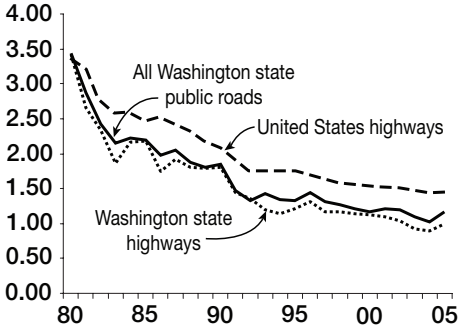
Nationwide, motor vehicle crashes are the eighth leading cause of death among Americans of all ages. In Washington state, traffic crashes kill more people age 1 to 44 than disease or other injuries. Thanks to a concerted and collaborative effort, the number of people killed in highway collisions in Washington state is decreasing and Washington state highways now are significantly safer than highways nationwide. Despite this success, crossover collisions remain a concern because they are among the deadliest collisions. Crossover collisions are incidents where a vehicle crosses the centerline or the median and collides with a vehicle or object in the opposing lanes. Nearly a third of all Washington state highway fatalities resulted from crossover collisions in 2006.

Figure 2.1

Traffic fatality rates in Washington compared with the national average

Fatalities per 100 million vehicle miles traveled 1980-2005



Source: National Highway Traffic Safety Administration and WSDOT Traffic Data Office

Figure 2.3 shows factors that often contribute to fatal and disabling collisions. Many of these are related to driver behavior. Enforcing laws, educating drivers and changing behavior can help prevent crossover collisions. However, it is inevitable that some drivers will run into the median. WSDOT engineers work to reduce the risk of injury and death for people in these vehicles, and for unsuspecting drivers who could be hit by them. This is a puzzle because even though median barriers help deter errant vehicles, they also introduce a new risk on the highway.

Median barriers provide a barrier between drivers who run off the highway and opposing traffic, and between drivers and other objects they may hit. People who drive off the road still may be involved in a collision, however, the barriers are designed to minimize the effects. WSDOT engineers know that vehicles may hit the median barrier and, as a result, are careful about median barrier placement and selection. Some median barriers are very rigid. Vehicles that strike rigid highway median barriers experience a great force of impact, and deceleration is rapid and significant. These forces often crush the vehicle or direct it back into traffic where it hits another vehicle, and occasionally the vehicle rolls over.

WSDOT installs barriers in the median in locations where oncoming traffic, bridge supports, steep slopes or other hazards are very close to traffic. While median barriers are incredibly effective at preventing cars from crashing into oncoming traffic, none of the approved barriers we can choose is 100 percent effective. Well-designed median barriers not only reduce the risk of crossover collisions, they also minimize the force of impact on people in vehicles that hit the barrier, redirect vehicles in a controlled manner and bring vehicles to a controlled stop.

The bottom line: Median barriers reduce the risk of crossover collisions but also create new risks for drivers who run off the road. This creates a dilemma for WSDOT engineers: When and where do the benefits outweigh the risks?

Ways to reduce crossover collisions

Increase traffic law enforcement, particularly for impaired driving, speeding and aggressive driving

Educate drivers

Improve vehicle maintenance

Lower driving speeds

Install pavement markings (lines, buttons and reflectors)

Build highway shoulders

Install centerline and shoulder rumble strips

Provide wide medians

Install median barrier

Smooth curves

Build safety rest areas

Provide law enforcement pull-outs

Shoulder rumble strips

During the past few years, WSDOT installed shoulder rumble strips on all rural freeways and many of the urban freeways in Seattle. It is estimated that these rumble strips have eliminated 10 to 20 percent of all run-off-the-road collisions. Washington state is one of a handful of states that have installed rumble strips in such a comprehensive manner.

