



Improved Guidelines for Estimating the Highway Safety Manual Calibration Factors

Dominique Lord, Srinivas Geedipally, Mohammadali Shirazi

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The *Highway Safety Manual* (HSM), published by the American Association of State Highway Transportation Officials, provides mathematical models that can be used to predict average crash frequencies at a given roadway site, which could be a segment of road or an intersection. These models are used to predict the total number of crashes that will occur, the severity of those crashes, and the types of crashes. These predictions are based on geometric design, traffic-control features, and traffic volumes for each site. The model that is used to predict crash frequencies is called a safety performance function (SPF). The model that is used to predict the severity of crashes is called a severity distribution function (SDF).

Conditions vary greatly among sites. For example, one site might have twelve-foot-wide lanes and another might have only ten-foot-wide lanes; one site might be subject to significant snowfall and another might not ever get snow. These variations are captured using crash modification factors (CMF). Since the models are developed from a few selected regions and time periods, SPFs and SDFs need to be adjusted, or calibrated, to more accurately reflect the frequency and severity of crashes at different times and in different regions. The HSM recommends using crash data from thirty to fifty sites, with a total of at least 100 crashes per year, as the basis for calibrating the prediction models. However, this research has demonstrated that there is ample evidence in the published literature to show that the HSM calibration recommendations are inappropriate and insufficient to allow for accurate calibration in most cases.

Through extensive analysis of simulated and observational data, the researchers sought to identify factors that would influence a more appropriate number of sites and crashes for calibrating SPFs and SDFs, determine how frequently a local or regional transportation agency should update the identified calibration factors, and determine whether or not it is justifiable to have region-specific calibration factors and when those factors are needed. Crash datasets from both Texas and Michigan were analyzed to gain insight related to regional issues.

The researchers present a number of recommendations, or guidelines, which include specific steps to be taken and mathematical equations to be employed, that make it possible to meet the study's objectives.