

Safety Evaluation of Raised Speed Limits on Kansas Freeways

Report Number: K-TRAN: KSU-16-3 • Publication Date: October 2018

Sunanda Dissanayake, Ph.D., P.E.
Reza Shirazinejad

Kansas State University Transportation Center

Introduction

Setting an appropriate speed limit is necessary to provide safe and efficient traffic operations for all road users. It must also be acceptable to the public and enforceable by police. Lower-than-required speed limits may make most drivers non-compliant, whereas higher-than-required speed limits may increase the number of crashes together with related injuries and fatalities. In 2011, the speed limit on a number of freeway segments in the state of Kansas increased from 70 to 75 miles per hour. The objective of this study is to evaluate the safety effects of freeway sections affected by speed limit change in Kansas.

Project Description

Sections where the speed limit changed from 70 mph to 75 mph and other comparable sections where the speed limit remained at 70 mph without any change were identified. Details of the crashes by severity level for 3 years before (2008–2010) and 3 years after (2012–2014) the speed limit change were collected using the state crash database. In order to get a general understanding, characteristics of crashes such as nighttime versus daytime, number of trucks involved, weather conditions, driver's gender, and other such factors were considered. Furthermore, several crash contributory causes were also investigated before and after the speed limit change. In order to evaluate the safety situation, three methods were utilized: (1) Empirical Bayes (EB) observational before-and-after studies; (2) Before-and-after method with comparison group; and (3) Cross-sectional method using the Negative Binomial (NB) regression model. The evaluation was conducted to see if the speed limit change has caused an increase in total crashes or fatal and injury crashes. In regard to speed analysis, the t-test was applied to see whether significant increases in the 85th percentile speed were observed between before-and-after conditions. Since the sample size was large, the Kolmogorov-Smirnov (K-S) test was also conducted to see if there was any difference between two sets of speed data distributions in the before period compared to the after period.

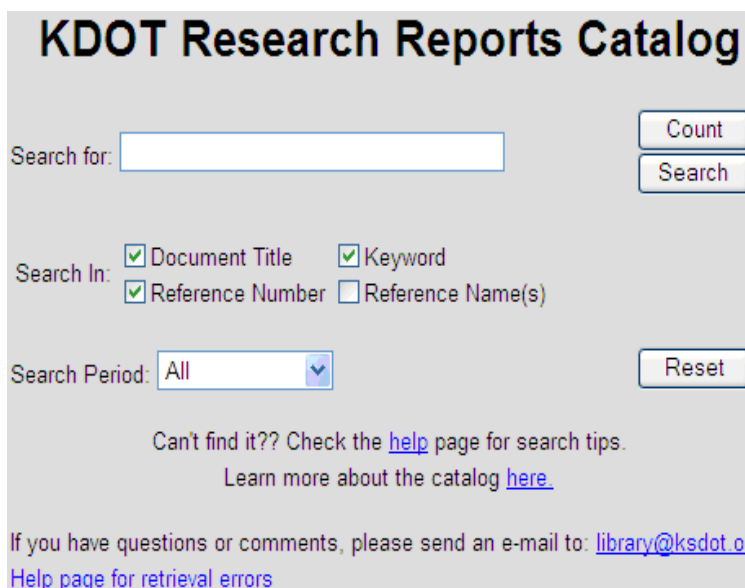
Project Results

By performing the EB before-and-after study, it was seen that total crashes increased by 16 percent, while using the before-and-after method with the comparison group showed around 27 percent increase in total crashes. Total crash increases were statistically significant according to the EB method, and the before-and-after method with the comparison group. On the other hand, fatal and injury crashes increased by 35 percent based on the before-and-after with the comparison group after the speed limit change. This increase was statistically significant, but the EB method results indicated no significant increase in fatal and injury crashes when the speed limit was raised to 75 mph. Further, cross-sectional study results showed the speed limit increase had a significant effect on total crashes, an increase of 25 percent; it was also significant for fatal and injury crashes, with those increasing by 62 percent, which is the highest amount of increase compared to the EB method and the before-and-after method with the comparison group. By considering pros and cons of each methodology, it can be said that the before-and-after method with comparison group provided the most reliable results.

The t-test results showed the 5-mph increase in the speed limit caused a statistically significant increase in 85th percentile speed for the sections affected by speed limit change. However, there was also an increase for the sections without a speed limit change, but this was due to large sample sizes of speed data in the before-and-after period. The K-S test results also showed that the speed distribution of treated sites during the after period was different than the before period. Understanding the results of this study will help with future speed limit adjustments on freeways in Kansas.

Project Information

For information on this report, please contact Sunanda Dissanayake, Ph.D., P.E.; Kansas State University, 2128 Fiedler Hall, Manhattan, KS 66506; (785) 532-1540 phone; sunanda@ksu.edu.



The screenshot shows the 'KDOT Research Reports Catalog' search page. It features a search box, a 'Count' button, and a 'Search' button. Below the search box are checkboxes for 'Document Title', 'Keyword', 'Reference Number', and 'Reference Name(s)'. There is also a 'Search Period' dropdown menu set to 'All' and a 'Reset' button. At the bottom, there is a link to a help page and an email address for questions.

Directions for Downloading the Full Report

To download the full report, visit <http://kdotapp.ksdot.org/kdotlib/kdotlib2.aspx> and do the following:

1. Enter K-TRAN: KSU-16-3 in the search box.
2. Click the Search button to the right of the search box.
3. You may have to scroll to find the specific report.
4. To download the report, click on the title of the report to open the PDF file and save it to your hard drive.

If you have any questions, please email us at KDOT#Research.Library@ks.gov.

KDOT RESEARCH