Pima Association of Governments Strategic Transportation Safety Plan

May 2016

PREPARED BY:

PREPARED FOR:

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The Pima Association of Governments' Regional Council adopted the regional Strategic Transportation Safety Plan in 2016.

The PAG Regional Council is represented by the chief elected officials of the Cities of South Tucson and Tucson, the Towns of Marana, Oro Valley, and Sahuarita, Pima County, the Pascua Yaqui Tribe, the Tohono O'odham Nation, and the Governor-appointed Pima County representative of the Arizona State Transportation Board.

PAG also manages the Regional Transportation Authority (RTA) and its 20-year, $2.1 billion RTA plan, which was approved by voters on May 16, 2006, along with a half-cent regional excise tax to fund the projects. RTA projects must be listed in the 2045 Regional Mobility and Accessibility Plan.

Disclaimer: This report has been prepared in cooperation with and financed in part by the U.S. Department of Transportation – Federal Highway Administration, the Federal Transit Administration, and the Arizona Department of Transportation. The contents of the report do not necessarily reflect the official view of the Arizona Department of Transportation, Federal Highway Administration, or Federal Transit Administration. This report does not constitute a standard, specification, or regulation. This is not a legal document. Although must care was taken to ensure the accuracy of information presented in this document, PAG does not guarantee the accuracy of this information.

1 EXECUTIVE SUMMARY

With the continuing growth of the Pima Association of Governments (PAG) region, a Strategic Transportation Safety Plan is necessary to reduce crashes among all transportation modes and facilities in the region. The PAG STSP establishes the regional vision, goals, objectives, strategies, countermeasures, and performance measures for making systematic improvements in transportation safety. It is a data-driven plan that establishes goals, objectives, and key action areas and integrates the four E's of transportation safety – Engineering, Education, Enforcement, and Emergency Medical Services (EMS). The development of the PAG STSP was done in close coordination with Arizona's 2014 Strategic Highway Safety Plan (SHSP) that was developed by the Arizona Department of Transportation (ADOT).

Based on crash data from 2009-2013, the PAG region has a serious crash rate of 7.52 incapacitating and fatal crashes per 100 million vehicle miles traveled (VMT). Serious crash rates for the PAG area were generally higher than the statewide rate of 7.41 for incapacitating and fatal crashes per 100 million VMT, as identified in the Arizona SHSP. The City of Tucson and Pima County have the highest number of total and fatal crashes, the highest daily VMT, and serious injury crash rates above the state total at 10.24 and 11.24 respectively.

The crash rates for each contributing factor were calculated and compared to the statewide crash rates using the total number of crashes. Five contributing factors had higher crash rates regionally compared to statewide: Intersections, Young Drivers, Older Drivers, Pedestrians, and Bicycles. Crash rates for each contributing factor for the region were also analyzed separately for non-state and state facilities.

Crash rates for each jurisdiction in PAG were also calculated, with the highest crash rates occurring in the Pascua Yaqui Nation, South Tucson, and the Tohono O'odham Nation. The three crash types had the highest number of serious crashes were: single vehicle, rear end, and angle crashes. Examples of single vehicle crashes are: rollover, lane departure, fixed object, etc. Fall was the season with the highest crash rate in the region, and summer had the lowest crash rate.

As of 2011, the City of Tucson Police Department no longer responds to Property Damage Only (PDO) collisions. There appears to be a correlation between this lack of reporting and the reduction of possible injury and non-incapacitating injury crashes in the City after 2010.

Network screening was conducted to analyze intersections (signalized and unsignalized) and segments in the region to determine which intersections and segments could be potential priority locations for future safety projects. Using Priority Index (PI) ranking, which is based on frequency of crashes, crash rate, and severity of crashes, lists of the top signalized intersections, unsignalized intersections, and segments were created.

GIS was used for spatial analysis of the crashes – each crash was attributed to an intersections or segment using a specific buffer based on unsignalized or signalized intersections, or urban or rural segments. Through this spatial analysis, the analysis of crash data was more consistent, and the data could be analyzed in different ways once each crash was attached to an intersection or segment.

Safety Performance Functions (SPFs) were used to identify locations with safety performance that were better or worse than a typical location based on crash experience, roadway facility characteristics, and average annual daily traffic (ADT).

