

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 24-564 (project 647) | September 2024

A System Level Analysis of Left-Turning Vehicle- Pedestrian Crashes



the **ISSUE**

Pedestrian fatalities account for approximately 17% of road fatalities, and a frightening number of those occur at intersections where pedestrians have the right-of-way. Drivers making left turns with permissive left-turn traffic signals strike many of these pedestrians. At such intersections with permissive left-turn signalization, traffic engineers give pedestrians a walk signal while simultaneously telling left-turning drivers to try and turn into that same crosswalk. In theory, left-turning drivers should scan the adjacent crosswalk, look for a gap in the oncoming traffic, check the crosswalk again, and then make their turn. In fact, research suggests that between 4% and 7% of left-turning drivers fail to fixate on the pedestrian in the conflicting crosswalk. Left-turning drivers also strike and kill three to four times more pedestrians than right-turning drivers.

Early research indicated that protected left-turn signalization offered safety advantages, especially for pedestrians. Later research prioritized reducing vehicle delay, often overlooking pedestrian safety concerns. This research investigates the resulting systematic conflict between left-turning drivers and pedestrians at intersections, a problem often attributed to human error but rooted in design protocols.

the **RESEARCH**

The study is divided into three parts. In part one, initial efforts to collect signalization data across various contexts revealed significant gaps, shifting the focus toward two key questions: How often is protected-only left-turn phasing used and where is it implemented with respect to street and neighborhood characteristics? This involved analyzing available signalization data to identify trends in protected left-turn implementation.



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Project Title

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the **RESEARCH** continued

In part two, the research builds on this signalization data to explore three critical questions: Are neighborhoods with higher levels of protection safer for cyclists and pedestrians? Does the urban-to-suburban context impact safety outcomes of left-turn signalization? And, is safety in high-crash neighborhoods influenced by left-turn signalization practices? These questions are addressed using crash data and neighborhood-level analysis to assess safety outcomes.

Finally, in part three, the study narrows its focus to a smaller set of intersections in Colorado. By closely examining intersections with severe pedestrian crashes, we aim to identify the most effective signalization strategies for improving pedestrian safety in high-risk areas.

the **FINDINGS**

This research found that protected-only left-turn signalization is rarely used, with only 20% of intersections employing it. When used, it is mainly in high-speed, high-capacity areas, leaving vulnerable road users—like pedestrians and cyclists—exposed in urban settings. Part two revealed higher crash rates for bikes and pedestrians in areas with more protected-only signals, especially in suburban neighborhoods with higher speeds. However, in urban areas, above-average protection levels correlated with slightly safer outcomes for pedestrians and cyclists. Lastly, part three identified factors contributing to pedestrian injury severity at intersections.

the **IMPACT**

Our research reveals not only the safety risks posed by inconsistent use of protected-only left-turn signalization but also a critical gap: we lack comprehensive data on signalization at current intersections. This limitation made it difficult to fully study the safety impacts of left-turn signal practices. We hope our findings encourage municipalities and agencies to improve how intersection signalization data are collected and maintained. Better data will allow for more accurate safety research, helping engineers make informed decisions about signalization that prioritizes pedestrian and cyclist safety, ultimately creating safer streets for everyone.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1264>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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