

# Evaluation of Bypass Lane Safety, Operations, and Design in Kansas

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## **Introduction**

The construction of bypass lanes at rural intersections has typically been considered a low-cost highway safety improvement by the transportation community. However, this needs to be quantitatively evaluated so that decisions can be made on whether to continue adding bypass lanes. Highway safety analyses utilize two common approaches to evaluate the effectiveness of a treatment: before-and-after study and cross-sectional study, both of which were utilized in this study. For the before-and-after study approach, this research performed paired sample *t*-test statistical analysis to estimate changes in total crash frequencies, crash rates, Equivalent Property Damage Only (EPDO) crash frequencies, and EPDO crash rates at intersections 3 to 5 years after the addition of bypass lanes, compared to 3 to 5 years before bypass lane additions. Crash data between 1990 and 2011 were obtained from the Kansas Crash and Analysis Record System (KCARS), maintained by the Kansas Department of Transportation (KDOT). For the cross-sectional study, intersections with bypass lanes were compared to intersections with no bypass lanes, for which crash data were obtained for more than 1,100 intersections in Kansas.

## **Project Description**

According to the before-and-after study, bypass lanes improve safety at unsignalized rural intersections. Total number of crashes and crash severity decreased after bypass lane additions, but these reductions were not statistically significant at a 95% confidence level for the majority of cases. For intersection-related crashes, however, a statistically significant reduction in crash rates occurred after the addition of bypass lanes at three-legged intersections. By lowering the confidence level to 90%, however, more categories become significant for both three-legged and four-legged intersections.

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## Project Description (Continued)

In the cross-sectional study, number of crashes and crash severities were lower at three-legged intersections with bypass lanes compared to three-legged intersections without bypass lanes, even though these reductions were not statistically significant at a 95% level. When considering a 300-ft intersection box, statistically significant crash reductions occurred at four-legged intersections, for all considered crash and crash rate categories. When considering 90% level, crash reduction at three-legged intersections was also statistically significant when considering a 300-ft intersection box.

Crash Modification Factors (CMFs) calculated to evaluate safety effectiveness of bypass lanes at unsignalized rural intersections in Kansas showed values less than 1.0 for almost all cases, indicating safety benefits of bypass lanes.

## Project Results

Overall, this study concludes that bypass lanes are beneficial in improving safety in rural areas, even though they may not be advisable in high volume conditions. Accordingly, there is no harm in continuing with the practice of adding shoulder bypass lanes at rural unsignalized intersections where the traffic volumes are relatively low.

## Project Information

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