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Identifying Factors to Improve Bicycle Lane Safety in Pittsburgh, PA

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Final Report – July 31, 2025

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16. Abstract

User-submitted data and crash data were analyzed to help identify factors that may improve bicycle safety in Pittsburgh, PA. Based on the results, it is recommended that 1) Protected bike lanes would benefit from improved deterrents and increased enforcement of traffic violations, 2) Incident reports should include whether a crash occurred in a bike lane, as well as the type of bike lane similar in the way that the NHTSA FARS data includes whether a crash occurred at an intersection, relationship to the trafficway, etc., and 3) Bike lanes should be treated as part of the roadway ecosystem and be regularly maintained and serviced.

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Background

Most serious crashes involving bicyclists occur at non-intersecting road locations. Over the past decade, there has been a steady increase in the number of bicyclist fatalities. According to the U.S. Department of Transportation National Highway Traffic Safety Administration (NHTSA) crash report[3] and Fatality Analysis Reporting System (FARS)[4], there was a record low 623 bicyclist fatalities in 2010 and it climbed to 1,166 fatalities in 2023, which is the highest it has been since 1975. This is a surprising trend given that many states, cities, and municipalities have been installing bicycle lanes to accommodate the increasing number of bicyclists (pedalcyclists). Overall, bicycle lanes have reduced crashes up to 49% on urban 4-lane roads and 30% on 2-lane urban roads[5] and reduced fatalities for all road users[6]. However, these studies aggregated data from 12 different cities and therefore, due to a variety of factors, some individual cities did not see crash reductions of this magnitude. For example, when looking at shared bicycle lanes, there was an 18% risk reduction in New York City[7] but no benefit Chicago[8]. Over the past 20 years, bicycle lanes in Pittsburgh have increased from 10 miles to over 100 miles. The purpose of this study was to investigate factors for potentially improving bicycle lane safety in Pittsburgh, PA by analyzing crowdsourced, user-submitted data and crash data. Notable findings may be shared with the City of Pittsburgh to aid in planning the expansion of Pittsburgh's bicycle network. For example, vehicles frequently stopped in bicycle lanes in a commercial district may indicate that delivery drivers are using the bike lane as temporary parking, which can be resolved by making the bike lane protected.

Data

This study analyzed data from two primary sources. Crowdsourced hazard data were acquired from dashcam.bike[9] and incident reports for Pittsburgh (Crash Data Dashboard[10], Crash Data[11], Pittsburgh Bicycle Facilities Map[12]) and the United States (NHTSA[13]). For background, dashcam.bike has developed a bicyclist-centric app that turns a smartphone

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[3] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813435
[4] https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
[5] Avelar et al. "Development of Crash Modification Factors for Bicycle Lane Additions While Reducing Lane and Shoulder Widths." FHWA, (2021)
[6] Wesley E. Marshall, Nicholas N. Ferenchak. "Why cities with high bicycling rates are safer for all road users." Journal of Transport & Health, 2019; DOI: 10.1016/j.jth.2019.03.004
[7] Nicholas N. Ferenchak, Wesley E. Marshall, "Advancing healthy cities through safer cycling: An examination of shared lane markings," International Journal of Transportation Science and Technology, Volume 8, Issue 2, Pages 136-145, 2019
[8] "Safe Streets for Cycling: How Street Design Affects Bicycle Safety and Ridership," New York City DOT, October 2021
[9] https://dashcam.bike
[10] https://experience.arcgis.com/experience/854cc687784c461caef34a41f68f2b69
[11] https://data.wprdc.org/dataset/allegheny-county-crash-data
[12]https://pittsburghpa.maps.arcgis.com/apps/instant/interactivelegend/index.html?appid=b56a2a11f5a74f64948c3f214b207e50
[13] https://cdan.dot.gov/query

into a bicycle "dash cam" and allows users to easily flag "hazards" with the tap of the screen. Once the user can safely interact with the app, they can enter hazard information into a report for submission. Report data are made publicly available and also directly submitted to Pittsburgh's 311 system. dashcam.bike provided a GeoJSON[14] file of the reports from which hazard description, report timestamp, and approximate address were extracted. Data for this study came from 8,805 reports submitted between April 29, 2022 to February 15, 2025. The locations of reported hazards are concentrated in downtown Pittsburgh and surrounding areas as shown in Figure 1. An example of the crash information involving bicyclists via the City of Pittsburgh's Crash Data Dashboard is shown in Figure 2 and current and future bicycle facilities are shown in Figure 3.

