City of Alexandria, Virginia

MEMORANDUM

DATE: 03/11/2022

TO: YON LAMBERT, DIRECTOR, DEPARTMENT OF TRANSPORTATION & ENVIRONMENTAL SERVICES

THRU: GREG USEEM, DIRECTOR, OFFICE OF PERFORMANCE ANALYTICS

FROM: JAMES BRYANT, PRINCIPAL GIS ANALYST

SUBJECT: UPDATED CITYWIDE CRASH ANALYSIS FOR VISION ZERO

INTRODUCTION

On January 24, 2016, the City of Alexandria adopted a Vision Zero resolution, which set a goal of eliminating traffic deaths and serious injuries by 2028. In an on-going effort to support this resolution, the Office of Performance Analytics (OPA) and Information Technology Services (ITS) has performed an updated citywide crash analysis. This analysis was completed in partnership with the Department of Transportation and Environmental Services (TES) and the Alexandria Police Department (APD). Details of the analysis can be found below and within the analysis attachments.

DATA

Traffic crashes from CY 2011 to CY 2020 were used to observe high-level ten-year crash trends. For the detailed analysis, crashes from CY 2016 to CY 2020 were used. Data was extracted by APD from their Record Management System (RMS). RMS crash data was compared with data captured in the State's Traffic Records Electronic Data System (TREDS). Data discrepancies were evaluated and resolved by the analysis team as needed. Data quality and availability were noted as challenges in the 2016 crash analysis report. However, since 2016, the overall quality and accuracy of the crash data has improved substantially.

Crash data includes information such as location, time, weather, intersection type, crash type, roadway conditions and surface, persons involved, and vehicle information. Crashes were mapped spatially using location information such as address or latitude and longitude coordinates. A small percentage (<1%) of crashes were unable to be mapped due to data inaccuracies or lack of location information. However, they were still included in the non-spatial components of the analysis. Only those crashes that occurred on city streets were used. Crashes that occurred on major highways (e.g. I-395, I-495) were excluded.

This reporting period includes the first year of the COVID-19 pandemic. No formal study has been conducted regarding the Alexandria-specific travel impacts of COVID-19. However, regional

studies have shown that travel patterns changed drastically due to public health lockdown measures in 2020 which resulted in lower overall traffic volumes and public transit ridership, and higher rates of walking and biking [1,2]. The impacts of the COVID-19 pandemic (lockdowns, work from home mandates etc.) should be considered when evaluating crash trends and insights associated with 2020.

10-YEAR CRASH TRENDS FOR 2011-2020

Crash totals from 2011-2020 show a downward trend for all crashes, including those that resulted in fatal or severe injury. The 2016-2020 annual crash averages across all modes (vehicle-only, pedestrian, bicyclist) and crash type (all crashes, and fatal or severe crashes) are less than those seen during 2011-2015. Vehicle-only crashes saw the biggest drop in annual crash averages by mode for 2016-2020 compared to 2011-2015. Additional ten-year trend details are provided in Attachment 1.

KEY FINDINGS FOR 2016-2020

The analysis resulted in the following findings regarding crash trends or high-risks conditions for crashes in which a person was killed or seriously injured (KSI). Detailed figures and tables are available in Attachment 2.

- **Key Finding 1: Crashes are trending downward**
  This downward crash trend is driven primarily by pedestrian and vehicle-only crashes. From 2019 to 2020, there was a 37% decline in crashes – the largest in this reporting period. Vehicle-only crashes account for the largest drop by mode from 2019 to 2020. Even when crash totals from 2020 are excluded, the overall downward trend persists for 2016-2019 and is driven primarily by vehicle-only and pedestrian crashes. (Attachment 2 slides 4-7)

- **Key Finding 2: KSI crashes are trending slightly upwards, while KSI risk varies by mode**
  Despite the anomalies with 2020, the proportion of crashes that are fatal or severe remained somewhat consistent throughout the reporting period, hovering around 3%. Vehicle-only crashes had the highest number of KSI crashes annually, followed by pedestrian then bicyclist crashes. From 2016-2020, vehicle-only crashes had the lowest proportion of KSI crashes, while pedestrian and bicyclist crashes alternated having the highest. (Attachment 2 slides 8-12)

- **Key Finding 3: Crash volume and KSI risk varies by hour, day, and month**
  During the weekday, high crash frequencies are seen during the evening commute. Early spring months had the highest proportion of KSI crashes for bicyclists, while the late summer months were the highest for pedestrians. (Attachment 2 slides 13-16)

- **Key Finding 4: Most KSI crashes occur at intersections**
  58% of KSI crashes occurred at an intersection. Five point or more intersections had the highest proportion of KSI crashes; however, the number of crashes is low. (Attachment 2 slides 17-19)

- **Key Finding 5: Most KSI bicyclist crashes occur where there is no bike infrastructure**
  Out of the 8 KSI bicyclist crashes, 7 had no presence of bike infrastructure. (Attachment 2 slides 20-21)

- **Key Finding 6: Not using a safety restraint while in a vehicle increases the risk of KSI crashes**
  Most vehicle occupants wore their safety restraint (e.g., seat belt) during crashes; however, those individuals that didn't were at a higher risk of a KSI crash (16%) than those who did (0.8%). (Attachment 2 slides 22-23)

- **Key Finding 7: Drinking while driving increases the risk of KSI crashes**
  6% of crashes that involve drinking result in death or severe injury, compared to 2% for crashes where drinking was not involved. Certain locations have higher concentrations of drinking related crashes than others. December had the highest number of drinking related crashes. Most drinking related crashes occurred on the weekend during the evening or early morning hours. (Attachment 2 slides 24-26)

- **Key Finding 8: Children, Teens, and Seniors are at higher risk of fatal or serious injury**
  Children, teens and seniors had the highest proportion of fatalities or serious injuries compared to other groups. (Attachment 2 slides 27-28)

- **Key Finding 9: Certain actions or maneuvers carry higher risk of fatal or severe injury for pedestrians**
  Pedestrian crashes where the driver is going straight ahead account for over half of all fatal and severe pedestrian crashes. Crashes where the driver is making a left turn account for over 20% of fatal and severe pedestrian crashes. Pedestrian crossing types such as crossing at an intersection with a signal, crossing at an intersection without a signal, and crossing not at an intersection (urban) occurred most frequently. (Attachment 2 slides 29-33)

- **Key Finding 10: Certain crash types have higher crash frequencies and KSI risk**
  Angle, rear end and sideswipe (same direction) accounted for 80% of crashes. Pedestrian and angle crashes account for over 50% of all fatal and severe crashes. (Attachment 2 slides 34-37)

- **Key Finding 11: Certain street characteristics and environmental conditions have higher KSI risk**
  Road types such as two-way not divided (unprotected median) and two-way divided (positive median) had the highest proportion of KSI crashes. Roads with a 35 MPH speed limit had the highest KSI crash rate per mile at 0.98. Certain environmental conditions such as presence of light, wet weather, and roads with holes or bumps have an increased KSI proportion. (Attachment 2 slides 38-41)

- **Key Finding 12: Crashes involving speeding vehicles are concentrated in certain areas**
  Crashes involving speeding vehicles are concentrated in areas near Seminary Road near I-395, Landmark area, Telegraph Road, and Old Town. (Attachment 2 slides 42-43)

- **Key Finding 13: Certain road segments have a higher concentration of KSI risk**
  Notable corridors where KSI risk is elevated include (1) Seminary Road near I-395 interchange to Dawes Avenue, (2) Duke Street, and (3) Old Town along Henry Street, Patrick Street, and N Washington Streets. (Attachment 2 slides 44-45)

REFERENCES

[1] *Voices of the Region – Final Report*. 03/11/21. ICF. National Capital Region Transportation Planning Board. https://www.mwcog.org/documents/2021/03/16/voices-of-the-region-survey-visualize-2045/
[2] *COVID-19 Traffic Trend Update for CTB. Volume, Speed and Crashes*. 01/19/21. Mena Lockwood, P.E. VDOT Traffic Engineering Division. https://www.ctb.virginia.gov/resources/2021/jan/pres/5_covid-19_traffictrends_011921_1.pdf

ATTACHMENTS
Attachment 1: 10-Year Crash Trends, 2011-2020
Attachment 2: Vison Zero Crash Analysis Findings, 2016-2020

VISION ZERO

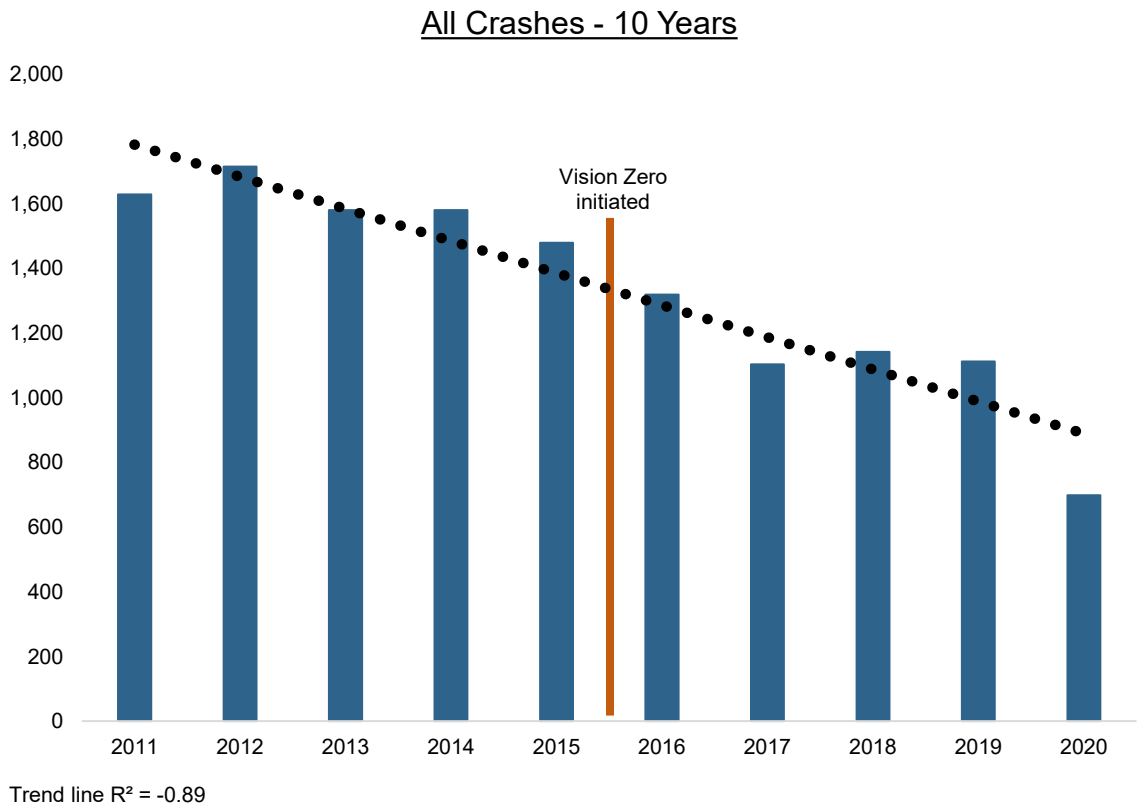
SAFER STREETS FOR ALEXANDRIA

Vision Zero in Alexandria, VA

10-Year Crash Trends

CY2011-CY2020

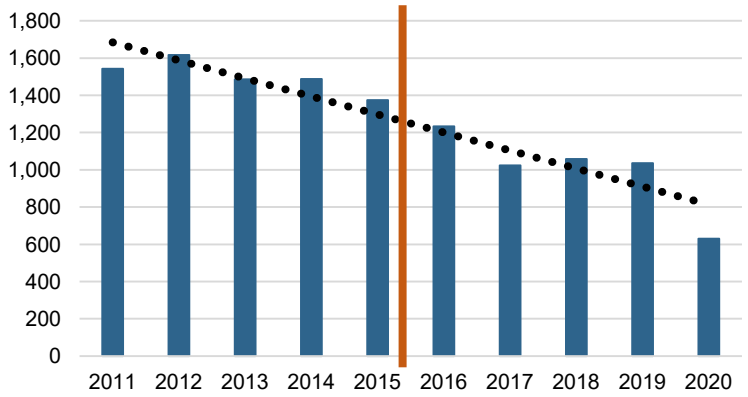
There is a downward trend for all crashes over the last ten years.



The strength of the trend is expressed through the R^2 value. The closer the R^2 value is to 1 or -1 the stronger the trend. Positive R^2 values indicate an upward trend, negative R^2 values indicate a downward trend, and zero indicates a flat trend.

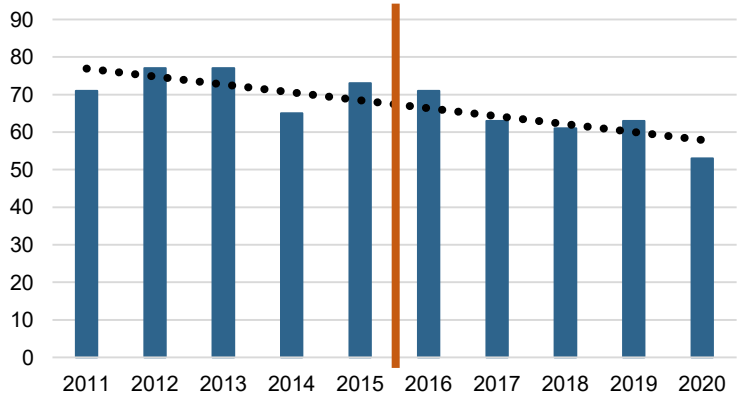
The downward trend for all crashes is seen across all modes over the last ten years.

Vehicle Only - 10 Years



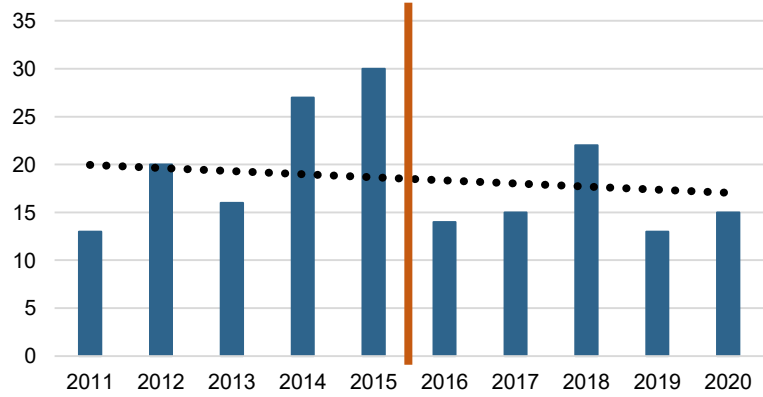
Trend line R^2 = -0.89

Pedestrian Crashes - 10 Years



Trend line R^2 = -0.69

Bicyclist Crashes - 10 Years

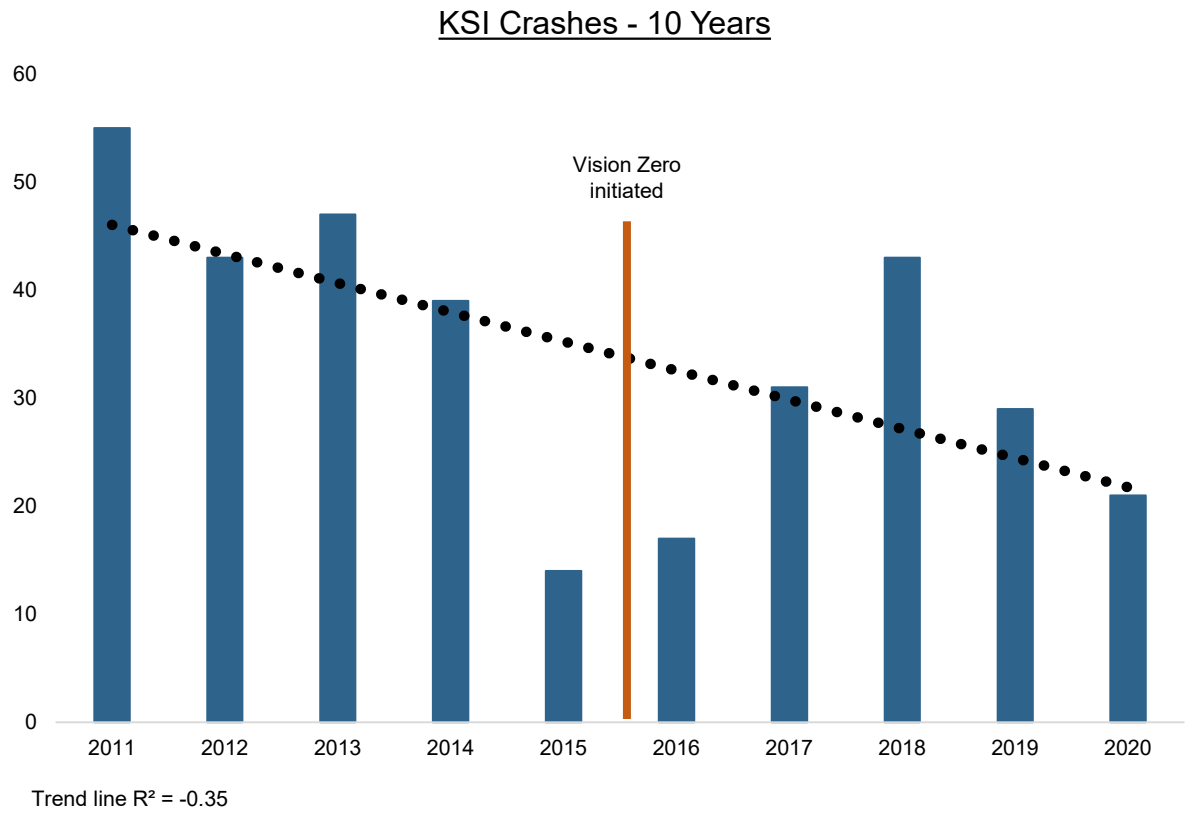


Trend line R^2 = -0.03

Vision Zero initiated at Alexandria 2016

The strength of the trend is expressed through the R^2 value. The closer the R^2 value is to 1 or -1 the stronger the trend. Positive R^2 values indicate an upward trend, negative R^2 values indicate a downward trend, and zero indicates a flat trend.

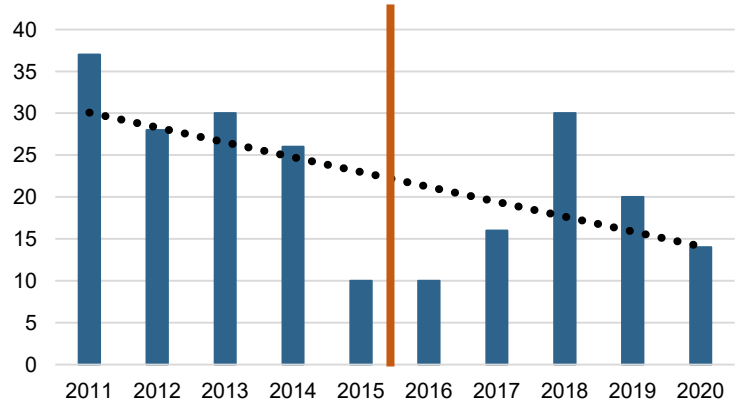
There is a downward trend for KSI crashes over the last ten years.



The strength of the trend is expressed through the R^2 value. The closer the R^2 value is to 1 or -1 the stronger the trend. Positive R^2 values indicate an upward trend, negative R^2 values indicate a downward trend, and zero indicates a flat trend.

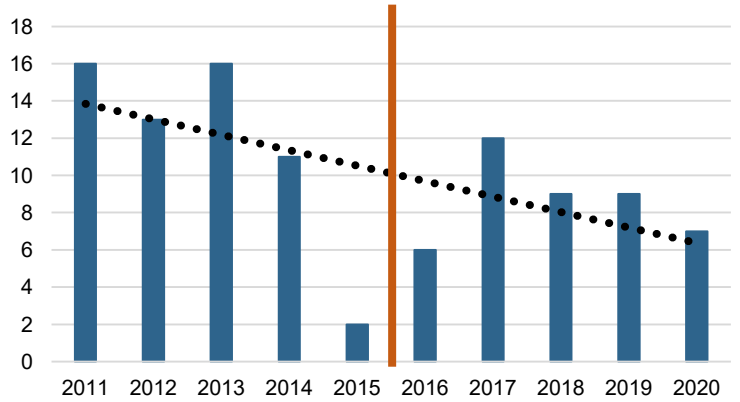
The downward trend for KSI crashes is seen across all modes over the last ten years.

