MEMORANDUM

To: City of Grand Rapids
From: Nelson Nygaard Consulting Associates
Date: September 11, 2019
Subject: Vision Zero Existing Conditions Assessment

INTRODUCTION

The City of Grand Rapids recognizes the importance of safe streets for all, as can be seen through recent efforts such as the Vital Streets Plan, the FY2020-2023 Strategic Plan, and the Vision Zero resolution. These plans are summarized in Figure 1.

This preliminary analysis of existing transportation safety conditions will be used to understand the people and places involved in reported crashes by comparing it with information known about the community, its population, and land use and transportation infrastructure characteristics. The analysis will help inform recommendations for prioritizing transportation safety infrastructure and non-infrastructure improvements in the City of Grand Rapids.

The preliminary source of data for the analysis is police-reported crashes within the city of Grand Rapids from the State of Michigan’s Transportation Improvement Association from 2009 through 2018. Police-reported crash data is used because of the consistency of data collection and the multitude of attributes that are included. The data allows for the examination of crashes based on several different variables, such as vehicle/mode type, parties involved, time and location, and prior actions.

The analysis does not include crashes that were not reported to the police, does not account for near-misses, and it does not identify locations with ongoing safety concerns where no crashes have occurred. Some of the transportation safety issues that are not reflected in police-reported crash data will be identified through conversations with stakeholders from various Grand Rapids agencies, organizations and individuals throughout the engagement process. The existing conditions analysis and the stakeholder conversations together will inform the Strength, Challenges, Opportunities, Aspirations and Results.

This analysis focuses on injury-only crashes, with an emphasis on fatal and serious injury crashes (FSI). This is in alignment with a Vision Zero philosophy, where the focus is on the elimination of fatal and serious injury crashes.

For background information on the demographics and transportation context within Grand Rapids, please refer to the separate Demographics of Mobility memorandum.

---

1 Fatal and/or serious injury (FSI) crashes are sometimes referred to as killed and/or serious/severe injury (KSI) crashes in other communities or in other safety reporting.
Figure 1  City-adopted plans supporting safe streets

<table>
<thead>
<tr>
<th>Plan or Document</th>
<th>Adopted</th>
<th>Key relevant content</th>
</tr>
</thead>
</table>
| Vital Streets Plan | Dec 2016 | Measures of Success:  
|                   |         | - Traffic-related serious injuries and fatalities  
|                   |         | - Network connectivity  
|                   |         | - Mode share  
|                   |         | - Person throughput  
|                   |         | - Person delay  |
| FY 2020-203 Strategic Plan | Apr 2019 | Strategies:  
|                   |         | - Increase biking by improving bicycle network and ensuring facilities are maintained.  
|                   |         | - Increase walkability by increasing sidewalk network and ensuring facilities are maintained  
|                   |         | - Pursue data-driven and evidence-based strategies to address root causes of police and fire related emergencies  
|                   |         | - Employ multi-disciplinary approaches, data-driven improvements, and broad policy changes to determine effective strategies for protecting vulnerable road users and for the creation of safer roadways  
|                   |         | - Identify transportation safety issues through data analysis, staff expertise and community inputs and equitably deliver appropriate and effective solutions throughout the community  
|                   |         | - Develop and implement a data-driven, actionable and comprehensive Vision Zero transportation safety plan with meaningful input from the community  |
| Resolution approving adoption of Vision Zero to eliminate traffic-related serious fatalities and serious injuries. | Feb 2018 | No one should die or be seriously injured while traveling on our city streets  
|                   |         | - People walking and bicycling, children, the elderly, people of color and people in low-income communities face a disproportionate risk of traffic injuries and fatalities  
|                   |         | - Vision Zero provides a framework for reducing traffic related deaths and serious injuries to zero, through a combination of engineering measures, education, and enforcement practices  
|                   |         | - City of Grand Rapids hereby adopts a goal of eliminating traffic deaths and serious injuries, and endorses Vision Zero as a comprehensive and holistic approach to achieving this goal  |

Key Findings

What are the year-over-year trends? (see page 5)

- **Over 9,000 vehicle-only crashes** occurred in Grand Rapids from 2009-2018. The last three years were also the years with the most crashes.

- **Pedestrian crashes**, while smaller in number (932 crashes over the same 10 years), have increased annually from 2009-2018. On average, approximately 93 reported pedestrian crashes occur each year.

- The **number of fatal or serious injury bicycle crashes** has increased over the past 10 years. Between 2009 and 2011, less than 5% of bicycle crashes resulted in a fatality or
serious injury. However, there were four years (2012, 2015, 2017 and 2018) when the percent of crashes resulting in a fatality or serious injury was greater than 10%.

- **More than 20% of pedestrian crashes result in fatal or serious injury.** Pedestrian severity increased from less than 20% between 2009 and 2014 to more than 30% in 2018.
- **The increase in the frequency of collisions in Grand Rapids is occurring faster than the increase in population and employment.**

**When do crashes occur?** (see page 10)

- **Many crashes happen on weekdays in the afternoon and early evening.** Crashes happen throughout the day, with more vehicle and bicycle-related crashes in the afternoon when more people are traveling. However, pedestrian crashes occur more frequently in the morning hours as well as the afternoon and evening.
- **Crashes of all modes are more likely to be serious or fatal in off-peak periods.** Crashes are most likely to result in a fatality or serious injury late in the night and into the early morning hours. The increase in severity is most prominent for pedestrian crashes.
- **Fewer crashes occur on Saturdays and Sundays.** However, crashes on these days are more likely to result in a fatality or serious injury.
- **Bicycle crashes are most common in the summer months,** and likely reflects the increased use of bicycles during this time.
- **Pedestrian and vehicle crashes are relatively stable month-to-month.** However, there is a more pronounced increase in vehicle crashes in the late summer and early autumn.

**Who is involved in crashes?** (see page 16)

- **Pedestrians and bicyclists aged 15-29 and 45-64** are disproportionately represented in crashes when compared to the age distribution of the city's population.
- **Younger, less experienced drivers are over-represented** as the driver of vehicles in pedestrian crashes and as drivers in vehicle crashes.
- **Passengers in their teens and early 20s are disproportionately represented** in crashes of all types.
- **Pedestrians aged 5-24 and 45-69 are over-represented as people who are killed or seriously injured** in pedestrian crashes relative to their citywide population representation.
- The likelihood of a pedestrian being killed or seriously injured **decreases slightly as the pedestrians age from children into adolescence and adulthood.** However, severity increases for pedestrians aged 65 or older.
- **Men are over-represented as pedestrians and bicyclists. They are also over-represented as drivers in pedestrian and bicycle crashes.** The over-representation is most significant in older age groups.
- **Women are over-represented** as passengers in vehicle crashes.
Where do crashes occur? (see page 22)

- 43% of pedestrian crashes and 47% of bicycle crashes occur at unsignalized intersections, representing the most common location type for these crashes. Vehicle crashes are most likely to occur at signalized intersections, representing 42% of crashes.
- Pedestrian collisions at mid-block locations are the most severe location type. Twenty-eight percent of crashes at mid-block locations result in a fatality or serious injury, compared to 20% for all pedestrian crashes.
- Approximately 80% of crashes of all modes occur on principal and minor arterials, yet these streets account for only 22% of roadway miles in the city.
- Approximately 60% of intersection crashes occur at just 30% of intersections. The top three intersection classes with the greatest frequency of crashes are principal arterial-minor arterial, principal arterial-local, and minor arterial-local.
- Traffic signals are located at less than 7% of intersections, but approximately half of all intersection crashes occur at these intersections.
- Pedestrian and bicycle crashes in Neighborhoods of Focus represent approximately 42% of citywide crashes, yet these neighborhoods represent only 24% of the city’s land area, 21% of the city’s jobs, and 32% of the city’s population.

Why do crashes occur? (see page 62)

- Approximately 40% of pedestrian crashes occur when a vehicle is proceeding straight and a pedestrian is crossing the street (either at an intersection, or mid-block).
- Pedestrian crashes involving left-turning vehicles are twice as common as crashes involving right-turning vehicles. Left-turn crashes tend to be more severe.
- Bicycle crashes are more likely to involve right-turning vehicles, but crashes with left-turning vehicles are more than four times as severe as right-turn crashes.
- Most vehicle crashes involve vehicles making left turns, when at least one vehicle is stopped or parked, and when one driver fails to yield or comply with a traffic control device.
- Failure to yield is the most common hazardous action cited in crashes for all modes. Pedestrian and vehicle crashes in which reckless driving is cited were more likely to be fatal or serious.
- Impairment due to drugs or alcohol is a factor in approximately 10% of all crashes. The likelihood of impairment increases on weekend and overnight, when more than 40% of crashes involve impairment.
CRASH SUMMARY AND TRENDS

In the ten years between 2009 and 2018 there were approximately 75,600 police-reported crashes in Grand Rapids (Figure 2). Approximately one-fifth of crashes (or 14,200) occurred on grade-separated highways or on highway on/off ramps (including I-96, I-196, US-131). For the Grand Rapids Mobility Study, highway crashes are not included in the analysis. As a city-led effort, Grand Rapids does not have jurisdiction over MDOT facilities and is limited in its ability to recommend policy or infrastructure changes there. These roadways also tend to have very different user needs and design considerations, and therefore should not be grouped with other surface street for crash analysis.

**Figure 2 Summary of all crashes (2009-2018)**

<table>
<thead>
<tr>
<th>Crash mode</th>
<th>Fatal</th>
<th>Serious injury</th>
<th>Other injury</th>
<th>Property damage only</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian crash</td>
<td>30</td>
<td>163</td>
<td>749</td>
<td>129</td>
<td>1,071</td>
</tr>
<tr>
<td>Bicycle crash</td>
<td>9</td>
<td>51</td>
<td>649</td>
<td>184</td>
<td>893</td>
</tr>
<tr>
<td>Vehicle crash</td>
<td>65</td>
<td>653</td>
<td>11,315</td>
<td>61,592</td>
<td>73,625</td>
</tr>
<tr>
<td>All crashes</td>
<td>104</td>
<td>867</td>
<td>12,713</td>
<td>61,905</td>
<td>75,589</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

Of the remaining 61,400 crashes, only crashes with an injury or fatality were included in the analysis (these represent approximately 18% of the crashes on surface streets- or 11,045 crashes). Because property damage only crashes do not result in any injury or fatality, they are de-emphasized in the Grand Rapids Mobility Study. Additionally, crashes that do not result in any injury are less likely to be reported to the police or may be self-reported by the people involved. Since there would be a risk in analyzing and determining recommendations from a set of crashes that are incomplete or potentially inaccurate, these crashes were excluded. However, all surface street crashes (including those with property damage only) are mapped in Figure 68 through Figure 70 in the Appendix for context.

The remainder of this memo focuses on the 11,045 police-reported fatal and injury crashes in Grand Rapids that occurred on surface streets (Figure 3). Approximately 85% of these were vehicle only, and less than 5% resulted in a fatal or serious injury. While pedestrian-involved crashes represent less than 10% of total crashes, more than 20% of them resulted in a fatal or serious injury (Figure 4 and Figure 5).

---

**Property damage only crashes**

Although property damage only crashes are not included in the detailed analysis found throughout this memo, a review of property damage only crashes can provide additional context regarding locations where crashes are occurring, and where more serious crashes may occur in the future. Property damage only crashes can also inform future capital projects and additional countermeasures to increase traffic safety. Data from property damage only crashes can also be used to secure grand funding.

It is recommended that Grand Rapids evaluate all crash locations to understand the patterns of property damage only crashes so that issues can be remedied during maintenance or capital project development.
Figure 3  Number of modal crashes by injury severity, 2009-2018

<table>
<thead>
<tr>
<th>Crash mode</th>
<th>Fatal</th>
<th>Serious Injury</th>
<th>Other Injury</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>30</td>
<td>159</td>
<td>743</td>
<td>932</td>
</tr>
<tr>
<td>Bicycle</td>
<td>8</td>
<td>51</td>
<td>646</td>
<td>705</td>
</tr>
<tr>
<td>Vehicle</td>
<td>43</td>
<td>452</td>
<td>8,913</td>
<td>9,408</td>
</tr>
<tr>
<td>TOTAL</td>
<td>81</td>
<td>662</td>
<td>10,302</td>
<td>11,045</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

Figure 4  Percent of modal crashes by injury severity, 2009-2018

<table>
<thead>
<tr>
<th>Crash mode</th>
<th>Fatal</th>
<th>Serious Injury</th>
<th>Other Injury</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>3.2%</td>
<td>17.1%</td>
<td>79.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>1.1%</td>
<td>7.2%</td>
<td>91.6%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Vehicle</td>
<td>0.5%</td>
<td>4.8%</td>
<td>94.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.7%</td>
<td>6.0%</td>
<td>93.3%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

Figure 5  Percent fatal and injury crashes, by mode and level of severity (2009-2018)

Source: Michigan Transportation Improvement Association

Crash Trends

This section looks at trends in crashes from 2009-2018 by mode and injury severity.

- **Figure 6** shows that the annual number of reported pedestrian and automobile crashes have generally increased over the past 10 years, while reported bicycle crashes have dropped, particularly in 2018 (pedestrian crashes were down in 2018 as well).

- However, while the number of bicycle crashes have decreased slightly, the number of fatal and serious injury bicycle crashes has increased (see **Figure 7**).

- The severity of pedestrian crashes has also increased in recent years, with 2018 being one of the highest years of fatal or serious pedestrian injuries despite the overall number of pedestrian crashes being down (31.7% of 82 crashes were fatal or serious in 2018). This trend is consistent with statewide and national data that shows pedestrian fatalities are increasing. A report from the Governors Highway Safety Association published in...
February 2019 identified an increase of 15.6% in pedestrian fatalities in Michigan in the first six months of 2017 compared to 2016. Nationally, pedestrian fatalities increased 27% from 2007 to 2016, despite a decrease of 14% for all traffic fatalities. A recent report from The Governors Highway Safety Association suggests potential factors that may contribute to this, including but not limited to impairment, distraction, and the increased number of SUVs purchased and on U.S. roadways.²

Figure 6  Annual number of fatal and injury crashes, 2009-2018

Source: Michigan Transportation Improvement Association

---

In order to better understand the crash history in the city of Grand Rapids, it is helpful to look at crashes in context, which includes normalizing the data for population and the number of jobs. This reflects exposure, which is a way of factoring in the likelihood that collisions are more frequent because there are more people in an area. For example, crashes have increased in Grand Rapids over the past decade. If crashes were increasing at the same rate as population and job growth, the rate of crashes would remain the same. Unfortunately, while Grand Rapids has seen both job and population growth over the past decade (7% and 3% respectively since 2009), overall crashes have increased at a faster rate over that same time period.

As Figure 8 shows, the number of crashes for every 10,000 jobs increased from 78 in 2009 to 88 in 2015. Similarly, for every 10,000 residents the number grew from 49 to 60 between 2009 and 2017. Therefore, changes in jobs and population do not fully explain the increase in crashes.