Figure 1: Locations of the 8,805 reports submitted through the dashcam.bike app. Color scales from darker blue to white based on number of hazards reported in the area. Darker blue indicates a single incident and white indicates multiple overlapping incidents.

[14] Thanks to Armin Samii, founder of dashcam.bike, for discussions and providing the data

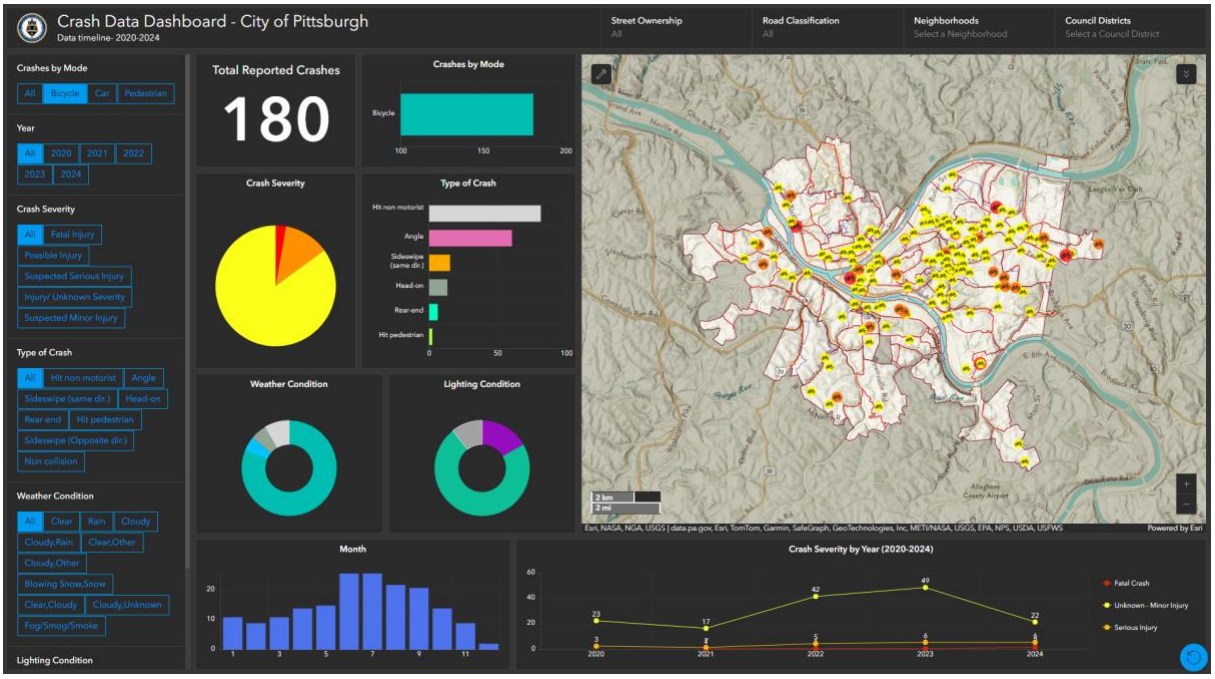

Figure 2: Pittsburgh Crash Data Dashboard showing crashes involving bicyclists from 2000-2004.