Vehicle Only KSI Crashes - 10 Years



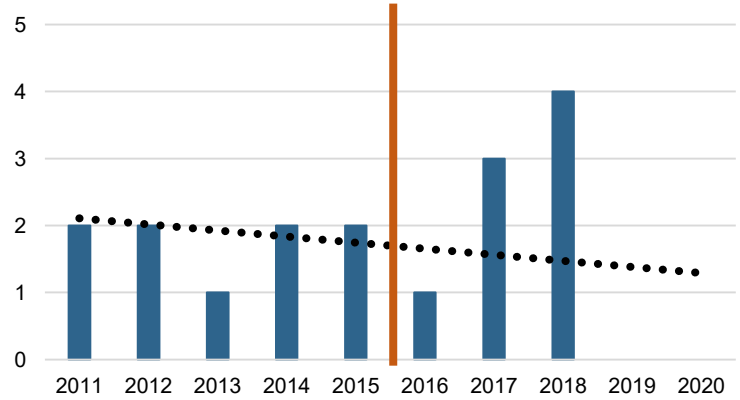
Trend line R^2 = -0.33

Pedestrian KSI Crashes - 10 Years



Trend line R^2 = -0.32

Bicyclist KSI Crashes - 10 Years

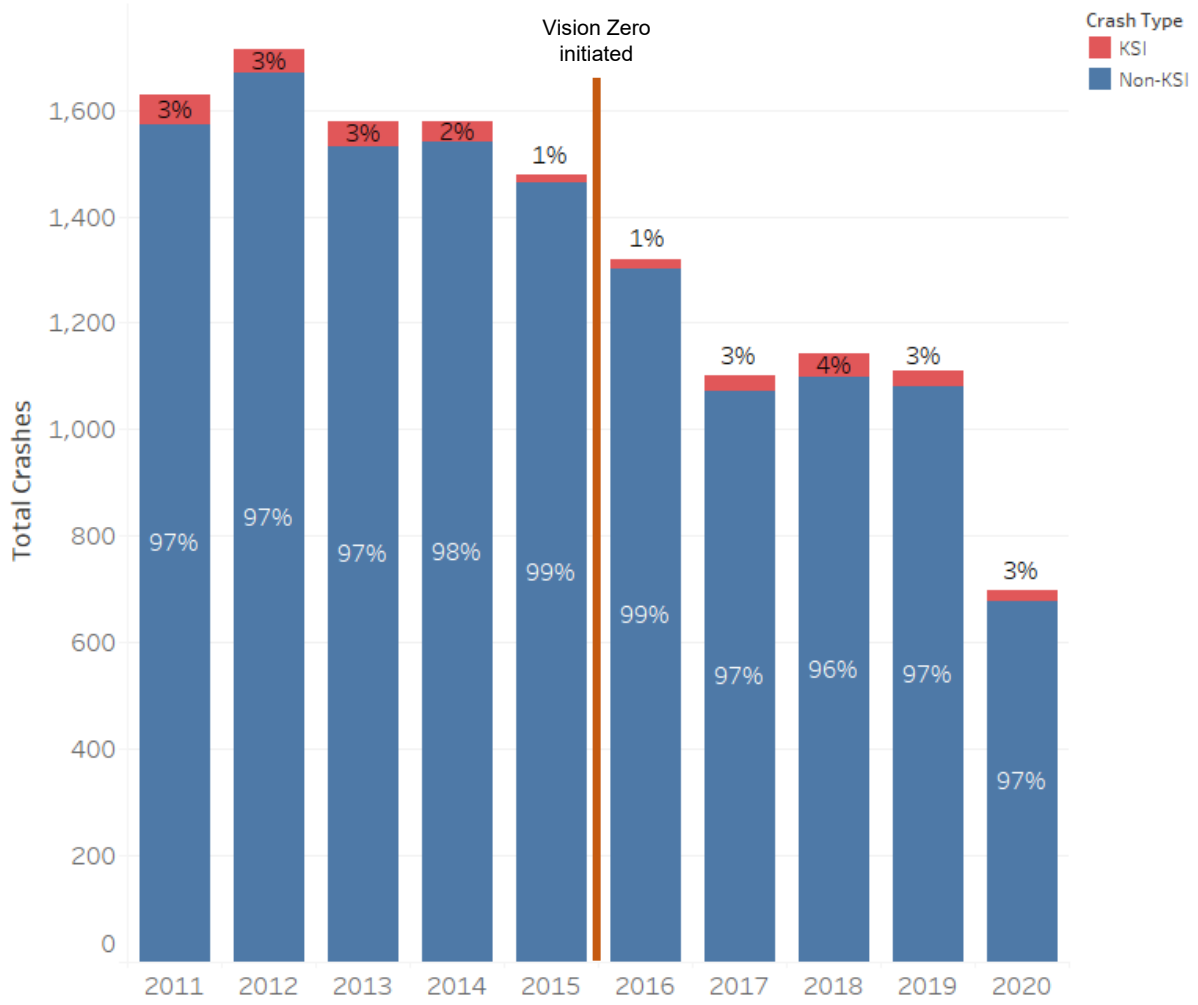


Trend line R^2 = -0.05

Vision Zero initiated at Alexandria 2016

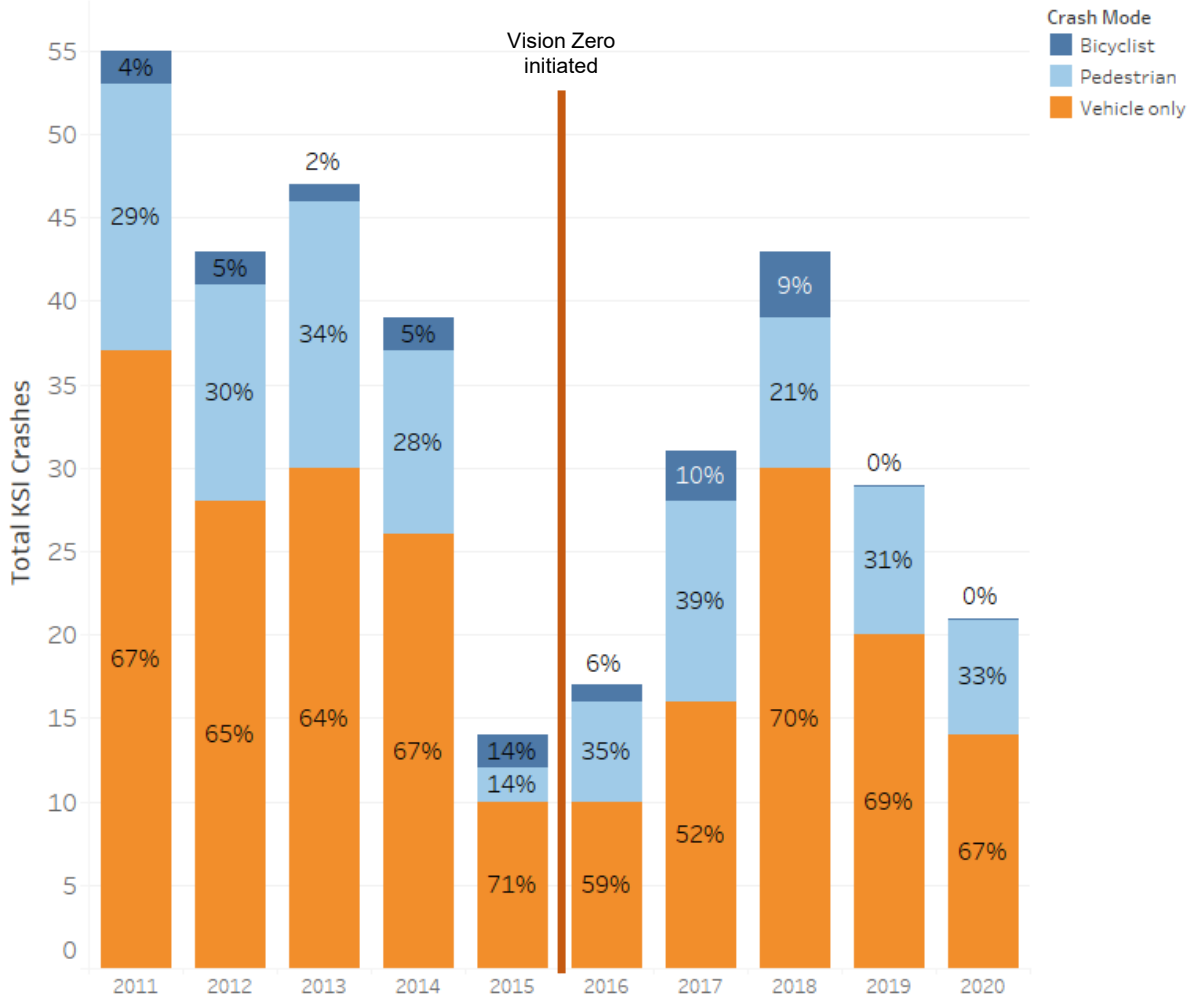
The strength of the trend is expressed through the R^2 value. The closer the R^2 value is to 1 or -1 the stronger the trend. Positive R^2 values indicate an upward trend, negative R^2 values indicate a downward trend, and zero indicates a flat trend.

The average annual proportion of KSI crashes for the last ten years is about 3%.



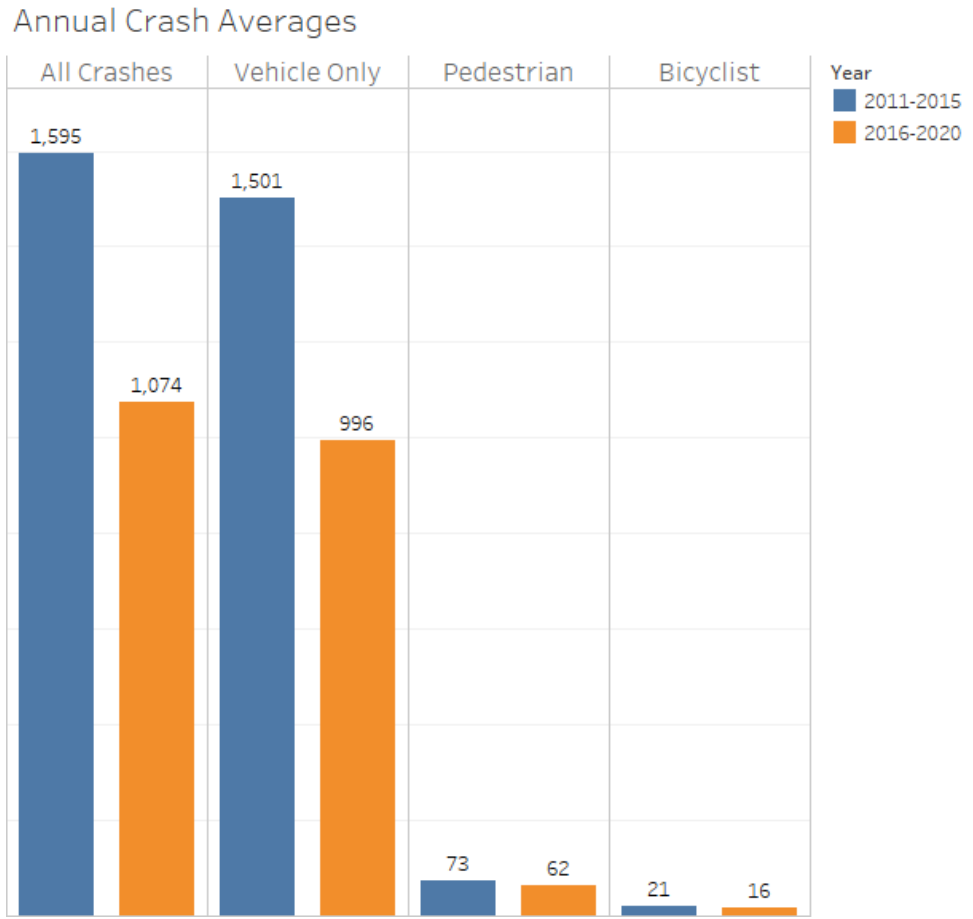
Vision Zero initiated at Alexandria 2016

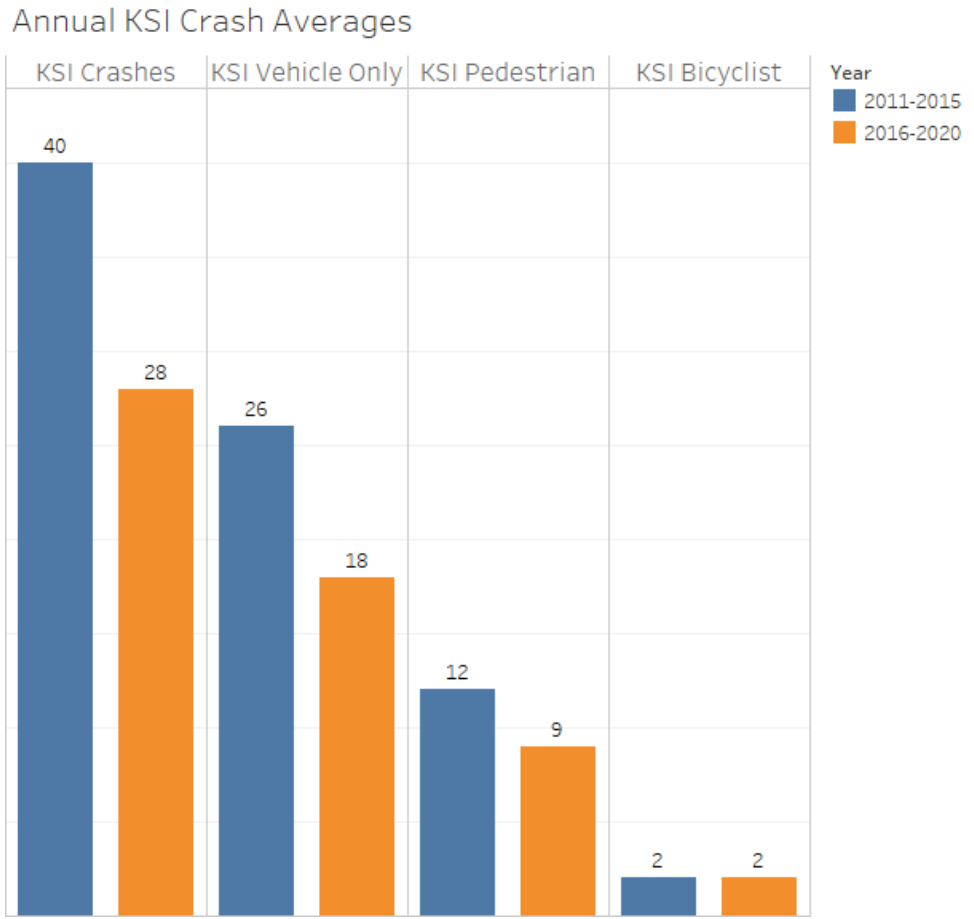
Over the last ten years, vehicle-only crashes have had the highest annual totals of KSI crashes followed by pedestrians and then bicyclist crashes.



Vision Zero initiated at Alexandria 2016

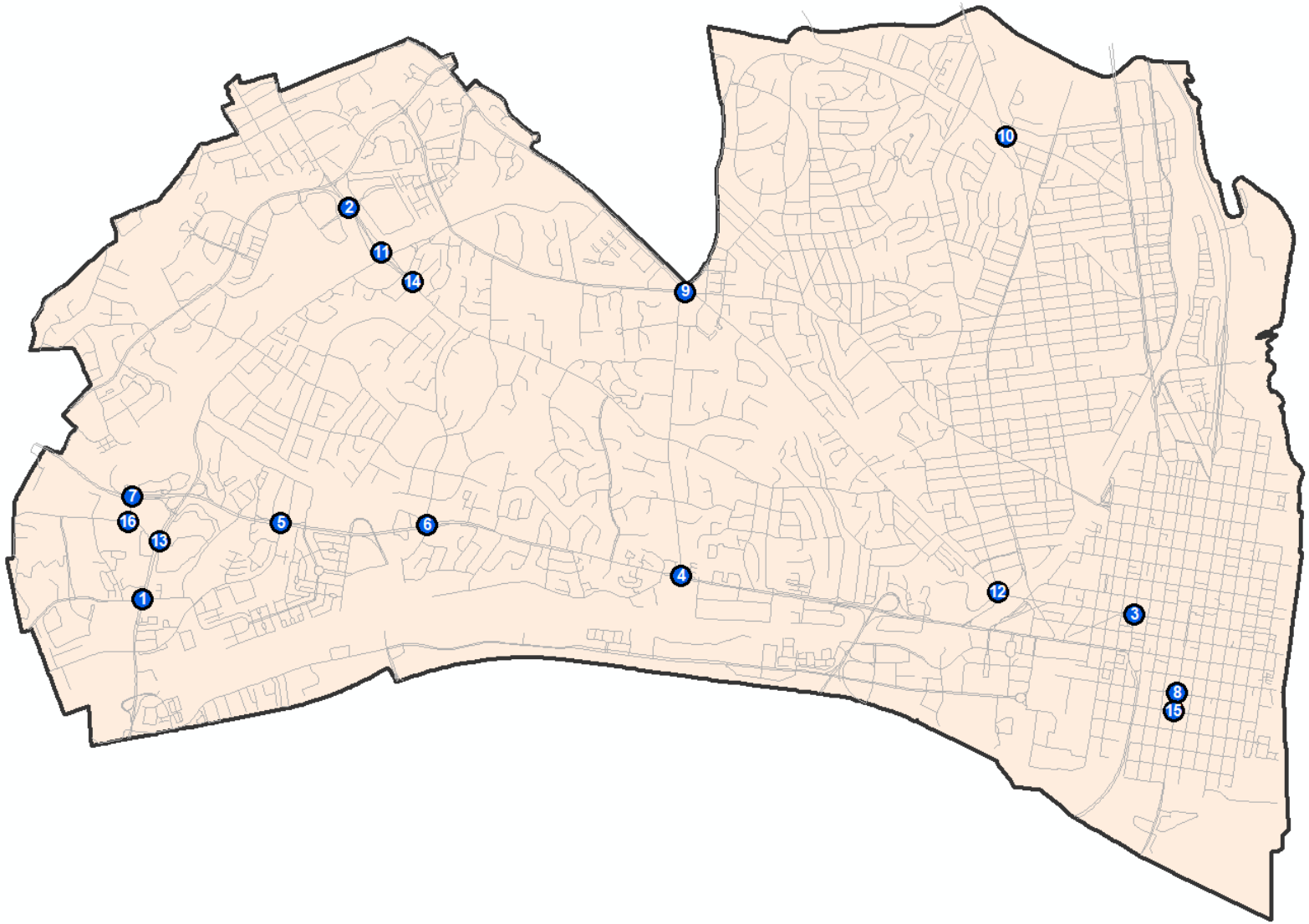
The annual crash averages by all modes and crash types for 2016-2020 are less than those during 2011-2015. Vehicle only crashes (all and KSI) saw the biggest drop in averages.





