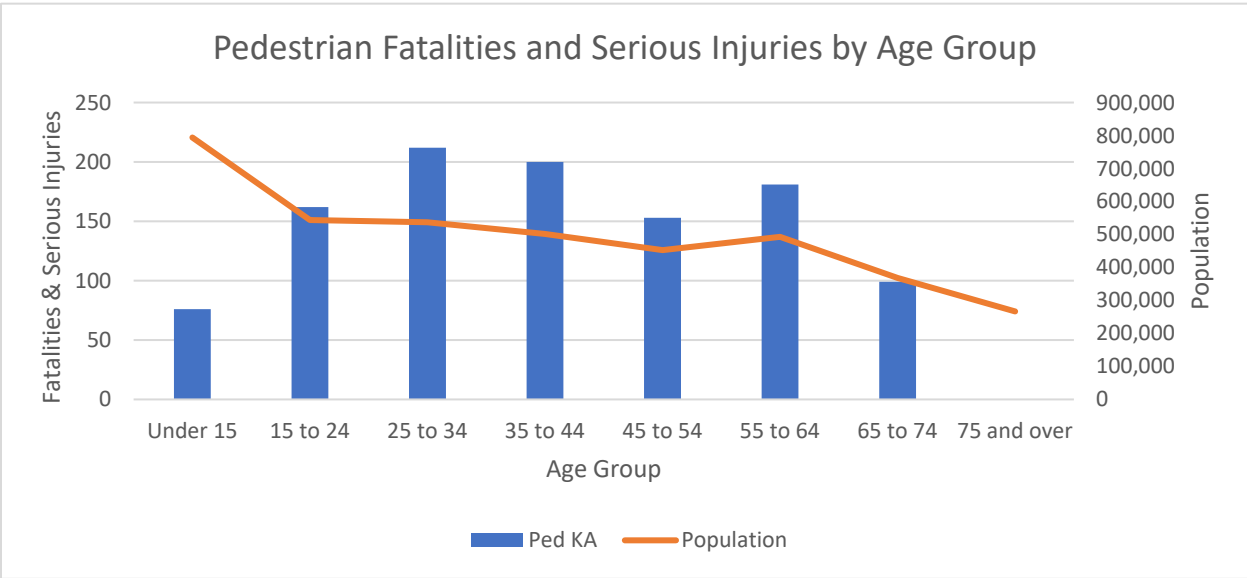


Figure 13. Pedestrian fatalities and serious injuries by age group (Source: SAFE-T Database 2017-2021)

Similar to pedestrians, there were 27 bicyclist fatalities and serious injuries among children under the age of 15 over the 2017-2021 study period, representing approximately 11% of fatalities and serious injuries across all ages. Though this is a relatively small proportion given their share of the population, it still represents a large number of children being killed or seriously injured while riding bicycles. Bicyclists aged 45-54 are particularly overrepresented in terms of crash frequency, with 49 fatalities and serious injuries during the study period, making up 20% of all fatalities and serious injuries despite only representing about 11% of the population in Oklahoma.

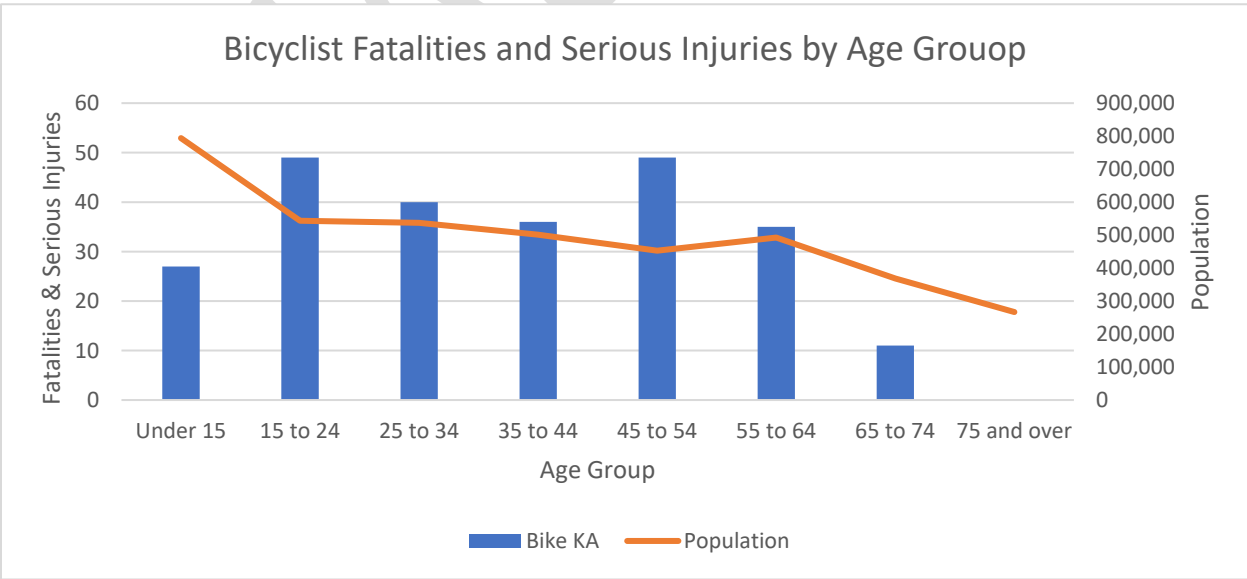


Figure 14. Bicyclist fatalities and serious injuries by age group (Source: SAFE-T Database 2017-2021)

Road Characteristics

CRASH LOCATION AND CONTROL TYPE

When there are long distances between intersections, pedestrians often choose to cross the road at midblock locations. Because there is no traffic control or physical protection for vulnerable road users at these locations, motorists may not anticipate pedestrians crossing. This increases both the likelihood and the relative severity of these crashes.

Bicyclist crashes are also most common at midblock locations where crashes with vehicles may occur due to sideswiping, overtaking, and many other causes. There is also a relative overrepresentation of bicyclist injuries occurring at unsignalized and uncontrolled intersections that may be due to inconsistent yielding behavior or other motorist and bicyclist behaviors.

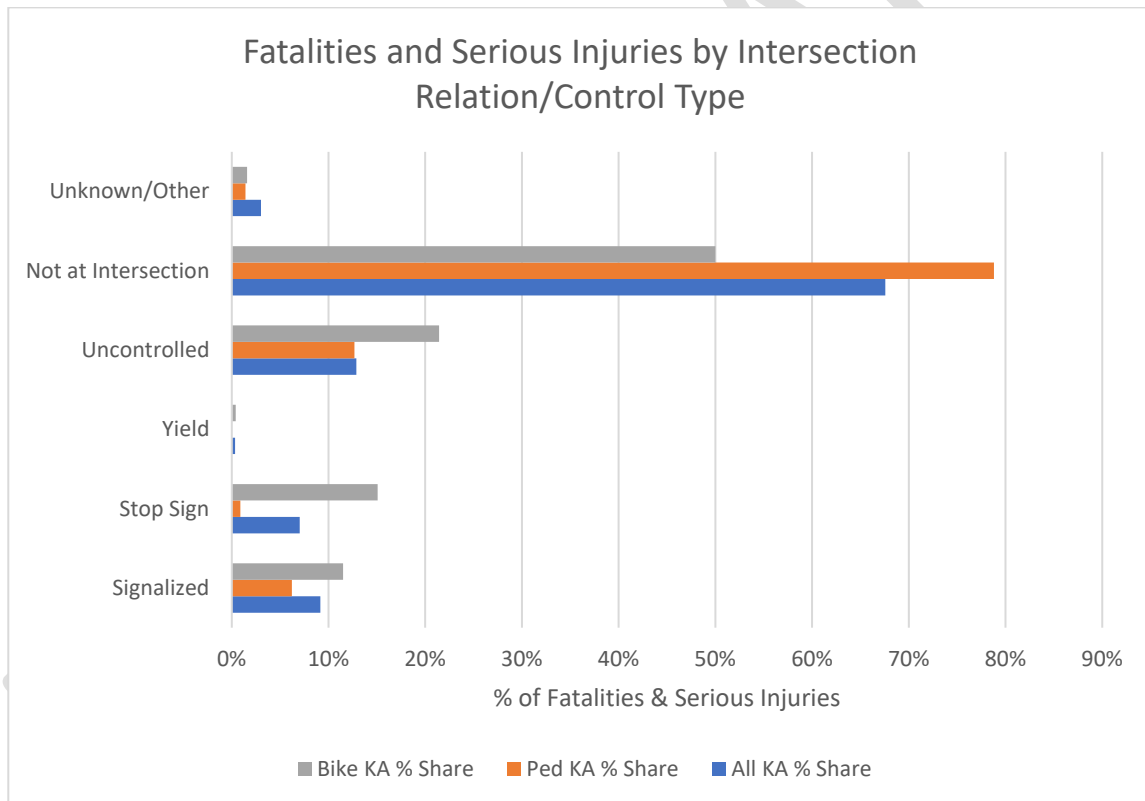


Figure 15. Fatalities and serious injuries by intersection relation and control type (Source: SAFE-T Database 2017-2021)

POSTED SPEED LIMIT

Crashes resulting in a VRU fatal and serious injury occur most frequently on facilities with speed limits of 25 MPH or lower.⁷² However, this represents a large portion of the state's roadway network, including many neighborhood streets. Approximately 20% of VRU deaths and serious injuries occur on roads with speed limits of 40-45 MPH. This represents trips taken on higher functional class roads where roads may have higher volumes and wider cross sections.

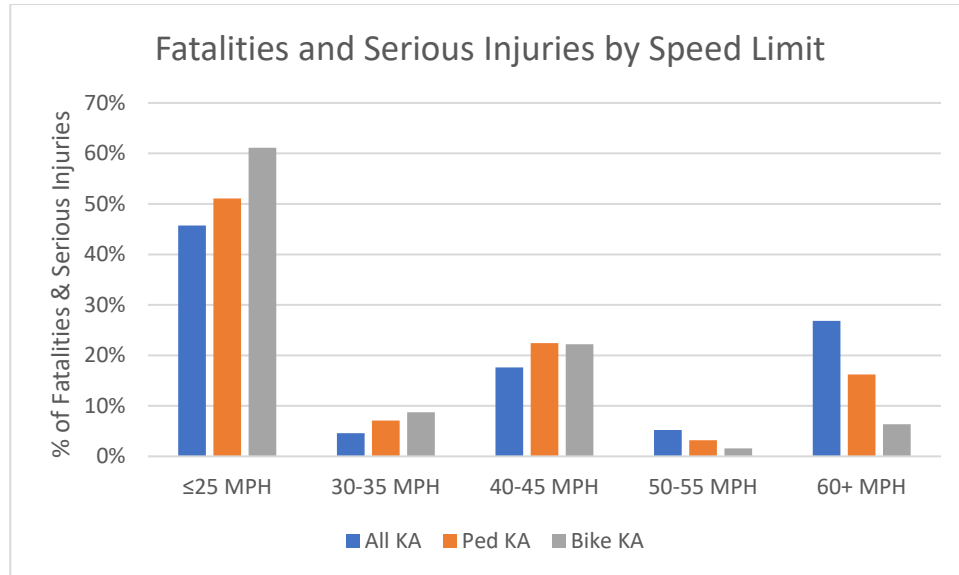


Figure 16. Fatalities and serious injuries by speed limit (Source: crash data from SAFE-T Database 2017-2021 and speed limit data from Open Street Maps)

⁷² Reported crash locations were correlated to speed limits from Open Street Maps in GIS.