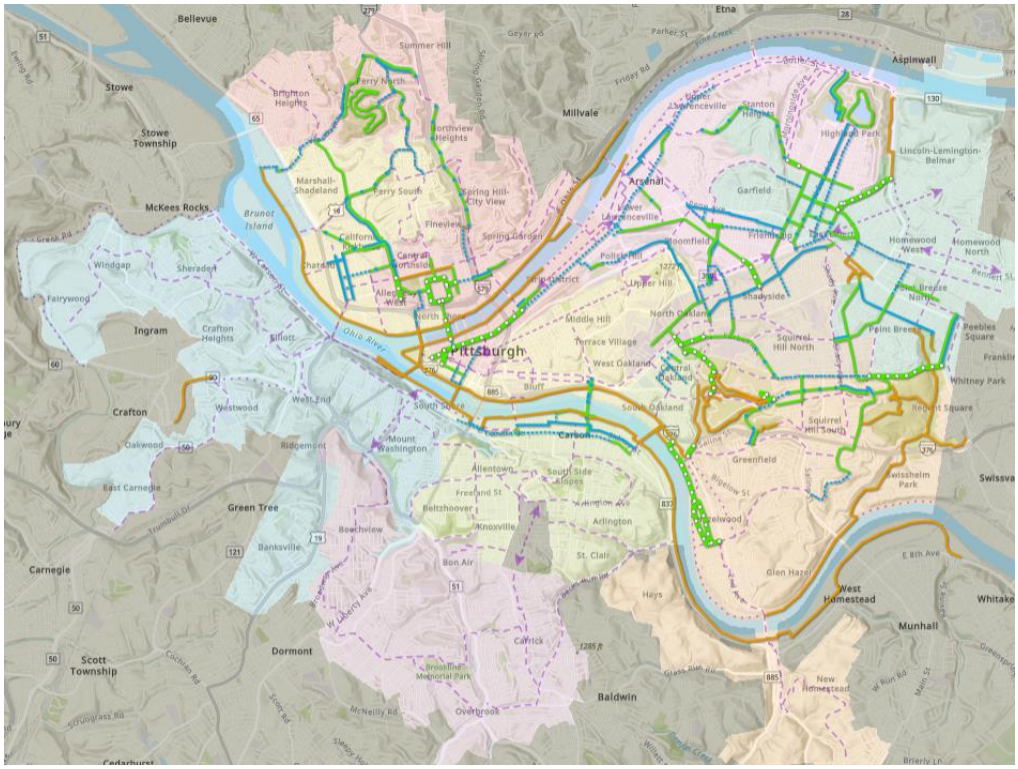

Figure 3: Existing (green) and proposed (purple) bicycle facilities in Pittsburgh, PA as of July 31, 2025.

Methods and Results

The crowdsourced hazard data were analyzed in two ways. First, the hazard descriptions provided by users were analyzed. The dashcam.bike app has fixed descriptions, but also has the capability for users to submit their own custom descriptions. The descriptions also include information other than hazards in bicycle lanes such as requests (e.g., "Signage that warns about the stairway ahead is needed here"), road infrastructure information (e.g., "Traffic Signal not Fully Operational"), feedback ("Enforcement failure. Calls to 911 are ineffective and unproductive for illegal parking."), and traffic infractions, e.g., ("at least two cars running a red light"), etc. To resolve these issues, relevant descriptions were clustered into categories that directly pertain to the safety of bicyclists on the road. Of the 8,805 total reports, 66.5% (5,851) of them contained a description specifically about bike lanes. The top 3 reported issues were: 1) Unattended, parked vehicles in bike lanes was the most reported problem accounting for 85.6% (4,950) of bike lane reports, 2) Snow or icy conditions in bike lanes often indicative of the need for snowplowing (6.1%, 540), and 3) Obstructions by vehicles in gridlock and other objects such as work equipment, dumpsters, etc. (9.1%, 531). Statistics for the remaining categories are shown in Table 1. Reports with hazards directly related to safety indicate "Close call or collision" and other dangerous driving behaviors such as running red lights, swerving, speeding, etc. Close calls accounted for 568 reports (9.7%) and the clustered category for dangerous driving accounted for 315 reports (3.6%). The final category of interest is related to reports indicated damaged (e.g., missing or broken posts/bollards) or worn-out bike lane facilities (e.g., faded paint lines), which account for 5.1% (297) of bike lane hazard reports.

