Implementation of Safety Performance Function (SPF) Methods to Identify High Collision Concentration

An assessment of the cost and efficiency of combining existing and new data for the development of safety performance functions for the state highway system.

WHAT IS THE NEED?

Identifying high collision concentration locations is a major objective of many state and local transportation agencies. In recent years, significant progress has been made with respect to crash prediction models for identifying such locations. In addition to providing valuable information related to factors that can potentially contribute to increase in the likelihood of traffic collisions, the Highway Safety Manual explains how Safety Performance Functions (SPFs) (i.e., a mathematical relationship describing the collision frequency and explanatory variables) are used to estimate the expected number of collisions per year for a given location, which serve as a baseline for network screening techniques which play a major role in the transportation safety management process.

California Department of Transportation (Caltrans) is currently in the process of developing Type 1 and Type 2 SPFs for roadway segments, intersections, and ramps on the entire state highway system. The added value of the current Caltrans efforts cannot be realized until the outcomes are deployed as part of a transportation safety management tool. Considering this, the need is to incorporate recently developed SPFs into Caltrans’ road safety management procedures.
WHAT ARE WE DOING?

The proposed project has three overarching activities:

i. Design and develop a Microsoft (MS) Excel transportation safety management tool for conducting SPF-based analyses and calibrating existing SPFs

ii. Incorporate all the Caltrans-approved SPFs into the tool so it can be used by selected Caltrans expert users

iii. Provide guidelines for developing additional SPFs, re-calibrating existing SPFs, and a roadmap for incorporating such SPFs into the tool

The other feature of the proposed SPF tool is to include the capability to conduct network screening to identify high collision concentration locations. The development of the network screening framework will consider the inclusion of network screening methods, such as sliding window method and continuous risk profile. The implemented network screening approaches would allow Caltrans to input the parameters which would define the high collision concentration locations, and the output of the network screening would result in a list of locations which meet the selection criteria. In addition, the tool would allow the network screening to be queried using different crash and location characteristics, such as districts, years, and party type.

WHAT IS OUR GOAL?

The goal of the transportation safety management tool is to assist Caltrans in gradually deploying newly developed SPFs into the network screening processes. The idea is to develop a tool that would be flexible enough to make use of any intermediate progress related to network screening capabilities.

WHAT IS THE BENEFIT?

As a result of implementing these activities, Caltrans shall be able to use the current SPFs for identifying high collision concentration locations. Using the most current SPFs will allow Caltrans to use state-of-the-art models to conduct the most efficient and more accurate network screening techniques for the California state highway system.

WHAT IS THE PROGRESS TO DATE?

The research team accomplished the following tasks:

• Developed SPFs for all three facility types – highway segment, intersection and ramp with total collision, as well as with injury combination of fatal, severe and visible (FSV) collisions and presented this to Caltrans and recommended to use FSV SPFs for network screening based on the model performance

• Developed MS Excel Macro spreadsheet SPFs tool incorporating all the estimated SPFs and demonstrated with the Technical Advisory Committee