Environmental Characteristics

TIME AND DAY

		Time of Day								
		12 AM - 3 AM	3 AM - 6 AM	6 AM - 9 AM	9 AM - 12 PM	12 PM - 3 PM	3 PM - 6 PM	6 PM - 9 PM	9 PM - 12 AM	
Day of Week	Monday	7	15	19	9	12	23	48	35	Weekdays
	Tuesday	8	14	15	11	21	22	36	26	
	Wednesday	10	11	16	9	10	29	48	37	
	Thursday	8	11	19	12	10	25	42	33	
	Friday	14	10	19	7	11	15	49	55	
	Saturday	24	14	9	3	8	10	49	43	Weekend
	Sunday	36	14	12	5	7	10	31	21	
		Dark Conditions		AM Peak	Light Conditions		PM Peak	Dark Conditions		

Figure 17. Pedestrian fatalities and serious injuries by day of week and time of day (Source: SAFE-T Database 2017-2021)

Looking at trends in the time and day of week on which crashes occur at can be important in understanding the context and behavior behind fatal and serious injury crashes. Between 2017 and 2021, pedestrian and bicyclist fatalities and serious injuries were most prevalent between 3pm to 12am during the week and 6pm to 3am over the weekend. This trend is consistent with other findings that show a high prevalence of severe pedestrian crashes in dark, unlit conditions in the *Lighting Conditions* section. Pedestrian and bicyclist fatalities and serious injuries also slightly increase from 6-9am and from 3-6pm during the week due to an increase in road user volumes and potential conflicts due to work commutes.

		Time of Day								
		12 AM - 3 AM	3 AM - 6 AM	6 AM - 9 AM	9 AM - 12 PM	12 PM - 3 PM	3 PM - 6 PM	6 PM - 9 PM	9 PM - 12 AM	
Day of Week	Monday	0	2	7	2	5	6	4	5	Weekdays
	Tuesday	1	1	1	4	6	9	4	5	
	Wednesday	2	3	6	8	4	8	10	6	
	Thursday	3	2	2	5	4	10	8	3	
	Friday	4	2	2	4	6	8	9	1	
	Saturday	5	3	0	4	4	6	10	10	Weekend
	Sunday	4	0	2	1	3	6	5	7	
		Dark Conditions		AM Peak	Light Conditions		PM Peak	Dark Conditions		

Figure 18. Bicyclist fatalities and serious injuries by day of week and time of day (Source: SAFE-T Database 2017-2021)

ROAD CONDITIONS

Between 2017 and 2021, 85% of all pedestrian fatalities and serious injuries occurred on dry roads, with only about 10% occurring on wet or ice/snow/slush roads. Between 2017 and 2021, 92% of all bicyclist fatalities and serious injuries occurred on dry roads, with only about 5% occurring on wet roads. These are generally consistent with expectations and does not reflect any elevated pattern.

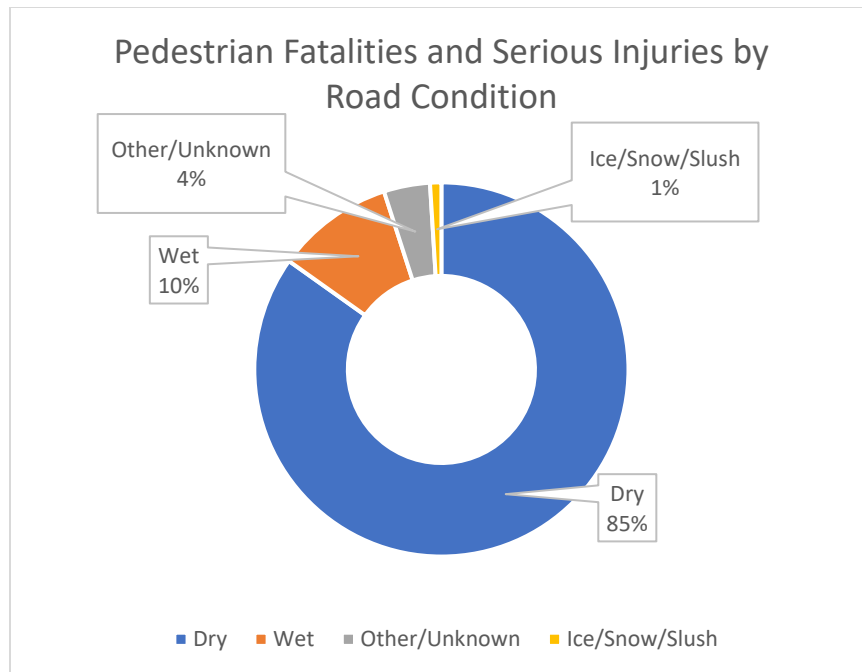


Figure 19. Pedestrian fatalities and serious injuries by road condition (Source: SAFE-T Database 2017-2021)

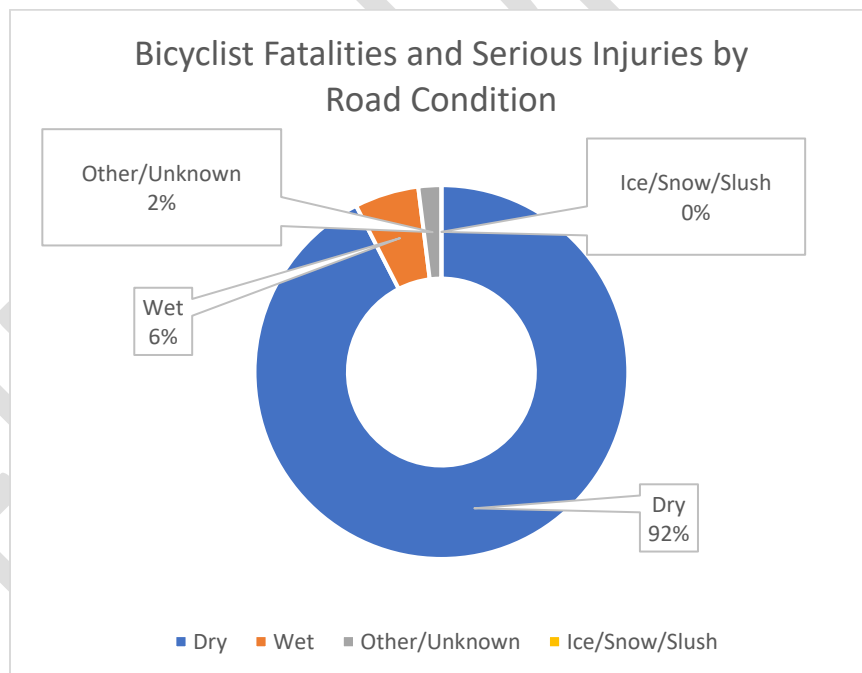


Figure 20. Bicyclist fatalities and serious injuries by road condition (Source: SAFE-T Database 2017-2021)

LIGHTING CONDITIONS

Between 2017 and 2021, 43% of all pedestrian fatalities and serious injuries occurred in dark, unlit conditions. An additional 24% occurred in dark conditions with lighting. This is consistent with the trend of vulnerable road user crashes being more frequent during the late night and early morning hours. Further, this indicates a strong overrepresentation of severe vulnerable road user crashes occurring under darkness where the presence of streetlighting may improve visibility and reduce these occurrences. With many pedestrian crashes occurring due to pedestrians crossing or traveling at uncontrolled midblock locations, dark conditions may further reduce motorists' ability to see and react to pedestrians in the road.

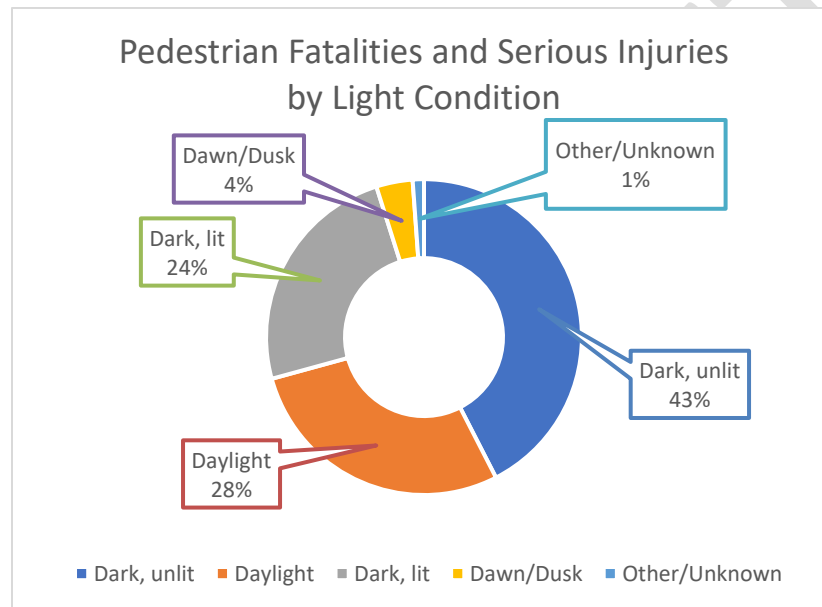


Figure 21. Pedestrian fatalities and serious injuries by light condition (Source: SAFE-T Database 2017-2021)

Between 2017 and 2021, 59% of all pedestrian fatalities and serious injuries occurred in dark, unlit conditions. An additional 16% occurred in dark conditions with lighting. This is consistent with the trend of vulnerable road user crashes being more frequent during the late-night hours. Similar to pedestrian crashes, this indicates a strong overrepresentation of severe vulnerable road user crashes occurring under darkness where the presence of streetlighting may improve visibility and reduce these occurrences.

