

What type of total crash and crash severity impacts can be expected from a four- to three-lane conversion project?

When considering a four-lane undivided to three-lane (four- to three-lane) conversion project, one of the first questions most agencies will ask is what the expected impact will be on crashes. This question typically focuses on the changes in total crashes and crash types that result from the overall conversion (whatever that might include). This is a valid question and concern, as changes made in the number or function of roadway lanes could have unintended or unforeseen consequences.

Past evaluations of four- to three-lane conversions have shown that the impacts on crashes are positive. In other words, crash numbers have dropped as a result of conversions, and crash severities have been lowered (i.e., the crashes that do occur tend to be property damage only). Additionally, the comfort of nonmotorized road users, such as pedestrians and bicyclists, tends to increase when the number of lanes is reduced because the through traffic distance to cross decreases and the offsets from parallel traffic streams increase.

CHARACTERISTICS TO CONSIDER



Four- to three-lane conversions can be used as an approach to address the frequency, type, and severity of some crashes. One example of this is illustrated by the impact of the removal of left-turning vehicles from lanes used by through movements, which may result in rear-end crashes. This type of conversion may be accomplished by reallocating existing pavement area through pavement marking restriping or reconstruction of the entire cross section.



Iowa LTAP

Three-lane roadway featuring two through lanes and a two-way left-turn lane

The primary characteristics of four- to three-lane conversions are the inclusion of through lanes (typically one in each direction) and a dedicated center two-way left-turn lane. The center two-way left-turn lane may be wider than a typical through lane and allows for left-turn movements to be completed by traffic in either direction. In some cases, through lane widths may also be reduced. If the lane reduction is accompanied by a narrowing of lane widths, this could also potentially lead to a reduction in speeds, further improving safety. Additional characteristics that can sometimes be associated with four- to three-lane conversions can include the installation of medians, addition or widening of sidewalks, addition of bicycle lanes, installation of curbs and landscaping, and removal or addition of on-street parking.

Regardless of the safety and operational considerations for vehicular traffic, the cross section design should take the safety of all users into account, including pedestrians, bicyclists, and transit users. In cases where traffic volumes and/or speeds are relatively high, these vulnerable users may require more protection or separation from the vehicular traffic stream, and a four- to three-lane conversion can provide that

space. The availability of right-of-way, however, can still be at a premium, and adding or modifying facilities for nonvehicular users can be difficult. Trade-offs need to be considered when adding facilities in light of the conversion goal(s), particularly if safety is a concern for the corridor.

CRASH REDUCTION FACTORS



Changes to the number, severity, and cost of crashes provide an indication of whether a four- to three-lane conversion has had a positive or negative impact on safety. While the passage of time is necessary before the impact of conversions on crashes becomes clear, an increase or decrease in crashes is one measure of the success or failure of a project. Other surrogates can also help identify whether safety has been positively impacted, including reduced traffic conflicts, lower speeds, and increased comfort for vulnerable users (e.g., bicyclists and pedestrians) of the corridor.

The crash reductions resulting from four- to three-lane conversions have been studied in different locations. Many agencies considering the potential crash reduction impacts of four- to three-lane conversions rely on the Federal Highway Administration (FHWA) *Road Diet Informational Guide* (Knapp et al. 2014). The crash reduction factors in this guide come from the Highway Safety Information System summary report *Evaluation of Lane Reduction "Road Diet" Measures on Crashes* (FHWA 2010), which is based on the work of Harkey et al. (2008) in National Cooperative Highway Research Program (NCHRP) Report 617.

Harkey et al. (2008) used data from California, Iowa, and Washington to calculate the following recommended crash reduction factors for four- to three-lane conversions:

- 19 percent for **urban/suburban areas**
- 47 percent for **rural or small urban areas**
- 29 percent for **other locations** that do not fit the characterizations above (This percent reduction was calculated based on data combined from the area types above.)

Additionally, the *Road Diet Informational Guide* notes that decreases in crashes involving drivers under the age of 35 and over the age of 65 have occurred following four- to three-lane conversions. These results may indicate that four- to three-lane conversions can simplify the driving task for drivers.

OTHER CRASH STUDIES



In addition to the work above, other studies of four- to three-lane conversions have statistically evaluated their safety impacts. The results from these studies that may be of interest are as follows:

- **Iowa** (Pawlovich et al. 2006): A full Bayes before-and-after analysis of 15 conversion sites found a 25.2 percent reduction in crash frequency per mile and an 18.8 percent reduction in crash rate.

- **Minnesota** (Gates et al. 2007): An empirical Bayes evaluation of 7 sites converted from four to three lanes found crash reductions between 37.3 and 54.3 percent, with an overall crash reduction of 44.2 percent.
- **Louisiana** (Sun and Rahman 2019): An empirical Bayes evaluation of 4 four- to three-lane and 6 four- to five-lane conversions found that four- to three-lane conversions reduced crashes by 2.7 to 60.2 percent while four- to five-lane conversions reduced crashes by 1.3 to 49.3 percent.
- **Rhode Island** (Zhou et al. 2022): An empirical Bayes evaluation of 13 four- to three-lane conversions found a 29 percent reduction in total crashes and a 37 percent in fatal and injury crashes.
- **Virginia** (Lim and Fontaine 2022): The effectiveness of four- to three-lane conversions with added bicycle lanes for 26 segments and 39 intersections were evaluated using the empirical Bayes approach, which found that total crashes were reduced by 38 percent and fatal and injury crashes were reduced by 64 percent.

SUMMARY



Four- to three-lane conversions have been repeatedly shown to reduce crashes. The crash reduction factors (total crashes) most frequently employed by agencies range from 19 percent to 47 percent, with a value of 29 percent sometimes used as an average for project planning. Reductions in total crashes, fatal crashes, and injury crashes have also been reported, indicating that this type of conversion can also reduce crash severity. The occurrence of specific crash types has also been reduced, specifically rear-end and sideswipe crashes. Finally, younger and older drivers also appear to benefit from four- to three-lane conversions, as the driving task is simplified through elimination of the potential for stopped left-turning vehicles in through lanes.