When looking at differences between crash modes, pedestrian crashes have increased most in relation to jobs and population growth. Pedestrian crashes increased 71% and 120%, respectively, in comparison to employment and population growth. In contrast, bicycle crashes have dropped in relation to Grand Rapid’s employment and population levels, and vehicle crashes have seen a more gradual increase.
Figure 8  Rate of fatal and injury crashes by jobs and residents, 2009-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Total jobs (per LEHD)</th>
<th>Total population (per ACS)</th>
<th>Overall crashes per 10,000...</th>
<th>Pedestrian crashes per 10,000...</th>
<th>Bicycle crashes per 10,000...</th>
<th>Vehicle crashes per 10,000...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jobs</td>
<td>Residents</td>
<td>Jobs</td>
<td>Residents</td>
</tr>
<tr>
<td>2009</td>
<td>121,687</td>
<td>193,707</td>
<td>78.1</td>
<td>49.0</td>
<td>4.8</td>
<td>3.0</td>
</tr>
<tr>
<td>2010</td>
<td>118,827</td>
<td>188,214</td>
<td>85.4</td>
<td>53.9</td>
<td>6.7</td>
<td>4.3</td>
</tr>
<tr>
<td>2011</td>
<td>125,172</td>
<td>189,813</td>
<td>86.6</td>
<td>57.1</td>
<td>6.6</td>
<td>4.3</td>
</tr>
<tr>
<td>2012</td>
<td>124,170</td>
<td>190,426</td>
<td>89.9</td>
<td>58.6</td>
<td>8.5</td>
<td>5.5</td>
</tr>
<tr>
<td>2013</td>
<td>126,766</td>
<td>192,285</td>
<td>82.8</td>
<td>54.6</td>
<td>6.5</td>
<td>4.3</td>
</tr>
<tr>
<td>2014</td>
<td>129,507</td>
<td>193,793</td>
<td>83.9</td>
<td>56.1</td>
<td>7.6</td>
<td>5.1</td>
</tr>
<tr>
<td>2015</td>
<td>130,297</td>
<td>196,099</td>
<td>88.3</td>
<td>58.7</td>
<td>8.1</td>
<td>5.4</td>
</tr>
<tr>
<td>2016</td>
<td>N/A</td>
<td>196,458</td>
<td>N/A</td>
<td>64.2</td>
<td>N/A</td>
<td>5.5</td>
</tr>
<tr>
<td>2017</td>
<td>N/A</td>
<td>198,811</td>
<td>N/A</td>
<td>60.8</td>
<td>N/A</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Note: Employment data for 2016, 2017 or 2018 are not available. Population data for 2018 is not available.
Source: LEHD 2015; US Census Bureau ACS 2013-2017 5-Year Estimates; Michigan Transportation Improvement Association
WHEN DO CRASHES OCCUR?

The following section describes the temporal pattern of crashes: by month, by day of the week, by hour of the day, and by hour and day of the week.

Months of the year

The number and severity of crashes changes month to month, and is highly dependent on seasons, weather and lighting. These conditions likely influence people’s behaviors – including mode of travel. As Figure 9 and Figure 10 indicate:

- Pedestrian crashes are relatively stable throughout the year, with a slight increase August through February. Injury severity fluctuates throughout the year but does not show a clear pattern related to month.
- Bicycle crashes are most common in the summer, particularly June through September. There were very few crashes over the last 10 years during winter months. This pattern likely reflects the time of year when people are most likely to use a bicycle in Grand Rapids. Like pedestrian crashes, injury severity is variable throughout the year.
- Vehicle crashes are more frequent during the late summer and early fall. The injury severity of these crashes is relatively stable throughout the year, though is slightly higher during summer months.
Figure 9  Total number of fatal and injury crashes by month and mode, 2009-2018

Source: Michigan Transportation Improvement Association

Figure 10  Severity of fatal and injury crashes by month by crash mode

Source: Michigan Transportation Improvement Association
Days of the week

Overall, crashes are more common during weekdays (Figure 11). This likely reflects a higher volume of traffic due to commuting patterns Monday through Friday.

Fatal and serious crashes are more prevalent on Saturdays and Sundays than on weekdays for all three modes (Figure 12).

Figure 11  Fatal and injury crashes by day of the week by crash mode

![Bar chart showing pedestrian, bicycle, and vehicle crashes by day of the week]

Source: Michigan Transportation Improvement Association

Figure 12  Severity of fatal and injury crashes by day of the week by crash mode

![Bar chart showing percent of fatal or serious crashes by day of the week]

Source: Michigan Transportation Improvement Association
Hours of the day

Vehicle and bicycle crashes predominately occur from the late morning, into the afternoon and evening. Pedestrian crashes are most likely to occur in the morning and afternoon peaks. Pedestrian crashes remain high into the late evening and overnight, relative to the other modes (Figure 13 and Figure 14).

The increased percent of crashes during commute hours is likely reflective of the increased exposure during that time. However, injury severity of crashes is greatest for all modes during the nighttime, especially for pedestrians and bicyclists between 3 and 6 am (Figure 15). Additional analysis examining factors such as speed and impairment in relation to time of day of crashes is in the Why do crashes occur? section.

Figure 13  Number of fatal and injury crashes by hour of the day by crash mode
Figure 14  Percent of fatal and injury crashes by mode by hour of the day

Source: Michigan Transportation Improvement Association

Figure 15  Percent of injury crashes fatal or serious, by hour of the day, and mode

Source: Michigan Transportation Improvement Association
Hours of the day, by day of the week

Pedestrian, bicycle and vehicle crashes on weekdays are more likely to occur during peak commute hours and throughout the afternoon. On weekends, pedestrian and vehicle crashes are most concentrated in the late night and early morning hours. For bicycles, crashes are most likely to occur in the afternoon (which is consistent with weekday bicycle crashes).

Figure 16 Percent of daily fatal and injury crashes by mode and hour of the day

Source: Michigan Transportation Improvement Association
WHO IS INVOLVED IN CRASHES?

The following section describes the people involved in crashes, particularly in reference to the age and gender of parties.

This section uses the term *party* or *parties* to refer to the individual people who are involved in a crash. There are four party types:

- Pedestrian – people who are on foot or in a non-motorized wheelchair. The Michigan UD-10 Traffic Crash Report Instruction Manual also identifies people who are on skis, skates or rollerblades or are riding on a horse as pedestrians.
- Bicyclist – people who are operating a bicycle.
- Driver – operator of a motor vehicle (motor vehicles include all road vehicles with a motor that is not operated on rails).
- Passenger – occupant of a motor vehicle who was not operating/driving the vehicle.

In the data analyzed for this memo, there were two bicycle crashes that included both bicyclists and pedestrians, and two vehicle-train crashes. There were three pedestrians in the bicycle crashes and two train engineers in the vehicle-train crashes. These five parties are excluded from the analysis of parties because of their unique circumstances and small sample. In all instances, each of these parties had “other injuries” or “no injuries.”
Age of parties

Figure 17 compares the distribution of all parties involved in all fatal and injury crashes across age categories to Grand Rapids’ overall population age distribution and the population of driving age. Examination of the parties involved in crashes can help in the development of policy and programming related to transportation safety.

- Pedestrians and bicyclists between 15 and 29 years and between 45 and 64 years are disproportionately represented in the crash data when compared to the age distribution of the city’s population.
- Younger, less experienced drivers are over-represented as the driver in pedestrian crashes and as the driver in vehicle crashes.
- Consistent with national statistics, passengers in their teens and early 20s are disproportionately represented in crashes of all types. Further analysis should examine the effectiveness of Michigan’s graduated driver’s licenses by comparing the ages of drivers in crashes where a passenger aged 15 through 24 was also in the vehicle.

Figure 17 People involved in fatal and injury crashes by party and age

Source: Michigan Transportation Improvement Association, US Census Bureau
Figure 18 compares the age distribution of all parties involved in any crash with at least one fatality or serious injury. In general, the trends are comparable to all crashes presented above. Key differences include:

- Pedestrians aged 60 and over are more likely to be involved in a fatal or serious injury crash than their prevalence in all pedestrian crashes. However, these parties continue to be under-represented relative to the city’s age distribution.

- Bicyclists aged 10 through 19 are less likely to be involved in a fatal or serious injury crash than their prevalence in all bicycle crashes.

- Bicyclists aged 30 or over are more likely to be involved in a fatal or serious injury crash than their prevalence in all bicycle crashes.

- Drivers aged 25 through 44 are more likely to be involved in a fatal or serious injury bicycle crash than their prevalence in all bicycle crashes.

Figure 18 Fatal and serious crashes by party, age, and overall population distribution

Source: Michigan Transportation Improvement Association, US Census Bureau
Figure 19 compares the age distribution of parties who were killed or seriously injured in crashes. There were three drivers and one passenger who were killed or seriously injured in pedestrian crashes, and one driver who was seriously injured in a bicycle crash. These five parties are excluded from the figure below because of their small sample size.

- Pedestrians aged 5 through 24 and 45 through 69 are over-represented in pedestrian crashes relative to their citywide representation.
- Bicyclists aged 20 through 49 are over-represented in bicycle crashes relative to their citywide representation.
- Drivers aged 20 through 34 and 50 through 59 are over-represented in vehicle crashes relative to their representation for people of driving age.
- Passengers aged 15 through 29 are over-represented in vehicle crashes relative to their citywide representation.

Figure 19  Parties with fatal or serious injuries compared to overall age distribution

Source: Michigan Transportation Improvement Association, US Census Bureau
Figure 20 shows the breakdown of severity for parties in each age group. Driver and passenger parties in pedestrian crashes and in bicycle crashes were excluded because they are largely composed of people who have no injury at all.

- Severity for pedestrians decreases slightly as the parties age from children into adolescence and adulthood and increases for people aged 65 or older.
- Severity for bicyclists is relatively limited, with no clear relationship between age and level of severity.
- The share of drivers with injuries (other injury or more serious) increases gradually as parties age. The lowest percent of drivers experiencing injuries occur for drivers aged 15 to 19, and the highest percent of drivers experiencing injuries occur for drivers aged 50 through 79.
- Comparable to drivers, passengers are more likely to experience injuries as they age. Approximately half of passengers involved in vehicle crashes between 5 and 35 years of age experience injuries, whereas approximately 70% of passengers between 45 and 64 years of age experience injuries.

Figure 20 Percent distribution of injury severity by party and age
Age and gender of parties

Figure 21 shows the ratio of men and women in each age group for parties in all crashes, relative to the citywide ratio of men and women in each age group.

- Male pedestrians make up a greater share of pedestrians involved in crashes, at all age groups. However, the disparity is greatest in the oldest age groups.
- Male bicyclists are over-represented in all age groups.
- Males are over-represented in older age groups as drivers in all crash types. Although women make up an increasingly larger share of the population for older age groups, men represent an increasing share of driver parties in crashes.
- Women are over-represented as passengers in vehicle crashes.

Source: Michigan Transportation Improvement Association, US Census Bureau
WHERE DO CRASHES OCCUR?

The following section describes the spatial location of crashes throughout Grand Rapids. Locations described in this section include geographic areas of the city (such as Wards, neighborhoods or other special designations), intersections and roadway classifications.

Spatial Distribution of Crashes

The maps on the following pages highlight the spatial distribution of injury crashes in Grand Rapids by mode. Figure 22 through Figure 24 show the total number of crashes that occurred in each representational hexagon throughout the city (all crashes in each mode, regardless of injury severity). This is done to represent the variation in density and distribution of crashes citywide. Although the maps use a consistent red color ramp, note that the colors in the maps are not comparable to each other because of the difference in magnitude of crashes between pedestrian crashes, bicycle crashes and vehicle crashes.

Figure 25 through Figure 27 show the number of fatal and serious injury crashes in each representational hexagon throughout the city for each mode. Like in the first three maps, the colors for one mode are not comparable to another, or to the number of overall crashes in the first three maps.
Figure 22  Spatial distribution of pedestrian crashes

Note: Includes crashes with fatalities, serious injuries and other injuries. Does not include crashes on highways, or with property damage only.
Figure 23  Spatial distribution of bicycle crashes

Note: Includes crashes with fatalities, serious injuries and other injuries. Does not include crashes on highways, or with property damage only.
Figure 24 Spatial distribution of vehicle crashes

Note: Includes crashes with fatalities, serious injuries and other injuries. Does not include crashes on highways, or with property damage only.
Figure 25  Spatial distribution of fatal and serious pedestrian crashes

Note: Includes crashes with fatalities and serious injuries. Does not include crashes on highways, or crashes with other injuries or property damage only.
Figure 26  Spatial distribution of fatal and serious bicycle crashes

Note: Includes crashes with fatalities and serious injuries. Does not include crashes on highways, or crashes with other injuries or property damage only.
Figure 27  Spatial distribution of fatal and serious vehicle crashes

Note: Includes crashes with fatalities and serious injuries. Does not include crashes on highways, or crashes with other injuries or property damage only.

Location Type

Reported crashes were assigned to location types based on their distance from the nearest intersection. Crashes within 150 feet of an intersection were classified as intersection crashes. These crashes were categorized further based on the traffic control device at the intersection (i.e., signalized intersection or unsignalized intersection). Crashes further than 150 feet from an intersection were classified as midblock crashes.

Pedestrian and bicycle crashes were more frequent at unsignalized intersections. A greater percent of fatal and serious crashes also occurred at unsignalized intersections. Vehicle crashes
occurred more frequently at intersections (signalized and unsignalized) in comparison to midblock (Figure 28).

**Figure 28** Injury crash summary by location type

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
<th>% FSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td><strong>Pedestrian Crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signalized intersection</td>
<td>380</td>
<td>40.8%</td>
<td>53</td>
</tr>
<tr>
<td>Unsignalized intersection</td>
<td>399</td>
<td>42.8%</td>
<td>93</td>
</tr>
<tr>
<td>Midblock</td>
<td>153</td>
<td>16.4%</td>
<td>43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>932</td>
<td>100.0%</td>
<td>189</td>
</tr>
<tr>
<td><strong>Bicycle Crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signalized intersection</td>
<td>308</td>
<td>43.7%</td>
<td>16</td>
</tr>
<tr>
<td>Unsignalized intersection</td>
<td>332</td>
<td>47.1%</td>
<td>37</td>
</tr>
<tr>
<td>Midblock</td>
<td>65</td>
<td>9.2%</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>705</td>
<td>100.0%</td>
<td>59</td>
</tr>
<tr>
<td><strong>Vehicle Crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signalized intersection</td>
<td>3,902</td>
<td>41.5%</td>
<td>199</td>
</tr>
<tr>
<td>Unsignalized intersection</td>
<td>3,527</td>
<td>37.5%</td>
<td>181</td>
</tr>
<tr>
<td>Midblock</td>
<td>1977</td>
<td>21.0%</td>
<td>114</td>
</tr>
<tr>
<td>Not in right-of-way</td>
<td>2</td>
<td>&lt;0.1%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9,408</td>
<td>100.0%</td>
<td>495</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids

**Roadway Classification**

Crashes were categorized by roadway classification. Intersection crashes were categorized based on the highest roadway class at the intersection, and mid-block crashes were categorized by the classification of the roadway they occurred on:

- Highway ramp\(^3\) – Roadways that connect the surface street network to the regional and interstate grade-separated highway network.
- Principal arterial – Larger, regionally significant streets that move a high volume of motor vehicle traffic with accommodations for transit stops and pedestrians.
  - Examples include Burton Street, Division Avenue and Leonard Street.
- Minor arterial – Similar to principal arterials but are intended to serve a smaller volume of vehicles. Accommodations for bicyclists may be provided.

\(^3\) This classification is used for crashes where a highway ramp and a surface street intersect. Crashes directly on highway ramps are not included.
- Examples include Eastern Avenue, Knapp Street, Richmond Street and Wealthy Street.

- Collector – Streets that serve a mix of local and regional vehicular traffic needs. Collector streets are more sensitive and attentive to non-auto users than arterial streets, and typically have modest speed limits.
  - Examples include Boston Street, Cherry Street, Diamond Avenue and Lane Avenue.

- Local – Provide connectivity and access to neighborhoods and local destinations for all modes of travel, with an emphasis on pedestrians, bicyclists and local area vehicle travel. Low speeds are maintained to respect and enable the local uses on these streets.

Across all crash modes, approximately 80% of crashes occur on principal and minor arterials, yet these streets account for approximately 22% of roadway miles in the city (Figure 29). These higher classified roadways also represent the locations where the most serious injury crashes occur. The higher frequency and severity of injury is likely a reflection of the higher vehicle volumes and speeds, respectively, for which these roadway classifications are designed.

Walking and bicycling facilities are typically not emphasized – though may be provided – on these street types, and often provide limited access control via driveways or storefronts. Therefore, the concentration of pedestrian and bicycling involved crashes along and across them merits further study.