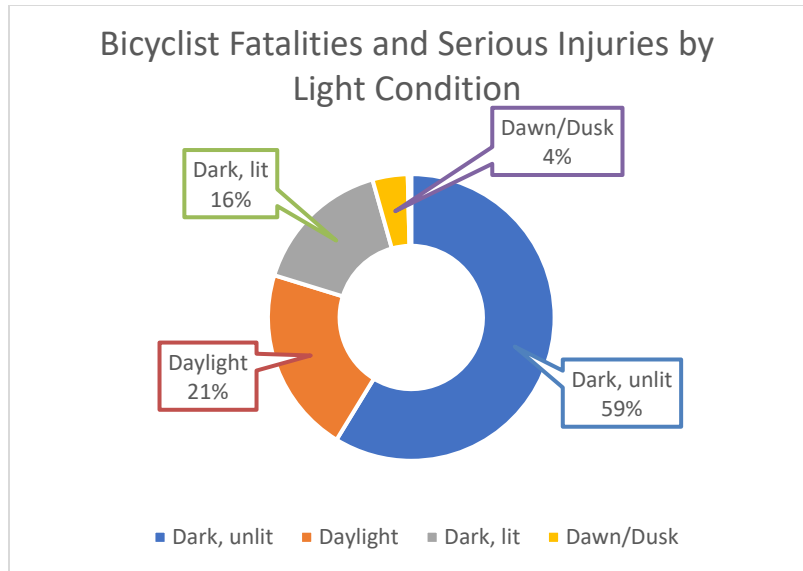


Figure 22. Bicyclist fatalities and serious injuries by light condition (Source: SAFE-T Database 2017-2021)

LAND USE CONTEXT

As may be expected, the vast majority of pedestrian and bicyclist fatalities and serious injuries occur in urban (population of 5,000 – 50,000) and urbanized (population of 50,000+) settings. This is due to larger volumes of pedestrian and bicyclist movements and the closer proximity between residential and commercial areas which encourages more active transportation modes.

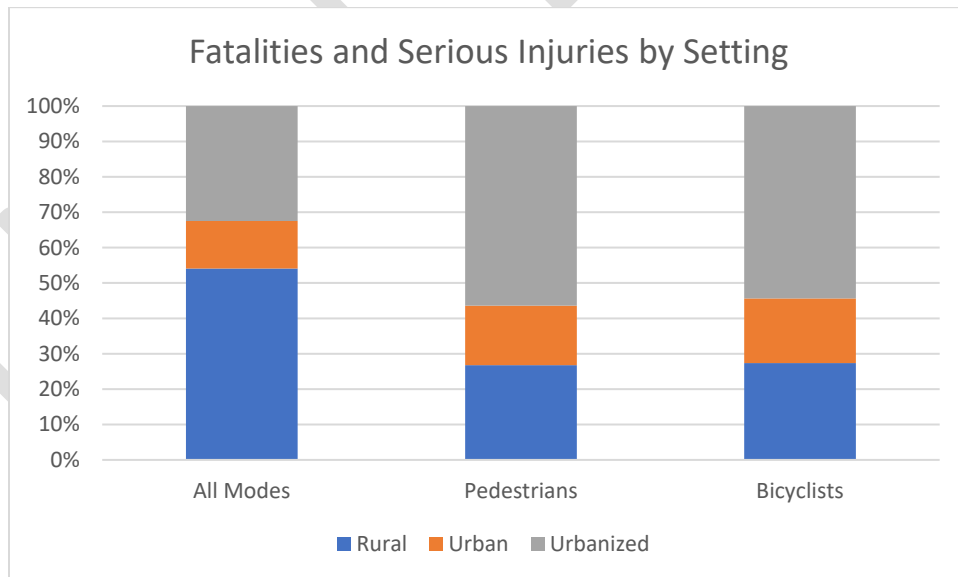


Figure 23. Fatalities and serious injuries by setting (Source: SAFE-T Database 2017-2021)

Fatal and Serious Injuries within Tribal Areas

The number of VRU deaths and serious injuries within Tribal Areas and outside Tribal Areas provides us only an estimate of VRU deaths and serious injuries, but is not enough information to determine impacts of road crashes involving American Indian populations in Oklahoma.⁷³ Demographic data for crash victims was also not available. Additionally, many factors contribute to potential confounding results of any further Indian American VRU fatal and serious injury crash analysis based on current data available. Populations living within each of the Tribal Areas in Oklahoma were not readily available and could not be accurately correlated to Census populations at the time of this analysis to determine the fatal and serious injury crash rates by population within each Tribal Area. Also, American Indian Census data usually has an undercount rate of 5.64%.⁷⁴ Additional data processing and analysis should be conducted in the future to evaluate the number of American Indians killed or seriously injured in road crashes while walking, bicycling, or rolling. Crash reports and demographic data from identification records of parties involved are needed to accurately determine the number and other contributing factors of American Indians being killed or seriously injured in road crashes across Oklahoma.

Table 2 Fatalities and serious injuries by Tribal Areas (Source: crash data from SAFE-T Database 2017-2021 and Tribal Areas from ODOT Open Data Portal)

Tribal Areas	Any KA (14,774)	Ped KA (1,128)	Bike KA (252)	Estimated Population (3,949,342)
Within Tribal Areas	66%	50%	44%	61%
Outside of Tribal Areas	34%	50%	56%	39%

Equity Considerations

Across the state of Oklahoma, approximately 34% of the population lives within a disadvantaged Census tract. This is based on the Equitable Transportation Community Explorer, developed by the United States Department of Transportation (USDOT) as part of the Justice40 Initiative, which uses climate and disaster risk burden, environmental burden, health vulnerability, social vulnerability, and transportation insecurity to determine an overall disadvantaged scores.⁷⁵

Despite the baseline of 34% of the population in Oklahoma living in disadvantaged areas, these communities face an overrepresentation of fatal and serious injuries under all modes, and particularly for vulnerable road users, with 39% of fatalities and serious injuries occurring in disadvantaged areas.

⁷³ <https://gis-okdot.opendata.arcgis.com/datasets/okdot::tribal-boundaries/explore>

⁷⁴ <https://www.census.gov/newsroom/press-releases/2022/2020-census-estimates-of-undercount-and-overcount.html#:~:text=American%20Indian%20or%20Alaska%20Native%20alone%20or%20in%20combination%20populations,significant%20undercount%20rate%20of%205.64%25>

⁷⁵ <https://experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/ETC-Explorer---State-Results/>

Pedestrian and bicyclist fatalities and serious injuries represent much larger overrepresentations. With 52% of pedestrian and 51% bicyclist fatalities and serious injuries occurring in disadvantaged areas, this reflects overrepresentations of 18% and 17% respectively.

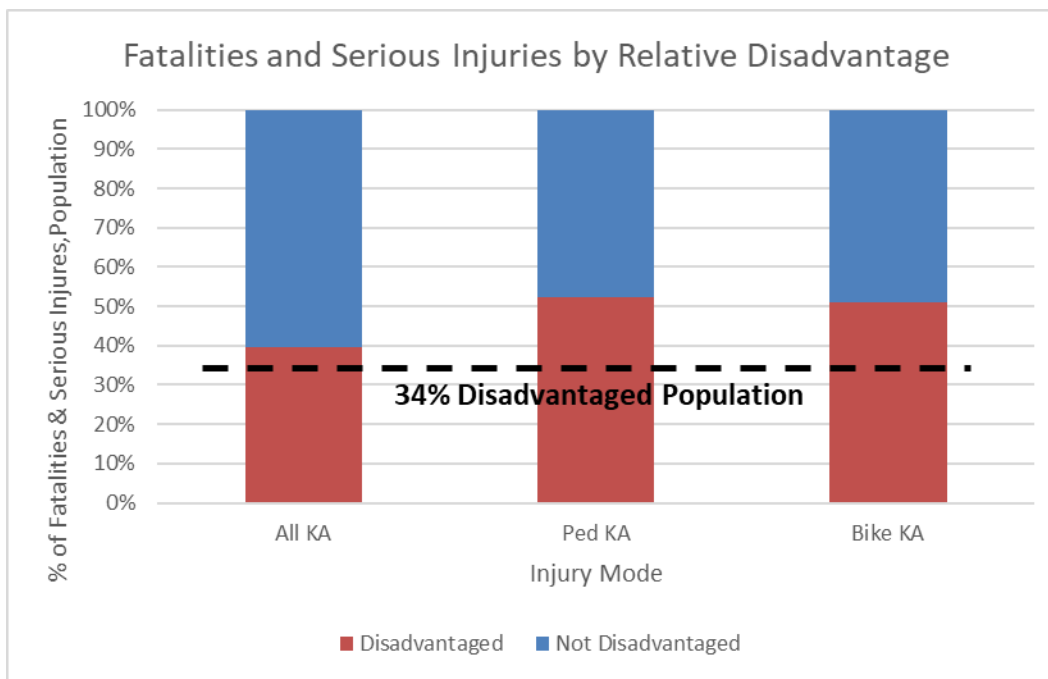


Figure 24. Fatalities and serious injuries by relative disadvantage (Source: crash data from SAFE-T Database 2017-2021 and disadvantaged data from USDOT Equitable Transportation Communities Explorer)

Descriptive Analysis Key Findings

With the data and resources maintained by ODOT, analysis was performed to better understand the unique and complex experiences of vulnerable road users across the state. This study identified several key insights to better understand the unique and complex factors of vulnerable road user crashes across Oklahoma. These key findings below are used to inform VRU safety strategies listed in the *Vulnerable Road User Safety Strategies and Projects* section of the Assessment.

Descriptive Analysis Key Findings
<p>Oklahoma is experiencing an increase in pedestrian fatalities. Over the study period, a slight increase in pedestrian fatalities and serious injuries was noted, indicating a strong need for additional investment and effective planning. Bicycle fatalities and serious injury were found to be fairly steady during the study period. Though this may appear less urgent than the pedestrian safety concern, it is still highly important to invest in improvements to bicycle safety across the state to ensure that the numbers begin decreasing.</p>
<p>Opportunities to improve the safety of vulnerable road users in dark conditions. Analyses found a large number of pedestrian and bicyclist crashes occurring at night, with many occurring in dark, unlit</p>

conditions. This points to a need to invest in infrastructure and policies that will help improve safety for these trips.

Many vulnerable road users are killed or seriously injured during hit and run events. Nearly a quarter of all vulnerable road user fatalities and serious injuries were found to involve hit and run crashes. This limits accountability for poor safety behaviors and may correlate to other unsafe behaviors leading up to the crash, such as impaired driving.

Pedestrians are crossing roads at unsafe locations. These unsafe behaviors may be indicative of road facilities which are not effectively serving vulnerable road users. Avoiding these behaviors may involve installation of additional crossing locations at busy pedestrian areas where the distance between crossing locations is long, improving motorist compliance with existing uncontrolled crossings, and providing traffic calming or reducing speed limits in pedestrian-heavy areas where these behaviors often occur to reduce the frequency and severity of these crashes when such crossings are made.

