

Transportation  
Safety and  
Mobility

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Project Title:  
Developing a Safety Effectiveness  
Evaluation Tool for California

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## Developing a Safety Effectiveness Evaluation Tool for California

A Safety Effectiveness Evaluation Tool For California

### WHAT IS THE NEED?

Safety is one of the top priorities of California Department of Transportation (Caltrans). Caltrans is in urgent need of a safety tool to evaluate various safety countermeasures and rank and prioritize safety projects. In the planning and development of safety projects, state department of transportations (DOTs) rely on an assessment tool to evaluate the impacts of alternative safety countermeasures. To respond to this need, it is necessary to develop a safety project evaluation tool that employs the state-of-the-practice methods, reflects local conditions, and tailors to Caltrans' needs to quantify the impacts of one or more countermeasures using expected fatal and serious injury reduction.

### WHAT ARE WE DOING?

The proposed research is a first attempt at creating a tool for evaluating safety effectiveness in California. We aim at reducing the methodological gaps mentioned above and providing a tool (preferably in a Excel spreadsheet) for conducting the safety effectiveness analysis in California. To achieve the goal, research will be conducted in the following steps:

#### 1. Task 1: Assess state-of-practice, needs and challenges

In this task, the team will scan the current practices of safety effectiveness evaluation at national and state levels as well as synthesize the key challenges in California.

**Work Product 1A:** A technical memo summarizing the findings.

#### 2. Task 2: Develop methodology for evaluating safety benefits

In this task, we make recommendations to improve the current practice of safety effectiveness evaluation. Data-driven models



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will be developed and trained using existing Crash Reduction Factor (CRF) and Crash Modification Factor (CMF) data from Federal Highway Administration (FHWA) and California, as well as a data set of before-and-after observations. The models will be implemented in R or Excel framework.

**Work Product 2A:** A technical memo summarizing the development of the evaluation methodology and recommendations.

### 3. Task 3. Develop a safety effectiveness evaluation tool

In this task, the team will develop a standalone interactive spreadsheet tool to conduct the safety evaluation analysis. The tool will incorporate above mentioned data and methodology recommendations from Task 2. The team will also provide two case studies for demonstrating application of the tool on two safety projects.

**Work Product 3A:** First version of the safety effectiveness evaluation tool.

**Work Product 3B:** Two demonstrations of the tool.

**Work Product 3C:** User manual of the tool.

### 4. Task 4. Complete Final Deliverables

In this task, the team will make modifications to the tool based on feedbacks from the last task. The team will help deploying the tool in different districts of Caltrans and integrating the tool with existing analysis tools and system.

**Work Product 4A:** Final Report

**Work Product 4B:** Policy Brief

**Work Product 4C:** Tool updates and deployment assistance

### 5. Task 5. Engagement Task

In this task, with the coordination of Caltrans, the team will conduct 4 training sessions, which can be either online or in person. The training sessions will cover both methodology and tool usage. Training materials, including the user manual and handouts, will be disseminated. Meanwhile, the tool will be made available to related Caltrans personnel and feedbacks will be collected.

## WHAT IS OUR GOAL?

Our goal is to develop a tool for evaluating safety effectiveness that is targeted for Californian roadway and traffic conditions:

- Employs the state-of-the-art safety assessment methods and practices
- Integrate both national and California data to better capture local conditions
- Easy to use and maintain

## WHAT IS THE BENEFIT?

With a more effective, user-friendly tool to prioritize and assess safety projects in California, the results of this are expected to save both staff time and safety project costs, and more lives thanks to improved road safety.

## WHAT IS THE PROGRESS TO DATE?

- The research team worked on enhancing the machine-learning model for Crash Modification Factor (CMF) forecast. An enhanced model based on new natural language encoding was proposed and tested.

- Research team had a kickoff meeting with Caltrans team.