The PAG region safety vision is "Working Together Towards Zero Deaths, Everyone Gets Home Alive", and the regional goal is "Reduce the number of fatal and serious injury crashes in the PAG region by 7 to 10% during the next 5 years". This is consistent with the Arizona SHSP target and goes beyond the three to seven percent reduction target identified in the state plan.

Emphasis areas for the PAG region were derived from the 12 emphasis areas included in the 2014 Arizona State Highway Safety Plan (SHSP); these areas contribute the most to overall crashes and fatal crashes. While pursuit of safety projects in all 12 emphasis areas is encouraged, the PAG STSP data-driven approach narrowed these down to the following 8 emphasis areas based on safety performance: 1) Vulnerable Users (Pedestrians and Bicyclists), 2) Older Drivers (age 65 or older), 3) Motorcycles, 4) Intersections, 5) Young Drivers (under age 25), 6) Road/Lane Departure, 7) Nighttime, and 8) Impaired Driving. Each emphasis area has related transportation safety strategies to employ to reduce fatal and serious injury crashes, as well as a goal to reach by 2025.

Some examples of recommended safety strategies are: midblock crossings, high-visibility crosswalks, rightsizing, and buffered bike lanes.

The implementation plan stage involves obtaining/developing a user-friendly safety data analysis tool that will analyze crash data through network screening and location-specific diagnostics, will allow for selection of appropriate crash modification strategies, and will include a cost-benefit function to help facilitate safety project development. This tool will help identify high priority locations at the project level and will establish a sustainable safety project development and evaluation methodology. Crash maps and heat maps can also be developed to provide a visualization of crash patterns.

PAG plans to monitor the effectiveness of regional transportation safety efforts by using the regional safety data analysis tool described above to provide a recurring Transportation Safety Performance Report that includes: crash statistics and trends, tracking safety performance to the safety target, and identification of transportation safety projects and activities in each action area. This monitoring effort will include reporting on the recently published National Performance Management Measures: Highway Safety Improvement Program; Final Rule (23 CFR Part 490).

2 INTRODUCTION

This safety plan represents the first Strategic Transportation Safety Plan (STSP) for the Tucson Metropolitan region. This plan establishes regional goals, objectives, strategies, countermeasures and safety performance measures for transportation safety in the PAG region, consistent with those set forth by the Arizona State Highway Safety Plan (SHSP). The purpose of this safety plan is to reduce the risk of death and serious injury to all transportation users in the PAG region.

The PAG STSP will serve as a tool for recommending projects for inclusion in the Regional Mobility and Accessibility Plan and will discuss project implementation strategies and tools.

The project benefitted greatly from oversight and guidance provided by the PAG Transportation Systems Subcommittee along with participation from law enforcement, transit, bicycle, and pedestrian safety specialists among other key stakeholders. The group was challenged to build a transportation safety culture that includes a broad range of experts and user groups across the four E's of safety. Continuation of this group and growth of a transportation safety culture in the implementation phase of this Plan will be essential to achieving lasting impacts in transportation safety. The stakeholders group participated in a number of project workshops and meetings at key points during the project. Details on stakeholder involvement can be found in Section 5.1.

3 SAFETY SYSTEM PERFORMANCE

The Pima Association of Governments (PAG) has developed the first comprehensive Strategic Transportation Safety Plan (STSP) for the region. The STSP identifies safety concerns and develops necessary steps to address those areas in order to reduce the risk of death and serious injury on the roadways throughout the region.

This section provides a summary of the first step of the STSP process, the crash data analysis.

3.1 REGIONAL SAFETY PERFORMANCE

Crash data for the following analyses was provided by ADOT for 2009-2013 for the PAG region. The data was reviewed and cleaned (i.e. crashes with incorrect or missing location information were updated), and was then provided to the consultant team. The 2009-2013 study period represented the most recent five years of available data when this project began in January 2015. Table 3.1 shows the total number of crashes by jurisdiction and injury severity, and **Error! Reference source not found.** shows the total number f people injured or killed in crashes during the study period. As shown in the tables, there were 468 fatal crashes during the five-year study period which resulted in 500 fatalities.

