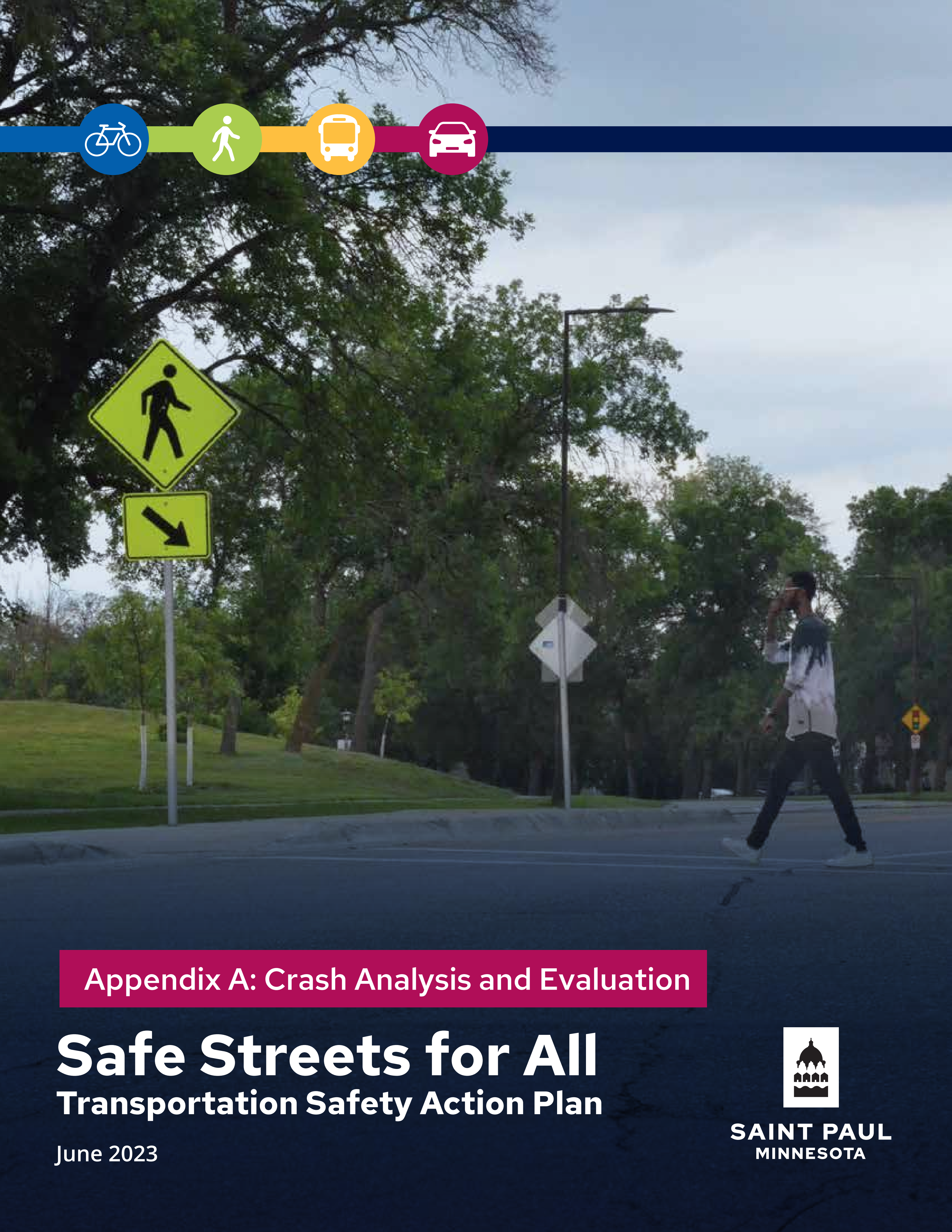

Appendix A: Crash Analysis and Evaluation

Safe Streets for All

Transportation Safety Action Plan

June 2023

SAINT PAUL
MINNESOTA

Crash Analysis and Evaluation

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Introduction

The City of Saint Paul is developing a Transportation Safety Action Plan (TSAP) to identify and eliminate fatal and serious injury crashes for all road users, including people who walk, bike, roll, take transit, and drive in Saint Paul. With community input, this plan will prioritize roadway and infrastructure projects that address safety challenges for residents of Saint Paul and support future funding opportunities for safety projects. This purpose of this Crash Analysis and Evaluation report is to summarize citywide crash trends, which will inform the recommendations throughout the plan by providing a detailed assessment of existing conditions and historical trends of crashes in Saint Paul.

This analysis includes the evaluation of national and statewide crash trends, five-year crash trends in Saint Paul, an equity analysis of crashes in Saint Paul, a proposed High Injury Network for all modes, and a High Crash Network for vulnerable roadway users. The term vulnerable road users (VRU) is typically used to refer to people walking, people bicycling, and anyone else not traveling inside a motor vehicle (such as people using mobility devices and people riding scooters). Vulnerable road users are of special interest when developing safety strategies because they are especially vulnerable to injuries or death when involved in crashes.

Crash Data

The analysis of crash trends in Saint Paul is based on data from the Minnesota Department of Transportation (MnDOT) Minnesota Crash Mapping Analysis Tool (MnCMAT2) database. This crash data comes from statewide police reports that MnDOT aggregates and publishes as a rolling 10-year dataset through the MnCMAT2 database.[1] This database does not include data on near misses, light rail crashes with pedestrians and bicycles, any crashes that were not reported to the police, or any crashes that were not reported by the police to the Minnesota Department of Public Safety. While it provides an incomplete picture of traffic safety in Saint Paul, it is the most comprehensive dataset available for analysis.

This analysis is based on all crashes within the City of Saint Paul from January 1, 2018, through December 31, 2022. During this period, there were 23,145 crashes in Saint Paul, 31 percent of which were on limited access highways. Since limited access highways are not a focus of this plan and these roads are all solely under the jurisdiction of MnDOT, these roadways were filtered out of the dataset for the analysis. These limited access highway crashes include all crashes that occurred on Interstate 35E, Interstate 94, U.S. Highway 52, Trunk Highway 280, and all ramps.[2] The remaining 16,070 crashes that occurred on surface streets within the City of Saint Paul (including county- and state-owned roadways) are the focus of this analysis.

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[1] Minnesota Department of Transportation. "Minnesota Crash Mapping Analysis Tool (MnDMAT2)." Minnesota Department of Transportation. May 15, 2023. https://www.dot.state.mn.us/stateaid/mncmat2.html

[2] Crashes that occurred at the intersections of Saint Paul streets and freeway on- and off-ramps are included in the analysis.

Crash Trends – State and National

Over the past decade, there has been a rise in the fatality rate of crashes in Saint Paul, mirroring a troubling state and national trend. Total traffic fatalities across the nation reached a 16-year high in 2021 (the latest year for which national data is available), with over 42,000 people killed.[3] Fatality rates have also risen in Minnesota, including in urban areas.[4] Figure 1 compares the fatality rates in Saint Paul to fatality rates in urban areas of Minnesota and nationally from 2011-2020.[5] Over that 10-year period, Saint Paul's fatality rate typically was higher than the state average for urban areas, but lower than the national average. Minneapolis' fatality rate was more varied over the period, and Saint Paul had a lower or equal fatality rate than Minneapolis for 8 of the 10-year span shown on the chart.

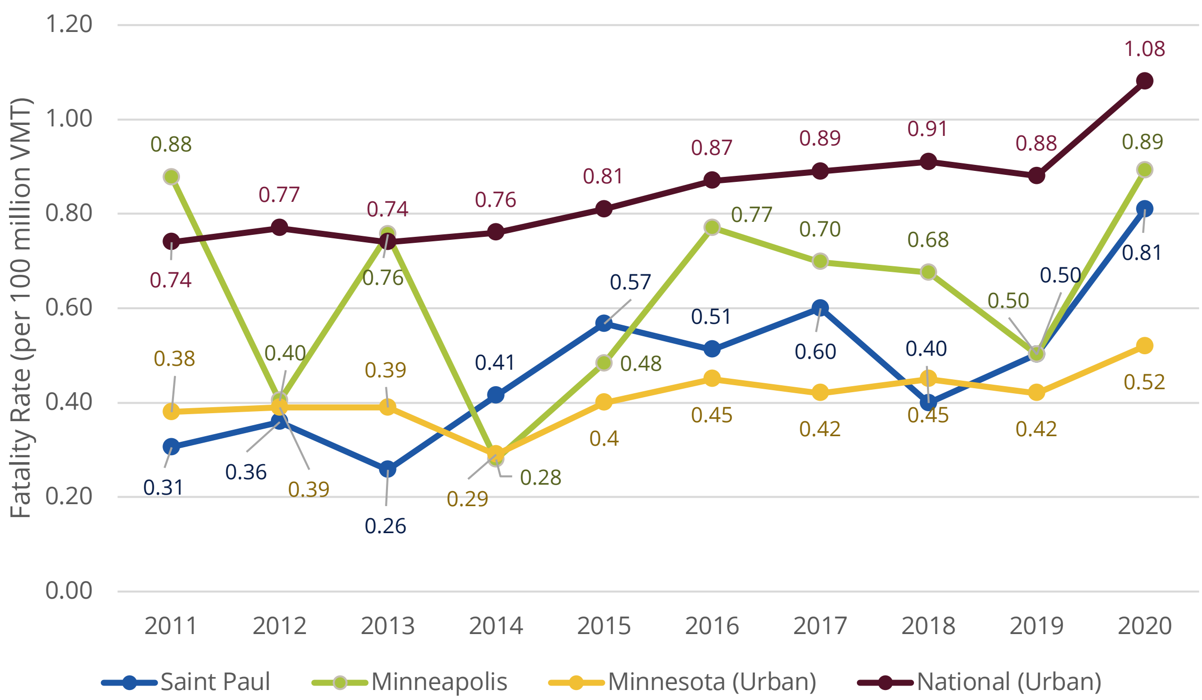

Figure 1: Fatality rates per 100 million Vehicle Miles Traveled, 2011-2020.

Source: FARS and MnDOT. Note: The 2015 rates for Saint Paul and Minneapolis are estimated due to lack of VMT information available.

Nationally, pedestrian fatalities have also increased. Total pedestrian fatalities increased 54 percent from 2010 to 2020, compared to a 13 percent increase for all other traffic deaths. As of 2020 Minnesota has one of the lowest pedestrian fatality rates in the country, higher than only Idaho, Massachusetts and Maine, meaning that Minnesota's streets are safer for pedestrians than the national average.[6] The pedestrian fatality rate (calculated as pedestrian deaths per 100,000

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[3] https://www.nhtsa.gov/press-releases/early-estimate-2021-traffic-fatalities
[4] The U.S. Census Bureau defines urban areas as a densely developed areas that either have at least 2,000 housing units or a have a population of at least 5,000.
[5] 2020 is the latest year for which full data is available for all sources.
[6] https://www-fars.nhtsa.dot.gov/states/statespedestrians.aspx

population) in Saint Paul can vary significantly based on the relatively small number of pedestrian deaths per year (Figure 2).[7] However, as with the total fatality rate, the pedestrian fatality rate in Saint Paul between 2011 and 2020 was typically higher than the statewide average, but lower than the national average. The pedestrian fatality rate in Minneapolis also is also highly variable, and Saint Paul had a lower or equal fatality rate than Minneapolis for 5 of the 10-year span shown on the chart.

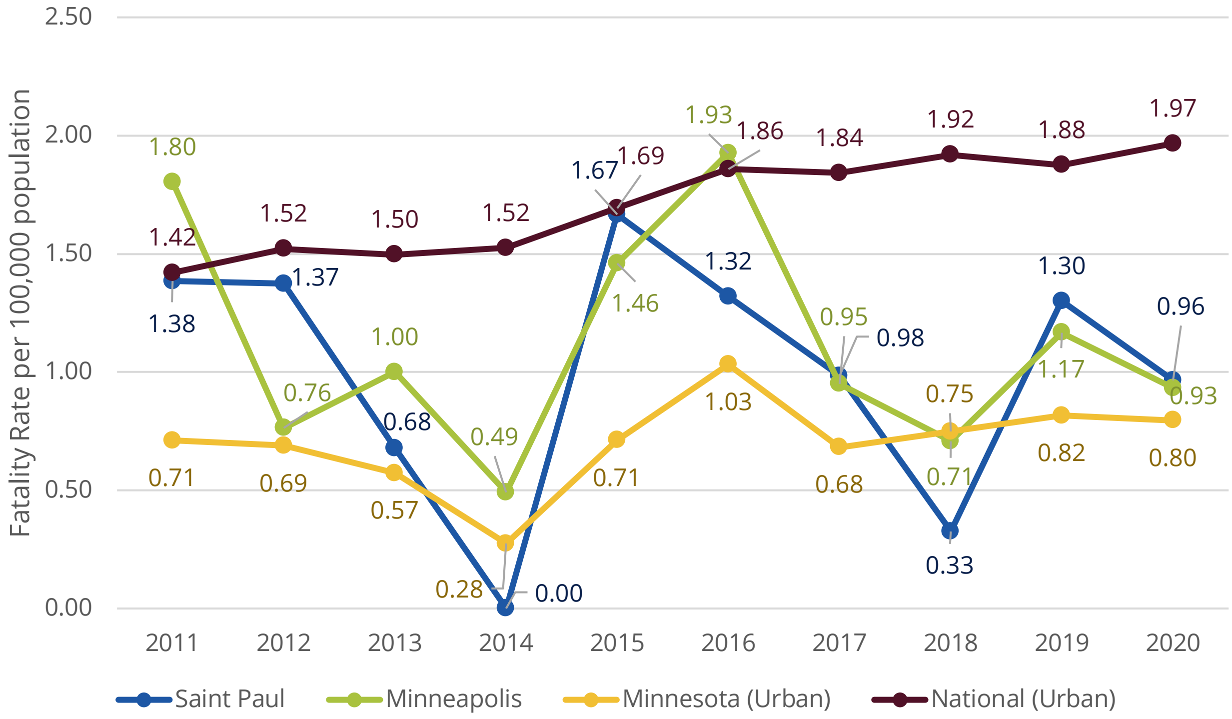

Figure 2: Pedestrian Fatality Rates per 100,000 population, 2011-2020. Source: FARS and Census.

A wide variety of factors influence national and regional crash trends. Some of the factors identified as contributing to a national increase in fatality rates include speeding, dangerous street design, alcohol impairment, and larger vehicle sizes:

- **Speeding:** Nationally, speed-related fatalities increased 17 percent from 2019 to 2020, and another 5 percent from 2020 to 2021.[8] This mirrors anecdotal evidence that decreased congestion and less traffic enforcement during the pandemic led to an increase in reckless driving, as empty roadways turned into speedways.[9]
- **Street Design:** Several street design factors influence fatality rates. Two-thirds of pedestrian fatalities nationally occurred on streets with no sidewalk, and 60 percent took

[7] Reporting pedestrian fatality rates as pedestrian deaths per 100,000 population is a standard used by the National Highway Traffic Safety Administration.
[8] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813298
[9]https://www.mprnews.org/episode/2022/06/30/dangerous-driving-habits-still-linger-after-lockdown-affecting-safety-on-minnesota-roads

place on arterial roadways.[10] Arterials are commonly designed to carry large volumes of traffic at high speeds and tend to have multiple lanes of traffic in each direction, proving especially dangerous to all users. Examples of arterials in Saint Paul include Snelling Avenue, Maryland Avenue, and Cretin Avenue.

- **Alcohol Impairment:** It is common for both drivers and pedestrians involved in fatal crashes to have a blood alcohol concentration (BAC) over the legal limit.[11] In 2020, 31 percent of pedestrians 16 and older who were killed in a crash were impaired, and 16 percent of pedestrian fatalities involved an impaired driver.
- **Larger Vehicle Sizes:** With more vans, sport utility vehicles (SUVs), and trucks on the roads, the average vehicle size and weight has increased across the country in recent years.[12] Larger vehicles not only inflict greater injury on pedestrians and bicyclist due to the mass of the vehicle and location on the body where people are struck by the vehicle, but recent data shows drivers of large vehicles are also more likely to strike pedestrians due to reduced visibility.[13] The City of Saint Paul is not able to influence vehicle sizes on the roads, but this finding does point to the importance of improving pedestrian safety through other measures to offset this trend, and working with state and federal partners on improving the safety of the vehicle fleet.

[10] https://www.ghsa.org/resources/Pedestrians22
[11] Pedestrian Traffic Fatalities by State, 2021 preliminary data: Governor's Highway Safety Assocation
[12] https://www.motor1.com/news/587230/suvs-still-rule-us-market/
[13] https://www.iihs.org/news/detail/suvs-other-large-vehicles-often-hit-pedestrians-while-turning

Crash Trends – Saint Paul

Between 2018 and 2022, there were 16,070 crashes in Saint Paul on the streets and intersections included in the dataset, with an average of 3,214 crashes per year. In 2018 and 2019, there were a higher volume of crashes at around 3,500 crashes per year. With the beginning of the COVID-19 pandemic in 2020, crashes decreased by 20.3 percent. This decrease in crashes mirrored the 19 percent decrease in vehicle miles traveled (VMT) within Saint Paul between 2019 and 2020. Both VMT and crashes increased between 2020 and 2021; VMT increased by 8.7 percent and crashes increased by 10.3 percent. The total number of crashes in Saint Paul was consistent between 2021 and 2022 (Figure 3).

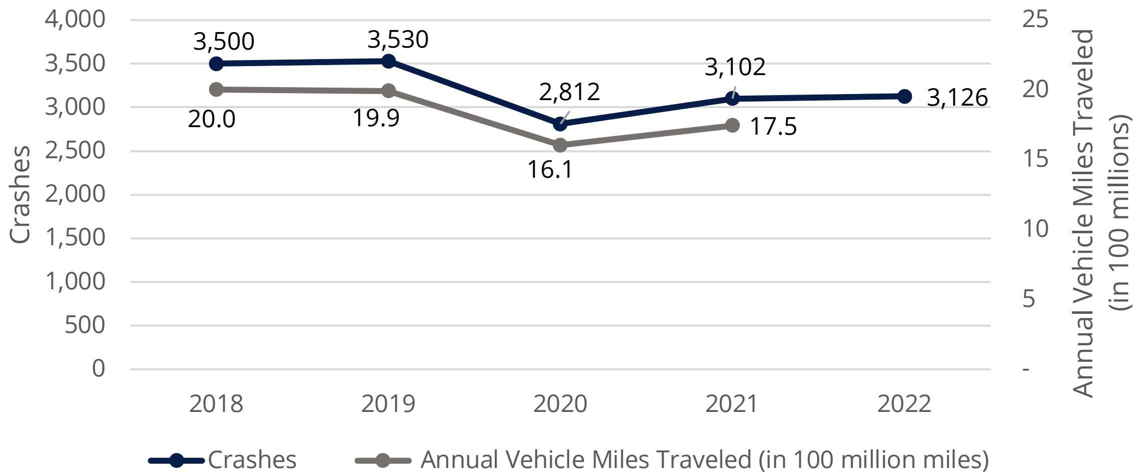

Figure 3: Crashes and Annual Vehicle Miles Traveled in Saint Paul, 2018-2022.
Source: MnCMAT2, MnDOT LRS and Roadway Characteristics Database. VMT data not yet available for 2022.

However, while the total crash rate remained consistent, the rate of fatal and serious injury crashes has increased since 2019, as shown in Figure 4. Crash rates for all crash types decreased with the start of the COVID-19 pandemic, but fatality rates continued to increase for the first two years of the pandemic.

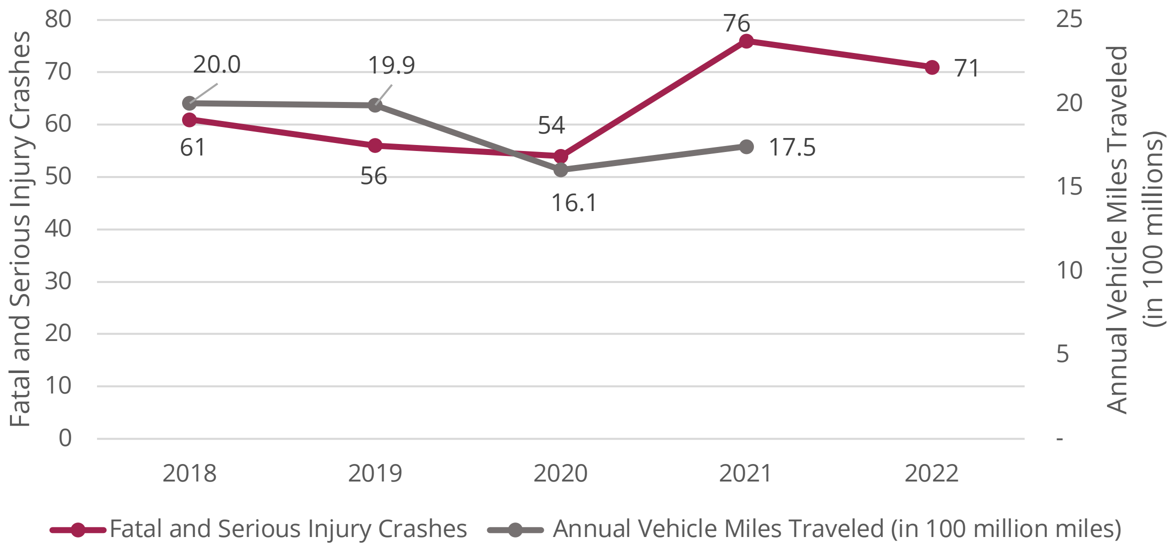

Figure 4: Fatal and Serious Injury Crashes and Annual Vehicle Miles Traveled in Saint Paul, 2018-2022.
Source: MnCMAT2, MnDOT LRS and Roadway Characteristics Database. VMT data not yet available for 2022.

The map in Figure 5 shows areas of the city where there were higher concentrations of crashes between 2018 and 2022. There was a large concentration of crashes in downtown Saint Paul and along the Interstate 94 corridor, particularly at locations where on and off ramps intersect major streets like Snelling Avenue, Lexington Parkway, University Ave, and Dale Street. Many other major arterial streets on the northern and eastern areas of the city also had high concentrations of crashes, including Maryland Avenue, Rice Street, White Bear Avenue, and East 7th Street.

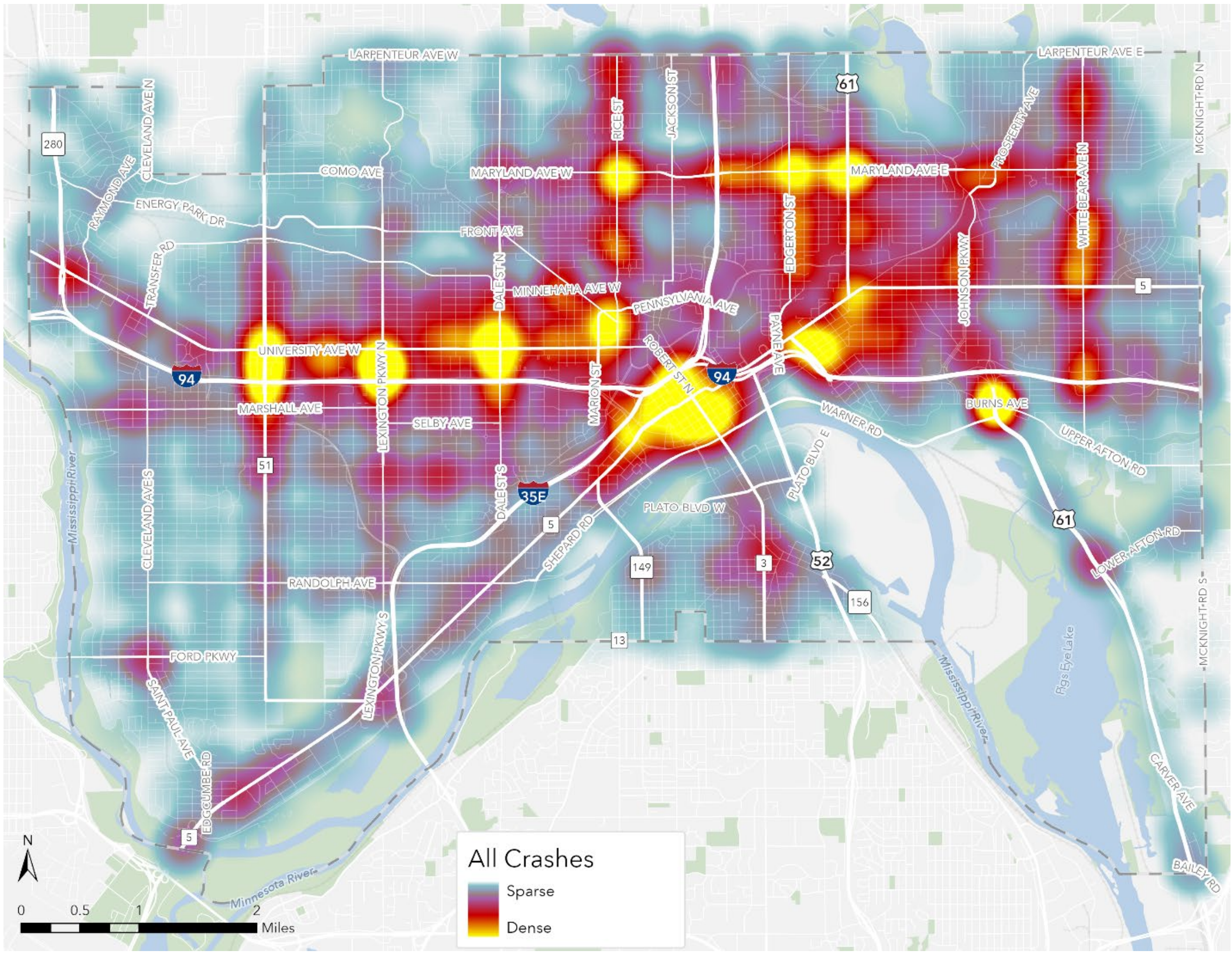

Figure 5: Map of all Crashes in Saint Paul, 2018-2022. Source: MnCMAT2.

Crash Trends by Mode

Evaluating crash trends by mode highlights trends in crashes for vehicles compared to vulnerable road users (defined as all road users not inside vehicles, mainly people walking, rolling, or biking). Between 2018 and 2022, an average of 4.3 percent of crashes involved pedestrians, 1.8 percent involved bicyclists, and the remaining 93.9 percent involved vehicles only.

