MPC-367

Project Title:
Developing Statistical Models for Crash Severity Comparing Statewide, County and Indian Reservation Roads

University:
University of Wyoming

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Research Needs:
Safety research projects utilize crash data to develop methodologies to prioritize safety improvements. Analyzing crash severity and factors that influence crashes needs to be approached utilizing statistical modeling. Weighing the many variables that appear to contribute to severity requires the proper statistical model to identify trends and bring about systematic recommendations for reducing fatalities and severe injury crashes on Wyoming roadways. Over the years, several states developed statistical models to analyze crash data. Developing a suitable model for the roadways in Wyoming must take into account the unique characteristics of the highway system and roadway users. Wyoming is a very large state in area and the least populated in the country. Roadway miles traveled per capita is high and traffic volumes are low. In addition, the state has lots of rural roads managed by the state DOT, local governments, and the Indian tribes. A custom statistical model will provide a tool to review crashes in their context of the state primary and secondary systems, on local county roads and the Indian reservation.

Research Objectives:
The objective of this research is to develop statistical models for crash severity and compare the respective results of the models for the statewide, county and Indian reservations roads.

Research Methods:
Because of the qualitative nature of crash data, a logistic regression model is being proposed. Other models that have been developed for other states and conditions will be investigated for applicability to the needs of this research and either expounded upon or generate new approaches to explore. Other statistical modeling approaches will be investigated to determine if their applicability would provide better representation of the data. A prototype of a logistic regression model is currently underway for Interstate 80 crashes in the state of Wyoming. It will provide analysis to predict the severity of crashes on the roadway system. This model will be tested using the crash data from Interstate 25 in the state. Further refinements are anticipated as the many predictor variables are analyzed for appropriateness to the model.

Expected Outcomes:
These models will provide crash data analysis that will identify trends or patterns in order to predict crash severity for roadways with different functional classifications throughout the state. They will also be utilized in the methodology being developed for identifying high risk locations and other risk factors unique to the Indian reservation roads. The methodology includes crash data analysis and prioritization of safety improvements.   The statistical models will provide more accurate assessment of the main causes of fatal and severe injury crashes. Such information is essential for the development of a strategic highway safety plan for the state as well as the Indian reservation.   The methodology that will be developed will have nation-wide application for Indian reservations throughout the United States.

Relevance to Strategic Goals:
The primary goal of the Wyoming Strategic Highway Safety Plan is to reduce fatal and serious injury crashes. The statistical model will be used for crash analysis for the purpose of determining ways to achieve that goal.

Educational Benefits:
Graduate students will be involved in developing this model.

Work Plan:

The following tasks will be performed in this study:

1. Conduct a comprehensive literature review on statistical modeling of crash severity. This review will include as review of several modeling applications in crash data analysis. (Two months)

2. Obtain crash data over a ten-year analysis period. (One month)

3. Develop logistic regression model for Interstate 80 to predict the severity of crashes given certain factors. This model will show the statistical significance of crash factors relating to severity.   This work is underway and is estimated to be completed within one month.

4. The developed I-80 model will be tested on Interstate 25 in the state of Wyoming for calibration and validation. Crash data from the Wyoming Critical Analysis Reporting Environment (CARE 9) database and traffic volumes provided by the Wyoming Department of Transportation. Based on these results, further investigation will determine if the appropriate factors are included. Modifications as needed will be made to the model. Other types of statistical models will be considered at this point if original assumptions of applicability of the logistical regression model do not hold. (Three to four months)

5. Models similar to the one developed for the interstate system will be developed and validated for the state primary road system, the state secondary road system, the local county road system and to the Indian Reservation Road system.   (Three to four months)

6. Evaluate the results for each roadway classification and identify strategies for each. Verify that trends and patterns reflect those which are documented in the literature. Perform comparisons of the different systems and produce conclusions and recommendations. (Three months)

7. Prepare final report of findings and present at professional meetings. (Two month)

8. Incorporate findings into reservation roads safety improvement program methodology. Present to WYDOT and Tribal council. (Two to three months)

Project Cost:
Total Project Costs: $154,305.36
MPC Funds Requested: $ 76,951.36
Matching Funds: $77,354   Source of Matching Funds: WY LTAP and WYDOT

TRB Keywords:

Safety modeling, crash severity, transportation safety.