The results from the data analysis are aggregated by jurisdiction. All state facilities, regardless of location within the boundaries of a local jurisdiction, were removed from the general data and were treated as their own jurisdiction - "State Highways". This allowed for results to be presented as local, State, and PAG region. In order to provide a point of comparison, crash rates are shown as crashes per 100 million Vehicle Miles Traveled (VMT), which mirrors the reporting in the Arizona 2014 Strategic Highway Safety Plan (SHSP). The VMT information was also obtained from ADOT, and is shown in Table 3.3.

Table 3.1: Total Crashes by Jurisdiction (2009 – 2013)

	Injury Severity					
Jurisdiction	**Fatal**	**Incapacitating Injury**	**Non-incapacitating Injury**	**Possible Injury**	**No Injury**	**Total**
Marana	8	28	212	334	1,841	2,423
Oro Valley	2	18	107	174	783	1,084
Pascua Yaqui	1	1	1	0	4	7
Pima County	119	490	1,614	2,235	9,926	14,384
Sahuarita	1	13	73	108	610	805
South Tucson	1	14	67	78	258	418
Tohono O'odham	16	31	51	87	371	556
Tucson	165	1,599	5,576	5,607	15,042*	27,989
Unknown	1	10	25	30	133	199
Total	**314**	**2,204**	**7,726**	**8,653**	**28,968**	**47,865**
State Highways	154	467	1,795	1,999	9,415	13,830
PAG Region Total	**468**	**2,671**	**9,521**	**10,652**	**38,383**	**61,695**

* See Section 3.3.1 for more information on No Injury crashes in the City of Tucson

Table 3.2: Total Persons Injured or Killed in Crashes by Jurisdiction (2009 – 2013)

	Injury Severity				
Jurisdiction	**Fatal**	**Incapacitating Injury**	**Non-incapacitating Injury**	**Possible Injury**	**Total**
Marana	8	39	294	529	870
Oro Valley	2	21	125	273	421
Pascua Yaqui	1	0	1	3	5
Pima County	121	631	2,162	3,441	6,355
Sahuarita	1	14	94	177	286
South Tucson	1	15	83	146	245
Tohono O'odham	18	64	93	156	331
Tucson	168	1,923	7,532	9,436	19,059
Unknown	1	25	30	46	102
Total	**321**	**2,732**	**10,414**	**14,207**	**27,674**
State Highways	179	643	2,666	3,290	6,778
PAG Region Total	**500**	**3,375**	**13,080**	**17,497**	**34,452**

Table 3.3: Vehicle Miles Traveled (VMT) by Jurisdiction

	Daily Vehicle Miles Traveled (000s)					
Jurisdiction	**2009**	**2010**	**2011**	**2012**	**2013**	**Total (MVMT)**
Marana	659,999	631,881	618,408	617,348	632,833	3,160
Oro Valley	518,254	497,974	491,372	486,052	496,196	2,490
Pascua Yaqui	8,001	7,597	5,746	5,874	6,052	33
Pima County	4,874,344	4,592,353	4,626,358	4,867,764	4,944,464	23,905
Sahuarita	209,406	214,312	213,659	214,108	220,425	1,072
South Tucson	71,538	68,605	68,862	68,520	70,027	348
Tohono O'odham	82,335	82,050	112,459	107,792	115,100	500
Tucson	9,656,183	9,268,683	9,300,948	9,308,031	9,682,616	47,216
Non-State Highways Total	**16,080,060**	**15,363,455**	**15,437,812**	**15,675,489**	**16,167,713**	**78,725**
State Highways (PAG region)	6,629,079	7,181,292	7,135,058	7,184,361	6,943,289	35,073
PAG Region Total	**22,709,139**	**22,544,747**	**22,572,870**	**22,859,850**	**23,111,002**	**113,798**

The analyses included in the Arizona SHSP were conducted for crashes between 2008 and 2012. However, where a five-year comparison is shown in the results, it was assumed that the PAG region and the state results are comparable because of the significant overlap between the study periods 2008-2012 and 2009-2013. Additionally, the PAG region data analyses were completed for the same emphasis areas that were included in the Arizona SHSP, although the top emphasis areas differ.

In the initial stages of data review, there were a few notable concerns with the data. VMT data was not accurately reported for the Tohono O'odham Nation for 2009 to 2010, which resulted in lower total VMT for the Nation for the five-year period as compared to other agencies in the region. This likely affected the crash rate results for the Nation, and should be kept in mind when reviewing the results.