Table 1: Clustered categories hazards in bike lanes from crowdsourced data

Hazard	**# Reports**	**Percentage (%)**	**Hazard**	**# Reports**	**Percentage (%)**
Parked Vehicle	4,950	85.6	Debris	52	0.9
Driving Vehicle	57	1	Animal Waste	11	0.2
Obstructions	531	9.1	Poor Patch	86	1.5
Snow or Ice	540	6.1	Damage	298	5.1
Flooding	13	0.2			

To extract more detailed information from the crowdsourced data, a sample of images (3,500) submitted with the reports were analyzed. Example images that have been cropped

are shown in Figure 4. Given that parked vehicles account for a majority of reports, focus was given on the types of vehicles blocking bike lanes and how much of the bike lanes were blocked. Vehicles were categorized as personal, commercial, work, and emergency and their percentage of reports were 47.4% (1659), 17.6% (616), 4.8% (169), 0.5% (13), respectively. 91% (3197) of the images were blocked either fully or partially. It was difficult to differentiate between personal vehicles and gig drivers unless a clear company graphic was visible. A bike lane was considered fully blocked (73.8%, 2585) if a bicyclist would have to exit the bike lane to avoid the obstacle. Partial blockage (17.5%, 612) indicates that an obstacle has encroached on the bike lane but enough space remains for the bicyclist to navigate the obstacle without leaving the bike lane.

