



Vulnerable Road User Assessment

VULNERABLE ROAD USER SAFETY ASSESSMENT

November 14, 2023

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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.

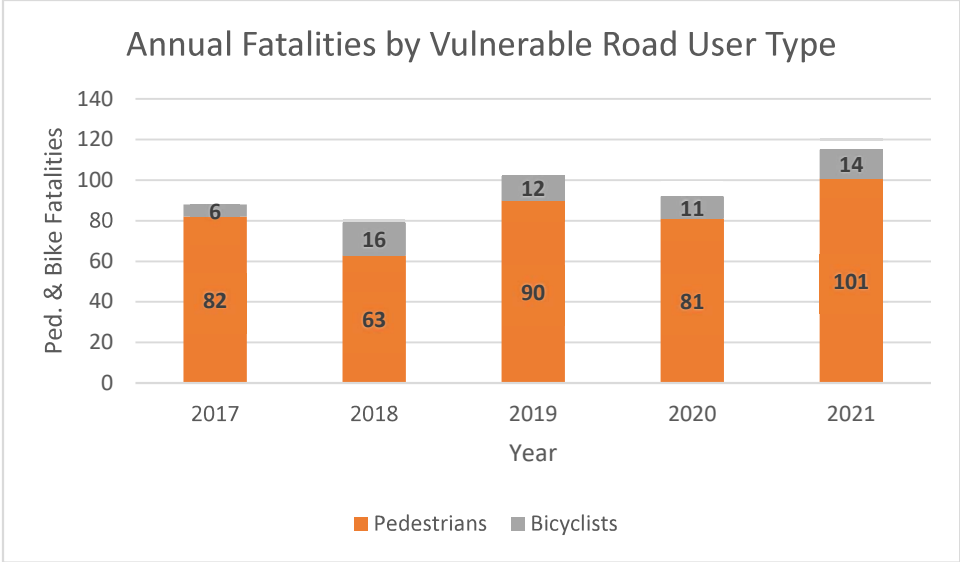


Figure 1. Annual fatalities by mode across Oklahoma (Source: SAFE-T Database 2017-2021)

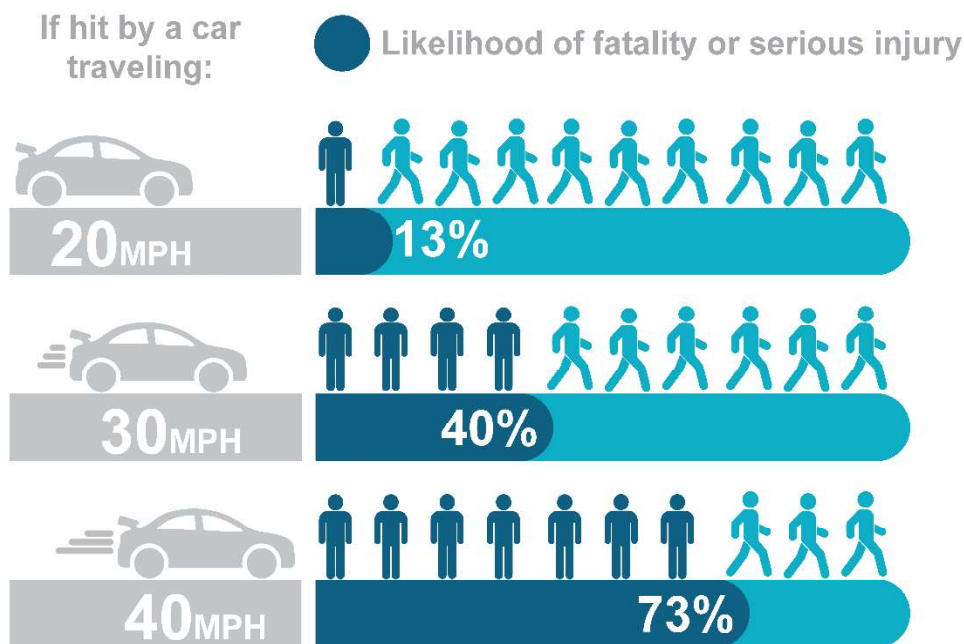
The first Oklahoma Department of Transportation (ODOT) VRU Safety Assessment (the “Assessment”) and new Vulnerable Road Users Emphasis Area in the 2023-2028 Strategic Highway Safety Plan (SHSP) are focused on understanding historical factors of reported crashes impacting VRU deaths and serious injuries 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 Vulnerable

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

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.

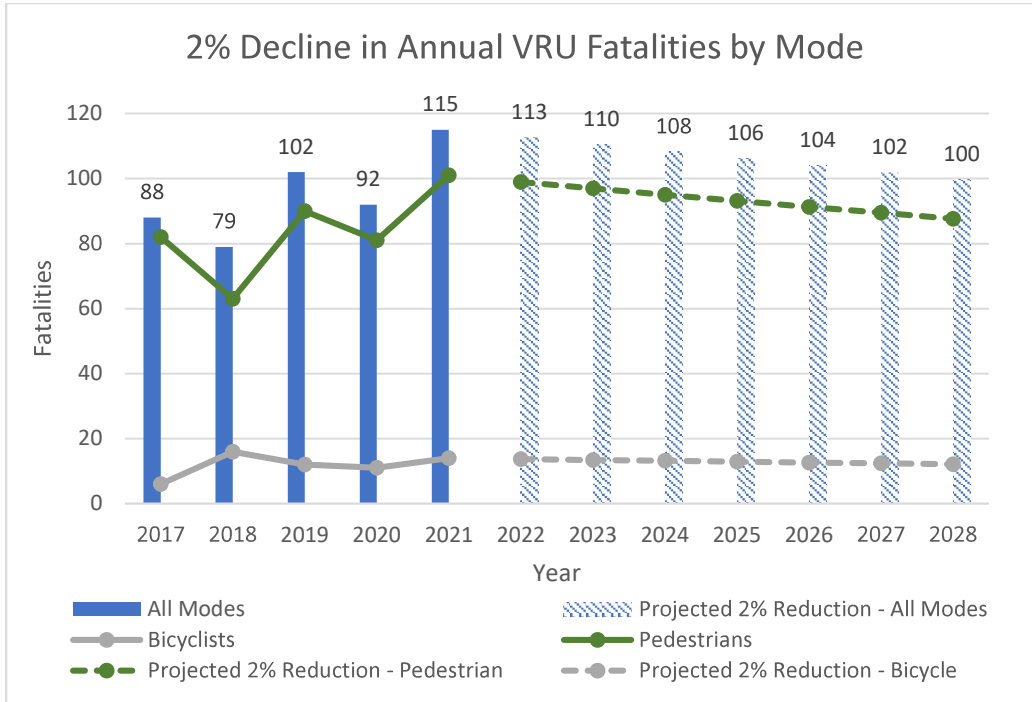


Figure 3. Projected annual fatalities with a 2% reduction by mode across Oklahoma (Source: SAFE-T Database 2017-2021)

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.

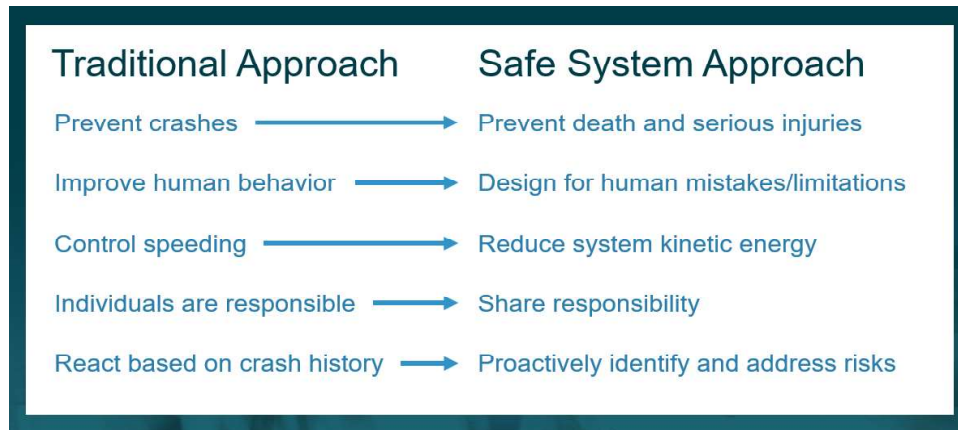


Figure 4. Comparison of the Traditional Approach and the Safe System Approach to Road Safety (Source: FHWA)