High Priority Crash Locations CY2011-20

Location ID	Location Name	KSI Crashes	Injury Crashes	Grand Total	Priority Score#	Rank*
1	Edsall Road & S Van Dorn Street	4	21	25	40	1
2	Seminary Road & Mark Center	2	26	28	35	2
3	King Street & N Henry Street	2	20	22	35	2
4	Duke Street & N Quaker Lane	7	15	22	31	3
5	Duke Street & S Pickett Street	1	21	22	30	4
6	Duke Street & N/S Jordan Street	2	16	18	29	5
7	Duke Street & S Walker Street	1	26	27	28	6
8	S Washington & Wilkes Street	2	15	17	28	6
9	King Street & N Quaker Lane & W Braddock Road	3	17	20	26	7
10	Mount Vernon Avenue & W Glebe Road	2	13	15	25	8
11	Seminary Road & 395	1	22	23	25	8
12	Russell Road & Callahan Drive	5	7	12	24	9
13	Stevenson Avenue & S Van Dorn Street	2	13	15	23	10
14	Seminary Rd & Library Lane	3	12	15	23	10
15	S Washington & Gibbon Street	2	14	16	23	10
16	Stevenson Avenue & S Walker Street	0	16	16	23	10

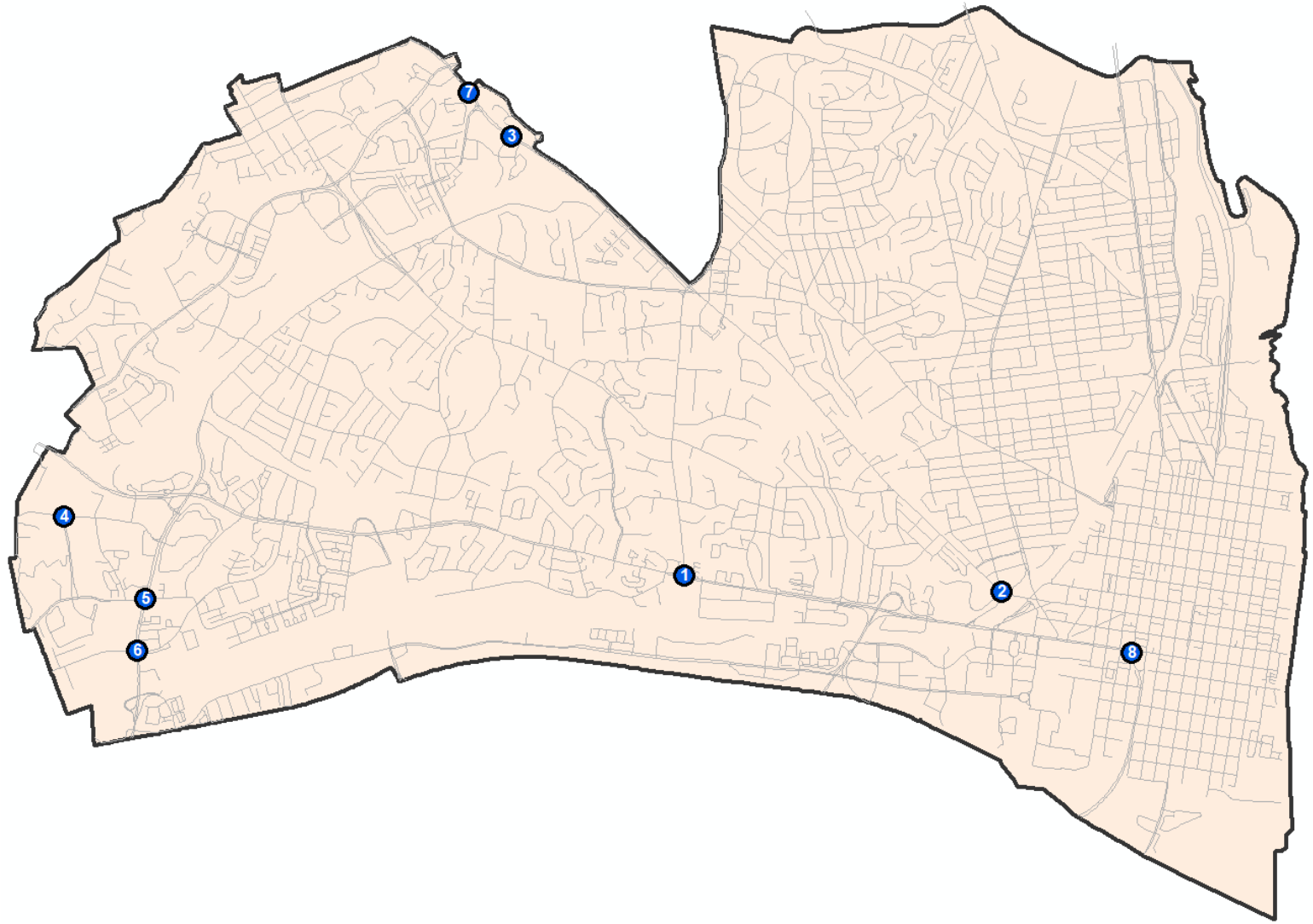


*These locations are in the 99th percentile (Top 1%) of the priority score by location. # Priority score is calculated as follows: vehicle injury crashes are given a multiplier of 1, a multiplier of 2 is used for vehicle KSI crashes and bicyclist and pedestrian injury crashes, and a multiplier of 4 is used for pedestrian and bicyclist KSI crashes.

Locations with the Most KSI Crashes CY2011-20

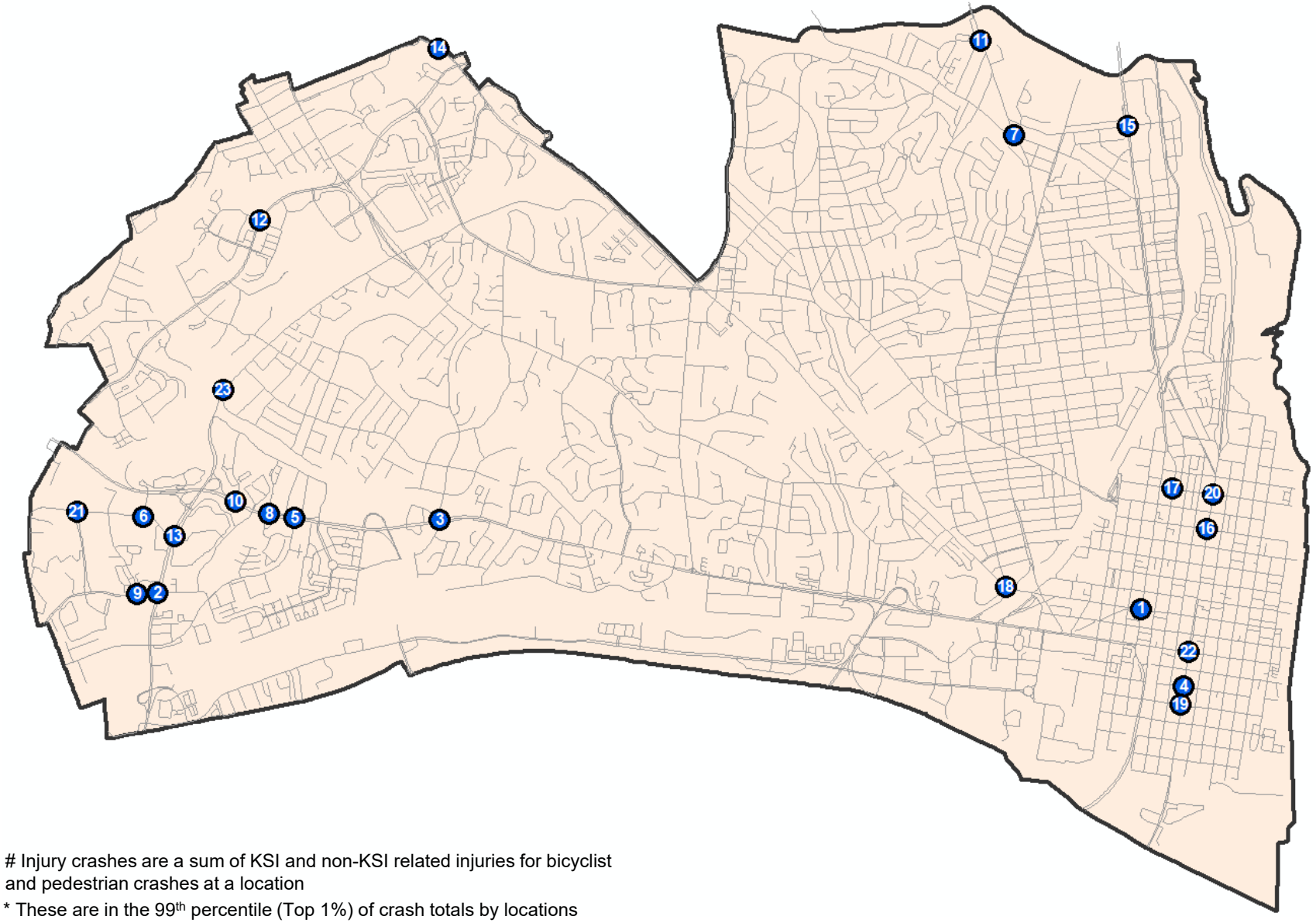
Location ID	Location Name	Vehicle	Bicyclist	Pedestrian	Total KSI Crashes	Rank*
1	Duke Street & N Quaker Lane	6	0	1	7	1
2	Russell Rd & Callahan Dr	3	1	1	5	2
3	King Street & Park Center Drive	4	0	1	5	2
4	Stevenson Avenue & Yoakum Parkway	1	1	3	5	2
5	Edsall Road & S Van Dorn Street	2	0	2	4	3
6	S Pickett St & S Van Dorn Street	3	0	1	4	3
7	King Street & S 28th Street	2	0	2	4	3
8	S Henry Street & Duke Street	3	0	1	4	3

* These are in the 99th percentile (Top 1%) of KSI crash totals by locations



Locations with High Pedestrian and Bicyclist Injuries CY2011-20

Location ID	Location Name	Injury Crashes #	Rank*
1	King Street & N Henry Street	10	1
2	Edsall Road & S Van Dorn Street	9	2
3	Duke Street & N/S Jordan Street	8	3
4	S Washington & Wilkes Street	7	4
5	Duke Street & S Pickett Street	7	4
6	Stevenson Avenue & S Walker St	7	4
7	Mount Vernon Ave & W Glebe Rd	6	5
8	Duke Street & N Paxton Street	6	5
9	Edsall Road & S Whiting Street	6	5
10	Duke Street & N Ripley Street	6	5
11	Mount Vernon Avenue & Four Mile Road	5	6
12	N Beauregard St & Rayburn Ave	5	6
13	Stevenson Ave & S Van Dorn St	5	6
14	King Street & Chesterfield Road	5	6
15	E Reed Ave & Richmond Ave	5	6
16	N Beauregard St & Sanger Ave	5	6
17	Madison St and N Patrick St	5	6
18	King St & Russell Rd & Callahan	5	6
19	Gibbon St & S Washington St	5	6
20	Madison St & N Washington St	5	6
21	Stevenson Avenue & Yoakum Parkway	5	6
22	Duke St & S Washington St	5	6
23	N Van Dorn St & Holmes Run Parkway	5	6

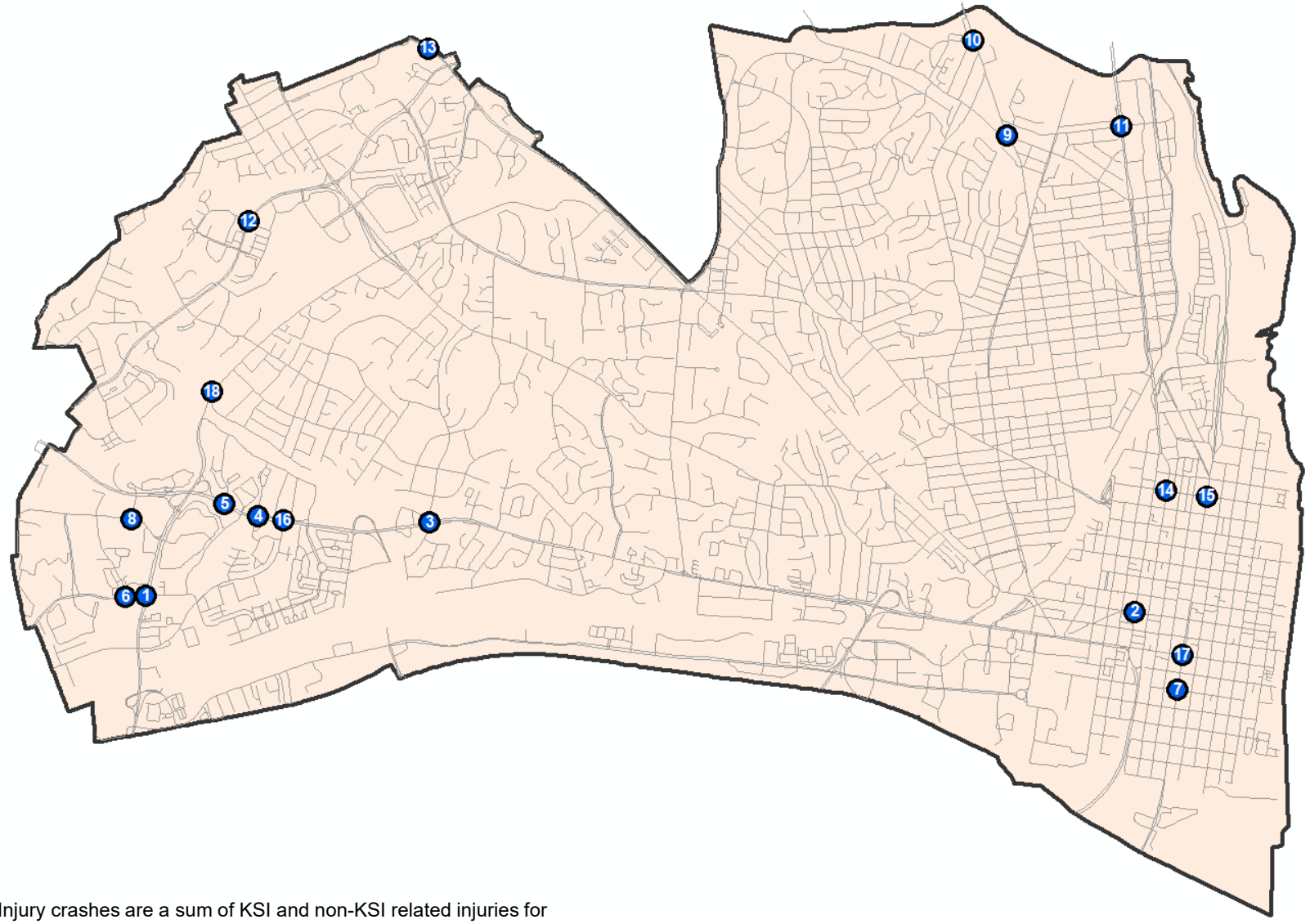


Injury crashes are a sum of KSI and non-KSI related injuries for bicyclist and pedestrian crashes at a location

* These are in the 99th percentile (Top 1%) of crash totals by locations

Locations with High Pedestrian Injuries CY2011-20

Location ID	Location Name	Injury Crashes #	Rank*
1	Edsall Road & S Van Dorn St	8	1
2	King Street & N Henry Street	8	1
3	Duke Street & N/S Jordan St	7	2
4	Duke Street & N Paxton Street	6	3
5	Duke Street & N Ripley Street	6	3
6	Edsall Road & S Whiting St	6	3
7	S Washington & Wilkes Street	6	3
8	Stevenson Ave & S Walker St	6	3
9	Mount Vernon Avenue & W Glebe Road	5	4
10	Mount Vernon Avenue & Four Mile Road	5	4
11	E Reed Avenue & Richmond Highway	5	4
12	N Beauregard St & Rayburn Avenue	5	4
13	King Street & Chesterfield Road	5	4
14	N Patrick Street & Madison Street	5	4
15	Madison Street & N Washington Street	5	4
16	Duke Street & S Pickett Street	5	4
17	Duke Street & Washington Street	5	4
18	N Van Dorn Street & Holmes Run Parkway	5	4



Injury crashes are a sum of KSI and non-KSI related injuries for pedestrian crashes at a location

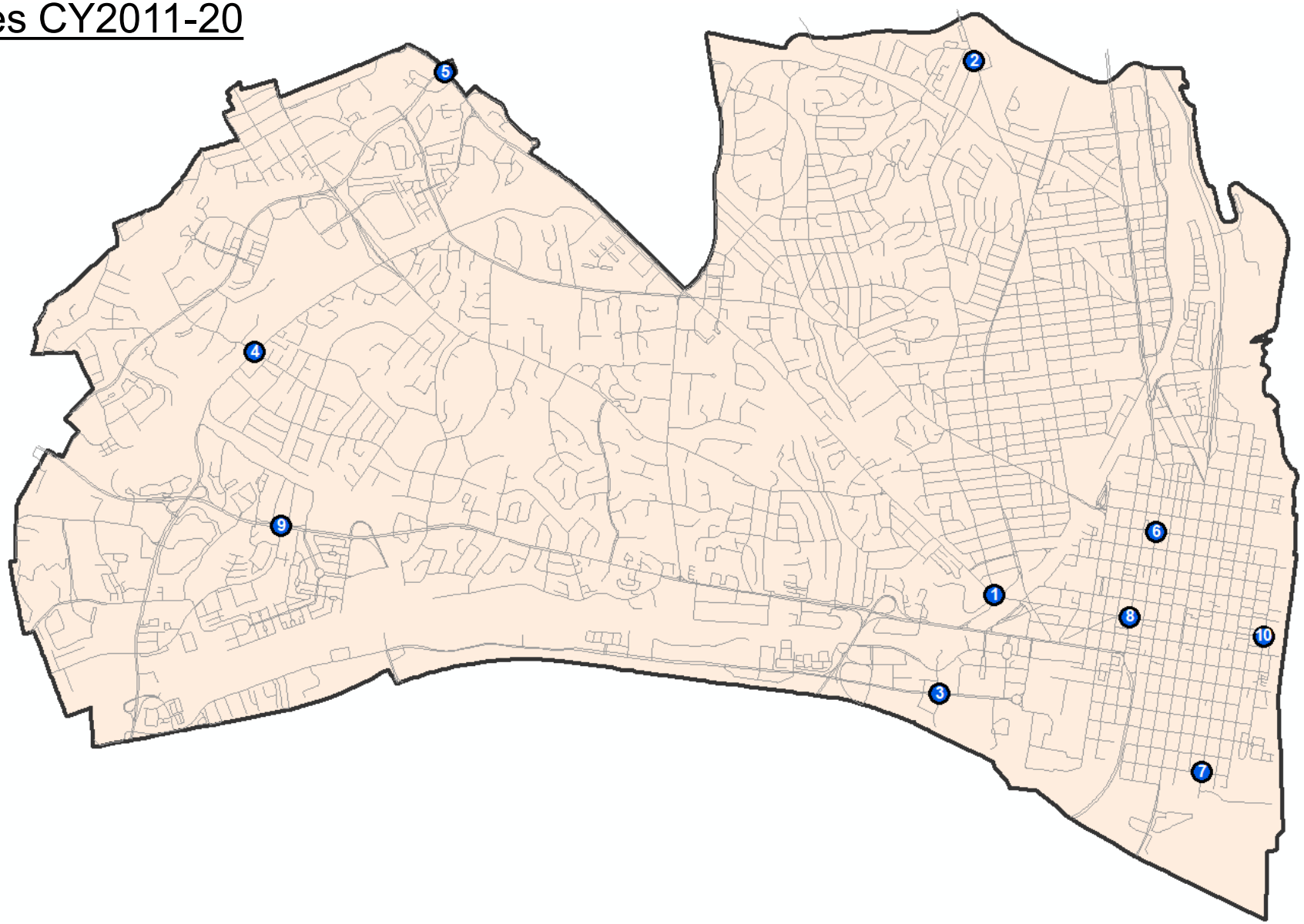
* These are in the 99th percentile (Top 1%) of crash totals by locations

Locations with High Bicyclist Injuries CY2011-20

Location ID	Location Name	Injury Crashes #	Rank*
1	Russell Road & Callahan Dr	3	1
2	Mount Vernon Ave & Executive Ave	2	2
3	Mill Road & Eisenhower Ave	2	2
4	Sanger Ave & Mount Vernon Ave	2	2
5	King St & S Walter Reed & N Beauregard	2	2
6	Pendleton St & N Patrick St	2	2
7	Green Street & S Royal Street	2	2
8	King Street & N Henry Street	2	2
9	Duke Street & S Pickett Street	2	2
10	King St & Union St	2	2

