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EVALUATION OF GEOMETRIC AND OPERATIONAL CHARACTERISTICS AFFECTING THE SAFETY OF SIX-LANE DIVIDED ROADWAYS

BACKGROUND

To determine the factors that influence the crash rates on Florida's roadways, the Florida Department of Transportation State Safety Office reviews and analyzes crash trends specific to the state highway system. One review revealed that six- or more lane, non-limited access roadways have the highest fatality rate (fatalities/million vehicle miles traveled) of all FDOT roadways. In 1998, six- or more lane divided highways had a 25% higher fatality rate than four-lane divided highways. By 2001, six-lane sections had 32% to 48% higher fatality rates than four-lane divided highways, depending on location (i.e., urban, suburban, or rural). Researchers hypothesize that the difference in the crash rates is due to the differences in geometrics and traffic characteristics between six- and four-lane highways. Thus, to improve safety of six-lane divided roadways in Florida, FDOT needs to identify the geometric and traffic variables that might be contributing to the high crash rates.

OBJECTIVES

The purpose of this project was to improve safety on six-lane divided roadways in Florida by mitigating the high crash rates associated with this type of facility. Researchers evaluated roadway and operational factors that influence the high injury and fatality rates on six-lane divided roadways. They analyzed geometric and traffic data stored in various databases (e.g., FDOT crash database, the Roadway Characteristics Inventory, and FDOT videologs) and collected in the field. The goal was to establish the correlation between identified factors and crashes involving injuries and fatalities.

Specific tasks included the following:

1. Literature review.
2. Collection of background data.
3. Comparison of crash data for four- and six-lane facilities.
4. Development of crash rate models for six-lane highways.

FINDINGS AND CONCLUSIONS

The descriptive statistics analysis showed that four-lane sections had more crashes than six-lane sections in terms of percentages. However, six-lane sections had higher crash, fatality, and injury rates than four-lane sections with regard to many environmental, weather, and geometric factors.

Researchers used zero-inflated negative binomial models to model crash rates according to three levels of severity: (1) fatal and severe injury, (2) non-incapacitating and possible injury, and (3)

property damage only. The models showed that a variety of geometric and operational variables affect the crash rates.

Two variables, signals per mile and inside shoulder width, were significant in all three models. In all three models, an increase in the number of signals per mile increased the crash rate. An increase in the inside shoulder width reduced the crash rate. Horizontal degree of curvature was significant in both the non-incapacitating/possible injury and property damage only models; an increase in horizontal degree of curvature reduced the crash rate. The total number of driveways per mile was significant in both the non-incapacitating/possible injury and property damage only models; an increase in the number of driveways per mile increased the crash rate. Outside shoulder width was significant in these two models as well; an increase in the outside shoulder width reduced the crash rate. Median width and surface width were significant in the property damage only model; increases in the median width or the surface width reduced the crash rate. Based on the results of this research, the researchers strongly endorse Florida Department of Transportation's efforts to enforce its standards, especially with regard to median width, shoulder width, and access management.

BENEFITS

This research strongly supports FDOT standards as articulated in the Plans Preparation Manual and the State Highway Access Management Classification System and Standards. It also shows that there is a definable relationship between the individual variables studied and the frequency of the various crash severity, producing information that will be useful to practitioners. Unfortunately, the model developed in this study is a poor predictor of these crashes and will not be implemented—factors that were not considered in developing the model were later determined to have a significant impact on the crash and injury frequencies and rates.

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