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>

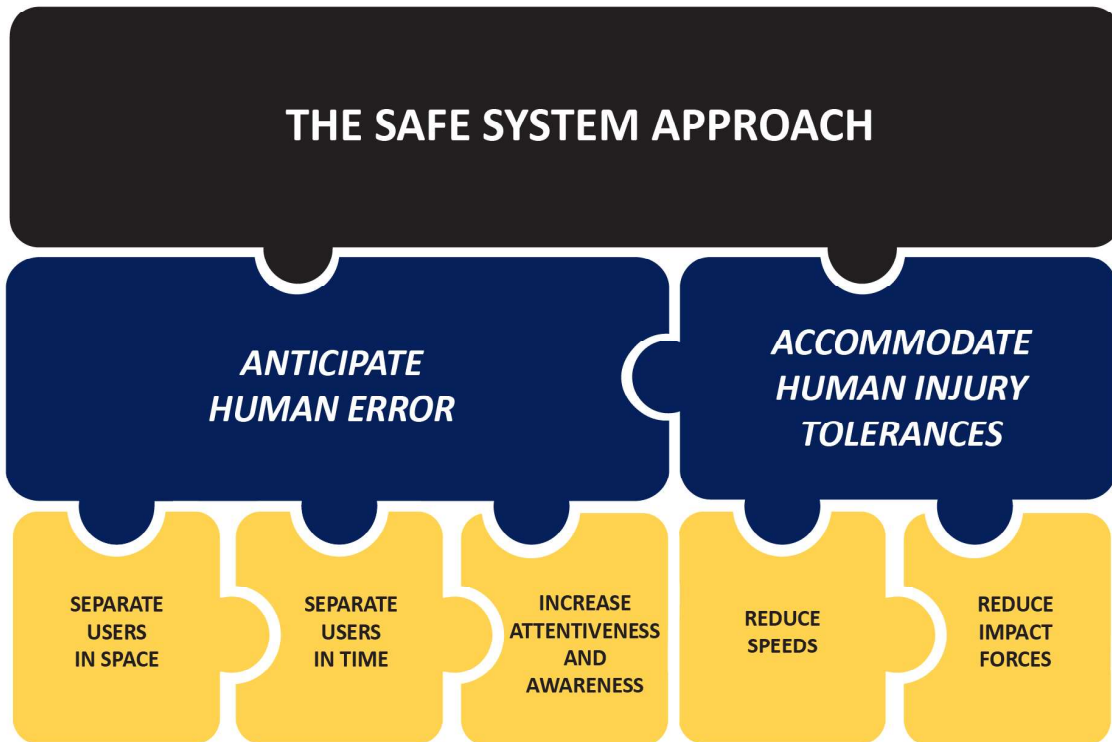


Figure 5. Flowchart of the Safe System Approach Framework (Source: Toole Design Group adapted from ITE)

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.

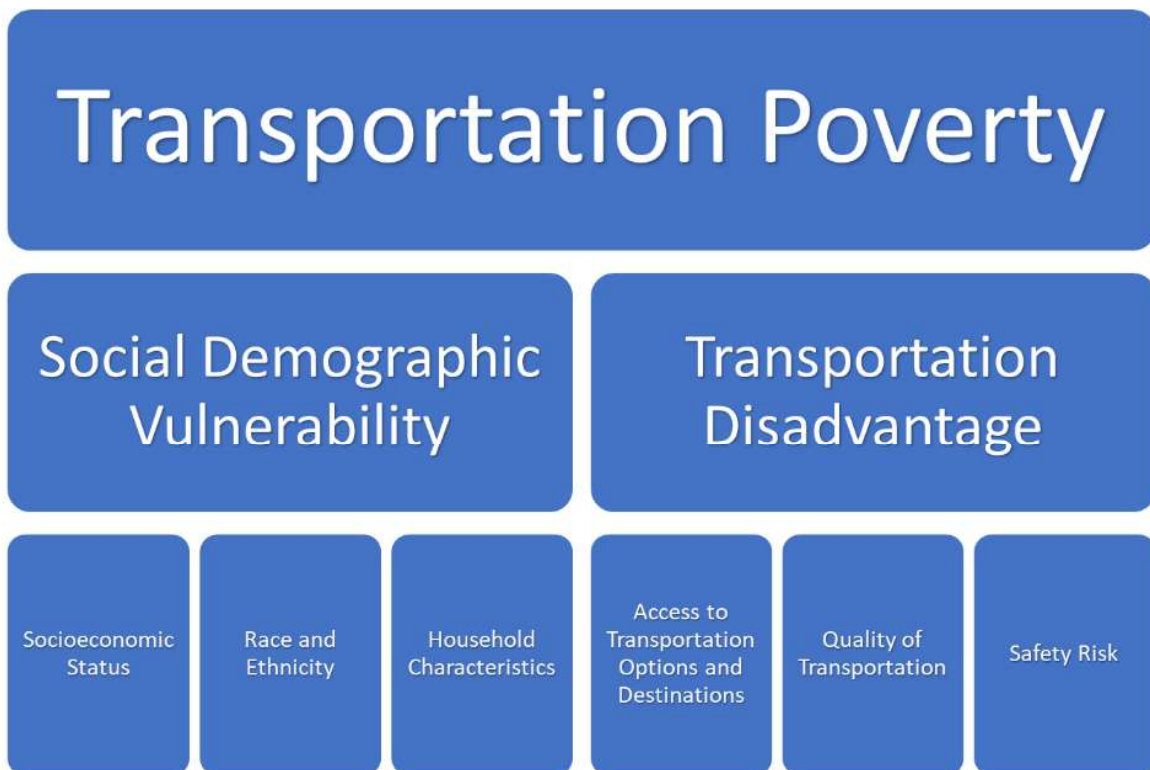


Figure 6. Transportation poverty is the confluence of sociodemographic vulnerability and transportation disadvantage; this transportation poverty framework shows how these two components can be characterized and the factors this analysis uses to quantify them.

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.

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/5f5bbbb6785a5f69c44e3d04/1599847366823/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
<p>The 2021-2023 HSPs include two countermeasure strategies related to VRUs.</p> <ul style="list-style-type: none">• 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 collisions between vehicles going straight with pedestrian uncontrolled/mid-block crossings or with bicyclists riding with traffic, 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.

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%20938%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%20938%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.

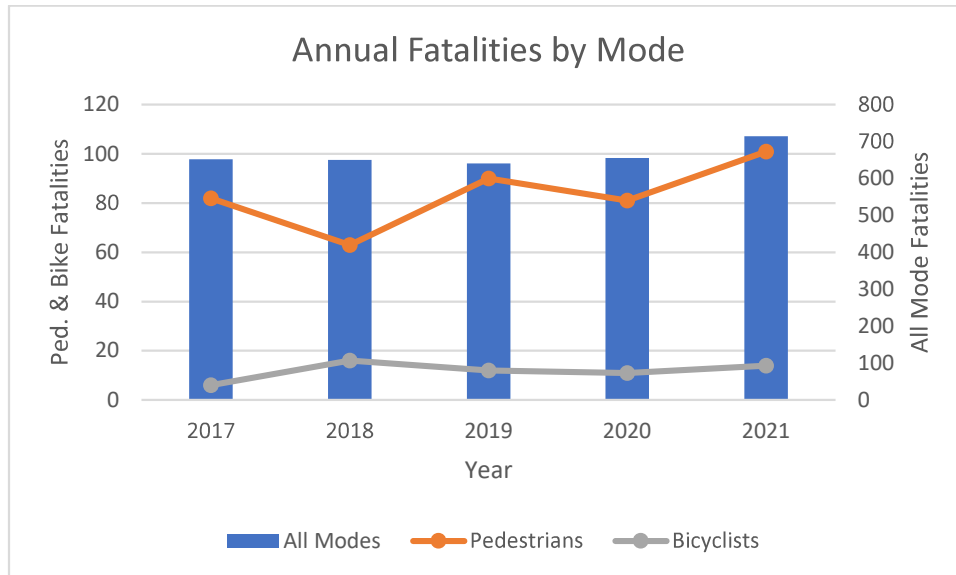


Figure 7. Annual fatalities by mode (Source: SAFE-T Database 2017-2021)

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>

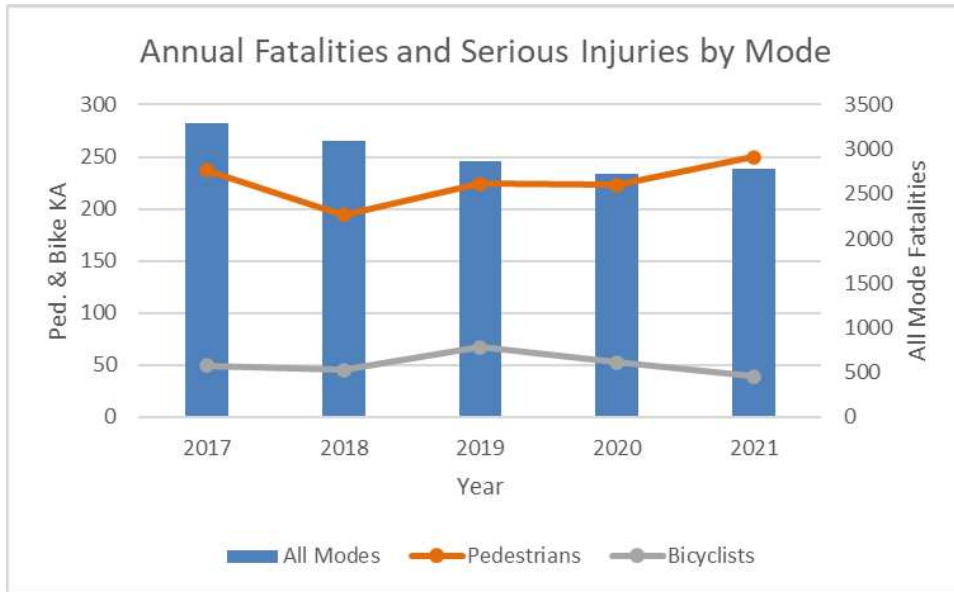


Figure 8. Annual fatalities and serious injuries by mode (Source: SAFE-T Database 2017-2021)

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%.