Bicyclists are being injured while riding along with traffic. Though this is generally the correct way to maneuver a bicycle in the presence of vehicular traffic, the prevalence of crashes under these conditions indicates a need for separated bicycle facilities on roads with histories of bicycle crashes or known popular routes.

Pedestrian and bicyclist fatalities and serious injuries are highly overrepresented in disadvantaged communities. Based on definitions in the Justice40 data set, disadvantaged communities represent higher frequencies of pedestrian and bicyclist fatalities and serious injuries. This may relate to lower rates of vehicle ownership and generally higher volumes of necessary active mode trips in these communities. This also means that the impacts of unsafe facilities may have stronger negative economic and social impacts on these communities which already experience other vulnerabilities.

Future VRU Safety Data Collection and Analysis Strategies

Throughout this initial Assessment, a number of additional datasets that either need to be collected and/or processed were identified that could be helpful to future analysis. Additionally, due to time limitations of this study, there are also additional analysis methods, including advanced hot spot and systemic analysis, that could be helpful as ODOT advances the VRU Safety Emphasis Area, identifies additional crash risks, and determines if programs and projects are positively impacting reducing vulnerable road user deaths and serious injuries across Oklahoma. Potential future data collection and analysis strategies include:

Future VRU Safety Data Collection and Analysis Strategies

Exposure data. Having access to more robust vehicle volumes as well as detailed pedestrian and bicyclist volumes could provide a greater understanding of the relative risk for vulnerable road users using different portions of the road network.

Additional road network data. Correlating safety performance to various additional road network characteristics could provide a more complete view of what risk factors are present which may impact

safety performance for vulnerable road users. Key road features include road functional classification, number of lanes, road width, turning lanes, lighting fixtures, and more.

Sidewalk and bicycle facility inventory. Asset management inventory of vulnerable road user facility types would provide understandings of safety performance as well as opportunities for infrastructure investments. These facility inventories should include sidewalks, crossings, bicycle facilities, pedestrian bridges, and more.

Pedestrian generator data. Similar to direct exposure data such as traffic volumes, pedestrian generator data can help fill in gaps to understand where vulnerable road users are traveling to and from, indicating key locations for safety investment. These facilities include schools, parks, commercial districts, and various public facilities.

Transit data. To further understand patterns of vulnerable road user movements, transit data, such as General Transit Feed Specification (GTFS), can tell us where pedestrians are moving at various times of day. Understanding where transit facilities are located and their relative use can help inform the types of facilities that receive investment and may present opportunities for partnerships with transit agencies.

Unsafe behavior information. Additional information on unsafe driver and road user behaviors, such as distracted driving, aggressive driving, and more can be valuable in diagnosing and responding to safety concerns, especially as it relates to vulnerable road users. Including and expanding on this information in crash reports and crash analysis systems will help eliminate these unsafe behaviors on roads.

Citation and near miss data. Crashes are relatively rare and represent only a portion of all events which impact the safety, security, and comfort of vulnerable road users. Additional data sets that capture near misses, citations for dangerous behaviors, and community-generated polling data can help to supplement crash data and provide a more nuanced understanding of the behavioral and infrastructural issues that impact safety performance in different communities. Conduct near miss video analytics analysis in the VRU Safety High-Risk Areas.

Tribal Communities. American Indians and Tribal Communities are a key part of Oklahoma's diverse population. Further data and analysis of American Indians involved in VRU fatal and serious injury crashes should be conducted to prevent American Indians from being killed or seriously injured while walking, bicycling, or rolling on roads in Oklahoma. This should be done in partnership with the Tribal Organizations and address existing safety concerns brought up during the VRU Safety High-Risk Area consultations. Future VRU Safety Assessment should include correlation of driver's license, identification cards, and/or death certificates to determine race/ethnicity and/or Tribal member or identification cards to crash records to determine to impact of VRU fatal and serious injury crashes on Indian Americans in Oklahoma.

Systemic Safety Analysis. Systemic safety analysis is proactive and identifies roadway, intersection, and context attributes correlated to the occurrence of target crash types. This can be used to prioritize facilities for safety investments where risk factors have been identified, regardless of crash

history. This is an important complement to standard hot spot network screening and project identification methods.

Investigate VRU Age. Studying the age of victims in VRU crashes can help us understand what underlying scenarios and issues may be impacting crashes and guide us to more effective safety programming.

Crash Clustering Analysis. To help capture corridor-level patterns of vulnerable road user crashes, crash clustering analysis can be performed, identifying broader patterns of crashes across commercial districts, residential neighborhoods, or other areas. This can lead to further prioritization of strategies and projects.

Project and Program Evaluation. To understand the effectiveness of VRU safety projects, periodic evaluation of countermeasures can be conducted. This analyzes before-after, or cross-sectional data for project locations, evaluating the safety impacts of investments and computing an estimated return on investment, crash modification factors, or other key metrics to quantify the effectiveness of safety investments both at the project and program levels.

FINAL DRAFT

SUMMARY OF QUANTITATIVE ANALYSIS

This section outlines the data and methods used to identify the VRU Safety High-Risk Areas which are central to this document and the basis for the stakeholder consultations. These VRU Safety High-Risk Areas include the ACOG, the INCOG, as well as Tribal Communities around the state of Oklahoma. Each of these three areas were found to satisfy the three factors defined in the following section, featuring high densities of pedestrian and bicyclist fatalities and serious injuries, large proportions of populations living in disadvantaged areas, and high proportions of indigenous populations.

Specific strategies and projects being recommended for future implementation are included in the *Vulnerable Road User Safety Strategies and Projects* section of this Assessment.

The initial VRU Safety High-Risk Areas where consultations were conducted as part of the SHSP included the following:

- Oklahoma City and ACOG
- Tulsa and INCOG
- Tribal Communities

Additional VRU Safety High-Risk Areas based on VRU fatalities and serious injuries per 100,000 residents where additional analysis, consultation, and most importantly resources to improve pedestrian and bicycle safety should also include the following:

- Norman
- Lawton
- Muskogee

Data and Methodology

The primary purpose for identifying VRU Safety High-Risk Areas for the vulnerable road user safety assessment is to help focus efforts and funding toward communities and locations that need them most urgently. This includes both communities with relative safety underperformance and elevated crash patterns as well as communities which are the most vulnerable to the economic, social, and other impacts of these crashes and safety concerns. To identify the most crucial of these locations, Oklahoma DOT focused efforts on three main factors:

- **Locations with relatively high geographic density of pedestrian and bicyclist fatalities and serious injuries.** Because these locations experience high numbers of vulnerable road user crashes and injuries within their boundaries, safety improvements may be expected to produce greater effects per dollar spent and per location addressed.
- **Locations with relatively high proportions of residents living in disadvantaged census tracts according to the Justice40 Equitable Transportation Communities Explorer.** Communities which experience a variety of economic and social disadvantages are particularly at risk to the impacts of underperforming transportation networks. For these communities, walking and biking may be more critical to their mobility, so unsafe networks may put them at elevated risk or may preclude them from taking some trips altogether.

- **Tribal Lands and locations with a greater number of American Indian populations walking and bicycling.** Due to overrepresentation of American Indians being killed or seriously injured walk walking and bicycling and the transportation inequities due to being historically underserved and marginalized, focusing safety funds and efforts at these locations can help produce more equal outcomes in the long term and improve safety performance for communities where safe active transportation systems may not be complete or accessible to all residents.

Geographic Crash Density Analysis

Vulnerable road user volumes tend to be the highest in more densely populated areas where walking and biking distances are shorter. Because of this, these areas tend to have the highest frequencies of pedestrian and bicyclist crashes as well. Heatmaps were developed using geospatial software and standard data density analysis tools, visualizing the relative density of pedestrian and bicyclist fatalities and serious injuries across the state of Oklahoma. As shown in the heatmaps below, both pedestrian and bicyclist fatalities and serious injuries are significantly concentrated in the Oklahoma City and Tulsa metro areas. There are also smaller clusters of crashes spread throughout the state in smaller cities and towns, such as Norman, Lawton, and Muskogee.

This analysis helps to capture a clearer understanding of the safety performance of Oklahoma's road network as it relates to pedestrians and bicyclists. As expected, pedestrian and bicyclist fatalities and serious injuries are highly concentrated in the urban areas, representing a great potential for safety improvement. Because of this concentration of crashes, the areas in and around Oklahoma City and Tulsa, captured by the ACOG and INCOG regions, were identified as VRU Safety High-Risk Areas.