Figure 2.2

Washington state highway collisions

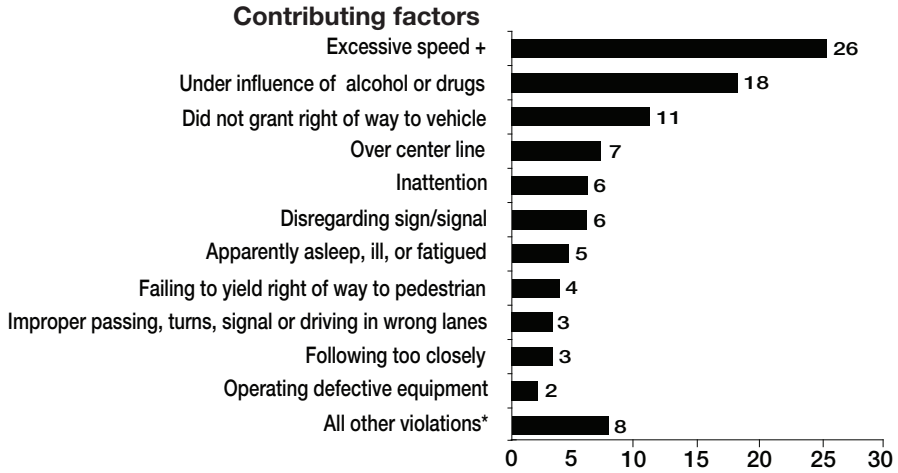
	1996	2006	Change	Percent change
Annual vehicle miles of travel	27.3 billion	31.6 billion	+ 4.3 billion	+16
All collisions				
Total number of collisions	51,469	52,285	+ 816	+ 2
Total number of collisions resulting in disabling injuries or fatality	1,869	1,160	- 709	- 38
Total number of disabling injuries	2,105	1,122	- 983	- 47
Total number of fatalities	360	299	- 61	- 17
Crossover collisions				
Number of crossover collisions	3,553	2,439	- 1114	- 31
Number of crossover disabling injuries	383	235	- 148	- 39
Number of crossover fatalities	139	96	- 43	- 31

Figure 2.3

Driver contributing circumstances in fatal and disabling collisions

Statewide: 2001 - 2006

Percent of fatal and disabling collisions



'+Exceeding safe speed and exceeding posted speed

*Other violations include headlight violation, improper backing, improper parking locations and miscellaneous violations.

Source: WSDOT Traffic Data Office

Common highway median approaches:

Beam guardrail is more rigid than cable barrier but less rigid than concrete barrier, which means that it may be more likely to crush the vehicles that hit it or rebound them back into traffic. Guardrail can be installed in locations where there is little room for deflection (lateral movement), including locations that are adjacent to steep slopes, rigid objects such as bridge supports, and bodies of water. Guardrail typically is more expensive than cable barrier but less expensive than concrete barrier, partly because water can flow around its supports, so it typically doesn't require special drainage systems.

Cable barrier is the least rigid type of barrier, which means that it will absorb some of the force of impact when a vehicle hits it, and it is more likely to stop a vehicle in the median. This also means that cable barrier can be installed only in locations where there is a wide, somewhat flat median. Cable median barrier typically is less expensive than guardrail or concrete barrier, partly because it allows water to flow past its supports so it typically doesn't require special drainage systems.

Concrete barrier is the most rigid barrier that WSDOT uses. While concrete barrier has the lowest occurrence of cross median crashes, it is more likely to crush the vehicles that hit it or rebound them back into traffic. Concrete barrier can be installed in locations where there is little room for deflection, including urban freeways. Concrete is typically the most expensive type of median barrier, partly because it blocks water, which means drainage systems often are required.

Centerline warning devices are useful in locations where there is very little space, and barriers are not a realistic option. Various warning devices can be installed in the center of the highway to help alert drivers who cross the median. These include rumble strips, which are bumps carved out of the road surface; raised pavement markers, which are applied to the road surface; reflective paint or plastic breakaway posts. These are among the most affordable median safety features. These often are used in conjunction with warning signs or lights and shoulder rumble strips.

Wide medians provide space for drivers who run off the road to slow and stop before they cross the median into opposing traffic. However, they are expensive and impractical in many locations because they require significant amounts of land. Boulders, water and slopes in the median can be hazards if a driver hits them.