

Introduction and Literature Review: Equity Analysis of Bike Crashes in LA

Introduction

Los Angeles County, a vast metropolitan area, presents significant challenges in bicycle safety. In 2022, California recorded 177 bicyclist fatalities involving motor vehicles, with Los Angeles County accounting for 38 of these deaths, leading the state in such incidents. To address this pressing issue, the city adopted Mobility Plan 2035, aiming to create "complete streets" that accommodate pedestrians, bicyclists, transit riders, and motorists. The plan emphasizes developing a comprehensive bicycle network to improve safety and accessibility. However, despite these efforts, challenges persist. A 2023 BikeLA report highlighted that 77% of bicycle fatalities in Los Angeles County occurred on multi-lane roads, often with three or more lanes per direction. Additionally, 85% of these fatalities happened on roads lacking bike lanes, underscoring the urgent need for improved infrastructure and more equitable transportation planning.

Motivation

Bicycle transportation plays a vital role in urban mobility, offering an affordable and sustainable alternative to motor vehicles. However, safety concerns persist, particularly in large metropolitan areas like Los Angeles. Research has shown that disparities in bicycle crash occurrences are often linked to socioeconomic and demographic factors, raising concerns about transportation equity and accessibility. Vulnerable populations—such as low-income residents, older adults, and individuals living in high-density areas—are disproportionately affected by bicycle crashes. Contributing factors include inadequate infrastructure, high-speed traffic corridors, and limited access to safety resources. Additionally, neighborhood-level variations in urban design, traffic enforcement, and transportation policies further exacerbate these inequities, making some communities significantly more prone to bicycle-related accidents than others. Understanding how income, age, and population density impact bicycle crash patterns is crucial for developing effective safety measures and promoting equitable transportation solutions.

Literature Review

Prior research has extensively examined how socioeconomic and demographic factors influence bicycle crash patterns, with a particular focus on income, race, age, and population density. Studies indicate that low-income communities tend to lack dedicated cycling infrastructure, leading to higher crash risks. For example, BikeLA (2023) [1] found that roadways in low-income neighborhoods are less likely to feature protected bike lanes, increasing exposure to

hazardous conditions. Furthermore, residents in these areas rely more on bicycles for transportation, heightening their risk of involvement in accidents. Addressing infrastructure disparities through equitable investment has been proposed as a key strategy to reduce such risks. Similarly, Minikel (2012) [2] examined cyclist safety on bicycle boulevards and parallel arterial routes in Berkeley, California, and found that arterial roads, which are more common in low-income communities, posed a significantly higher risk for cyclists compared to designated bicycle boulevards.

Beyond economic disparities, race and ethnicity also play a role in cycling safety. Research has shown that minority communities often face disproportionate safety risks due to infrastructural underinvestment and higher traffic volumes in their neighborhoods. Winters et al. (2012) [3] explored how perceived cycling risks compare to actual observed risks and found that minority groups and lower-income individuals tend to cycle in riskier environments despite having similar perceptions of safety. This suggests that targeted interventions should consider both subjective safety concerns and objective crash data when designing equitable transportation policies.

Age is another critical determinant of cycling safety. Studies suggest that younger cyclists may engage in riskier behaviors due to inexperience, while older individuals face challenges related to declining reaction times and physical limitations. LADOT (2019) [4] highlights that injury severity differs by age, with older cyclists being more prone to life-threatening injuries in crashes. Research also suggests that age-specific interventions, such as targeted education campaigns and infrastructure improvements, could mitigate these risks. Additionally, Schepers et al. (2014) [5] introduced a conceptual framework for road safety and mobility, emphasizing that cycling safety should be considered within the broader context of multimodal urban transport. Their study indicates that integrating bicycle safety measures into urban mobility planning is crucial to reducing crash risks among all age groups.

Population density further shapes bicycle crash trends. Riley (2020) [6] found that high-density urban areas experience a greater number of crashes due to heavier traffic and increased interactions between cyclists and motor vehicles. However, these areas also tend to have more established cycling infrastructure, which can mitigate some risks. Conversely, low-density areas often lack dedicated bike lanes, forcing cyclists to share roads with motor vehicles, though they may experience lower overall crash volumes. Better Bike Share Partnership (2023) [7] suggests that urban planning strategies tailored to density variations—such as expanding bike lane networks in high-density areas and implementing traffic calming measures in low-density zones—can improve cyclist safety across different community types. DiGioia et al. (2017) [8] conducted a critical review of bicycle infrastructure's safety

impacts, concluding that while protected bike lanes and reduced vehicle speeds can significantly enhance safety, there remains a lack of rigorous research evaluating other treatments like shared lane markings.

The interplay between income, race, age, and population density in shaping bicycle crash risks remains a crucial research focus. Existing studies provide valuable insights into these relationships, but further analysis is needed to inform targeted policy interventions that promote safer and more equitable cycling conditions in Los Angeles.

Data Description

To analyze the equity implications of bicycle crashes in Los Angeles County, this study will utilize the following data sources:

- **Race:** Demographic data detailing the racial composition of each census tract will be obtained from the U.S. Census Bureau. This information will help assess whether certain racial groups are disproportionately affected by bicycle crashes.
- **Income:** Median household income data for each census tract will be collected to analyze the relationship between income levels and bicycle crash occurrences.
- **Age:** Age distribution data within each census tract will be used to examine the susceptibility of different age groups to bicycle crashes.

Additionally, bicycle crash data, including location, severity, and contributing factors, will be sourced from the Transportation Injury Mapping System (TIMS). By integrating these datasets, the study aims to identify patterns and correlations that can inform equitable transportation planning and policy development in Los Angeles County.

This structured approach will provide a comprehensive understanding of the factors influencing bicycle crash disparities, guiding efforts to enhance safety and equity in urban transportation.

References

[1] *BikeLA, Bicycle safety report 2023: Analyzing crash patterns in Los Angeles County, BikeLA, 2023.*

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