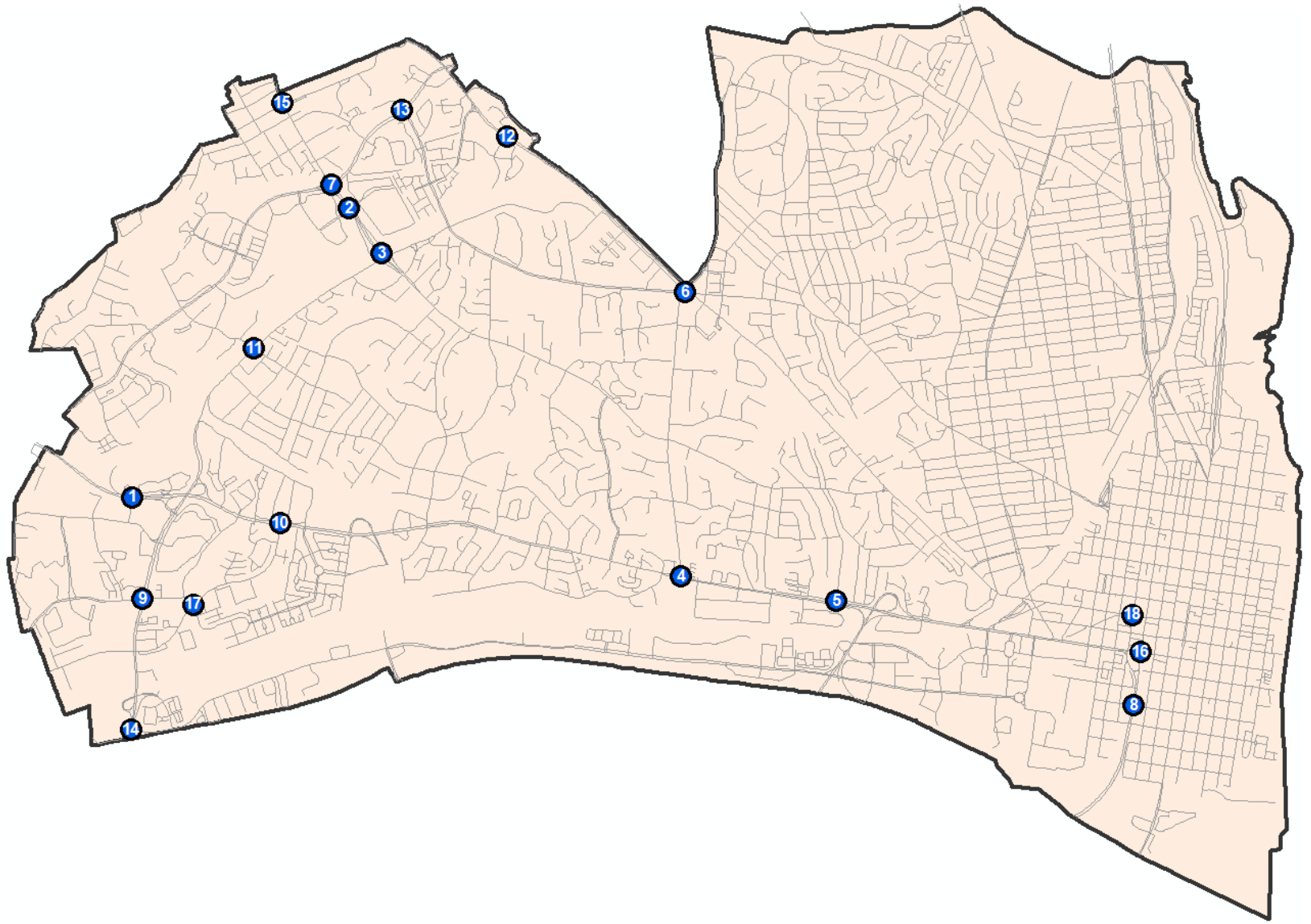
Injury crashes are a sum of KSI and non-KSI related injuries for bicyclist crashes at a location

* These are in the 99.5th percentile (Top 0.5%) of crash totals by locations



Locations with High Vehicle Only Injuries CY2011-20

Location ID	Location Name	Injury Crashes #	Rank*
1	Duke Street & S Walker St	27	1
2	Seminary Road & Mark Center	25	2
3	Seminary Road & 395	22	3
4	Duke Street & N Quaker La	21	4
5	Duke Street & W Taylor Run Parkway	19	5
6	King Street & N Quaker Lane & W Braddock Road	18	6
7	Seminary Road & N Beauregard Street	17	7
8	S Patrick Street & Gibbon St	16	8
9	Edsall Road & S Van Dorn St	16	8
10	Duke Street & S Pickett St	15	9
11	N Van Dorn St & Richenbacher Ave & Sanger Av	14	10
12	King Street & Park Center Dr	14	10
13	N Beauregard Street & W Braddock Road	13	11
14	Eisenhower Avenue & S Van Dorn Street	12	12
15	Seminary Rd & Dawes Ave	12	12
16	Duke Street & S Patrick St	12	12
17	Edsall Rd & S Pickett St & Cameron Station Blvd	12	12
18	King Street & N Henry Street	12	12



*These are in the 99th percentile (Top 1%) of injury crashes by location, # Injury crashes are a sum of KSI and non-KSI related injuries for vehicle only crashes at a location

VISION ZERO

SAFER STREETS FOR ALEXANDRIA

Vision Zero in Alexandria, VA

Executive Summary

- On January 24, 2016, the City of Alexandria adopted a Vision Zero resolution, which set a goal of eliminating traffic deaths and serious injuries by 2028. In an on-going effort to support this resolution, the Office of Performance Analytics (OPA) and Information Technology Services (ITS) has performed an updated citywide crash analysis for CY2016 - CY2020 in partnership with the Department of Transportation and Environmental Services (TES) and the Alexandria Police Department (APD)

- This analysis is organized into the following sections:

    - Analysis Notes - highlights important analysis terms, methodology notes, and general information

    - Key Findings - highlights the key findings from the crash analysis

- The traffic crash data was extracted by APD from their Record Management System (RMS). RMS crash data was compared with data captured in the State's Traffic Records Electronic Data System (TREDS). Data discrepancies were evaluated and resolved by the analysis team as needed.

- Findings from this analysis can inform future transportation planning decisions regarding policy, infrastructure or public outreach.

- This reporting period includes the first year of the COVID-19 pandemic. No formal study has been conducted regarding the Alexandria-specific travel impacts of COVID-19. However, regional studies have shown that travel patterns changed drastically due to public health lockdown measures in 2020 which resulted in lower overall traffic volumes and public transit ridership, and higher rates of walking and biking [Study references in memo]. The impacts of the COVID-19 pandemic (lockdowns, work from home mandates etc.) should be considered when evaluating crash trends and insights associated with 2020.

Analysis Notes

- For this analysis, crash data is evaluated by two major classifications: Severity and Mode:
  - Crash severity is classified as either a crash that results in someone being killed or severely injured (KSI) or it does not (non-KSI). All or total crashes refer to KSI and non-KSI crashes
  - Crash mode is classified into three groups: vehicle-only crashes, crashes that involve pedestrians, and those that involve bicyclists

- The crash data used in this analysis consists of three tables (1) crash data (2) crash names and (3) crash vehicles.
  - Crash data – is the primary data table which contains general information of the crash such as location, weather, time, day, type of crash, intersection type, road condition, who was involved (vehicles only, pedestrian, or bicyclists) and severity (killed, seriously injured or other injuries)
  - Crash names - Contains information about all individuals involved in a crash including age, primary action at the time of the crash, whether they were drinking and wearing their safety restraint
  - Crash vehicles – Contains information about all the vehicles involved in a crash including vehicle type, speed they were traveling, and vehicle maneuver performed at the time of the accident

- For the graphs that display crash trends over time, the strength of the trend is expressed through the r^2 value. The closer the r^2 value is to 1 or -1 the stronger the trend. Positive r^2 values indicate an upward trend, negative r^2 values indicate a downward trend, and zero indicates a flat trend.

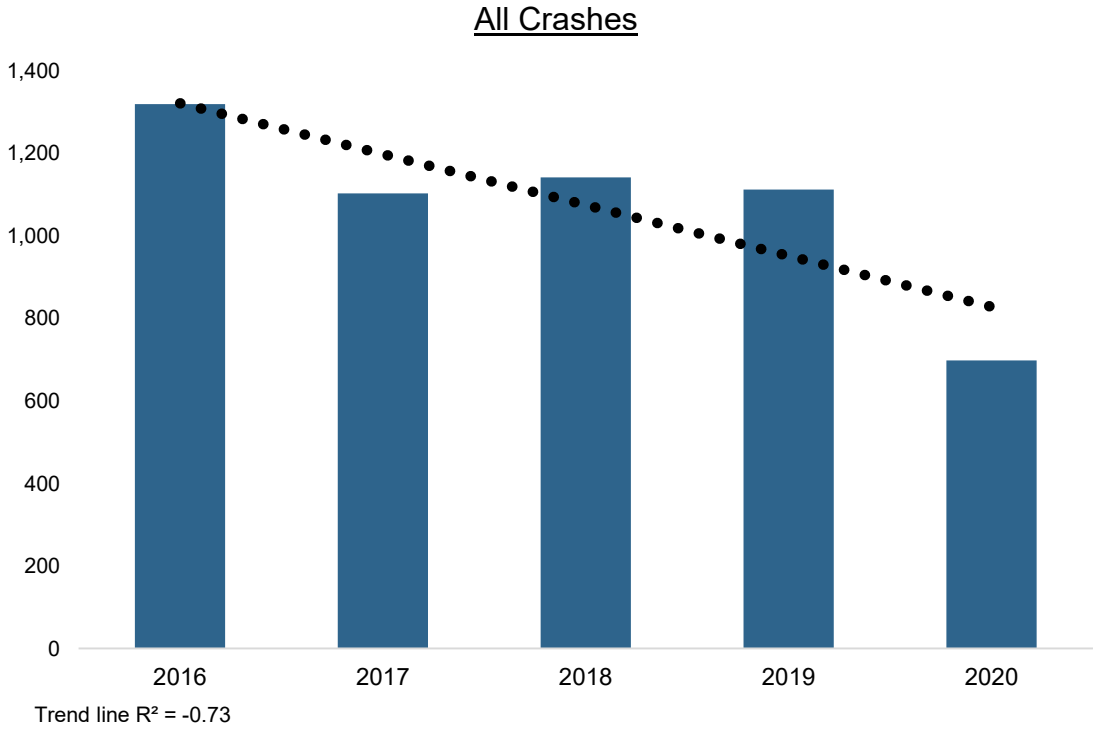
- Within the crash data the incident address, or latitude and longitude coordinates, were used to map crash locations. Due to data inaccuracies or lack of location information, 25 crash records (<1%) were unable to be mapped. However, they were included in the non-spatial parts of the analysis.

- Maps showing concentration of crashes were used to show general concentration of crashes for planning purposes. Crash concentrations can vary based on parameters used. Parameters used for this analysis were derived from Alexandria specific data characteristics and industry guidance.

- The High Injury Network was created to highlight corridors with high concentrations of KSI crashes. If two street segments had a KSI crash (killed or seriously injury crash), and the distance between them was less than 2,500 feet; both those segments and any segments lying between them are combined to define a single corridor. Only those segments that have KSI crashes on them or on segments around them, are selected. Two more steps were taken to refine the final outcome. First, we dropped corridors that were less than 2,500 feet. Then, we removed any corridor with only one KSI from the tally. If needed, other adjustments were made based on subject matter expertise.

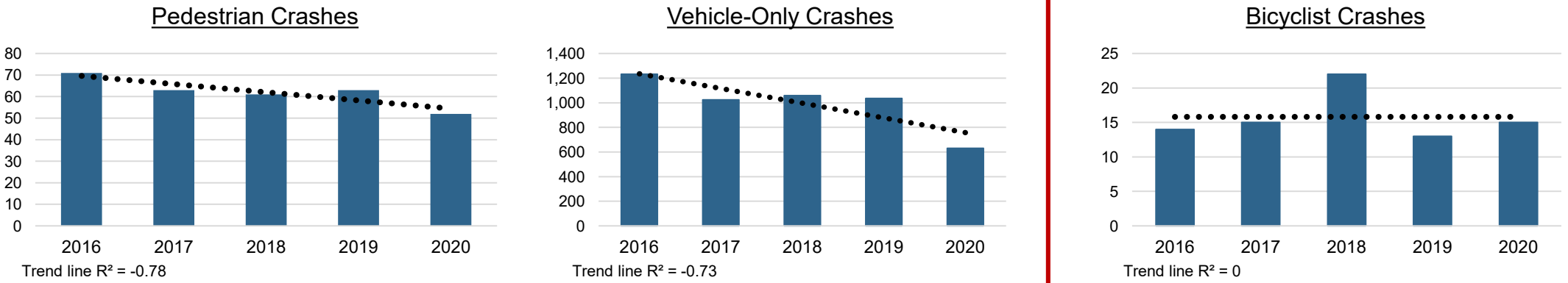
<u>Key Finding 1:</u> Crashes are trending downward

Total crashes for this reporting period are trending downwards.

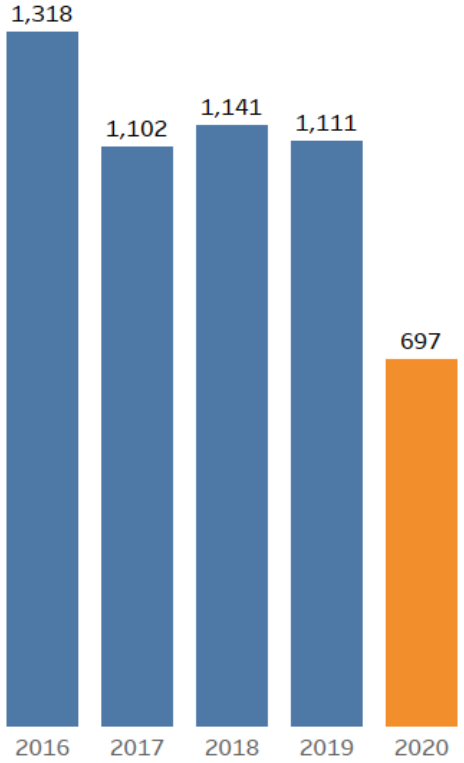


Year	Total Crashes	Previous Year Difference
2016	1,318	
2017	1,102	-16%
2018	1,141	4%
2019	1,111	-3%
2020	697	-37%
Total	5,369	

The downward crash trend is driven primarily by pedestrian and vehicle-only crashes.



In 2020, there was a noticeable decline in crash totals. From 2019 to 2020, there was a 37% decline in crashes – the largest in this reporting period. Vehicle-only crashes accounted for the largest drop by mode from 2019 to 2020. The impacts of the COVID-19 pandemic should be considered when evaluating crash trends and insights associated with 2020. Regional studies have shown that people's travel patterns changed drastically due to public health lockdown measures in 2020 (see memo for study references).



Year	Total Crashes	Previous Year Difference
2016	1,318	
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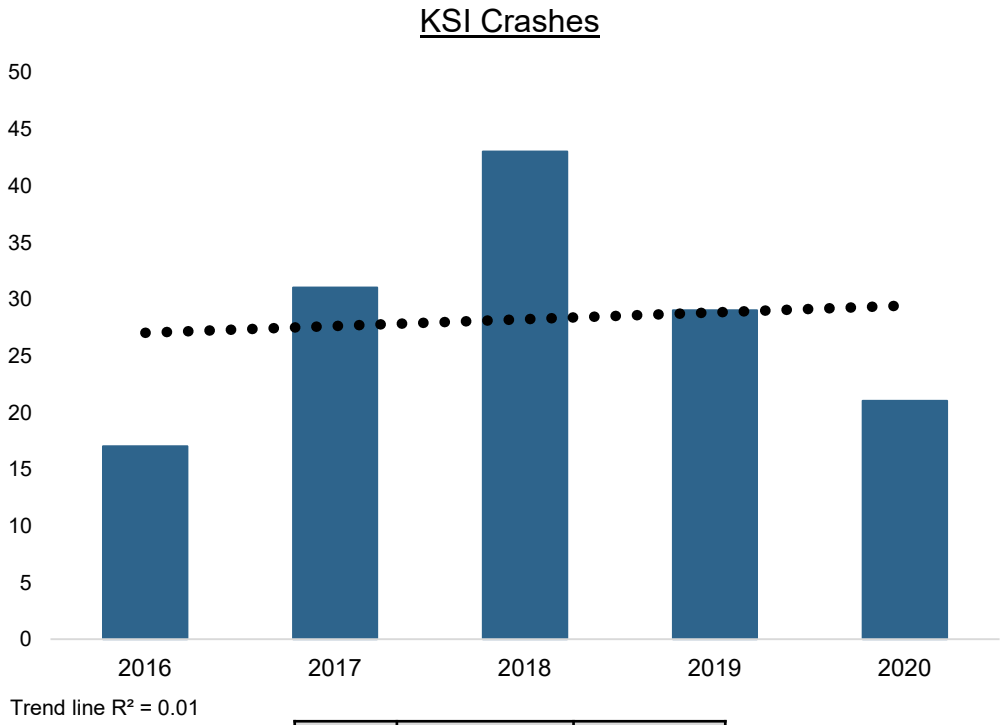
2019	1,111	-3%
2020	697	-37%
Total	5,369	

Crash Mode	2019 Total	2020 Total	Previous Year Difference
Bicyclist	13	15	15%
Pedestrian	63	52	-18%
Vehicle-Only	1,035	630	-39%

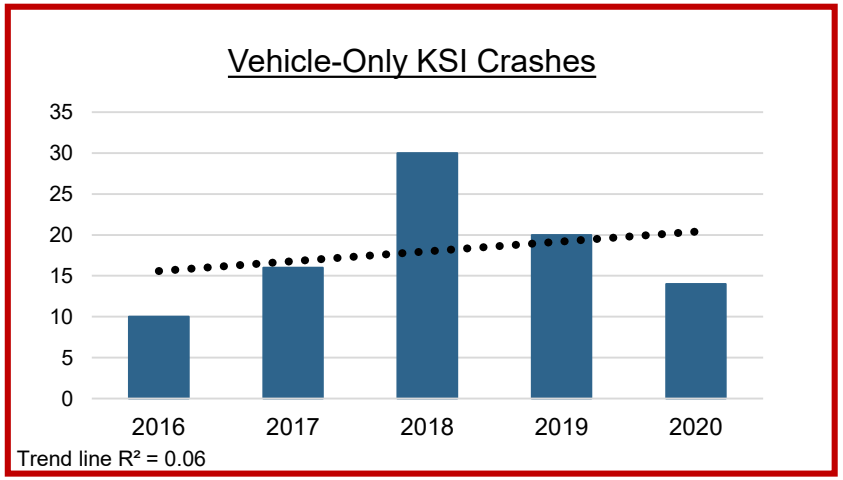
Key Finding 2: KSI crashes are trending slightly upwards, while KSI risk varies by mode

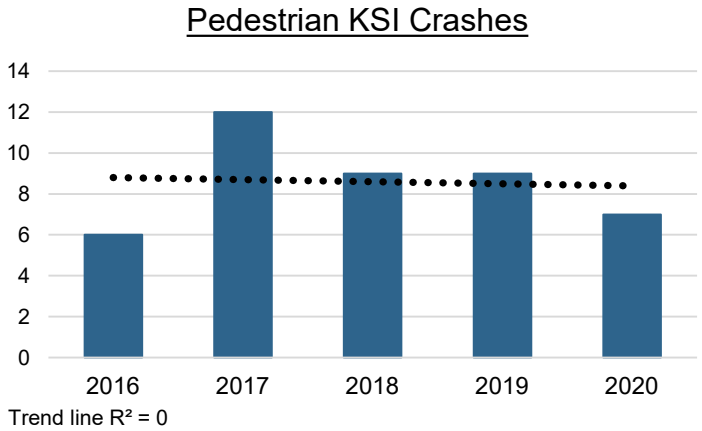
KSI crashes for this reporting period are trending slightly upwards.

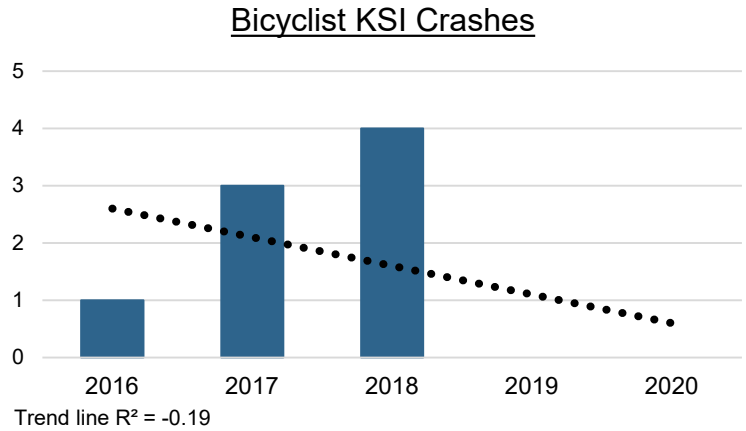


Year	KSI Crashes	Previous Year Difference
2016	17	
2017	31	82%
2018	43	39%
2019	29	-33%
2020	21	-28%
Total	141	

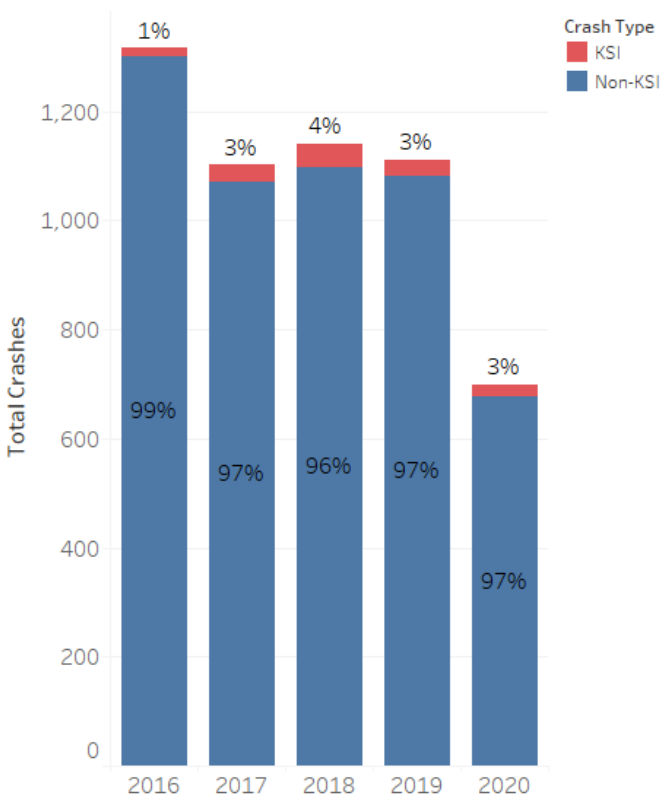
The slightly upward KSI trend is driven primarily by vehicle-only KSI crashes.