In addition, pedestrian, bicycle, and intersection crash rates are shown per 100 million vehicle miles traveled (100 MVMT), which may not be the best method of measurement. Pedestrian and bicycle facilities do not have a measure of exposure to account for an increase or decrease in pedestrian and bicycle traffic, making it difficult to track changes in safety based on a crash rate. In addition to bicycle and pedestrian crashes, intersection-related crash rates may not be best measured with a crash rate based on VMT. The VMT at intersections may represent a higher percentage of the overall VMT for one jurisdiction than for another, which would result in crash rates that may not be entirely indicative of issues that may be present. Despite the concerns, the crash rates for all contributing factors are presented as crashes per VMT. However, there is work being done to develop better methods to collect bicycle and pedestrian volumes in order to improve these analyses.

3.2 Crash Contributing Factors

To be consistent with the state plan, the crash data for the PAG region was evaluated for each of the 12 state-selected emphasis areas, referred to as crash contributing factors in this section. Contributing factors can become emphasis areas for the PAG region if the factor contributes a high crash frequency,

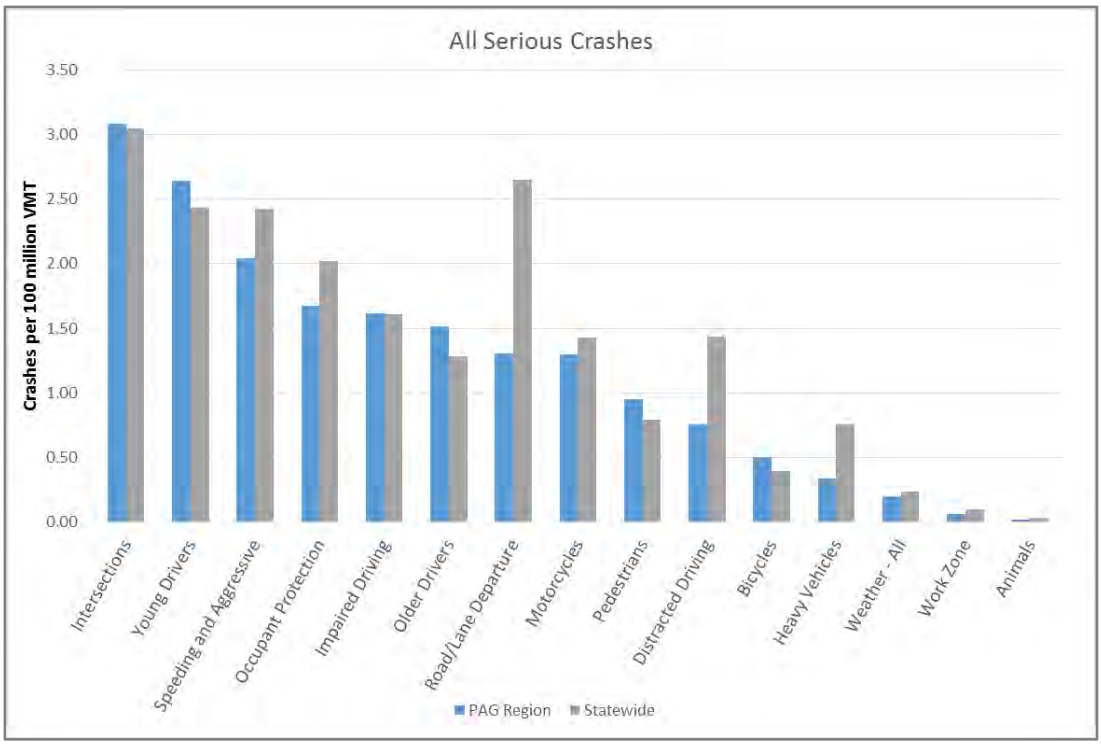
rate, and/or severity to the region. Figure 3.1 shows a comparison of the crash rates for the PAG region and the state for each of the contributing factors. The contributing factors are shown in the figure in decreasing order of the total number of crashes in the PAG region.

Where applicable, the contributing factors were evaluated for additional subcategories; for example, age-related data is shown separately for young drivers and older drivers. However, it should be noted that the weather category includes precipitation-related crashes and wind/dust-related crashes. The results for the separate categories can be found in Appendix A, but for the purpose of this analysis and discussion, all weather-related crashes are included as a single contributing factor. Rates are provided per 100 million vehicle miles traveled (100 MVMT).

