

Head-On Crashes

Roadway departures accounted for 57,475 highway deaths between 2016 and 2018.

Head-on collisions were the most harmful event in 15,744 of these fatalities.

Vehicle head-on collisions¹ are the most harmful event in approximately 14 percent of all U.S. traffic fatalities each year and 27 percent of all roadway departure² (RwD) fatalities. There were 5,248 average annual RwD fatalities between

2016 and 2018 where a head-on collision was identified as the most harmful event. Figure 1 shows the key characteristics of fatalities where RwD head-on collisions are overrepresented in crashes. To reduce severe RwD crashes, FHWA recommends that State and local agencies consider three broad strategies:

1. Keep vehicles on the roadway or in their lane,
2. Reduce the potential for crashes when vehicles leave the roadway, and
3. Minimize the severity of crashes that do occur.

This brochure describes solutions that can be used to reduce fatal and serious injuries resulting from RwD head-on crashes for each of these three strategy areas (Ref. [Roadway Departure Safety](#)).

Figure 1. Characteristics of RwD fatalities involving head-on crashes – FARS data 2016 – 2018.

Keeping Vehicles on the Roadway

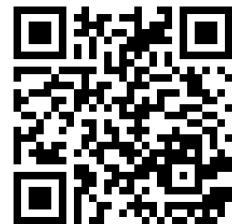
- **Pavement Markings** – Center line pavement markings help to delineate the road and separate opposing directions of travel. The addition of edge lines further assists vehicles with lateral placement within a lane. Widening both center lines and edge lines from 4 inches to 5 inches by the Illinois DOT resulted in an annual 14 percent reduction in opposite direction fatal plus injury crashes for 2-lane rural roads. Widening edge lines from 4 inches to 6 inches by the Kansas DOT resulted in a 53 percent reduction in annual opposite direction fatal plus injury crashes for 2-lane rural roads (Ref. [Final Report for NCHRP Project 17-66 – publication pending](#)).
- **Curve Warning Signs at Horizontal Curves** – Installing chevron signs at horizontal curves on rural 2-lane undivided roads can produce a 25 percent reduction in non-intersection head-on and opposite-direction sideswipe crashes (Ref. [Final Report for NCHRP Project 17-66 – publication pending](#)). Installing new fluorescent curve signs or upgrading existing curve signs to fluorescent sheeting on rural 2-lane undivided roads can result in approximately an 18 percent reduction in non-intersection head-on, run-off-road, and sideswipe crashes and a 34 percent reduction in non-intersection nighttime head-on, run-off-road, and sideswipe crashes of all severity types (Ref. CMF Clearinghouse IDs [2432](#) and [2435](#)).

¹ Crashes where the most harmful event is a head-on crash (FARS code 12).

² Crashes in which the vehicle crosses an edge line or center line, or otherwise leaves the traveled way.



- **Center Line Rumble Strips** – Center line rumble strips are effective treatments to reduce head-on crashes on undivided roadways with 2-way traffic. A study based on findings from three states determined that center line rumble strips can reduce rural head-on and sideswipe fatal and injury crashes by up to 45 percent and reduce all head-on and sideswipe crashes by 37 percent (Ref. [Rumble Strips and Rumble Stripes](#), CMF Clearinghouse IDs [3360](#) and [3355](#)).
- **Friction Treatments** - For locations with a history of RWD crashes and where the pavement surface is in good condition, high-friction surface treatment (HFST) is an effective solution to help reduce head-on crashes. A FHWA research report that assessed the influence of HFST on crashes in three states determined that HFST is estimated to reduce head-on and sideswipe crashes by 31 percent (Ref. [FHWA-HRT-20-061](#), CMF Clearinghouse ID [10336](#)).



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Reducing the Crash Potential When Vehicles Leave the Roadway

- **SafetyEdgeSM** - Run-off-road crashes are twice as likely to result in a fatality when a near-vertical pavement edge is exposed (Ref. [SafetyEdge](#)). Installing the SafetyEdgeSM during all paving or resurfacing projects helps vehicles that drift off roadways to return to the pavement with much less potential for the drivers to lose control. This lane departure maneuver can result in crashes with on-coming traffic in the opposing lane. A five-state study showed the SafetyEdgeSM will reduce head-on crashes by 19 percent on 2-lane rural roads (Ref. [FHWA-SA-17-044](#), CMF Clearinghouse ID [9217](#)).
- **Center Line Buffer Area** – Providing additional lateral separation between the two solid center line markings on rural 2-lane highways can reduce head-on crashes by as much as 25, 64, and 90 percent for buffer widths of 2, 4, and 10 feet respectively (Ref. [Final Report for NCHRP Project 17-66 – publication pending](#)).
- **Median Widths** – Increasing a 10 feet wide median to 20, 40, 60, and 80 feet can reduce rural cross-median crashes up to 16, 40, 57, and 69 percent, respectively (Ref. CMF Clearinghouse IDs [4523](#), [4534](#), [4545](#), and [4555](#)).
- **Shoulder Widths** – Increasing the width of a shoulder is known to help reduce crashes. On 2-lane rural roads, widening an unpaved shoulder to more than 5 feet can reduce the number of head-on, run-off-road, and sideswipe crashes by 79 percent (Ref. Report Number K-TRAN:KU-11-1, CMF Clearinghouse ID [5404](#)). For paved shoulders on rural 2-lane roads, widening a 6 foot shoulder to 8 foot can reduce these crashes by as much as 13 percent (Ref. HSM 1st ed., page 13-11, Ref. CMF Clearinghouse ID [5168](#)).
- **Maintenance to Control Vegetation Growth for Sight Distance** – Vegetation adjacent to the road, especially on the inside of a horizontal curve, can potentially limit driver's visibility of approaching vehicles, the road itself, or traffic control devices. Ideally, the safety of vehicles operating on the road is enhanced if the driver can see the length of required stopping sight distance for the associated speed (Ref. [FHWA-SA-07-018](#)).



Center line buffer area at TX-21. Source: TTI

Minimizing the Severity of Crashes

- **Median Barrier** – One multi-state study determined that the addition of a median barrier on a rural divided highway can be expected to reduce fatal or injury cross median crashes by up to 96 percent (Ref. NCHRP Report 794, CMF Clearinghouse ID [7042](#)).

For Additional Information

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