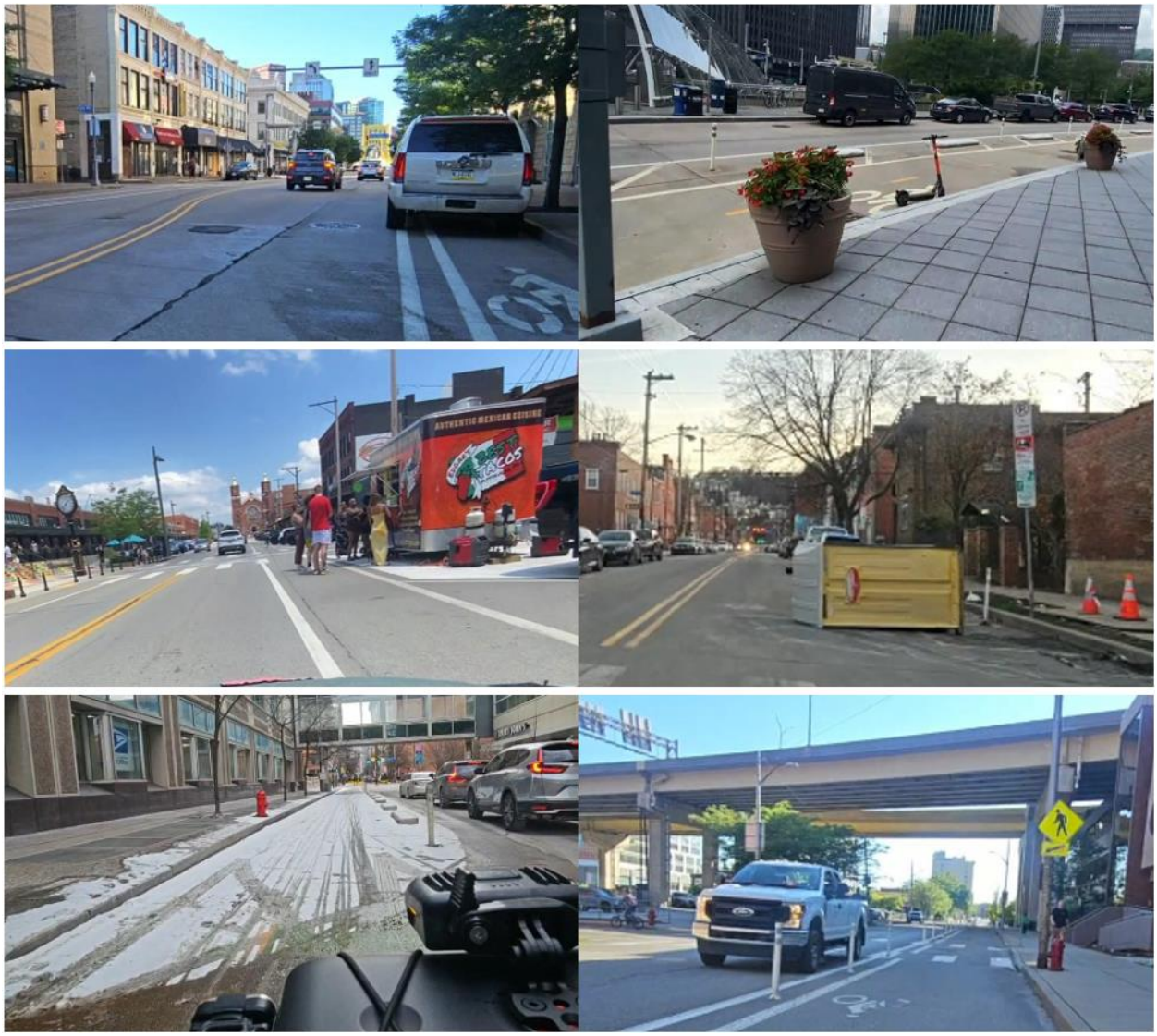

Figure 4: Examples of cropped crowdsourced images submitted with reports. Top left shows vehicle fully blocking the bike lane and top right shows scooter partially blocking the bike

lane. Middle left shows people occluding the bike lane and middle right shows a tipped over portable restroom occluding the bike lane. Bottom left shows accumulation of snow and bottom right shows work vehicle stopped next to bike lane instead of in the bike lane (positive feedback).

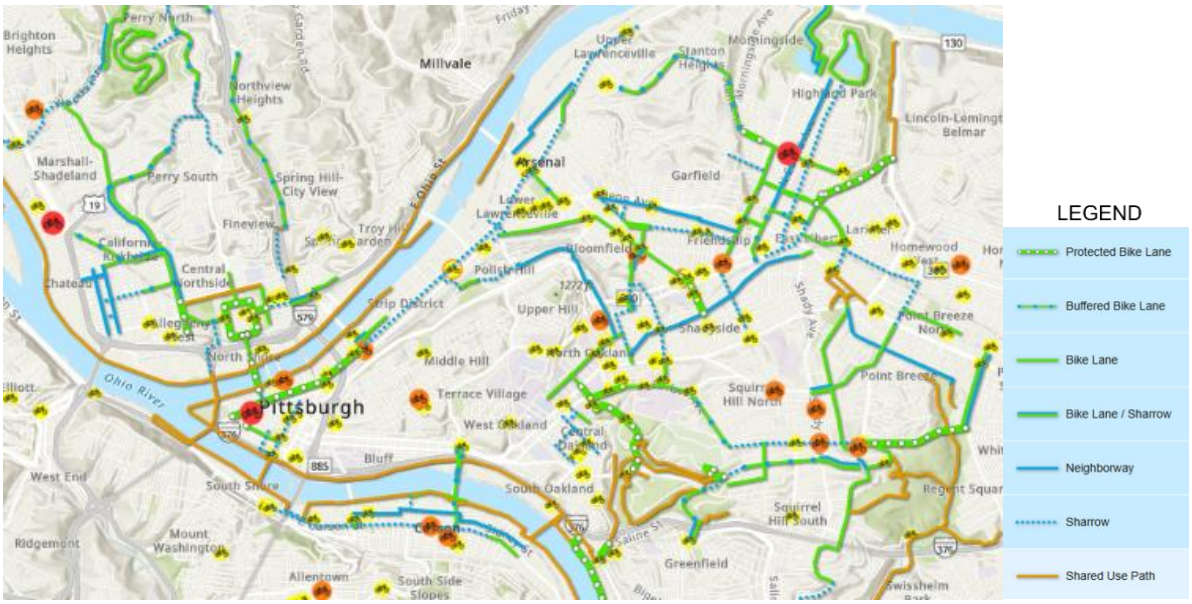

Figure 5: Overlay of reported crashes (2020 to 2024) involving bicyclists with current bicycle facilities in the Pittsburgh, PA area. Bicycle icons: Yellow indicates minor injury, orange indicates serious injury, and red indicates fatal injury.

