

Social and Infrastructure Factors Shaping Road Safety: A Multi-Level Analysis of Crashes in Ohio, Texas, and Washington

INTRODUCTION

Over the past decade, disparities in traffic safety have persisted, with marginalized communities experiencing higher rates of fatalities and injuries. The goal of this study is to take a multi-level analysis approach to understand and address unique contexts and challenges of different communities. The analysis was conducted at three levels: individual, neighborhood, and roadway segments, focusing on disparities in Ohio, Washington, and Texas based on crash severity outcomes, likelihood of crash rates, and infrastructure characteristics. To address these disparities, this study proposes evidence-based recommendations to address these disparities using a Safe System approach.

METHODOLOGY

The research team analyzed crash data, census data, and roadway data across three states—Ohio, Washington, and Texas—by considering different scopes to examine patterns and trends. The study used a variety of methods including intersectional analysis, binary logit, Bayesian models, structural equation models to quantify disparities.

- At the **individual level**, disparities were examined in injury severities among crashes involving pedestrians, bicyclists, and motor vehicle occupants.
- The **neighborhood-level** analysis covered pre-COVID (2018–2019) and post-COVID (2021–2022) periods to reveal persistent and emerging crash rates for underserved populations due to sociodemographic and infrastructure factors.
- The **roadway segment-level** analysis developed an interactive tool to visualize safety scores across road segments in [Cleveland](#), [Austin](#), and [Seattle](#).

KEY FINDINGS

The results of this study highlight increasing fatalities and disproportionate safety impacts on minority populations across the three states:

1. Minority populations experienced the highest fatalities and incapacitating injury rates often exceeding statewide averages.
2. Fatalities and injuries among pedestrians, bicyclists, and motor vehicle occupants, including drivers, showed traffic safety disparities by race and ethnicity.



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ABOUT THE AAA FOUNDATION FOR TRAFFIC SAFETY

Founded in 1947, the AAA Foundation for Traffic Safety in Washington, D.C., is a nonprofit, publicly supported charitable research and educational organization dedicated to saving lives by preventing traffic crashes and reducing injuries when crashes occur. Funding for this research was provided by voluntary contributions from AAA/CAA and their affiliated motor clubs, individual members, AAA-affiliated insurance companies, and other organizations or sources.

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3. Intersectional analysis from the individual level analysis revealed overrepresentation of certain demographic groups in traffic fatalities and injuries.
4. The neighborhood analysis found disparities in crash rates driven by sociodemographic and infrastructure factors.
5. The roadway segment analysis in socioeconomic disadvantaged areas lack the readiness to prevent fatal and incapacitating crashes as shown by the Safe System scores.
 - **Cleveland, Ohio:** High poverty and unemployment contributed to poor SSA alignment.
 - **Austin, Texas:** Early adoption of equity-focused Vision Zero policies resulted in comparatively better safety alignment in disadvantaged areas.
 - **Seattle, Washington:** Demographic factors were strongly associated with lower safety alignment.

Comprehensive data for each state are available in the full report and supplementary insights are presented in the appendices for each level of analysis.

IMPLICATIONS

The findings and recommendations from this study can help guide other regions designing safer transportation systems. Targeted interventions should be able to recognize the multifaceted nature of these disparities focusing on the following:

- Expanding analysis, policies, and practices to include complex, dynamic, and intersecting factors contributing to traffic safety inequities such as human experiences.
- Developing place-based analysis to uncover inequities and inform targeted interventions.
- Applying a Safe System approach with an equity-lens framework to tackle persistent and systemic traffic safety disparities affecting marginalized communities.

The key state-level recommendations are outlined below and were compiled based on the multilevel approach implemented across the three states. Additional and detailed recommendations can be found in the full report.

State-Level Recommendations	Ohio	Texas	Washington
<p>Culturally relevant messaging outreach and education campaigns</p> <p>Develop culturally tailored educational campaigns to address traffic safety behaviors in diverse communities through stakeholders’ collaboration, partnering with schools and local organizations to amplify safety messaging and encourage community participation.</p>	✓	✓	✓
<p>Urban pedestrian infrastructure</p> <p>Implement traffic calming measures, narrower lanes, pedestrian-exclusive signal phases at intersections in urban areas, enhance visibility with improved street lighting, and increase marked crosswalks and signalized pedestrian crossings in underserved areas.</p>	✓		✓
<p>Develop bike-friendly infrastructure</p> <p>Install protected bike lanes to separate cyclists from vehicles in low-income communities.</p> <p>Create subsidy programs for free or low-cost bicycle safety equipment (e.g., helmets, lights) and offer safety training for individuals with disabilities and low-income populations.</p>		✓	✓
<p>Rural roadway safety programs and emergency response</p> <p>Install rumble strips, widen shoulders, and improve roadway lighting in rural areas. Expand access to trauma care and emergency services in rural areas.</p>	✓	✓	✓
<p>Encourage employers in the industrial and service sectors to collaborate with transportation agencies</p> <p>Improve signage, speed management, and lighting to enhance safety and visibility, and design safe ingress and egress points to minimize conflicts and reduce crash risks.</p>		✓	✓