TECHSUMMARY October 2013

State Project No. 30000149 / LTRC Project No. 506

Developing Louisiana Crash Reduction Factors

INTRODUCTION

Although, like the rest of the country, Louisiana has made great strides in reducing the number of crashes, particularly fatal crashes, in recent years, our fatal crash rate of 1.56 is still higher than the national average of 1.10 in 2010. The vision of Louisiana Strategic Highway Safety Plan (LSHSP) is to reach Destination Zero Deaths on Louisiana roadways, which calls to cut the fatalities by half by 2030. To reach such a hefty goal, a list of actions is proposed aiming to reduce crashes and crash severities in all 4E aspects: engineering, education, enforcement, and emergency service. As it has been long recognized, the effectiveness of a crash countermeasure may vary from state to state because of the differences in road user behavior and travel environment, as well as the quality and sources of research used to determine the crash reduction factor (CRF). Not all CRFs listed in the FHWA desktop references clearly related to particular situations in Louisiana. There is a need to compile and present crash countermeasures in a way that would make it easier for LADOTD engineers and planners to apply a CRF for a given situation.

OBJECTIVE

The primary goal of this research was to develop and document a list of CRFs to be used by LADOTD. Particularly, this research will document the state-of-the-practice in CRF development and develop inexpensive CRFs for Louisiana with available information.

SCOPE

This project aimed to develop crash modification factors that are unique to Louisiana. Only highway related CMFs (CMF=1- CRF) were considered here (excluding crash countermeasures for vehicles and human factors). The analysis only focused on the data from Louisiana highways.

METHODOLOGY

This study consisted of the following major steps:

1. CMF overview and crash countermeasures catalog
2. Development of Louisiana crash modification factors

Crash Reduction Factor Overview and Crash Countermeasures Catalog

Crash countermeasures could come from a variety of areas, which is categorized by roadway engineering, vehicle, user behaviors, and emergency services. The Highway Safety Manual (HSM) listed three different sets of treatments based on the safety effectiveness mainly from roadway engineering aspect: (1) countermeasures with available CMFs; (2) countermeasures with known safety effects; (3) countermeasures with unknown safety effects, which is listed in Table 1.

A web-based repository of CMFs, called CMF Clearinghouse, has also been established to provide transportation professionals a regularly updated, online repository of CMFs, a mechanism for sharing newly developed CMFs, and educational information on the proper application of CMFs.

LTRC Report 506

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Table 1
Crash reduction summary

	Before		After		Percentage Change	
	Crashes	Average Crash Rate	Crashes	*Average Crash Rate	Crashes	Crash Rate
LA 3025	358	10.05	147	4.59	-59%	-54.3%
LA 182	178	8.12	85	3.53	-52%	-56.5%
LA 28	206	7.38	99	4.09	-52%	-44.6%
LA 1138	260	16.01	167	10.63	-36%	-33.6%

**calculated as total number of crashes per million VMT*

Development of Louisiana Crash Modification Factors

Developing a unique CMF for Louisiana was the main purpose of the project. Based on the investigation, two unique CMFs were generated for Louisiana in this study; one for lane converting through restriping and another for Raised Pavement Markers (RPM).

Crash Modification Factor for Four-lane to Five-lane Urban Roadway Conversions

Undivided highways have consistently exhibited low safety performance, particularly in urban or suburban areas where driveway density is relatively high. Installing physical separation either by barrier or by green space (boulevard) has been the most recommended crash countermeasure for the problem. With sufficient roadway width, a four-lane undivided highway can also be easily changed to a five-lane roadway with the center lane for left-turns. This least expensive option expectedly reduces rear-end collisions. To meet the urgent need in crash reduction on this type of roadway, several district offices of LADOTD converted undivided four-lane roadways to five-lanes within the last decade. A CMF was developed based on the four segments shown in Table 2.

Crash Modification Factor for Raised Pavement Markers and Striping

RPM and striping are the most common and cost-effective safety features used on highways. As with many highway devices, RPM needs to be replaced periodically to maintain its intended functionality, which requires significant resources. To select the most efficient crash countermeasure under limited resources, the effects of all crash countermeasures need to be understood and quantitatively measured. There is a need to substantiate the effect of RPM in order to decide the continuation of RPM on freeways in Louisiana, which was precisely the purpose of the evaluation.

Two data sets were used for the analysis. The quality of RPM along with pavement striping (center and edge lines) on Louisiana freeways were inspected annually by few designated engineers who give subjective ratings. Three categories of ratings (good, fair, and poor) were used to describe the condition of the RPM and striping. The segments in poor condition will be scheduled for either RPM replacement or re-striping. The nine years (2002-2010) of RPM and striping ratings for all Louisiana freeways were obtained for the analysis along with the corresponding nine years of crash data.

CONCLUSIONS

1. Converting four-lane undivided urban roadways to five-lane roadways with a middle lane for left turns is an effective and feasible solution to reduce crashes on urban undivided roadways that have lots of driveways in Louisiana.
2. RPM helps reduce crashes on rural freeways in Louisiana based on the subjective RPM rating data.

RECOMMENDATIONS

It is recommended to investigate safety on urban undivided roadways statewide to see if immediate lane converting project is needed. Researchers also recommend to continue the RPM program on rural freeways in Louisiana.

Table 2
CMF results

	Expected Crash Reduction	Standard Deviation	Estimated CMF	Standard Deviation
LA3025	175	27.62	0.45 (0.55)	0.051
LA182	110	20.53	0.43 (0.57)	0.062
LA28	111	21.28	0.47 (0.53)	0.062
LA1138	87	25.42	0.65 (0.35)	0.075

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