Kansas Department of Transportation

TECHNICAL SUMMARY

Evaluation of Safety Performance of Rural Roundabouts

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Introduction

Although transportation safety is paramount for both urban and rural populations, factors such as low traffic numbers, high speed limits, and lengthy travel times for rural locations contribute to specific safety concerns. In addition, rural transportation systems also typically have fewer available emergency services and longer emergency response times. Therefore, determining practical safety countermeasures for rural locations is essential for lowering crash frequency and severity.

Roundabouts are circular crossroads in which incoming cars must yield to moving traffic as they circulate around a central island. Due to their capacity to increase safety, decrease congestion, and improve traffic flow, roundabouts have become increasingly popular on a global scale. Urban regions primarily utilize roundabouts to decrease traffic delays, increase capacity, and improve traffic operations. Urban studies have repeatedly demonstrated that, compared to conventional intersection configurations, roundabouts minimize fatal and serious injury crashes. Roundabouts may also be helpful in rural locations, specifically for areas with conflict points and slow-moving traffic. However, further research is needed to determine how well roundabouts improve road safety in rural areas.

Project Description

The primary goal of this study was to assess how rural roundabouts in Kansas impact roadway safety. The study utilized comparison groups and a before-and-after study as well as a thorough benefit-cost analysis to determine the return on investment for roundabouts in rural areas. This research also aimed to assess crash frequency at rural roundabouts in Kansas and compare it with crash frequencies at conventional stop-controlled or signalized junctions in surrounding rural areas, thereby evaluating the overall safety performance of rural roundabouts.

To achieve these objectives, this research used a before-and-after study with comparison groups, which is a statistical method frequently used in transportation safety research. This method compares the observed crash frequency in treatment groups with the projected number of crashes in comparison groups, considering traffic volumes, geometric design elements, and historical crash data. This approach provides a thorough assessment of safety performance while accounting for potential biases and confounding factors. In addition to the safety assessment, this study conducted a thorough benefit-cost analysis to quantify safety benefits with building costs.

Project Results

This research effort affirmed the safety advantages of rural roundabouts by demonstrating their success at considerably lowering both injury and fatal crashes. This trend was supported by before-and-after analysis and comparison group analysis performed for isolated rural roundabouts, which both showed statistically significant decreases in the total number of fatal plus injury crashes (35 and 30.4) and the number of injury crashes (30 and 26.3). Favorable benefit-cost ratios of 11.16:1 and 9.41:1 were also shown for isolated rural roundabouts using both methods, which highlight the cost-effectiveness of isolated rural roundabouts, demonstrate a significant return on investment, and support their continued use. The analysis for rural interchange roundabouts showed a decrease of 18 expected injury crashes over the study period and a 68.33% reduction in expected injury crashes, which both contribute to enhanced road safety.

Maintenance costs for roundabouts were not included in this analysis. Recognizing these costs could slightly increase the expense components of the benefit-cost ratios, but given the robust ratios observed, their inclusion is unlikely to significantly alter the overall conclusions. Future studies could beneficially investigate this aspect.

Project Information

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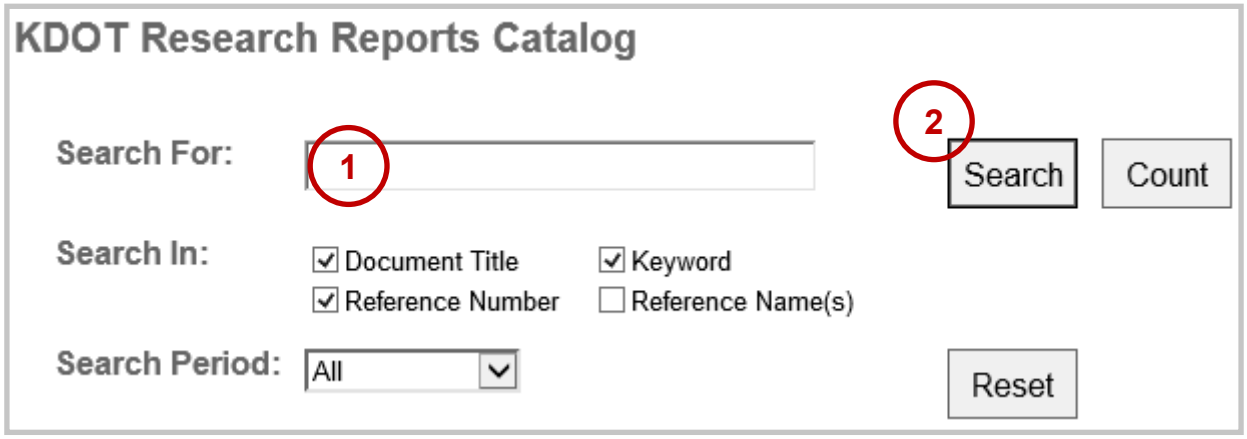

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