**Figure 29  Fatal and injury crash summary by roadway classification**

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Roadway Miles</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
<th>Crashes per mile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Pedestrian Crashes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway Ramp</td>
<td>--</td>
<td>--</td>
<td>29</td>
<td>3.1%</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>61.8</td>
<td>9.6%</td>
<td>487</td>
<td>52.3%</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>79.0</td>
<td>12.2%</td>
<td>265</td>
<td>28.4%</td>
</tr>
<tr>
<td>Collector</td>
<td>49.5</td>
<td>7.7%</td>
<td>46</td>
<td>4.9%</td>
</tr>
<tr>
<td>Local</td>
<td>455.8</td>
<td>70.5%</td>
<td>105</td>
<td>11.3%</td>
</tr>
<tr>
<td>Total</td>
<td>646.1</td>
<td>100.0%</td>
<td>932</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Note regarding table formatting and coloring**

Tables throughout this memo use color-coding within cells to improve readability by shading cells relative to their values. Darker cells indicate a larger number or percent, and lighter cells indicate lower values. Green is used to represent proportions, and red is used to represent the percent of crashes that result in a fatality or serious injury.
### Bicycle Crashes

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Roadway Miles</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
<th>Crashes per mile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Highway Ramp</td>
<td>--</td>
<td>--</td>
<td>28</td>
<td>4.0%</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>61.8</td>
<td>9.6%</td>
<td>341</td>
<td>48.4%</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>79.0</td>
<td>12.2%</td>
<td>219</td>
<td>31.1%</td>
</tr>
<tr>
<td>Collector</td>
<td>49.5</td>
<td>7.7%</td>
<td>32</td>
<td>4.5%</td>
</tr>
<tr>
<td>Local</td>
<td>455.8</td>
<td>70.5%</td>
<td>85</td>
<td>12.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>646.1</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>705</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

### Vehicle Crashes

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Roadway Miles</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
<th>Crashes per mile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Highway Ramp</td>
<td>--</td>
<td>--</td>
<td>436</td>
<td>4.6%</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>61.8</td>
<td>9.6%</td>
<td>5,478</td>
<td>58.2%</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>79.0</td>
<td>12.2%</td>
<td>2,266</td>
<td>24.1%</td>
</tr>
<tr>
<td>Collector</td>
<td>49.5</td>
<td>7.7%</td>
<td>493</td>
<td>5.2%</td>
</tr>
<tr>
<td>Local</td>
<td>455.8</td>
<td>70.5%</td>
<td>733</td>
<td>7.8%</td>
</tr>
<tr>
<td>Not in right-of-way</td>
<td>--</td>
<td>--</td>
<td>2</td>
<td>&lt;0.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>646.1</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>9,408</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids

### Intersection Crashes

This section focuses only on crashes that occurred at intersections (i.e. within 150 ft of where two or more streets intersect). These crashes represent approximately 79% of vehicle crashes, 84% of pedestrian crashes, and 91% of bicycle crashes. Although these crashes are close to an intersection, it does not necessarily indicate whether the crash involved turns or people traveling on different streets. More details about the specific actions of parties in a crash are in the Prior action section within the Why do crashes occur? section.

This section describes the breakdown of crashes by intersection class, by number of legs, by traffic control, and lastly identifies the intersections with highest number of collisions.

### Intersection Class

There are approximate 3,870 intersections in Grand Rapids. Each intersection was categorized based on the roadway classification of the two intersecting roadways. There are 14 unique categories based on the five roadway classifications defined above. More than half of these intersections (52%) are where only local streets intersect. Approximately one-fifth of intersections (18%) are where a minor arterial intersects a local street, and another 12% are where a principal arterial intersects a local street. Approximately 40% of all intersections have an arterial street (principal or minor) on one of their legs.

Overall, approximately 60% of intersection crashes occur at just 30% of intersections. Figure 30 shows the proportion of intersections by intersection class, and the proportion of by crash mode...
and intersection class. The principal arterial—local intersection class represents approximately 12% intersections, yet between 21-23% of crashes for all three crash modes occur at these intersections. Comparatively, the local-local intersection class represents approximately 52% of intersections, but less than 10% of crashes for all three modes occur at these intersections. These variations across intersection classes suggest factors such as street design, traffic speeds and traffic volumes influence crash frequency and severity.

**Figure 30 Summary of intersection crashes by intersection classification**

<table>
<thead>
<tr>
<th>Intersection class</th>
<th>Intersections</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td><strong>Pedestrian crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway Ramp – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>16</td>
</tr>
<tr>
<td>Highway Ramp – Minor Arterial</td>
<td>9</td>
<td>0.2%</td>
<td>10</td>
</tr>
<tr>
<td>Highway Ramp – Collector</td>
<td>4</td>
<td>0.1%</td>
<td>1</td>
</tr>
<tr>
<td>Highway Ramp – Local</td>
<td>2</td>
<td>0.1%</td>
<td>2</td>
</tr>
<tr>
<td>Principal Arterial – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>42</td>
</tr>
<tr>
<td>Principal Arterial – Minor Arterial</td>
<td>70</td>
<td>1.8%</td>
<td>138</td>
</tr>
<tr>
<td>Principal Arterial – Collector</td>
<td>38</td>
<td>1.0%</td>
<td>59</td>
</tr>
<tr>
<td>Principal Arterial – Local</td>
<td>480</td>
<td>12.4%</td>
<td>175</td>
</tr>
<tr>
<td>Minor Arterial – Minor Arterial</td>
<td>43</td>
<td>1.1%</td>
<td>56</td>
</tr>
<tr>
<td>Minor Arterial – Collector</td>
<td>82</td>
<td>2.1%</td>
<td>36</td>
</tr>
<tr>
<td>Minor Arterial – Local</td>
<td>694</td>
<td>17.9%</td>
<td>142</td>
</tr>
<tr>
<td>Collector – Collector</td>
<td>18</td>
<td>0.5%</td>
<td>3</td>
</tr>
<tr>
<td>Collector – Local</td>
<td>372</td>
<td>9.6%</td>
<td>36</td>
</tr>
<tr>
<td>Local – Local</td>
<td>2,016</td>
<td>52.1%</td>
<td>63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>779</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Bicycle crashes</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Ramp – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>21</td>
<td>3.3%</td>
<td>3</td>
<td>5.7%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Highway Ramp – Minor Arterial</td>
<td>9</td>
<td>0.2%</td>
<td>7</td>
<td>1.1%</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Highway Ramp – Collector</td>
<td>4</td>
<td>0.1%</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Highway Ramp – Local</td>
<td>2</td>
<td>0.1%</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Principal Arterial – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>26</td>
<td>4.1%</td>
<td>1</td>
<td>1.9%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Principal Arterial – Minor Arterial</td>
<td>70</td>
<td>1.8%</td>
<td>109</td>
<td>17.0%</td>
<td>6</td>
<td>11.3%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Principal Arterial – Collector</td>
<td>38</td>
<td>1.0%</td>
<td>50</td>
<td>7.8%</td>
<td>3</td>
<td>5.7%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Principal Arterial – Local</td>
<td>480</td>
<td>12.4%</td>
<td>135</td>
<td>21.1%</td>
<td>14</td>
<td>26.4%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Minor Arterial – Minor Arterial</td>
<td>43</td>
<td>1.1%</td>
<td>23</td>
<td>3.6%</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Minor Arterial – Collector</td>
<td>82</td>
<td>2.1%</td>
<td>58</td>
<td>9.1%</td>
<td>5</td>
<td>9.4%</td>
<td>8.6%</td>
</tr>
</tbody>
</table>
### Intersection class and number of legs

Intersections with more legs tend to be considered more complex – as they involve a greater variety of potential movements and directions – and therefore more dangerous. However, as shown in Figure 31, there is no clear relationship between the number of legs on an intersection and the level of severity. Traffic controls may sufficiently address the complexity, or the perception of risk increase the likelihood of careful actions by people in all modes.

However, 5-leg intersections make up less than 1% of intersections, but account for approximately 2-3% of crashes. Although the sample size is very small, crashes at 5-leg intersections are two to three times more common than would be expected if the number of legs in an intersection had no impact on crash frequency.

---

#### Intersection class and number of legs

<table>
<thead>
<tr>
<th>Intersection class</th>
<th>Intersections</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Minor Arterial – Local</td>
<td>694</td>
<td>17.9%</td>
<td>124</td>
</tr>
<tr>
<td>Collector – Collector</td>
<td>18</td>
<td>0.5%</td>
<td>3</td>
</tr>
<tr>
<td>Collector – Local</td>
<td>372</td>
<td>9.6%</td>
<td>23</td>
</tr>
<tr>
<td>Local – Local</td>
<td>2,016</td>
<td>52.1%</td>
<td>61</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>640</td>
</tr>
</tbody>
</table>

**Vehicle crashes**

<table>
<thead>
<tr>
<th>Intersection class</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
<th>#</th>
<th>%</th>
<th>% FSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Ramp – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>338</td>
<td>4.5%</td>
<td>14</td>
<td>3.7%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Highway Ramp – Minor Arterial</td>
<td>9</td>
<td>0.2%</td>
<td>78</td>
<td>1.0%</td>
<td>2</td>
<td>0.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Highway Ramp – Collector</td>
<td>4</td>
<td>0.1%</td>
<td>6</td>
<td>0.1%</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Highway Ramp – Local</td>
<td>2</td>
<td>0.1%</td>
<td>14</td>
<td>0.2%</td>
<td>2</td>
<td>0.5%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Principal Arterial – Principal Arterial</td>
<td>21</td>
<td>0.5%</td>
<td>468</td>
<td>6.3%</td>
<td>22</td>
<td>5.8%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Principal Arterial – Minor Arterial</td>
<td>70</td>
<td>1.8%</td>
<td>1,524</td>
<td>20.5%</td>
<td>103</td>
<td>27.1%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Principal Arterial – Collector</td>
<td>38</td>
<td>1.0%</td>
<td>536</td>
<td>7.2%</td>
<td>18</td>
<td>4.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Principal Arterial – Local</td>
<td>480</td>
<td>12.4%</td>
<td>1,639</td>
<td>22.1%</td>
<td>72</td>
<td>18.9%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Minor Arterial – Minor Arterial</td>
<td>43</td>
<td>1.1%</td>
<td>367</td>
<td>4.9%</td>
<td>13</td>
<td>3.4%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Minor Arterial – Collector</td>
<td>82</td>
<td>2.1%</td>
<td>422</td>
<td>5.7%</td>
<td>21</td>
<td>5.5%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Minor Arterial – Collector</td>
<td>694</td>
<td>17.9%</td>
<td>1,132</td>
<td>15.2%</td>
<td>68</td>
<td>17.9%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Collector – Collector</td>
<td>18</td>
<td>0.5%</td>
<td>39</td>
<td>0.5%</td>
<td>3</td>
<td>0.8%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Collector – Local</td>
<td>372</td>
<td>9.6%</td>
<td>342</td>
<td>4.6%</td>
<td>15</td>
<td>3.9%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Local – Local</td>
<td>2,016</td>
<td>52.1%</td>
<td>524</td>
<td>7.1%</td>
<td>27</td>
<td>7.1%</td>
<td>5.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>7,429</td>
<td>100.0%</td>
<td>380</td>
<td>100.0%</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids
### Figure 31 Percent fatal or serious by crash mode and number of intersection legs

<table>
<thead>
<tr>
<th>Number of legs</th>
<th>Pedestrian crashes</th>
<th>Bicycle crashes</th>
<th>Vehicle crash</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intersections</td>
<td>Crashes</td>
<td>Fatal/Serious Injury Crashes</td>
</tr>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>3 legs</td>
<td>2,747</td>
<td>71.0%</td>
<td>309</td>
</tr>
<tr>
<td>4 legs</td>
<td>1,101</td>
<td>28.4%</td>
<td>449</td>
</tr>
<tr>
<td>5 legs</td>
<td>22</td>
<td>0.6%</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>3,870</td>
<td>100.0%</td>
<td>779</td>
</tr>
</tbody>
</table>

|                | Intersections      | Crashes         | Fatal/Serious Injury Crashes |
|                | #   | %  | #   | %  | #   | %  | % FSI |
| 3 legs         | 2,747 | 71.0% | 238 | 37.2% | 22 | 41.5% | 9.2% |
| 4 legs         | 1,101 | 28.4% | 387 | 60.5% | 31 | 58.5% | 8.0% |
| 5 legs         | 22   | 0.6%  | 15  | 2.3%  | 0  | 0.0%  | 0.0% |
| Total          | 3,870 | 100.0% | 640 | 100.0% | 53 | 100.0% | 8.3% |

|                | Intersections      | Crashes         | Fatal/Serious Injury Crashes |
|                | #   | %  | #   | %  | #   | %  | % FSI |
| 3 legs         | 2,747 | 71.0% | 3,040 | 40.9% | 178 | 46.8% | 5.9% |
| 4 legs         | 1,101 | 28.4% | 4,244 | 57.1% | 193 | 50.8% | 4.5% |
| 5 legs         | 22   | 0.6%  | 145  | 2.0%  | 9  | 2.4%  | 6.2% |
| Total          | 3,870 | 100.0% | 7,429 | 100.0% | 380 | 100.0% | 5.1% |

Source: Michigan Transportation Improvement Association, City of Grand Rapids

### Intersection Traffic Control

Traffic control devices includes signage or signals that inform drivers, bicyclists and pedestrians on who has the right-of-way and how to proceed through an intersection. Traffic control includes stop signs, yield signs and traffic signals. There are approximate 3,870 intersections in Grand Rapids. Two-thirds of them are stop-controlled, and less than seven percent are signalized.

Some intersections are classified as “implied yield” or “none.” **Implied yield** refers to 3-leg intersections without any signed traffic control. Per Michigan state law, vehicles that are traveling on the leg that is not the through street much yield the right-of-way to traffic on the through street. **None** refers to 3-leg intersections where one of the legs is a one-way street traveling away from the intersection. At these intersections, there are no stop signs or yield signs on the through street.

Approximately an equal number of crashes occur at stop-controlled intersections as occur at intersections with traffic signals. However, crashes at intersections with stop signs are more likely to be fatal or serious when a pedestrian or bicycle is involved in the crash. For vehicle crashes, the difference in severity is not notable (see **Figure 32**).

---

Intersections with traffic circles/roundabouts are uncommon (representing less than 1% of intersections). But for the pedestrian and bicycle crashes that occurred at those locations, they have been more serious than crashes at other traffic controls. Vehicle crashes don’t experience the same increase in severity at traffic circles/roundabouts.

It should be noted that traffic circles/roundabouts may not yet have been in place at the time of the collisions reported at these locations. Additional analysis on the dates of crashes relative to the date of construction or installation of the traffic circles/roundabouts would provide more complete context about those crashes.