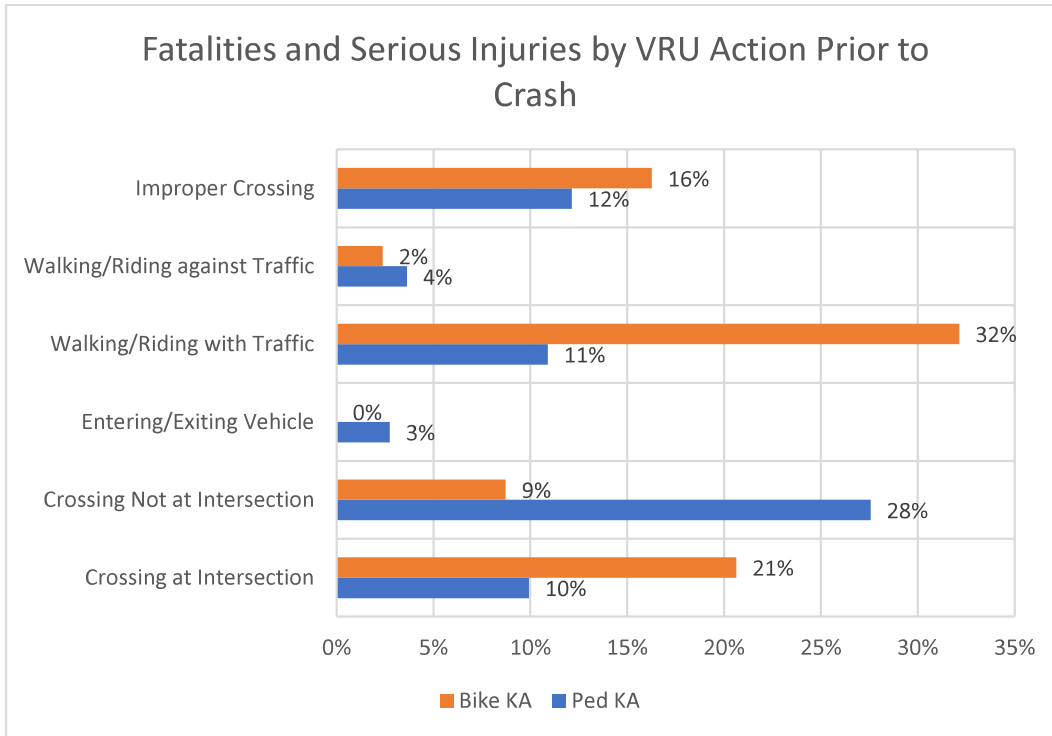


Figure 9. Fatalities and serious injuries by vulnerable road user action prior to crash (Source: SAFE-T Database 2017-2021)

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.

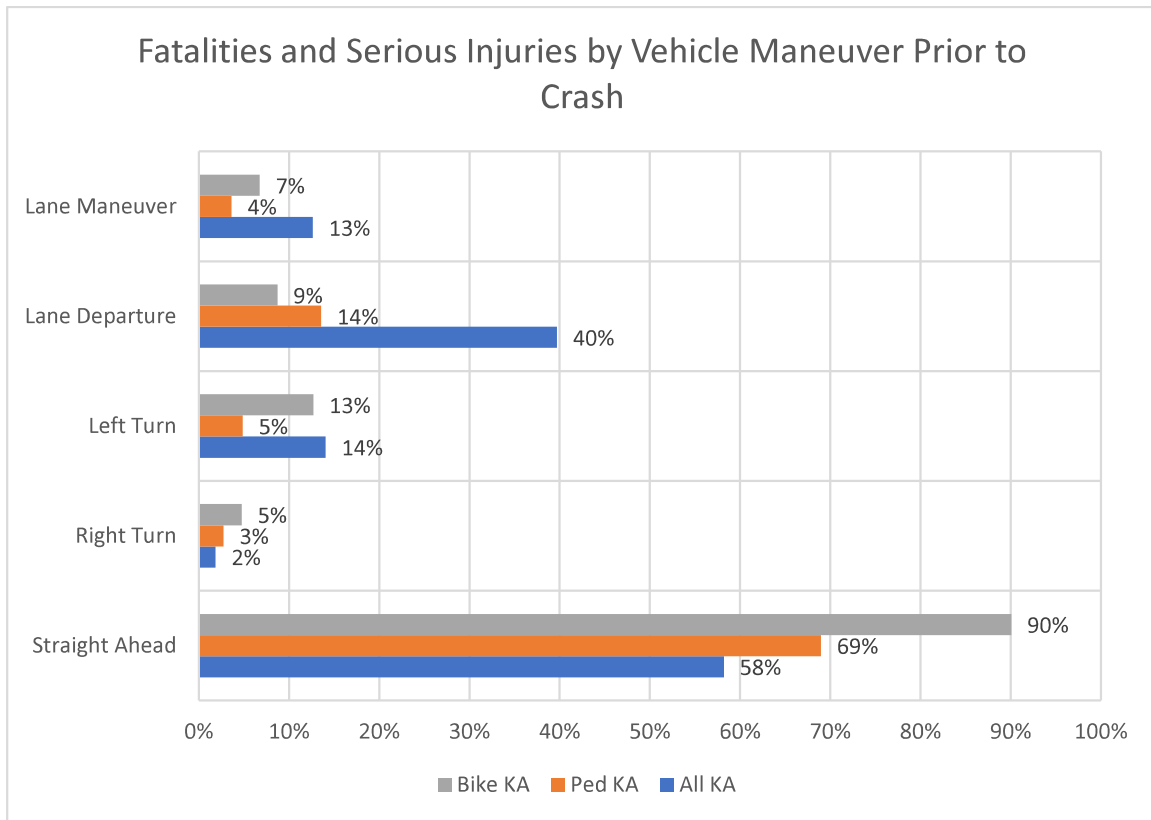


Figure 10. Fatalities and serious injuries by vehicle maneuver prior to crash (Source: SAFE-T Database 2017-2021)

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.

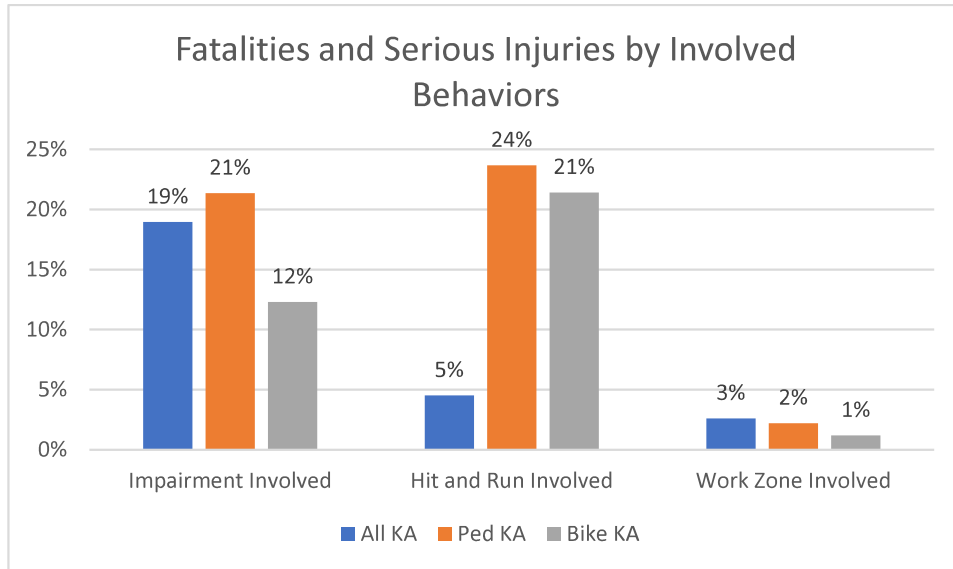


Figure 11. Fatalities and serious injuries by involved behaviors (Source: SAFE-T Database 2017-2021)

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.