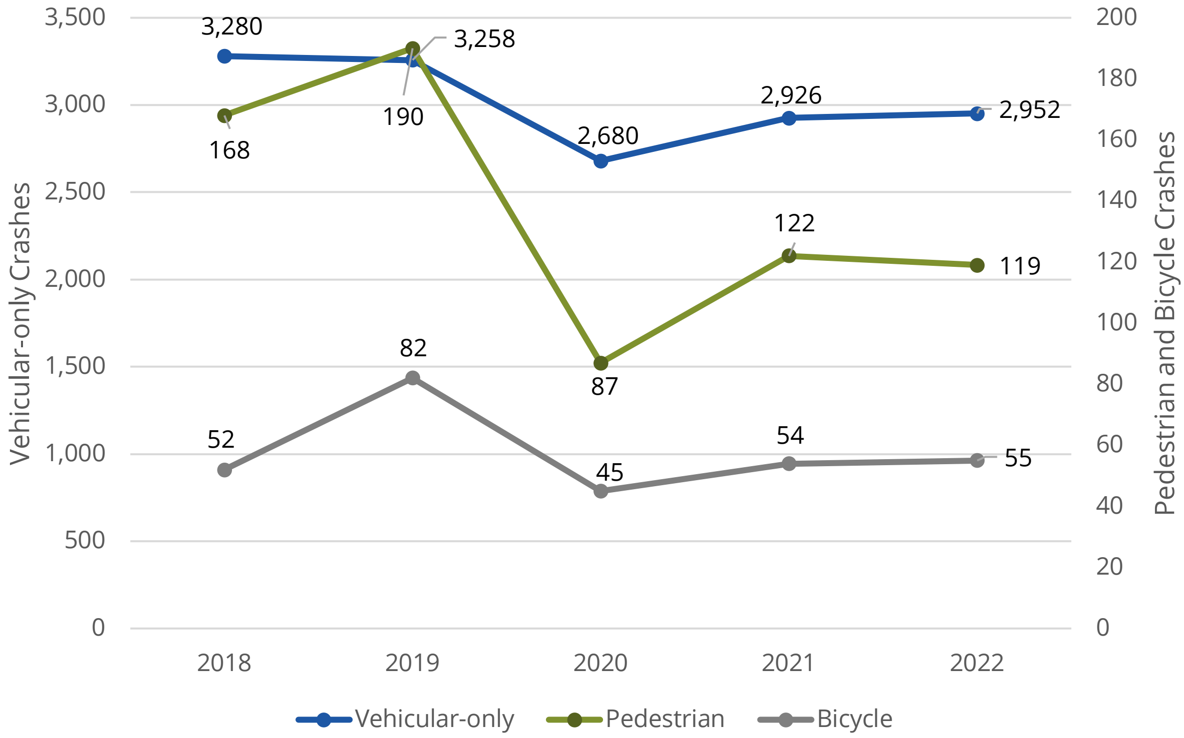

Figure 6: Crash Trends by Mode, 2018-2022. Source: MnCMAT2.

Crashes for all modes decreased substantially in 2020 with the start of the COVID-19 pandemic (Figure 6). However, it is worth noting that 2019 represented a high in both pedestrian and bicycle crashes in the ten-year period for which MnCMAT2 data are reported. In 2021, crashes for all modes increased, largely driven by a return to normal travel activities following the COVID-19 shutdowns. Pedestrian crashes both decreased more markedly with the beginning of the COVID-19 pandemic and rebounded at a higher rate than the other modes in 2021 as the initial pandemic impacts on travel patterns changed. Overall, between 2018 and 2022, vehicle-only crashes decreased by 10 percent, pedestrian crashes decreased by 29 percent, and bicycle crashes increased by about 5 percent (though with high variability over the past five years).

The maps in Figure 7 and Figure 8 show where higher concentrations of pedestrian and bicycle crashes occurred from 2018 to 2022. The same general areas of the city appear as high pedestrian crash areas and in the heat map of all crashes in Figure 4. Some notable differences include a concentration of crashes along University Avenue, whereas the intersections near Interstate 94 had higher concentrations of all crashes. Downtown appears to have the largest concentration of pedestrian and bicycle crashes. One difference between bicycling and walking is that pedestrian crashes downtown are more highly concentrated west of Robert Street, while bicycle crashes are concentrated east of Robert Street.

When examining the crash patterns compared to the city's current bicycle infrastructure (Figure 8) it is clear that some crash hot spots line up with dedicated facilities, but the pattern is not consistent. High bicycle crash areas appear more correlated with high-traffic roadways and intersections than existing bike routes currently.

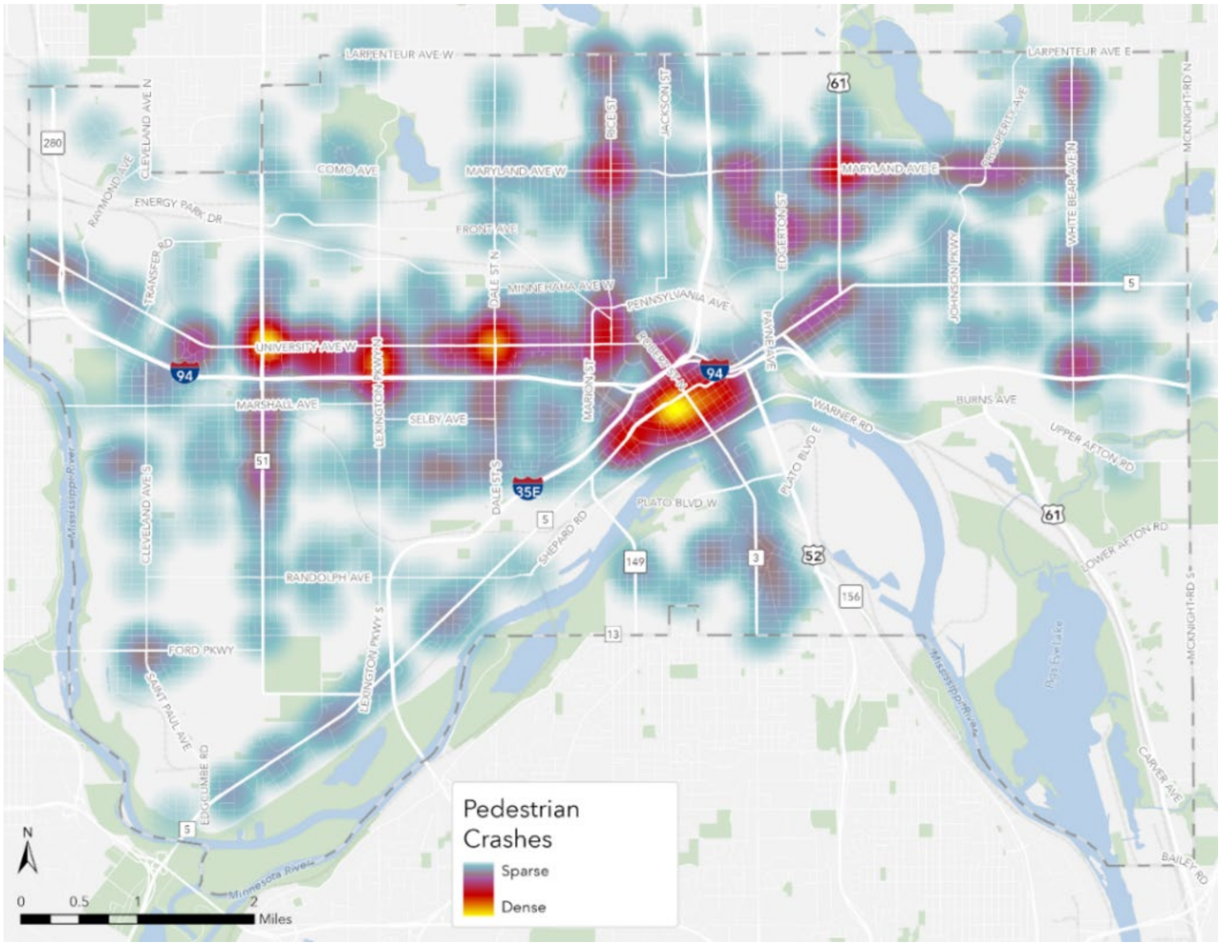

Figure 7: Heat Map of Pedestrian Crashes, 2018-2022. Source: MnCMAT2.

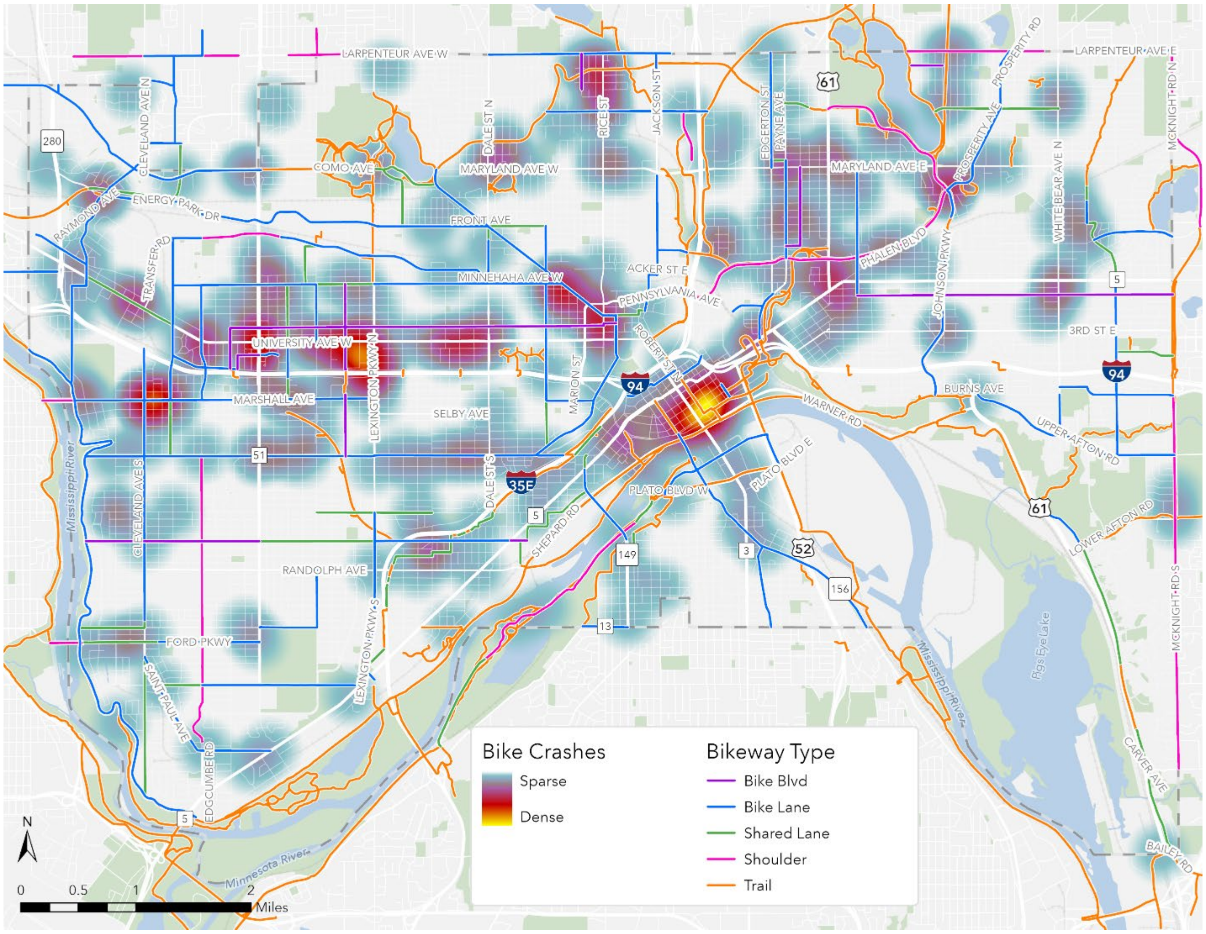

Figure 8: Heat Map of Bicycle Crashes and Existing Bikeways, 2018-2022. Source: MnCMAT2, City of Saint Paul Bikeways dataset.

Light Rail Crashes

Metro Transit operates the at-grade Green Line light rail service on the University Avenue corridor and through Downtown Saint Paul. Crashes involving light rail vehicles striking vehicles, pedestrians or bicyclists regularly occur along this corridor, as shown below (2015-2019 data available). While the City of Saint Paul has limited control over transit operations, most crashes involving pedestrians occur in the street or at pedestrian crossings (rather than at stations) and may indicate a need for continual coordination with Metro Transit to improve safety at these locations.

Table 1: Light Rail Crashes in Saint Paul, 2015-2019

	Total Crashes	Fatal	Injury-causing
Vehicle	96	1	28
Pedestrian	33	6	20
Total	**129**	**7**	**48**

Source: Metro Transit

Crash Severity Trends

Understanding trends in fatal and serious injury crashes is an important step toward the overall goal to reduce fatalities and serious injuries. The MnCMAT2 database defines crash severity in five categories: Fatal, Serious Injury, Minor Injury, Possible Injury, and Property Damage Only.[14]

In the study period, there were 54 fatal crashes and 264 serious injury crashes. In the 54 fatal crashes, 60 people were killed, according to MnCMAT2 crash data.[15] This varies slightly from fatalities data reported to the Fatality Analysis Reporting System (FARS) database, which aggregates crash statistics on a national level. According to FARS, between 2018 and 2021, 54 people were killed in crashes in Saint Paul (including crashes on freeways) and 47 people were killed in crashes that occurred on surface streets within the City of Saint Paul (including county- and state-owned roadways) that are the focus of this analysis.[16] Figure 9 shows the differences in data on fatalities on surface streets by data source, showing slight differences between the data. It is not clear as to why these datasets differ, but it is likely because FARS data also can include data from other sources beyond police reports or due to differences in data cleaning.[17] Throughout this analysis, MnCMAT2 data will be used for fatal crashes because it is a more comprehensive crash dataset.

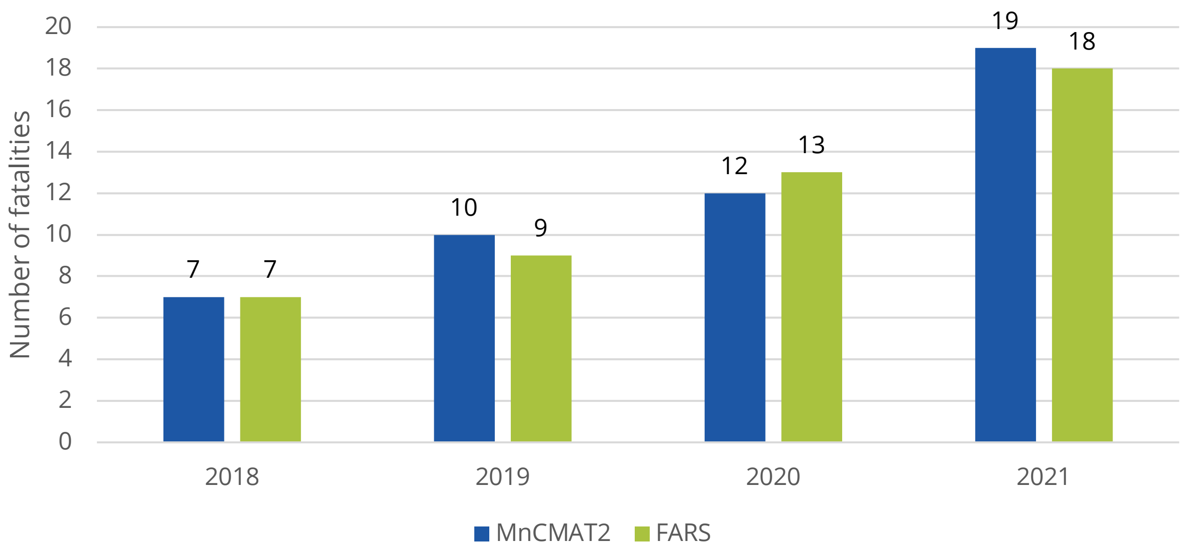

Figure 9: Fatalities on Surface Streets by Data Source, 2018-2021. Source: MnCMAT2 and FARS.

[14] Crashes in the MnCMAT2 database are classified as Fatal if a fatality occurs within 30 days of the crash.
[15] 58 of these fatalities were in crashes classified as Fatal and 2 were in crashes classified as Serious Injury in the MnCMAT2 database.
[16] FARS crash fatality data for 2022 are not yet available.
[17] FARS data can include police reports, state vehicle registration files, state driver licensing files, state highway department data, vital records department data, death certificates, coroner/medical examiner reports, or emergency medical service reports.

Based on MnCMAT2 data, fatal crashes make up 0.34 percent and serious injury crashes make up 1.6 percent of all crashes in Saint Paul. Figure 10 shows the five-year crash trend for fatal and serious injury crashes. Like other crash types, serious injury crashes decreased in 2020 and increased again in 2021. Unlike other crash types, fatal crashes did not decrease during the pandemic. Similarly, the rate of fatal and serious injury crashes per 100 million vehicle miles traveled in Saint Paul (rather than just the absolute number) rose in 2020 and continued to rise in 2021, illustrating that crashes in those years were much more likely to be severe (Figure 11).

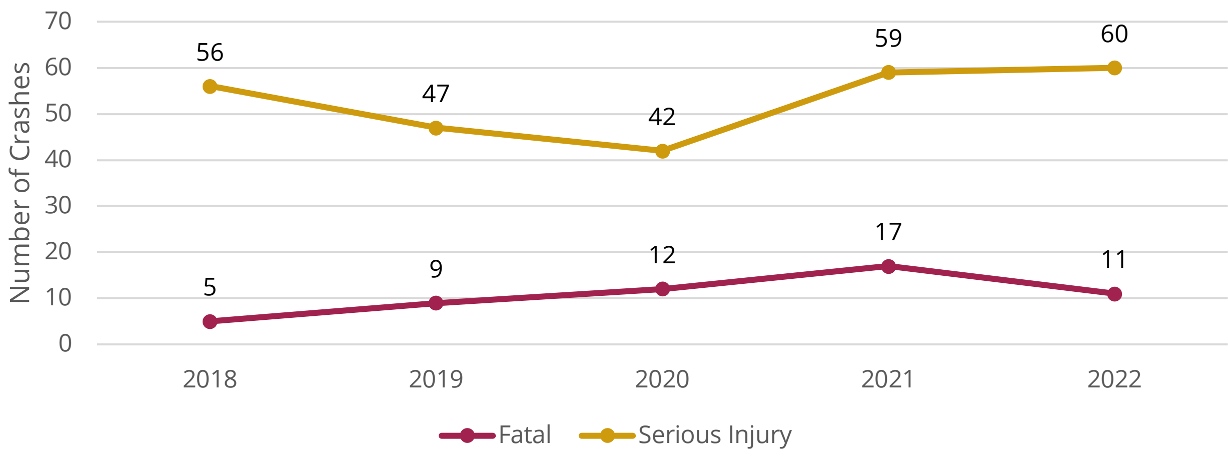

Figure 10: Fatal and Serious Injury Crash Trend, 2018-2022. Source: MnCMAT2.

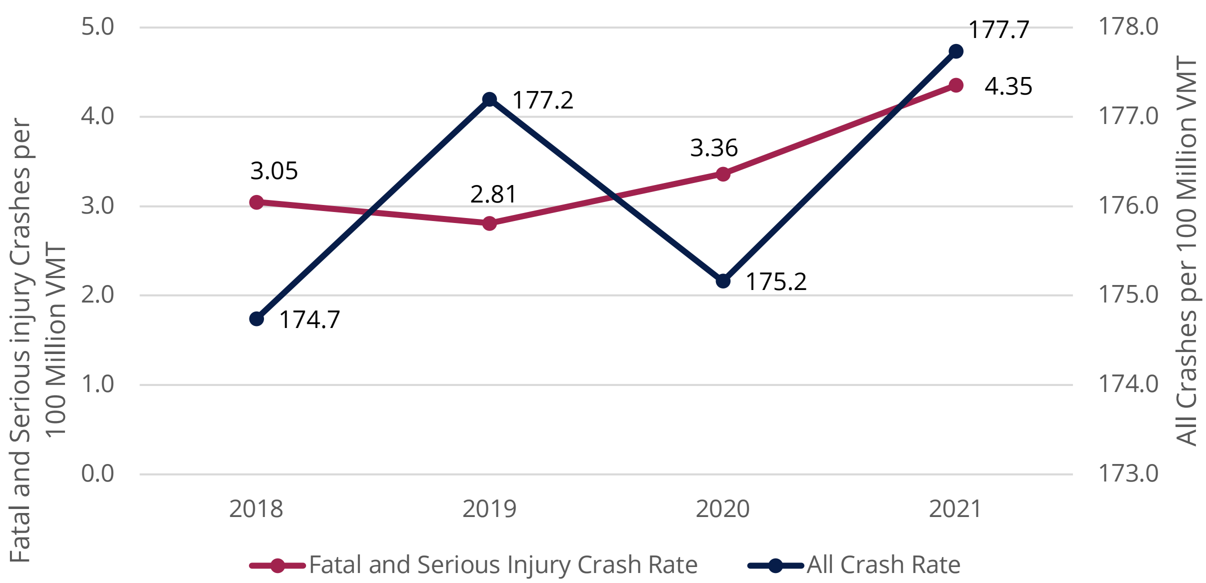

Figure 11: Crash Rate Trends, Fatal and Serious Injury Crashes 2018-2022. Source: MnCMAT2, MnDOT LRS and Roadway Characteristics Database. VMT data not yet available for 2022.

The maps in Figure 12 and Figure 13 show the spatial patterns of fatal and serious injury crashes throughout Saint Paul during the study period. **These crashes follow the same general pattern of all** crashes, with more fatal and serious crashes on the eastern and northern sides of the city, concentrations along arterial streets, and downtown. There are high concentrations of fatal and serious injury crashes along University Avenue, Rice Street, Maryland Avenue, East and West 7th Street, and White Bear Avenue.

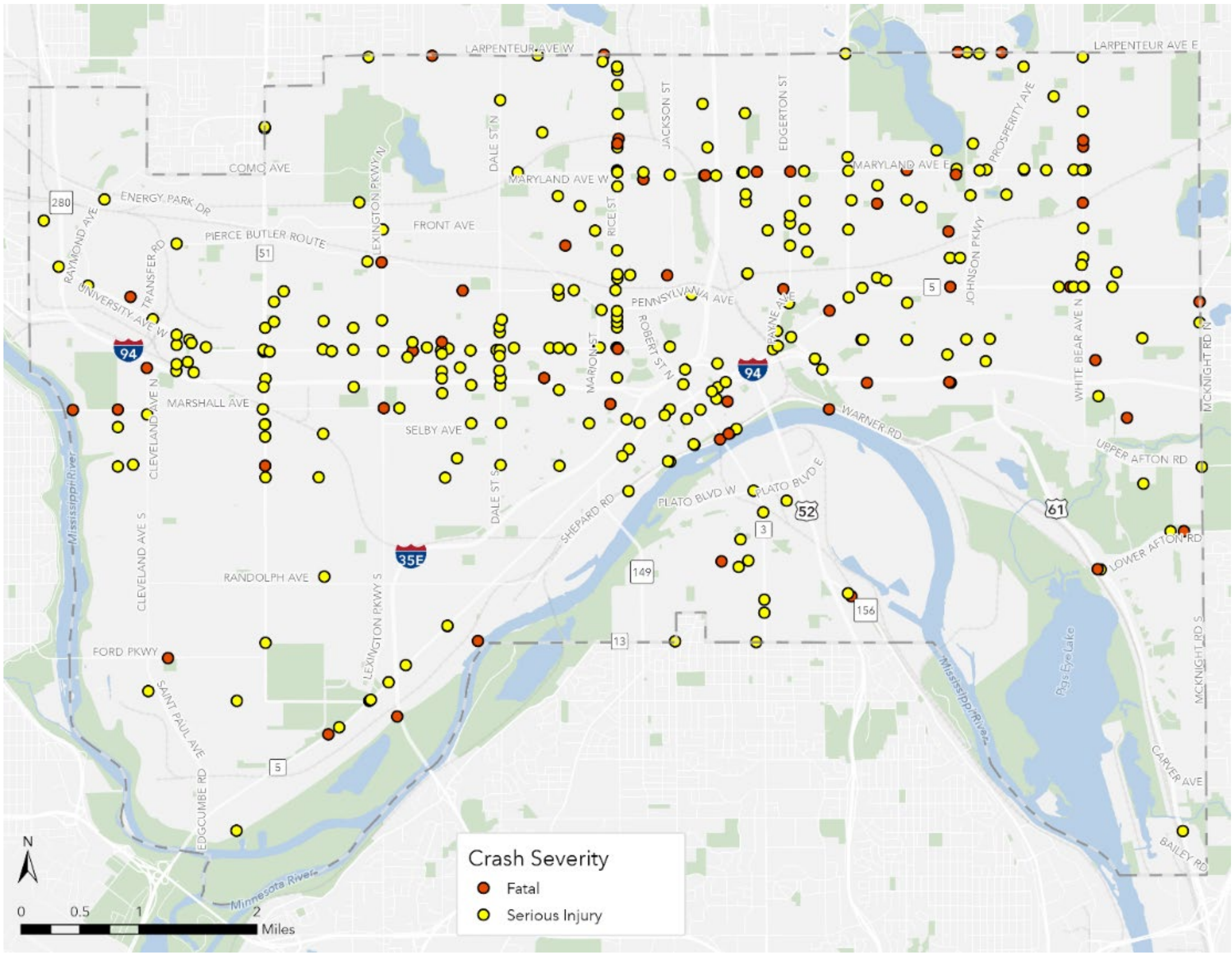

Figure 12 Map of Fatal and Serious Injury Crashes, 2018-2022. Source: MnCMAT2.

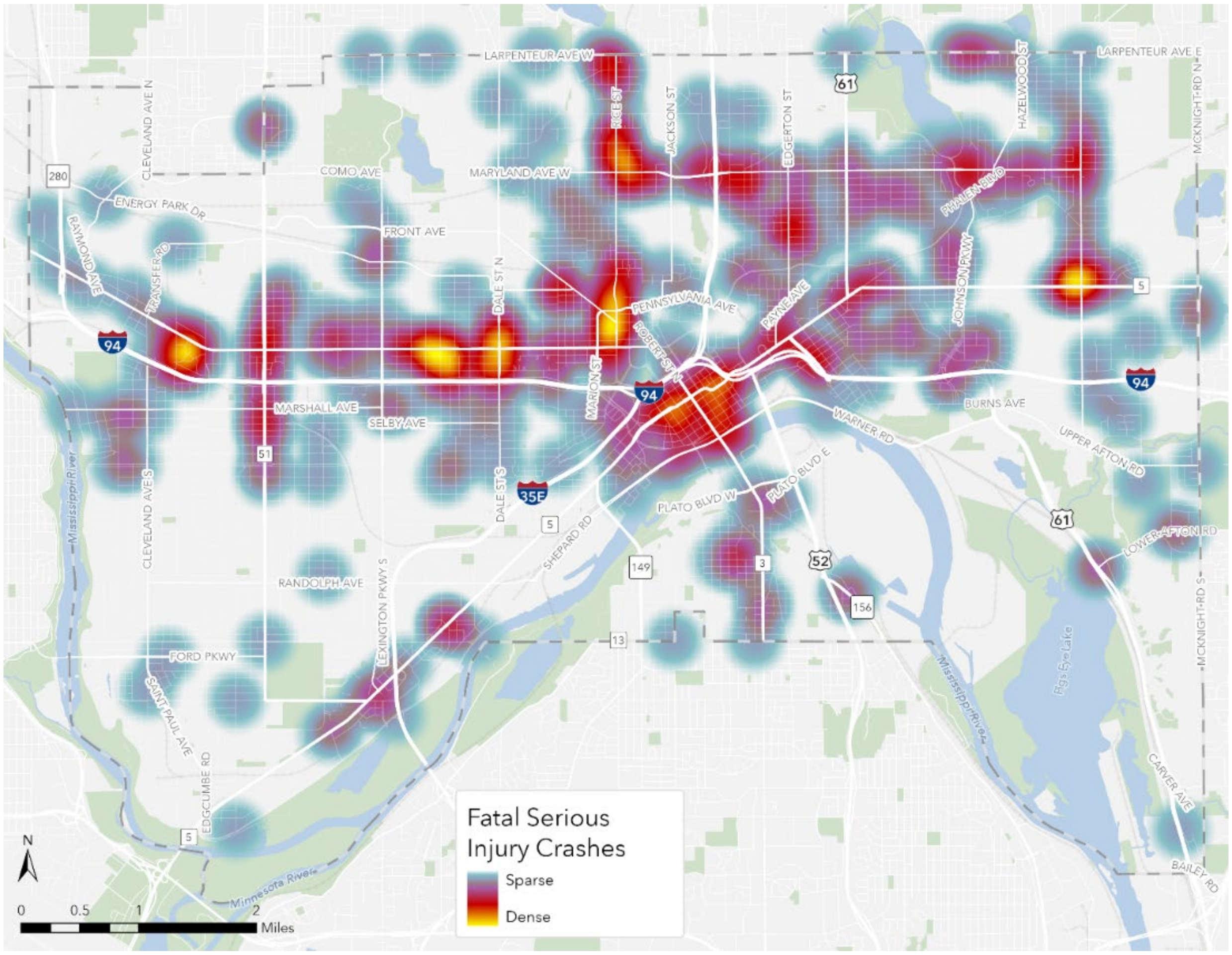

Figure 13: Heat Map of Fatal and Serious Injury Crashes, 2018-2022. Source: MnCMAT2.