**Figure 32**  Summary of intersection fatal and injury crashes by traffic control

<table>
<thead>
<tr>
<th>Traffic control</th>
<th>Intersections</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td><strong>Pedestrian crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop sign</td>
<td>2,585</td>
<td>66.8%</td>
<td>370</td>
</tr>
<tr>
<td>Traffic signal</td>
<td>254</td>
<td>6.6%</td>
<td>380</td>
</tr>
<tr>
<td>Traffic circle / roundabout</td>
<td>8</td>
<td>0.2%</td>
<td>4</td>
</tr>
<tr>
<td>Yield sign</td>
<td>20</td>
<td>0.5%</td>
<td>4</td>
</tr>
<tr>
<td>Implied yield</td>
<td>14</td>
<td>0.4%</td>
<td>5</td>
</tr>
<tr>
<td>None</td>
<td>15</td>
<td>0.4%</td>
<td>10</td>
</tr>
<tr>
<td>unknown</td>
<td>974</td>
<td>25.2%</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>779</td>
</tr>
<tr>
<td><strong>Bicycle crashes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop sign</td>
<td>2,585</td>
<td>66.8%</td>
<td>303</td>
</tr>
<tr>
<td>Traffic signal</td>
<td>254</td>
<td>6.6%</td>
<td>308</td>
</tr>
<tr>
<td>Traffic circle / roundabout</td>
<td>8</td>
<td>0.2%</td>
<td>11</td>
</tr>
<tr>
<td>Yield sign</td>
<td>20</td>
<td>0.5%</td>
<td>5</td>
</tr>
<tr>
<td>Implied yield</td>
<td>14</td>
<td>0.4%</td>
<td>5</td>
</tr>
<tr>
<td>None</td>
<td>15</td>
<td>0.4%</td>
<td>6</td>
</tr>
<tr>
<td>unknown</td>
<td>974</td>
<td>25.2%</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>640</td>
</tr>
</tbody>
</table>
### Traffic control

<table>
<thead>
<tr>
<th>Traffic control</th>
<th>Intersections</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td><strong>Stop sign</strong></td>
<td>2,585</td>
<td>66.8%</td>
<td>3,307</td>
</tr>
<tr>
<td><strong>Traffic signal</strong></td>
<td>254</td>
<td>6.6%</td>
<td>3,902</td>
</tr>
<tr>
<td><strong>Traffic circle / roundabout</strong></td>
<td>8</td>
<td>0.2%</td>
<td>21</td>
</tr>
<tr>
<td><strong>Yield sign</strong></td>
<td>20</td>
<td>0.5%</td>
<td>6</td>
</tr>
<tr>
<td><strong>Implied yield</strong></td>
<td>14</td>
<td>0.4%</td>
<td>12</td>
</tr>
<tr>
<td><strong>None</strong></td>
<td>15</td>
<td>0.4%</td>
<td>32</td>
</tr>
<tr>
<td><strong>unknown</strong></td>
<td>974</td>
<td>25.2%</td>
<td>149</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,870</td>
<td>100.0%</td>
<td>7,429</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids

### High Crash Intersections

**Figure 33** examines intersections within the City of Grand Rapids that have the highest number of crashes by mode. 28th Street and Eastern Avenue has the highest total number of crashes per intersection, and a high number of vehicle, pedestrian, and bicycle crashes relative to other intersections. Fulton and Market, Monroe and Pearl, and Fuller and Michigan also have higher pedestrian crash numbers per intersection. Monroe and Pearl has the highest number of bicycle crashes per intersection.
Figure 33  Top intersections by number of fatal and injury crashes

Note: Excludes intersections with less than 25 crashes.

Source: Michigan Transportation Improvement Association, City of Grand Rapids
Figure 34 identifies the percent of crashes at each intersection that resulted in a fatality or serious injury. Darker red indicates a greater portion of crashes at that intersection were fatal or serious.

Figure 34  Fatal and injury crash severity by intersection (intersection crashes only)

Source: Michigan Transportation Improvement Association, City of Grand Rapids
**Figure 35** identifies the intersections with 20 or more fatal and injury crashes. Circles are sized proportional to the number of crashes, with the fill colors representing the share of crashes that included pedestrians, bicycles, or vehicles only.

**Figure 35**  Crashes for intersections with 20 or more fatal and injury crashes

Note: Excludes intersections with less than 20 crashes.

Source: Michigan Transportation Improvement Association, City of Grand Rapids

**High Crash Corridors**

A preliminary analysis of injury crashes by corridor and mode found that 28th Street is the top corridor for overall crashes, predominantly vehicle crashes (**Figure 36**). East Beltline also has a high overall and vehicle crash count. Division, Fulton and Leonard are the highest pedestrian and bicycle crash corridors.
The corridors with the greatest number of crashes are also corridors that are currently, or were recently, owned and maintained by MDOT. 28th Street (M-11) and East Beltline (M-44) are current MDOT roadways, whereas Leonard, Division and Fulton were transferred over to Grand Rapids jurisdiction in January 2018. Grand Rapids is consulted to some level on MDOT projects, but the city does not control the design processes for those roadways. Therefore, the city is limited in its ability to influence changes or implement countermeasures on those roadways.

Figure 36  Top corridors by number of fatal and injury crashes

Note: Excludes corridors with less than 100 crashes. An individual crash may be represented on more than one corridor.

Source: Michigan Transportation Improvement Association, City of Grand Rapids

The total number of crashes per corridor may be misleading as longer corridors are more likely to experience more crashes than shorter corridors. Figure 37 identifies the corridors with the most crashes relative to the length of the corridor. 28th Street, East Beltline and Division remain near the top of the list. However other corridors, such as Pearl and Weston, rise much higher than shown in Figure 36. This suggests those corridors have fewer crashes, but those crashes are highly concentrated in shorter segments. Those two corridors also have some of the highest pedestrian and bicycle crashes per mile.
Figure 37  Crashes per mile by corridor

Note: Excludes crashes on local streets. Excludes corridors with less than 50 crashes per mile. An individual crash may be represented in more than one corridor.

Source: Michigan Transportation Improvement Association, City of Grand Rapids

Weighted High Crash Corridors

The list of top crash corridors above provides a basic list of top crash corridors based on the number of collisions and based on the number of collisions relative to corridor length. An alternative method of selecting high crash corridors is to elevate the corridors that experience a higher proportion of crashes involving vulnerable roadway users.

Vehicle crashes occur approximately 10 times more often than pedestrian or bicycle crashes in Grand Rapids, and vehicle crashes are also less likely to result in a fatality or serious injury than pedestrian or bicycle crashes. To identify high-crash corridors without over-emphasizing vehicle crashes (because they are the most frequent but least serious), each vehicle crash was weighted at

---

**Crash mode**
- Pedestrian crash
- Bicycle crash
- Vehicle crash

**Corridor**
- 28th
- East Beltline
- Pearl
- Weston
- Division
- Newberry
- Sparks
- 44th
- Lake Eastbrook
- East Paris
- Michigan
- Burton
- Breton
- Kalamazoo
- Eastern
- Plainfield
- Fuller
- Oakes
- Leonard
- Stocking
- Lake Michigan
- Ransom
- Wealthy
- Alpine
- Fulton
- Ottawa
- Lafayette
- Franklin
- Hall
- Grandville
- Sexard
- Cherry
- Lexington
- College
- Bridge
- Louis
- Madison
- Lake
- Broadway
- Lyon
- Ravine
- Mount Vernon
- Clyde Park
- Knapp
- 32nd
- Sccribner
- Bostwick
- Woodlawn
- Ann
- Watson
- State

**Crashes per mile per corridor**
- 118.0
- 120.7
- 122.8
- 128.0
- 144.8
- 171.3
- 212.1
- 219.5

50  100  150  200

---

Nelson\Nygaard Consulting Associates Inc. | 41
one-tenth (i.e. 10 vehicle crashes are considered equivalent to one pedestrian or one bicycle crash).

The result of this weighting is shown in Figure 38. This map illustrates sections along corridors that have higher densities of bicycle and pedestrian corridors, particularly evident on Leonard Street, Michigan Street, Fulton Street, Wealthy Street, Franklin Street, Division Avenue, Fuller Avenue and East Beltline Avenue.

**Figure 38 Weighted Crash Density**

Grand Rapids is divided into three Wards, each of which is represented by two Commissioners on the City Commission (the Ward boundaries are shown in Figure 39). Figure 40 summarizes the crashes in each of the Wards, and identifies the number of crashes, density of crashes per
square mile, crash rate per 10,000 jobs and residents for each crash mode. The bottom rows combine all crashes within each of the Wards.

Pedestrian and bicycle crashes occur most frequently in Ward 1, followed by Ward 2 and Ward 3. This ordering is the same for crashes per square mile and crashes per 10,000 people and jobs. Although it has fewer pedestrian and bicycle crashes, Ward 3 has a slightly higher rate of fatal and severe injury crashes.

In terms of vehicle crashes, Ward 3 experiences the most crashes per square mile and per 10,000 jobs and residents, even though there are approximately the same number of crashes in each Ward. Vehicle crash severity is highest in Ward 1 and lowest in Ward 2, though the differences in severity are not large.

Figure 39  Ward boundaries

Source: City of Grand Rapids
### Fatal and injury crash summary by Ward

<table>
<thead>
<tr>
<th>Ward</th>
<th>Area (square miles)</th>
<th>Population</th>
<th>Jobs</th>
<th>Crashes</th>
<th>Crash density per square mile</th>
<th>Crash rate per 10,000 jobs and residents</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>percentage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pedestrian crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward 1</td>
<td>16.5</td>
<td>65,000</td>
<td>39,429</td>
<td>424</td>
<td>45.4%</td>
<td>25.7</td>
<td>40.6</td>
</tr>
<tr>
<td>Ward 2</td>
<td>16.4</td>
<td>63,345</td>
<td>63,346</td>
<td>297</td>
<td>31.9%</td>
<td>18.1</td>
<td>23.4</td>
</tr>
<tr>
<td>Ward 3</td>
<td>12.4</td>
<td>65,488</td>
<td>27,235</td>
<td>211</td>
<td>22.6%</td>
<td>17.0</td>
<td>22.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45.3</td>
<td>193,833</td>
<td>130,010</td>
<td>932</td>
<td>100.0%</td>
<td>20.6</td>
<td>28.8</td>
</tr>
<tr>
<td><strong>Bicycle crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward 1</td>
<td>16.5</td>
<td>65,000</td>
<td>39,429</td>
<td>289</td>
<td>41.0%</td>
<td>17.5</td>
<td>27.7</td>
</tr>
<tr>
<td>Ward 2</td>
<td>16.4</td>
<td>63,345</td>
<td>63,346</td>
<td>249</td>
<td>35.3%</td>
<td>15.1</td>
<td>19.7</td>
</tr>
<tr>
<td>Ward 3</td>
<td>12.4</td>
<td>65,488</td>
<td>27,235</td>
<td>167</td>
<td>23.7%</td>
<td>13.5</td>
<td>18.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45.3</td>
<td>193,833</td>
<td>130,010</td>
<td>705</td>
<td>100.0%</td>
<td>15.6</td>
<td>21.8</td>
</tr>
<tr>
<td><strong>Vehicle crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward 1</td>
<td>16.5</td>
<td>65,000</td>
<td>39,429</td>
<td>3,190</td>
<td>33.9%</td>
<td>193.4</td>
<td>305.5</td>
</tr>
<tr>
<td>Ward 2</td>
<td>16.4</td>
<td>63,345</td>
<td>63,346</td>
<td>3,139</td>
<td>33.4%</td>
<td>191.0</td>
<td>247.8</td>
</tr>
<tr>
<td>Ward 3</td>
<td>12.4</td>
<td>65,488</td>
<td>27,235</td>
<td>3,079</td>
<td>32.7%</td>
<td>248.5</td>
<td>332.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45.3</td>
<td>193,833</td>
<td>130,010</td>
<td>9,408</td>
<td>100.0%</td>
<td>207.7</td>
<td>290.5</td>
</tr>
<tr>
<td><strong>All crashes combined</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward 1</td>
<td>16.5</td>
<td>65,000</td>
<td>39,429</td>
<td>3,903</td>
<td>35.3%</td>
<td>236.5</td>
<td>373.7</td>
</tr>
<tr>
<td>Ward 2</td>
<td>16.4</td>
<td>63,345</td>
<td>63,346</td>
<td>3,685</td>
<td>33.4%</td>
<td>224.7</td>
<td>290.9</td>
</tr>
<tr>
<td>Ward 3</td>
<td>12.4</td>
<td>65,488</td>
<td>27,235</td>
<td>3,457</td>
<td>31.3%</td>
<td>278.8</td>
<td>372.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45.3</td>
<td>193,833</td>
<td>130,010</td>
<td>11,045</td>
<td>100.0%</td>
<td>243.8</td>
<td>341.1</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids

Note: Color ramps in the ‘crash density per square mile’ column and the ‘crash rate per 10,000 jobs and residents’ column are scaled unique to each mode and column.
Crashes by Neighborhood

Figure 41 highlights the distribution of crashes across the neighborhoods of Grand Rapids, by mode and number of crashes. Neighborhoods such as Garfield Park and West Grand stand out as having higher numbers of crashes overall. In contrast, Oldtown-Heartside has a smaller number of overall crashes compared to these two neighborhoods, but the proportion of pedestrian crashes within that neighborhood stands out as high.

When considering land area, Downtown and Oldtown-Heartside have the highest density of crashes overall, including the highest density of pedestrian and bicycle crashes. Neighborhoods such as Baxter, East Hills, Garfield Park, Grandville, Heritage Hill, Midtown, Roosevelt Park and Southeast Community have lower rates of crashes overall but higher rates of pedestrian and bicycle crashes (Figure 42).

In comparison, Lake Eastbrook and ShangraLa have the highest overall crash rates per 10,000 residents and jobs, primarily due to the high rate of vehicle crashes. Fulton Heights has a high rate of crashes across all three crash modes while Baxter, Grandville, Heritage Hill, John Ball Park, Oldtown-Heartside, Roosevelt Park, Southeast Community and Southwest have lower rates of vehicle crashes but higher rates of pedestrian and bicycle crashes (Figure 43).

A detailed table with the frequency and number of crashes in each neighborhood is in Figure 44.
Figure 41 Fatal and injury crashes by crash mode and neighborhood
Figure 42 Neighborhood injury crash density by crash mode, per square mile

Source: Michigan Transportation Improvement Association, City of Grand Rapids
Figure 43  Neighborhood injury crash rate by crash mode per 10,000 jobs and residents

Source: Michigan Transportation Improvement Association, City of Grand Rapids, US Census Bureau, LEHD 2015
## Figure 44 Crash summary by neighborhood