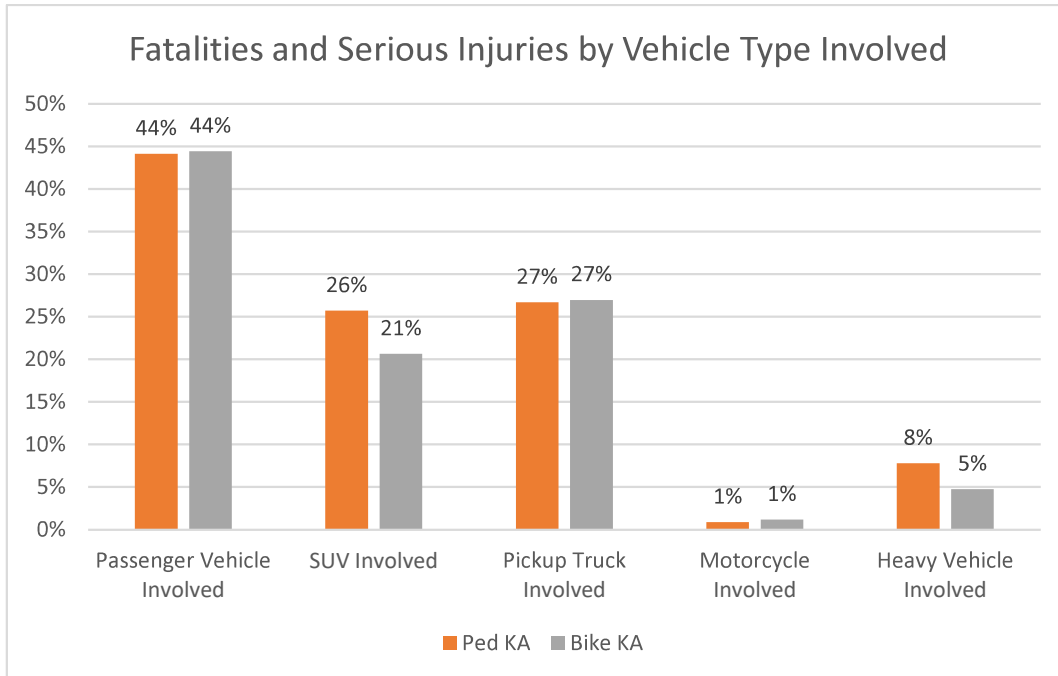


Figure 12. Fatalities and serious injuries by vehicle type involved (Source: SAFE-T Database 2017-2021)

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.

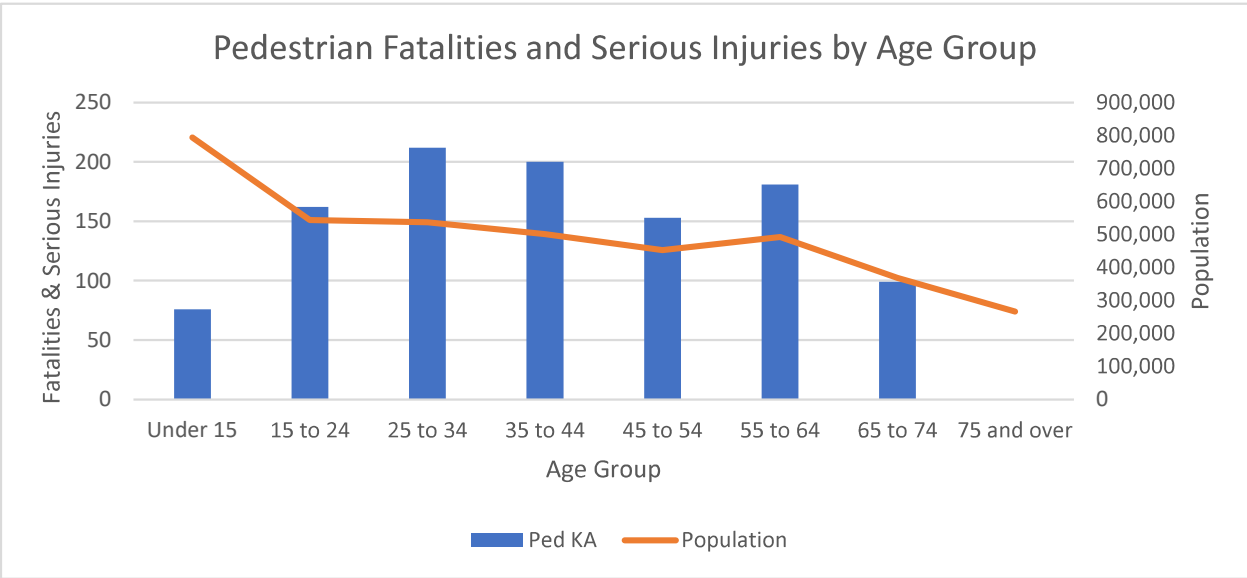


Figure 13. Pedestrian fatalities and serious injuries by age group (Source: SAFE-T Database 2017-2021)

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.

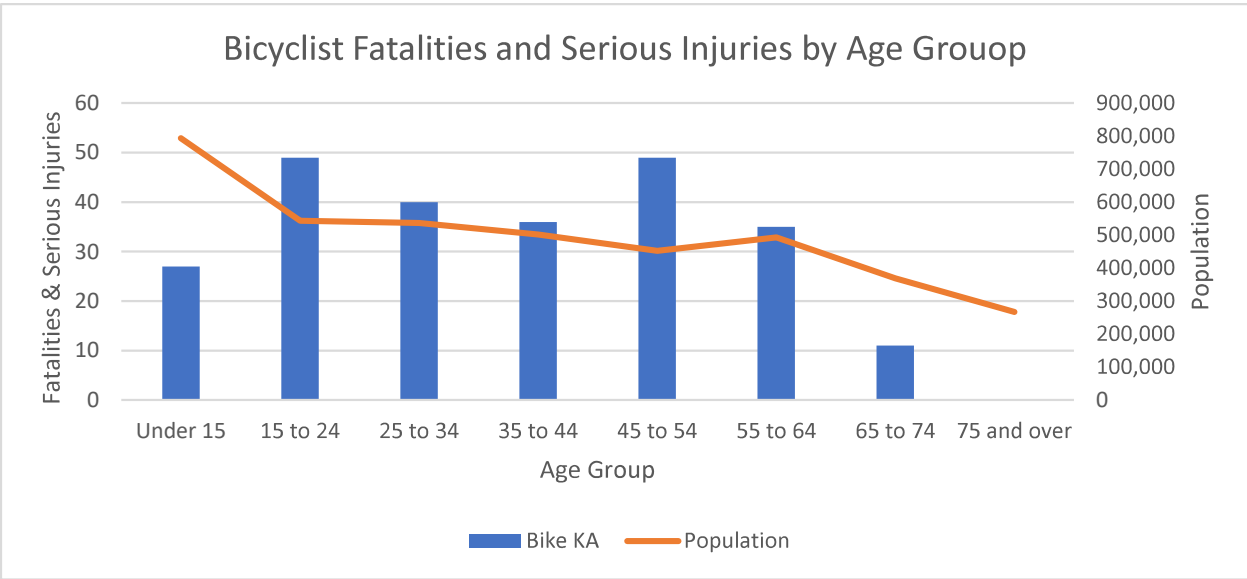


Figure 14. Bicyclist fatalities and serious injuries by age group (Source: SAFE-T Database 2017-2021)

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.