As shown, crash rates are lower in the PAG region than statewide for many of the contributing factors. However, the crash rates are higher in the PAG region than statewide for the following areas:

- Intersections: 3.08 crashes per 100 MVMT (PAG) vs. 3.04 crashes/100 MVMT (State)
- Young Drivers: 2.64 crashes/100 MVMT (PAG) vs. 2.43 crashes/100 MVMT (State)
- Older Drivers: 1.51 crashes/100 MVMT (PAG) vs. 1.29 crashes/100 MVMT (State)
- Pedestrians: 0.95 crashes/100 MVMT (PAG) vs. 0.79 crashes/100 MVMT (State)
- Bicycles: 0.50 crashes/100 MVMT (PAG) vs. 0.40 crashes/100 MVMT (State)

Figure 3.1: Crash Rates by Contributing Factor (All Roadways)



Crash rates per VMT are not ideal for evaluating pedestrian and bicycle safety, but it is currently the best available method for analysis and comparison. It should also be noted that crash rates are considerably

lower in the PAG region than statewide for several of the contributing factors, including speeding and aggressive driving, occupant protection, and distracted driving.

While Figure 3.1 shows the crash rates for the overall PAG region, Figure 3.2 provides the same information, but with separate crash rates for non-state and state facilities within the PAG region. As shown in the figure, crash rates on non-state facilities in the region are higher than the crash rates on state facilities for all of the contributing factors. In many cases the crash rates for the non-state facilities in the PAG region are higher than the crash rates statewide. For example, the crash rate for impaired driving for the PAG region (1.17 crashes/100 MVMT) is lower than the statewide crash rate (1.61 crashes/100 MVMT), but when the rates are calculated separately for non-state and state facilities, the PAG region non-state roadway crash rate (1.77 crashes/100 MVMT) is higher than the statewide rate.

Figure 3.2: Crash Rates by Contributing Factor (State vs Non-State Facilities)