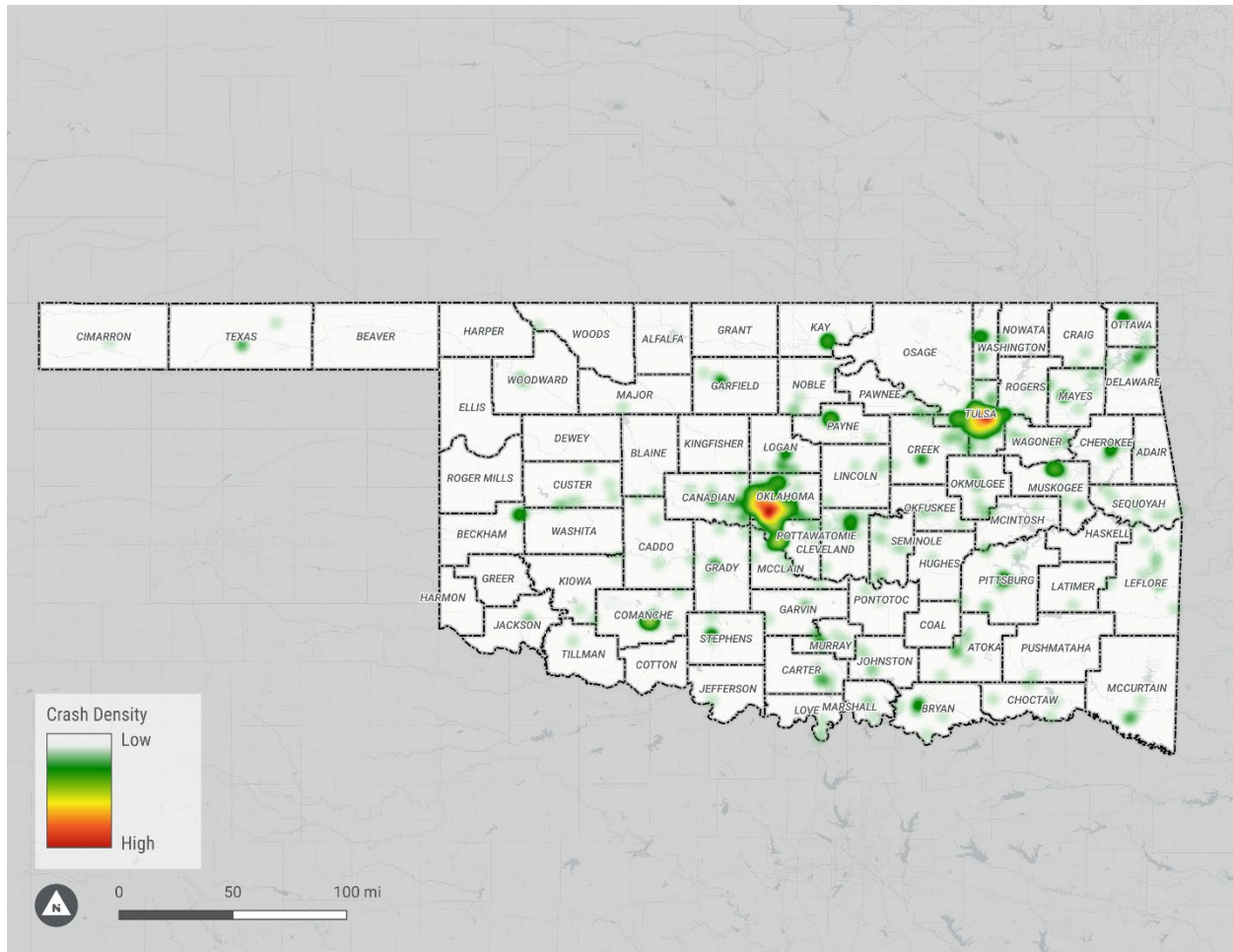


Figure 25. Heatmap of pedestrian fatalities and serious injuries across the state (Source: SAFE-T Database 2017-2021)

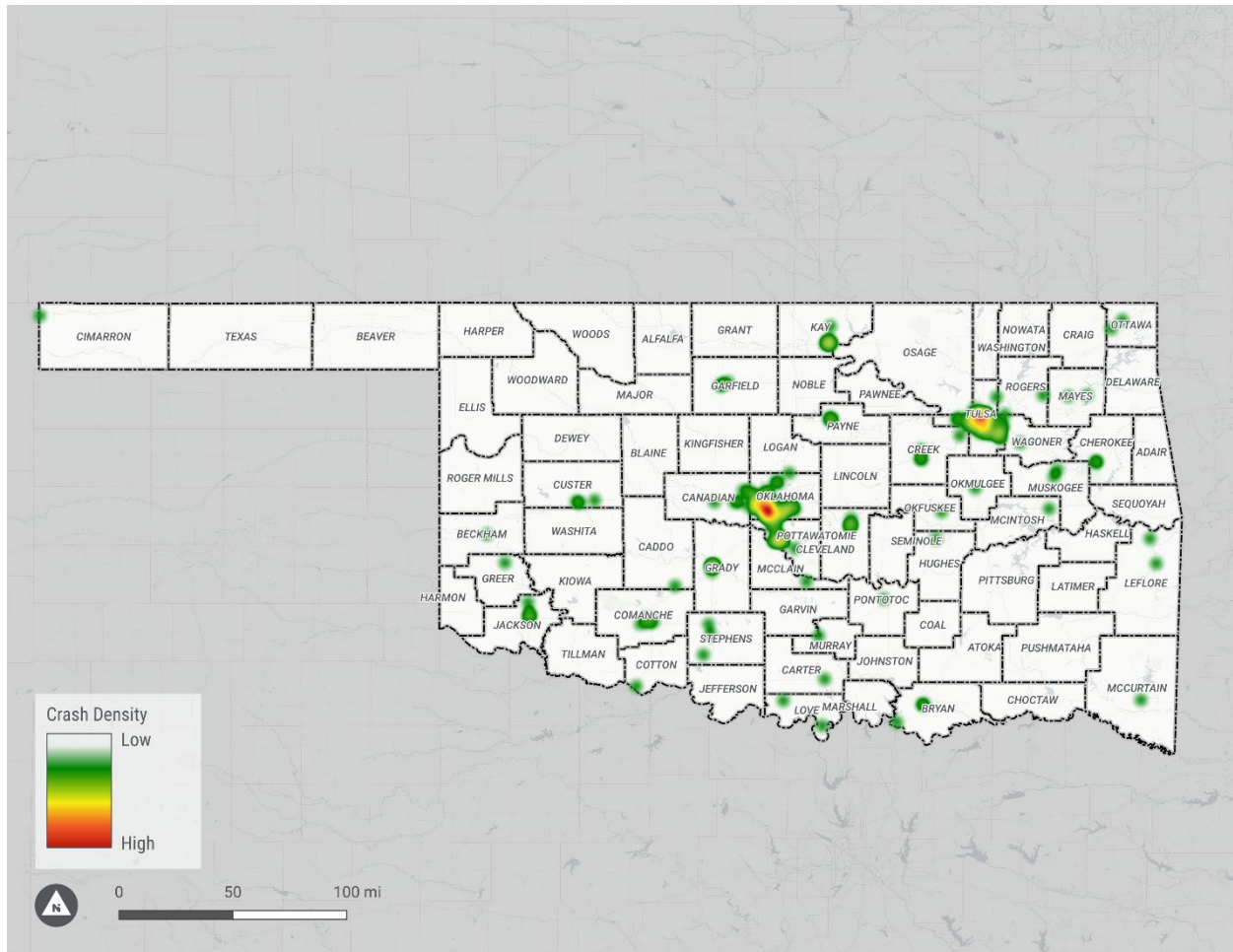


Figure 26. Heatmap of bicyclist fatalities and serious injuries across the state (Source: SAFE-T Database 2017-2021)

Disadvantaged Communities

As discussed in the section on *Equity Considerations*, the strong overrepresentation of vulnerable road user crashes in disadvantaged communities highlights the importance of considering equity when defining safety programming and policies. This ensures that adequate resources are being provided, at appropriately high levels, to our more vulnerable communities. Residents in these areas may have more limited access to reliable transportation, are economically strained, or are more vulnerable to the financial and societal repercussions of poor safety performance. For this reason, disadvantaged communities should be highlighted in future safety programming coming out of this effort.

The two VRU Safety High-Risk Areas of Tulsa and Oklahoma City are explored in more depth below, highlighting these communities as critical areas for the focus of this vulnerable road user safety assessment. Due to the high numbers of residents in these communities that live in disadvantaged communities, this further confirmed the selection of Tulsa and Oklahoma City as VRU Safety High-Risk Areas where the impacts of VRU crashes would be most significant.

TULSA

Looking further into Tulsa, 41% of the population has been identified as living in a disadvantaged Census tract, meaning that there is an overrepresentation in Tulsa compared to the statewide 34%. Citywide, only 25% of the population has been identified as being transportation insecure. However, despite this, 40% of traffic fatalities and serious injuries in Tulsa occur in these tracts. Census tracts in the northeast and western parts of the city were found to have the highest rates of transportation insecurity. Additionally, although some of these Census tracts were found to have lower rates of transportation insecurity, they were found to have a much higher share of the roadway fatalities despite not appearing to be transportation insecure. This was especially evident in communities along the south side of the Arkansas River.

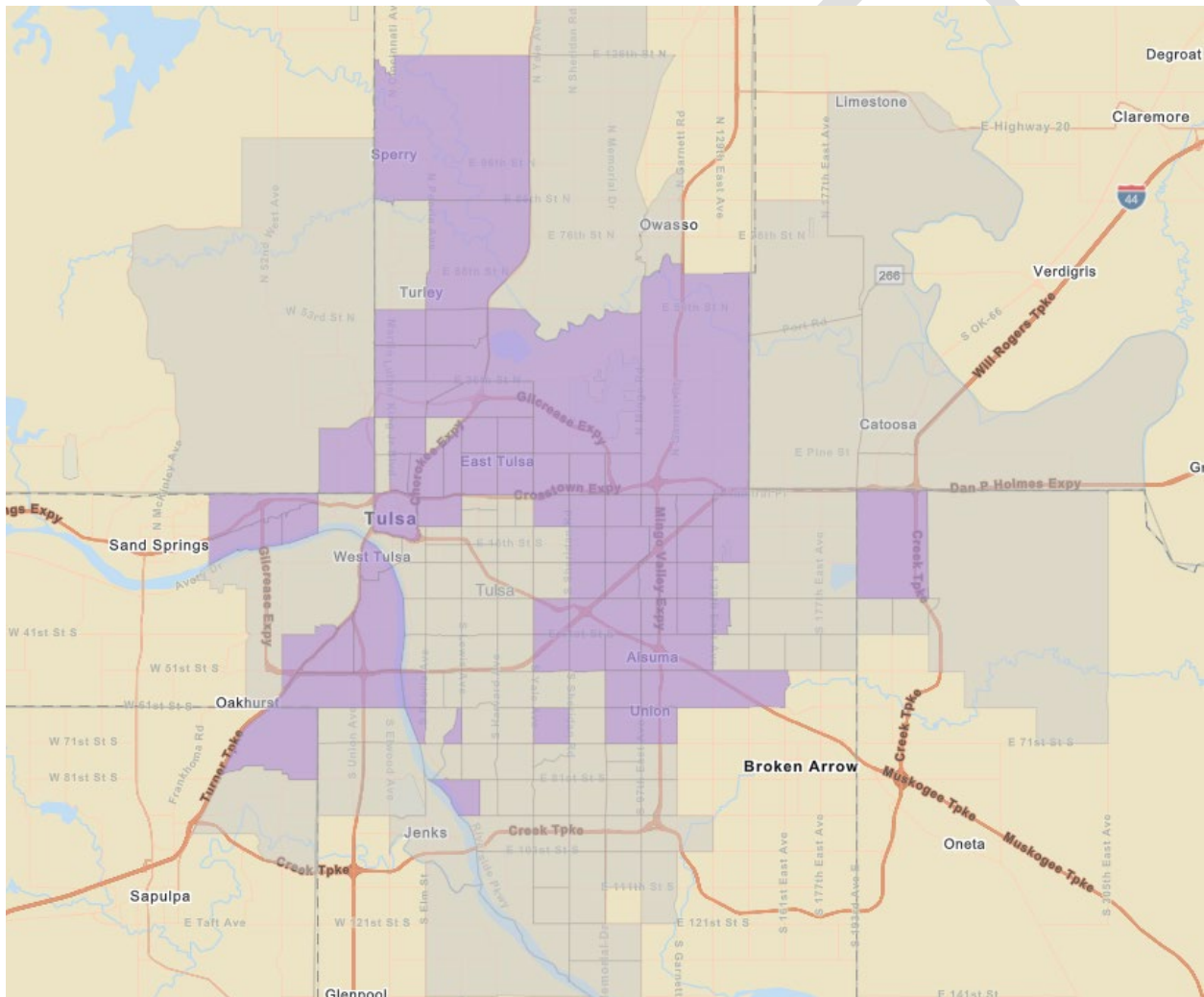


Figure 27. Tulsa's disadvantaged Census Tracts shown in purple (Source: [USDOT Equitable Transportation Communities Explorer, 2023](#))

OKLAHOMA CITY

In Oklahoma City, 34% of the population has been identified as living in a disadvantaged Census tract. Overall, 32% of the City lived in a transportation disadvantaged Census tract, but there are tracts throughout the city that have a much higher percentage of transportation insecurity than other portions of the city. Specifically in the southwestern Oklahoma City, many of the Census tracts that may appear to have a low overall rate of transportation insecurity but have an extremely high rates of traffic fatalities. Some of the disadvantaged tracts that don't appear to be transportation insecure should be further investigated from the lens of traffic safety to provide for a more holistic understanding of the conditions in these Census tracts.