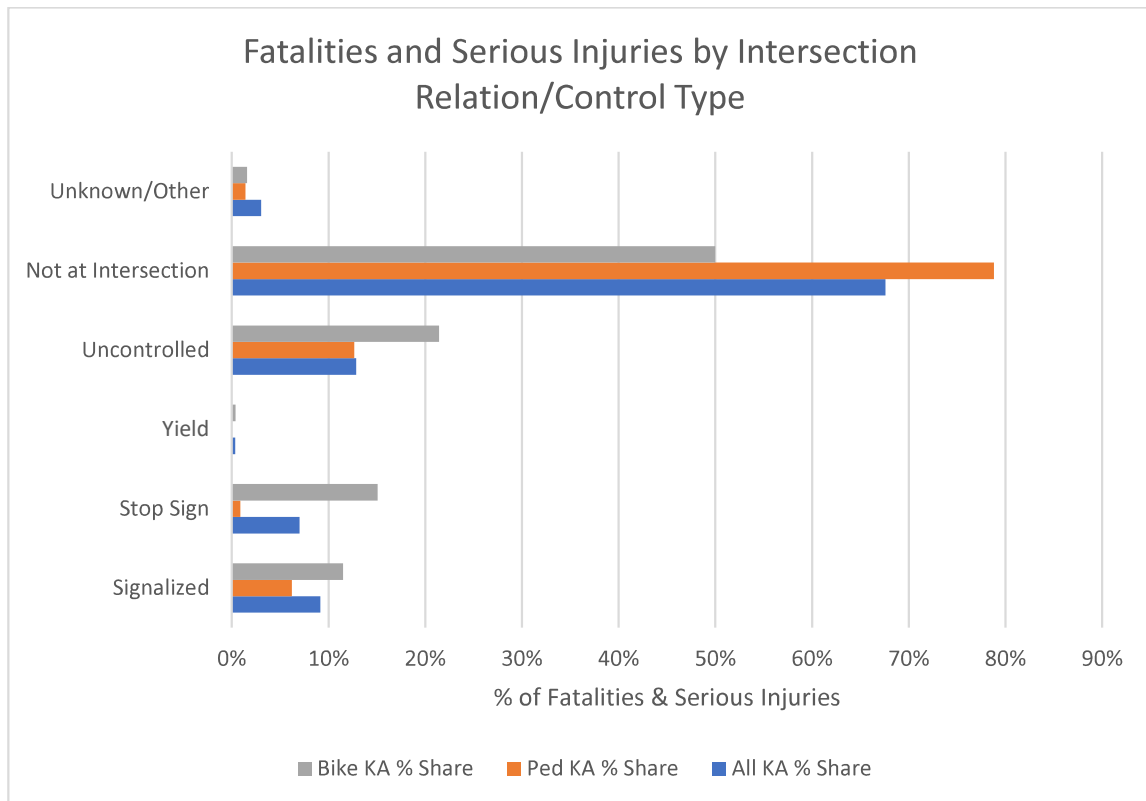


Figure 15. Fatalities and serious injuries by intersection relation and control type (Source: SAFE-T Database 2017-2021)

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.

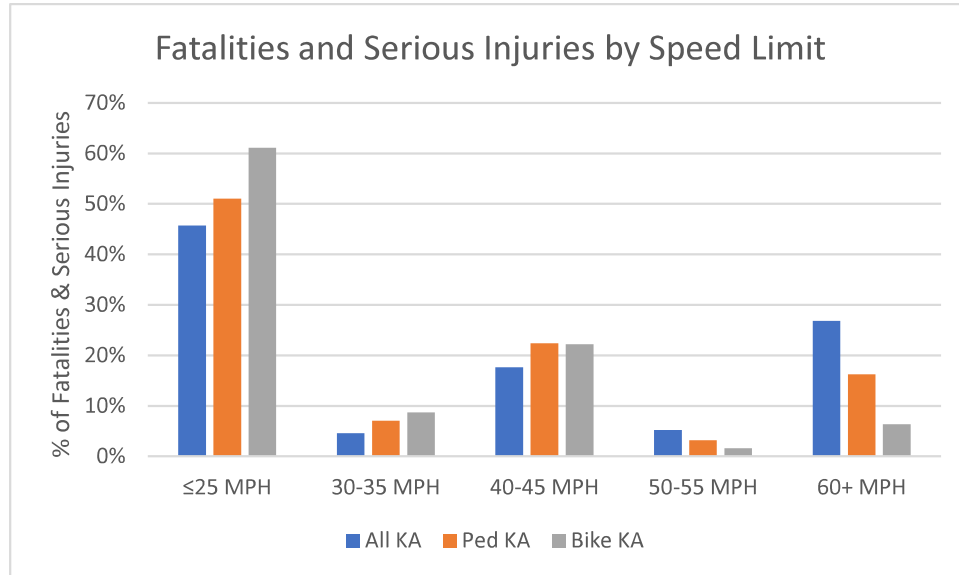


Figure 16. Fatalities and serious injuries by speed limit (Source: crash data from SAFE-T Database 2017-2021 and speed limit data from Open Street Maps)

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.

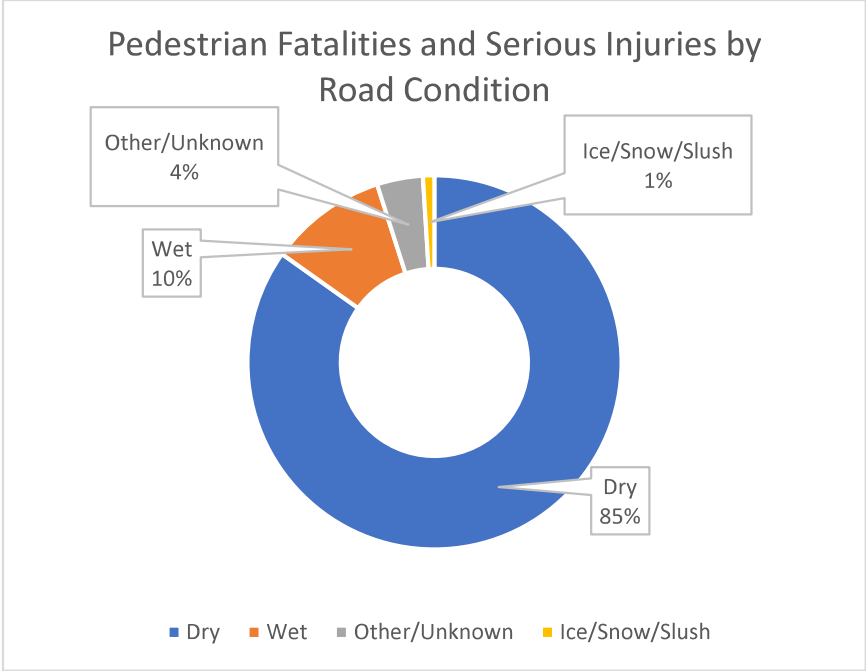


Figure 19. Pedestrian fatalities and serious injuries by road condition (Source: SAFE-T Database 2017-2021)

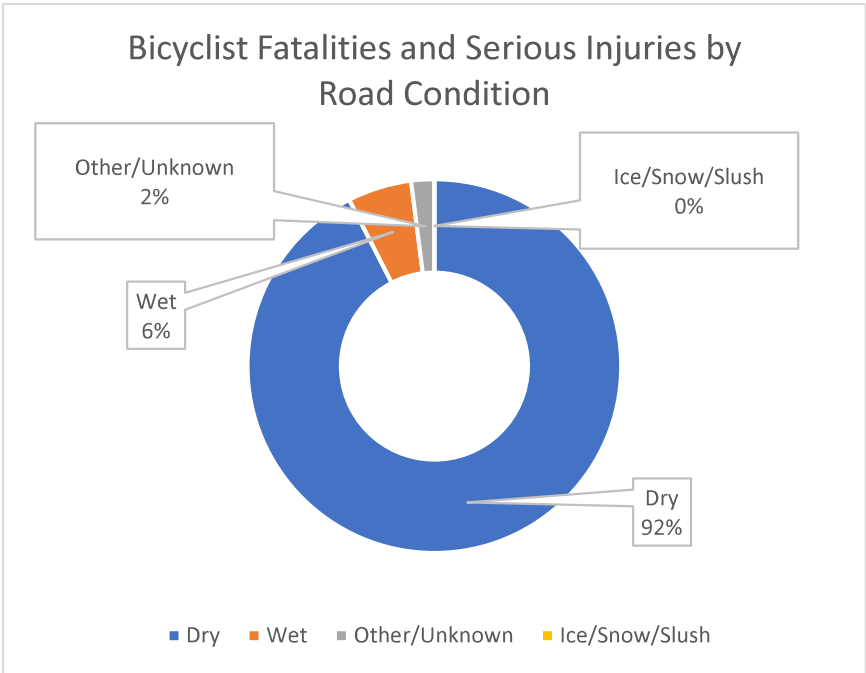


Figure 20. Bicyclist fatalities and serious injuries by road condition (Source: SAFE-T Database 2017-2021)

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.