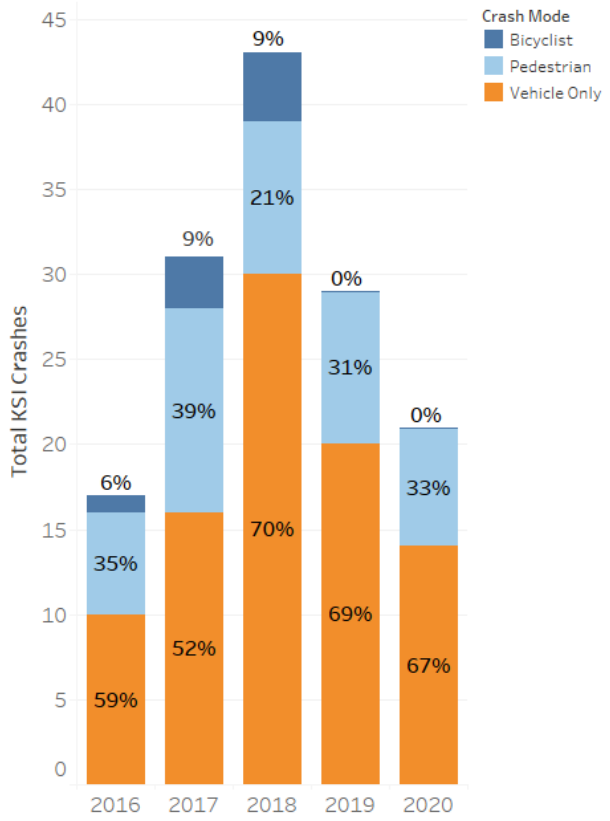




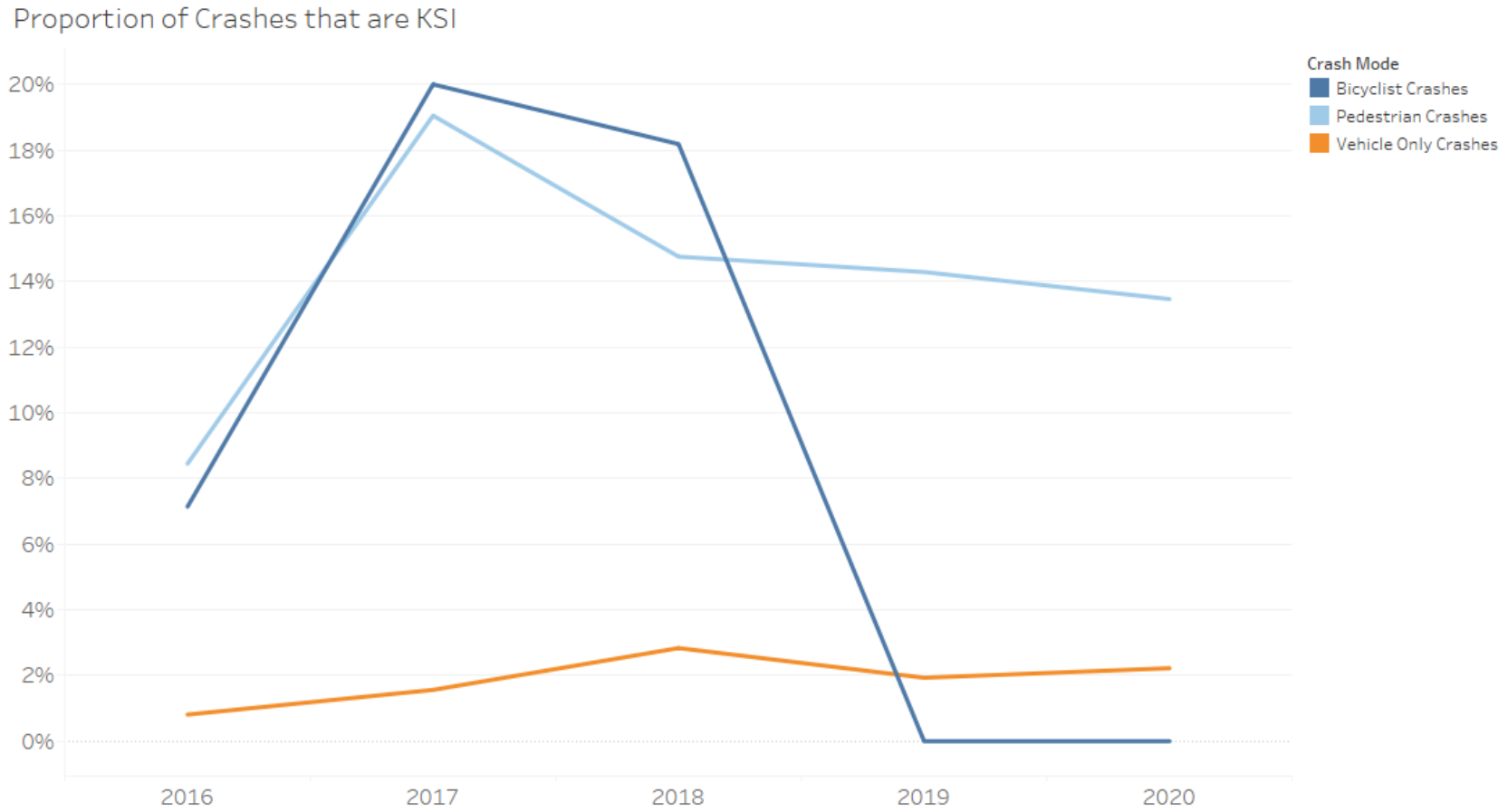


The proportion of crashes that were fatal or severe remained somewhat consistent throughout the reporting period, hovering around 3%. Vehicle-only crashes had the highest number of KSI crashes every year, followed by pedestrian crashes, then bicyclist crashes.



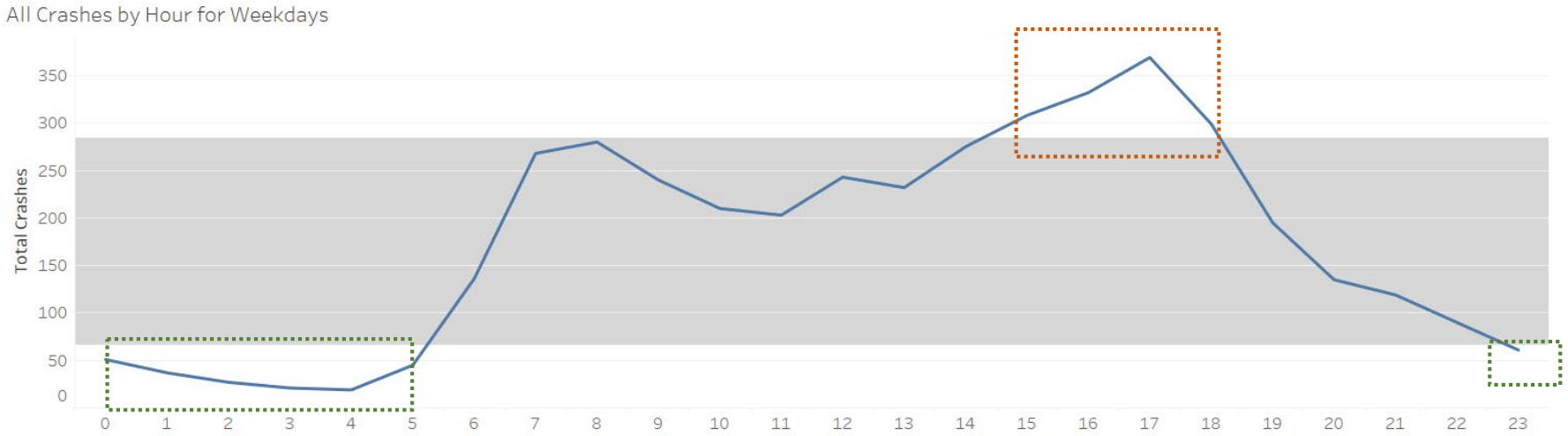


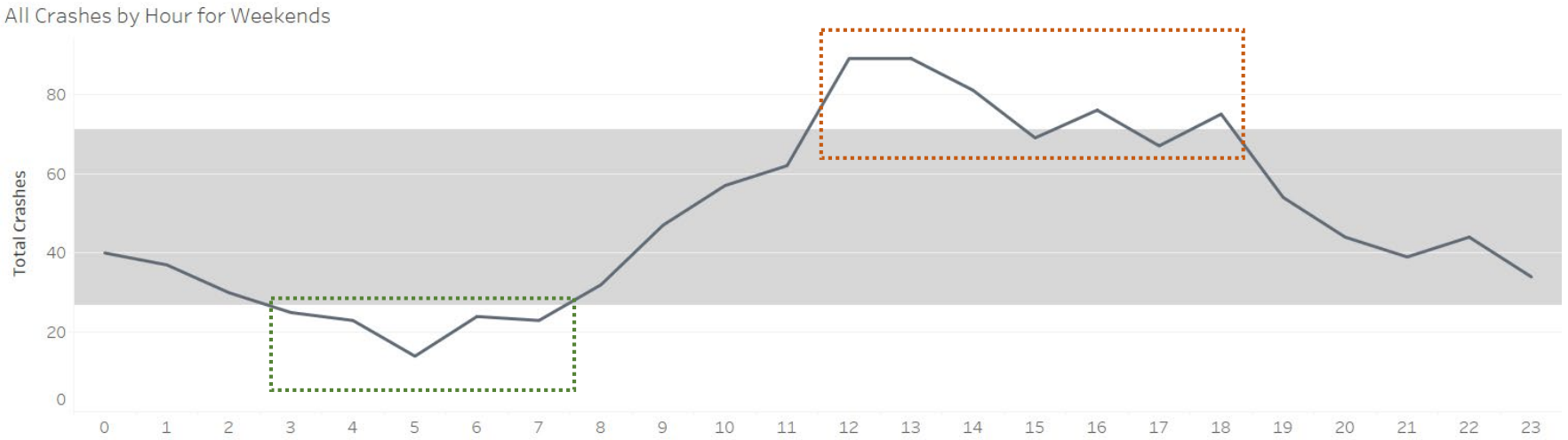
The proportion of vehicle-only crashes that were fatal or severe were overall much lower than pedestrian and bicyclist crashes. The proportion of pedestrian and bicyclist crashes that were fatal or severe followed a similar trajectory from 2016-2018, then the bicyclist KSI proportion dropped significantly while the pedestrian KSI proportion hovered around 14%.



Key Finding 3: Crash volume and KSI risk varies by hour, day, and month

During the weekday, the highest crash frequencies are seen during the evening commute (3:00pm – 6:00pm/15:00-18:00). The lowest weekday crash frequencies are seen during the late night, early morning hours (11:00pm - 5:00am/23:00-5:00). On the weekend, the highest crash frequencies are seen during mid-day (12:00pm – 2:00pm/12:00-14:00), while the lowest are seen during the early morning hours (3:00am to 7:00am/3:00-7:00).



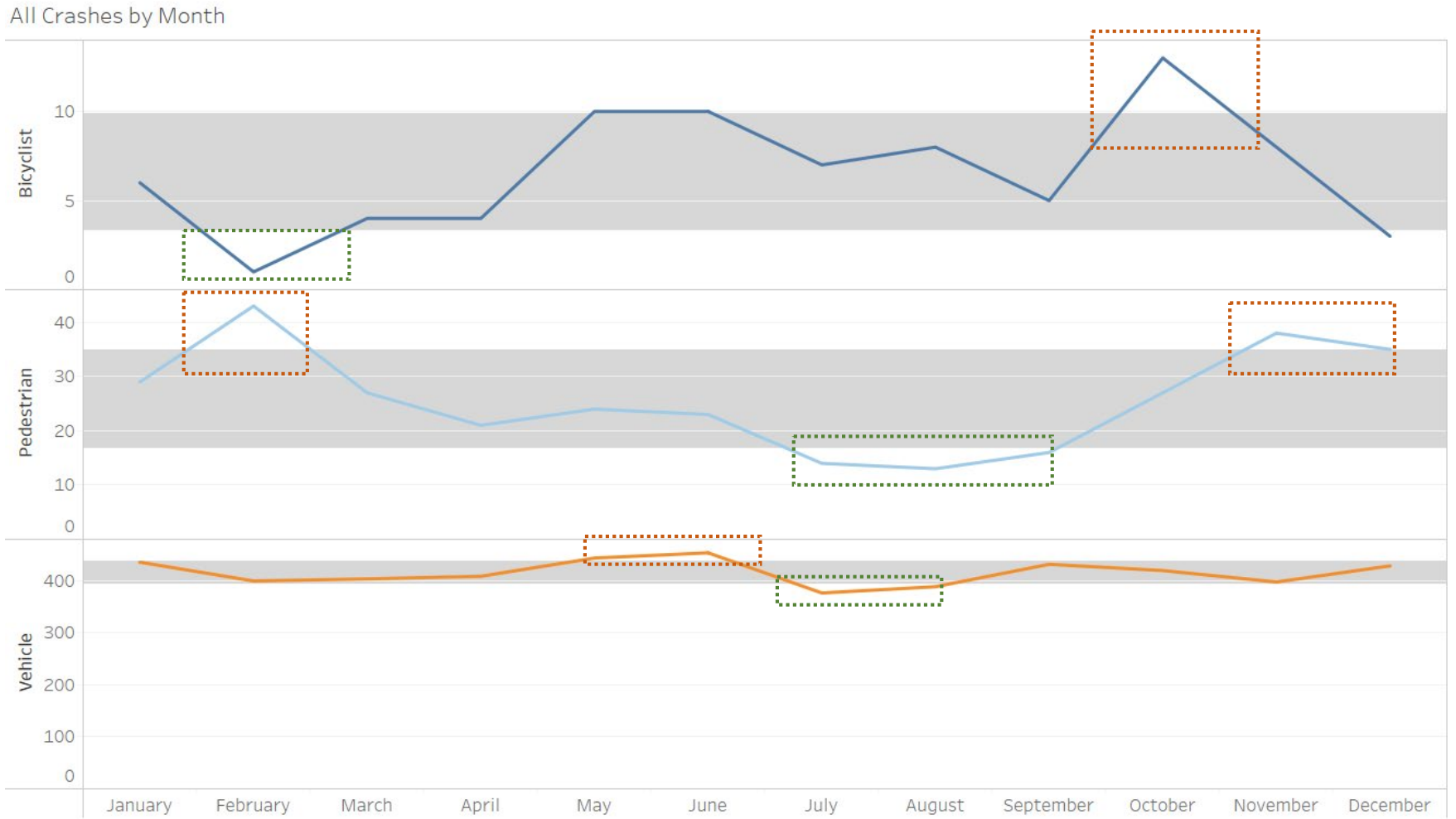


Gray bands show -1/+1 standard deviation. High crash volume is defined as above one standard deviation (above gray bar); low crash volume is below one standard deviation (below gray bar)

Low Crash Volume

High Crash Volume

Examining crashes by month identifies any seasonal trends. The highest monthly crash totals by mode were October for bicycle crashes, February for pedestrian crashes, and June for vehicle-only crashes. The lowest monthly crash totals were February for bicycle crashes, August for pedestrian crashes, and July for vehicle-only crashes.

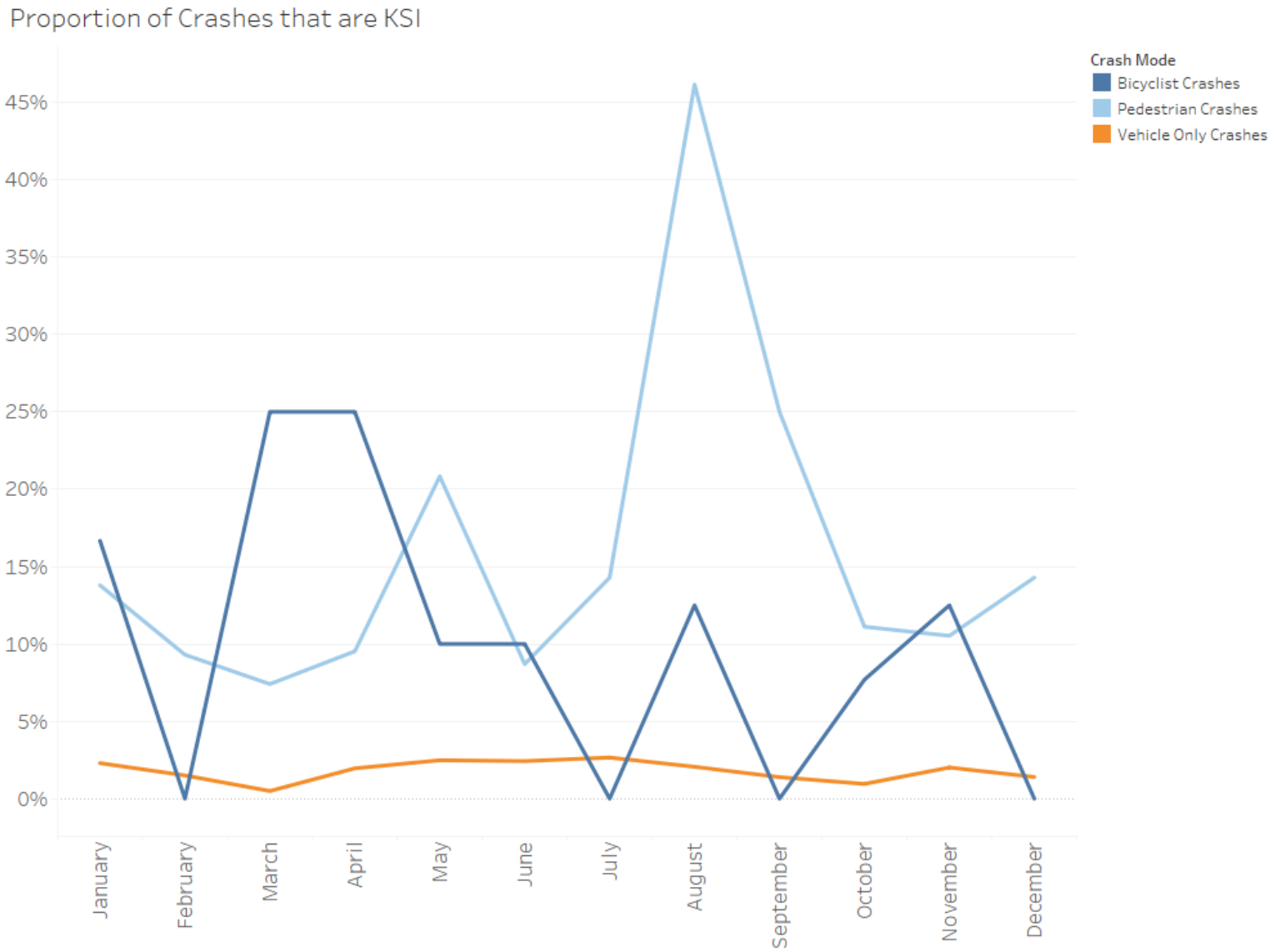


***Gray bands show - 1/+1 standard deviation. High crash volume is defined above one standard deviation (above gray bar); low crash volume is below one standard deviation (below gray bar)

Low Crash Volume

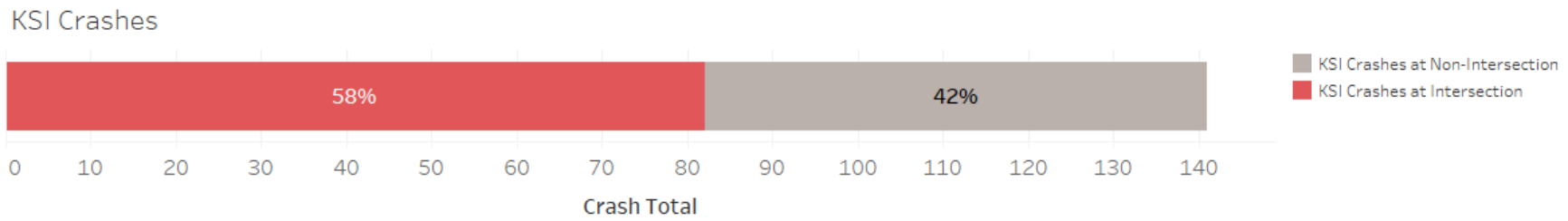
High Crash Volume

March and April had the highest proportion of fatal or severe crashes for bicyclists. August and September were high months for fatal or severe pedestrian crashes. Vehicle-only crashes remained constant through out the year with only minor fluctuations in KSI proportion.