Crash Severity by Mode

Vulnerable road users, including pedestrians and bicyclists, are at a higher risk of being involved in injury crashes. **In Saint Paul, only 1.2 percent of vehicle-only crashes involved fatalities or serious injuries, compared to 5.5 percent of all crashes involving bicyclists, and 16.8 percent of all crashes involving pedestrians. Only 11.8 percent of all crashes involving pedestrians and 17.7 percent of crashes involving bicyclists did not result in any injuries, while 82.5 percent of vehicle-only crashes did not result in any injuries (Figure 14). Injury or fatality is common in almost all crashes involving vulnerable road users.**

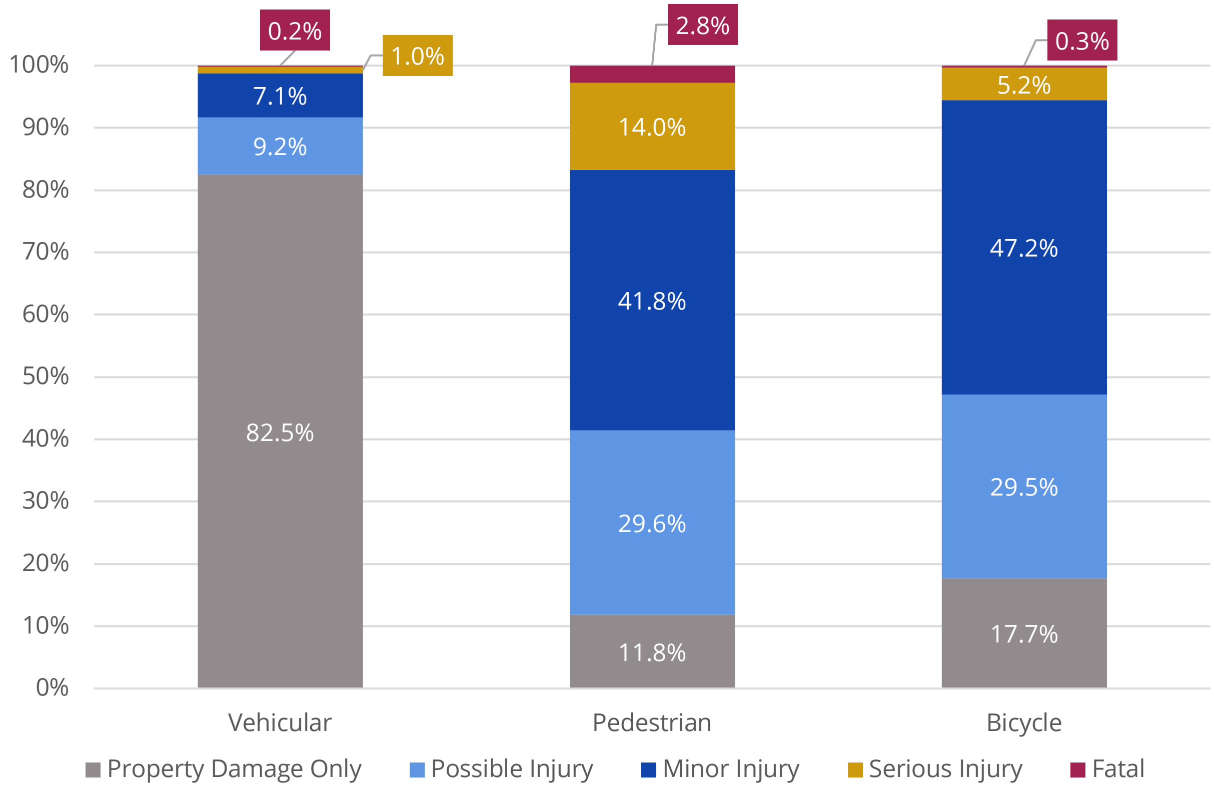

Figure 14: Crash Severity by Mode, 2018-2022. Source: MnCMAT2.

People walking, rolling, and biking are significantly over-represented in fatal and serious injury crashes. Pedestrians accounted for 36.2 percent of all fatalities and serious injuries from 2018 to 2022, even though walking only accounts for 12.8 percent of all trips taken by Saint Paul residents according to the Metropolitan Council's 2019 Household Travel Survey.[18] Bicyclists account for 5 percent of all serious crashes, despite only 0.1 percent of all trips being made by bicycle (Figure 15). The remaining approximately 10 percent of all trips are taken via transit (6.6 percent) or simply cateogorized as "other."

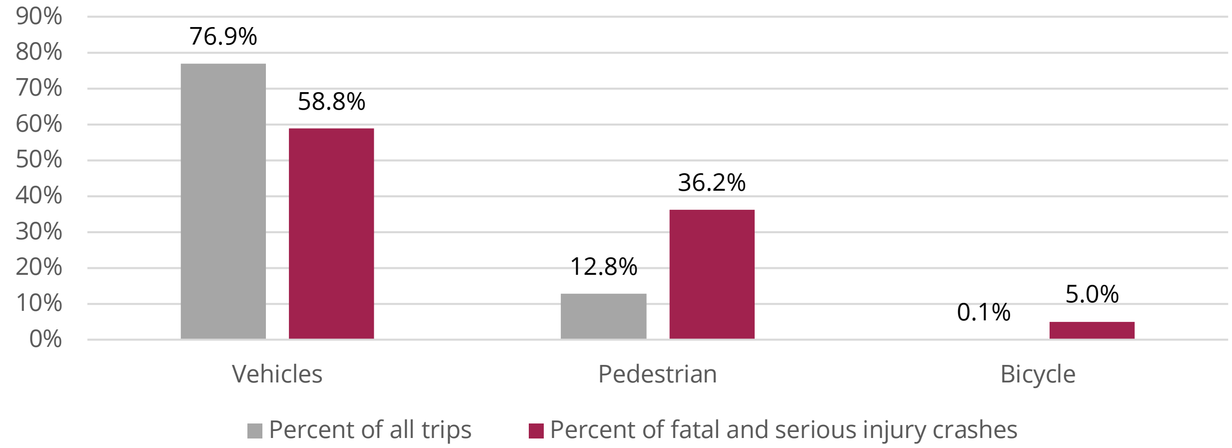

Figure 15: Crash Severity Compared to Travel Patterns, Source: MnCMAT2 and Met Council 2019 Household Travel Survey.

[18] Metropolitan Council 2019 Household Travel Survey: https://metrotransitmn.shinyapps.io/travel-survey-explorer/

In the study period, there were 187 fatal and serious injury crashes involving vehicles only, 115 fatal and serious crashes involving pedestrians, and 16 fatal or serious injury crashes involving a bicyclist. The largest number of fatal and serious injury crashes occurred in 2021 (Figure 16).

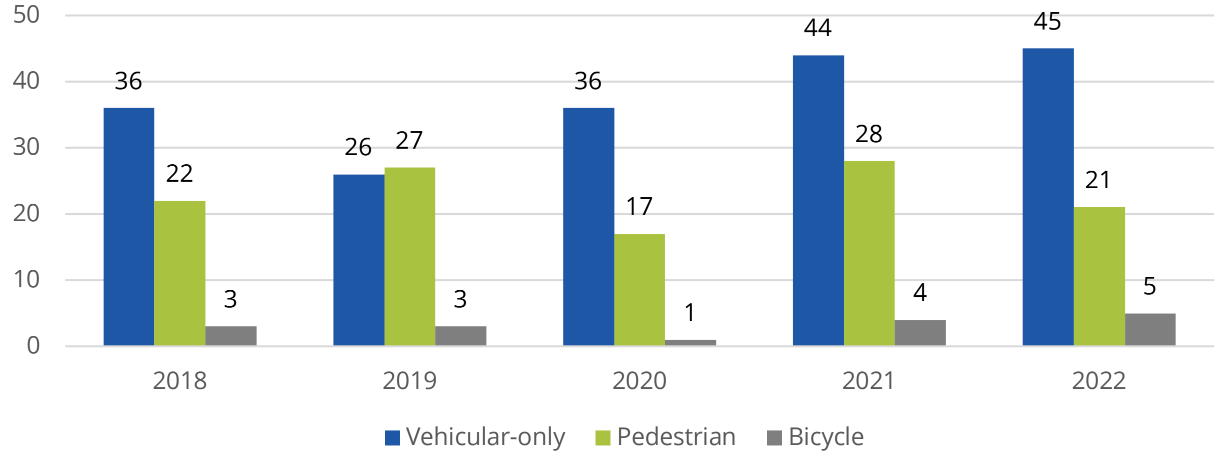

Figure 16: Fatal and Serious Injury Crashes by Year and Mode, 2018-2022. Source: MnCMAT2.

The proportion of pedestrian crashes that involved fatalities or serious injuries increased between 2018 and 2021, with a high of 23 percent of all pedestrian crashes involving fatalities or serious injuries in 2021 (Figure 17). **The proportion of fatal or serious injury crashes involving pedestrians increased markedly with the beginning of the COVID-19 pandemic, and while the proportion has declined it has not returned to their pre-pandemic baseline as of 2022.**

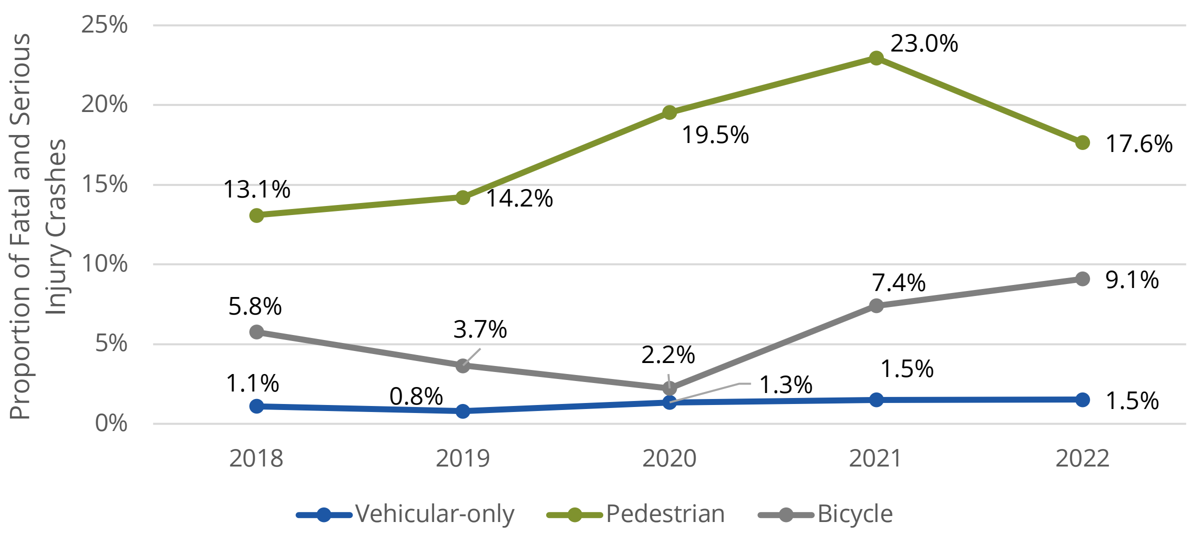

Figure 17: Fatal and Serious Injury Crashes as a Proportion of all Crashes by Mode, 2018-2022. Source: MnCMAT2.

These trends indicate that vulnerable road users, including pedestrians and bicyclists, are at a higher risk of being involved in more serious crashes, especially when comparing the severity of crashes involving each mode with the percentage of total trips involving that mode. **All vulnerable road users, and particularly pedestrians, are at higher risk of injury or death while using the city's transportation system.**

High Crash Locations

Methodology

High crash locations were identified based on three factors: crash volumes, crash rates, and crash costs. The following sections describe the methodology used for each of the three factors and how the three were combined to create a composite ranking of high crash road segments and high crash intersections.

This analysis only includes streets for which Annual Average Daily Traffic (AADT) data is available and is published in MnDOT's AADT dataset, since traffic volume is a component of calculating crash rates.[19] This MnDOT dataset includes most major streets in Saint Paul but does not include traffic volumes for local, neighborhood streets which is a limitation of this analysis. Streets that did not have traffic volume data in MnDOT's dataset were excluded from this analysis of high crash locations. However, since most fatal and serious injury crashes do not occur on neighborhood streets, this analysis captures the majority of all fatal and serious injury crashes.

Crash Volumes Methodology

Crash volumes were calculated for intersections and segments for which AADT data are available. Intersection-related crashes within a 150-foot radius of an intersection were joined to intersection points in GIS and summed as intersection crashes.[20] All non-intersection related crashes within a 150-foot radius of street segments were joined to street segments and summed as segment crashes.

Crash Rate Methodology

Crash rates provide a way to calculate crashes as a function of exposure, which allows for direct comparison of intersections and street segments that have different traffic volumes. The most current available AADT data were used for this analysis.[21]

This analysis uses crash rate methodology from the Federal Highway Administration's (FHWA) Local and Rural Road Safety Program. [22] Crash rates were calculated for intersections and street segments using the following formulas.

[19] https://gisdata.mn.gov/dataset/trans-aadt-traffic-segments
[20] Intersection-related crashes included crashes that were classified in the MnCMAT2 dataset's RELATIONTOINTERSECTION attribute as the following: Intersection Related, Four-Way Intersection, T-Intersection, Y-Intersection, Five-Way Intersection or More, or Roundabout.
[21] https://gisdata.mn.gov/dataset/trans-aadt-traffic-segments
[22] https://safety.fhwa.dot.gov/local_rural/training/fhwasa14072/sec4.cfm

Intersection Crash Rates

Intersection crash rates per million vehicle entering vehicles (MEV) were calculated with the following formula. Total Entering Volume was calculated by summing the AADT for all legs of an intersection and dividing the total by two:

$$Intersection\ Crash\ Rate = \frac{Number\ of\ crashes\ from\ 2018\ to\ 2022\ x\ 1{,}000{,}000}{Total\ Entering\ Volume\ per\ day\ x\ 365\frac{days}{year}x\ 5\ years}$$

Segment Crash Rates

Segment crash rates per million vehicle miles (MVM) traveled were calculated using the following formula:

$$MVM = \frac{AADT * segment\ length\ in\ miles * 365 * 5\ years}{1{,}000{,}000}$$

$$Segment\ Crash\ Rate = \frac{Number\ of\ crashes\ from\ 2018\ to\ 2022}{MVM}$$

Crash Cost Methodology

Crash costs are an approach commonly used in benefit-cost analyses to understand the "societal cost" of crashes, including factors such as property damage, medical care, insurance payouts and missed work. Calculating the total economic value of a crash allows a comparison of between different types of intersections and street segments. The crash cost for each intersection and segment was calculated based on summing the total economic cost of each crash joined to that location using standard crash costs developed by MnDOT in 2022:[23]

- Fatal Crash: $13,600,000
- Serious Injury Crash: $750,000
- Minor Injury Crash: $230,000
- Possible Injury Crash: $120,000
- No Injury/Property Damage Crash: $13,000

Ranking Methodology

For each of these three crash evaluation factors (crash volume, crash rate, and crash cost), all intersections and segments were ranked from highest to lowest. These rankings were then combined into a composite ranking of high crash segments and high crash intersections.

23 http://www.dot.state.mn.us/planning/program/pdf/Table%20A.1%20SV%20L-ML-H%2031-Aug-2022.pdf

High Crash Segments

The map in Figure 18 shows segment crash rankings for Saint Paul streets, symbolized based on the composite crash ranking. In this map, street segments are defined based on the segments defined in MnDOT's AADT dataset. Streets that did not have traffic volume data in MnDOT's dataset were excluded from this analysis. Areas with higher crash rates, or crashes per million vehicles miles (MVM), follow the same general pattern of areas in the city high crash concentrations. Table 2 summarizes the top twenty high crash segments, which were ranked according to crash rate and additional factors.[24]

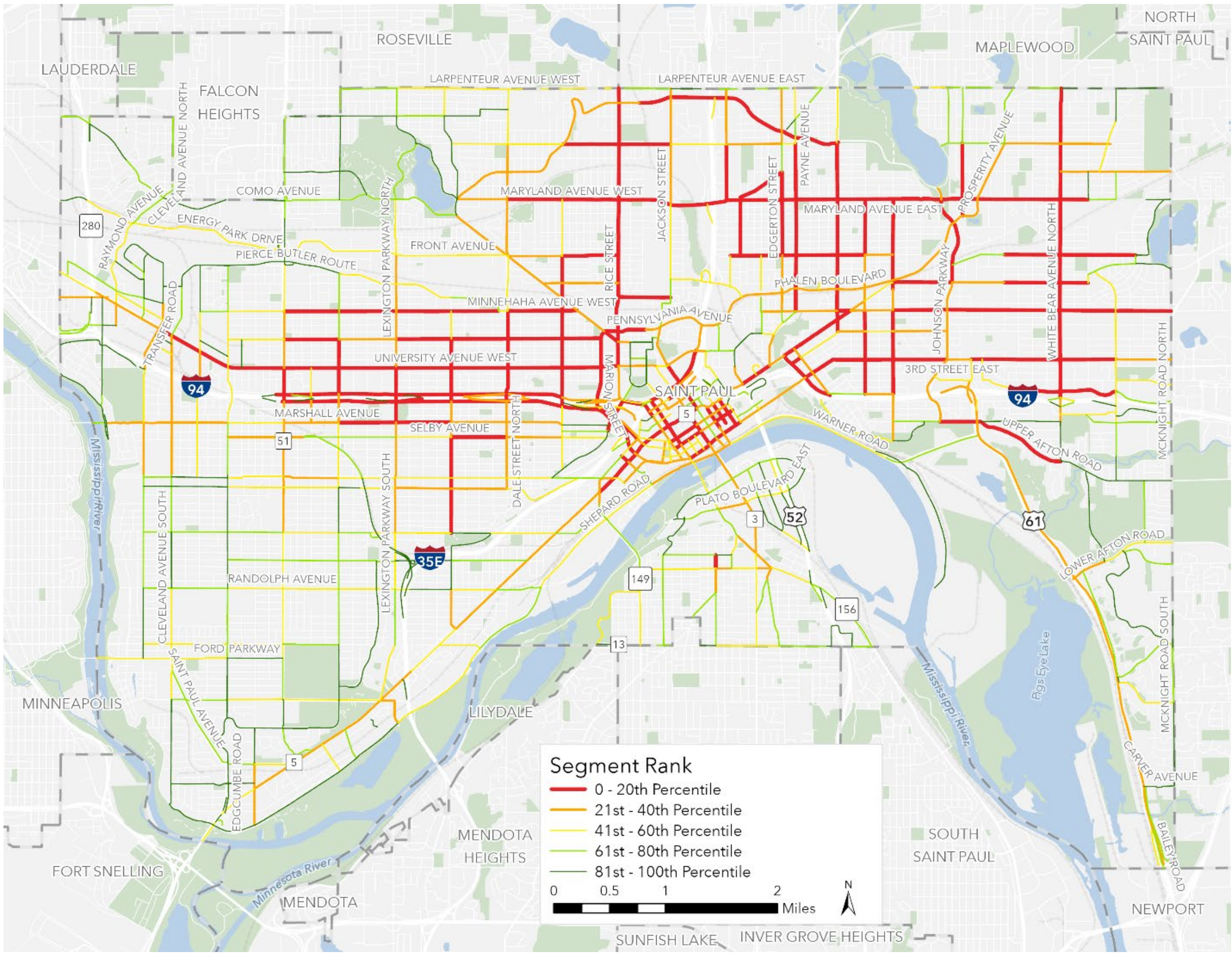

Figure 18: Composite Crash Ranking of Street Segments, 2018-2022. Source: MnCMAT2, MnDOT AADT dataset.

[24] This table ranks only segments that are at least 0.25 miles long and are within 150 feet of at least one fatal or serious injury crash.

Table 2: Top 20 High Crash Street Segments

Overall Rank	Segment	Segment Crash Rate (crashes/MVM)	Total Number of Crashes	Total Crash Cost
1	N Edgerton St from Maryland Ave to Case Ave	25.91	107	$20,453,000
2	W Saint Anthony Ave from Lexington Pkwy to Dale St	29.27	150	$9,143,000
3	N Rice St from Pennsylvania Ave to University Ave	15.82	132	$24,466,000
4	N Forest St from Maryland Ave to Case Ave	23.10	63	$17,298,000
5	W Saint Anthony Ave from Dale St to Western Ave	23.49	57	$16,251,000
6	W Concordia Ave from Lexington Pkwy to Dale St	17.57	111	$7,126,000
7	N Dale St from University Ave to Concordia Ave	15.04	160	$10,949,000
8	W Saint Anthony Ave from I-94 Ramp (Snelling) to Hamline Ave	16.59	114	$6,871,000
9	W Concordia Ave from Hamline Ave to Lexington Pkwy	19.51	86	$4,985,000
10	E Minnehaha Ave from Earl St to Johnson Pkwy	13.09	81	$17,553,000
11	N Rice St from Arlington Ave to Maryland Ave	10.42	145	$37,494,000
12	N Lexington Pkwy from University Ave to Saint Anthony Ave	12.95	178	$11,044,000
13	W University Ave from Snelling Ave to Hamline Ave	12.25	151	$11,932,000
14	N Snelling Ave from University Ave to Concordia Ave	11.21	205	$14,908,000
15	N Rice St from Maryland Ave to Pennsylvania Ave	9.49	286	$19,087,000
16	N Arcade St from Wheelock Pkwy to Maryland Ave	11.95	130	$9,323,000
17	W University Ave from Lexington Pkwy to Dale St	8.81	243	$30,513,000
18	E Maryland Ave from Hazelwood St to White Bear Ave	11.78	119	$10,502,000
19	E 3rd St from Maria Ave to Forest St	13.97	108	$5,681,000
20	Johnson Pkwy from Maryland Ave to Phalen Blvd	12.99	57	$18,171,000

Source: MnCMAT2, MnDOT AADT dataset.

High Crash Intersections

Figure 19 shows intersection crash rankings for Saint Paul intersections. Intersections that did not have traffic volume data in MnDOT's dataset for all intersecting streets were excluded from this analysis. High crash rate intersections largely follow the same spatial pattern as high crash rate street segments. Table 3 summarizes the top 20 high crash signalized intersections in Saint Paul between 2018 and 2022 and Table 4 summarizes the six high crash unsignalized intersections.[25]

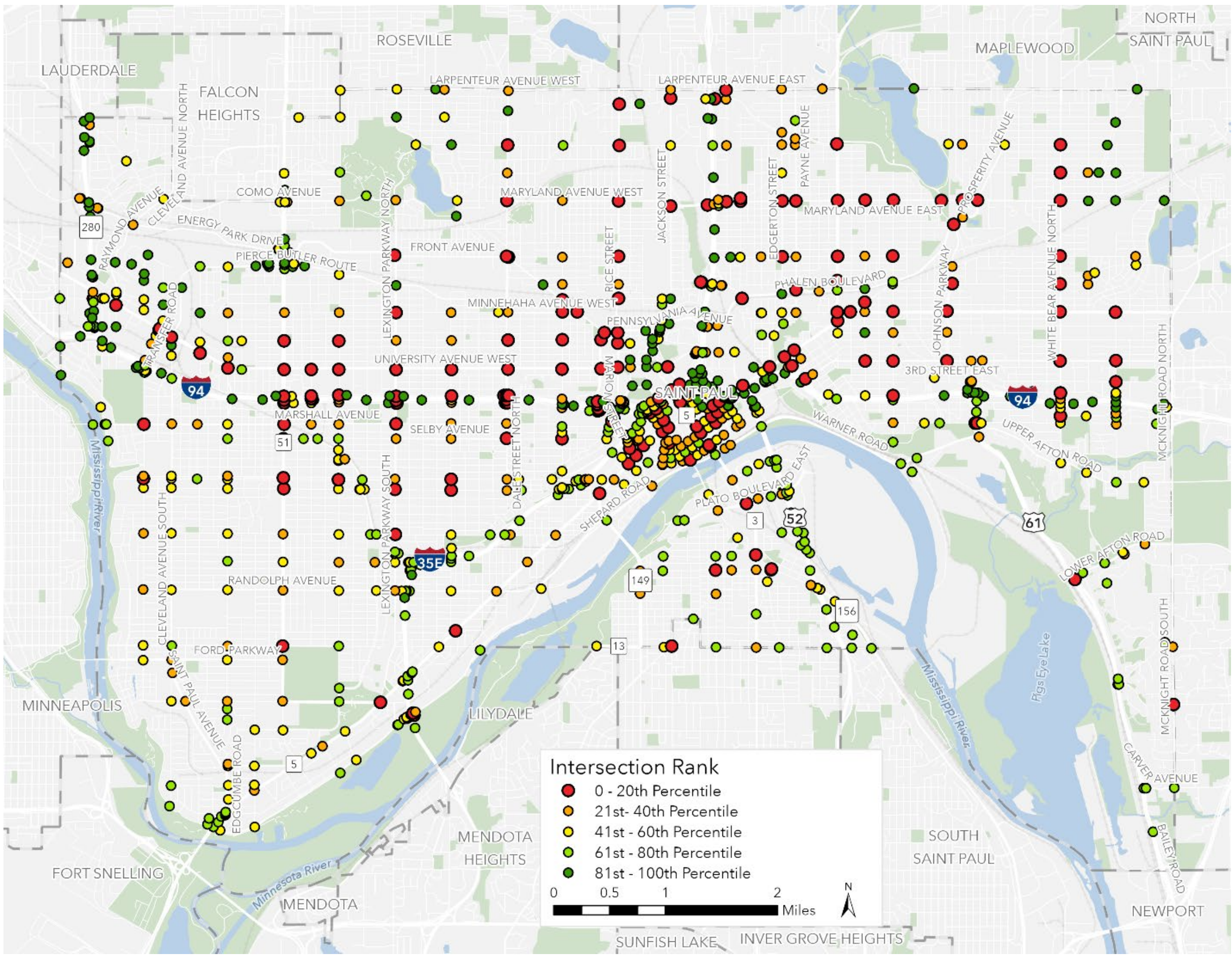

Figure 19 Composite Crash Ranking by Intersection, 2018-2022. Source: MnCMAT2, MnDOT AADT dataset.

[25] This table ranks only intersections that are within 150 feet of at least one fatal or serious injury crash.