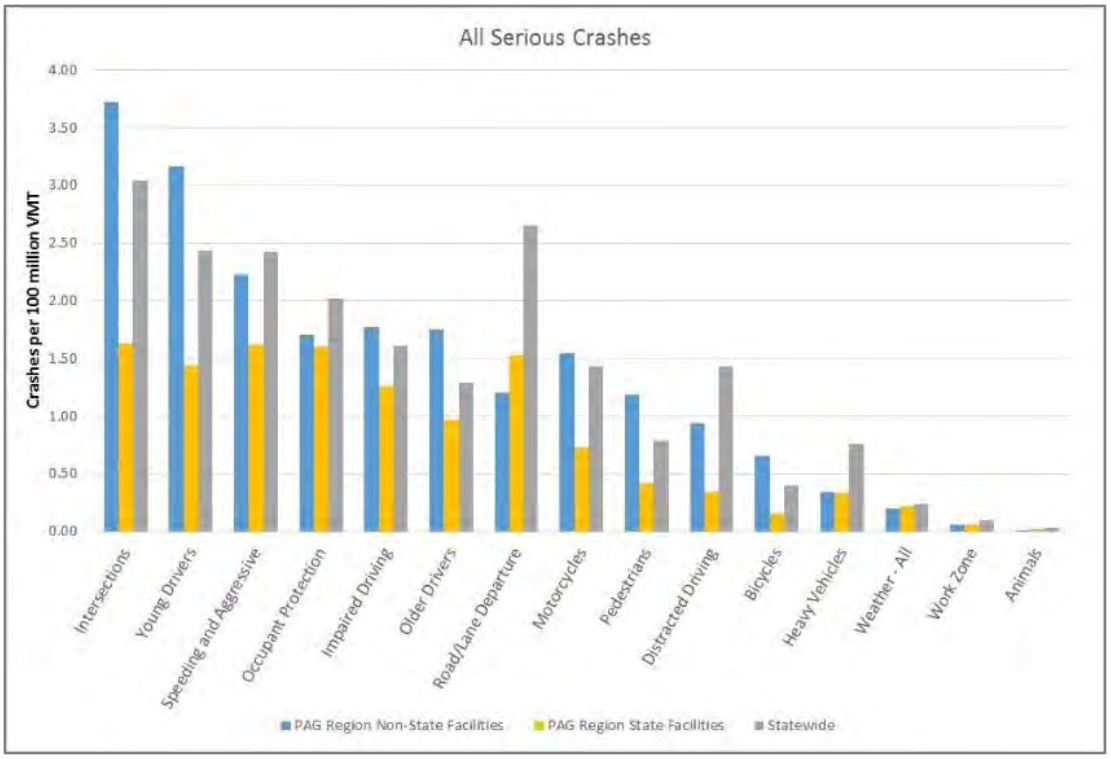


Table 3.4 provides some additional information, including the number of crashes associated with each contributing factor. The crash rates shown in the table correspond to the information shown in Figure 3.1. Lastly, the "percentage of total" columns show the percentage of overall serious crashes that are associated with each contributing factor. The table also includes some information about crashes in urban, rural, and tribal areas. Note that crashes on tribal lands are also included in the urban and rural areas. Separate tables for fatal and incapacitating injury crashes are included in Appendix B.

Table 3.4: Crash Data by Contributing Factor

	Total Crashes		Crashes per 100 MVMT		Percentage of Total	
Contributing Factor	**PAG**	**State**	**PAG**	**State**	**PAG**	**State**
Intersections	1,286	9,161	3.08	3.04	41%	41%
Young Drivers	1,101	7,319	2.64	2.43	35%	33%
Speeding and Aggressive Driving	851	7,291	2.04	2.42	27%	33%
Occupant Protection	699	6,075	1.68	2.02	22%	27%
Impaired Driving	673	4,852	1.61	1.61	21%	22%
Older Drivers	631	3,873	1.51	1.29	20%	17%
Road/Lane Departure	544	7,979	1.30	2.65	17%	36%
Motorcycles	542	4,298	1.30	1.43	17%	19%
Pedestrian	397	2,376	0.95	0.79	13%	11%
Distracted Driving	316	4,311	0.76	1.43	10%	19%
Bicycles	210	1,189	0.50	0.40	7%	5%
Heavy Vehicles	142	2,276	0.34	0.76	5%	10%
Weather - All	85	706	0.20	0.23	3%	3%
Weather - Precipitation	81	618	0.14	0.21	3%	3%
Work Zone	26	296	0.06	0.10	1%	1%
Animals	7	99	0.02	0.03	0%	0%
Weather - Dust/Wind	4	88	0.01	0.03	0%	0%
Total	**3,138**	**22,289**	**7.52**	**7.41**	-	-
Urban Areas	2,605	16,434	6.27	5.46	83%	74%
Rural Areas	533	5,855	1.28	1.95	17%	26%
Tribal Lands	113	965	0.27	0.32	4%	4%

3.3 Regional Trends in Crashes

Figure 3.3 shows the overall crash rates during the entire five-year period for all serious crashes. Crash rates are included for each jurisdiction, all non-state highways in the PAG region, state highways in the PAG region, all roadways in the PAG region, and all roadways statewide. As seen in the figure, the overall crash rate for the PAG region is comparable to the statewide crash rate. However, when divided into non-state and state facilities, it was found that the crash rate on non-state facilities is higher than the rate on state facilities and the overall rate statewide.

Figure 3.3: Five-Year Crash Rates (by Jurisdiction)