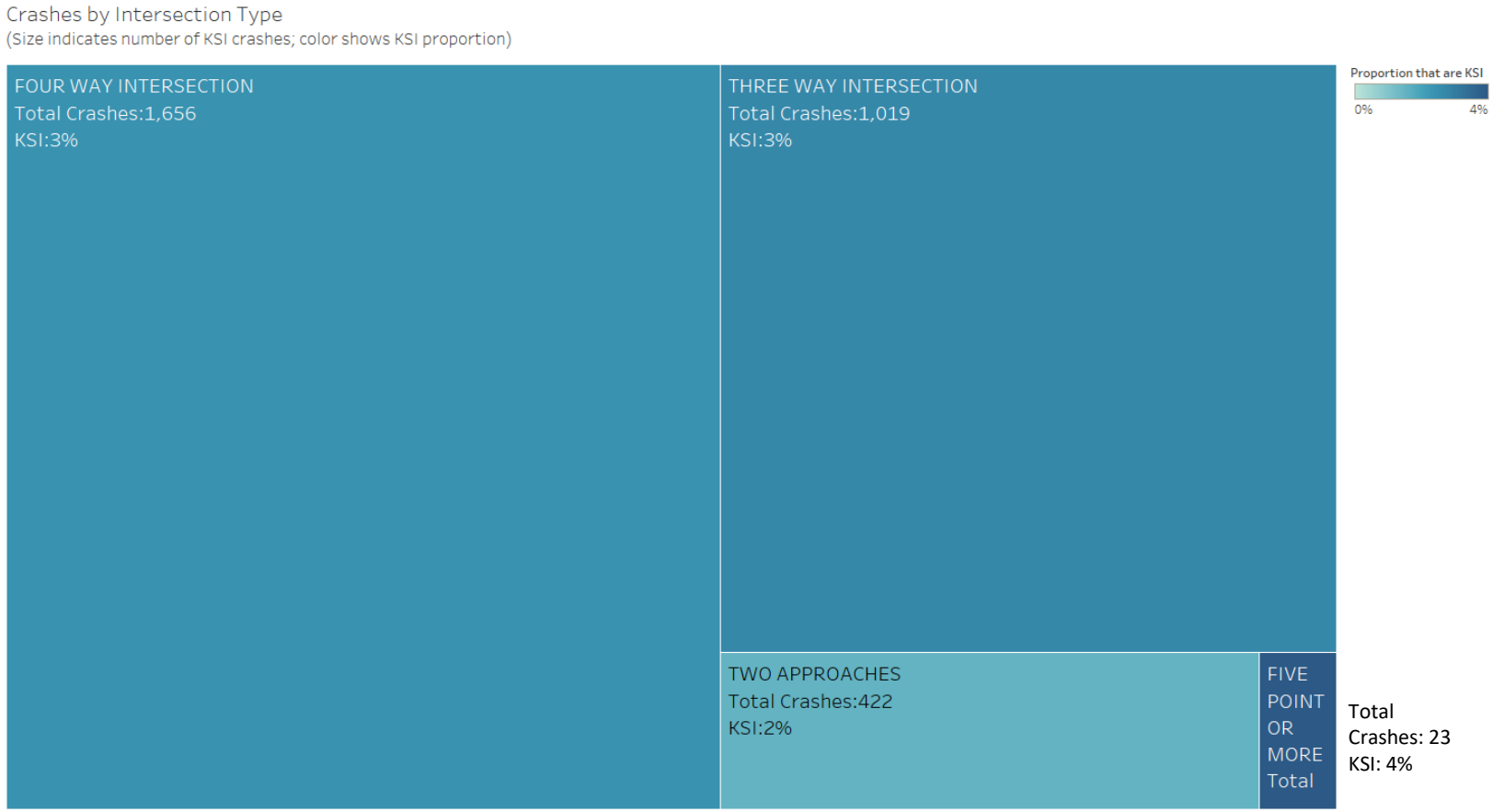


Key Finding 4: Most KSI crashes occur at intersections

The majority of KSI crashes occur at intersections.

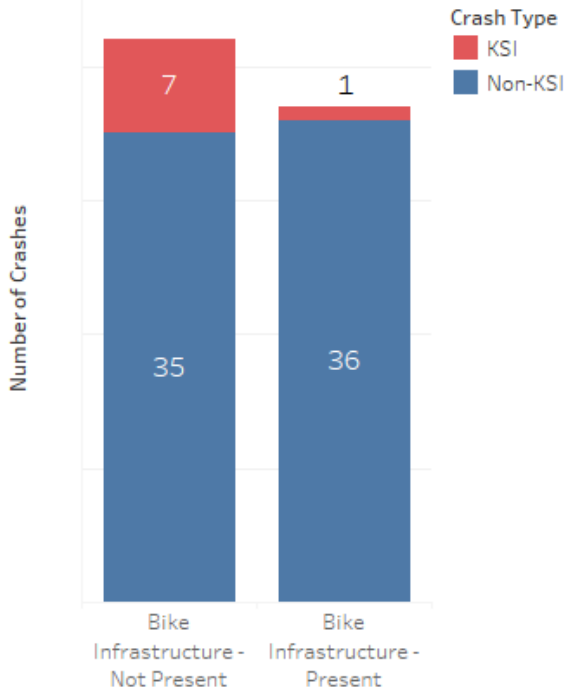


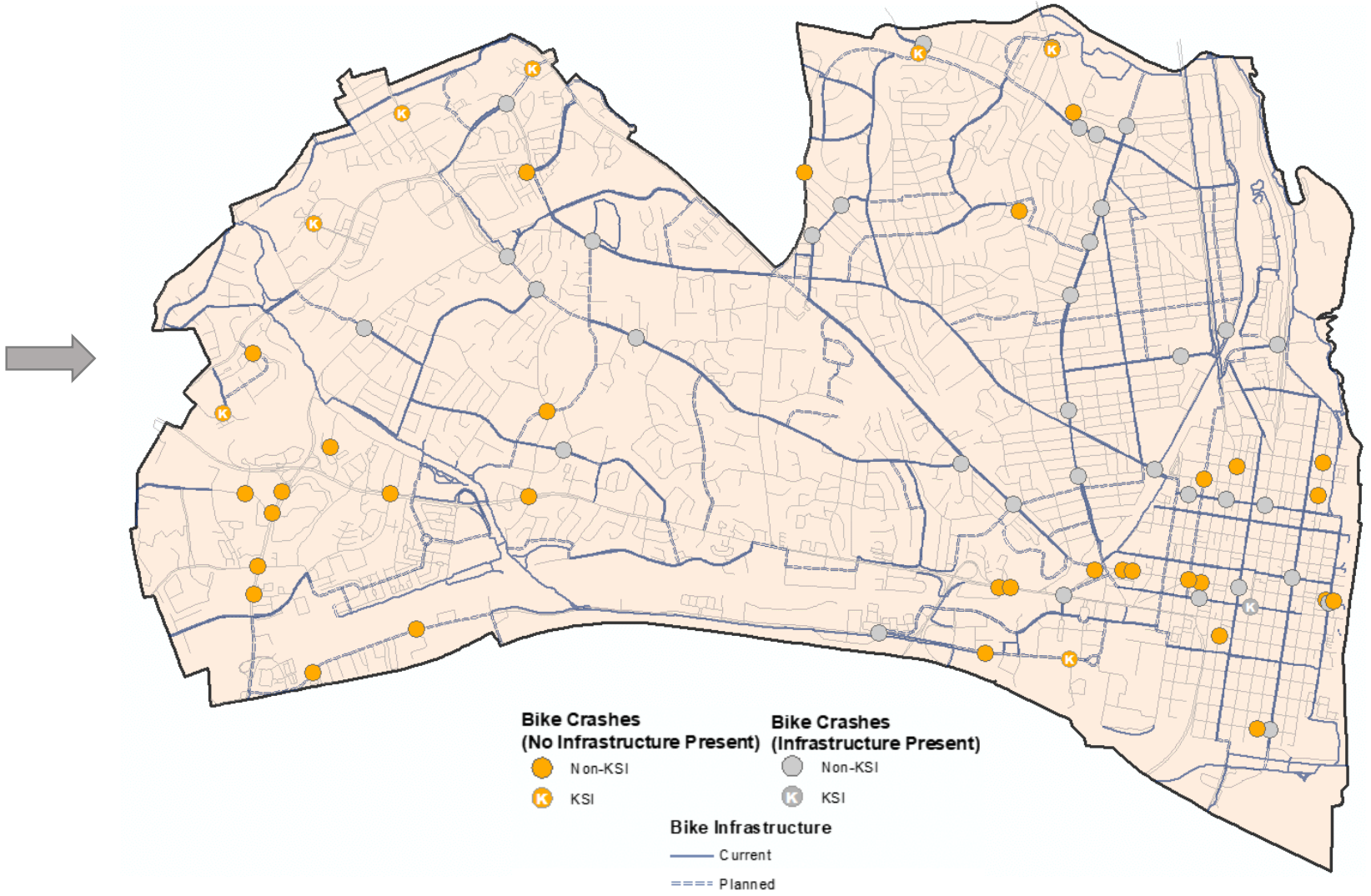
Five point or more intersections had the highest proportion of KSI crashes, but the number of crashes are low. Four-way and three-way intersections had the next highest KSI proportion at 3%.



Key Finding 5: Most KSI bicyclist crashes occur where there is no bike infrastructure

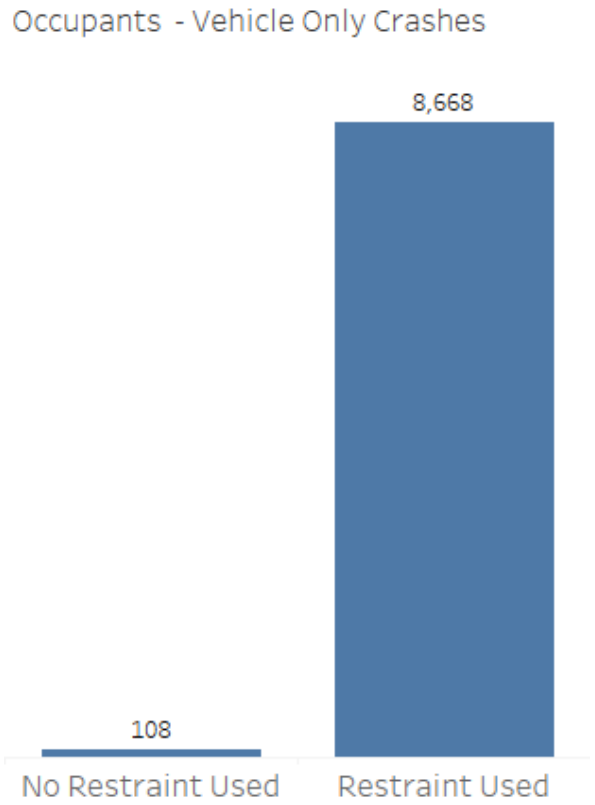
The majority of bicyclist KSI crashes occurred where no bike infrastructure was present.

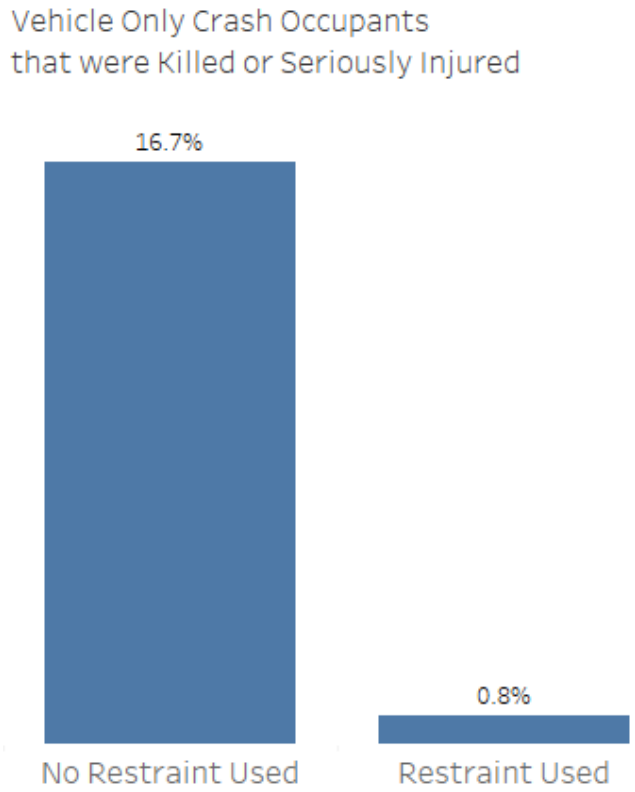




Key Finding 6: Not using a safety restraint while in a vehicle increases KSI risk

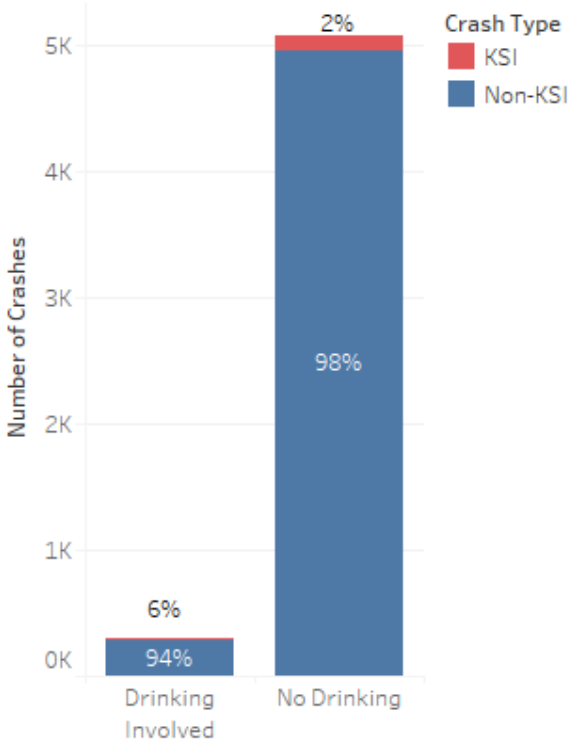
In vehicle-only crashes, the majority of occupants used their safety restraint (e.g., seat belt). Vehicle occupants who didn't wear their safety restraints were approximately 20 times more likely to be killed or seriously injured than those who did wear them.

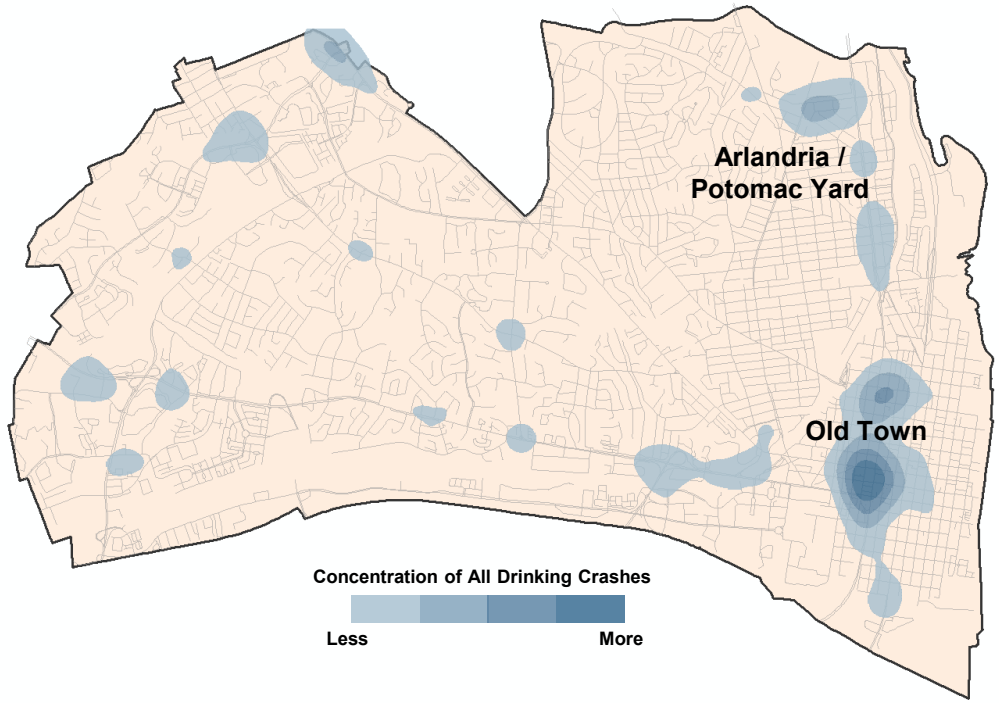




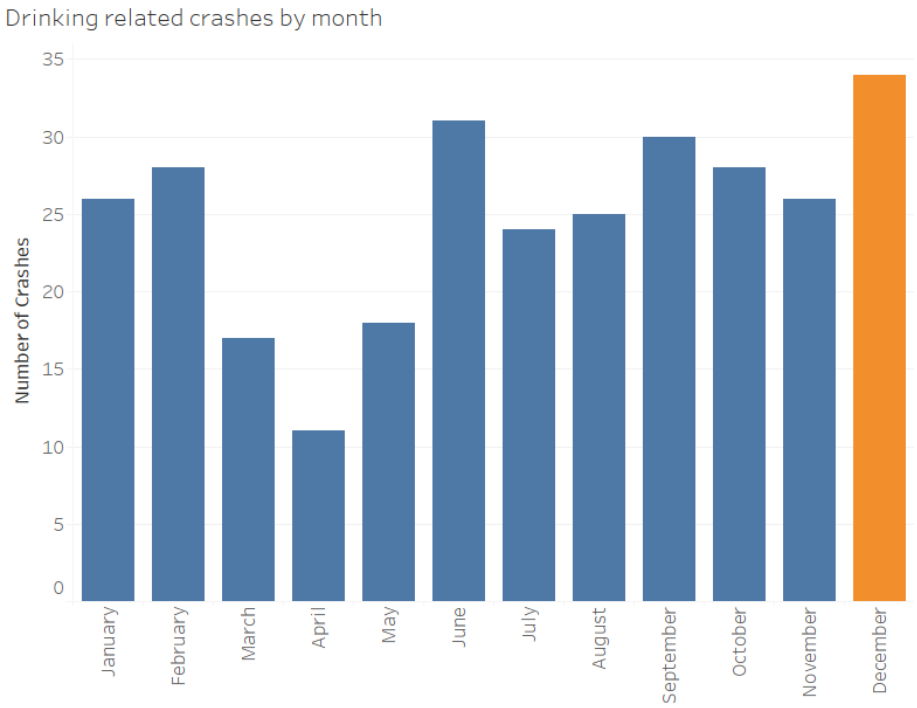
<u>Key Finding 7:</u> Drinking while driving increases the risk of KSI crashes

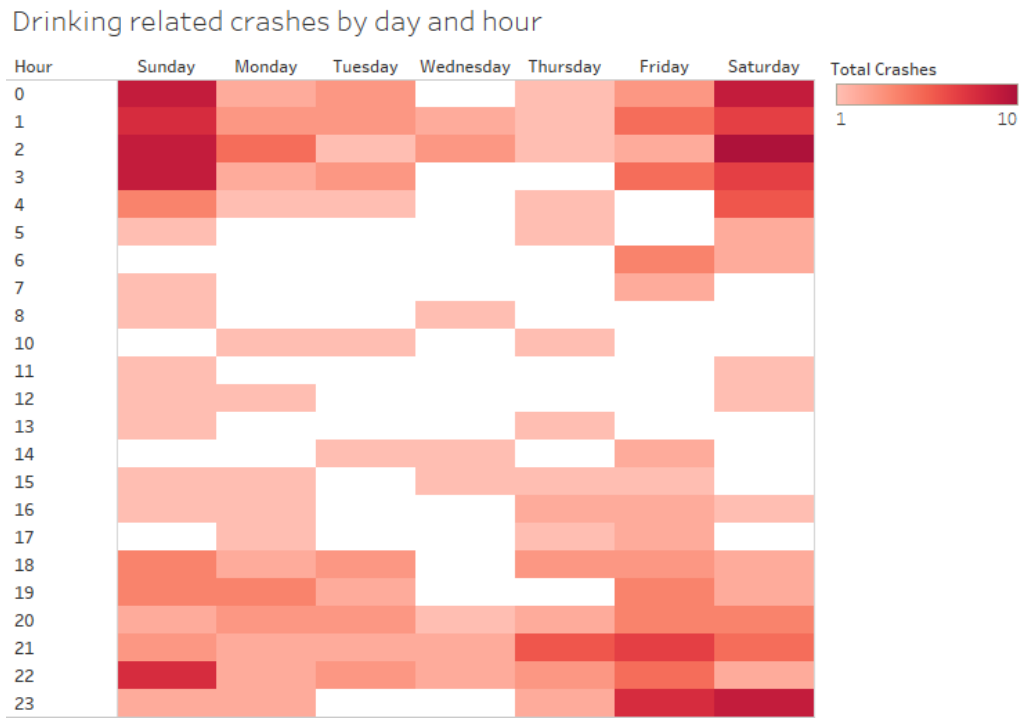
Crashes when drinking was involved had a higher proportion of KSI crashes (6%) compared to crashes that didn't (2%). Certain locations within the City have higher concentrations of drinking related crashes than others.





