

# Research Summary

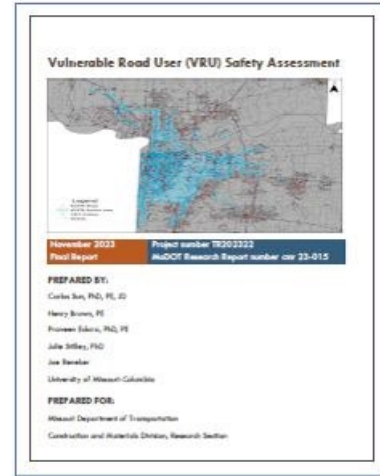
## Vulnerable Road User (VRU) Safety Assessment

According to the Federal Highway Administration, a Vulnerable Road User (VRU) is a nonmotorist such as a pedestrian, bicyclist, or highway worker but does not include a motorcyclist. NHTSA reports that VRU fatalities have been increasing. For example, 2021 NHTSA data shows that pedestrian fatalities are up by 13% and bicyclist up by 5%.

VRU crashes impact underrepresented populations disproportionately and inhibit sustainable transportation modes involving VRUs. As described in 23 U.S.C. §148(1), each state is required to produce an initial Vulnerable Road User Safety Assessment as part of the state's Strategic Highway Safety Plan. This report documents Missouri's effort in developing an initial VRU safety assessment plan. Safety planning is a foundational process towards bringing down VRU deaths and injuries with a vision towards zero fatalities by 2030.

The methodology used in the VRU safety assessment involves a combination of systemic analysis with high-crash location analysis. The main sources of data include police crash reports, MoDOT roadway data, and hospital data. The cross-tabulation statistical technique was used which reveals the association of contributory factors to VRU crashes.

For intersections, facilities were divided by density (Rural/Urban/urbanized), the number of intersection legs, and signalization (Yes/No). For



example, Z4N stands for urbanized 4-legged unsignalized intersections. Table 1 shows urbanized intersections contain more than 80% of the fatal VRU crashes. Segment facilities are classified by density (Rural/Urban/urbanized), the number of lanes, and median type (Divided/Undivided). For example, R2U stands for rural 2-lane undivided roadways. In contrast to intersections, rural segments captured a large percentage (34.7%) of fatal VRU crashes.

**Table 1: VRU Crashes at Missouri Intersections**

Facility	Fatal		Serious Injury	
	Number	%	Number	%
Rural	26	9.2%	89	7.8%
R3N	14	5.0%	52	4.5%
R4N	8	2.8%	28	2.4%
Urban	29	10.3%	137	12.0%
U3N	11	3.9%	57	5.0%
U4N	9	3.2%	58	5.1%
Urbanized	227	80.5%	918	80.2%
Z3N	96	34.0%	332	29.0%
Z3Y	29	10.3%	129	11.3%
Z4N	31	11.0%	186	16.3%
Z4Y	35	12.4%	203	17.7%



High-crash analysis highlights specific facilities because of a high crash frequency. However, due to lack of demand/exposure data, high-crash should not be equated with high-risk as the high crash frequency may be due to high VRU demand, thus greater VRU exposure. As reflected in the systemic analysis, all the high-crash intersections are located in an urbanized area.

*“...urbanized intersections contain more than 80% of the fatal intersection VRU crashes.”*

High crash analysis of road segments revealed that there are a large number of VRU crashes that occur on freeways and controlled-access highways. A common scenario is when the VRUs from a previous incident are injured in a secondary crash. I-70, I-55, and I-44 were the top three roads in terms of VRU crash frequency.

Significant engagement with stakeholders occurred via two separate meetings, a special meeting with St. Louis County staff, and an electronic survey. These stakeholders represented every MoDOT district in Missouri, and they were diverse in terms of the organization served. The organizations included metropolitan planning organizations, regional planning commissions, counties, cities, and advocacy groups.

They provided significant feedback on a list of low-cost countermeasures. These countermeasures include treatments such as raised medians, speed reduction techniques, high-visibility crosswalks, beacons, curb extensions, and signal timing. For example, agencies found some treatments to have a conflicting effect such as positively impacting VRU safety while negatively impacting transit service. This report provides an overall assessment of VRU safety in Missouri and a central vision for coordinating among agencies.

### ***Project Information***

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