Table 3 Top 20 High Crash Signalized Intersections

Overall Ranking	Intersection	Intersection Crash Rate (crashes/MEV)	Total Number of Crashes	Total Crash Cost
1	N Snelling Ave and W Saint Anthony Ave	1.80	66	$4,300,000
2	E Maryland Ave and N Edgerton St	1.19	35	$14,907,000
3	N Dale St and W University Ave	1.05	64	$4,271,000
4	N Rice St and W Maryland Ave	1.03	54	$3,383,000
5	E Case Ave and White Bear Ave N	1.65	33	$2,349,000
6	Mounds Blvd and E Kellogg Blvd	0.97	47	$5,958,000
7	N Arcade St and E Maryland Ave	0.91	52	$3,898,000
8	W Saint Anthony Ave and N Dale St	2.98	30	$1,989,000
9	E 7th St and N White Bear Ave	1.26	31	$2,326,000
10	N Rice St and W Lafond Ave	0.89	48	$3,064,000
11	W Minnehaha Ave and Western Ave N	1.30	25	$2,444,000
12	W Concordia Ave and N Dale St	2.37	23	$1,898,000
13	N Lexington Ave and W University Ave	0.84	47	$2,751,000
14	Johnson Pkwy and E Maryland Ave	0.96	30	$2,093,000
15	N Hamline Ave and W University Ave	0.81	37	$2,187,000
16	N Snelling Ave and W University Ave	0.62	51	$5,056,000
17	N Western Ave and W University Ave	0.98	27	$1,846,000
18	N Rice St and W Arlington Ave	0.79	28	$2,394,000

19	N Clarence St and E Maryland Ave	1.03	19	$1,849,000
20	W 7th St and N Wabasha St	0.69	22	$3,252,000

Source: MnCMAT2, MnDOT AADT dataset.

Table 4 Top High Crash Unsignalized Intersections

Overall Ranking	Intersection	Intersection Crash Rate (crashes/MEV)	Total Number of Crashes	Total Crash Cost
1	7th St and W Victoria Ave	0.52	12	$2,905,000
2	N Victoria St and W Saint Anthony Ave	1.22	8	$841,000
3	W Minnehaha Ave and W Como Ave	0.38	11	$880,000
4	N Ruth St and E 3rd St	0.39	7	$1,259,000
5	Charlton St and Dodd Rd	0.89	3	$993,000
6	E Case Ave and N Burr St	0.94	2	$763,000

Source: MnCMAT2, MnDOT AADT dataset.

Figure 20 shows the top 20 high crash signalized intersections and segments among the intersections and segments for which MnDOT records AADT data. These high crash locations provide an understanding of where the safety needs are greatest in the city and where safety investments would provide the greatest benefit. Any future projects programmed for these streets or intersections should include a comprehensive review of the location's specific safety challenges, and improved safety should be a determining factor when developing the project design.

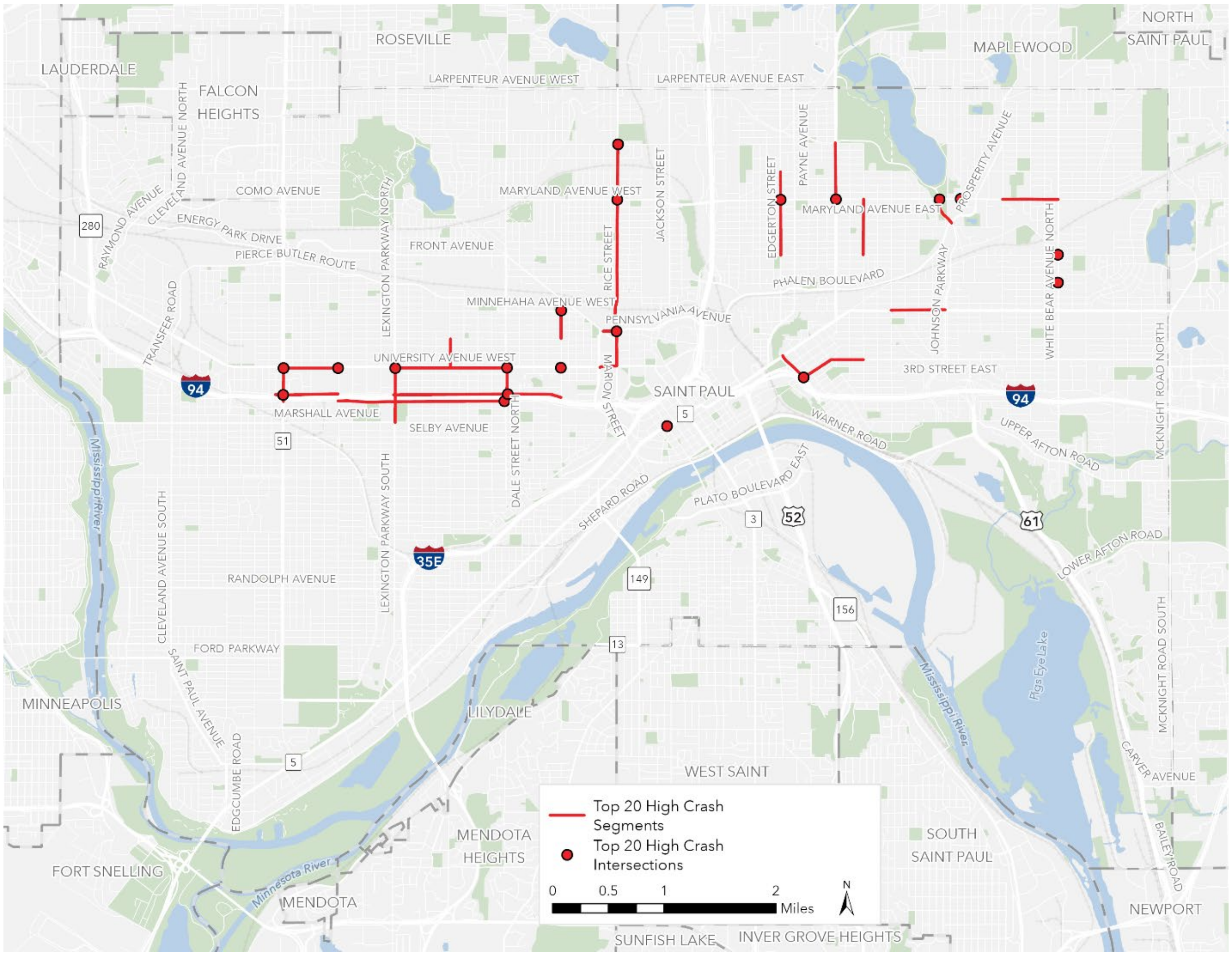

Figure 20: Top 20 High Crash Segments and Intersections. Source: MnCMAT2, MnDOT AADT dataset.

Crash Characteristics and Contributing Factors

The MnCMAT2 database includes data on many crash characteristics and contributing factors. Evaluating crash factors can highlight targeted areas for intervention. These crash characteristics are collected from initial police reports, meaning the data analysis can only be as complete as the officer's initial data collection. The analysis provided here is intended to provide baseline information about the types of crashes occurring within the city, but not all crash characteristics are correctable through safety interventions.

Crashes by Roadway Ownership and Functional Classification

Crashes occurring on Ramsey County-owned streets are overrepresented relative to the proportion of streets in Saint Paul that are county-owned. While county-owned streets make up only 13.3 percent of lane miles in the city, 23.5 percent of all crashes and 31.9 percent of all fatal and serious injury crashes occurred on those streets (Figure 21) This suggests that targeting safety interventions along county-owned roads should be a priority strategy for decreasing fatal and serious injury crashes. Except for a limited number of at-grade state trunk highways, most of the what would be considered the busiest streets in Saint Paul are owned and operated by the county.

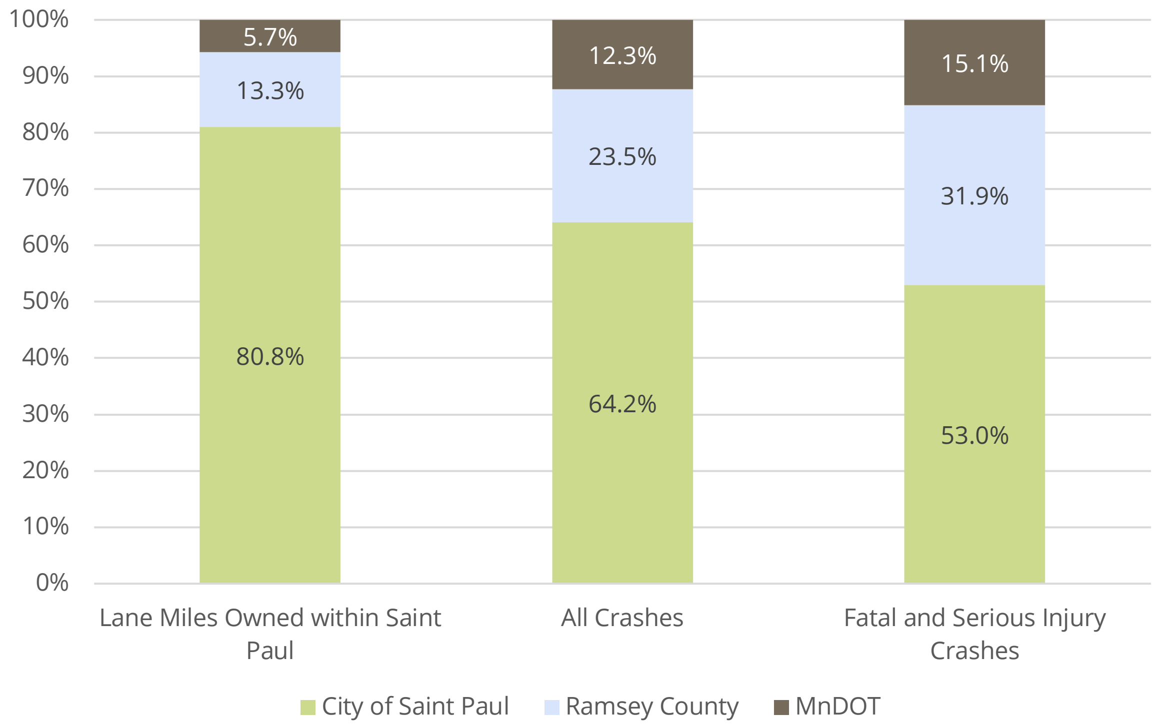

Figure 21: Crashes by Roadway Ownership, 2018-2022. Source: MnCMAT2, City of Saint Paul.[26]

[26] Ownership by lane mileage is based on data from the City of Saint Paul's Street Centerline GIS dataset's OWNERSHIP attribute and excludes lane mileage on Interstate 94, Interstate 35E, U.S. Highway 52, Trunk Highway 280, and ramps.

Functional classification is the Federal Highway Administration's roadway classification system, which classifies streets based on their role within the transportation network. Figure 22 compares the amount of lane miles of each functional classification category and the number of crashes by the functional classification of the street on which the crash occurred.[27] While Minor Arterials only account for 21 percent of all lane miles in Saint Paul, 39.1 percent of all crashes occurred on Minor Arterials between 2018 and 2022, and 46.7 percent of all fatal and serious injury crashes took place on Minor Arterials during this period.[28] **This suggests that targeting safety interventions along Minor Arterials should be a priority strategy for decreasing fatal and serious injury crashes.**

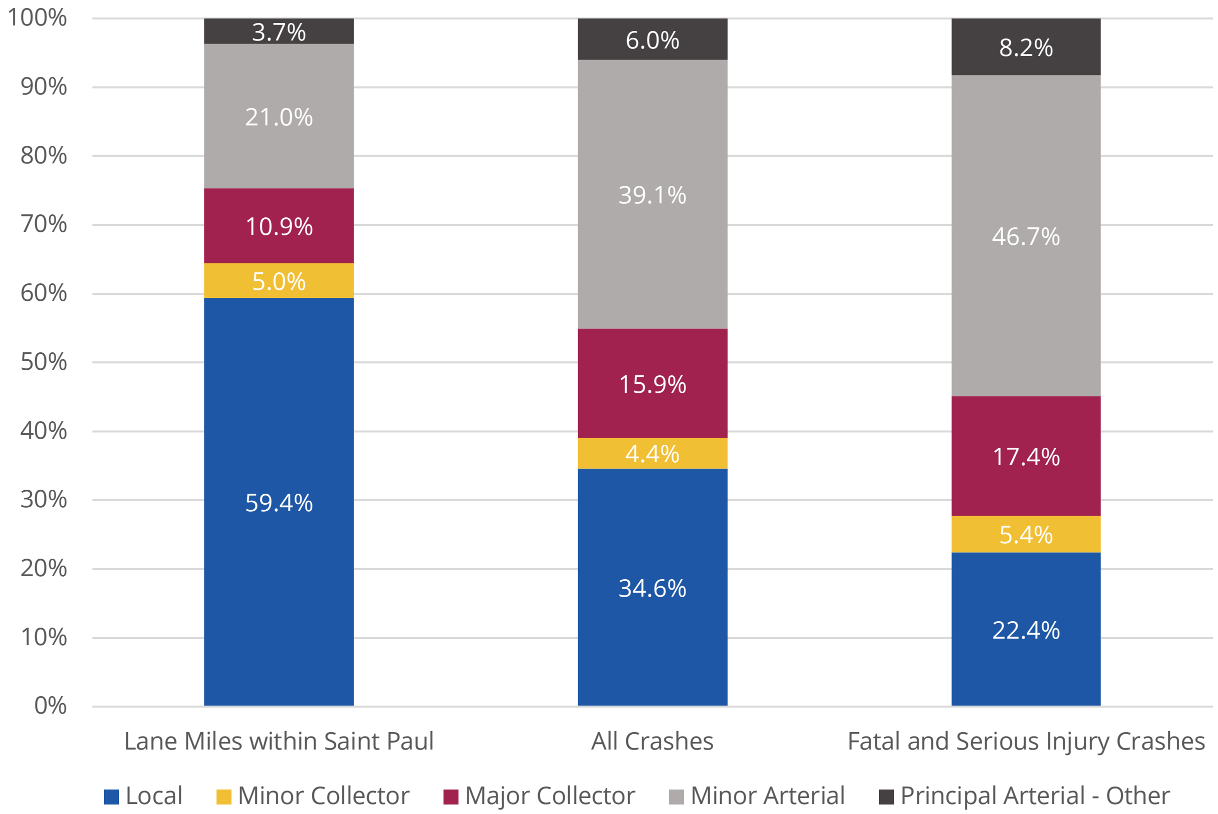

Figure 22: Crashes by Functional Classification, 2018-2022. Source: MnCMAT2 and City of Saint Paul.

[27] Lane miles by functional classification is based on the City of Saint Paul's Street Centerline GIS dataset's FUNCL_FED attribute and excludes lane mileage on Interstate 94, Interstate 35E, U.S. Highway 52, Trunk Highway 280, and ramps.

[28] Minor Arterials provide services for trips of moderate length, serve geographic areas that are smaller than their higher arterial counterparts, and offer connectivity to the higher arterial roadway system. These are important roads through the city, and they frequently include local bus routes. Examples in Saint Paul include Maryland Avenue, White Bear Avenue, Ford Parkway, East 3rd Street, and Selby Avenue.

Crashes by Time of Year

The volume of crashes per month is relatively stable throughout the year, decreasing slightly between February and April before increasing during the summer months. The months that see the most crashes overall are winter months. **Fatal and serious injury crashes increase sharply between April and May, remaining high during the summer months then dropping between October and December.** May, June, and July see the most fatal and serious injury crashes (Figure 23).

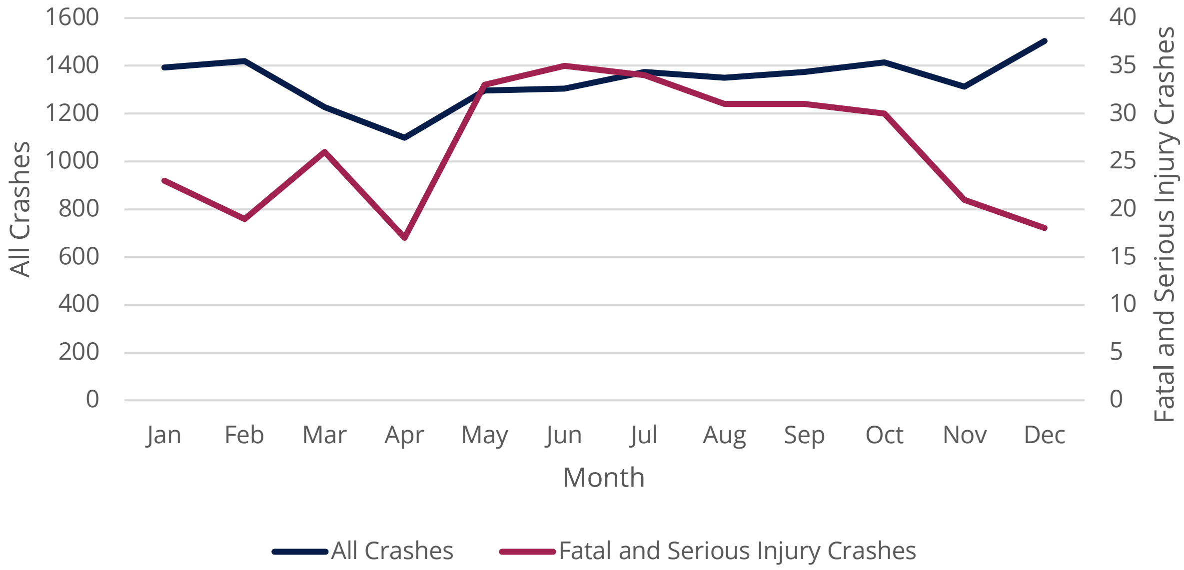

Figure 23: Average Crashes by Month, 2018-2022. Source: MnCMAT2.

Crashes by Time of Day

Crashes increase throughout the day, with a slight peak in the morning and the highest peak in the evening between 4:00 and 5:00pm, likely related to rush-hour commuting. Fatal and serious injury crashes followed a similar pattern, but peak at 6:00pm, a bit later than all crashes (Figure 24). Pedestrian and bicycle crashes also peaked around 5:00pm (Figure 25). **Another notable trend is that fatal and serious injury crashes are lower in daytime hours but higher in nighttime hours.**

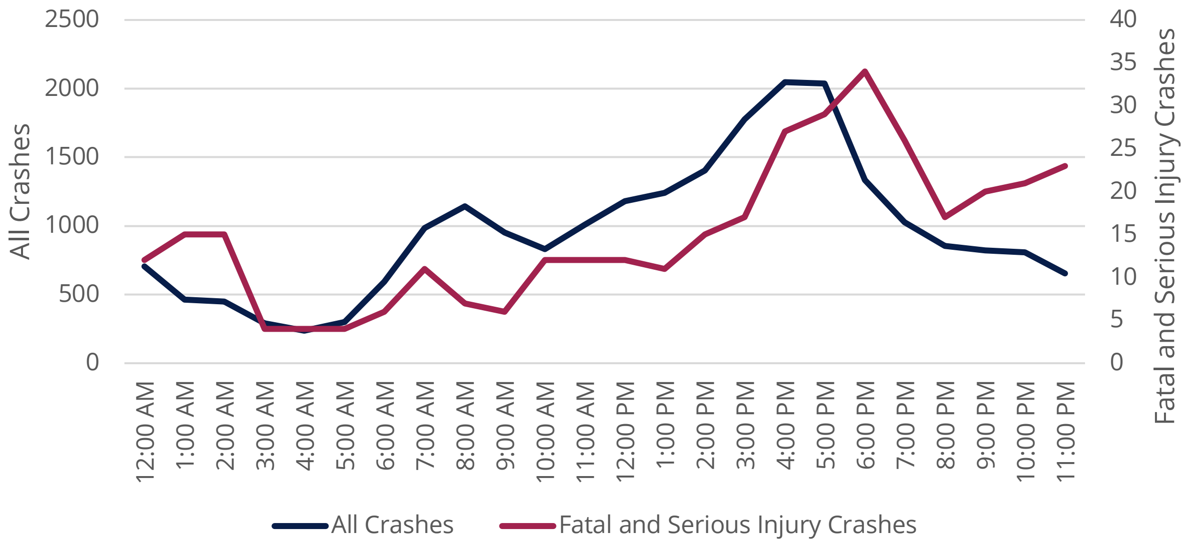

Figure 24: Crashes by Time of Day, 2018-2022. Source: MnCMAT2.

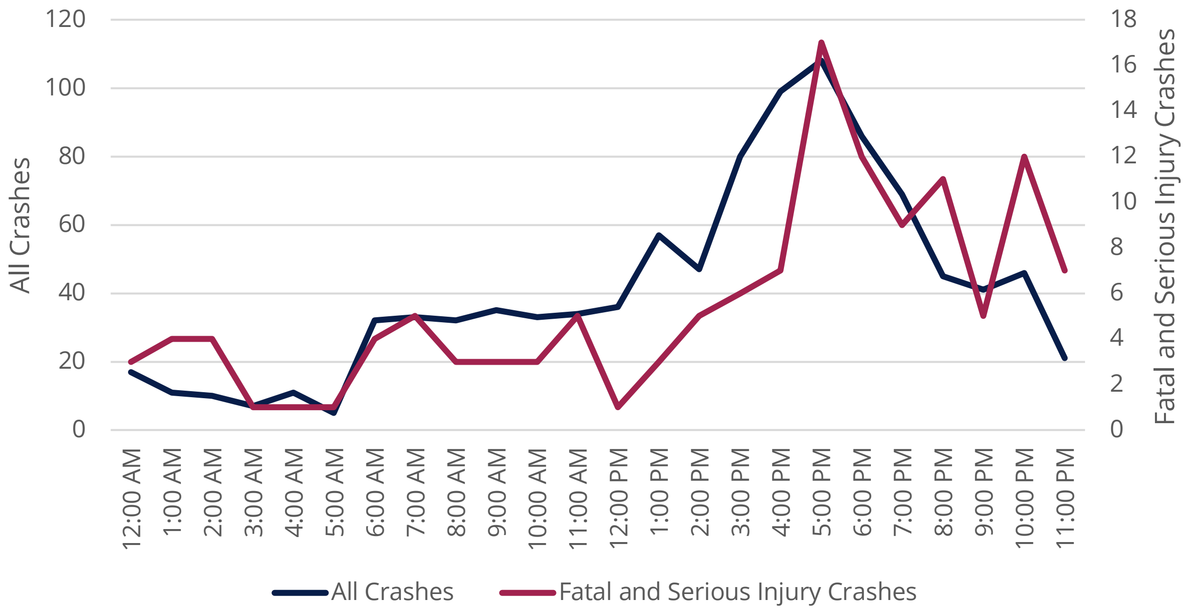

Figure 25: Pedestrian and Bicycle Crashes by Time of Day, 2018-2022. Source: MnCMAT2.

Crashes by Daylight Conditions

For all modes, most crashes occurred in daylight. However, a higher proportion of fatal and serious injury crashes occurred when it was dark outside. **Notably, a higher proportion of fatal and serious injury crashes involving pedestrians and bicyclists occurred when it was dark outside compared to fatal and serious injury crashes that only involved vehicles.** (Figure 26; Figure 27). For fatal and serious injury crashes that took place when it was dark, streetlights were present and on in 82 percent of crashes for all modes and in 78 percent of bike and pedestrian crashes. This indicates that the presence of streetlights likely has less influence than the time of day on the probability of a crash.

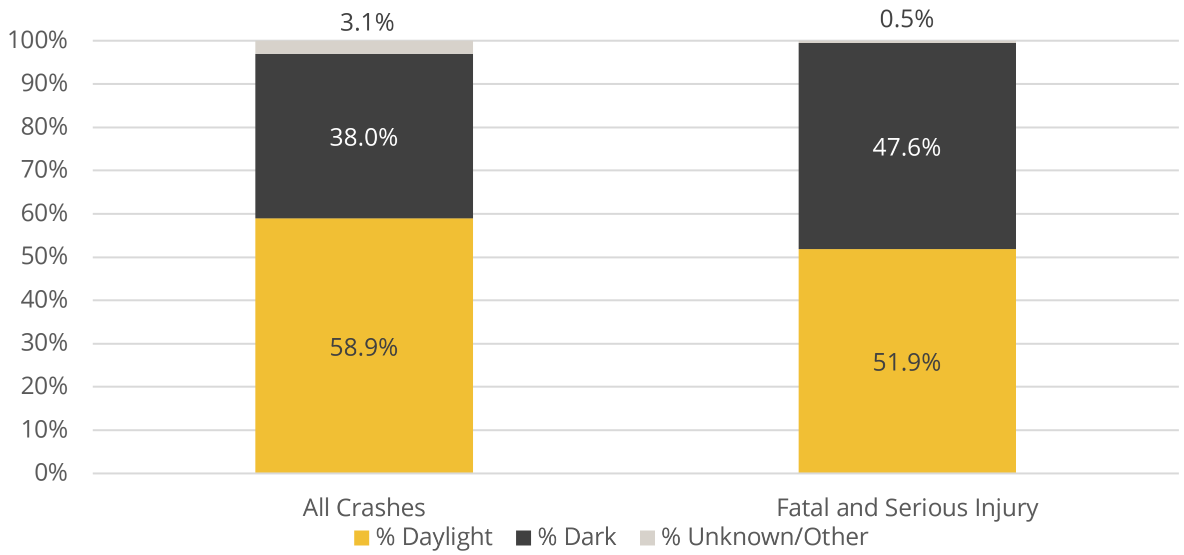

Figure 26: Daylight Conditions and Crash Severity for Vehicular-Only Crashes, 2018-2022. Source: MnCMAT2.

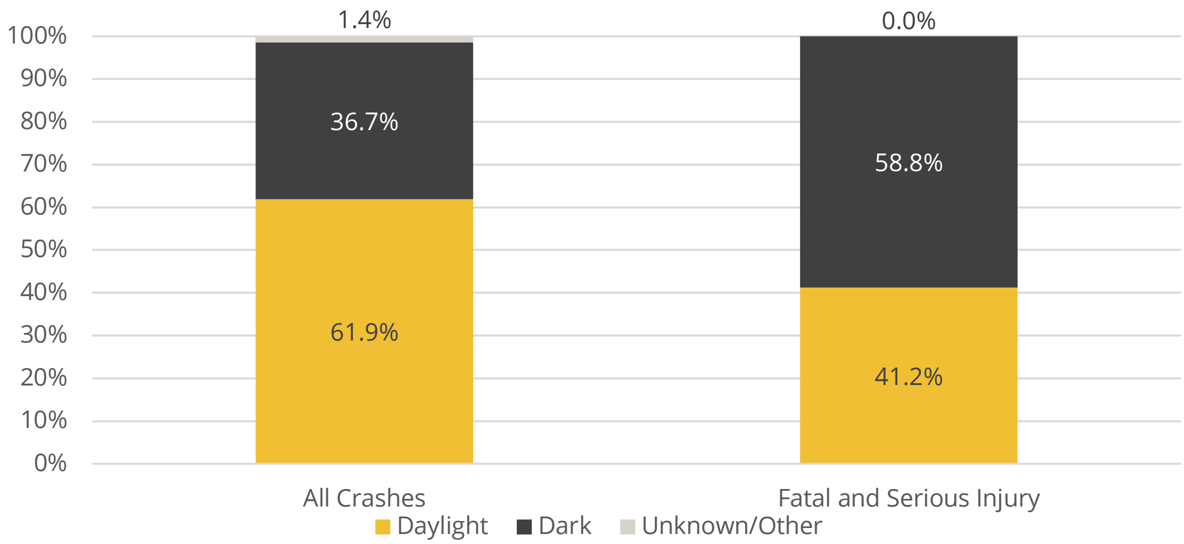

Figure 27: Daylight Conditions and Severity of Bike and Pedestrian Crashes, 2018-2022. Source: MnCMAT2.