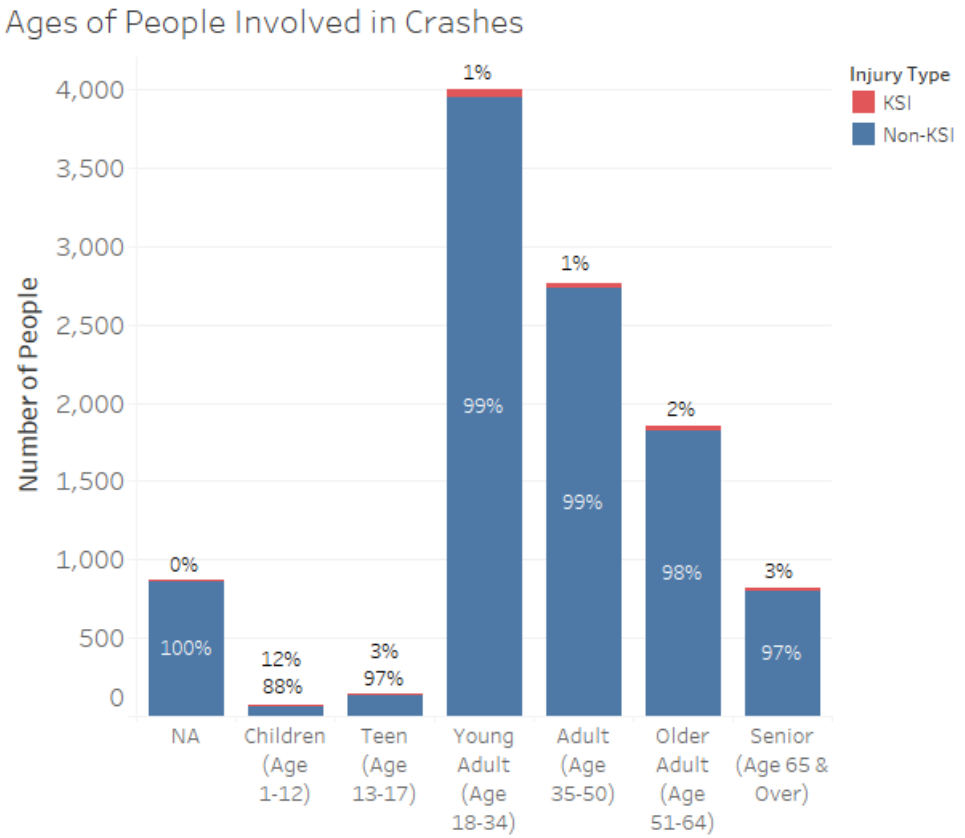
December had the highest number of drinking-related crashes. Most drinking-related crashes occurred on the weekend during the evening or early morning hours.





Key Finding 8: Children, teens, and seniors are at higher risk of fatal or serious injury

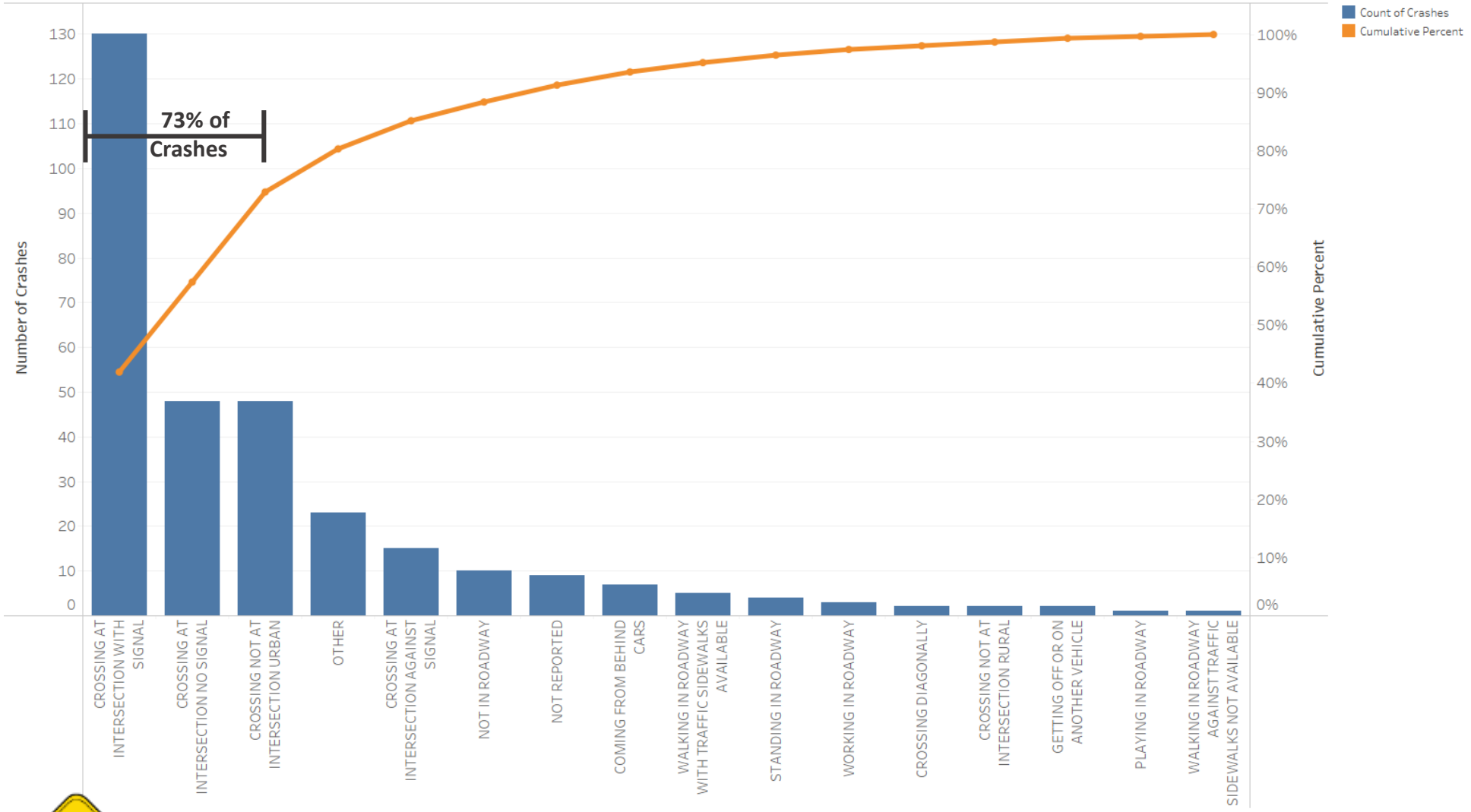
Children, teens and seniors had the highest proportion of fatalities or serious injuries compared to other age groups. Young adults had the highest total number of fatalities or serious injuries compared to other age groups.



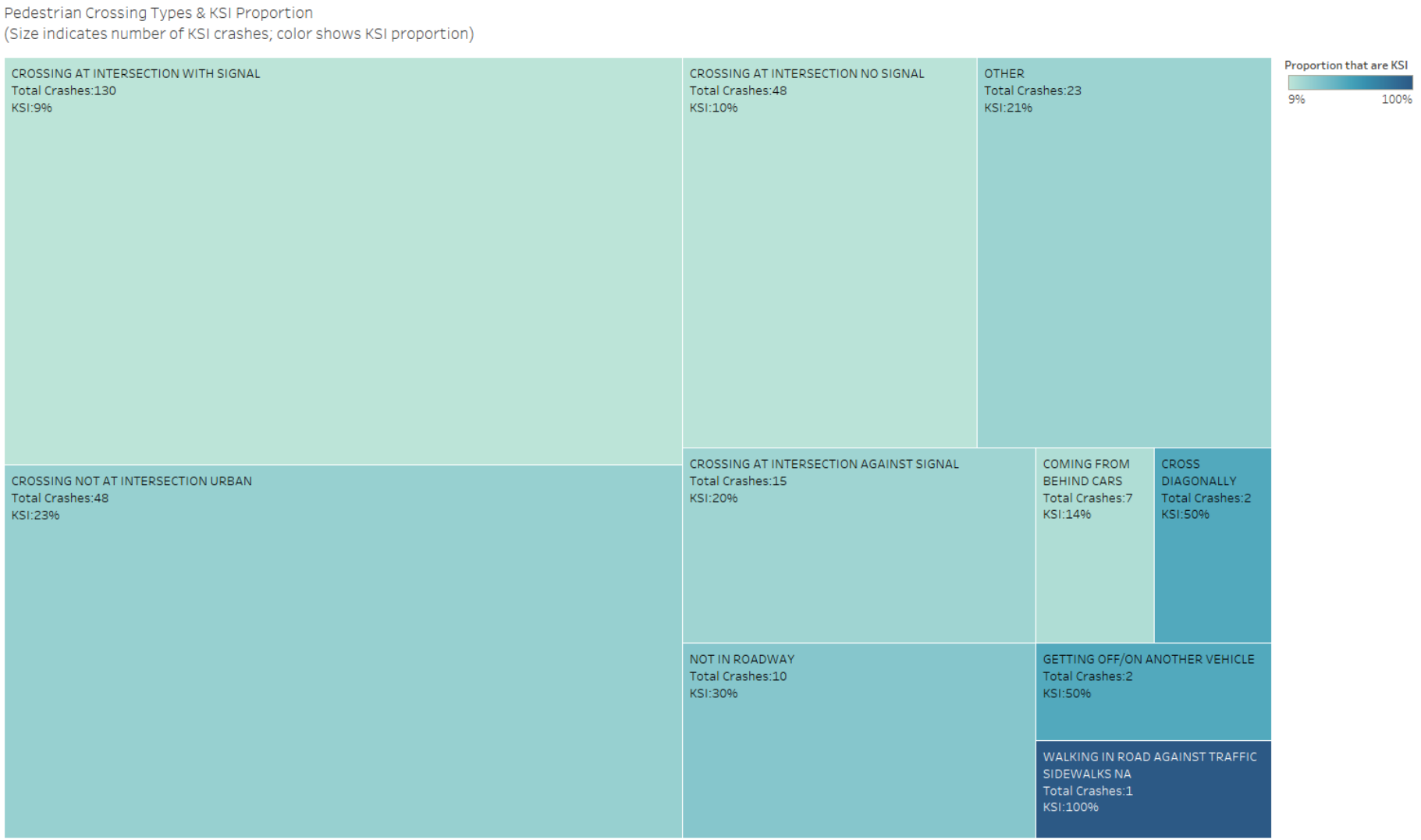
Age Group	Total Number of KSI Injuries	Proportion of all KSI Injuries
Children	8	5%
Teen	5	3%
Young Adult	56	36%
Adult	34	22%
Older Adult	32	20%
Senior	21	13%
NA (Unknown)	1	1%

Key Finding 9: Certain actions or maneuvers carry higher risk of fatal or severe injury for pedestrians

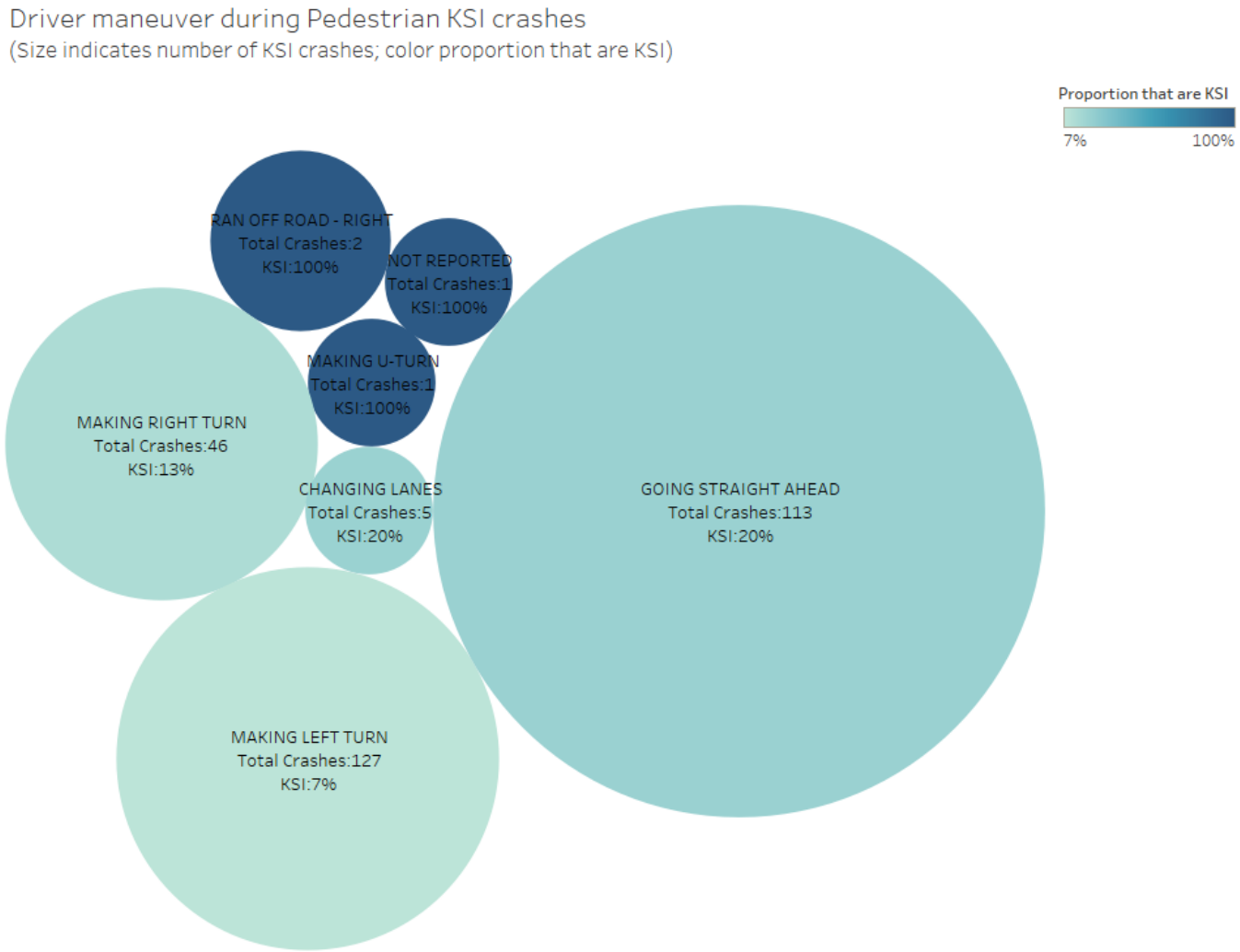
During pedestrian crashes, certain pedestrian crossing types occur more frequently than others. Crossing at an intersection with a signal, Crossing at an intersection without a signal, and Crossing not at an intersection (urban) account for 73% of actions taken by pedestrians.



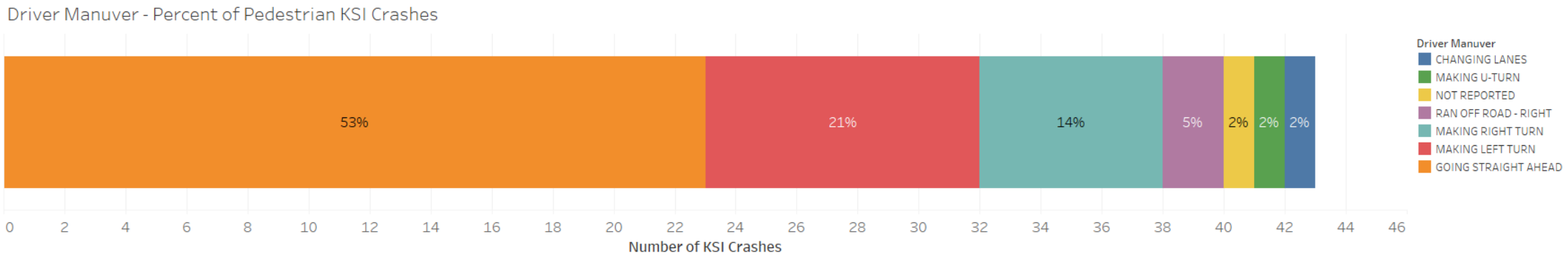
Certain pedestrian crossing types have higher KSI risk than others. Walking in road against traffic (where sidewalks were not available) had the highest KSI proportion, but low crash numbers. Crossing at intersection with a signal and crossing not at an intersection (urban) had high numbers of KSI crashes.



During pedestrian KSI crashes, certain driver maneuvers result in a higher proportion of KSI crashes. Ran off road (right) and Making a U-Turn had the highest proportion of KSI crashes, but low crash numbers.

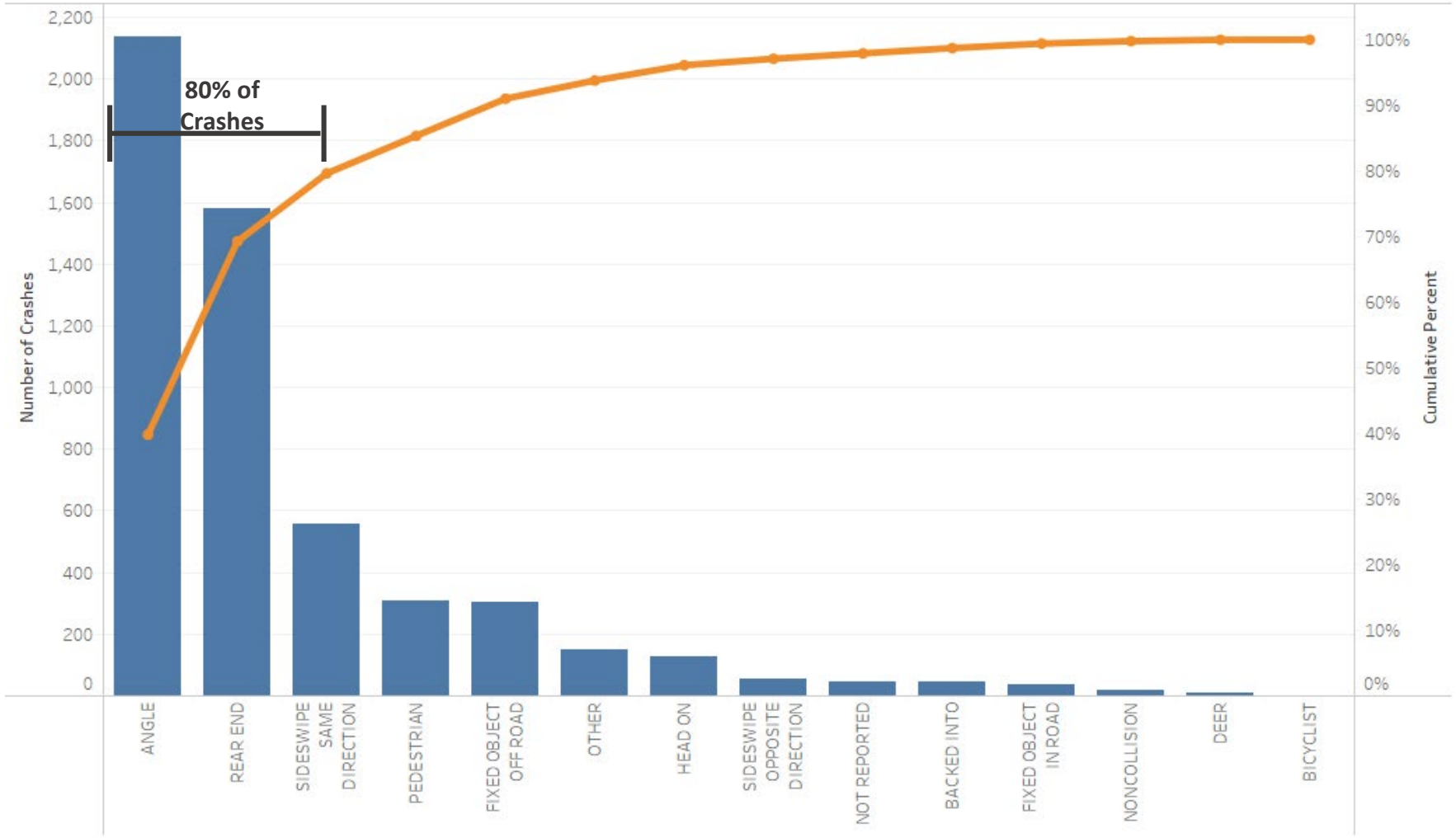


Crashes where the driver was going straight ahead account for over half of fatal or severe pedestrian crashes.