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Pedestrian crashes</th>
<th></th>
<th>Bicycle crashes</th>
<th></th>
<th>Vehicle crashes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of crashes</td>
<td>Per 10,000 jobs and residents</td>
<td>Per square mile</td>
<td>Percent fatal or serious injury</td>
<td>Number of crashes</td>
<td>Per 10,000 jobs and residents</td>
</tr>
<tr>
<td>Alger Heights</td>
<td>17</td>
<td>33.8</td>
<td>20.8</td>
<td>5.0%</td>
<td>8</td>
<td>15.9</td>
</tr>
<tr>
<td>East</td>
<td>10</td>
<td>38.8</td>
<td>40.4</td>
<td>20.0%</td>
<td>17</td>
<td>68.0</td>
</tr>
<tr>
<td>Belltown Lookout</td>
<td>16</td>
<td>18.4</td>
<td>19.9</td>
<td>25.0%</td>
<td>24</td>
<td>27.6</td>
</tr>
<tr>
<td>Black Hills</td>
<td>2</td>
<td>8.9</td>
<td>2.2</td>
<td>100.0%</td>
<td>2</td>
<td>8.9</td>
</tr>
<tr>
<td>Creston</td>
<td>33</td>
<td>21.2</td>
<td>11.9</td>
<td>24.2%</td>
<td>30</td>
<td>19.3</td>
</tr>
<tr>
<td>Downtown</td>
<td>54</td>
<td>18.6</td>
<td>172.7</td>
<td>18.5%</td>
<td>31</td>
<td>10.7</td>
</tr>
<tr>
<td>East Heights</td>
<td>13</td>
<td>24.6</td>
<td>35.2</td>
<td>7.7%</td>
<td>16</td>
<td>30.3</td>
</tr>
<tr>
<td>Eastern Burton</td>
<td>3</td>
<td>26.9</td>
<td>20.0</td>
<td>0.0%</td>
<td>2</td>
<td>17.9</td>
</tr>
<tr>
<td>Eastgate</td>
<td>1</td>
<td>4.2</td>
<td>3.4</td>
<td>0.0%</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Easttown</td>
<td>18</td>
<td>15.2</td>
<td>29.5</td>
<td>11.1%</td>
<td>18</td>
<td>15.2</td>
</tr>
<tr>
<td>Fulton Heights</td>
<td>7</td>
<td>43.7</td>
<td>18.8</td>
<td>0.0%</td>
<td>4</td>
<td>25.0</td>
</tr>
<tr>
<td>Garfield Park</td>
<td>98</td>
<td>42.0</td>
<td>39.8</td>
<td>23.5%</td>
<td>53</td>
<td>22.7</td>
</tr>
<tr>
<td>Grandville</td>
<td>22</td>
<td>63.9</td>
<td>50.4</td>
<td>18.2%</td>
<td>13</td>
<td>37.8</td>
</tr>
<tr>
<td>Heritage Hill</td>
<td>20</td>
<td>35.2</td>
<td>41.3</td>
<td>30.0%</td>
<td>37</td>
<td>65.1</td>
</tr>
<tr>
<td>Highland Park</td>
<td>9</td>
<td>20.5</td>
<td>31.1</td>
<td>11.1%</td>
<td>12</td>
<td>27.3</td>
</tr>
<tr>
<td>John Ball Park</td>
<td>74</td>
<td>49.7</td>
<td>22.3</td>
<td>21.6%</td>
<td>58</td>
<td>38.0</td>
</tr>
<tr>
<td>Kon-O-Sha Park</td>
<td>30</td>
<td>15.2</td>
<td>16.3</td>
<td>26.7%</td>
<td>23</td>
<td>14.7</td>
</tr>
<tr>
<td>Lake Eastbrook</td>
<td>24</td>
<td>30.4</td>
<td>24.0</td>
<td>37.6%</td>
<td>9</td>
<td>11.4</td>
</tr>
<tr>
<td>Leffingwell-Twin Lakes</td>
<td>5</td>
<td>7.2</td>
<td>3.7</td>
<td>20.0%</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>Michigan Oaks</td>
<td>5</td>
<td>10.6</td>
<td>3.0</td>
<td>20.0%</td>
<td>6</td>
<td>12.7</td>
</tr>
<tr>
<td>Midtown</td>
<td>23</td>
<td>37.4</td>
<td>41.3</td>
<td>8.7%</td>
<td>20</td>
<td>32.5</td>
</tr>
<tr>
<td>Millbank</td>
<td>14</td>
<td>19.1</td>
<td>10.4</td>
<td>14.3%</td>
<td>15</td>
<td>20.5</td>
</tr>
<tr>
<td>North End</td>
<td>6</td>
<td>8.0</td>
<td>2.9</td>
<td>16.7%</td>
<td>10</td>
<td>13.3</td>
</tr>
<tr>
<td>North Park</td>
<td>16</td>
<td>24.9</td>
<td>9.6</td>
<td>25.0%</td>
<td>3</td>
<td>4.7</td>
</tr>
<tr>
<td>Northeast</td>
<td>41</td>
<td>26.1</td>
<td>14.0</td>
<td>20.3%</td>
<td>24</td>
<td>15.3</td>
</tr>
<tr>
<td>Oldtown-Haastad Park</td>
<td>117</td>
<td>85.7</td>
<td>227.3</td>
<td>11.1%</td>
<td>56</td>
<td>41.0</td>
</tr>
<tr>
<td>Ottawa Hills</td>
<td>1</td>
<td>8.0</td>
<td>8.1</td>
<td>100.0%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Richmond-Oakleigh</td>
<td>1</td>
<td>2.1</td>
<td>0.5</td>
<td>100.0%</td>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>Ridgemoor Park</td>
<td>13</td>
<td>11.3</td>
<td>7.6</td>
<td>15.4%</td>
<td>9</td>
<td>7.8</td>
</tr>
<tr>
<td>Roosevelt Park</td>
<td>22</td>
<td>48.2</td>
<td>51.1</td>
<td>31.8%</td>
<td>17</td>
<td>37.2</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>Pedestrian crashes</td>
<td>Bicycle crashes</td>
<td>Vehicle crashes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>---------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of crashes</td>
<td>Per 10,000 jobs and residents</td>
<td>Per square mile</td>
<td>Percent fatal or serious injury</td>
<td>Number of crashes</td>
<td>Per 10,000 jobs and residents</td>
</tr>
<tr>
<td>Shangri-La</td>
<td>5</td>
<td>24.2</td>
<td>11.6</td>
<td>40.0%</td>
<td>5</td>
<td>24.2</td>
</tr>
<tr>
<td>Shawmut Hills</td>
<td>15</td>
<td>13.0</td>
<td>4.7</td>
<td>13.3%</td>
<td>17</td>
<td>14.7</td>
</tr>
<tr>
<td>Shawnee Park</td>
<td>13</td>
<td>25.6</td>
<td>10.2</td>
<td>0.0%</td>
<td>4</td>
<td>7.9</td>
</tr>
<tr>
<td>Southeast Community</td>
<td>51</td>
<td>51.4</td>
<td>43.3</td>
<td>33.2%</td>
<td>44</td>
<td>44.3</td>
</tr>
<tr>
<td>Southeast End</td>
<td>37</td>
<td>31.2</td>
<td>26.5</td>
<td>13.5%</td>
<td>20</td>
<td>16.9</td>
</tr>
<tr>
<td>Southwest</td>
<td>21</td>
<td>51.4</td>
<td>37.7</td>
<td>26.6%</td>
<td>11</td>
<td>26.9</td>
</tr>
<tr>
<td>West Grand</td>
<td>75</td>
<td>27.1</td>
<td>27.2</td>
<td>13.3%</td>
<td>77</td>
<td>27.8</td>
</tr>
<tr>
<td>Citywide</td>
<td>932</td>
<td>28.8</td>
<td>20.6</td>
<td>20.3%</td>
<td>705</td>
<td>21.8</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, Grand Rapids

Note: Color ramps in the 'per 10,000 jobs and residents' column and the 'per square mile' column are scaled unique to each column.
Crashes by Corridor Improvement Authority (CIA)

The City of Grand Rapids has several designated Corridor Improvement Authorities (CIA) (**Figure 45**). The South Division/Grandville Ave CIA has the highest overall crash rates per square mile and the most pedestrian and vehicle crashes compared to the other CIAs. The Uptown CIA has the highest density of bicycle crashes, but a lower level of severity than bicycle crashes overall. Over 25% of pedestrian crashes in Southtown, North Quarter and South Division/Grandville Area are fatal or serious injury. Over 11% of bicycle crashes in South Division/Grandville Area, Westside and Michigan Street are fatal or serious injury.

**Figure 46** provides a detailed summary of crashes in each CIA, including comparisons to the remainder of the city not within a CIA.

**Figure 45** Corridor Improvement Authorities

---

**CRASHES BY CORRIDOR IMPROVEMENT AUTHORITY**

2009-2018

- **CRASH MODE**
  - VEHICLE CRASH
  - PEDESTRIAN CRASH
  - BICYCLE CRASH

- **NUMBER OF CRASHES**
  - 100
  - 500
  - 1000

- **GRAND RAPIDS CITY LIMITS**

Data Sources: City of Grand Rapids

Source: Michigan Transportation Improvement Association, Grand Rapids
Figure 46  Fatal and injury crash summary by Corridor Improvement Authority (CIA)

<table>
<thead>
<tr>
<th>Corridor Improvement Authority (CIA)</th>
<th>Area (square miles)</th>
<th>Crashes</th>
<th>Crash density per square mile</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Pedestrian crashes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan Street</td>
<td>0.2</td>
<td>27</td>
<td>3.9%</td>
<td>111.4</td>
</tr>
<tr>
<td>North Quarter</td>
<td>0.5</td>
<td>15</td>
<td>1.6%</td>
<td>32.8</td>
</tr>
<tr>
<td>South Division/Grandville Ave</td>
<td>0.6</td>
<td>87</td>
<td>9.3%</td>
<td>145.7</td>
</tr>
<tr>
<td>Southtown</td>
<td>0.7</td>
<td>61</td>
<td>6.5%</td>
<td>92.8</td>
</tr>
<tr>
<td>Uptown</td>
<td>0.3</td>
<td>31</td>
<td>3.3%</td>
<td>108.6</td>
</tr>
<tr>
<td>Westside</td>
<td>0.8</td>
<td>74</td>
<td>7.9%</td>
<td>87.9</td>
</tr>
<tr>
<td>All other areas (not a CIA)</td>
<td>42.2</td>
<td>637</td>
<td>68.3%</td>
<td>15.1</td>
</tr>
<tr>
<td>Total</td>
<td>45.3</td>
<td>932</td>
<td>100.0%</td>
<td>20.6</td>
</tr>
<tr>
<td>Bicycle crashes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan Street</td>
<td>0.2</td>
<td>18</td>
<td>2.6%</td>
<td>74.2</td>
</tr>
<tr>
<td>North Quarter</td>
<td>0.5</td>
<td>23</td>
<td>3.3%</td>
<td>50.3</td>
</tr>
<tr>
<td>South Division/Grandville Ave</td>
<td>0.6</td>
<td>58</td>
<td>8.2%</td>
<td>97.1</td>
</tr>
<tr>
<td>Southtown</td>
<td>0.7</td>
<td>37</td>
<td>5.2%</td>
<td>56.3</td>
</tr>
<tr>
<td>Uptown</td>
<td>0.3</td>
<td>39</td>
<td>5.5%</td>
<td>136.6</td>
</tr>
<tr>
<td>Westside</td>
<td>0.8</td>
<td>73</td>
<td>10.4%</td>
<td>86.8</td>
</tr>
<tr>
<td>All other areas (not a CIA)</td>
<td>42.2</td>
<td>457</td>
<td>64.8%</td>
<td>10.8</td>
</tr>
<tr>
<td>Total</td>
<td>45.3</td>
<td>705</td>
<td>100.0%</td>
<td>15.6</td>
</tr>
<tr>
<td>Vehicle crashes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan Street</td>
<td>0.2</td>
<td>201</td>
<td>2.1%</td>
<td>829.1</td>
</tr>
<tr>
<td>North Quarter</td>
<td>0.5</td>
<td>155</td>
<td>1.6%</td>
<td>338.9</td>
</tr>
<tr>
<td>South Division/Grandville Ave</td>
<td>0.6</td>
<td>707</td>
<td>7.5%</td>
<td>1,184.2</td>
</tr>
<tr>
<td>Southtown</td>
<td>0.7</td>
<td>467</td>
<td>5.0%</td>
<td>710.4</td>
</tr>
<tr>
<td>Uptown</td>
<td>0.3</td>
<td>249</td>
<td>2.6%</td>
<td>872.0</td>
</tr>
<tr>
<td>Westside</td>
<td>0.8</td>
<td>486</td>
<td>5.2%</td>
<td>577.6</td>
</tr>
<tr>
<td>All other areas (not a CIA)</td>
<td>42.2</td>
<td>7,143</td>
<td>76.0%</td>
<td>169.1</td>
</tr>
<tr>
<td>Total</td>
<td>45.3</td>
<td>9,408</td>
<td>100.0%</td>
<td>207.6</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids
Crashes in Neighborhoods of Focus

Neighborhoods of Focus are 17 Census Tracts that were classified by the city in 2016 following research funded by the Kellogg Foundation. These Census Tracts were identified based on areas with higher poverty and unemployment rates, and lower rates of educational attainment than elsewhere in the city. The Neighborhoods of Focus make up approximately 32% of the city’s population, and 21% of the city’s jobs. Neighborhoods of Focus include areas that are more disproportionately Black or Hispanic/Latinx than in other areas of the city. Although in aggregate Neighborhoods of Focus are more disadvantaged than the city overall, there are some areas that are relatively well off.

Pedestrian and bicycle crashes in Neighborhoods of Focus each represent approximately 40% of citywide crashes; however, these neighborhoods only represent approximately 24% of the city’s land area, 32% of the city’s residents, and 21% of the city’s jobs.

Figure 47 summarizes the overall number and rate of crashes in Neighborhoods of Focus, other areas of the city, and citywide. Figure 48 identifies each of the Census Tracts that form the Neighborhoods of Focus in a map. Figure 49 summarizes the collision data for each of the Census Tracts in the Neighborhoods of Focus.

### Figure 47 Injury crash summary by Neighborhoods of Focus

<table>
<thead>
<tr>
<th>Neighborhood Type</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
<th>Crash Rate, per 10,000 ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Pedestrian Crashes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhoods of Focus</td>
<td>375</td>
<td>40.2%</td>
<td>77</td>
</tr>
<tr>
<td>Other neighborhoods</td>
<td>557</td>
<td>59.8%</td>
<td>112</td>
</tr>
<tr>
<td>Total</td>
<td>932</td>
<td>100.0%</td>
<td>189</td>
</tr>
<tr>
<td>Bicycle Crashes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhoods of Focus</td>
<td>262</td>
<td>37.2%</td>
<td>27</td>
</tr>
<tr>
<td>Other neighborhoods</td>
<td>443</td>
<td>62.8%</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>705</td>
<td>100.0%</td>
<td>59</td>
</tr>
<tr>
<td>Vehicle Crashes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhoods of Focus</td>
<td>2,526</td>
<td>26.8%</td>
<td>145</td>
</tr>
<tr>
<td>Other neighborhoods</td>
<td>6,882</td>
<td>73.2%</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>9,408</td>
<td>100.0%</td>
<td>59</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids
### Figure 49 Crash summary by Neighborhoods of Focus Census Tracts

<table>
<thead>
<tr>
<th>Census Tract</th>
<th>Pedestrian crashes</th>
<th>Bicycle crashes</th>
<th>Vehicle crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of crashes</td>
<td>Number of crashes</td>
<td>Number of crashes</td>
</tr>
<tr>
<td></td>
<td>Per 10,000 jobs and residents</td>
<td>Per 10,000 jobs and residents</td>
<td>Per 10,000 jobs and residents</td>
</tr>
<tr>
<td></td>
<td>Per square mile</td>
<td>Per square mile</td>
<td>Per square mile</td>
</tr>
<tr>
<td></td>
<td>Percent fatal or serious injury</td>
<td>Percent fatal or serious injury</td>
<td>Percent fatal or serious injury</td>
</tr>
<tr>
<td>Tract 15</td>
<td>26</td>
<td>28.8</td>
<td>46.3</td>
</tr>
<tr>
<td>Tract 16</td>
<td>18</td>
<td>26.7</td>
<td>29.3</td>
</tr>
<tr>
<td>Tract 19</td>
<td>61</td>
<td>79.8</td>
<td>71.2</td>
</tr>
<tr>
<td>Tract 26</td>
<td>61</td>
<td>83.4</td>
<td>40.9</td>
</tr>
<tr>
<td>Tract 27</td>
<td>10</td>
<td>18.9</td>
<td>5.4</td>
</tr>
<tr>
<td>Tract 28</td>
<td>27</td>
<td>77.7</td>
<td>50.4</td>
</tr>
<tr>
<td>Tract 29</td>
<td>5</td>
<td>42.4</td>
<td>26.9</td>
</tr>
<tr>
<td>Tract 30</td>
<td>4</td>
<td>19.4</td>
<td>21.5</td>
</tr>
<tr>
<td>Tract 31</td>
<td>13</td>
<td>34.7</td>
<td>34.8</td>
</tr>
<tr>
<td>Tract 32</td>
<td>19</td>
<td>38.7</td>
<td>40.2</td>
</tr>
<tr>
<td>Tract 33</td>
<td>9</td>
<td>11.8</td>
<td>19.8</td>
</tr>
<tr>
<td>Tract 35</td>
<td>19</td>
<td>31.2</td>
<td>27.1</td>
</tr>
<tr>
<td>Tract 36</td>
<td>21</td>
<td>53.1</td>
<td>38.7</td>
</tr>
<tr>
<td>Tract 37</td>
<td>17</td>
<td>32.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Tract 38</td>
<td>28</td>
<td>38.2</td>
<td>59.0</td>
</tr>
<tr>
<td>Tract 39</td>
<td>14</td>
<td>35.0</td>
<td>43.4</td>
</tr>
<tr>
<td>Tract 40</td>
<td>23</td>
<td>44.0</td>
<td>46.5</td>
</tr>
<tr>
<td>Neighborhoods of Focus</td>
<td>375</td>
<td>41.2</td>
<td>35.0</td>
</tr>
<tr>
<td>Other Census Tracts</td>
<td>557</td>
<td>23.6</td>
<td>13.0</td>
</tr>
<tr>
<td>Citywide</td>
<td>932</td>
<td>28.5</td>
<td>17.5</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, Grand Rapids

Note: Color ramps in the ‘per 10,000 jobs and residents’ column and the ‘per square mile’ column are scaled unique to each column.
Crashes near Parks

Grand Rapids has developed a goal to ensure all residents have access to a high-quality park within a 10-minute walk of their home. Grand Rapids received a technical assistance grant from the Urban Land Institute in 2018 to develop a measurable action plan to achieve that goal.

