Kansas Department of Transportation

TECHNICAL SUMMARY

Calibration of the Highway Safety Manual and Development of New Safety Performance Functions for Rural Multilane Highways in Kansas

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Sunanda Dissanayake, Ph.D., P.E.
Syeda Rubaiyat Aziz

Kansas State University Transportation Center

Introduction

Rural roads account for 90.3% of the 140,476 total centerline miles of roadways in Kansas. In recent years, rural fatal crashes have accounted for about 66% of all fatal crashes. The Highway Safety Manual (HSM) provides models and methodologies for analyzing the safety of various types of highways. Predictive methods in the HSM were developed based on national trends and data from sample states throughout the United States. However, these methodologies are of limited use if they are not calibrated for individual jurisdictions or local conditions.

Project Description

The objective of this study was to analyze the HSM calibration procedures for rural multilane segments and intersections in Kansas. The HSM categorizes rural multilane segments as four-lane divided (4D) and four-lane undivided (4U) segments, and rural multilane intersections as three-legged intersections with minor-road stop control (3ST), four-legged intersections with minor-road stop control (4ST), and four-legged signalized intersections (4SG). The number of predicted crashes at each segment was obtained according to the HSM calibration process. Results from calibration of rural segments indicated that the HSM overpredicts fatal and injury crashes by 50% and 65% and underpredicts total crashes by 48% and 64% on rural 4D and 4U segments, respectively. The HSM-given safety performance function (SPF) regression coefficients were then modified to capture variation in crash prediction. The adjusted models for 4D and 4U multilane segments indicated significant improvement in crash prediction for rural Kansas.

Project Description (Continued)

Furthermore, Kansas-specific safety performance functions were developed following the HSM recommendations. In order to develop Kansas-specific SPFs, Negative Binomial regression was applied to obtain the most suitable model. Several additional variables were considered and tested in the new SPFs, followed by model validation on various sets of locations. The Kansas-specific SPFs are capable of more accurately predicting total as well as fatal and injury crashes on multilane segments compared to the HSM and the modified HSM models.

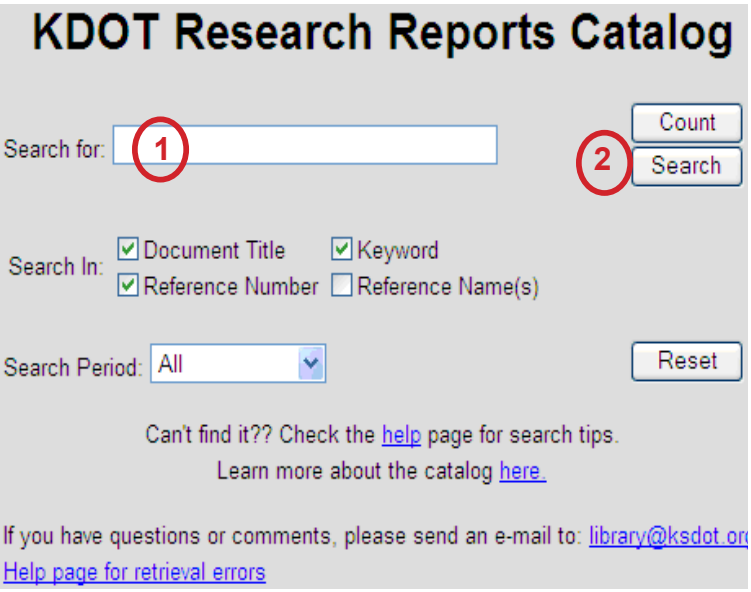
In addition to multilane segments, rural intersections on multilane highways were also calibrated according to the HSM methodology. Using crash modification factors for corresponding variables, SPFs were adjusted to obtain final predicted crash frequency at intersections.

Project Results

Obtained calibration factors indicated that the HSM is capable of predicting crashes at intersections on rural multilane sections at satisfactory levels. Findings of this study can be used for improving safety of rural multilane highways in the state of 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.



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