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Research Results

Phase 4: Strategies for Reducing Pedestrian and Bicyclist Injury at the Corridor Level (SMART 4)

Identifying sites for safety investigations under these programs will enable Caltrans to utilize investigative resources more efficiently.

Modal

DECEMBER 2024

Project Title: Strategies for Reducing Pedestrian and Bicyclist Injuries at the Corridor Level

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WHAT WAS THE NEED?

Pedestrian and bicyclist fatalities in California increased by 49 percent and 56 percent, respectively, between 2010 and 2018. As stated in the California Department of Transportation's (Caltrans) 5 priorities, Caltrans aims to increase the mode share of pedestrians and bicyclists, while also moving towards zero deaths. To do so, Caltrans must work to improve safety for nonmotorized users.

This study builds on bicycle exposure modeling and pedestrian and bicycle safety monitoring program work from SMART3. It helps Caltrans understand the risk to bicyclists on the state highway system (SHS) and continue implementing the monitoring programs to prioritize the selection of sites for safety investigations. In addition, the rate groups models enable safety investigators to select appropriate countermeasures.

WHAT DID WE DO?

This project focused on working closely with Caltrans to complete the following research objectives:

1. Produce bicycle exposure estimates on the SHS based on the pilot model initiated under the SMART3 project.
2. Continue enhancements of the pedestrian and bicycle safety monitoring report tools by incorporating updated data, combining the spot and corridor methodologies into one tool, and responding to functional needs that arise. Also, equity and exposure considerations should be incorporated into safety monitoring tools for prioritization of spot and corridor locations.
3. Update all rate group estimates on the SHS based on

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the most recent five years of crash and traffic volume data.

WHAT WAS THE OUTCOME?

A detailed report was generated of bicycle safety in California advancing and reinforcing initiatives to improve the Bicycle Safety Monitoring Program. Each chapter outlines specific actions that form part of a broader strategy to improve bicycle safety across California. Below is a summary, key insights, and recommendations for each chapter.

5.1 Chapter 2 -Develop Bicycle Exposure Estimates on the SHS

Short-term counts were expanded to annual counts based on expansion patterns generated from counts obtained from continuous counters. Different econometric models—linear, negative binomial, and Poisson regression—were used to estimate Annual Average Daily Bicycle Traffic (AADBT) by regressing Strava count, sociodemographic, land use, and geospatial characteristics with observed and imputed values of AADBT. The Poisson model was selected as the final model due to its better fit and ease of implementation as a spreadsheet model. Counts at all segments of the SHS were predicted using this model. Counts at intersections were calculated from the constituent segments predicted counts.

5.2 Chapter 3 -Incorporate Exposure Estimates and Equity Considerations into Safety Monitoring Tools

An Excel macro-based tool (Tool B) was developed to prioritize High Collision Concentration Locations (HCCLs) and corridors using a composite index that integrates multiple equity and exposure metrics for a comprehensive assessment. The metrics were aggregated using a set of proposed weights derived from a literature review, statistical distributions, and correlations between metrics. However, determining the optimal weights remains a challenge due to the need to balance various factors, including the relative importance of each metric, which can be inherently subjective. To address this, the tool allows users to modify the weights based on their specific needs and circumstances. However, it is recommend using the default weights for consistency and alignment with established methods.

5.3 Chapter 4 -Support the Pedestrian and Bicycle Safety Monitoring Tools

Determining the best severity levels and analysis parameters to align the Bicyclist Safety Monitoring Program with the Safe System Approach remains a challenge. The relatively low number of fatal and serious injury crashes makes it difficult to pinpoint high-crash locations. One possible solution is broadening the severity range while still emphasizing more severe crashes, but this would require further research to validate the appropriate weightings.

WHAT IS THE BENEFIT?

Reduce statewide pedestrian and bicyclist fatalities and injuries through targeted and data-driven safety interventions. The study provides a comprehensive overview of bicycle safety in California and supports ongoing efforts to enhance and expand the state's Bicycle Safety Monitoring Program.

IMAGES

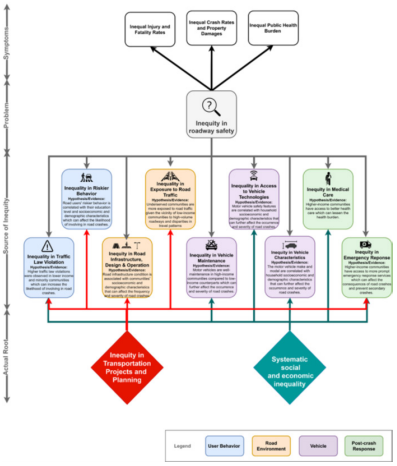


Image 1: Diagram of Sources of Inequity in Roadway Safety.

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