

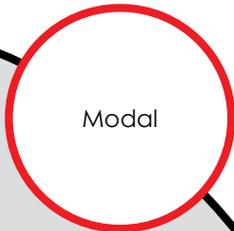


Caltrans Division of Research,
Innovation and System Information

Research



Results



Modal

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Project Title:

Analysis of Bikeways

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Development of Crash Reduction Factors for Bicycle-Related Safety Countermeasures

Develop high quality California-specific Crash Reduction Factors (CRFs) for bicycle-related safety countermeasures.

WHAT WAS THE NEED?

Communities across California are looking to alternatives to the motor vehicle as the primary means of transportation to, from, and between activities. Investments in bicycling infrastructure, education, and enforcement have improved, and continue to have the potential to improve the quality of life in communities large and small.

Furthermore, there is an increasing interest in improving safety for vulnerable road users and advancing the goals of Vision Zero to eliminate traffic fatalities and serious injuries. A transportation network with safe bicycle facilities means less traffic, more physical activity, and reduced carbon emissions, making bicycling a solution to many pressing concerns. California Department of Transportation (Caltrans) is responding to this shift by adopting new policies intended to encourage bicycling and emphasize safety, livability, and sustainability for all. This approach is also aligned with Caltrans' current mission to "Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability", its vision toward "A performance-driven, transparent and accountable organization that values its people, resources and partners, and meets new challenges through leadership, innovation and teamwork", as well as the first of five goals to "Provide a safe transportation system for workers and users, and promote health through active transportation and reduced pollution in communities."

As communities and transportation agencies confront an increasing demand for bicycle infrastructure and programs, there is a need for information about the effectiveness of such facilities. Crash Reduction Factors (CRFs) play a crucial



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role in providing the quantitative data that is needed by practitioners engaged in bicycle safety improvements as they ascertain expected effectiveness of various countermeasures.

WHAT WAS OUR GOAL?

Provide the best expertise to meet the needs of this project and apply state-of-the-art methodologies to California data and apply the statistical analyses required to develop California-specific Crash Modification Factors (CMFs) to support relevant bicycle safety programs across California. To do this, the researchers will identify the existence, quality, and applicability of any available CRFs. This information will help to identify research gaps and prioritize which countermeasures to focus on for the data collection. In the end, a countermeasure evaluation framework will be developed.

WHAT DID WE DO?

The research team conducted the following tasks:

1. Documented existing bicycle-related safety countermeasures appropriate for various environments: urban/rural, intersections, midblock crossings and road segments. This included searches of existing compilations of countermeasures including the BIKESAFE Countermeasure Selection Tool, the Federal Highway Administration (FHWA) Separated Bike Lane Planning and Design Guide 2015, and the extensive literature review conducted by team members as part of forthcoming National Cooperative Highway Research Program (NCHRP) 15-63 Guidance to Improve Pedestrian and Bicycle Safety at Intersections.
2. Documented the available CMFs or CRFs for the countermeasures listed in Task 1. The team researched the FHWA CMF Clearinghouse, the Highway Safety Manual (HSM), and FHWA Desktop Reference for CRFs, as well as the extensive literature review conducted by team members as part of NCHRP 15-63 Guidance

to Improve Pedestrian and Bicycle Safety at Intersections.

In addition, the research team reviewed the ongoing projects to obtain previews of any soon-to-be published materials from NCHRP 17-84 Pedestrian and Bicycle Safety Performance Functions for the HSM, FHWA Development of Crash Modification Factors Program Task B5, and NCHRP 07-25 Guide for Pedestrian and Bicycle Safety at Alternative Intersections and Interchanges.

3. Assessed the applicability of the CMFs or CRFs found in Task 2 to bicycle-specific safety concerns, conditions and use in California. Rated the applicability of the CMFs or CRFs.
4. Reviewed and rates the quality of the CRFs listed in Task 2. The team rated the quality of the CRFs in accordance with the star rating system, used by the FHWA CMF Clearinghouse, in which five stars represents the highest quality level and a single star the lowest. CMFs/CRFs with fewer than three stars in the CMF Clearinghouse rating system were excluded from consideration for further use.
5. Developed a framework to recommend:
 - a. data requirements for approved countermeasure installations for site-specific evaluation and CMF calibration/estimation, and
 - b. analytical approaches that can be utilized to quantify the before-after change subject to different types of data availability.

WHAT WAS THE OUTCOME?

The researchers identified a comprehensive list of countermeasures and existing CMFs and reviewed their quality and applicability to California. They determined key bicycle injury and fatality crash patterns in the state, prioritized potential bicycle safety countermeasures for study, and identified potential study sites. Developing quality

California-specific CMFs for bicycle-related safety countermeasures will support practitioners in making more informed decisions about infrastructure improvement projects.

Currently, there is limited availability of relevant and high quality CMFs. Analysis of severe and fatal bicycle crashes pointed to the need for study of segment bicycle safety treatments, like Class IV bicycle lanes, because of the prevalence of segment parallel path and overtaking crashes, especially among fatal crashes. The researchers compiled a data set of existing and planned Class IV bicycle lanes, which are increasingly common throughout California, and identified existing bicycle count data collected on those facilities.

They recommend that Class IV, traditional Class II, and buffered bicycle lanes be studied further to develop state-specific CMFs, and that intersection treatments on these facilities be included in any studies. However, the availability of quality data before and after installation of the treatments may determine the robustness of any CMF studies.

WHAT IS THE BENEFIT?

Caltrans is adopting new policies intended to encourage bicycling and emphasize safety, livability, and sustainability for all. This aligned with Caltrans' current mission to "Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability". The results of this research will help shape policy by proving the specific countermeasures that show the biggest crash reductions.

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<https://dot.ca.gov/programs/research-innovation-system-information/research-final-reports>

IMAGES

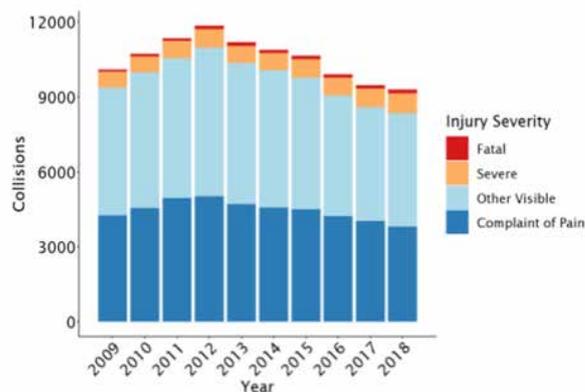


Figure 1: Severity of Motor Vehicle-Bicycle Crashes by Year (2009-2018)

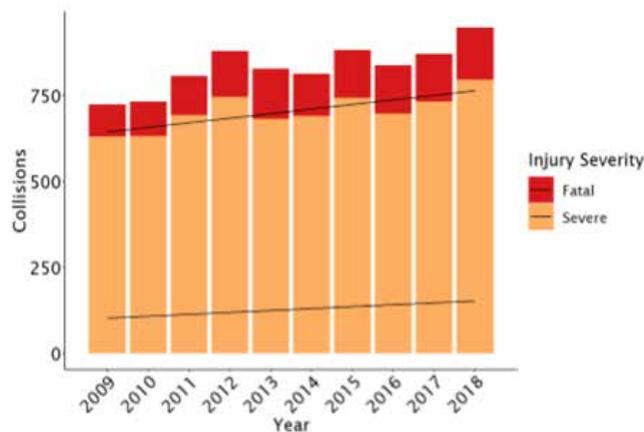


Figure 2: Fatal and Severe Motor Vehicle-Bicycle Crashes by Year (2009-2018)

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