

Speed Limits

The purpose of speed limits

While most drivers are assumed to be capable of making reasonable judgments about appropriate driving speeds, speed limits are necessary because of the significant risks drivers can impose on others. Other reasons include some drivers' inability to correctly judge the capabilities of their vehicles (e.g., stopping or handling) and the tendency to underestimate or misjudge the effects of speed on crash probability and severity. Speed limits enhance safety by establishing an upper bound on speed (which reduces the severity of the crash and perhaps the probability of a crash) and by reducing dispersion in speeds (i.e., lessening differences in speed among drivers using the same road at the same time) thus reducing the potential for vehicle conflicts.

Key points

Following are key points regarding speed limits and safety:

- Injury severity rises sharply with the speed of the vehicle in a collision.
- Increases in crash severity have been observed to coincide with increases in speed limits.
- The relationship between the probability of a crash and speed is less clear; however, there is evidence that increases in posted speed limit may result in increases in the number of crashes.
- When posted speed limits increase, studies have shown that traffic speeds increase by a lesser amount, which may be a reflection of high levels of noncompliance with the previous lower speed limit.
- Lower speed limits are used at night because illumination limitations of headlamps restricts the distance ahead that a driver can see.

Changes in posted speed limits on higher speed roads

A 1998 Texas Transportation Institute report documented an evaluation of the effects of raising the speed limit on Texas highways to 70 mph. Speed data were available from 30 permanent speed monitoring sites. The authors found that for most of the sites, there is indication that raising the speed limit to 70 mph resulted in increased traffic speeds. They found the following average speed increases:

- Rural interstate (limit raised 65 to 70 mph) – about 3 mph,
- Urban interstates (limit raised 55 to 70 mph) – about 8 mph,
- Rural US highways (limit raised 55 to 70 mph) – about 4 mph,
- Urban US highways (limit raised 55 to 70 mph) – about 7 mph, and
- Rural state highways and farm to market roads (limit raised 55 to 70 mph) – about 5 mph.

The study found that injury crashes increased by about 16 percent between January 1996 and March 1997 for rural interstate highways. The calculated increases in the more severe injury categories (fatal, serious injury, or moderate injury) on rural interstates were not significant. The study also found that non-fatal crashes increased significantly on rural, two-lane and



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multi-lane, undivided and divided highways, though fatal crashes did not change significantly.

A 2008 study examined traffic speeds before and after raising daytime speed limits for passenger vehicles from 75 to 80 mph on rural interstates (I-10 and I-20) in west Texas. During the 16-month period following the speed limit increase, mean speeds of passenger vehicles on I-20 increased by 9 mph relative to the comparison road, and on I-10 mean speeds increased by 4 mph relative to the comparison road.

A 2006 study reported on a number of analyses of the effect of raising speed limits on high-speed roads and other factors on speed choice, crash incidence, and crash severity. It was found that a speed limit increase on a high-speed road (Interstates and freeways) is generally associated with a less-than-equivalent increase in average vehicle speed (e.g., a 10 mph speed limit increase corresponds to average speeds around 3 mph higher). A relatively small but statistically significant correspondence between speed limits and total crash rates was identified. A speed limit increase from 55 to 65 mph on a high-speed road section would be associated with a crash count increase of around 3 percent. An increase in the speed limit of 10 mph was calculated to be associated with a change in fatal injury count between 13 and 28 percent.

Safety and speed limit relationships

A cause-and-effect relationship between speed limits and safety is not straightforward. Many factors affect highway safety, with speed and/or speed limit being among those factors. The relationship among speed limits, driver speed choice, and safety on a given road is complex.

Speed is directly related to injury severity in a crash. The probability of severe injury increases sharply with the impact speed of a vehicle in a collision, reflecting the laws of physics.

Speed is also linked to the probability of being in a crash, although the evidence is not as compelling because crashes are complex events that seldom can be attributed to a single factor. Many driver attributes and behavioral factors besides speed (e.g., driving under the influence of alcohol or other drugs, age, attitudes toward risk, and experience of the driver) affect the probability of crashes. In addition to driver attributes the roadway characteristics, such as shoulder width or horizontal curve design, also influence crash probability. Interstates with their high posted speed limits have low crash rates; however, they also have distinguishing design features such as limited access control and wide clear zones. Therefore, it is difficult to separate the effects of speed from other characteristics.

Limited-access highways

Limited access highways provide the least opportunity for vehicle conflicts and thus should have the lowest crash rates of all road classes. Some studies



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have found an association between crash involvement rates and deviation from average traffic speeds even on Interstate highways. One such study found crash involvement rates were higher in the vicinity of interchanges where differences in vehicle speeds were greatest and, thus, the potential for vehicle conflicts was highest. Two other studies reinforce the importance of traffic speed dispersion to crash involvement on Interstate highways. One 1985 study found a statistically significant relationship between increasing traffic speed dispersion and fatality rates on rural but not on urban Interstate highways, and a 1988 study found that crash rates increased as traffic speed dispersion increased on both rural and urban Interstate highways.

Nonlimited-access rural highways

The potential for vehicle conflicts is considerably greater on undivided highways, particularly high-speed nonlimited-access highways. Vehicles entering and exiting the highway at intersections and driveways, and passing maneuvers on two-lane undivided highways, increase the occurrence of conflicts between vehicles with large speed differences and hence increase crash probability. High crash involvement rates are associated with vehicles traveling well above or below the average traffic speed. According to a Transportation Research Board report, “speed dispersion, created in part by the characteristics of rural nonlimited-access highways, contributes significantly to increased crash probability for this road class. The level of speed also appears to affect crash probability for certain crash types, such as single-vehicle crashes.”

Nighttime speed limits

Lower speed limits have been used at night because, in general, driver vision is reduced during nighttime conditions compared to daytime conditions. Detection distances of potential hazards on the roadway at night can range from 300 to 500 ft under modern low-beam illumination (depending on the size and contrast of the potential hazard), which can be covered in as little as 3 seconds when traveling 75 mph. In addition, the nighttime fatality rate is three times higher than the daytime fatality rate.



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