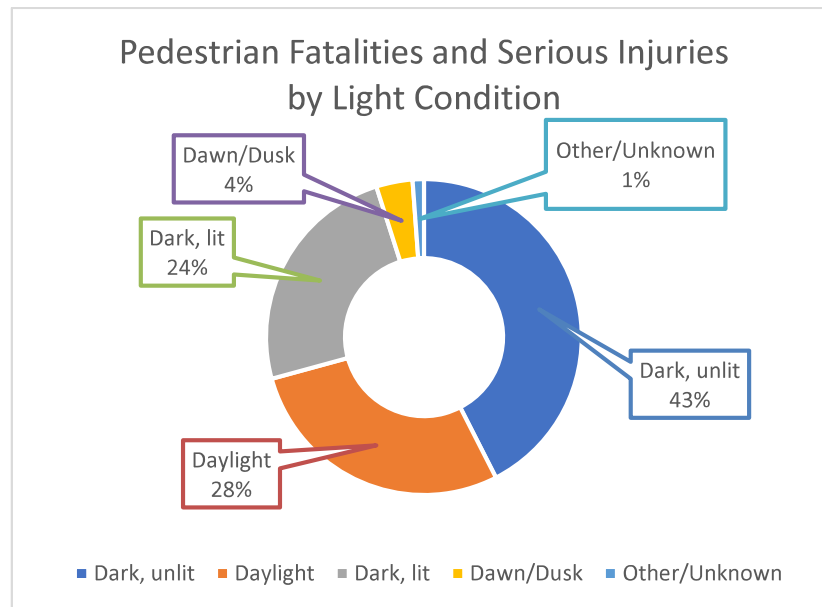


Figure 21. Pedestrian fatalities and serious injuries by light condition (Source: SAFE-T Database 2017-2021)

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.

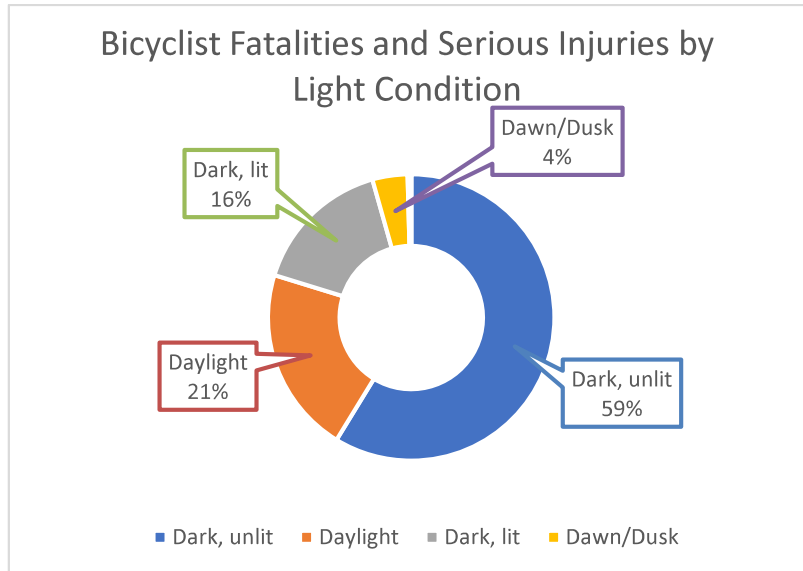


Figure 22. Bicyclist fatalities and serious injuries by light condition (Source: SAFE-T Database 2017-2021)

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.

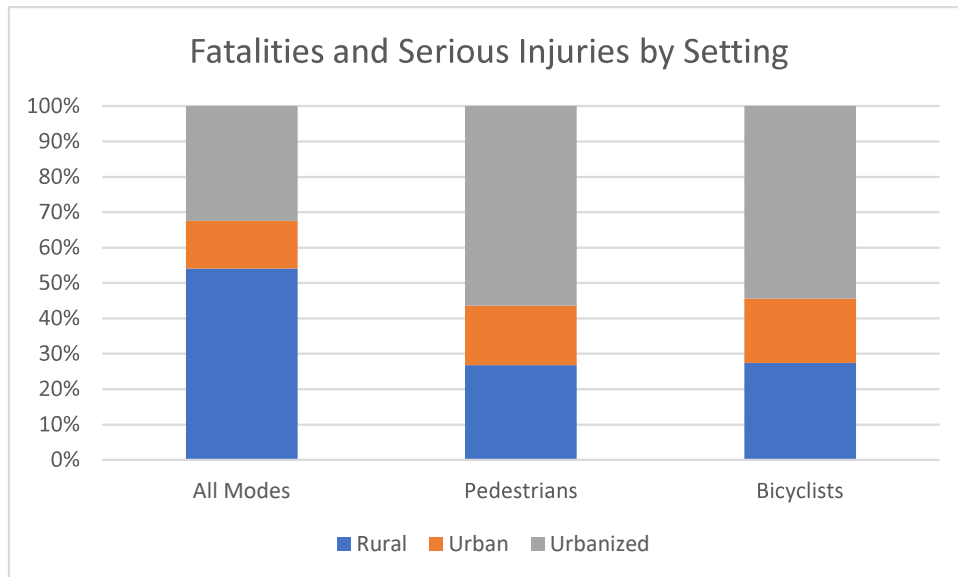


Figure 23. Fatalities and serious injuries by setting (Source: SAFE-T Database 2017-2021)

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.

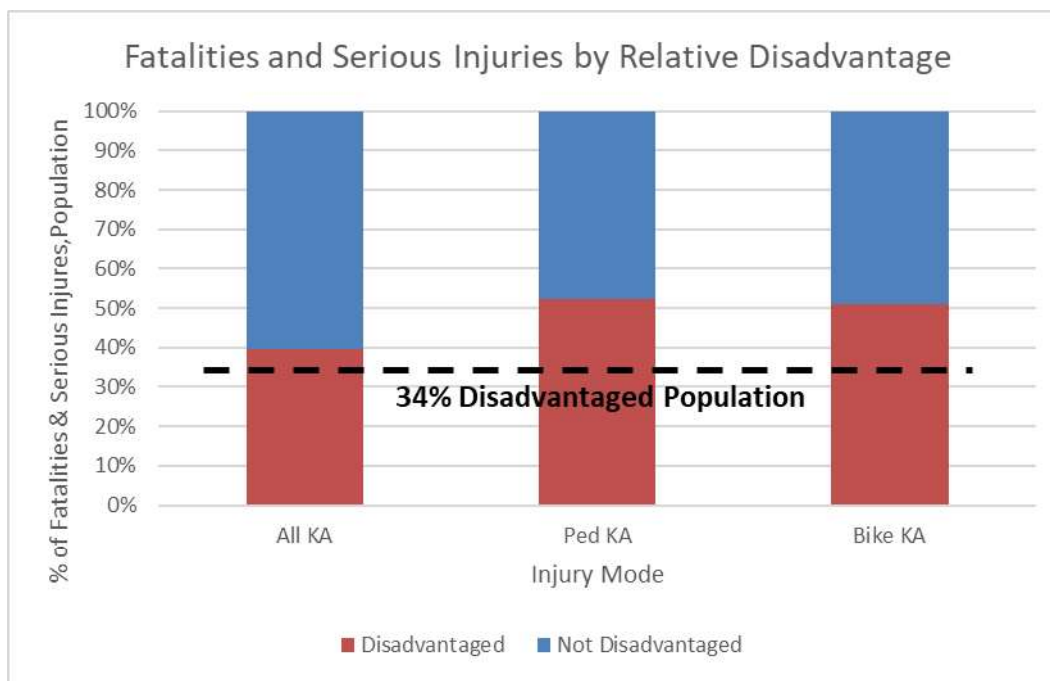


Figure 24. Fatalities and serious injuries by relative disadvantage (Source: crash data from SAFE-T Database 2017-2021 and disadvantaged data from USDOT Equitable Transportation Communities Explorer)

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>

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

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
<p>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.</p>
<p>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</p>

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

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.

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.