Table 2: Number of miles added for each facility type

	2020	2021	2022	2023	2024	2020-2024
Neighborway	7	5	5	0	0	17
Sharrow	1	1	7	3	1	13
Protected Bike Lane	0	2	2	2	0	6
Shared Use Path	0	1	0	1	0	2
Buffered Bike Lane	0	3	3	1	1	8
Bike Lane	0	2	1	3	2	8
All Facilities	8	14	18	10	4	54

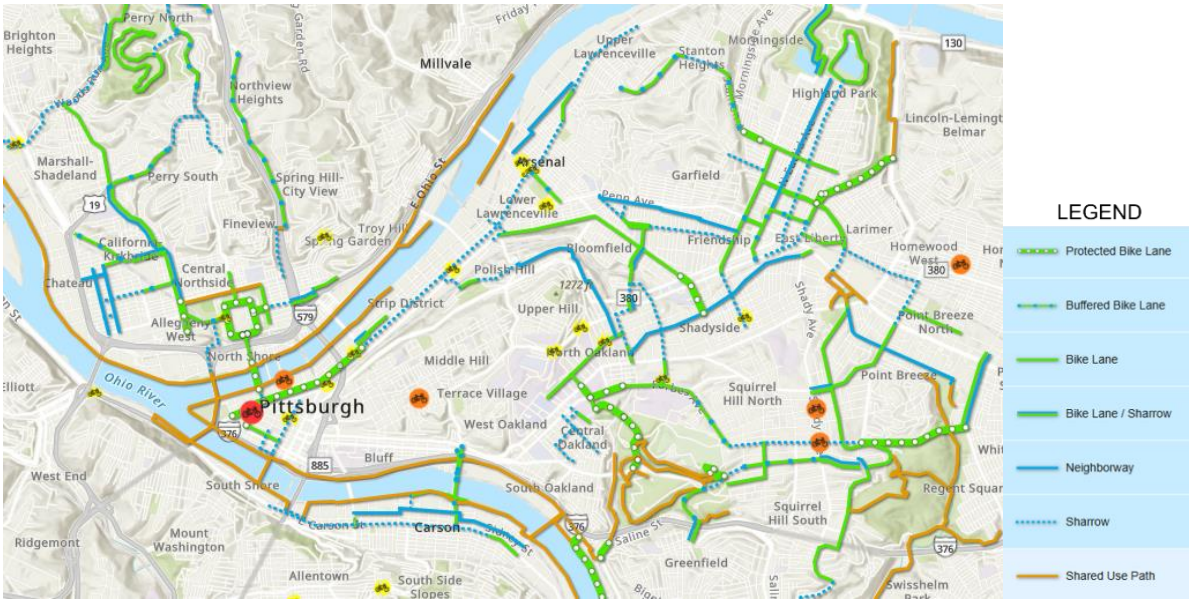

Figure 6: Overlay of reported 2024 crashes involving bicyclists with current bicycle facilities.