Crashes by Weather

Most crashes occurred in clear weather conditions, consistent with the fact that days without precipitation events are more common than days with rain, snow, or sleet/hail (Figure 28). However, a higher proportion of fatal and serious injury crashes occurred in clear weather conditions. The increased proportion of property-damage only and minor injury crashes when it is raining or snowing may be due to slower vehicle speeds and more cautious driving behaviors under these weather conditions.

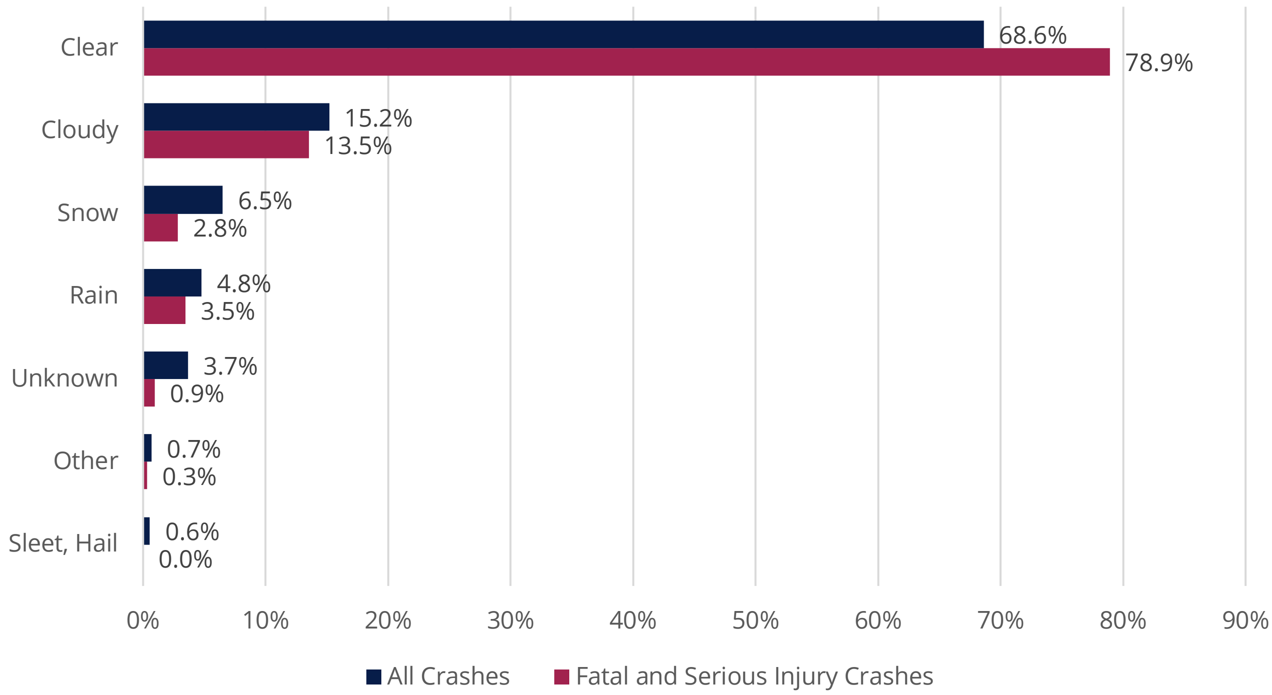

Figure 28: Crashes by Weather Conditions, 2018-2022.

Source: MnCMAT2. Note: Other crashes include Blowing Sand/Soil/Dirt/Snow, Severe Crosswinds, Fog/Smog/Smoke, and Other categories from the MnCMAT2 dataset.

Crashes by Roadway Conditions

Most crashes also take place in dry roadway conditions, consistent with the fact that days without precipitation events are more common than days with rain, snow, or sleet/hail. **Of all crashes, 65.7 percent occurred on dry roadways, and 78.9 percent of fatal and serious injury crashes occurred on dry roadways.** The proportion of all crashes occurring when roadways were wet or covered in ice/frost or snow is greater than the proportion of fatal and serious injury crashes occurring in those conditions (Figure 29).

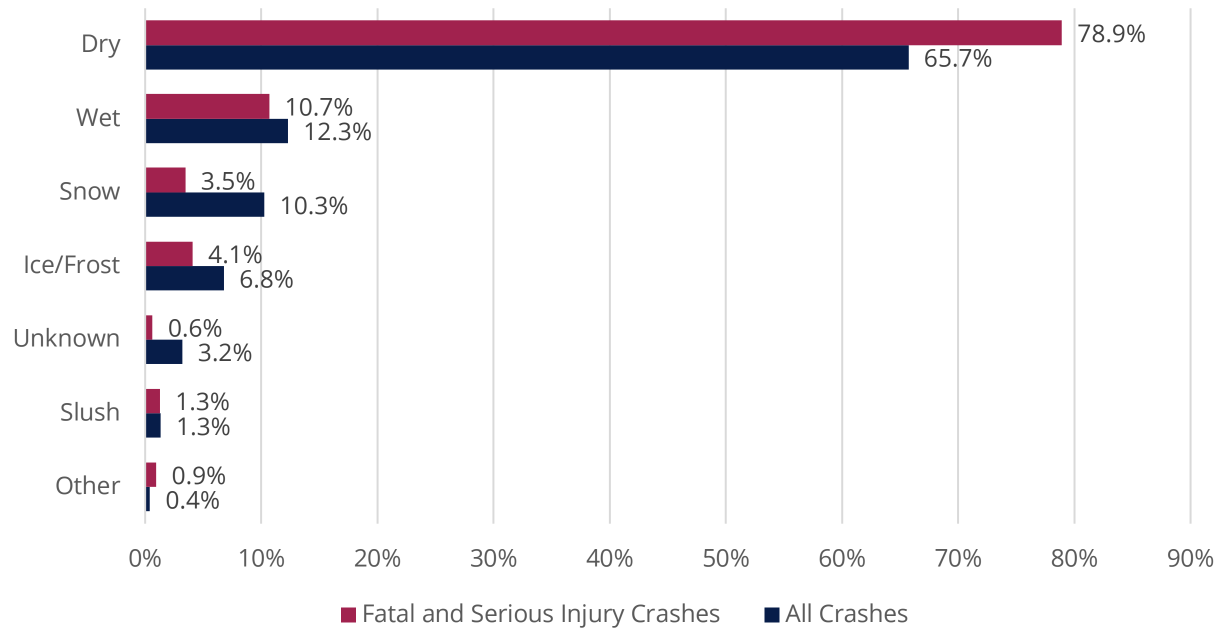

Figure 29: Crashes by Roadway Conditions, 2018-2022. Source: MnCMAT2. Note: Other includes Ruts/Holes/Bumps, Mud/Dirt/Gravel, and Other categories from the MnCMAT2 dataset.

Crashes by Roadway Design

Most crashes in Saint Paul occurred on streets that were Two-Way, Not Divided streets (Figure 30). This was consistent for all crash severity types and modes. The proportion of fatal and severe crashes on each roadway type is relatively consistent with the proportion of all crashes, with the exception of two-way divided roadways without a median barrier, on which fatal and serious injury crashes were over-represented. **The proportion of crashes occurring on two-way undivided streets is largely consistent with the proportion of Saint Paul streets that are two-way undivided.**[29]

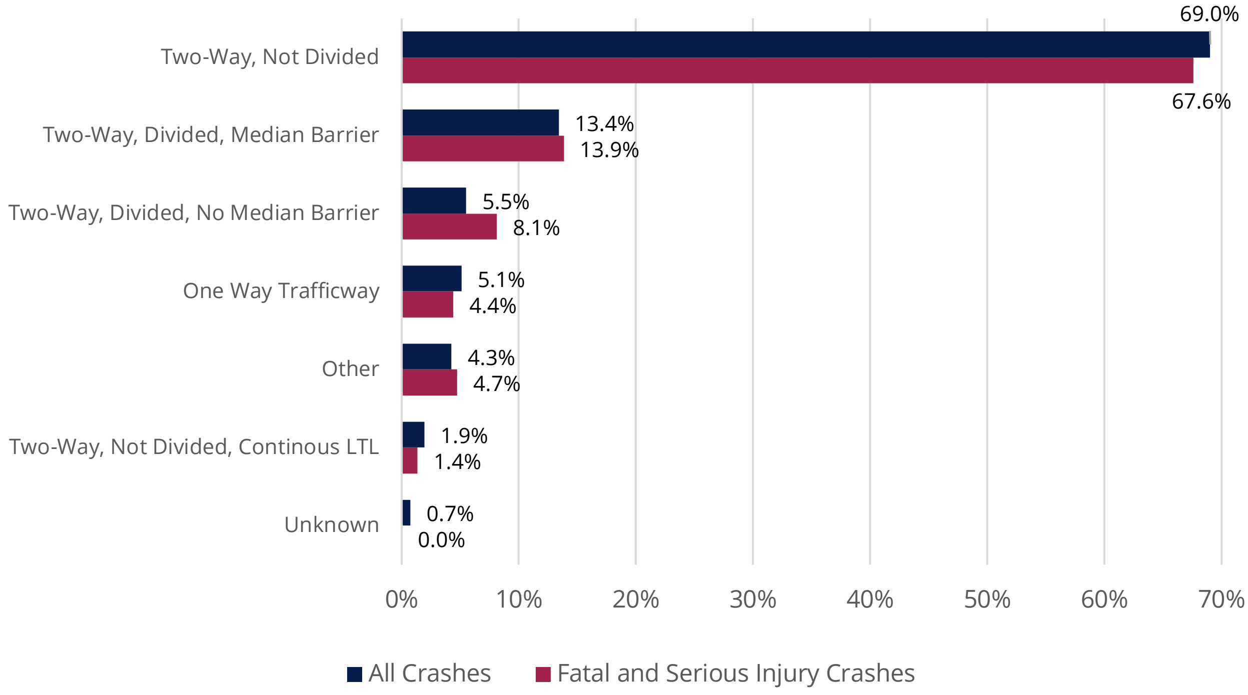

Figure 30: Crashes by Roadway Design, 2018-2022. Source: MnCMAT2.

[29] According to the City of Saint Paul's Street Centerline GIS file, 68 percent of Saint Paul's streets are two-way undivided streets.

Crashes by Relationship to Intersection and Traffic Control Device

About 56 percent of all crashes and 67 percent of fatal and serious injury crashes occur at an intersection. A high concentration of fatal and serious injury crashes occurred at four-way intersections (47 percent), and just under 10 percent occurred at T intersections (Figure 31).[30] While the data reveals that only about half of all crashes occur at an intersection, crashes at intersections or interchanges are more likely to involve fatalities and serious injury. To significantly improve traffic safety, intersections should be a priority target of future safety improvements.

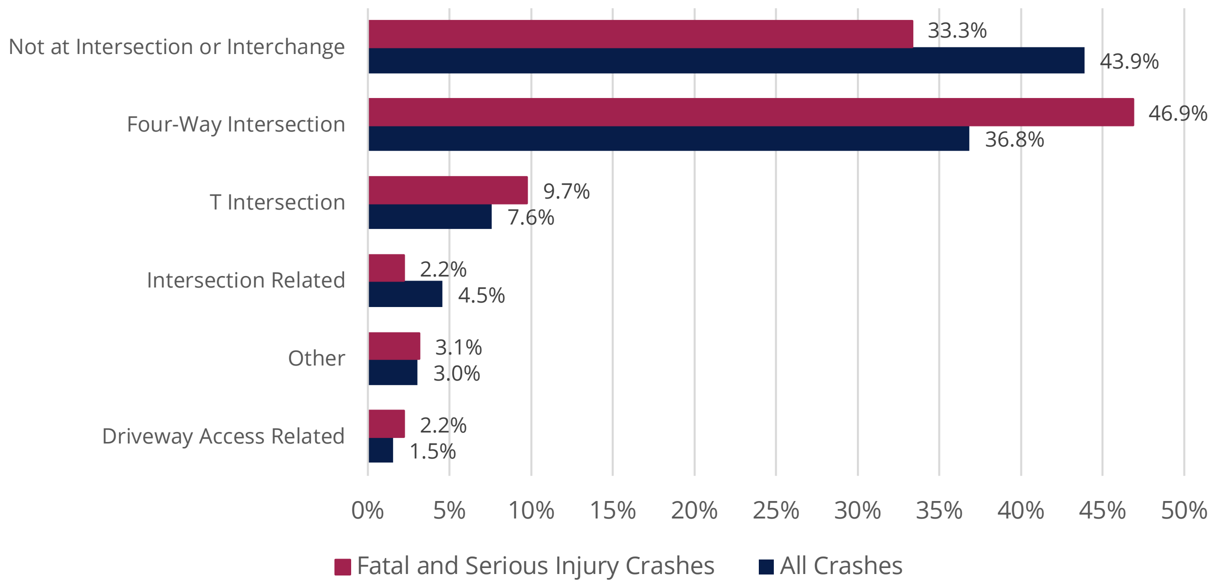

Figure 31: Crashes by Relationship to Intersection, 2018-2022. Source: MnCMAT2.

Approximately half of all crashes that occurred at an intersection were at intersections with a traffic control signal (51.5 percent), followed by 24.6 percent at intersections with stop signs and 19.3 percent at intersections with no controls. A slightly higher proportion of fatal and serious injury crashes occurred at intersections with traffic control signals (55.5 percent) (Figure 32). This is consistent with the fact that traffic signals are typically located on roads with higher traffic volumes, though it indicates that targeting intersection safety improvements at signalized intersections is likely to have a high impact on crash reduction.

[30] The following intersection types are not displayed in this figure because they represented less than 1 percent of all crashes: At School Crossing, Other Traffic Circle, Shared Use Path or Trail, Crossover Related, Railway Grade Crossing, Acceleration/Deceleration Lane, Roundabout, Interchange Other Areas, Interchange On Ramp, Interchange Off Ramp, Five-Way Intersection, Y Intersection, Entrance/Exit Ramp, and Unknown.

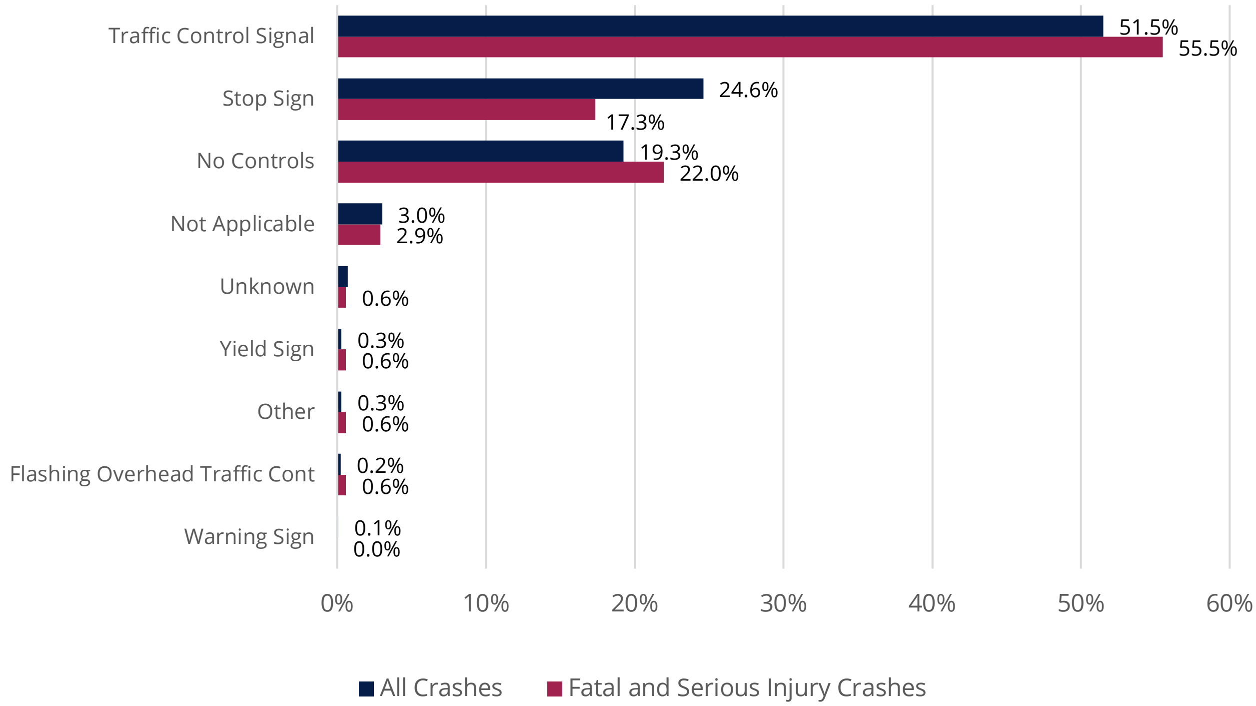

Figure 32: Intersection Crashes by Traffic Control Device, 2018-2022. Source: MnCMAT2.

Crashes by Speed Limit

Most crashes occurred on streets with a posted speed limit of 30 miles per hour at the time of the crash. This was consistent for fatal and serious injury crashes and reflects the fact that most streets in Saint Paul had a posted speed limit of 30 miles per hour before 2021 when the City implemented a citywide speed limit reduction. The proportion of fatal and serious injury crashes occurring on streets with 35 and 40 mph speed limits is slightly higher than for all crash types (Figure 33). Most bike and pedestrian crashes also occurred on streets with a posted speed limit of 30 mph at the time of the crash (68 percent of bicycle and pedestrian crashes).

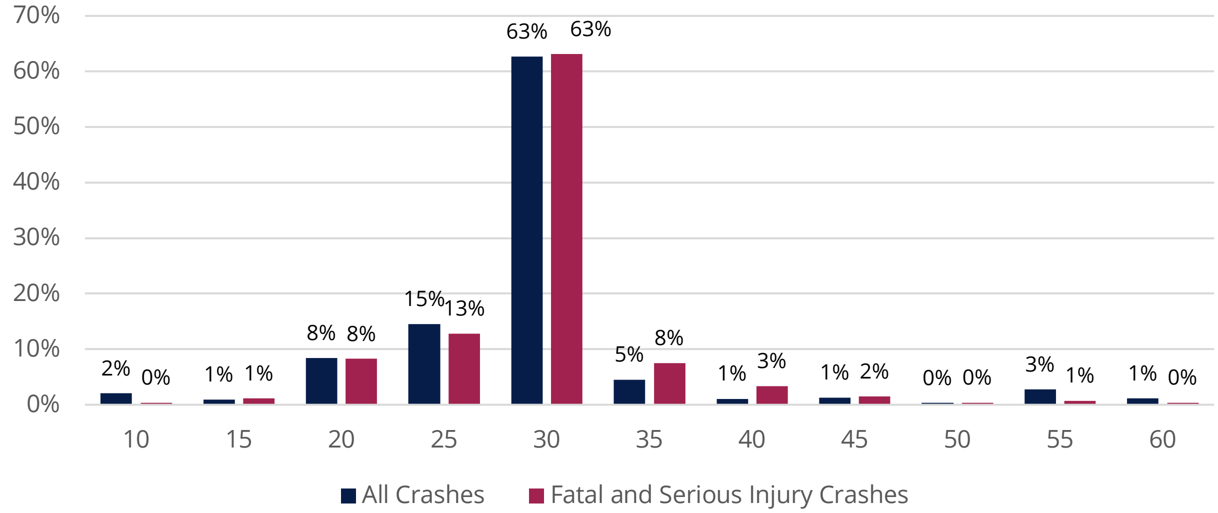

Figure 33: Crashes by Speed Limit, 2018-2022. Source: MnCMAT2. Note: Speed limit data is based on the posted speed limit at the time that the crash occurred.

The City of Saint Paul reduced speed limits on most city-owned streets in 2020. **Following this change, the number of fatal and serious injury crashes on roadways with a speed limit of 30 mph or higher decreased, while the number of severe crashes on roadways with a speed limit of 20 to 25 mph increased** (Figure 34). This reflects that a similar volume of crashes were occurring on the streets with lower speed limits that previously had higher speed limits prior to 2020.

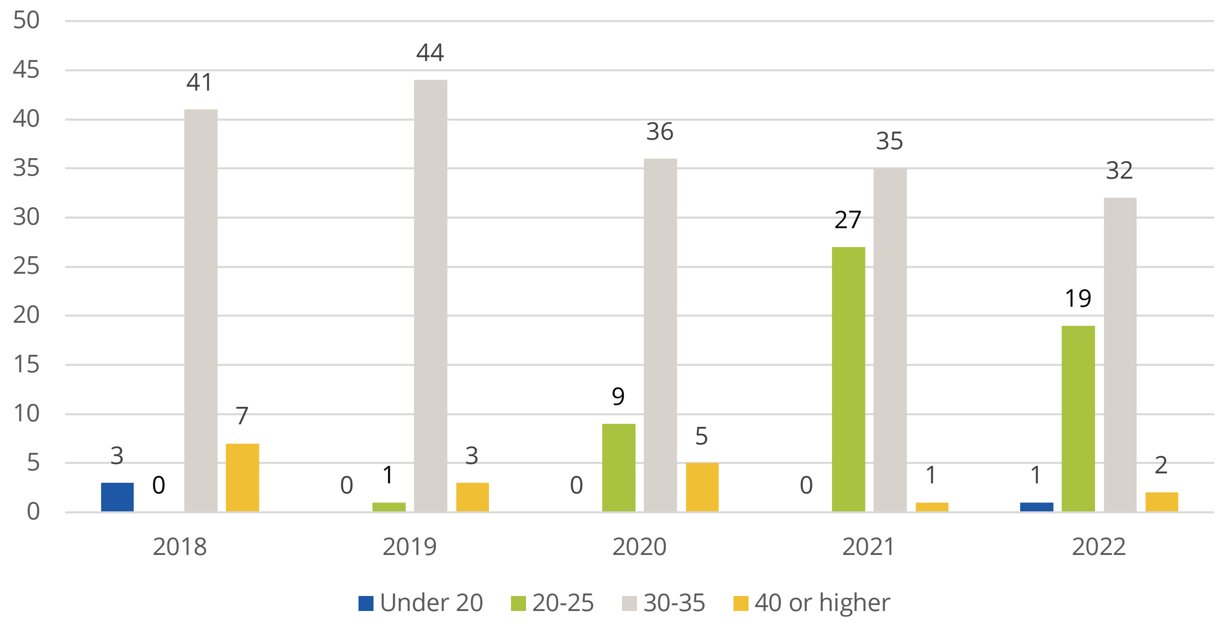

Figure 34: Fatal and serious injury crashes by speed limit by year. Source: MnCMAT2.

Vehicular-Only Crashes by Crash Type

Most crashes are classified as having an "Other" Basic Crash type in the MnCMAT2, limiting the utility of crash type analysis. For vehicular-only[31] crashes of all severities, rear end crashes are the second most frequent crash type documented. For fatal and serious injury crashes, angle crashes are the most common crash type (Figure 35).

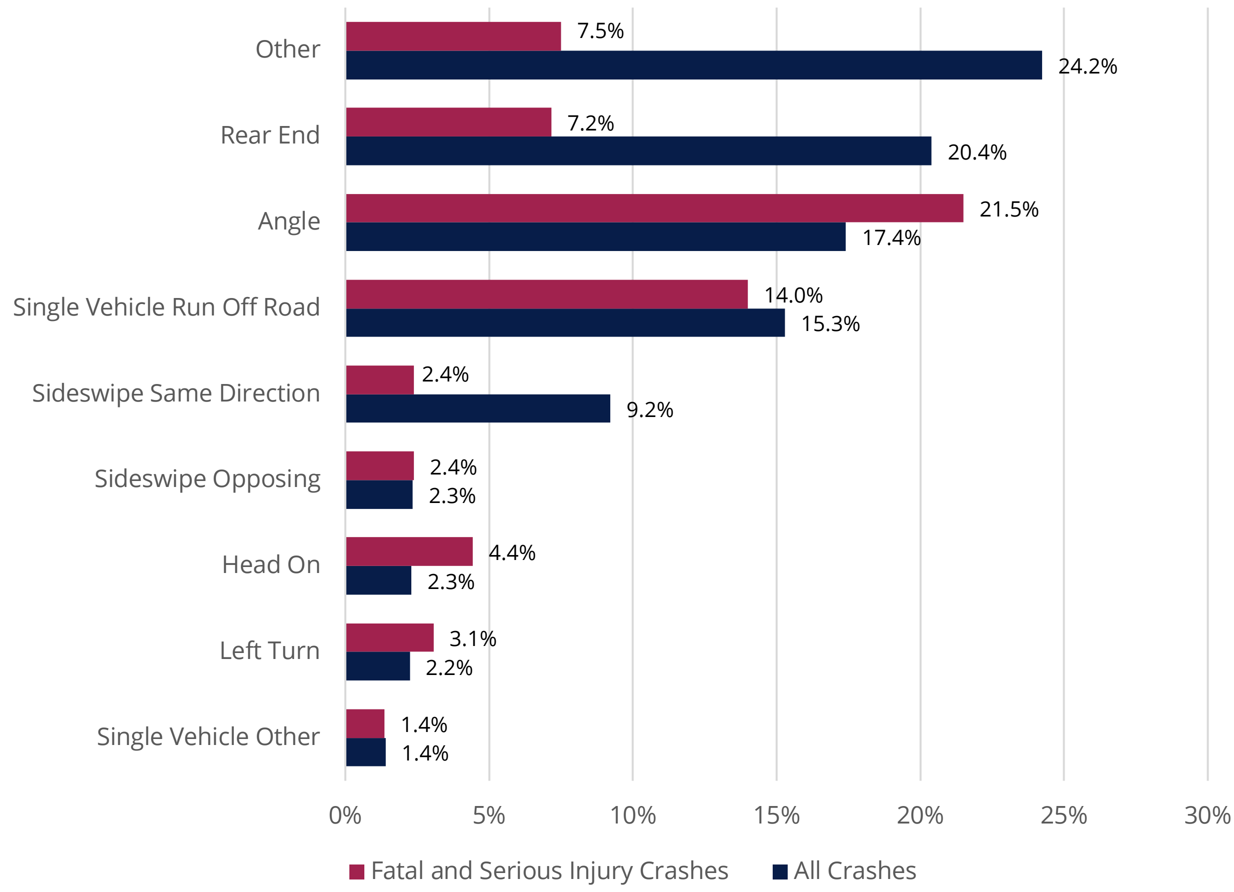

Figure 35: Basic Crash Type for Vehicular-only Crashes, 2018-2022. Source: MnCMAT2.

[31] Vehicular crashes in this case excludes crashes involving pedestrians, bicycles and motorized bicycles, motorized foot scooters, and motorized wheelchairs and other mobility devices.

Crashes by Manner of Collision

Approximately 32 percent of all crashes during the study period were front-to-rear (rear end) collisions, followed closely by angle collisions at 30 percent. Over half of fatal and serious injury crashes were angle collisions, while only 17 percent and 13 percent were front-to-front and front-to-rear collisions, respectively (Figure 36). Angle collisions occur when a vehicle strikes another between 90 and 180 degrees and can occur in a variety of ways, including involving turning vehicles at intersections, or when someone runs a red light or stop/yield sign. The high amount of fatal and serious injury for this type of collision suggests that improvements specifically targeted to reducing angle crashes (such as safety improvements at intersections) would be beneficial in improving safety. This is consistent with the finding that intersections should be a priority target of future safety improvements.