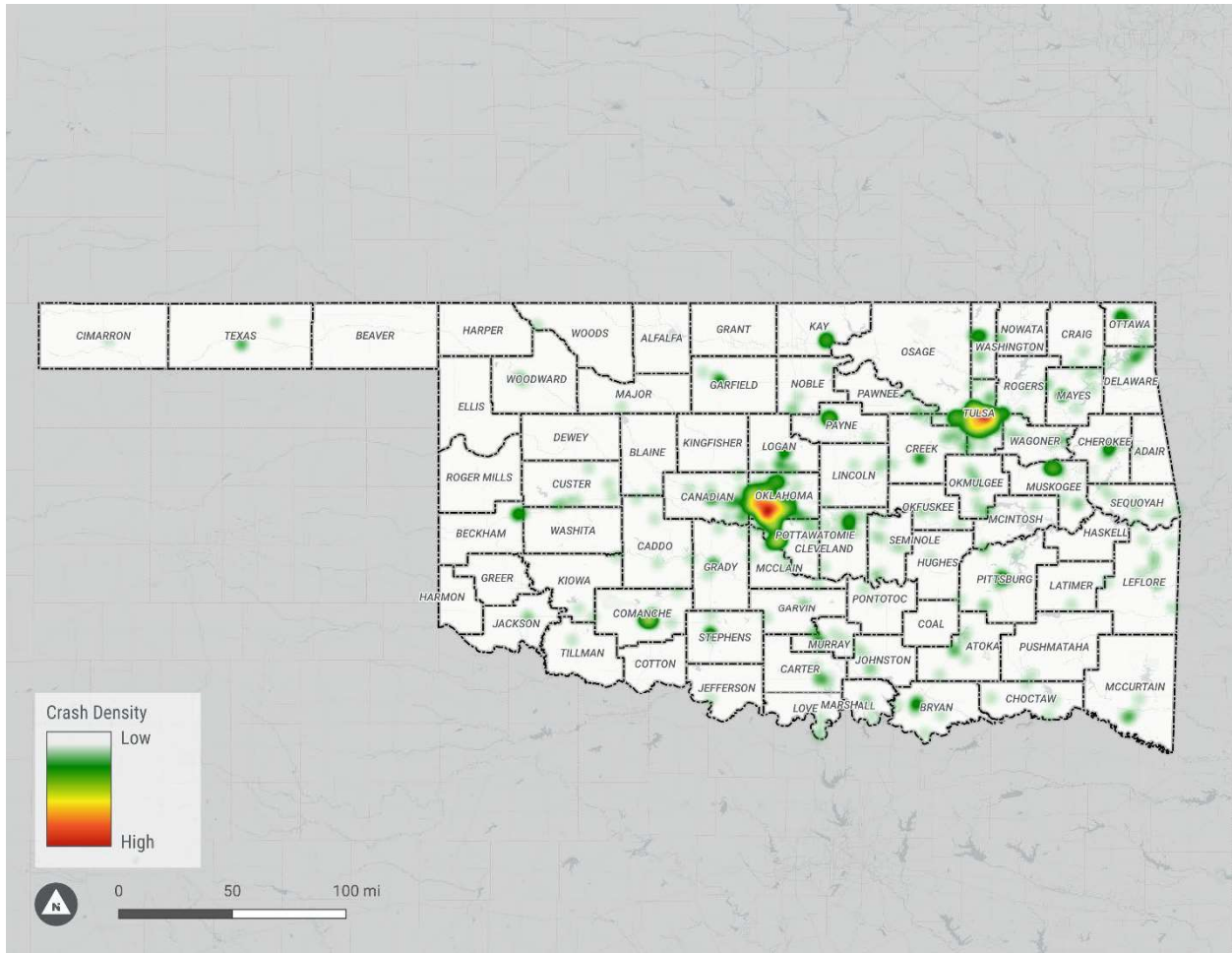


Figure 25. Heatmap of pedestrian fatalities and serious injuries across the state (Source: SAFE-T Database 2017-2021)

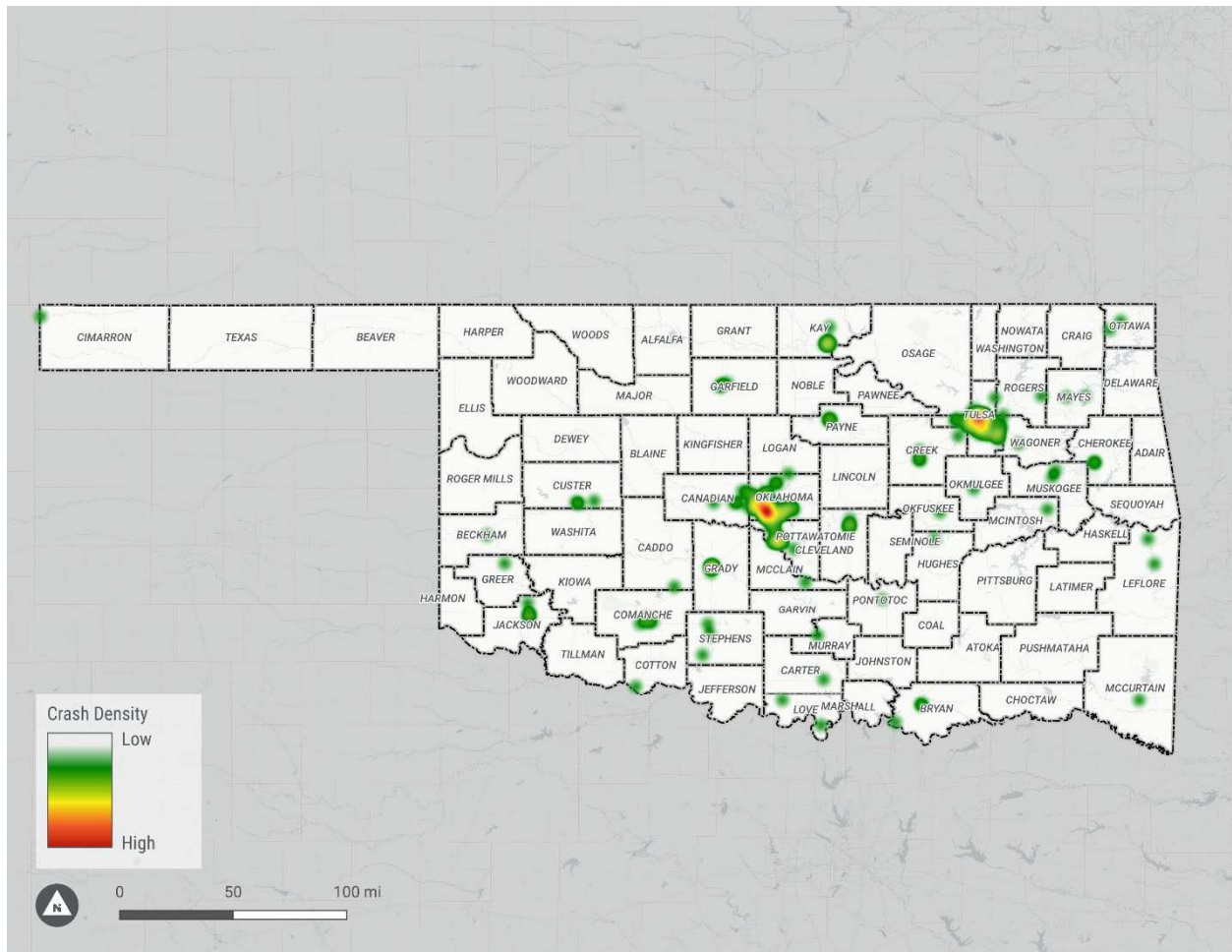


Figure 26. Heatmap of bicyclist fatalities and serious injuries across the state (Source: SAFE-T Database 2017-2021)

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.