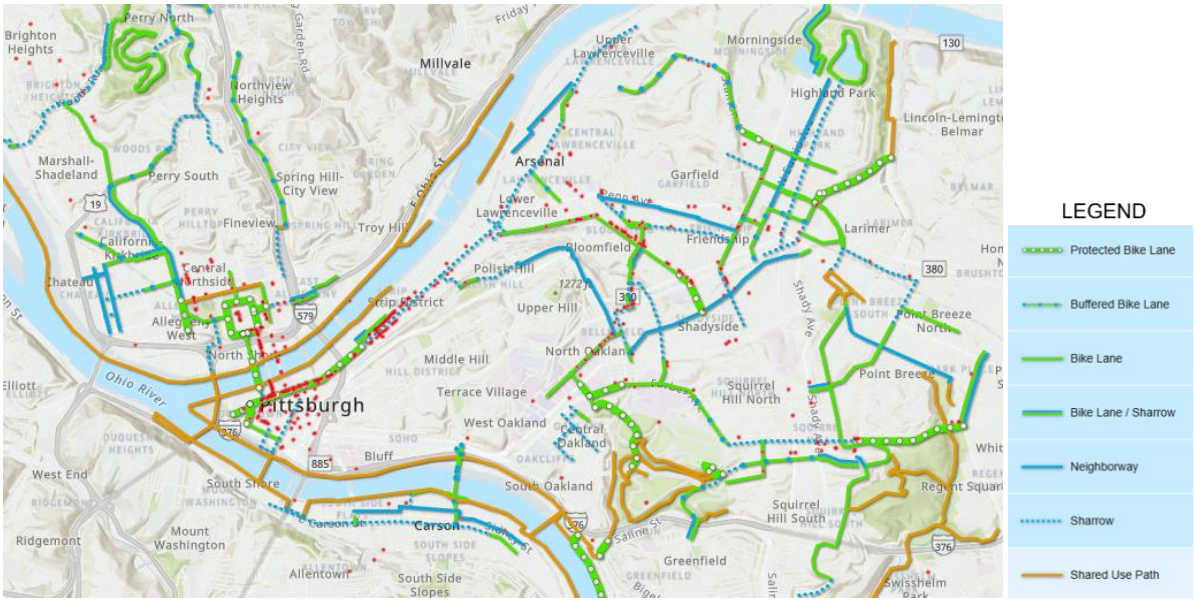

Figure 7: Overlay of crowdsourced reports of “Close call or collision” (red circles) with current bicycle facilities in the Pittsburgh, PA area.

According to the Pittsburgh Crash Data Dashboard, there have been a total of 180 reported crashes involving a bicyclist from 2020 to 2024. Of those 180 crashes, 153 (85%) resulted in minor injury, 22 (12.2%) resulted in severe injury, and 5 (2.8%) resulted in fatality. All of those crashes were combined with the bike facilities data for a qualitative indication of proximity to crashes to bicycle facilities. These data are shown together in Figure 5 illustrating many crashes near bicycle facilities. However, during the 5-year period of crash

data, 54 miles of new bicycle facilities were installed (Table 2). The most recent crash data from 2024 (30 crashes, 22 minor injuries, 6 serious injuries, and 2 fatalities) is shown in Figure 6. There were a surprising number of crashes included those with severe injuries and even a fatality near protected bike lanes. More details on the crashes were acquired from the Allegheny County Crash Data website[15]. For crashes with severe injury, aggressive driving was indicated in 3 of the crashes and distracted driving was indicated in 1 crash. There were no severe or fatal crashes involving driver speeding or intoxication. 8 of the 10 crashes resulting in severe injuries and both fatal crashes occurred at signalized intersections, but the driver did not run a red light. Unfortunately, crash report data does not indicate the location of the bicyclist. Were they in the intersection? Were they in the protected bike lane? Crowdsourced data from dashcam.bike give some insight into driver behavior. Reports were filtered for "Close call or collision" and shown with bicycle facilities as shown in Figure 7.

Recommendations

Recommendations based on the results of this study are as follows:

- Protected bike lanes would benefit from improved deterrents and increased enforcement of traffic violations. All types of vehicles routinely park or stop in bike lanes with non-commercial, non-work vehicles being the most frequent violators. It was even observed that vehicles navigate between bollards/posts of protected lanes to obstruct the bike lane.
- Incident reports should include whether a crash occurred in a bike lane, as well as the type of bike lane similar in the way that the NHTSA FARS data includes whether a crash occurred at an intersection, relationship to the trafficway, etc. This would help identify whether bicycle facilities are adequate for the area.
- Bike lanes should be treated as part of the roadway ecosystem and be regularly maintained and serviced. Damaged protected bike lanes create obstructions and confusion for drivers. Responsive, high-quality repairs will restore the intent of the bicycle facilities. Snow appears to accumulate in the bike lanes more than roads perhaps because of less traffic and therefore may need to be more regularly plowed, shoveled, or treated.

[15] https://data.wprdc.org/dataset/allegheny-county-crash-data/resource/4c016b4c-59f0-45ca-981c-718c784b3462?inner_span=True