TECHSUMMARY March 2014

SIO No. 30000240 / LTRC Project No. 10-5SS

Developing Inexpensive Crash Countermeasures For Louisiana Local Roads

INTRODUCTION

Local road crash countermeasures are an important part of the overall efforts to reduce crashes and their severity in Louisiana. The efforts to develop a local road safety program are hampered by the lack of an appropriate risk assessment and low cost countermeasures that enable local agencies to reduce crash frequencies with limited budgets. This project deals with both issues. First, statistical models were developed to assess the risk of local road segments with respect to crash frequencies. Secondly, low cost countermeasures were researched and recommended for individual road segments based on current geometric features, crash frequency, and type of crashes. Thirdly, a score was developed for each road segment that incorporates the risk, benefits of improvements, and cost, which allows ranking of road projects. Fourthly, guidelines for a local road safety improvement program are provided to allow local agencies to develop procedures for a systematic system-wide road improvement methodology.

OBJECTIVE

The objective of this research project was to develop a procedure for selecting the top 5 percent of crash locations and suggest inexpensive crash countermeasures for local roads in Louisiana.

METHODOLOGY

Five years of crash data (2005-2009) from two parishes (Terrebonne and Lafourche) were used as the basis for this study. The road grid was taken from the Tiger Shape Files of the US Census Bureau and road segments of 500 feet were created. Google Earth was used to obtain road engineering features of approximately 36,000 road segments. The annual average daily travel (AADT) was obtained for the main roads from websites that publish AADT from local agencies. All information gathered was entered into a data warehouse. A procedure was developed for identifying candidates for crash countermeasures, selecting inexpensive crash countermeasures, providing costs and benefits of countermeasures, and ranking the projects using costs, benefits, and crash risks for Louisiana local roads. The deliverables include an Excel application that uses Online Analytical Procession (OLAP) to obtain a ranking of candidates for road improvements. This application makes use of crash data, engineering features, and AADT to compute empirical Bayes estimates and tail probabilities for each road segment and intersection. Road segments and intersections with a tail probability below 5 percent were selected as candidates for countermeasures. These candidates were evaluated using Google Earth, countermeasures were suggested, and costs and benefits of the countermeasures were obtained using published information. The resulting road improvement projects were then ranked using multi-criteria Data Envelope Analysis (DEA) including costs, benefits, and crash risks. This procedure led to a list of 30 intersections

LTRC Report 503

Read online summary or final report:
www.ltrc.lsu.edu/publications.html

PRINCIPAL INVESTIGATOR:
Helmut Schneider, Ph.D.
225-578-2516

LTRC CONTACT:
Mark Morvant, P.E.
225-767-9124

FUNDING:
SPR: TT-Fed/TT-Reg

Louisiana Transportation Research Center

4101 Gourrier Ave
Baton Rouge, LA 70808-4443

www.ltrc.lsu.edu

and 36 road segments for which specific low cost countermeasures were recommended and a ranking for implementation was provided.

CONCLUSIONS AND RECOMMENDATIONS

The process developed in this project serves as the basis of a local road safety improvement program that allows local agencies, with guidelines and procedures, a systematic system-wide road improvement methodology. Such a safety improvement program includes the following steps: (1) prepare local road inventory by dividing roads into segments of nearly equal length and obtain road engineering features, AADT and crash counts for road segments; (2) select road features and AADT class to obtain ranking of crash sites; (3) select all locations with less than 5 percent tail probability and create a list of road segments and intersections that are candidates for countermeasures; (4) obtain information on the selected sites from Google Earth to identify potential road hazards; (5) identify initial countermeasures, costs of countermeasures, and benefits using available Crash Modification Factors (CMF); and (6) rank sites using DEA. The above steps serve as a guideline to institute a systematic system-wide road improvement program. This program should also include resources available to implement countermeasures, collaboration with enforcement agencies, DOTD, and the Louisiana Highway Safety Commission to determine a plan for implementing the countermeasures in engineering, education, and enforcement.

IMPLEMENTATION STATUS

The procedure is ready to be implemented for Terrebonne and Lafourche Parishes. Three specific recommendations were made to allow implementation of the procedure for local agencies in other parishes: (1) create a database for local road sections and features in parishes; (2) create a database of AADT for local roads of parishes and cities; and (3) increase the number of local agencies that provide electronic crash records with GPS information.

LIMITATIONS

While the procedure was able to identify 30 intersections and 36 road segments in two Louisiana parishes that are candidates for improvement and for which countermeasures were identified, several issues were encountered that impacted the development of the procedure.

- The procedure relies on data that were not readily available. There is no database of a road inventory for local roads that could be used to obtain engineering features of the roads.
- There is no complete database for AADT on local roads available. AADT is published sporadically on websites. The AADT used in this project was obtained from a variety of websites and AADT was estimated for roads without available AADT.
- While using Google Earth has the advantage of saving time by not having to travel to the sites, the disadvantage is that the views may be a year old or older depending on the area.
- The crash data used were from 2005 to 2009 and thus crash patterns may have changed already in the past three years.
- Because of the lack of data, a Safety Performance Function (SPF) was not developed. To develop an SPF exposure data and engineering features are needed. The AADT were not sufficient for estimating a SPF for local roads.
- The countermeasures chosen were limited to engineering. Education and enforcement countermeasures should also play an important role in the evaluation of sites, because the engineering countermeasures alone may not lead to a desired reduction in crashes.