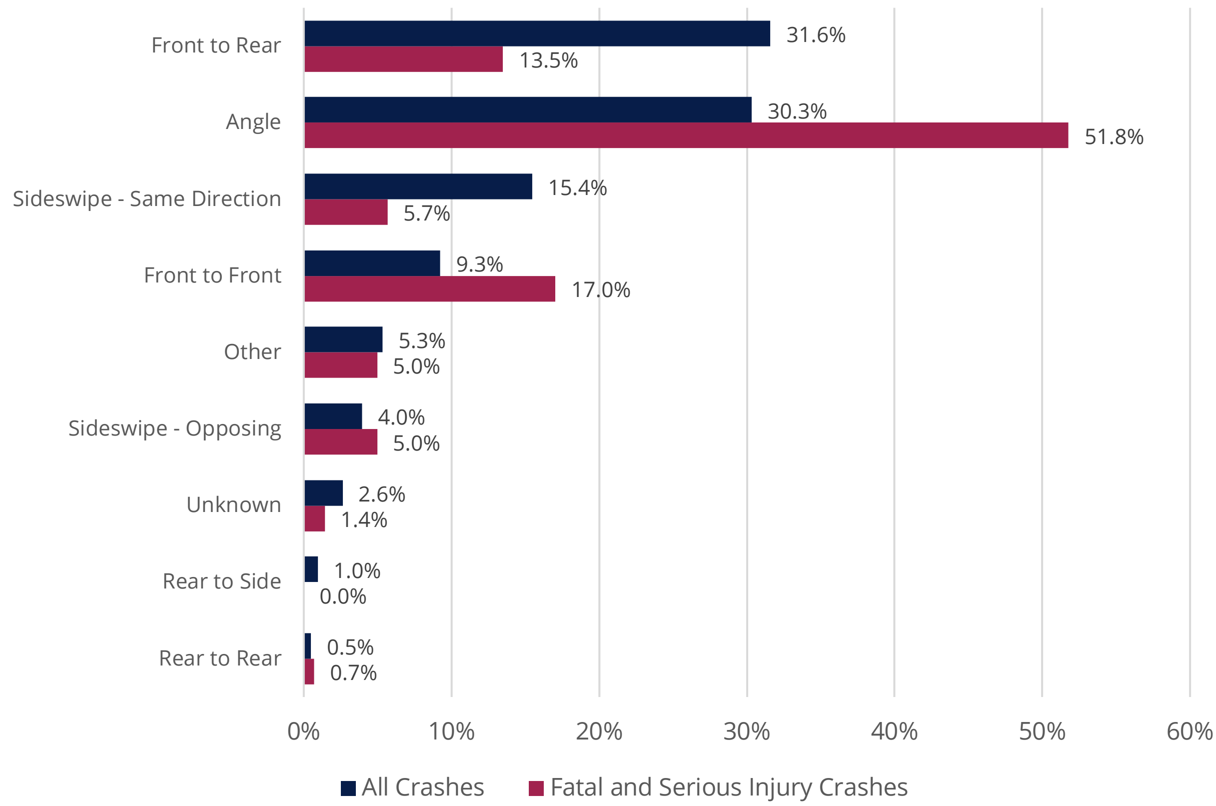

Figure 36: Crashes by Manner of Collision, 2018-2022. Source: MnCMAT2.

Vulnerable Road User Crashes by Location and Maneuver

The most common location for pedestrian and bicycle crashes was at an intersection with a marked crosswalk (Figure 37). **This data suggests that bicycle and pedestrian crossing improvements at existing crosswalks would have the greatest safety benefit.**

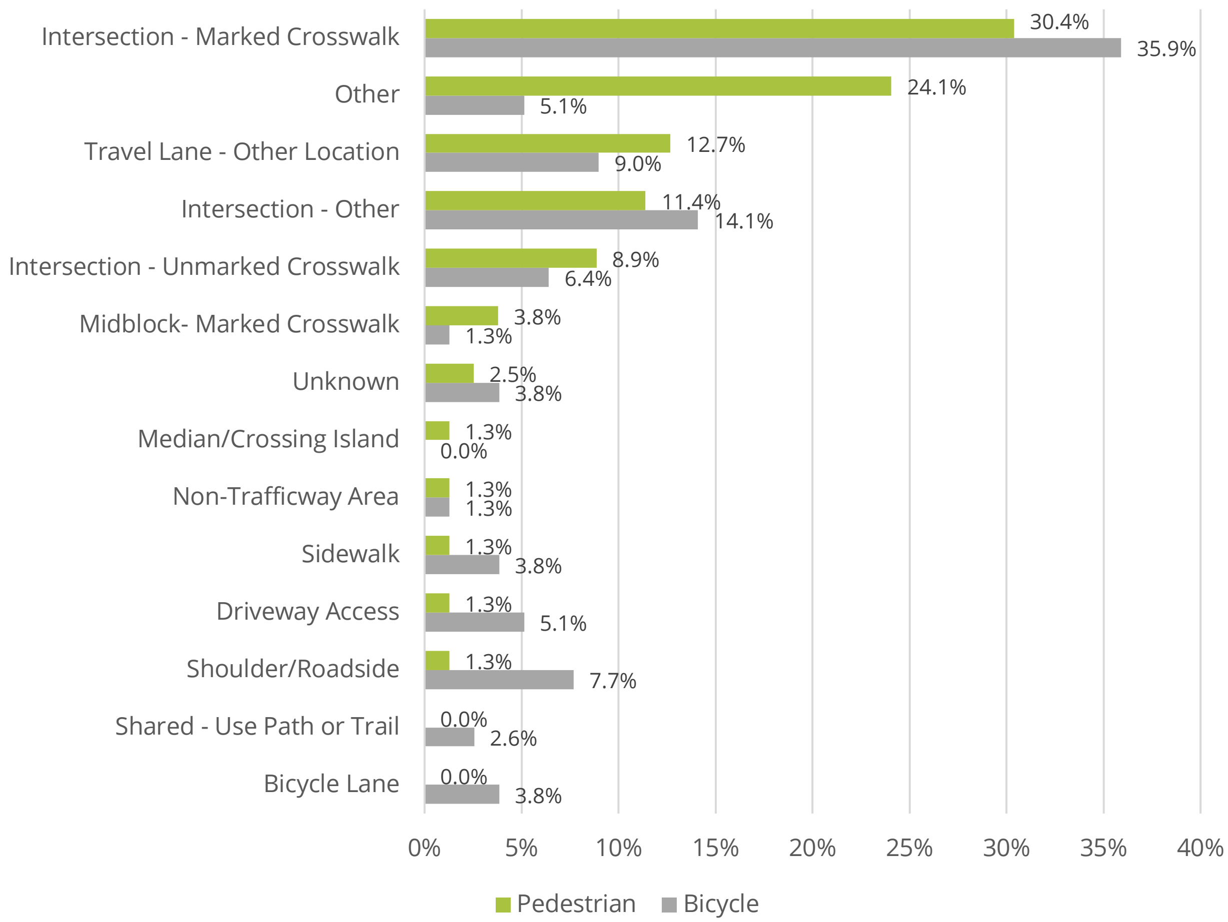

Figure 377: Pedestrian and Bicycle Crashes by Location, 2018-2022. Source: MnCMAT2.

Consistent with the most common crash location for pedestrians and bicyclists being at intersections, the most common pre-crash non-motorist maneuver in these crashes was Walk/Cycle Across Traffic (X-ing), meaning that the pedestrian or bicyclist was crossing traffic when they were struck. This was the pre-crash action/location for 54 percent of pedestrian crashes and 38 percent of bicycle crashes (Figure 38). **These trends indicate that crossing vehicle traffic is the most dangerous maneuver for** pedestrians and bicyclists, further emphasizing the importance of improving roadway crossing safety for bicyclists and pedestrians.

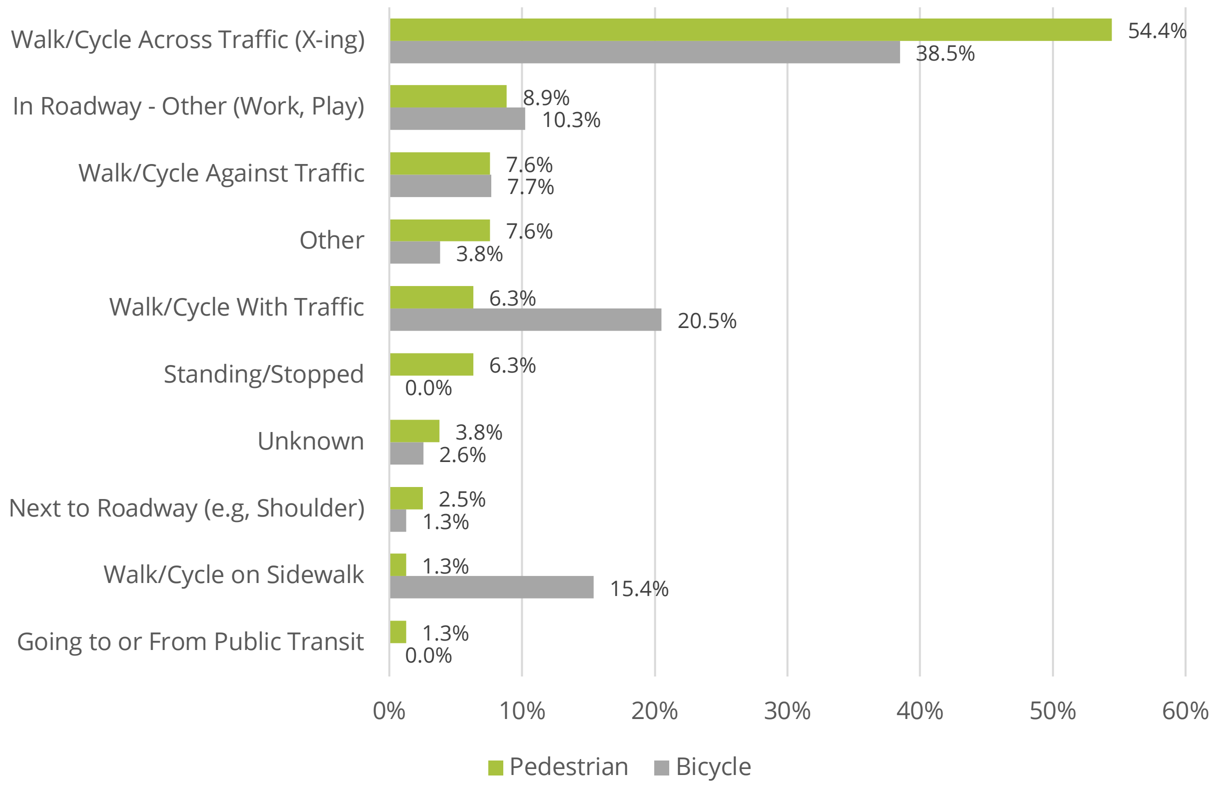

Figure 38: Pedestrian and Bicycle Crashes by Non-Motorist Maneuver, 2018-2022. Source: MnCMAT2.

Crashes by Vehicle Type

Over half of all crashes involved a Passenger Car vehicle. Sports Utility Vehicles were the second most common vehicle type involved in crashes (Figure 39). This was consistent across crash severity types and for pedestrian and bicycle crashes. A higher proportion of motorcycles are involved in fatal and serious injury crashes, which would be expected since the vehicle does not provide protection to the rider involved in a crash.

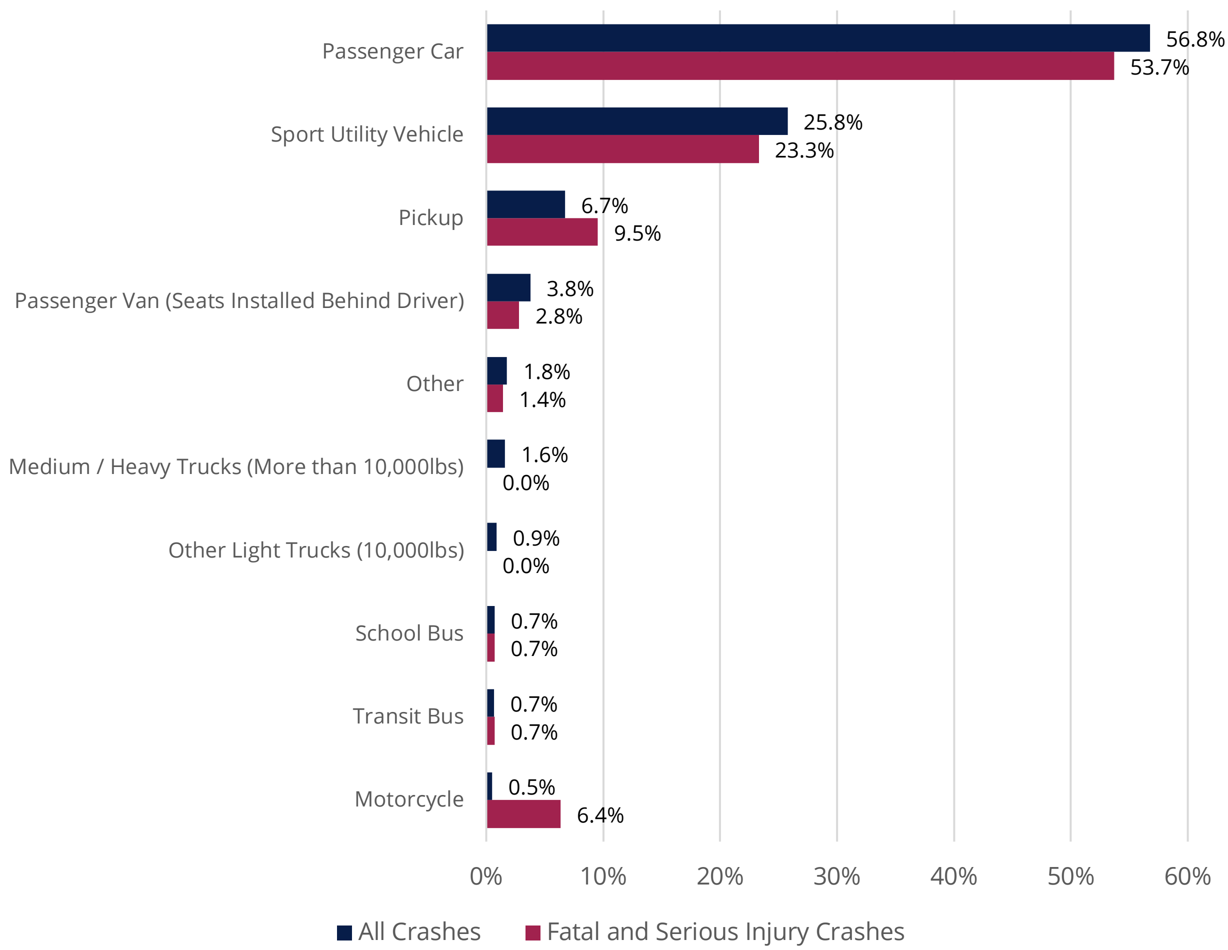

Figure 39: Crashes by Vehicle Type, 2018-2022. Source: MnCMAT2.

Crashes by Driver Behavioral Factors and Physical Conditions[32]

MnCMAT2 documents many behavioral factors and conditions for motorists involved in crashes. This includes the physical condition of involved persons. For all crash types, the driver's condition was documented as "Apparently Normal" for 75 percent of crashes. For fatal and serious injury crashes, 54 percent of motorists were described as being in "Apparently Normal" physical condition. For all crashes, 10.5 percent of motorists were under the influence of alcohol or illicit drugs. Fatal and serious injury crashes were more likely to be attributed to drivers under the influence of alcohol or illicit drugs, with 14.8 percent of serious crashes involving drivers under the influence (Figure 40).

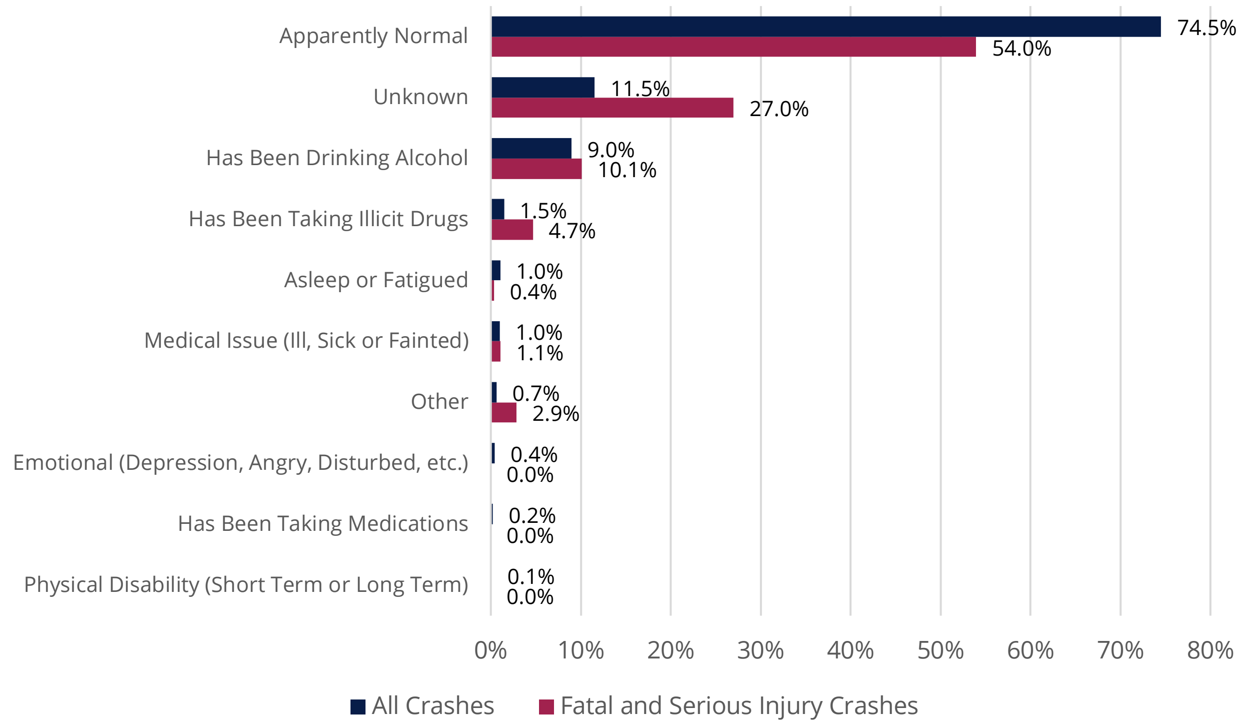

Figure 40: Crashes by Motorist Physical Condition, 2018-2022. Source: MnCMAT2.

While the MnCMAT2 database documents contributing factors for crashes, half of all crashes in Saint Paul were classified as Unknown or No Clear Contributing Factor. Contributing Factors are documented by responding officers at the scene of a crash, and factors such as conflicting witness statements, hit-and-runs, or a crash that was not witnessed by the officer make this data difficult to rely on. **Crashes involving careless or reckless driving, speeding, and failure to yield the right-of-way were more likely to cause fatalities or severe injuries (**Figure 41**).**

[32] All data on driver behavioral factors and physical conditions are based on the roadway User 1 (U1) in the MnCMAT2 database, in this analysis this is assumed to be the driver at fault for the crash

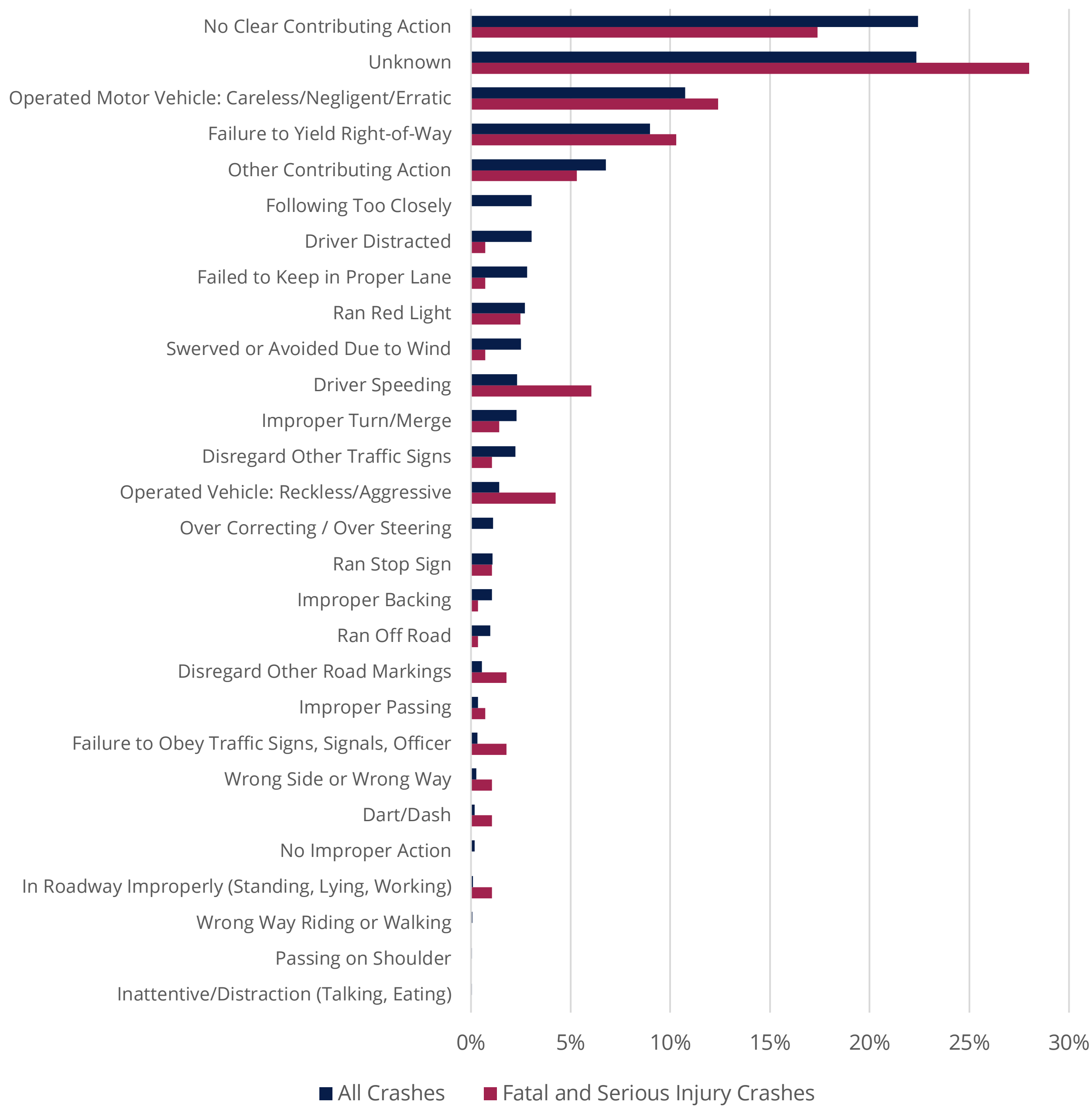

Figure 41 Crashes by Contributing Factor, 2018-2022. Source: MnCMAT2.

Finally, MnCMAT2 documents the driver's pre-crash maneuver. For over 60 percent of all crashes, the driver was moving forward when the crash occurred. **For bicycle and pedestrian crashes, the pre-crash motorist maneuvers of Turning Left or Turning Right were over-represented** (Figure 42).

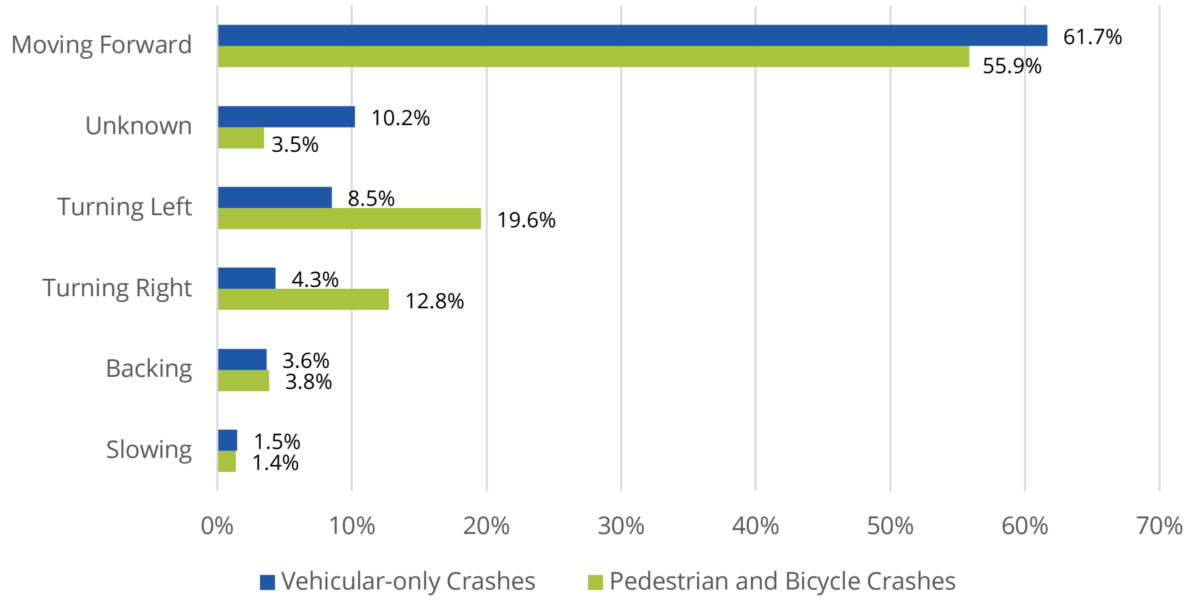

Figure 42 Driver Pre-Crash Maneuver, 2018-2022. Source: MnCMAT2.

Some anecdotal evidence and national and state-level data has examined the increase in reckless driving behaviors during and following the COVID-19 pandemic. Figure 43 examines the proportion of all crashes caused by certain behavior factors in 2022 vs 2018 to determine which, if any driving behaviors changed significantly over the analysis period (factors accounting for fewer than 2 percent of all crashes were excluded from the analysis, as well as crashes coded as "unknown" or "no contributing factor"). **This analysis found that the proportion of all crashes caused by speeding increased 184 percent over the 5-year period. Run-off-road type crashes increased 175 percent during this period, a crash type often associated with speeding or reckless driving. Other factors, such as "failure to keep in proper lane," and "improper turn/merge" also increased, along with "ran red light" and "ran stop sign."** Other factors, such as "in roadway improperly," "reckless/aggressive driving," and "passing on shoulder" also had significant increases, but these factors account for a very small proportion of overall crashes.