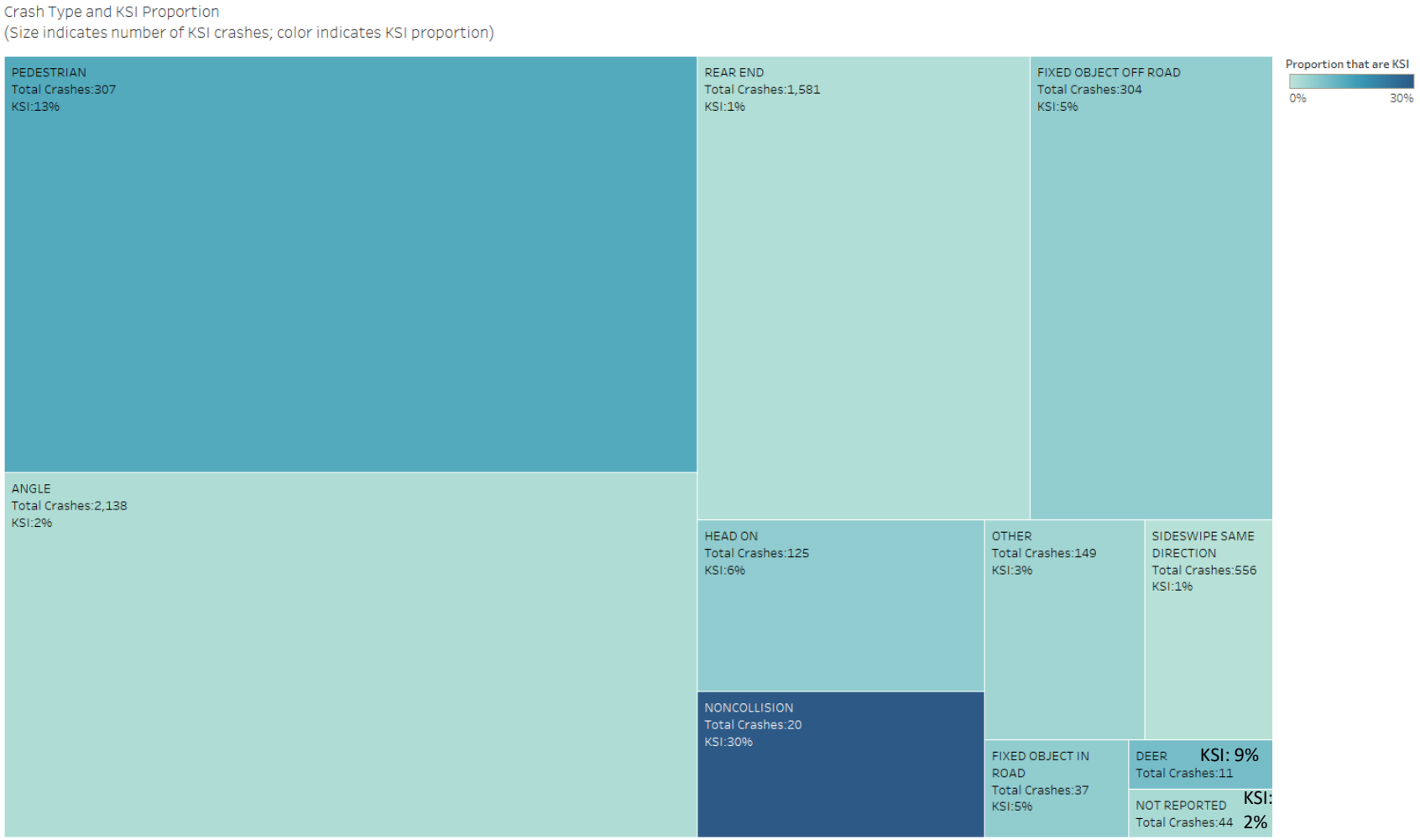


Key Finding 10: Certain crash types have higher crash frequencies and KSI risk

Certain crash types occur more frequently than others. Angle, Rear end, or Sideswipe (same direction) account for 80% of all crashes.

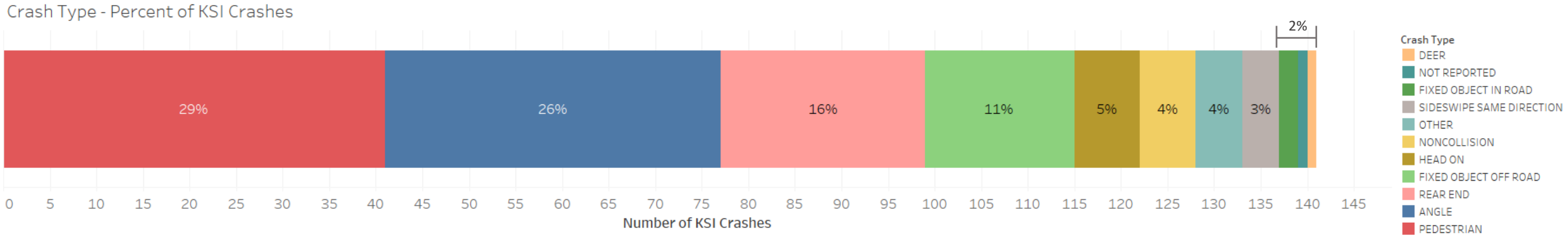


Certain crash types have higher KSI risk than others. Pedestrian and Non-collision crashes have the highest proportion of KSI crashes.



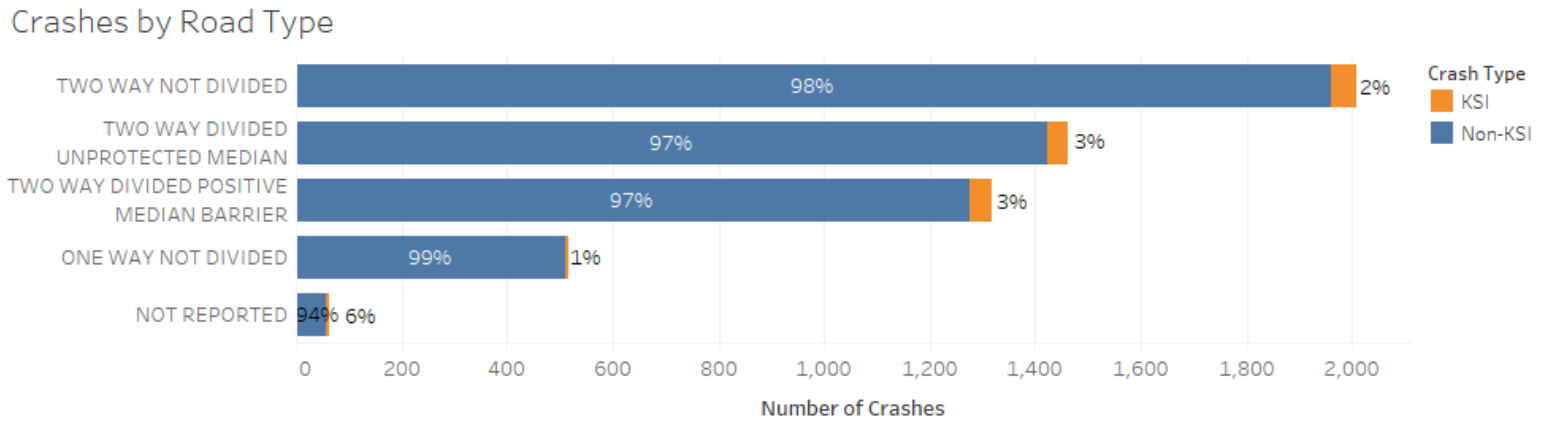
*Non-Collision - Includes crashes such as run-off road, crossing median and vehicle rollovers

Pedestrian crashes and angle crashes account for over half of all fatal and severe crashes.

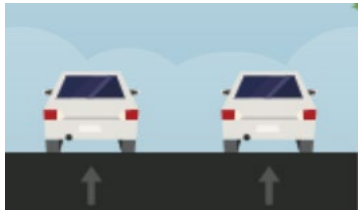


Key Finding 11: Certain street characteristics and environmental conditions have higher KSI risk

Examining crashes by various road types shows that Two-way (not divided) roads had the most KSI and non-KSI crashes. While Two-way (divided – Unprotected Median) and Two-way (divided – Positive Median Barrier) roads had the highest proportion of KSI crashes.

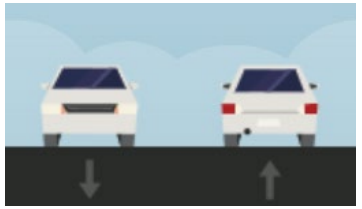


One Way Not Divided

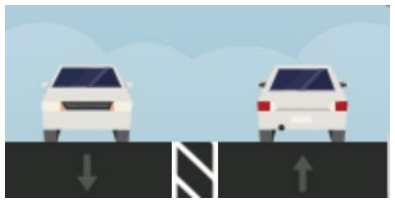


Two-Way Divided Positive Median Barrier

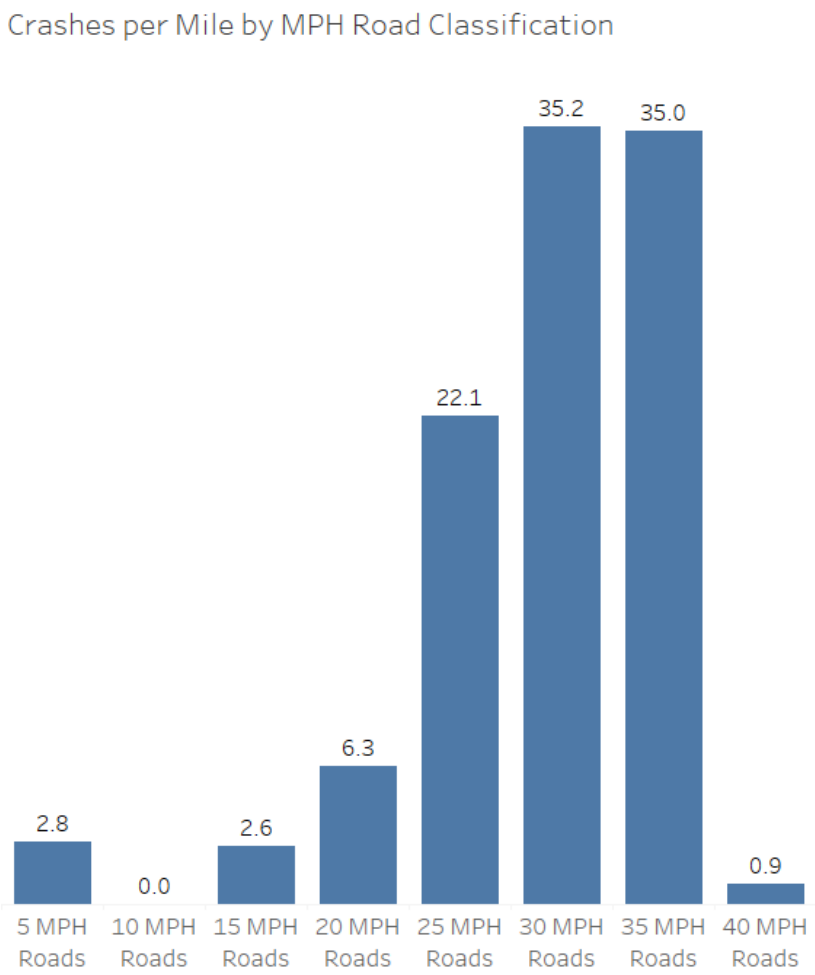
Two Way Not Divided

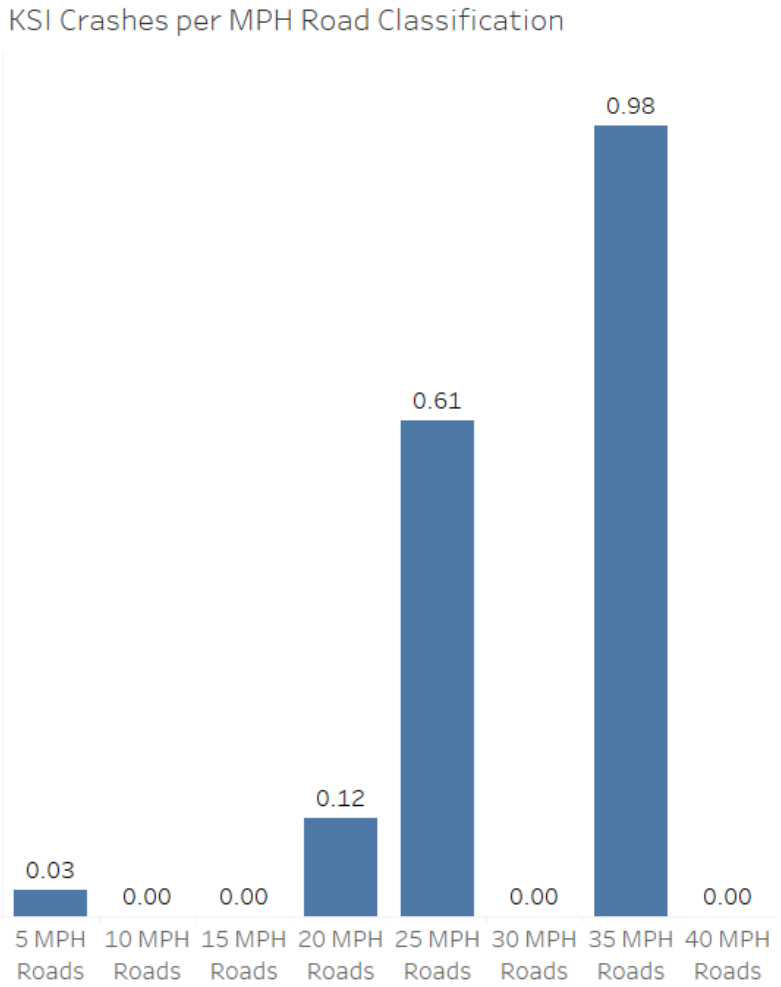


Two-Way Divided Unprotected Median



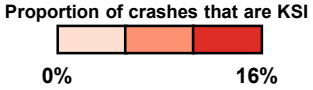
30 MPH roads have the highest crash rate per mile at 35.2, while 35 MPH roads have the highest KSI crash rate per mile at 0.98.



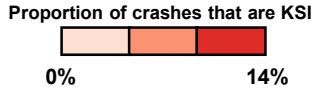


Certain environmental conditions have higher proportions of KSI crashes. The majority of crashes occurred during clear conditions; however, KSI crashes did occur during wet weather (rain or mist) for pedestrian and vehicle-only crashes. When roads had holes, ruts or bumps the proportion of KSI crashes increased for vehicle-only crashes. The proportion of crashes that were fatal or severe were higher at dark (road lighted) for pedestrians and at dawn for bicyclists.

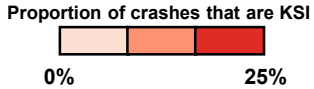
Weather Condition	Total Crashes		
	Vehicle Only	Bicyclist	Pedestrian
Blowing Debris	0	0	1
Fog	16	0	0
Mist	211	0	13
Clear	4,176	77	253
Other	10	0	0
Rain	524	2	39
Severe Crosswinds	3	0	0
Sleet or Hail	3	0	0
Smoke or Dust	4	0	0
Snow	23	0	1
Not Reported	10	0	3



Road Condition	Total Crashes		
	Vehicle Only	Bicyclist	Pedestrian
Edge Pavement Drop Off	1	0	0
Holes, Ruts, or Bumps	17	0	0
Loose Material	4	0	0
No Defects	4,843	79	303
Other	9	0	1
Restricted Width	5	0	0
Roadway Obstruction	2	0	0
Slick Pavement	82	0	3
Under Repair	5	0	0
Not Reported	12	0	3

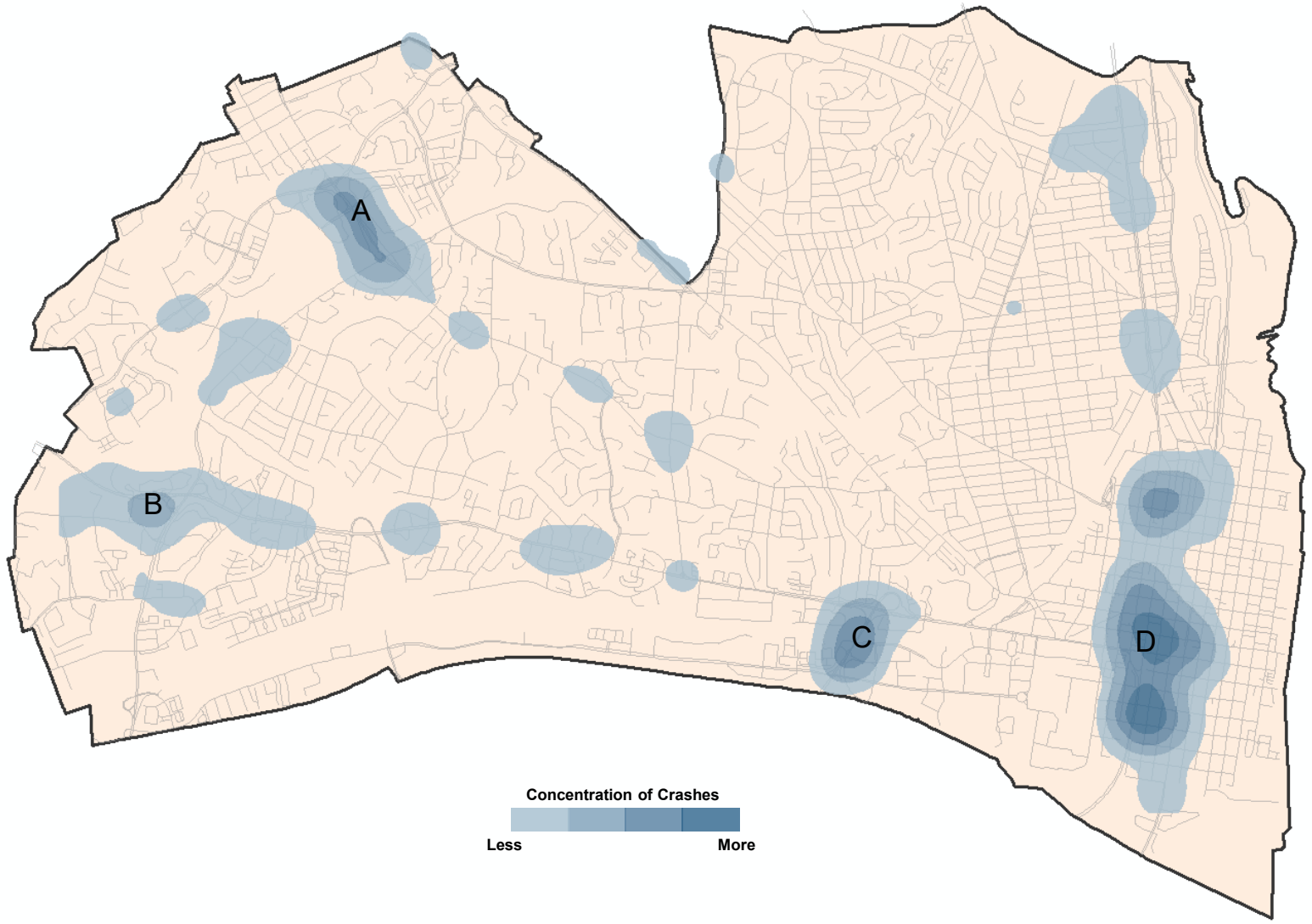


Light Condition	Total Crashes		
	Vehicle Only	Bicyclist	Pedestrian
Darkness, Road Lighted	1,067	12	94
Darkness, Road Not Lighted	50	1	12
Darkness, Unknown Lighting	14	0	1
Dawn	161	4	8
Daylight	3,459	58	169
Dusk	219	4	20
Unknown	7	0	3
Not Reported	13	0	3



Key Finding 12: Crashes involving speeding vehicles are concentrated in certain areas

Crashes involving speeding vehicles are concentrated in these major areas: Seminary Road near I-395 interchange (A), Landmark Area (B), Telegraph Road (C), and Old Town (D). Note: It's expected that number of speeding related crashes are under-reported to the inaccuracies of recording speed at the time of the crash



Key Finding 13: Certain road segments have a higher concentration KSI risk

The High Injury Network (HIN) is a collection of corridors that have a high concentration of KSI crashes. 70% of all fatal or severe crashes occurred on these corridors.