



The Ohio Department of Transportation Office of Research & Development Executive Summary Report

Crash Base Rates for Freeways/Reduction Strategies for Rear End Crashes Volume 1: Crash Base Rates for Freeways in Ohio

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Problem

The identification of freeway segments that are considered hazardous and the determination of effective remedies to alleviate the situation pose a challenge to traffic engineers and planners.

A problem location is one that presents a risk to the users in terms of high probability of crash occurrence or severity. A safety analysis of a specific location can include a "base crash rates" analysis for identifying crash patterns at the study location. After the crash rate for each crash type is calculated for a study freeway segment, each crash rate can be compared to the "base crash rate" for locations with similar geometric, traffic, and environmental factors. If the calculated crash rate for any crash type at a particular location is found to be higher than the "base crash rate," then that location is chosen for further study to determine if a safety problem actually exists at that location and, if so, what counter measure(s) can be used.

Objectives

The primary objective of this study is to develop a set of mathematical models to estimate base crash rates for freeways in Ohio. The models estimate the incremental changes in the dependent variables (crash rate for different types of crashes) resulting from changes in the independent variables including geometric features, operational controls, and environmental conditions. Crash data and inventory data available with ODOT will be used to develop and validate the models.

Description

The base crash density/rate models were developed for the following crash types:

1. Injury crashes
2. PDO crashes
3. Total crashes
4. Angle crashes
5. Fixed Crashes
6. Rear end crashes
7. Sideswipe crashes
8. Wet road crashes
9. Night crashes

The following independent variables were used in the development of the models:

1. Speed Limit
2. ADT Total
3. Population Density
4. Lanes
5. Roadway Width
6. Surface Width
7. Shoulder Left Inside Width
8. Shoulder Left Outside Width
9. Shoulder Right Inside Width
10. Shoulder Right Outside Width
11. Unprotected Barrier
12. Positive Barrier
13. Curbed Barrier
14. Median Width
15. Curve Degree
16. Grade Percentage
17. V/C Ratio
18. Distance to Interchange

A master database was prepared by using data available from ODOT. The database was randomly split into two-

thirds for model building and one-third for model validation.

To evaluate the complex interaction among the dependent and independent variables, Automatic Interaction Detection (AID) technique was used. AID assisted in identifying a set of independent variables that have significant relationship with each dependent variable. The data was split into mutually exclusive groups such that the data in the same group were similar to each other. After the completion of AID analysis, stepwise multiple regression technique was used to develop mathematical models for the split groups. Finally, the models were validated with the one-third data that was set aside for validation.

Conclusions & Recommendations

This study developed state-wide and district-wide base crash density and rate models for freeways. These models are recommended for use by ODOT for evaluating freeway crashes. It is recommended that the means and standard deviations for different crashes provided by the AID analysis be used for calculating base crash densities/rates. The regression equations may be used as an additional tool for predicting state-wide and district-wide base crash density/rate for each crash type.

Implementation Potential

The use of base crash densities/rates for freeways, which are developed in this study, would allow ODOT to perform safety analysis for freeways in a consistent and uniform manner throughout the State. The results of this study have a high potential of implementation in Ohio.