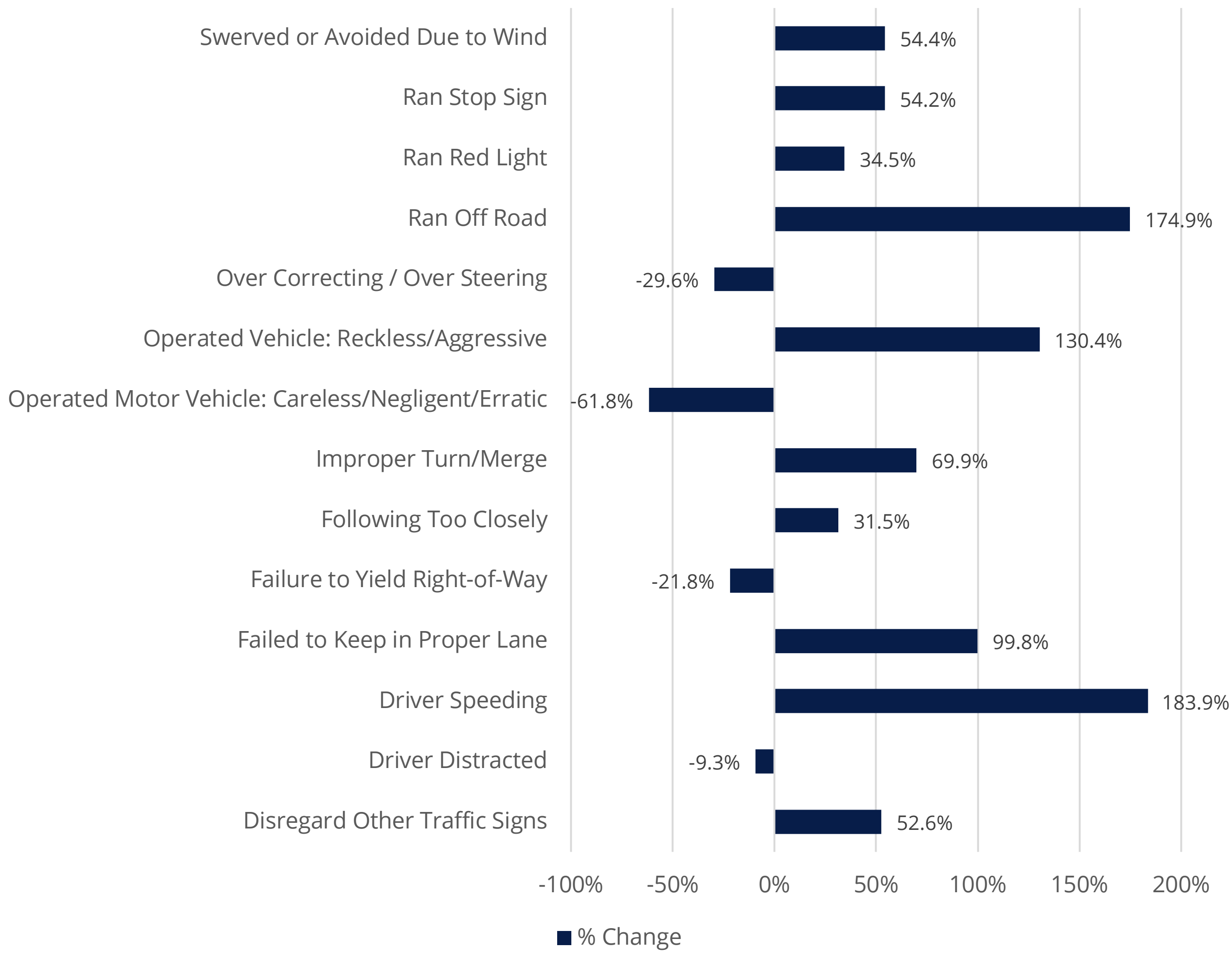

Figure 43: Change in Proportion of all Crashes Attributed to Behavioral Factors, 2022 vs 2018. Source: MnCMAT2

Crashes by Age of People Involved

Approximately 50 percent of all crashes and fatal and serious injury crashes involved motorists between the ages of 21 and 49 years old (Figure 44).[33] Less than ten percent of all crashes and fatal and serious injury crashes involved motorists under the age of 18. There is not a major takeaway from this information that Saint Paul can act on in this Transportation Safety Action Plan but provides baseline information.

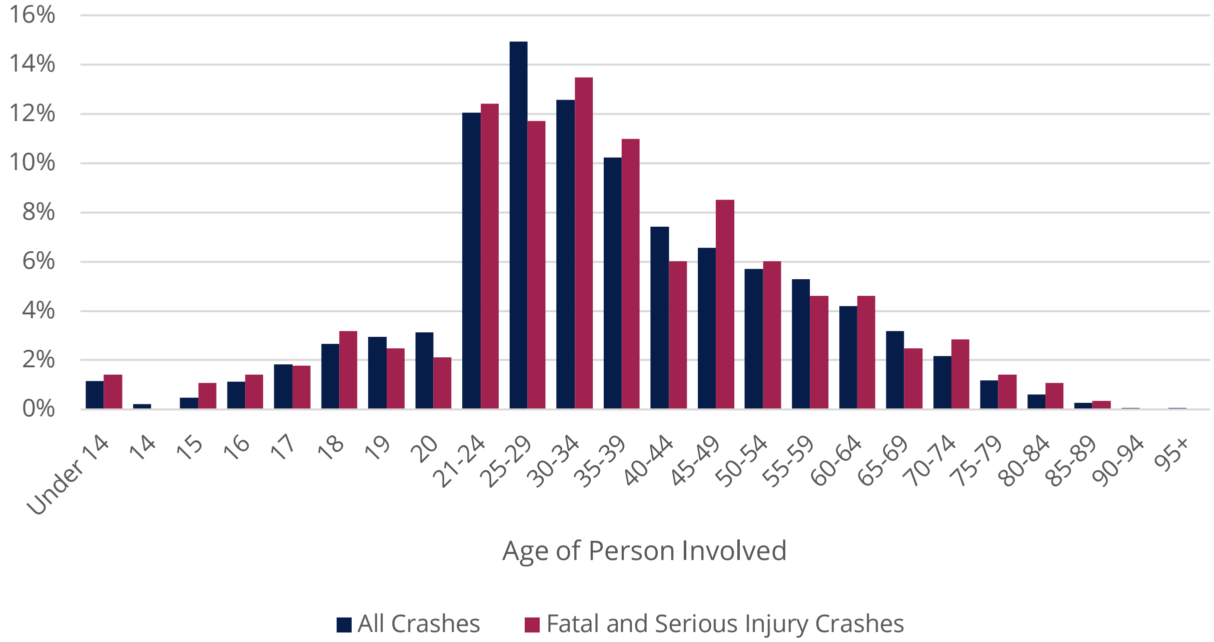

Figure 44 Crashes by Age of People Involved, 2018-2022. Source: MnCMAT2

[33] The data in this figure is based on the roadway User 1 (U1) in the MnCMAT2 database.

Crashes by Sex of People Involved

Most crashes in Saint Paul involved motorists who were identified as Male in the crash report. Male motorists were involved in 61 percent of all crashes in Saint Paul and in 66 percent of all fatal and serious injury crashes (Figure 45). There is not a major takeaway from this information that Saint Paul can act on in this Transportation Safety Action Plan but provides baseline information.

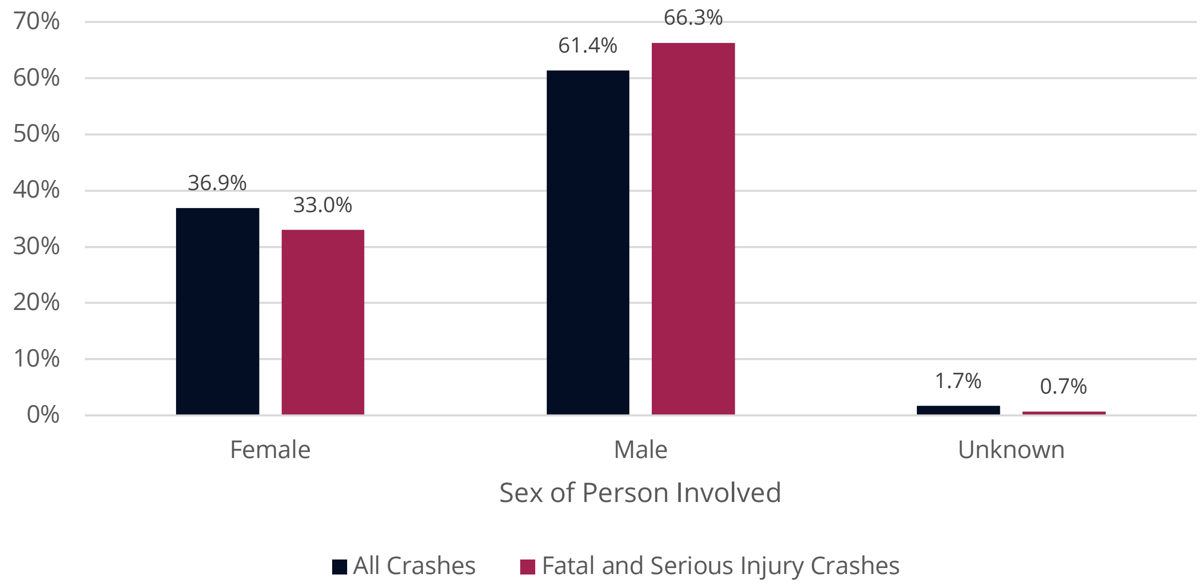

Figure 45 Crashes by Sex of People Involved, 2018-2022. Source: MnCMAT2

Crash Data Equity Analysis

Purpose

Traffic safety is an equity issue. Nationally, People of Color and low-income communities bear a disproportionate burden of traffic-related injuries and fatalities. Indigenous people and Black people are much more likely to be killed when walking than other racial and ethnic groups, and lower-income census tracts have significantly higher pedestrian fatality rates than affluent communities (Figure 46; Figure 47).

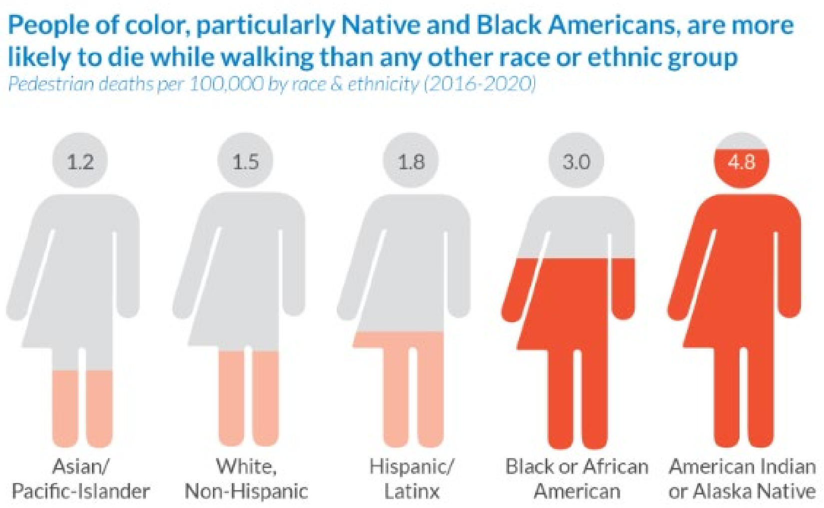

Figure 46: Traffic safety equity disparities. Source: Dangerous by Design.

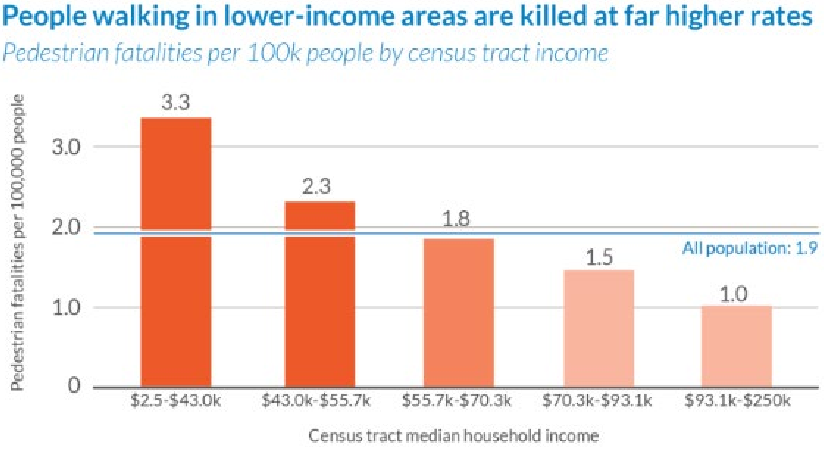

Figure 47: Traffic safety equity disparities. Source: Dangerous by Design.

Although decades of data demonstrate these patterns across the country, no racial equity analysis of crash data has been completed for the City of Saint Paul because demographic data is not available for the crashes. Therefore, this analysis seeks to better understand the relationships among race and ethnicity, disadvantaged communities, and traffic-related injuries and deaths in Saint Paul. Key questions include:

1. Are there racial and ethnic inequities in traffic-related serious injuries and deaths in Saint Paul? If so, what are they?
2. Are there more traffic-related serious injuries and deaths in parts of the city that are both (1) majority Black, Indigenous, and/or People of Color (BIPOC), and (2) USDOT-designated Historically Disadvantaged Communities (HDC)?[34]

Methodology

To answer these questions, the analysis took a two-pronged approach:

1. **Demographic Analysis.** To find out if there are racial disparities in serious traffic injuries and fatalities, data from the Fatality Analysis Reporting System (FARS) maintained by the USDOT's National Highway Traffic Safety Administration (NHTSA) was used.[35] FARS data from 2010 to 2019 was used, and the data includes the race and ethnicity of people who died in fatal traffic crashes. Race and ethnicity information was not available for 2020 and later years. The data was then disaggregated by race and ethnicity and compared to the city-wide average proportion of residents in each race and ethnic group.
2. **Geographic Analysis.** To understand if there are more traffic-related serious injuries and deaths in BIPOC and Historically Disadvantaged Communities, a GIS layer was created of "Equity Priority Areas" that are census tracts in which over 50 percent of residents identified as BIPOC and/or Hispanic, based on 2019 Census data, and are an HDC. The crash data was overlaid on the Equity Priority Areas to calculate the percentage of serious-injury and fatal crashes that occurred there, comparing it to the percentage of residents who live in the Equity Priority Areas, and the percentage of geographic area of Saint Paul. Additionally, the road segments and intersections with high crash rates (crashes per traffic volume) were overlaid on the Equity Priority Areas to observe patterns.

Demographic Analysis

The demographic analysis found that Black, Indigenous, and People of Color in Saint Paul were over-represented in traffic-related fatalities between 2010 and 2019 (race and ethnicity data are not available for 2020). This is based on a simple analysis, not a statistical test. While BIPOC made up an average of 45.9 percent of the Saint Paul population, they comprised 50 percent of the traffic fatalities. White people averaged 54.1 percent of population and 50 percent of traffic fatalities.

The analysis also compared fatalities by race to the racial and ethnic composition of the city in 2015-2019 (Table 5). During this period, **people who are Black and American Indian were over-represented in traffic-related fatalities.** People who are White and Asian are significantly under-represented in traffic fatalities.

[34] https://www.arcgis.com/apps/dashboards/99f9268777ff4218867ceedfabe58a3a
[35] https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars

Table 5 Fatalities Compared to City Population, 2015-2019.

	% Traffic Fatalities	% Population
White (Non-Hispanic)	42.2%	57.0%
Black (Non-Hispanic)	20.0%	16.1%
Other (Non-Hispanic)	20.0%	0.2%
Hispanic or Latino (any race)	6.7%	9.2%
American Indian	4.4%	0.8%
Asian	4.4%	18.7%
Multiple Races (Non-Hispanic)	2.2%	4.0%

Source: FARS, Census Bureau

It's also important to note that 20 percent of traffic-related fatalities were listed as "Other Race (Non-Hispanic)", compared to only 0.2 percent of the population. Data quality and the use of racial and ethnic categories that are inconsistent with how the Census Bureau categorizes race is a major limitation of the FARS data.

Geographic Analysis

As described above in the methodology, for the geographic analysis the Equity Priority Areas were mapped based on a combination of census tracts that the USDOT has identified as Disadvantaged Areas and census tracts that have over 50 percent BIPOC. These criteria were selected based on input from the Technical Advisory Committee (TAC) for the Transportation Safety Action Plan as well as other research and discussion. The benefits of using these datasets include:

- The HDC index includes a multitude of relevant data including transportation, health, environmental, economic, resilience, and equity-related disadvantages;
- The USDOT uses the HDC index to evaluate Safe Streets for All grant applications; and
- By only including the HDC tracts that have 50 percent or more BIPOC, Saint Paul is able to apply a racial equity lens to the analysis (the HDC map does not include race or ethnicity as a variable).

The map in Figure 48 shows an overlay of HDCs (crosshatched with bold outline) and more than 50 percent BIPOC population (in purple).

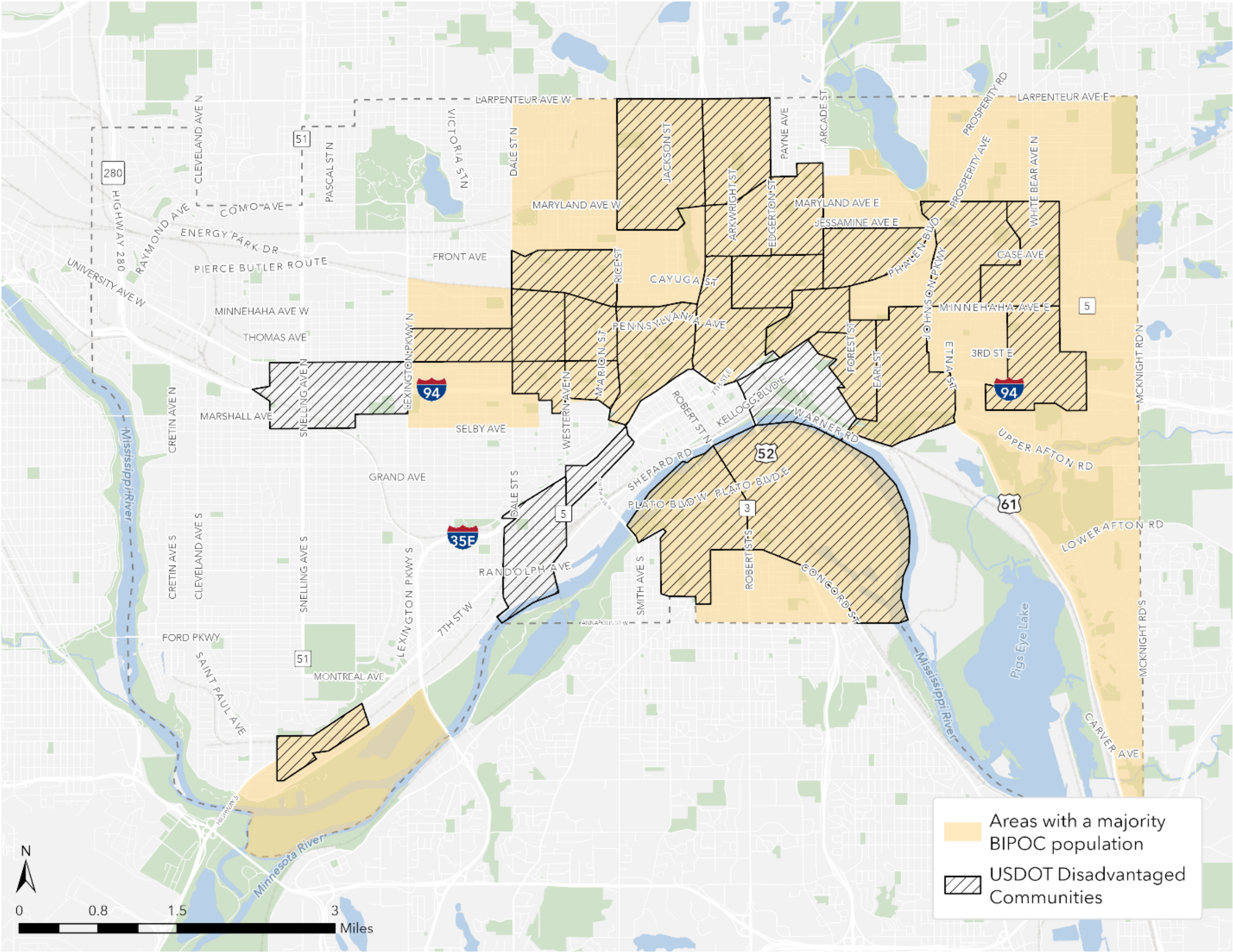

Figure 48: USDOT Historically Disadvantaged Communities and Areas with Majority BIPOC Population

The map in Figure 49 shows the resulting Equity Priority areas in blue. Three HDC tracts had less than 50 percent BIPOC and were therefore removed.

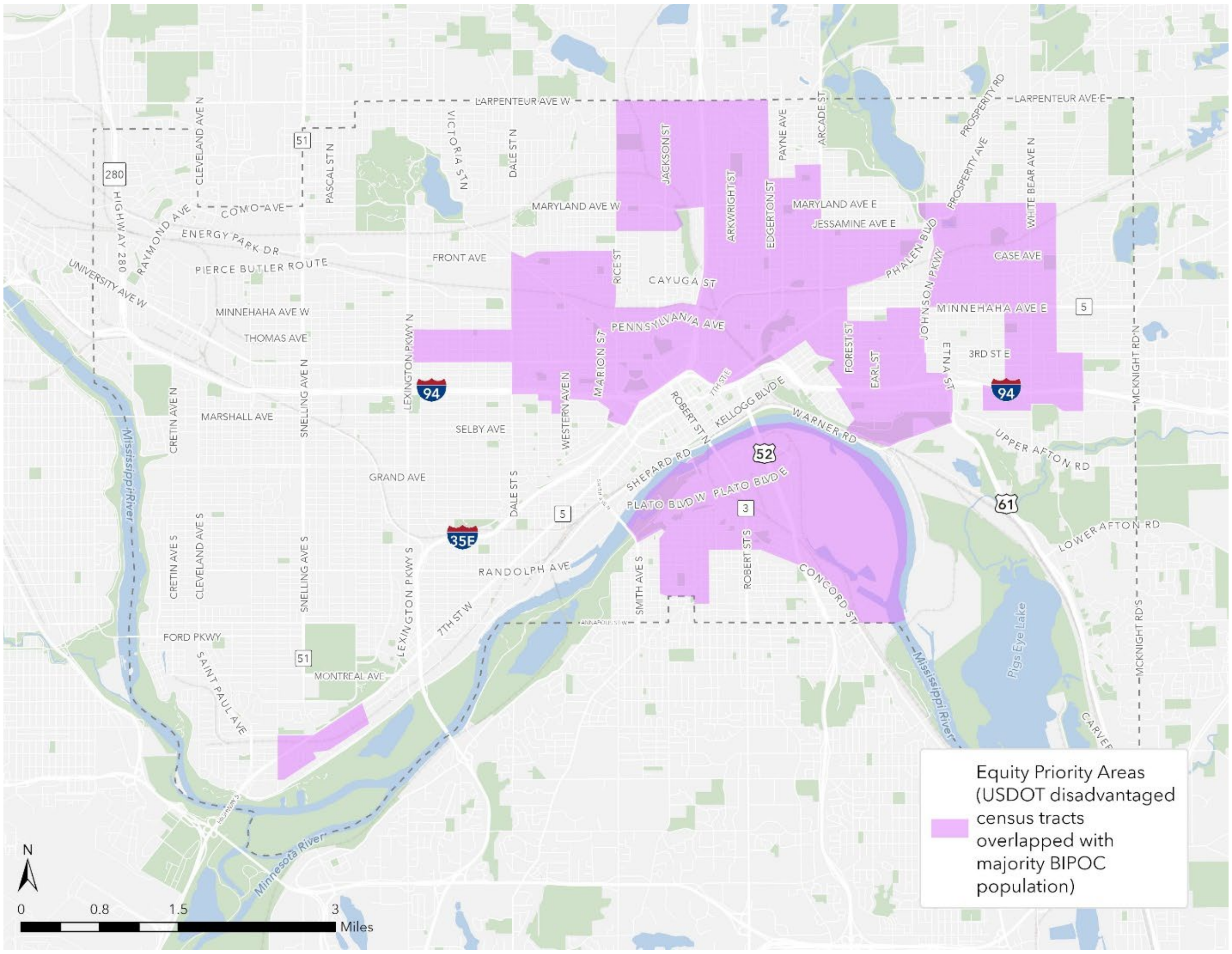

Figure 49: Saint Paul Equity Priority Areas.

When crashes data was overlaid on these areas as shown on the map on the following page, **the Equity Priority Areas bear a disproportionate burden of traffic-related serious injuries and fatalities.**

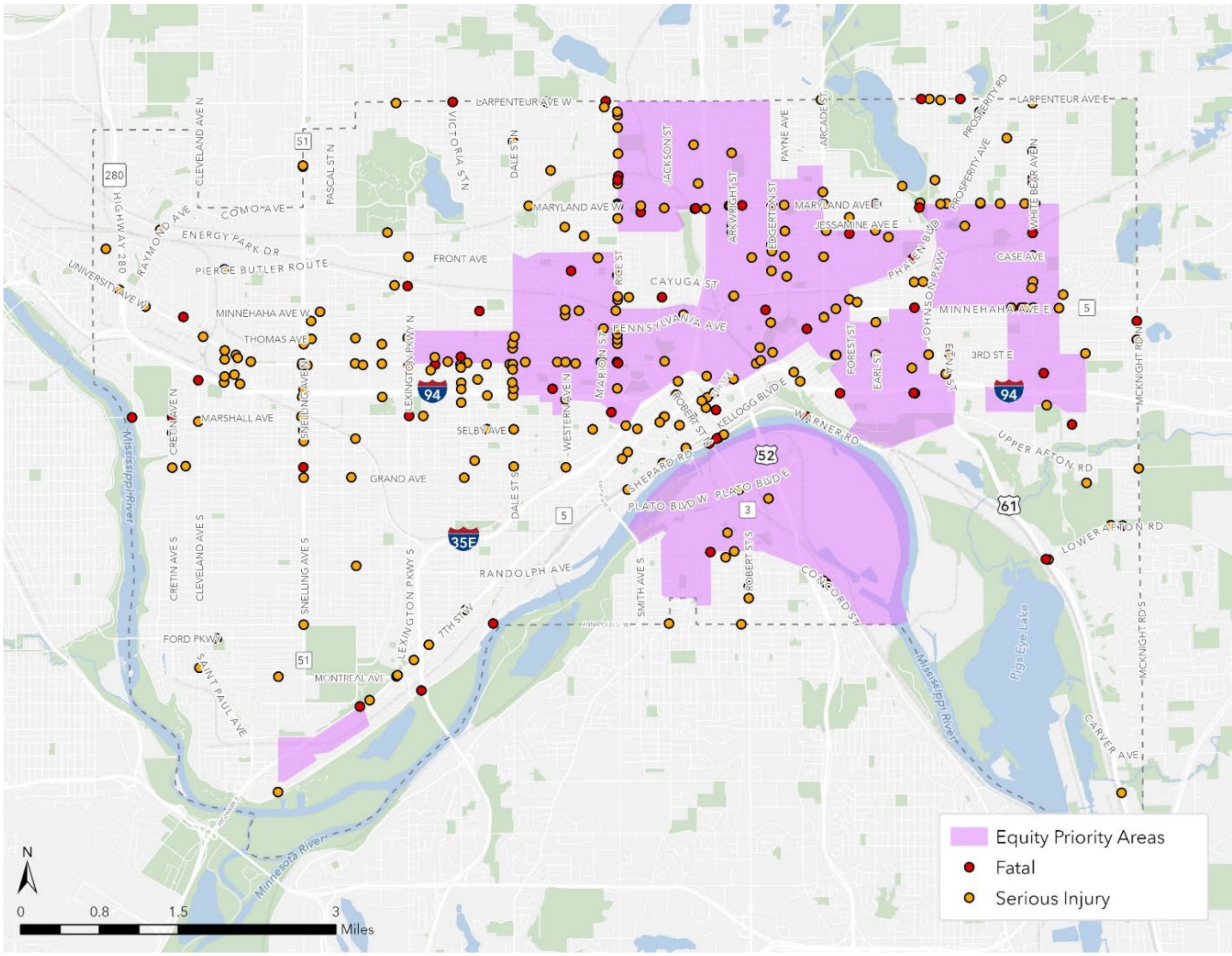

Figure 50: Fatal and serious injury crashes with the project equity priority areas. Source: MnCMAT2.