Access to parks, and the quality of parks are important components of this goal. However, safe roads are also crucial to park access. Figure 50 identifies the number of crashes within 10-minute walkshed of each park in Grand Rapids, the percent of those crashes that resulted in a fatality or serious injury, and the number of crashes relative to the walkshed area in square miles. Figure 51 is a map identifying park locations.
**Figure 50  
Crash summary by park (based on 10-minute walksheds)**

<table>
<thead>
<tr>
<th>Parks</th>
<th>Pedestrian crashes</th>
<th>Bicycle crashes</th>
<th>Vehicle crashes</th>
<th>All crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>% FSI</td>
<td>Per square mile</td>
<td>#</td>
</tr>
<tr>
<td>Aberdeen Park</td>
<td>3</td>
<td>0.0%</td>
<td>7.6</td>
<td>1</td>
</tr>
<tr>
<td>Alexander Park</td>
<td>7</td>
<td>0.0%</td>
<td>21.2</td>
<td>11</td>
</tr>
<tr>
<td>Alger and Seymour Parks</td>
<td>7</td>
<td>14.3%</td>
<td>14.1</td>
<td>1</td>
</tr>
<tr>
<td>An-Nab-Awen Park</td>
<td>46</td>
<td>13.0%</td>
<td>145.2</td>
<td>22</td>
</tr>
<tr>
<td>Baja Park</td>
<td>7</td>
<td>42.9%</td>
<td>23.0</td>
<td>9</td>
</tr>
<tr>
<td>Baldwin Park</td>
<td>13</td>
<td>30.8%</td>
<td>28.7</td>
<td>29</td>
</tr>
<tr>
<td>Ball Park</td>
<td>8</td>
<td>12.5%</td>
<td>15.4</td>
<td>3</td>
</tr>
<tr>
<td>Ball-Perkins Park</td>
<td>4</td>
<td>75.0%</td>
<td>12.5</td>
<td>2</td>
</tr>
<tr>
<td>Beckwith Site</td>
<td>4</td>
<td>50.0%</td>
<td>17.4</td>
<td>5</td>
</tr>
<tr>
<td>Belknap Park</td>
<td>6</td>
<td>33.3%</td>
<td>18.8</td>
<td>19</td>
</tr>
<tr>
<td>Bike Park</td>
<td>4</td>
<td>75.0%</td>
<td>20.8</td>
<td>2</td>
</tr>
<tr>
<td>Blandford Nature Center</td>
<td>0</td>
<td>0.0%</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>Briggs Park</td>
<td>10</td>
<td>30.0%</td>
<td>17.5</td>
<td>16</td>
</tr>
<tr>
<td>Buchanan Elementary</td>
<td>29</td>
<td>6.9%</td>
<td>66.9</td>
<td>17</td>
</tr>
<tr>
<td>Butterworth Site</td>
<td>3</td>
<td>33.3%</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>CA Frost Elementary</td>
<td>0</td>
<td>0.0%</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>CA Frost High School</td>
<td>1</td>
<td>0.0%</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>Calder Park</td>
<td>63</td>
<td>14.3%</td>
<td>178.2</td>
<td>35</td>
</tr>
<tr>
<td>Cambridge Park</td>
<td>1</td>
<td>0.0%</td>
<td>2.7</td>
<td>1</td>
</tr>
<tr>
<td>Camelot Park</td>
<td>2</td>
<td>0.0%</td>
<td>7.0</td>
<td>0</td>
</tr>
<tr>
<td>Campus Park</td>
<td>15</td>
<td>20.0%</td>
<td>45.5</td>
<td>11</td>
</tr>
<tr>
<td>Campus Elementary</td>
<td>11</td>
<td>18.2%</td>
<td>21.7</td>
<td>6</td>
</tr>
<tr>
<td>Canal Street and 6th St Bridge Parks</td>
<td>13</td>
<td>30.8%</td>
<td>25.8</td>
<td>22</td>
</tr>
<tr>
<td>Caulfield Park</td>
<td>21</td>
<td>28.6%</td>
<td>59.4</td>
<td>15</td>
</tr>
<tr>
<td>Cherry Green</td>
<td>13</td>
<td>7.7%</td>
<td>25.9</td>
<td>25</td>
</tr>
<tr>
<td>Cherry Park</td>
<td>16</td>
<td>6.3%</td>
<td>36.4</td>
<td>21</td>
</tr>
<tr>
<td>Cheseboro Park</td>
<td>9</td>
<td>0.0%</td>
<td>22.4</td>
<td>7</td>
</tr>
<tr>
<td>Clemente Park</td>
<td>15</td>
<td>20.0%</td>
<td>43.2</td>
<td>8</td>
</tr>
<tr>
<td>Parks</td>
<td>Pedestrian crashes</td>
<td></td>
<td>Bicycle crashes</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------</td>
<td>------------</td>
<td>-----------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>#</td>
<td>% FSI</td>
<td>Per square mile</td>
<td>#</td>
</tr>
<tr>
<td>Coit Park</td>
<td>5</td>
<td>40.0%</td>
<td>15.1</td>
<td>6</td>
</tr>
<tr>
<td>Congress Park</td>
<td>16</td>
<td>6.3%</td>
<td>42.6</td>
<td>19</td>
</tr>
<tr>
<td>Covell Dog Park and Tremont Greenspace</td>
<td>6</td>
<td>0.0%</td>
<td>14.4</td>
<td>3</td>
</tr>
<tr>
<td>Crescent Park</td>
<td>79</td>
<td>15.2%</td>
<td>202.6</td>
<td>38</td>
</tr>
<tr>
<td>Creston High School Park</td>
<td>20</td>
<td>35.0%</td>
<td>51.6</td>
<td>10</td>
</tr>
<tr>
<td>Dickinson Buffer Park</td>
<td>9</td>
<td>22.2%</td>
<td>26.0</td>
<td>8</td>
</tr>
<tr>
<td>Douglas Park</td>
<td>33</td>
<td>15.2%</td>
<td>83.3</td>
<td>34</td>
</tr>
<tr>
<td>Eastern Park</td>
<td>0</td>
<td>0%</td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>ED Property 1</td>
<td>12</td>
<td>8.3%</td>
<td>47.4</td>
<td>6</td>
</tr>
<tr>
<td>ED Property 6</td>
<td>0</td>
<td>0%</td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>Fish Ladder Park</td>
<td>4</td>
<td>50.0%</td>
<td>16.7</td>
<td>5</td>
</tr>
<tr>
<td>Foster Park</td>
<td>30</td>
<td>23.3%</td>
<td>68.1</td>
<td>48</td>
</tr>
<tr>
<td>Fuller Park</td>
<td>25</td>
<td>8.0%</td>
<td>70.4</td>
<td>16</td>
</tr>
<tr>
<td>Garfield Park Burton Woods</td>
<td>33</td>
<td>21.2%</td>
<td>55.3</td>
<td>17</td>
</tr>
<tr>
<td>Grand Rapids Township Park</td>
<td>3</td>
<td>0.0%</td>
<td>48.5</td>
<td>0</td>
</tr>
<tr>
<td>GRPS University School</td>
<td>22</td>
<td>18.2%</td>
<td>30.5</td>
<td>11</td>
</tr>
<tr>
<td>Harrison Park</td>
<td>20</td>
<td>15.0%</td>
<td>45.5</td>
<td>20</td>
</tr>
<tr>
<td>Heartside Park</td>
<td>75</td>
<td>16.0%</td>
<td>212.5</td>
<td>37</td>
</tr>
<tr>
<td>Heritage Hill Park</td>
<td>11</td>
<td>18.2%</td>
<td>24.9</td>
<td>18</td>
</tr>
<tr>
<td>Highland Park</td>
<td>14</td>
<td>14.3%</td>
<td>28.5</td>
<td>15</td>
</tr>
<tr>
<td>Hillcrest Park</td>
<td>7</td>
<td>0.0%</td>
<td>22.5</td>
<td>4</td>
</tr>
<tr>
<td>Houseman Field</td>
<td>20</td>
<td>10.0%</td>
<td>46.7</td>
<td>17</td>
</tr>
<tr>
<td>Huff Park</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>6</td>
</tr>
<tr>
<td>Joe Taylor Park</td>
<td>14</td>
<td>14.3%</td>
<td>33.9</td>
<td>24</td>
</tr>
<tr>
<td>John Ball Park</td>
<td>8</td>
<td>25.0%</td>
<td>20.3</td>
<td>10</td>
</tr>
<tr>
<td>KEC Oakleigh</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>3</td>
</tr>
<tr>
<td>Ken-O-Sha Elementary School</td>
<td>1</td>
<td>0.0%</td>
<td>5.1</td>
<td>0</td>
</tr>
<tr>
<td>Ken-O-Sha Park</td>
<td>1</td>
<td>0.0%</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>Parks</td>
<td>Pedestrian crashes</td>
<td>Bicycle crashes</td>
<td>Vehicle crashes</td>
<td>All crashes</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>#</td>
<td>% FSI</td>
<td>Per square mile</td>
<td>#</td>
</tr>
<tr>
<td>Kensington Park</td>
<td>3</td>
<td>66.7%</td>
<td>12.5</td>
<td>2</td>
</tr>
<tr>
<td>Kent Hills Park</td>
<td>3</td>
<td>0.0%</td>
<td>10.6</td>
<td>2</td>
</tr>
<tr>
<td>Lambert Lake Fen Nature Preserve</td>
<td>0</td>
<td>–</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Lexington Park</td>
<td>35</td>
<td>14.3%</td>
<td>84.1</td>
<td>25</td>
</tr>
<tr>
<td>Lincoln Park</td>
<td>17</td>
<td>17.6%</td>
<td>42.0</td>
<td>18</td>
</tr>
<tr>
<td>Lincoln Place Park</td>
<td>90</td>
<td>15.6%</td>
<td>199.1</td>
<td>66</td>
</tr>
<tr>
<td>Lyon Square</td>
<td>94</td>
<td>13.8%</td>
<td>260.3</td>
<td>42</td>
</tr>
<tr>
<td>Madison Park</td>
<td>19</td>
<td>21.1%</td>
<td>51.8</td>
<td>19</td>
</tr>
<tr>
<td>Mary Waters Park</td>
<td>11</td>
<td>18.2%</td>
<td>28.8</td>
<td>15</td>
</tr>
<tr>
<td>McKay-Jaycee Park</td>
<td>11</td>
<td>36.4%</td>
<td>21.6</td>
<td>7</td>
</tr>
<tr>
<td>Midtown Green Park</td>
<td>13</td>
<td>23.1%</td>
<td>36.7</td>
<td>8</td>
</tr>
<tr>
<td>Millennium Park</td>
<td>0</td>
<td>–</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>MLK Park</td>
<td>11</td>
<td>0.0%</td>
<td>27.5</td>
<td>5</td>
</tr>
<tr>
<td>Money Park</td>
<td>22</td>
<td>36.4%</td>
<td>50.4</td>
<td>26</td>
</tr>
<tr>
<td>Mulick Park</td>
<td>1</td>
<td>0.0%</td>
<td>2.4</td>
<td>1</td>
</tr>
<tr>
<td>Nagold Park</td>
<td>19</td>
<td>21.1%</td>
<td>62.1</td>
<td>11</td>
</tr>
<tr>
<td>North Park</td>
<td>1</td>
<td>0.0%</td>
<td>2.9</td>
<td>1</td>
</tr>
<tr>
<td>Northeast Middle School</td>
<td>10</td>
<td>30.0%</td>
<td>32.5</td>
<td>4</td>
</tr>
<tr>
<td>Oak Park</td>
<td>126</td>
<td>12.7%</td>
<td>323.0</td>
<td>53</td>
</tr>
<tr>
<td>Oakdale Park</td>
<td>10</td>
<td>10.0%</td>
<td>33.7</td>
<td>5</td>
</tr>
<tr>
<td>Ottawa Hills High School</td>
<td>2</td>
<td>0.0%</td>
<td>9.4</td>
<td>2</td>
</tr>
<tr>
<td>Ottawa Hills Park</td>
<td>8</td>
<td>0.0%</td>
<td>17.6</td>
<td>8</td>
</tr>
<tr>
<td>Oxford Place</td>
<td>0</td>
<td>–</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>Paris and Seymour Parks</td>
<td>7</td>
<td>14.3%</td>
<td>19.4</td>
<td>1</td>
</tr>
<tr>
<td>Paul Phillips Recreation Center and Pleasant Park</td>
<td>13</td>
<td>30.8%</td>
<td>30.1</td>
<td>19</td>
</tr>
<tr>
<td>Pekich Park</td>
<td>106</td>
<td>17.0%</td>
<td>242.3</td>
<td>60</td>
</tr>
<tr>
<td>Plaster Creek Family and Bike Parks</td>
<td>8</td>
<td>12.5%</td>
<td>34.5</td>
<td>3</td>
</tr>
</tbody>
</table>
## Pedestrian crashes