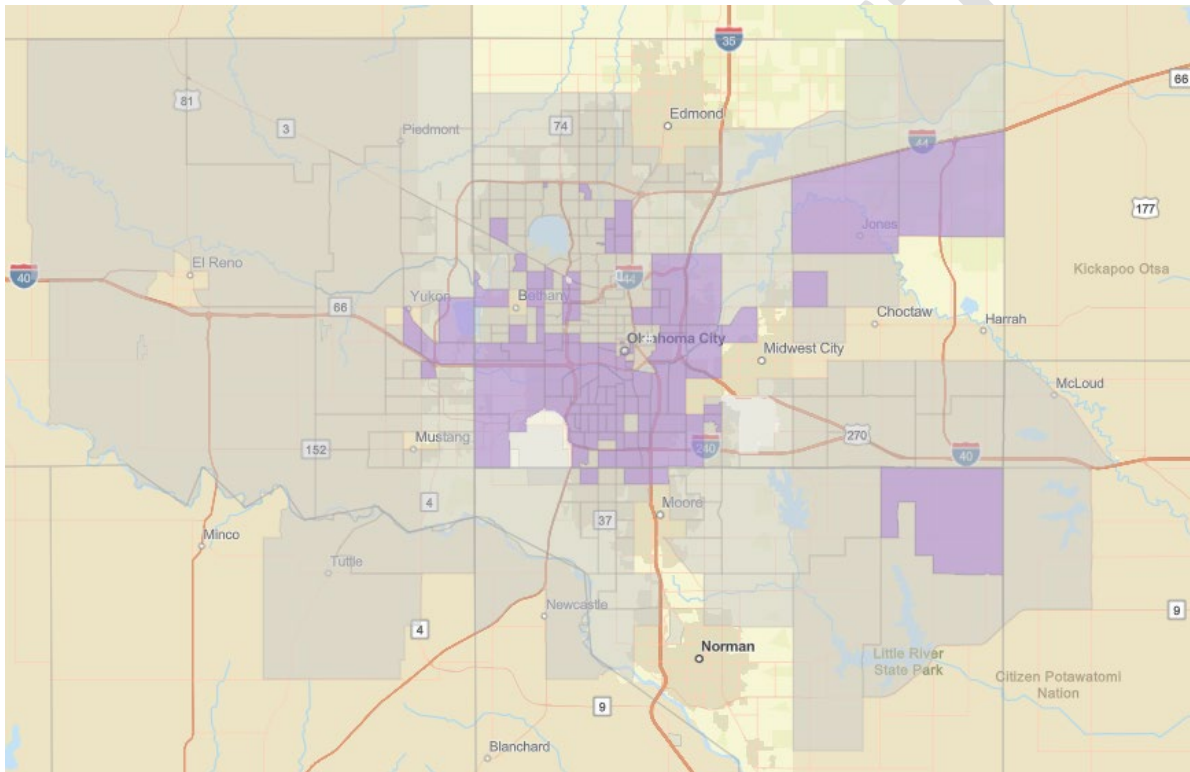


Figure 28. Oklahoma City's disadvantaged Census Tracts shown in purple (Source: USDOT Equitable Transportation Communities Explorer, 2023⁷⁶)

Tribal Communities

According to the Oklahoma Office of the Tribal Liaison, “38 federally recognized Oklahoma tribal nations have inalienable self-governance power over their citizens and territories, and possess unique culture, beliefs, value systems, and history as a sovereign nation.”⁷⁷ The 2020 US Census date, 633,831

⁷⁶ <https://experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/Homepage/>

⁷⁷ <https://oklahoma.gov/health/health-education/community-outreach/community-development-services/office-of-tribal-liaison.html>

Oklahomans are American Indian, making up approximately 16% of the Oklahoma population.⁷⁸ Moreover, the Centers for Disease Control and Prevention (CDC) indicates motor vehicles crashes are a leading cause of American Indian deaths in the United States.⁷⁹ Additionally, NHTSA indicated 64% of Indian American road crash fatalities occur in rural areas.⁸⁰ Data from National Safety Council and GHSA indicate that American Indians experience the greatest pedestrian injury, built environment, travel activity, and social equity disparities and the greatest pedestrian and bicyclist fatalities per capita rates.^{81, 82} Given the greater number of American Indians living in Oklahoma and overrepresentation of being killed in road crashes nationally, ODOT has added Tribal Communities as a VRU Safety High-Risk Area in this SHSP.

Additional analysis should be performed to evaluate the impact of VRU fatal or serious injury crashes in Tribal Areas and among American Indian populations as noted in *Tribal Communities* of the *Summary of Quantitative Analysis* section.

Additional High-Risk Area Identification

Beyond the goals and scope of this vulnerable road user safety assessment, there are more opportunities to identify, study, and invest in additional VRU Safety High-Risk Areas. Building on the factors which are the focus of this effort, additional considerations are presented below for expanding the assessment and consultations to more communities across Oklahoma.

Beyond the two major cities of Oklahoma City and Tulsa, smaller cities including Norman, Lawton, and Moore make up the top five cities by pedestrian fatal and serious injuries, followed by Midwest City, Muskogee, Sand Springs, Edmond, and Stillwater. When normalized for population, Tulsa and Sand Springs have relatively high rates of vulnerable road user fatalities and serious injuries per capita, with Norman, Lawton, and Edmond having relatively low rates per capita. This may indicate differences in the relative safety performance of transportation networks between these cities as well as differing levels of walking and biking among residents.

Despite lower relative densities of vulnerable road user crashes, comparing crash rates to resident population is an important analysis to understand crash rates. Though these smaller communities were not included in the initial VRU Safety High-Risk Area consultations, they represent a critical component

⁷⁸ <https://www.census.gov/library/stories/state-by-state/oklahoma-population-change-between-census-decade.html>

⁷⁹

<https://www.cdc.gov/transportationsafety/native/factsheet.html#:~:text=Motor%20vehicle%20traffic%20crashes%20are,Indian%20and%20Alaska%20Native%20people.&text=Motor%20vehicle%20traffic%20crash%20death,other%20racial%20and%20ethnic%20groups>

⁸⁰ <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813493>

⁸¹ <https://injuryfacts.nsc.org/motor-vehicle/road-users/disparities-by-race-or-ethnic-origin/>

⁸² https://www.ghsa.org/sites/default/files/2021-06/An%20Analysis%20of%20Traffic%20Fatalities%20by%20Race%20and%20Ethnicity_0.pdf

of the state’s pursuit of zero vulnerable road user fatalities and serious injuries and should be included in future consultations and receive funding and resources as a VRU Safety High-Risk Area.

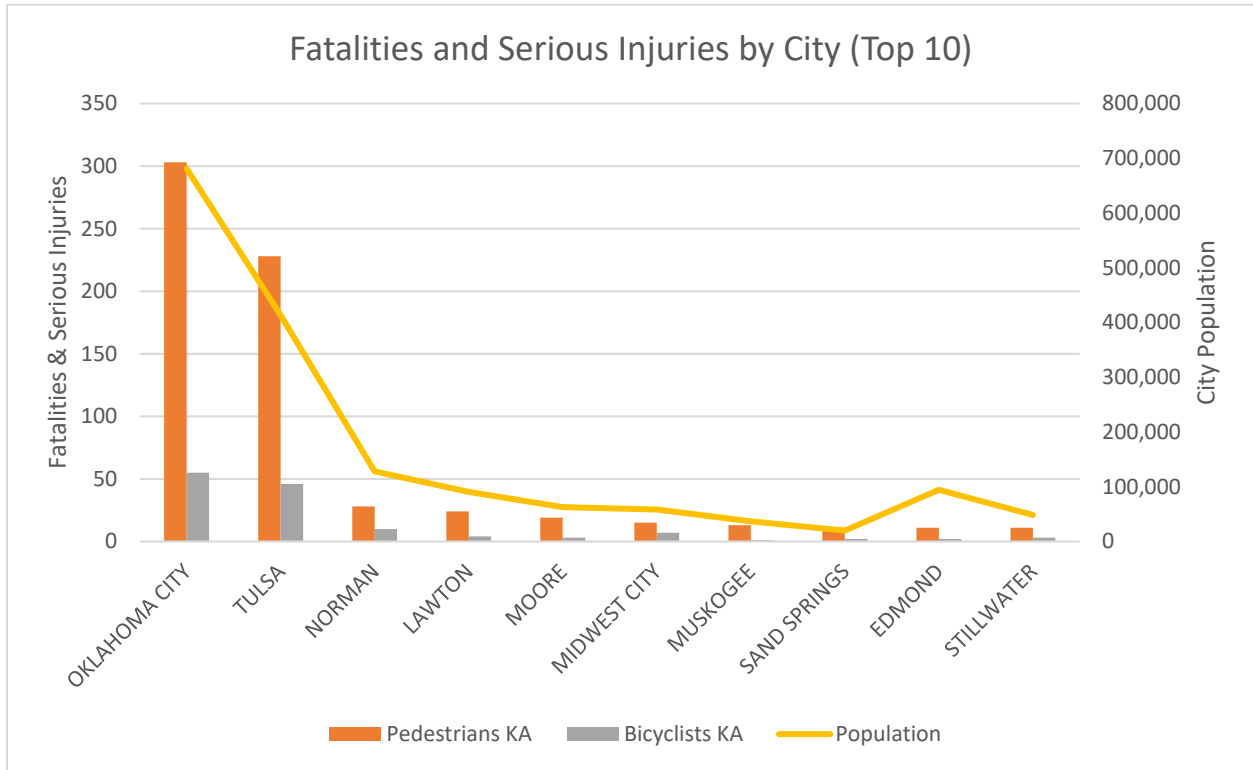


Figure 29. Fatalities and serious injuries by city (top 10 cities) (Source: SAFE-T Database 2017-2021)

Table 3. Fatalities and serious injuries per 10k population by city (top 10 cities) (Source: SAFE-T Database 2017-2021)

City Name	City Population	Pedestrian KA per 10k Population	Bicycle KA per 10k Population
OKLAHOMA CITY	681,054	4.4	0.8
TULSA	413,066	5.5	1.1
NORMAN	128,026	2.2	0.8
LAWTON	90,381	2.7	0.4
MOORE	62,793	3.0	0.5
MIDWEST CITY	58,409	2.6	1.2
MUSKOGEE	36,878	3.5	0.3
SAND SPRINGS	19,874	5.5	1.0
EDMOND	94,428	1.2	0.2
STILLWATER	48,394	2.3	0.6

VRU High Injury Intersection Potential Projects

A simple network screening was conducted to identify intersections where more than one vulnerable road user fatal or serious injury crash occurred within each of the initial VRU Safety High-Risk Areas. Then ODOT conducted a desktop audit of the high-injury intersections to identify possible vulnerable road user safety infrastructure issues. This list of high-injury intersections and possible improvements will help agencies within the VRU Safety High-Risk Areas prioritize vulnerable road user safety improvements to high injury intersections where need and impact are greatest.