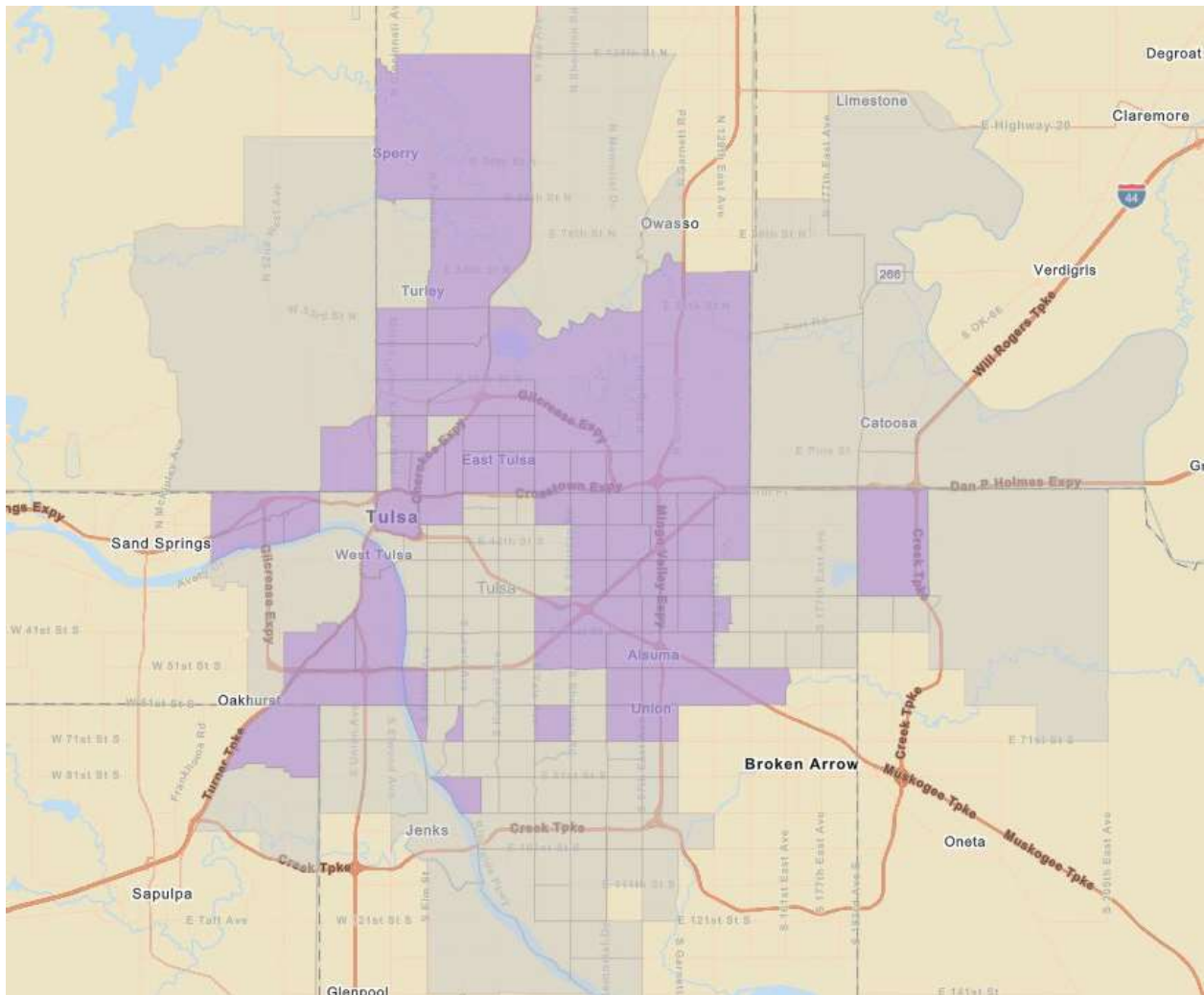


Figure 27. Tulsa's disadvantaged Census Tracts shown in purple (Source: [USDOT Equitable Transportation Communities Explorer](#), 2023)

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.

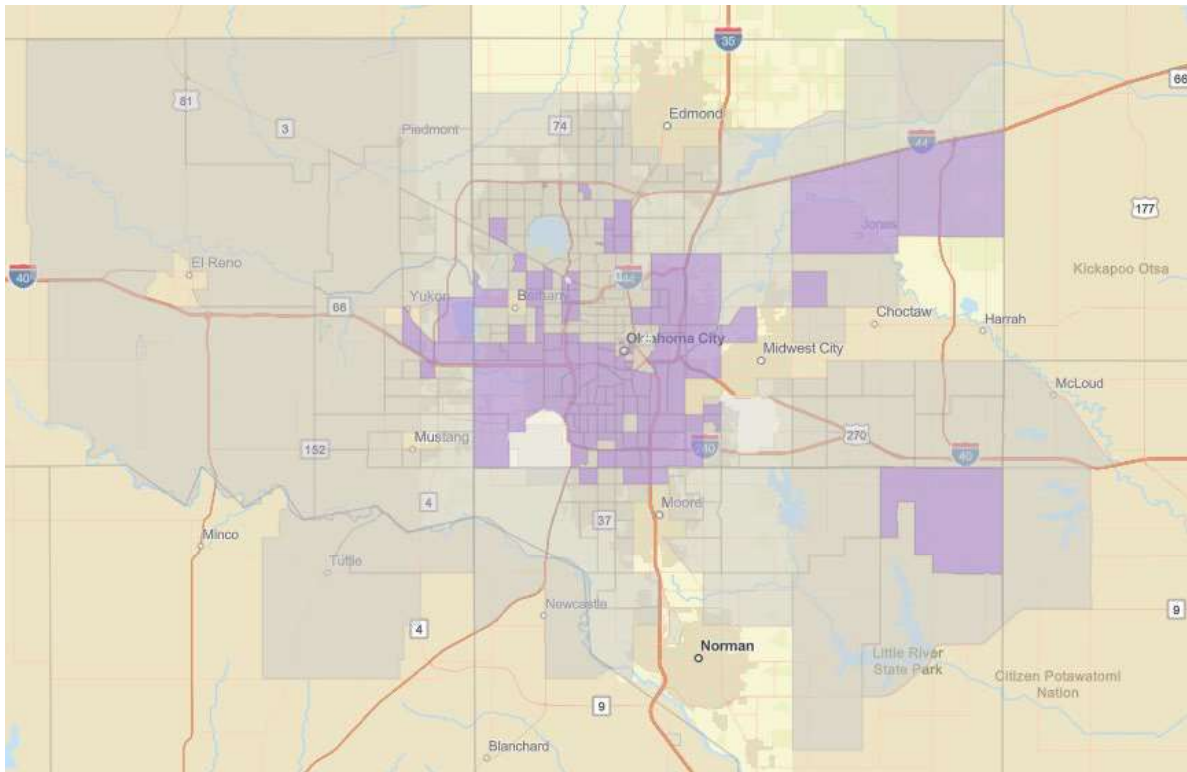


Figure 28. Oklahoma City's disadvantaged Census Tracts shown in purple (Source: USDOT Equitable Transportation Communities Explorer, 2023⁷⁶)

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 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.⁸²

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.

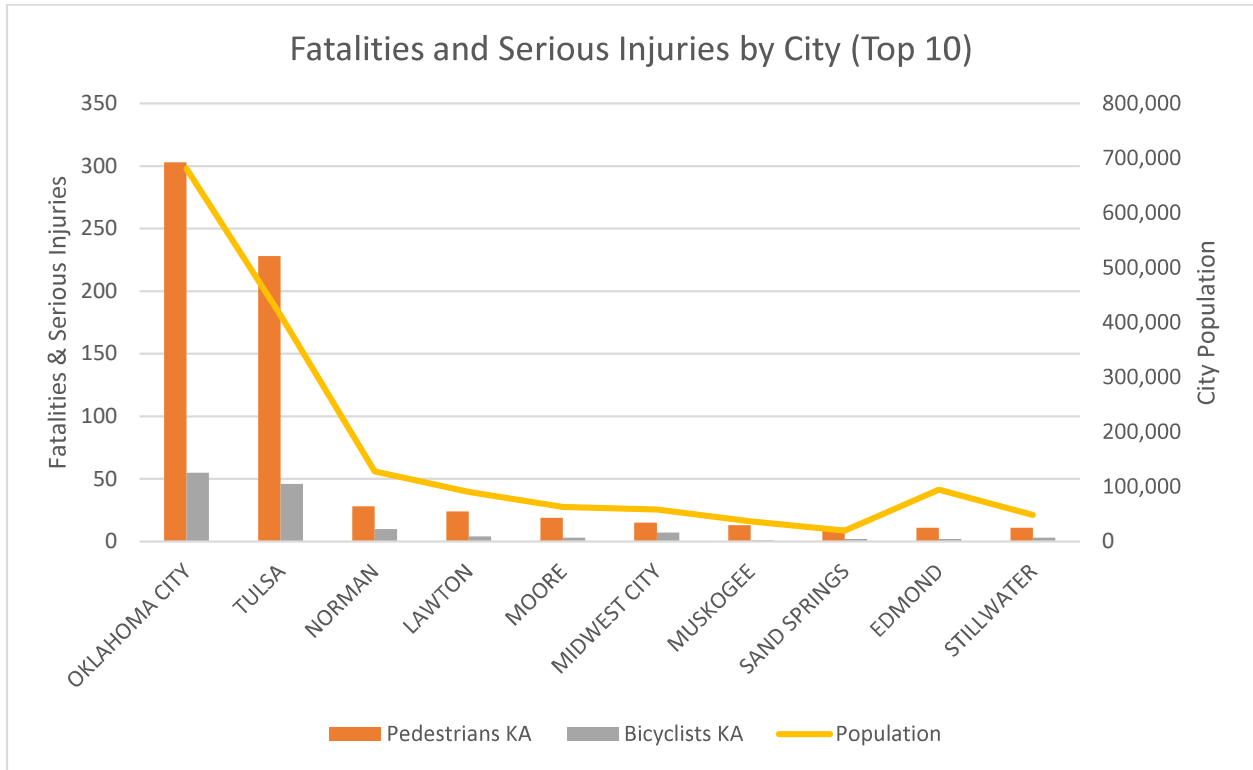


Figure 29. Fatalities and serious injuries by city (top 10 cities) (Source: SAFE-T Database 2017-2021)

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
<i>OKLAHOMA CITY</i>	681,054	4.4	0.8
<i>TULSA</i>	413,066	5.5	1.1
<i>NORMAN</i>	128,026	2.2	0.8
<i>LAWTON</i>	90,381	2.7	0.4
<i>MOORE</i>	62,793	3.0	0.5
<i>MIDWEST CITY</i>	58,409	2.6	1.2
<i>MUSKOGEE</i>	36,878	3.5	0.3
<i>SAND SPRINGS</i>	19,874	5.5	1.0
<i>EDMOND</i>	94,428	1.2	0.2
<i>STILLWATER</i>	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

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 Statues. 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.