<table>
<thead>
<tr>
<th>Parks</th>
<th>#</th>
<th>% FSI</th>
<th>Per square mile</th>
<th>#</th>
<th>% FSI</th>
<th>Per square mile</th>
<th>#</th>
<th>% FSI</th>
<th>Per square mile</th>
<th>#</th>
<th>% FSI</th>
<th>Per square mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaster Creek Trail - 28th St.</td>
<td>23</td>
<td>47.8%</td>
<td>69.8</td>
<td>9</td>
<td>0.0%</td>
<td>27.3</td>
<td>275</td>
<td>7.6%</td>
<td>834.6</td>
<td>307</td>
<td>10.4%</td>
<td>931.7</td>
</tr>
<tr>
<td>Plaster Creek Trail - Eastern Ave.</td>
<td>15</td>
<td>46.7%</td>
<td>79.6</td>
<td>8</td>
<td>12.5%</td>
<td>42.5</td>
<td>166</td>
<td>7.2%</td>
<td>881.3</td>
<td>189</td>
<td>10.6%</td>
<td>1,003.4</td>
</tr>
<tr>
<td>Plaster Creek Trail by Brookside</td>
<td>14</td>
<td>35.7%</td>
<td>40.8</td>
<td>3</td>
<td>0.0%</td>
<td>8.7</td>
<td>117</td>
<td>8.5%</td>
<td>340.7</td>
<td>134</td>
<td>11.2%</td>
<td>390.2</td>
</tr>
<tr>
<td>Raspberry Field</td>
<td>31</td>
<td>29.0%</td>
<td>76.5</td>
<td>18</td>
<td>11.1%</td>
<td>44.4</td>
<td>209</td>
<td>6.2%</td>
<td>515.9</td>
<td>258</td>
<td>9.3%</td>
<td>636.8</td>
</tr>
<tr>
<td>Parks and Joan Croc Center Athletic Fields</td>
<td>7</td>
<td>14.3%</td>
<td>33.9</td>
<td>2</td>
<td>0.0%</td>
<td>9.7</td>
<td>35</td>
<td>2.9%</td>
<td>169.4</td>
<td>44</td>
<td>4.5%</td>
<td>212.9</td>
</tr>
<tr>
<td>Reservoir and Lookout Parks</td>
<td>2</td>
<td>50.0%</td>
<td>9.3</td>
<td>3</td>
<td>66.7%</td>
<td>14.0</td>
<td>21</td>
<td>4.8%</td>
<td>98.0</td>
<td>26</td>
<td>15.4%</td>
<td>121.3</td>
</tr>
<tr>
<td>Richmond Park</td>
<td>11</td>
<td>18.2%</td>
<td>20.7</td>
<td>9</td>
<td>11.1%</td>
<td>16.9</td>
<td>72</td>
<td>5.6%</td>
<td>135.4</td>
<td>92</td>
<td>7.6%</td>
<td>173.0</td>
</tr>
<tr>
<td>Ridgemoor Park</td>
<td>8</td>
<td>12.5%</td>
<td>17.8</td>
<td>1</td>
<td>0.0%</td>
<td>2.2</td>
<td>88</td>
<td>5.7%</td>
<td>195.8</td>
<td>97</td>
<td>6.2%</td>
<td>215.9</td>
</tr>
<tr>
<td>Riverside Middle School</td>
<td>3</td>
<td>0.0%</td>
<td>7.0</td>
<td>3</td>
<td>0.0%</td>
<td>7.0</td>
<td>37</td>
<td>0.0%</td>
<td>86.1</td>
<td>43</td>
<td>0.0%</td>
<td>100.1</td>
</tr>
<tr>
<td>Riverside Park</td>
<td>7</td>
<td>0.0%</td>
<td>5.1</td>
<td>7</td>
<td>57.1%</td>
<td>5.1</td>
<td>139</td>
<td>2.2%</td>
<td>101.7</td>
<td>153</td>
<td>4.6%</td>
<td>112.0</td>
</tr>
<tr>
<td>Roosevelt Park</td>
<td>12</td>
<td>16.7%</td>
<td>60.6</td>
<td>9</td>
<td>22.2%</td>
<td>45.5</td>
<td>54</td>
<td>5.6%</td>
<td>272.9</td>
<td>75</td>
<td>9.3%</td>
<td>379.0</td>
</tr>
<tr>
<td>Rosa Park Circle and Louis Campau Promenade</td>
<td>140</td>
<td>13.6%</td>
<td>327.5</td>
<td>61</td>
<td>4.9%</td>
<td>142.7</td>
<td>403</td>
<td>2.7%</td>
<td>942.8</td>
<td>604</td>
<td>5.5%</td>
<td>1,413.0</td>
</tr>
<tr>
<td>Shawmut Hills Park</td>
<td>1</td>
<td>0.0%</td>
<td>2.6</td>
<td>4</td>
<td>0.0%</td>
<td>10.5</td>
<td>28</td>
<td>10.7%</td>
<td>73.3</td>
<td>33</td>
<td>9.1%</td>
<td>86.4</td>
</tr>
<tr>
<td>Sherwood School Grounds</td>
<td>2</td>
<td>0.0%</td>
<td>5.5</td>
<td>1</td>
<td>0.0%</td>
<td>2.7</td>
<td>26</td>
<td>3.8%</td>
<td>71.3</td>
<td>29</td>
<td>3.4%</td>
<td>79.5</td>
</tr>
<tr>
<td>Sigbee Park</td>
<td>20</td>
<td>15.0%</td>
<td>52.5</td>
<td>22</td>
<td>4.5%</td>
<td>57.8</td>
<td>119</td>
<td>3.4%</td>
<td>312.4</td>
<td>161</td>
<td>5.0%</td>
<td>422.7</td>
</tr>
<tr>
<td>Stocking School Grounds</td>
<td>20</td>
<td>15.0%</td>
<td>42.7</td>
<td>13</td>
<td>0.0%</td>
<td>27.8</td>
<td>133</td>
<td>4.5%</td>
<td>284.2</td>
<td>166</td>
<td>5.4%</td>
<td>354.7</td>
</tr>
<tr>
<td>Sullivan Field</td>
<td>2</td>
<td>50.0%</td>
<td>6.1</td>
<td>3</td>
<td>0.0%</td>
<td>9.2</td>
<td>29</td>
<td>6.9%</td>
<td>89.0</td>
<td>34</td>
<td>8.8%</td>
<td>104.3</td>
</tr>
<tr>
<td>The Highlands</td>
<td>0</td>
<td>0.0%</td>
<td>0.0</td>
<td>3</td>
<td>0.0%</td>
<td>5.6</td>
<td>33</td>
<td>6.1%</td>
<td>61.2</td>
<td>36</td>
<td>5.6%</td>
<td>66.4</td>
</tr>
<tr>
<td>Union High School Grounds</td>
<td>2</td>
<td>100.0%</td>
<td>5.5</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>21</td>
<td>14.3%</td>
<td>57.7</td>
<td>23</td>
<td>21.7%</td>
<td>63.2</td>
</tr>
<tr>
<td>Unnamed</td>
<td>100</td>
<td>13.0%</td>
<td>276.2</td>
<td>43</td>
<td>4.7%</td>
<td>118.8</td>
<td>267</td>
<td>3.7%</td>
<td>737.5</td>
<td>410</td>
<td>6.1%</td>
<td>1,132.5</td>
</tr>
<tr>
<td>Veterans and Monument Parks</td>
<td>146</td>
<td>12.3%</td>
<td>321.2</td>
<td>77</td>
<td>9.1%</td>
<td>169.4</td>
<td>356</td>
<td>3.4%</td>
<td>783.3</td>
<td>579</td>
<td>6.4%</td>
<td>1,274.0</td>
</tr>
<tr>
<td>Wellerwood Elementary</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>0</td>
<td>0.0%</td>
<td>0.0</td>
<td>0</td>
<td>7.6%</td>
<td>53.5</td>
<td>7</td>
<td>28.6%</td>
<td>53.5</td>
</tr>
<tr>
<td>Wellerwood GRPS</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>0</td>
<td>--</td>
<td>0.0</td>
<td>11</td>
<td>18.2%</td>
<td>35.4</td>
<td>11</td>
<td>18.2%</td>
<td>35.4</td>
</tr>
<tr>
<td>Westown Commons Park</td>
<td>14</td>
<td>35.7%</td>
<td>32.1</td>
<td>22</td>
<td>9.1%</td>
<td>50.4</td>
<td>118</td>
<td>3.4%</td>
<td>270.3</td>
<td>154</td>
<td>7.1%</td>
<td>352.8</td>
</tr>
<tr>
<td>Wilcox Park</td>
<td>11</td>
<td>9.1%</td>
<td>39.5</td>
<td>12</td>
<td>0.0%</td>
<td>43.1</td>
<td>59</td>
<td>6.8%</td>
<td>212.1</td>
<td>82</td>
<td>6.1%</td>
<td>294.7</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association, City of Grand Rapids
Figure 51 Parks and Open Spaces
WHY DO CRASHES OCCUR?

Gaining an understanding of why crashes occur is critical to the development and implementation of effective infrastructure improvements and non-infrastructure programming. Police-reported crash data provides some information on the factors involved in crashes. It is important to complement this data with qualitative data, such as the interviews with first responders, trauma teams and neighborhood residents being conducted during the engagement portion of this project; and walking audits to have a more complete picture of the lived experience of transportation safety.

Prior action

The reported crash records include details on the action of each party just prior to the crash. The relationship between the actions of a crash’s respective parties highlights key actions that account for a large share of crashes. For crashes where more than three parties were involved\(^5\), only the first two parties were analyzed.

Figure 52 identifies the top eight vehicle actions and top five pedestrian actions in pedestrian crashes. Approximately 40% of pedestrian crashes occur when a vehicle is proceeding straight and a pedestrian is crossing the street (either at an intersection, or mid-block), and an additional 27% of crashes occur when a vehicle is turning at an intersection while the pedestrian is crossing the street. Vehicles making a left turn and striking a pedestrian occur twice as often as when a vehicle makes a right turn and strikes a pedestrian.

Figure 53 identifies the top eight vehicle actions and top seven bicycle actions in bicycle crashes. The most common pair of actions is when both the vehicle and bicyclist are proceeding straight. This is followed by vehicles turning left or turning right while a bicyclist is proceeding straight.

Unlike in pedestrian crashes, vehicles turning right is a more common prior action than vehicles turning left. However, when a vehicle makes a left turn, it is more than four time as likely to result in a fatality or serious injury than when making a right turn.

Figure 54 identifies the top combinations of vehicle actions in vehicle collisions. Most crashes involve vehicles proceeding straight, making a left turn, or vehicles that are stopped or parked.

---

\(^5\) There were 1,503 crashes where more than three parties were involved. 1,424 were vehicle crashes, 64 were pedestrian crashes, and 15 were bicycle crashes.
Figure 52 Prior actions in pedestrian crashes

<table>
<thead>
<tr>
<th>Vehicle prior action</th>
<th>Pedestrian crossing at intersection</th>
<th>Pedestrian crossing mid-block</th>
<th>Pedestrian in roadway (working, playing, standing)</th>
<th>Other</th>
<th>Pedestrian walking in roadway</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
<td>140</td>
<td>222</td>
<td>59</td>
<td>37</td>
<td>31</td>
<td>489</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>161</td>
<td>24</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>203</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>90</td>
<td>4</td>
<td>1</td>
<td>–</td>
<td>3</td>
<td>98</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>12</td>
<td>11</td>
<td>9</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>Starting up</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>13</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Vehicle backing</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>11</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>Slowing or stopping</td>
<td>7</td>
<td>11</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Stopped or parked</td>
<td>2</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>423</strong></td>
<td><strong>289</strong></td>
<td><strong>93</strong></td>
<td><strong>83</strong></td>
<td><strong>44</strong></td>
<td><strong>932</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent fatal or serious injury</th>
<th>Pedestrian crossing at intersection</th>
<th>Pedestrian crossing mid-block</th>
<th>Pedestrian in roadway (working, playing, standing)</th>
<th>Other</th>
<th>Pedestrian walking in roadway</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
<td>23.6%</td>
<td>29.7%</td>
<td>18.6%</td>
<td>37.8%</td>
<td>29.0%</td>
<td>27.2%</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>11.2%</td>
<td>20.8%</td>
<td>14.3%</td>
<td>11.1%</td>
<td>0.0%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>7.8%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>–</td>
<td>0.0%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>25.0%</td>
<td>0.0%</td>
<td>22.2%</td>
<td>50.0%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Starting up</td>
<td>7.7%</td>
<td>30.8%</td>
<td>0.0%</td>
<td>30.8%</td>
<td>0.0%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Vehicle backing</td>
<td>50.0%</td>
<td>0.0%</td>
<td>22.2%</td>
<td>9.1%</td>
<td>0.0%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Slowing or stopping</td>
<td>14.3%</td>
<td>9.1%</td>
<td>50.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Stopped or parked</td>
<td>0.0%</td>
<td>–</td>
<td>100.0%</td>
<td>0.0%</td>
<td>–</td>
<td>25.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14.4%</strong></td>
<td><strong>27.3%</strong></td>
<td><strong>17.2%</strong></td>
<td><strong>26.5%</strong></td>
<td><strong>25.0%</strong></td>
<td><strong>20.3%</strong></td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association
## Prior actions in bicycle crashes

<table>
<thead>
<tr>
<th>Vehicle prior action</th>
<th>Bicycle proceeding straight</th>
<th>Bicycle crossing at intersection</th>
<th>Other</th>
<th>Bicycle crossing not at intersection</th>
<th>Bicycle rode out</th>
<th>Bicycle turning left</th>
<th>Bicycle turning right</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
<td>164</td>
<td>26</td>
<td>28</td>
<td>29</td>
<td>21</td>
<td>10</td>
<td>7</td>
<td>285</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>100</td>
<td>51</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>171</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>72</td>
<td>23</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>108</td>
</tr>
<tr>
<td>Vehicle starting up</td>
<td>38</td>
<td>18</td>
<td>9</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>68</td>
</tr>
<tr>
<td>Vehicle stopped or parked</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>–</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>25</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>23</td>
</tr>
<tr>
<td>Vehicle slowing or stopping</td>
<td>10</td>
<td>5</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>21</td>
</tr>
<tr>
<td>Vehicle backing</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>404</strong></td>
<td><strong>133</strong></td>
<td><strong>71</strong></td>
<td><strong>35</strong></td>
<td><strong>35</strong></td>
<td><strong>17</strong></td>
<td><strong>10</strong></td>
<td><strong>705</strong></td>
</tr>
</tbody>
</table>

## Percent fatal or serious injury

<table>
<thead>
<tr>
<th>Vehicle prior action</th>
<th>Bicycle proceeding straight</th>
<th>Bicycle crossing at intersection</th>
<th>Other</th>
<th>Bicycle crossing not at intersection</th>
<th>Bicycle rode out</th>
<th>Bicycle turning left</th>
<th>Bicycle turning right</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
<td>11.6%</td>
<td>3.8%</td>
<td>10.7%</td>
<td>10.3%</td>
<td>14.3%</td>
<td>10.0%</td>
<td>42.9%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>2.0%</td>
<td>3.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>13.9%</td>
<td>8.7%</td>
<td>20.0%</td>
<td>100.0%</td>
<td>33.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Vehicle starting up</td>
<td>2.6%</td>
<td>5.6%</td>
<td>11.1%</td>
<td>–</td>
<td>0.0%</td>
<td>–</td>
<td>–</td>
<td>4.4%</td>
</tr>
<tr>
<td>Vehicle stopped or parked</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>–</td>
<td>0.0%</td>
<td>0.0%</td>
<td>–</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other</td>
<td>14.3%</td>
<td>0.0%</td>
<td>10.0%</td>
<td>0.0%</td>
<td>–</td>
<td>0.0%</td>
<td>–</td>
<td>8.7%</td>
</tr>
<tr>
<td>Vehicle slowing or stopping</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>–</td>
<td>–</td>
<td>50.0%</td>
<td>–</td>
<td>4.8%</td>
</tr>
<tr>
<td>Vehicle backing</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.2%</strong></td>
<td><strong>4.5%</strong></td>
<td><strong>8.5%</strong></td>
<td><strong>11.4%</strong></td>
<td><strong>11.4%</strong></td>
<td><strong>17.6%</strong></td>
<td><strong>30.0%</strong></td>
<td><strong>8.4%</strong></td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association
## Figure 54  Prior actions in vehicle crashes

<table>
<thead>
<tr>
<th>Vehicle 1 prior action</th>
<th>Vehicle stopped or parked</th>
<th>Vehicle proceeding straight</th>
<th>Vehicle turning left</th>
<th>Other</th>
<th>Vehicle slowing down / stopping</th>
<th>Vehicle starting up</th>
<th>Vehicle turning right</th>
<th>Vehicle drove out</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
<td>1,647</td>
<td>1,949</td>
<td>1,737</td>
<td>693</td>
<td>601</td>
<td>324</td>
<td>192</td>
<td>--</td>
<td>7,143</td>
</tr>
<tr>
<td>Vehicle slowing down / stopping</td>
<td>485</td>
<td>--</td>
<td>15</td>
<td>31</td>
<td>223</td>
<td>30</td>
<td>24</td>
<td>--</td>
<td>808</td>
</tr>
<tr>
<td>Other</td>
<td>102</td>
<td>230</td>
<td>59</td>
<td>138</td>
<td>37</td>
<td>7</td>
<td>27</td>
<td>7</td>
<td>607</td>
</tr>
<tr>
<td>Vehicle stopped or parked</td>
<td>196</td>
<td>--</td>
<td>39</td>
<td>32</td>
<td>1</td>
<td>3</td>
<td>42</td>
<td>--</td>
<td>313</td>
</tr>
<tr>
<td>Vehicle drove out</td>
<td>2</td>
<td>208</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>--</td>
<td>1</td>
<td>2</td>
<td>227</td>
</tr>
<tr>
<td>Vehicle starting up</td>
<td>104</td>
<td>--</td>
<td>4</td>
<td>12</td>
<td>--</td>
<td>24</td>
<td>--</td>
<td>--</td>
<td>144</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>--</td>
<td>--</td>
<td>33</td>
<td>69</td>
<td>--</td>
<td>--</td>
<td>16</td>
<td>--</td>
<td>118</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>34</td>
<td>--</td>
<td>--</td>
<td>14</td>
<td>--</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>2,536</td>
<td>2,387</td>
<td>1,892</td>
<td>1,015</td>
<td>865</td>
<td>388</td>
<td>316</td>
<td>9</td>
<td>9,408</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent fatal or serious injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle proceeding straight</td>
</tr>
<tr>
<td>Vehicle slowing down / stopping</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Vehicle stopped or parked</td>
</tr>
<tr>
<td>Vehicle drove out</td>
</tr>
<tr>
<td>Vehicle starting up</td>
</tr>
<tr>
<td>Vehicle turning left</td>
</tr>
<tr>
<td>Vehicle turning right</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association
Direction of parties

To further understand the context of the most common prior actions, this section compares the direction of travel for each party. For example, when two parties are both proceeding straight, it could refer to parties traveling in the same direction, traveling in opposite directions, or traveling perpendicular to each other.