OKLAHOMA CITY

- Martin Luther King Boulevard and Reno Avenue: Three crosswalks, bus station no pedestrian signals
- Council Road and 8th Street North: Gas station, no Crosswalks. Corner sidewalks on East side of street – no sidewalk on west side
- Rockwell Avenue and Melrose Lane: No sidewalks - one crosswalk exists – three crosswalks missing
- Rockwell Avenue and 7th Street North: No sidewalks - one crosswalk exists – three crosswalks missing
- MacArthur Boulevard and Reno Avenue: Pedestrian islands and three crosswalks. One crosswalk missing
- MacArthur Boulevard and 10th Street North: Four crosswalks with double lines, faded paint
- Harvard Avenue and Reno Avenue: Google Photo taken at night

- St. Clair Avenue and 23rd Street North: Sidewalks but no crosswalks
- Independence Avenue and Northwest Expressway: Medians but no sidewalks or crosswalks
- May Avenue and 42nd Street South: Nearest crosswalk is two blocks away
- May Avenue and 30th Street South: Only one sidewalk, no crosswalks
- Linn Avenue and Northwest Expressway: Medians but no crosswalks
- South Villa Avenue and Southwest 59th Street: No crosswalks
- Agnew Avenue and 15th Street South: One crosswalk
- Agnew Avenue and Exchange Avenue: Sidewalks but no crosswalks
- Pennsylvania Avenue and Highland Park Drive: Apartment complex – four crosswalks
- Western Avenue and 74th Street South (I-240): No crosswalks
- Lottie Avenue and 23rd Street North: No crosswalks
- South Sunnyside Road and Southeast 59th Street: Crosswalks but no sidewalks

TULSA

- 57 West Avenue and 31st Street South: Rural appearance, no sidewalks
- Peoria Avenue and 61st Street South: 4 crosswalks
- Trenton Avenue and 71st Street South: 4 crosswalks
- Harvard Avenue and Pine Street: 4 crosswalks
- Urbana Avenue and 15th Street South: 4 crosswalks
- Yale Avenue and 46th Street South: No crosswalks, 2 pedestrian islands
- Yale Avenue and Independence Street: Sidewalks but no crosswalks
- 69 E. Avenue and 15 Street South: Apartment complex, no crosswalks
- Garnett Road and 11 Street South: 4 crosswalks, 1 bike lane, 1 pedestrian island
- Garnett Road and 5 Street South: Residential area, no crosswalks

MUSKOGEE CREEK NATION (TULSA METRO)

- McKinley Avenue and Second St (Highway 97): 4 crosswalks, two way stop
- Sand Springs Expressway (14.17, 14.20, 14.49): Would make a good safety corridor
- Riverside Drive and 96th Street South: 4 crosswalks
- Peoria Avenue & 68th Street, 63rd Street, 61st street, and 60th street: Would make a good safety corridor
- Trenton Avenue and East 71st Street South: Two apartment complexes and Braum's but 4 crosswalks
- Lewis Avenue & 69th Street, 67th Street, 61st Street, 5th Place: Would make a good safety corridor
- Delaware Place and 51st Street: Two apartment complexes nearby, no crosswalk
- Harvard Ave and 51st Street, 49th Street, 46th Street, 41st Street: Would make a good safety corridor
- Yale Avenue and 51st Street South: 4 crosswalks including pedestrian islands
- Yale Avenue and 51st Street South: 4 crosswalks
- Braden Avenue and 47 Place South: 2 apartment complexes, no crosswalks
- Sheridan Road and 21 Street South: 4 crosswalks
- Sheridan Road and 11 Street South: 4 crosswalks and one bike lane
- 74 East Avenue and Admiral Place: No crosswalks

- Memorial Drive and 41 Street South: Medians but no crosswalks
- 89 East Avenue and Admiral Place: Motel, no crosswalks
- Garnett Road and 41st Street South: 2 crosswalks
- Garnett Road and 36th Street South, 34th Street South, 33rd Street South, 31st Street South, 29th Street South and 26th Street South: Would make a good safety corridor
- Garnett Road and 11th Street South: 4 crosswalks and one bike lane
- 129 East Avenue and 15 Street South: Residential area, church, no crosswalk

FINAL DRAFT

SUMMARY OF CONSULTATIONS

The purpose of consultations for the VRU Assessment is to gain local knowledge and perspective on the factors contributing to the safety concerns in VRU Safety High-Risk Areas and to identify potential projects or strategies to improve VRU safety.

Consultations with local communities on safety issues were conducted in two phases. The first phase included consultations in each of the eight ODOT Districts as part of the Active Transportation Plan (ATP) effort. In these sessions, participants discussed a variety of topics including vulnerable road user safety. As a part of a second phase with VRU focused consultations, ODOT and consultants presented findings from the ATP, preliminary findings from the VRU analysis, and an overview of potential safety countermeasures. Summarized input received from consultation participants is summarized below.

ACOG

Representatives from ACOG, ODOT, the City of Norman, and the City of Oklahoma City were present at the consultation on August 8, 2023, including:

- Traffic Engineer (City of Norman)
- Mobility and Planning Manager (ACOG)
- Maxton Harris (City of Oklahoma City)
- Transportation Planning Services Division Manager (ACOG)
- Deputy Director (ACOG)
- Transportation Planner- Safety (ACOG)
- State Traffic Engineer (ODOT)
- Active Transportation Coordinator (ODOT)
- MPO Coordinator (ODOT)
- State Highway Safety Engineer (ODOT)
- SHSP/VRU Planning Coordinator (ODOT)

KEY FINDINGS

Several key findings came out of the consultation with ACOG stakeholders. Oklahoma City, in partnership with ACOG, was awarded a SS4A safety action plan grant. Oklahoma City is wrapping up the Bike/Walk OKC Plan, and the Alternative Speed Abatement Program (ASAP) recently passed through the city's traffic commission which includes several of the countermeasures discussed during the consultation. The ASAP includes speed feedback signs and mini roundabouts, which were not mentioned in the consultation. Another key finding during this consultation is a plan for a fully electronic crash reporting system that will significantly reduce lag time for agencies accessing crash data, which ODOT is currently updating. Lastly, the State Obesity Plan was discussed, and how it ties into the ATP currently under development.

SAFETY CONCERNS

A large concern in the region revolves around the lack of capacity within smaller communities to design and implement safety improvements. Smaller communities often have state highways through their

core that lack sidewalks, lighting, and safe crossings. ODOT can be a partner for smaller communities with low capacity, especially where crash data indicates safety concerns.

Lack of experience with safety countermeasures is also a concern, since some recent safety improvements in Oklahoma City have had field adjustments. Consultation participants expressed details for implementing safety treatments are important to ensure complete and accurate design. Participants also expressed need for education around using the facilities as well through social media, advertising, outreach, and community events.

Expanding upon lack of experience, a safety concern example in Oklahoma City is around leading pedestrian intervals (LPIs). LPIs were approved throughout downtown but during the transition to implement LPIs, the automatic pedestrian phase was removed in favor of pedestrian actuation. This is actually a step back in terms of safety, since pedestrians are used to automatic pedestrian phases and often do not wait for the pedestrian signal that now requires actuation.

The last major safety concern noted are high intensity activated crosswalks (HAWKs). HAWKs are not easy to interpret, and several communities have voiced that these are less effective than RRFBs or a standard pedestrian signal. Drivers are unsure what to do with the flashing yellow lights on HAWKs and therefore yielding compliance is low.

POSSIBLE SOLUTIONS AND LOCAL PREFERENCES

Local safety preferences include chicanes, bicycle signalization concurrent with LPIs, mini roundabouts, dynamic speed feedback signs paired with rumble strips or speed humps (especially used as a gateway treatment), RRFB or pedestrian signals, and raised crosswalks.

In Oklahoma City, there is a preference for installing pedestrian refuge islands and median treatments on five lane arterials. This is an efficient preference since there are lots of medians throughout the city due to the old streetcar that is not operating any longer.

Oklahoma City is focusing on self-enforcing treatments that do not require manual enforcement of speeding. The purpose is two-fold: the police department has low capacity and reduced speeds without engineering treatments are not realistic.

INCOG

Representatives from INCOG, ODOT, and the City of Tulsa were present at the consultation on August 4, 2023, including:

- Transportation Planning and Programs Director (INCOG)
- Transportation Planner (INCOG)
- Traffic Operations Planning Manager (City of Tulsa)
- Senior Transportation Planner/ Bicycle and Pedestrian Coordinator (INCOG)
- Traffic Engineer/ Bike and Pedestrian Advisor (City of Tulsa)
- Structural Engineer (City of Tulsa)
- Traffic Operations Manager (City of Tulsa)
- MPO Coordinator (ODOT)
- Planning and Policy Branch Manager (ODOT)

- State Traffic Engineer (ODOT)
- Active Transportation Coordinator (ODOT)
- SHSP/VRU Planning Coordinator (ODOT)
- State Highway Safety Engineer (ODOT)

KEY FINDINGS

The two key findings from the consultation with INCOG were that many regional safety plans have been or will be published soon and a cultural shift is needed when it comes to VRU safety. INCOG recently published their regional safety plan, will update their GO Plan and conduct a Local Road Safety Action Plan in 2024. Despite regional efforts toward increasing VRU safety, a cultural shift is needed for stakeholders within the INCOG region. This can be simplified into designing the roadways for all users, rather than accommodating bicyclists and pedestrians on roadways.