While these areas contain 28 percent of Saint Paul residents and 22 percent of the City's area, 48 percent of fatal accidents and 48 percent of serious injury crashes happened there (Table 6). Cells highlighted in green in the table below represent those where the percentage of crashes is below the expected value based on the total population in that area, while cells highlighted in red represent those values where crashes are above the expected value based on the population. The analysis shows that both the USDOT Disadvantaged Areas and the Plan's more focused equity priority areas represent a disproportionate number of all types of crashes.

Table 6: Crashes in Equity Priority Areas.

	USDOT Disadvantaged Areas	Equity Priority Area (USDOT Areas with BIPOC majority)	Non-Equity Priority Area	Saint Paul (all)
Population	92,106 (30%)	83,887 (28%)	220,660 (72%)	304,547
Area (square miles)	14.8 (26%)	12.6 (22%)	43.5 (78%	56.1
Population density (people per square mile)	6,223.4	6,657.7	5072.6	5,428.6
Fatal Crashes[36]	28 (52%)	26 (48%)	28 (52%)	54
Serious Injury Crashes	147 (55%)	128 (48%)	136 (51%)	264
All Crashes	8,506 (53%)	7,048 (44%)	9,021 (56%)	16,070
Bicycle Crashes	136 (47%)	99 (34%)	189 (66%)	288
Pedestrian Crashes	360 (52%)	289 (42%)	397 (58%)	686

Source: Census Bureau, MnCMAT2.

Crashes that occurred in Equity Priority Areas were more likely to be serious or fatal compared to the other parts of the city. In this period, Equity Priority Areas had 2.06 fatal crashes per square mile, whereas Non-equity priority areas had only 0.64 fatal crashes per square mile. The gap between Equity Priority Areas and Non-Equity Priority Areas is even more pronounced for Serious Injury Crashes, with a rate of 10.16 and 3.13 per square mile, respectively.

Finally, the top 20 high crash road segments and intersections were overlaid on the Equity Priority Areas. Fourteen of the top 20 high crash intersections and 14 of the top 20 high crash segments are in an Equity Priority Area, despite these areas being only 17 percent of the city's land area.

[36] Fatal crash data refer to number of crashes, not number of fatalities in this table

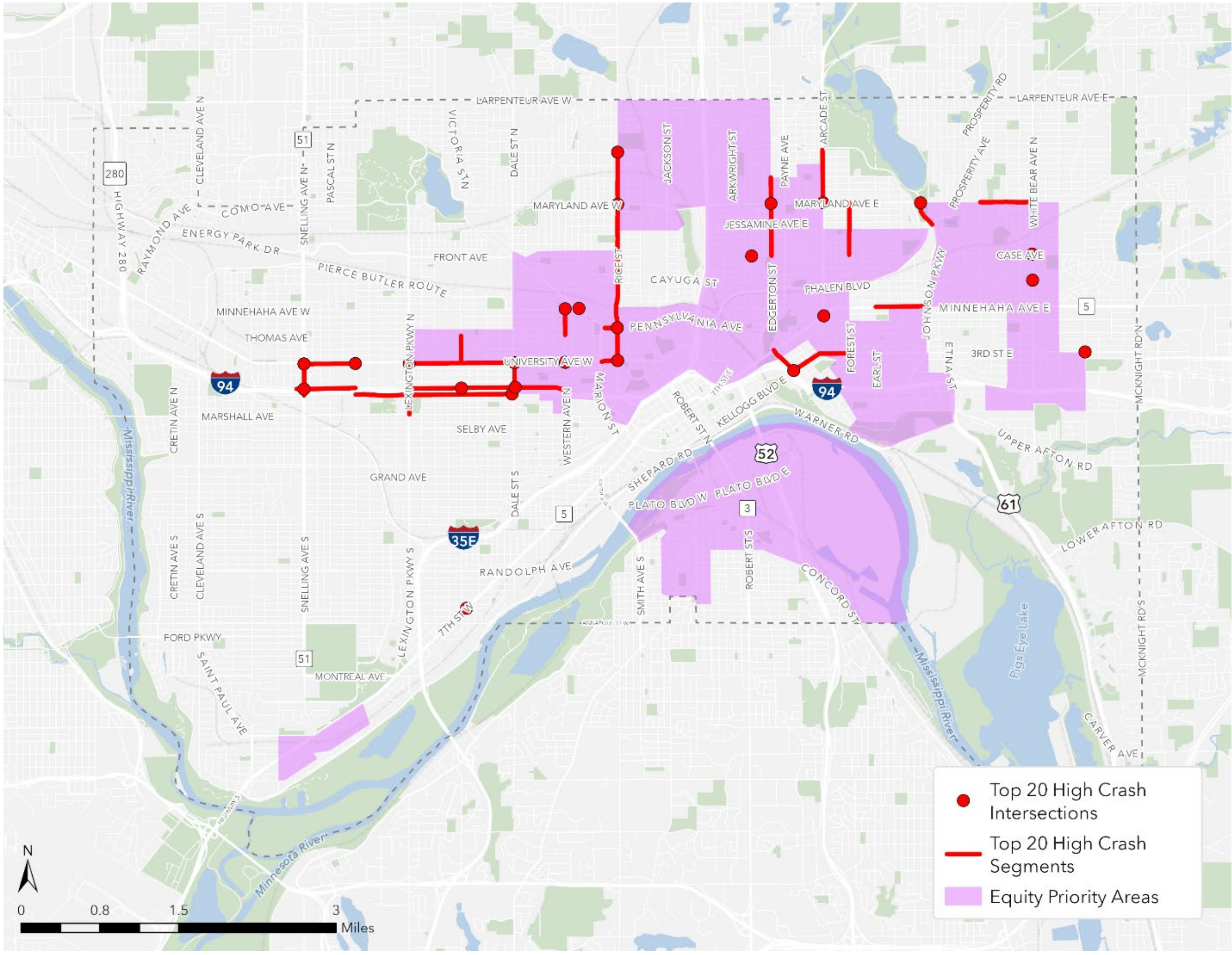

Figure 51 High Crash Intersections and Segments in Equity Priority Areas.

High Injury Network and High Crash Network

High Injury Network – All Modes

Methodology

A High Injury Network (HIN) is a network of streets where more severe crashes occur and where safety interventions should be targeted. Saint Paul's HIN is based on the 1,806 crashes that occurred between 2018 and 2022 that were classified as fatal, serious injury, or minor injury. These crash severity levels were weighted to assign a higher priority to fatal and serious injury crashes.

This HIN was developed in the following steps:

1. The City of Saint Paul's Street Centerline dataset was used to create longer corridor segments by merging individual block features that had the same street name and functional classification.
2. These longer corridor segments were broken up into smaller segments at major streets/arterials to create shorter segments so that patterns along and within a single corridor could be evaluated.
3. Fatal, serious injury, and minor injury crashes of all modes were joined to these corridor segments using a 50-foot buffer to join the crashes to the corresponding street.
4. Crashes were weighted to assign a higher weight to fatal and serious injury crashes than minor injury crashes. Fatal and serious injury crashes received a weight of 3 and minor injury crashes received a weight of 1.
5. Segments with only 1 crash and segments that were shorter than 0.25 miles were excluded from the sample because these segments would have a high crash rate calculated, but do not represent a safety issue.
6. The weighted crash score was normalized by segment length to get a value for crashes per mile.
7. The list of corridor segments was ranked from high-to-low weighted crashes per mile.
8. The top 20 percent of corridor segments based on the crash score per mile were mapped and visually checked to create an intuitive network. Some segments just outside the top 20 percent of crash scores were included in the network in this step for reasons such as a high number of total crashes linking of two higher-crash segments to create a continuous, intuitive network.

Traffic volume was not included as a factor in developing the HIN because AADT data were not available for all streets and the HIN was intended to reflect all streets. Additionally, the purpose of the HIN is to identify segments where a high volume of fatalities and serious injuries occur, regardless of traffic volumes and crash rates.

High Injury Network

The map in Figure 52 shows Saint Paul's High Injury Network for all modes (vehicle, pedestrian, and bicycle crashes). **Some of the major streets included in the High Injury Network are portions of White Bear Avenue, Maryland Avenue, East and West 7th Street, Snelling Avenue, Robert Street, Minnehaha Avenue, Rice Street, Dale Street, and University Avenue.** The segments included in this HIN are those that have approximately the top 20 percent of weighted crash scores within Saint Paul. **This High Injury Network captures about 56 percent of all fatal and injury crashes and represents about 17 percent of the surface street roadway miles in Saint Paul.** The High Injury Network is a major product of the crash analysis and will be used to identify priority locations for future safety projects, since improvements on this network will have a high potential of reducing fatal and injury-causing crashes.

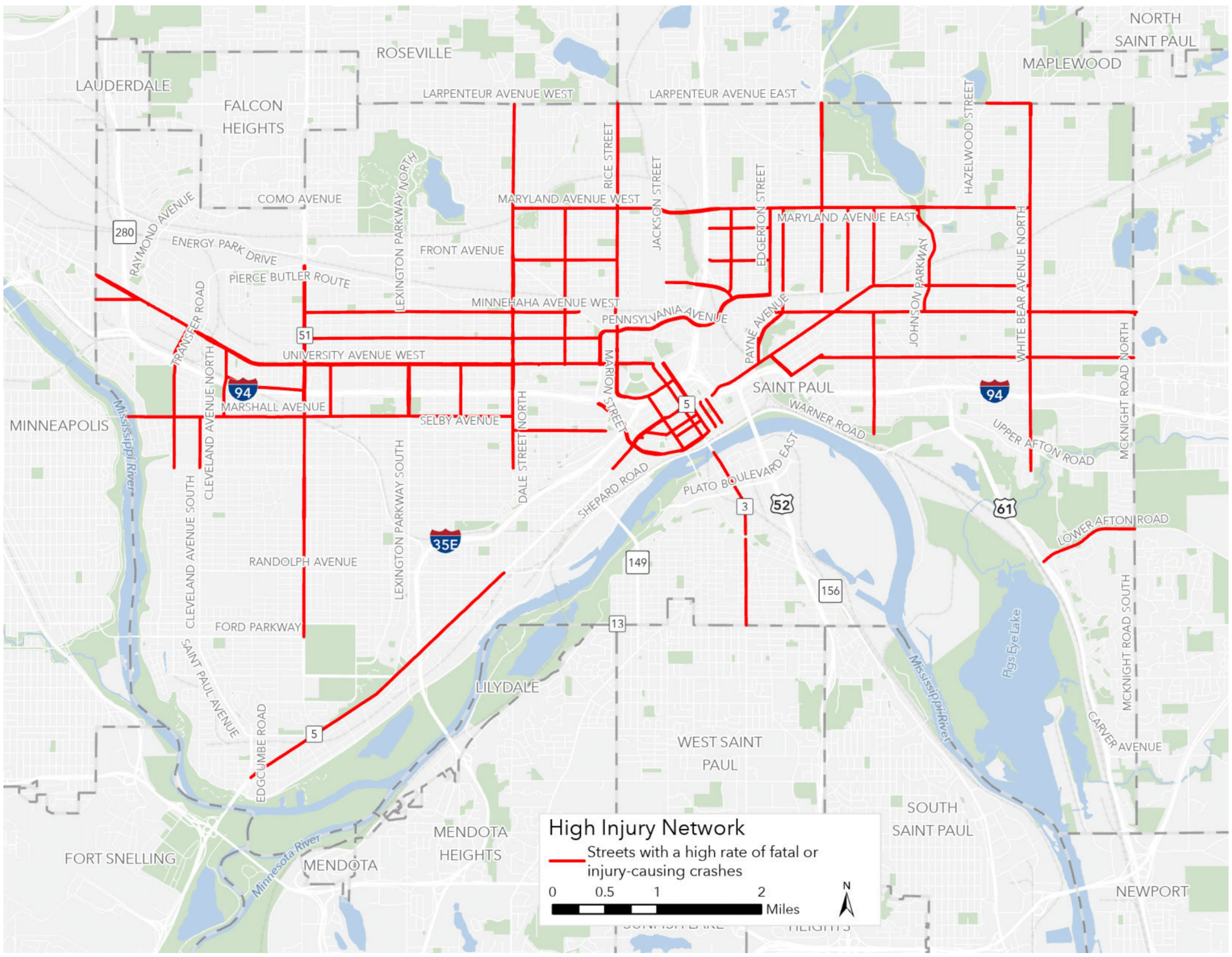

Figure 52 High Injury Network, 2018-2022.

High Crash Network – Vulnerable Road Users

Methodology

Like the HIN for all modes, a High Crash Network (HCN) was developed for vulnerable road users. A separate HCN was created for both bicyclists and pedestrians. These networks were created using a similar methodology as the HIN; however, for the HCN all crash severity levels were included. This is because there are fewer serious injury and fatal crashes involving pedestrians and bicyclists, meaning that it would be more difficult to identify spatial trends. In addition, any crash involving a vulnerable road user has the potential of being a serious injury or fatal crash. For these reasons, the network for vulnerable road users is a High Crash Network rather than a High Injury Network.

High Crash Network

The map in Figure 53 shows a simplified network of segments with the highest number of bicycle and pedestrian crashes per mile, or segments with a high number of total bicycle and pedestrian crashes. In this map, high crash segments are disaggregated for bicycle and pedestrian crashes. **The segments shown in purple are those that are top crash corridors for both pedestrian and bicycle crashes. This includes University Avenue, Snelling Avenue, Lexington Parkway, Rice Street, Arcade Street, and many streets in downtown Saint Paul.** The lines shown in blue are those that are only in the top crash corridors for pedestrian crashes, and those shown in red are only in the top crash corridors for bicycle crashes.

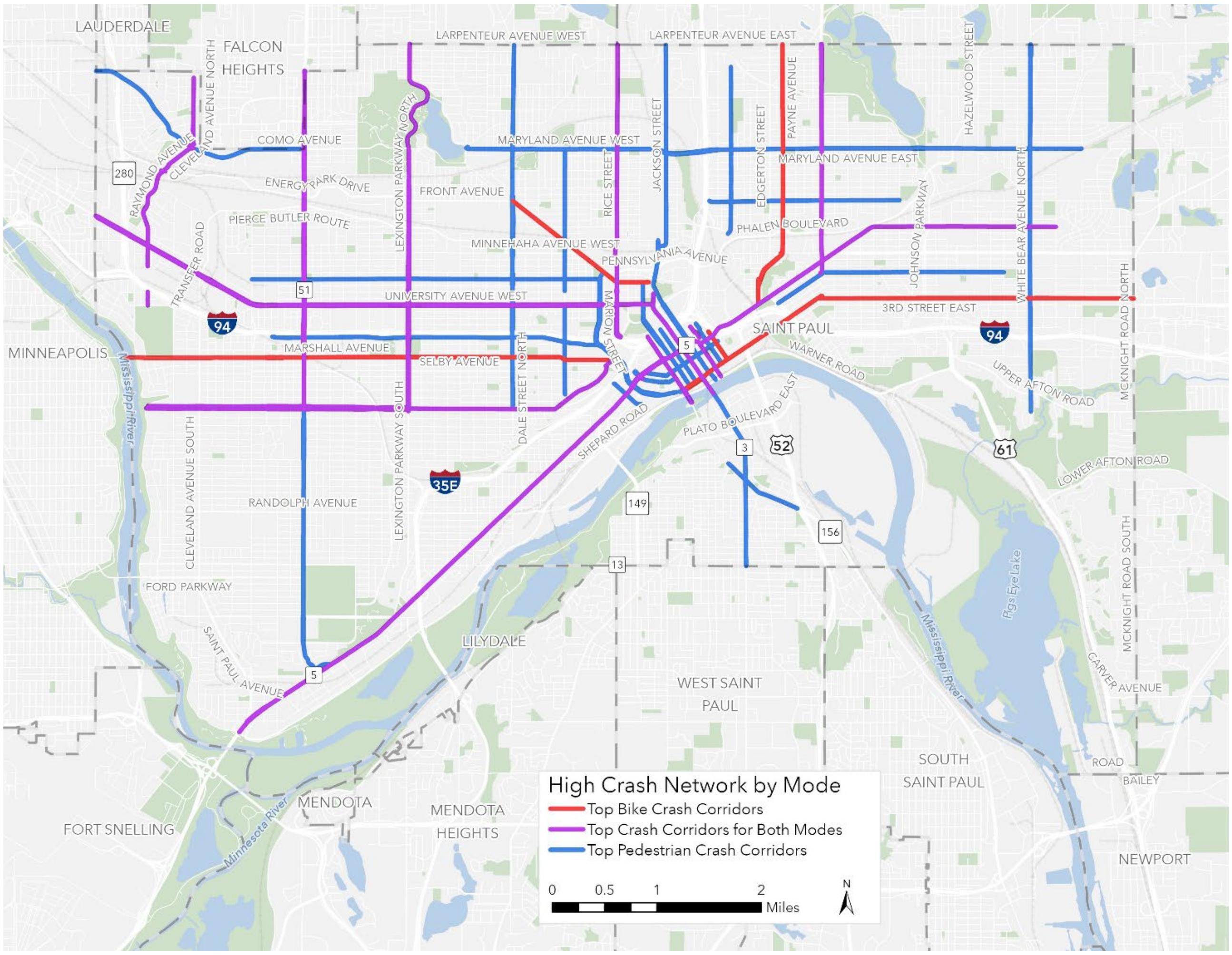

Figure 53: High Crash Network, 2018-2022.

Combined High Injury Network and High Crash Network

The HIN and HCN were combined to identify areas of overlap, which indicate the corridors in the city that have both a high rate of bicycle and pedestrian crashes, as well as a high rate of fatal and injury-causing crashes. These segments, as shown below in the map and table, represent the top priority corridors of the city for future safety projects, since improvements to these corridors have the highest potential to reduce fatalities and injuries for all roadway users. Future improvements on these segments should include substantial investments in pedestrian and bicycle safety, as well as vehicle safety.

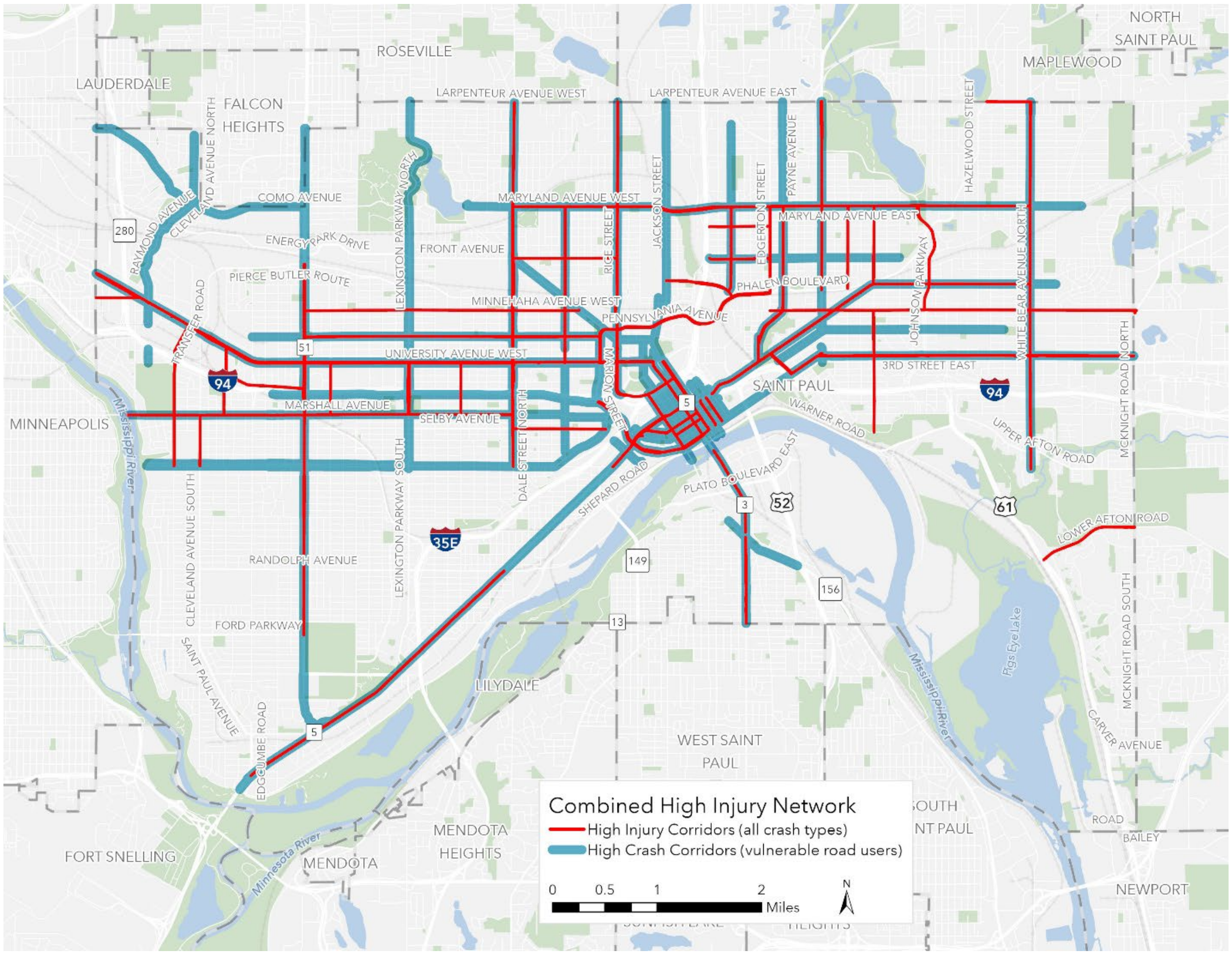

Figure 54: Combined High Injury Network and High Crash Network.

Key Findings and Next Steps

The crash analysis identifies a number of significant trends over the five-year analysis period. The takeaways identified below will guide the development of the Transportation Safety Action Plan's recommendations:

- Vulnerable Road Users, including pedestrians and bicyclists, are at a higher risk of being involved in more serious crashes, especially when comparing the severity of crashes involving each mode with the percentage of total trips involving that mode. **This indicates all vulnerable road users, and particularly pedestrians, are at higher risk of injury or death while using the city's transportation system, and future investments should prioritize improving safety for these users.**
- While only 23 percent of all crashes occurred on county-owned streets, 32 percent of all fatal and serious injury crashes occurred on those streets. **Targeting safety interventions along roads under County jurisdiction, in partnership with Ramsey County, should be a priority strategy for decreasing fatal and serious injury crashes.**
- While Minor Arterials only account for 21 percent of all lane miles in Saint Paul 39 percent of all crashes occurred on Minor Arterials between 2018 and 2022 and 47 percent of all fatal and serious injury crashes took place on Minor Arterials during this period. **Targeting safety interventions along Minor Arterials should be a priority strategy for decreasing fatal and serious injury crashes.**
- Approximately half of all crashes that occurred at an intersection were at intersections with a traffic control signal (51.5 percent), with a slightly higher proportion of fatal and serious injury crashes occurring at these intersections (55.5 percent). **Targeting intersection safety improvements at signalized intersections is likely to have a high impact on crash reduction.**
- A high proportion of both pedestrians and cyclists are hit when they are crossing traffic at an intersection (especially at intersections with a marked crosswalk). Turning vehicles are much more likely to result in a pedestrian or bicycle crashes, compared with all crashes. **These trends indicate that intersection projects that improve safety for cyclists and pedestrians, especially those that reduce conflicts and speed of turning vehicles will improve safety for vulnerable road users.**
- This High Injury Network captures about 56 percent of all fatal and injury crashes and represents about 17 percent of the city's roadway miles, and includes significant overlap with the High Crash Network, which identifies the corridors with the highest rates of pedestrian and bicycle crashes. **Concentrating investments along the identified streets that have both high fatality/injury rates and high rates of vulnerable road user crashes have the potential to significantly improve traffic safety.**
- The proportion of all crashes caused by speeding, running off the road, and reckless driving increased significantly over the past five years. Crashes involving speeding, reckless or careless driving, and failure to yield are also more likely to cause serious injuries or death than other crash types. **This plan should identify design-based methods to reduce driver speeds, as well as possible behavioral and enforcement strategies to reduce reckless or careless driving through partnerships with other agencies.**
- A disproportionate number of fatal and serious injury crashes occur in the city's defined Equity Priority Areas, and these areas also contain a disproportionate number of the city's highest

crash rate segments and intersections. While the equity priority areas only contain 19 percent of the City's population and 17 percent of the total land area, these areas account for 31 percent of all fatal crashes. Crashes that occurred in Equity Priority Areas were more likely to be serious or fatal compared to the other parts of the city; **This indicates that the population within these areas are disproportionately affected by traffic crashes, and the plan should prioritize improvements in these areas to mitigate these disparities.**

Future Work

While this document was focused on identifying city-wide crash trends that reveal potential action items for the Transportation Safety Action plan, several topics have been identified for possible future follow-up study:

- **Downtown Crash Study:** Downtown Saint Paul is a crash hot spot for all modes, likely due to high traffic volumes as well as high pedestrian and cyclist traffic. A future analysis of downtown crash trends would be necessary to identify a specific set of improvements aimed at improving safety in the downtown area.
- **Comprehensive Review of Minor Arterials and Collector Roadways:** These roadways account for approximately 70 percent of all fatal and serious injury crashes in the City. However, this analysis did not review these roadways individually to identify the specific factors leading to high crash rates. A comprehensive review of these roadways, including city, county- and state-owned streets, would be necessary to identify the factors leading to the high injury rates, as well as identify potential future improvements.
- **Comprehensive Review of High Crash Intersections:** Similarly, while this analysis identified the top high crash intersections within the City, it did not review the intersections individually to identify the specific risk factors or mitigating improvements. A future review of high-crash intersections would more specifically provide improvement recommendations at those locations.
- **Future Coordination with Ramsey County and MnDOT:** Many of the City's highest crash corridors are county- or state-owned. Future coordination with these agencies will be required to identify future improvements.
- **Future Crash Equity Analysis:** This analysis included a racial equity focused crash analysis that is the first of its kind in Saint Paul. The City should share the findings of this analysis with community members, leaders, and partners to discuss and interpret it. These conversations could provide valuable context and future directions for equity work (for example, engaging community members and others to understand whether the Equity Priority Areas are the appropriate geographic units). Areas for future crash equity analysis could include the following:
    - Undertaking additional demographic analysis using crash data from the Saint Paul Police Department or more recent FARS data as it becomes available.
    - Undertaking additional geographic analysis with statistical analysis to control for population density and other factors, and to understand the degree to which fatal and serious injury crashes are concentrated in Equity Priority Areas.

- Examining traffic safety benefits as well as burdens. Transportation equity considers the fair distribution of both burdens and benefits.[37] This analysis examined transportation safety burdens in terms of serious injuries and deaths; future analyses could explore the distribution of benefits and the role of the City of Saint Paul and other public agencies in them. For example, the City could do a look-back to see where transportation safety improvements have been made, and how many were within the Equity Priority Areas. This could inform future project criteria and prioritization.

[37] Transportation equity definition from MnDOT's Statewide Multimodal Transportation Plan