The crash report forms include the direction of travel for some parties, but not all. This section analyzes data for the crashes where both parties have valid directions of travel data. In general, the directionality data is complete for most vehicle crashes, included in more than half of bicycle crashes, and included for very few pedestrian crashes.

The directionality is divided into three general categories:

- **Same direction** – both parties are traveling in the same direction on the same street
- **Opposite or head on** – both parties are traveling on the same street in opposite directions
- **Perpendicular or angle** – both parties are traveling in different directions on different streets

**Figure 55** identifies the directionality for nine prior action combination. Key findings from the analysis of directions include:

- In bicycle crashes where both parties are proceeding straight, three-quarters of crashes occur where both parties are traveling on perpendicular streets, and one-fifth occur when they are traveling in the same direction. The former likely involves a party that fails to yield or comply with a traffic control device, and the latter may be a result of sideswipes.
- In bicycle crashes where the driver of a vehicle is making a left or right turn and the bicyclist is proceeding straight, more than 70% of crashes involve bicyclists traveling along the road onto which the driver is turning. However, one-quarter of the left turn crashes involve opposite directions of travel, suggesting vehicle drivers may not be aware of or watching out for bicycle traffic.
- In vehicle crashes, when both drivers are proceeding straight, the most common direction combination is perpendicular or angle. This suggests at least one vehicle driver is failing to yield or comply with a traffic control device. When one of the vehicle drivers is proceeding straight and the other is turning left, there is a greater likelihood that the crash involves opposite directions of travel. This suggests the turning driver is failing to yield to oncoming traffic, or one of them fails to comply with a traffic control device. In situations when one driver is proceeding straight and the other is stopped, most crashes occur when the parties are traveling in the same direction. This suggests rear-end crashes or crashes where a vehicle sideswipes a parked vehicle.
Figure 55 Analysis of directions for select prior action combinations

<table>
<thead>
<tr>
<th>Vehicle action</th>
<th>Pedestrian action / Bicycle action / Vehicle 2 action</th>
<th>Total crashes</th>
<th>Crashes where directionality could be determined</th>
<th>Same direction</th>
<th>Opposite or head on</th>
<th>Perpendicular or angle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pedestrian crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>Pedestrian crossing at intersection</td>
<td>161</td>
<td>24</td>
<td>3</td>
<td>--</td>
<td>21</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>Pedestrian crossing at intersection</td>
<td>90</td>
<td>13</td>
<td>1</td>
<td>--</td>
<td>12</td>
</tr>
<tr>
<td><strong>Bicycle crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle proceeding straight</td>
<td>Bicycle proceeding straight</td>
<td>164</td>
<td>111</td>
<td>23</td>
<td>4</td>
<td>84</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>Bicycle proceeding straight</td>
<td>100</td>
<td>53</td>
<td>7</td>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>Vehicle turning left</td>
<td>Bicycle proceeding straight</td>
<td>72</td>
<td>42</td>
<td>1</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>Vehicle turning right</td>
<td>Bicycle crossing at intersection</td>
<td>51</td>
<td>28</td>
<td>1</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td><strong>Vehicle crashes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle proceeding straight</td>
<td>Vehicle proceeding straight</td>
<td>1,949</td>
<td>1,926</td>
<td>235</td>
<td>189</td>
<td>1,502</td>
</tr>
<tr>
<td>Vehicle proceeding straight</td>
<td>Vehicle turning left</td>
<td>1,737</td>
<td>1,722</td>
<td>122</td>
<td>503</td>
<td>1,097</td>
</tr>
<tr>
<td>Vehicle proceeding straight</td>
<td>Vehicle stopped or parked</td>
<td>1,647</td>
<td>1,602</td>
<td>1,462</td>
<td>96</td>
<td>44</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

Hazardous actions

Hazardous actions are identified in police-reported crash records as the action or actions that contributed to the crash, in the opinion of the investigating officer. More than one hazardous action can be assigned to an individual crash, and some crashes may not have any hazardous actions identified. Figure 56 identifies the percent of crashes in each crash mode where a hazardous action was cited, and the percent of those crashes that resulted in a fatality or serious injury.
### Figure 56 Hazardous actions cited in injury crashes

<table>
<thead>
<tr>
<th>Hazardous action</th>
<th>Pedestrian crashes</th>
<th>Bicycle crashes</th>
<th>Vehicle crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>% FSI</td>
</tr>
<tr>
<td>Careless driving</td>
<td>25</td>
<td>3.0%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Disregard traffic control</td>
<td>37</td>
<td>4.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Drove left of center</td>
<td>1</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Drove wrong way</td>
<td>2</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Failed to yield</td>
<td>383</td>
<td>46.7%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Improper backing</td>
<td>13</td>
<td>1.5%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Improper lane use</td>
<td>8</td>
<td>1.0%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Improper / no signal</td>
<td>1</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Improper passing</td>
<td>0</td>
<td>0.0%</td>
<td>-</td>
</tr>
<tr>
<td>Improper turn</td>
<td>5</td>
<td>0.6%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Reckless driving</td>
<td>12</td>
<td>1.5%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Speed too fast</td>
<td>13</td>
<td>1.6%</td>
<td>23.1%</td>
</tr>
<tr>
<td>Speed too slow</td>
<td>2</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unable to stop</td>
<td>16</td>
<td>2.0%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Other</td>
<td>327</td>
<td>39.8%</td>
<td>27.2%</td>
</tr>
</tbody>
</table>

Note: More than one hazardous action can be assigned to an individual crash.

Source: Michigan Transportation Improvement Association

### Drugs or alcohol

Drugs and alcohol can impair people’s ability to operate a motor vehicle and may impact vision and perception. Drugs include illegal and legal drugs, including prescription drugs, medicinal and recreational marijuana, opioids, benzodiazepine (e.g. valium and Xanax), among many others. Alcohol includes beer, wine, liquor and other alcoholic beverages such as hard seltzers and sparkling wines. Additionally, the mixture of both alcohol and drugs together, or even small amounts of drugs or alcohol below a legal limit could also impact someone’s abilities.

In the crash report forms, responding officers identify parties where alcohol or drugs are suspected, where they believe alcohol or drugs were a contributing factor, and where test results indicated a party had alcohol or drugs in their system. A crash meeting at least one of these criteria is considered a crash that involves impairment.

Impairment was identified in 16.6% of pedestrian crashes, 7.1% of bicycle crashes, and 8.7% of vehicle crashes. A higher percent of fatal or serious injury crashes across all three modes involved impairment (Figure 57).
Figure 57  Impairment summary

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Crashes</th>
<th>Fatal/Serious Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Pedestrian crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impairment involved</td>
<td>155</td>
<td>16.6%</td>
</tr>
<tr>
<td>No impairment</td>
<td>777</td>
<td>83.4%</td>
</tr>
<tr>
<td>Total</td>
<td>932</td>
<td>100.0%</td>
</tr>
<tr>
<td>Bicycle crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impairment involved</td>
<td>50</td>
<td>7.1%</td>
</tr>
<tr>
<td>No impairment</td>
<td>655</td>
<td>92.9%</td>
</tr>
<tr>
<td>Total</td>
<td>705</td>
<td>100.0%</td>
</tr>
<tr>
<td>Vehicle crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impairment involved</td>
<td>816</td>
<td>8.7%</td>
</tr>
<tr>
<td>No impairment</td>
<td>8,592</td>
<td>91.3%</td>
</tr>
<tr>
<td>Total</td>
<td>9,408</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

A higher percent of crashes involving impairment happen on the weekends and in the evening/nighttime hours for all three modes (Figure 58 and Figure 59). The increase is particularly large for pedestrian and vehicle crashes on Sundays and in the early morning hours between midnight and 4 AM.

Figure 58  Impairment by day of the week

Source: Michigan Transportation Improvement Association
For pedestrian and bicycle crashes that involve impairment, pedestrians and bicyclists are most likely to be the party that is impaired (Figure 60). Pedestrians are impaired in approximately 80% of pedestrian crashes with impairment, and bicyclists are impaired in approximately 76% of bicycle crashes with impairment. A small percent of crashes involved both parties being impaired.

Figure 60  Party impaired for pedestrian and bicycle injury crashes involving impairment

Source: Michigan Transportation Improvement Association

**Distraction**

Distractions can play a major role in collisions because inattention or lack of eye contact between parties can lead to errors or misjudgment. Distractions may include focusing on activities or objects outside the right-of-way, talking to other people, eating, personal hygiene care, reading physical documents or maps or tuning a radio. Over the past couple of decades, personal electronic devices including mobile phones, smart phones and tablets, along with navigation and entertainment screens in vehicles have become more prevalent and consumed more attention by people in all modes.

Distraction has only been collected in police-reported crash data since 2016. The data presented in this section is limited to the three years for which distraction data has been recorded. During this time, there were 3,593 crashes, with 376 crashing being documented as having distraction as
a hazardous action. However, due to the small sample size, this analysis may not be representative of how prevalent distractions are, or how serious.

A summary of distractions in collisions are reported in Figure 61. The prevalence of distraction was highest in vehicle crashes. Based on the reported data, there is little variability in levels of severity between crashes where distraction was present or not. Again, the small sample size and new reporting of this hazardous action suggests conclusions from this data should be limited.

Figure 61  Distraction summary

<table>
<thead>
<tr>
<th>Distraction</th>
<th>Crashes</th>
<th>Fatal/Severe Injury Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Pedestrian crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distraction involved</td>
<td>26</td>
<td>8.1%</td>
</tr>
<tr>
<td>No distraction</td>
<td>295</td>
<td>91.9%</td>
</tr>
<tr>
<td>Total</td>
<td>321</td>
<td>100.0%</td>
</tr>
<tr>
<td>Bicycle crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distraction involved</td>
<td>9</td>
<td>5.1%</td>
</tr>
<tr>
<td>No distraction</td>
<td>166</td>
<td>94.9%</td>
</tr>
<tr>
<td>Total</td>
<td>175</td>
<td>100.0%</td>
</tr>
<tr>
<td>Vehicle crashes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distraction involved</td>
<td>341</td>
<td>11.0%</td>
</tr>
<tr>
<td>No distraction</td>
<td>2,756</td>
<td>89.0%</td>
</tr>
<tr>
<td>Total</td>
<td>3,097</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

Figure 62 shows the party that was identified as being distracted in collisions involving distraction. In pedestrian crashes, pedestrians are distracted in more than half of crashes. There is also a small share of pedestrian crashes where both parties were distracted. In bicycle crashes, however, drivers are the distracted party in more than half of crashes.

Figure 62  Party distracted for active transportation injury crashes involving distraction

Figure 63 shows the trend in percent of crashes that involve distraction, as recorded by the police crash reports. The trend is variable for all three modes.
Road condition

Figure 64 shows the level of severity for crashes that occurred on roads covered by different materials, some of which are related to weather. In vehicle crashes, crashes that occurred on roadways with debris resulted in a fatality or serious injury in approximately one-fifth of the time.

Weather

Weather may play a role in the frequency and severity of crashes. However, as shown in Figure 65, there is no obvious link between weather conditions and severity across modes. Some weather
conditions are relatively uncommon that the sample size may not be large enough to identify clear trends.

**Figure 65** Percent fatal or serious by crash mode and weather condition

<table>
<thead>
<tr>
<th>Weather</th>
<th>Pedestrian crash</th>
<th>Bicycle crash</th>
<th>Vehicle crash</th>
<th>All crashes overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blowing Snow</td>
<td>0.0%</td>
<td>--</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Clear</td>
<td>21.4%</td>
<td>9.6%</td>
<td>5.6%</td>
<td>7.3%</td>
</tr>
<tr>
<td>Cloudy</td>
<td>21.8%</td>
<td>6.2%</td>
<td>5.0%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Fog</td>
<td>50.0%</td>
<td>0.0%</td>
<td>5.9%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Rain</td>
<td>15.5%</td>
<td>4.9%</td>
<td>5.2%</td>
<td>6.2%</td>
</tr>
<tr>
<td>Severe Crosswinds</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Sleet / Hail</td>
<td>0.0%</td>
<td>--</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Snow</td>
<td>13.2%</td>
<td>0.0%</td>
<td>3.9%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0%</td>
<td>0.0%</td>
<td>15.0%</td>
<td>10.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.3%</strong></td>
<td><strong>8.4%</strong></td>
<td><strong>5.3%</strong></td>
<td><strong>6.7%</strong></td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

**Lighting**

**Figure 66** shows the severity of crashes by lighting condition. During hours of darkness, crashes that occurred in areas without street lighting were more serious. This increase in severity is most prominent for pedestrian crashes.

**Figure 66** Percent fatal or serious by crash mode and weather condition

<table>
<thead>
<tr>
<th>Weather</th>
<th>Pedestrian crash</th>
<th>Bicycle crash</th>
<th>Vehicle crash</th>
<th>All crashes overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark – Lighted</td>
<td>25.1%</td>
<td>11.2%</td>
<td>7.6%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Dark – Unlighted</td>
<td>34.0%</td>
<td>13.3%</td>
<td>8.4%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Dawn</td>
<td>28.0%</td>
<td>0.0%</td>
<td>6.2%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Daylight</td>
<td>16.0%</td>
<td>8.0%</td>
<td>4.3%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Dusk</td>
<td>17.2%</td>
<td>6.3%</td>
<td>7.2%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0%</td>
<td>0.0%</td>
<td>33.3%</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.3%</strong></td>
<td><strong>8.4%</strong></td>
<td><strong>5.3%</strong></td>
<td><strong>6.7%</strong></td>
</tr>
</tbody>
</table>

Source: Michigan Transportation Improvement Association

**Vehicle type**

Research has shown that vehicle mass and design are factors in the severity of injury in crashes. While the sample sizes are relatively small in some crash mode and vehicle combinations, **Figure 67** highlights the greater vulnerability of pedestrians and bicyclists in crashes overall, based on mass and design.
Figure 67  Severity of injury crashes by vehicle type

Source: Michigan Transportation Improvement Association
APPENDIX

Figure 68  Spatial distribution of all surface street pedestrian crashes

Note: Includes crashes with fatalities, serious injuries, other injuries and property damage only. Does not include crashes on highways.
Figure 69  Spatial distribution of all surface street bicycle crashes

Note: Includes crashes with fatalities, serious injuries, other injuries and property damage only. Does not include crashes on highways.
Figure 70  Spatial distribution of all surface street vehicle crashes

Note: Includes crashes with fatalities, serious injuries, other injuries and property damage only. Does not include crashes on highways.