SAFETY CONCERNS

The safety concerns within the INCOG region are multi-faceted. Speeding has increased since COVID, especially in the Tulsa area, which poses a serious threat to VRUs. Speeding, combined with the increase in transient populations in recent years, and the lack of sidewalks or walking facilities in the region has led to an increase in pedestrian crashes. The Sidewalk Gap Map shows where sidewalks are missing throughout the region. Pedestrian crashes have been noted at intersections when vehicles have permissive left turns (i.e., non-exclusive pedestrian phasing) – particularly at diamond intersections. There are also several incidents of road rage against bicyclists.

There are concerns about heavy truck traffic at intersections, particularly when making right turns at small-radius corners of intersections where a truck may off-track onto the sidewalk. A disabled pedestrian was killed in Tulsa in this scenario. It is important for engineers to evaluate the design vehicle for intersections and install truck aprons where they are needed.

Participants also noted that HAWKs are ineffective and pose a threat to pedestrians. Tulsa had issues with motorists passing inactive signals that were down due to electrical grid issues. Since the cost of a HAWK is similar to a pedestrian signal, Tulsa prefers to install pedestrian signals.

POSSIBLE SOLUTIONS AND LOCAL PREFERENCES

Local safety preferences include road diets, RRFBs, pedestrian signals, high-visibility crosswalk markings, pedestrian refuge islands, and rumble strips on roadways with shoulders to prevent lane departure. There was an emphasis on reducing speed limits only when the reduction is paired with changes to the roadway that naturally enforce the speed limit reduction. Participants also recommended doing a multimodal analysis for each project.

Tribal Communities

Representatives from The Chickasaw Nation, ODOT, and the Tribal Liaison for ODOT were present for the first consultation on August 3, 2023, including:

- Sr. Transportation Program Manager (Chickasaw Nation)
- Tribal Liaison (ODOT)

- Active Transportation Coordinator (ODOT)
- SHSP/VRU Planning Coordinator (ODOT)
- State Highway Safety Engineer (ODOT)

Representatives from the Cherokee Nation and ODOT were present for the second consultation on August 8, 2023, including:

- Transportation Planner (Cherokee Nation)
- Active Transportation Coordinator (ODOT)
- State Highway Safety Engineer (ODOT)
- SHSP/VRU Planning Coordinator (ODOT)

Both consultations are summarized below.

KEY FINDINGS

Key findings from the two consultations with tribal communities included community buy-in being a challenge, road ownership poses a challenge to implementation, limited funding for tribal community active transportation projects is a challenge, the Chickasaw Nation is developing a safety plan, and the Cherokee Nation has applied for SS4A action plan funding.

Participants shared that buy-in for safety improvements is a challenge. For recent curb extension and road diet projects, various agency staff and elected officials were hesitant. The first roundabout in the region was difficult to pass because people were generally unfamiliar with the facility type. In order for systemic safety to be successful, buy-in will be needed from counties and cities for new facility designs.

Road ownership is a challenge for tribal communities as well. Roads maintained by a tribal entity are on trust lands. Otherwise, tribal entities partner with non-tribal entities for road projects. This extra coordination can be a challenge for implementing projects.

Apart from safe routes to school and occasional TAP grants, there is very little funding to support active transportation users across Tribal communities. This poses a challenge for implementing VRU safety projects.

The Chickasaw Nation is developing a safety plan that includes seven Emphasis Areas as well as a safety countermeasure toolbox. The seven Emphasis Areas include: roadway/lane departure, safe speeds, occupant safety, VRUs, and bridge safety. The safety plan excludes state-owned highways. There are several Tribal entities that have safety plans developed, but many of the smaller communities may not have capacity to develop their own safety plan and will need support from regional or state partners.

The Cherokee Nation has applied for the upcoming SS4A safety action plan funding.

SAFETY CONCERNS

Safety concerns in tribal communities include distracted driving, lighting at dusk and dawn, limited and dangerous road crossings for pedestrians, and lane departure. The safety concern most noted by participants is the lack of pedestrian facilities, including a lack of shoulders on many roads. It was noted that even major urban areas are lacking walking facilities, so pedestrians are often seen walking in the street.

POSSIBLE SOLUTIONS AND LOCAL PREFERENCES

Local safety preferences include sidewalks, bicycle facilities, expanded transit service beyond high-density areas, increased transit service, traffic calming (i.e., speed humps, mini roundabouts, curb extensions, etc.), daylighting at corners, speed management, road diets (with clearly designed transitions on either end of the road diet limits), pedestrian refuge islands, and rumble strips.

Lawton and Muskogee

The preliminary analysis identifying high-risk areas determined that ACOG, INCOG, and Tribal Communities were the areas deemed high-risk due to actual number of VRU fatalities and serious injuries occurring. In order to create the most comprehensive safety assessment additional analysis was completed to determine any areas that may be high-risk based on alternative criteria. The lengthy, in-depth additional analysis determined based on population ratio there were two additional high-risk areas of the City of Lawton and the City of Muskogee.

An alternative strategy for consultation was used for these additional high-risk areas based on the time constraint of document deadlines and the time needed for the extensive efforts of analysis. Each entity has been provided the VRU analysis, along with the data associated with their area. Possible solutions and local preferences are an on-going process determined by comments from local officials and future individual meetings. These additional high-risk areas are of equal concern and will be provided the same opportunities for input.

Consultation Key Findings

Consultation VRU Safety Strengths
ACOG safety preferences include chicanes, bicycle signalization concurrent with LPIs, mini roundabouts, dynamic speed feedback signs paired with rumble strips or speed humps (especially used as a gateway treatment), RRFB or pedestrian signals, raised crosswalks, pedestrian refuge islands, and median treatments.
Oklahoma City is focusing on self-enforcing treatments that do not require manual enforcement of speeding.
INCOG safety preferences include road diets, RRFBs, pedestrian signals, high-visibility crosswalk markings, pedestrian refuge islands, and rumble strips on roadways with shoulders to prevent lane departure.
INCOG reduces speed limits only when the reduction is paired with self-enforcing treatments to the roadway.

Tribal community safety preferences include sidewalks, bicycle facilities, expanded transit service beyond high-density areas, increased transit service, traffic calming (i.e., speed humps, mini roundabouts, curb extensions, etc.), daylighting at corners, speed management, road diets (with clearly designed transitions on either end of the road diet limits), pedestrian refuge islands, and rumble strips.

Consultation VRU Safety Opportunities

Partnership between ODOT and small communities that have highways through their downtown core to supplement design and implementation capacity for safety enhancements such as sidewalks, lighting, and enhanced crossings.

Education for both agency transportation staff and the general public about designing and using new facilities (like bike lanes).

Systemically apply LPIs with APS on an automatic pedestrian phase.

Development of statewide safety treatment design and implementation guidance for agencies, for consistent facility design across the state.

Statewide safety treatment design guidance should include best practices for signalized intersections including protected left turns where pedestrian crashes exist.

Statewide safety treatment design guidance should include details for designing truck aprons and curb radii according to the design vehicle.

Statewide safety treatment design guidance should recommend pedestrian signals or RRFBs for enhanced crossings, instead of HAWKS.

Statewide safety treatment design guidance should include recommendations on spacing of enhanced crossings in urban, suburban, and rural settings.

Prioritize sidewalk implementation where need and impact would be greatest based on fatal and serious injury pedestrian crashes. Consider shoulder walkway or trail implementation in rural settings where sidewalks may not be contextually appropriate or prohibitively expensive.

VULNERABLE ROAD USER SAFETY STRATEGIES

The background document review, vulnerable road user safety analysis, and the high-risk area consultations were used to identify strategies that would contribute toward eliminating vulnerable road user deaths and serious injuries on all roads across Oklahoma. Specific and measurable strategies were provided both statewide and for each of the initial VRU Safety High-Risk Areas listed below:

- Statewide
- Oklahoma City and ACOG
- Tulsa and INCOG
- Tribal Communities

These strategies are specific and measurable and should be used as implementation instructions for the VRU Emphasis Area.

For goals, performance measures, and measurable objectives, see the Action Plan in the Appendix.

CONCLUSIONS

Across Oklahoma, VRU fatalities and serious injuries have been on the rise, with a 23% increase in pedestrian fatalities across the state from 2017 through 2021. High density of crashes resulting in VRU deaths and serious injuries were found in urban areas, including Oklahoma City and Tulsa, but there were also high VRU fatalities and serious injury rates per 100,000 residents in smaller cities, including Norman, Lawton, and Muskogee. Additionally, given the greater number of American Indians living in Oklahoma and overrepresentation in pedestrian and bicycle crashes nationally, Tribal Communities were also a high-risk area. The VRU Safety High-Risk Areas are identified as the following:

- Oklahoma City and ACOG
- Tulsa and INCOG
- Norman
- Lawton
- Muskogee
- Tribal Communities

Analyses also identified an overrepresentation of these fatalities and injuries in disadvantaged communities across the state and particularly in our larger metro areas. Other key findings include higher rates of pedestrian fatalities and serious injuries, VRU fatalities and injuries in dark, unlit conditions, as well as a high rate of DUI and hit-and-run involvement. Analyses and consultations also noted the importance of focusing efforts and investments in communities with large indigenous populations, recognizing the unique needs and histories that the communities represent. These findings are key to informing Oklahoma authorities' decision making related to VRU safety and guiding the development of this VRU safety assessment. However, Oklahoma has made efforts to improve VRU safety in many existing policies, programs, and practices. This includes adding a new VRU Safety Emphasis Area in the 2023 SHSP, the 2045 LRTP, the ATP, the OHSO, safety awareness programs, such as Watch for Me OK program, and various policies underneath the Oklahoma Motor Vehicle Statutes. However, more work needs to be done to reach zero VRU fatalities and serious injuries on all roads across Oklahoma.

The next steps in Oklahoma should include adopting a goal of zero VRU deaths or serious injuries by a target year in Oklahoma, moving towards fully embedding the Safe System Approach in all road safety decisions and prioritizing VRU safety across programs. This includes prioritizing resources and improvements in the identified VRU Safety High-Risk Areas and advancing the VRU Safety Strategies outlined, while also monitoring what improvements are working to prevent VRU deaths and serious injuries. Those improvements should be applied in similar conditions where crashes could occur to be sure that the state is utilizing a proactive approach to VRU safety.