**Research Project:** ***SP209B4J***
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RESEARCH SUMMARY

# THE DEVELOPMENT OF LOCAL CALIBRATION FACTORS FOR IMPLEMENTING THE HIGHWAY SAFETY MANUAL IN MARYLAND

## Problem

One of the best strategies to improve traffic safety and reduce motor vehicle traffic crashes is to provide well-planned engineering, education, and enforcement countermeasures that are tailored to given crash, traffic, and roadway characteristics. The implementation of the American Association of State Highway and Transportation Officials' Highway Safety Manual (HSM) methodologies is expected to provide a cost-effective approach to transportation safety planning and engineering. However, the safety performance functions for HSM's predictive method were developed using data from states other than Maryland (California and Washington). Therefore, Local calibration factors (LCFs) need to be developed to apply HSM's predictive method to Maryland.

## Objective

The primary goal was to determine LCFs to adjust HSM predicted vehicle crashes for Maryland-specific applications. The specific objectives were

- to review studies that applied and evaluated the HSM methodologies;
- to collect and compile all required data for the selected roadway segments and intersections;
- to estimate crash frequencies for roadway segments and intersections by different roadway facility types; and
- to develop LCFs for Maryland.

## Description

First, available data sets from SHA were collected for the three-year study period (2008-2010). Second, after assigning crashes to the study road network, datasets for homogeneous segments and intersections were compiled. Third, samples were drawn at 90% confidence level. Fourth, additional data items were collected for the sampled sites. Google Earth Pro was utilized for manually counting and measuring missing geographical variables. The Average Annual Daily Traffic (AADT) on minor roads was estimated using multiple regression models. Fifth, predicted crashes and LCFs were computed using the Federal Highway Administration's Interactive Highway Safety Design Model (IHSDM). The difference between the LCFs based on the Maryland crash data and the HSM default data was statistically significant. Therefore, use of the Maryland data was recommended.

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## Results

Tables 1 and 2 summarize LCFs by different combinations of crash severity (K-fatal; A-incapacitating injury; B-non-incapacitating injury; C-possible injury; and PDO-property damage only crashes). In general, LCFs for all facilities were less than 1.0, implying that those facility types in Maryland had fewer crashes than the predicted crashes using the HSM crash prediction methodology. Lower LCFs for intersections probably implies that intersections in Maryland are safer in general. The exclusion of the City of Baltimore, where like other large cities there are many busy intersections, may be a reason for the lower intersection LCFs.

KABC LCFs for two out of seven segment types and all intersection types were higher than LCFs for total crashes. If the purpose of the research is to predict fatal and injury crashes, KABC LCFs would be useful. The only disadvantage is that no LCF for KABC crashes for R2U segments is available.

**Table 1. Maryland LCFs by Crash Severity – Roadway Segments**

| Segments | R2U | R4U* | R4D | U2U | U3T | U4U | U4D | U5T |
|---|---|---|---|---|---|---|---|---|
| Total Crashes | 0.6956 | 2.3408 | 0.5838 | 0.6814 | 1.0785 | 0.8788 | 0.8269 | 1.1891 |
| KABC Crashes | N.A. | 1.9499 | 0.4193 | 0.6125 | 1.3053 | 0.7696 | 1.0665 | 1.1918 |
| KAB Crashes | N.A. | 1.9231 | 0.4565 | N.A. | N.A. | N.A. | N.A. | N.A. |
| PDO Crashes | N.A. | N.A. | N.A. | 0.7313 | 0.9362 | 0.9611 | 0.7310 | 1.1874 |

Note 1: There were only 19 R4U segments in the final data set. Thus, all of them were included in the study.
Note 2: The asterisk denotes that the facility did not meet HSM minimum sample size criteria of 30-50 sites or the minimum annual crash threshold of 100.
Note 3: N.A. means that no SPF is available in HSM.

**Table 2. Maryland LCFs by Crash Severity – Intersections**

| Intersections | R23ST* | R24ST* | R24SG* | RM3ST* | RM4ST* | RM4SG* | U3ST* | U4ST* | U3SG | U4SG |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Crashes | 0.1645 | 0.2011 | 0.2634 | 0.1788 | 0.3667 | 0.1086 | 0.1562 | 0.3824 | 0.3982 | 0.4782 |
| KABC Crashes | N.A. | N.A. | N.A. | 0.2550 | 0.3923 | 0.1327 | 0.2273 | 0.4964 | 0.5967 | 0.6285 |
| KAB Crashes | N.A. | N.A. | N.A. | 0.2664 | 0.3953 | 0.1879 | N.A. | N.A. | N.A. | N.A. |
| PDO Crashes | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | 0.1138 | 0.3003 | 0.3427 | 0.3970 |

The HSM predictive method and the developed LCFs can be used to evaluate existing facilities, alternative design modifications, new facility designs, and the effectiveness of engineering countermeasures in Maryland. At the system level, the predicted crashes would guide practitioners in prioritizing locations for safety improvements.

## Report Information

Link to the final report: http://www.roads.maryland.gov/OPR_Research/MD-14-SP209B4J_Local-Calibration-Factors-for-HSM_Report.pdf. For more information about the study please contact:

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