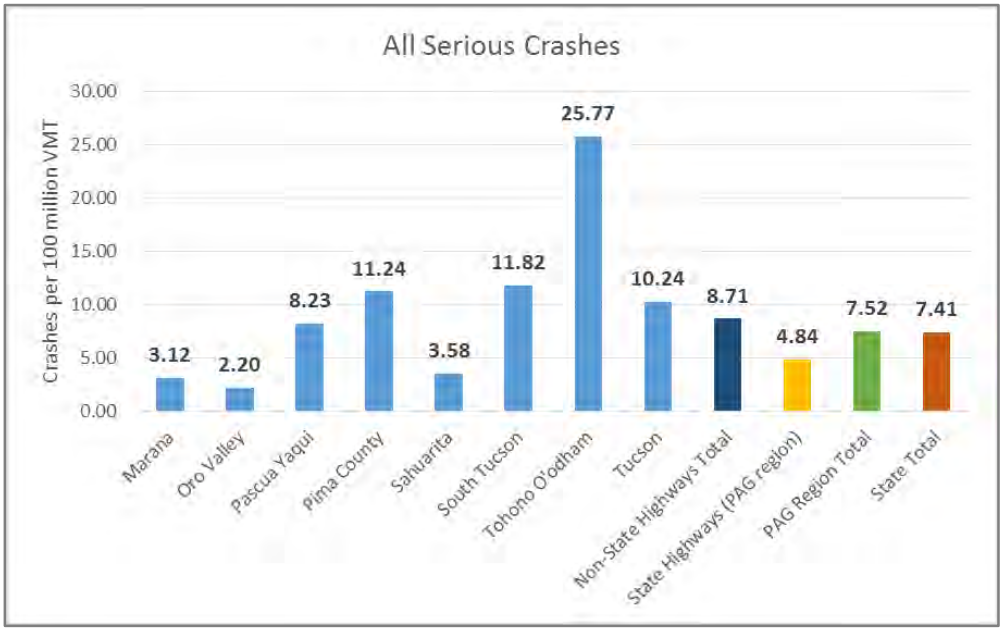


Figure 3.4 and Table 3.5 show the crash rates for the PAG jurisdictions as well as the overall PAG region for each year in the study period. There was only one serious crash in the Pascua Yaqui jurisdiction during the study period, a fatal pedestrian crash in 2010. Combined with the low VMT in the jurisdiction, the resulting crash rate is very high. Pascua Yaqui, South Tucson, and Tohono O'odham crash rates are significantly higher than those for the other jurisdictions, therefore they are shown separately in Table 3.5 rather than graphically in Figure 3.4.

As shown in Figure 3.4 and Table 3.5, the crash rates in 2013 are generally similar or lower than the rates in 2009 for each of the jurisdictions, although there have been some fluctuations in rates during the five-year study period. Overall, the crash rate for the PAG region has decreased, from 7.82 crashes per 100 MVMT in 2009 to 6.80 crashes per 100 MVMT in 2013.

Figure 3.4: Crash Rates by Year

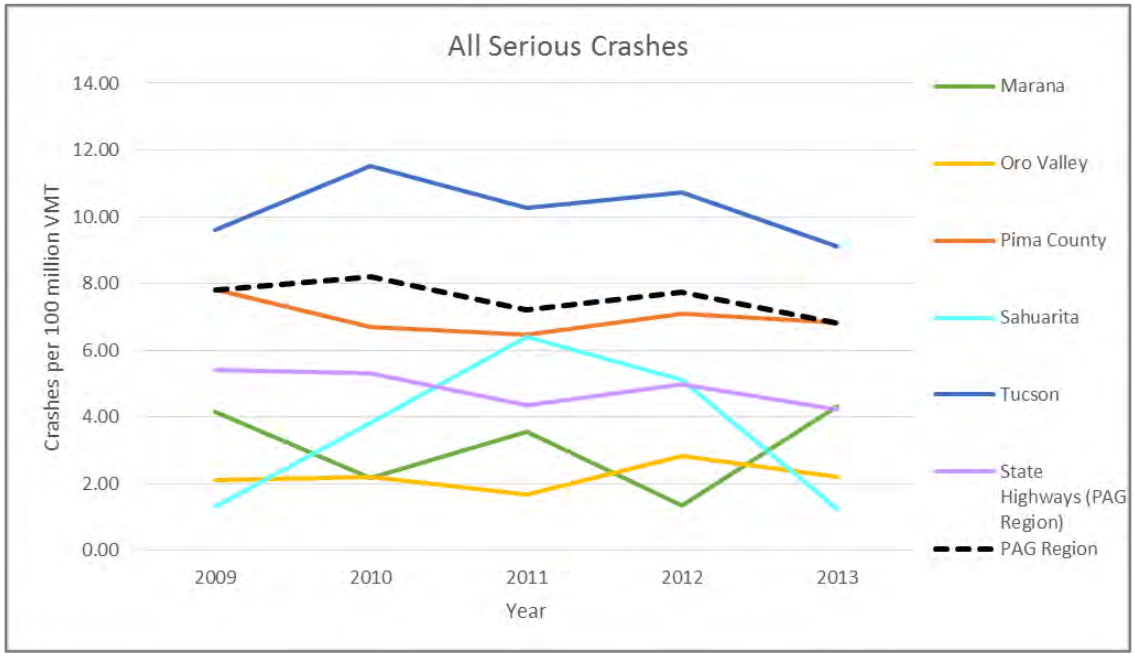
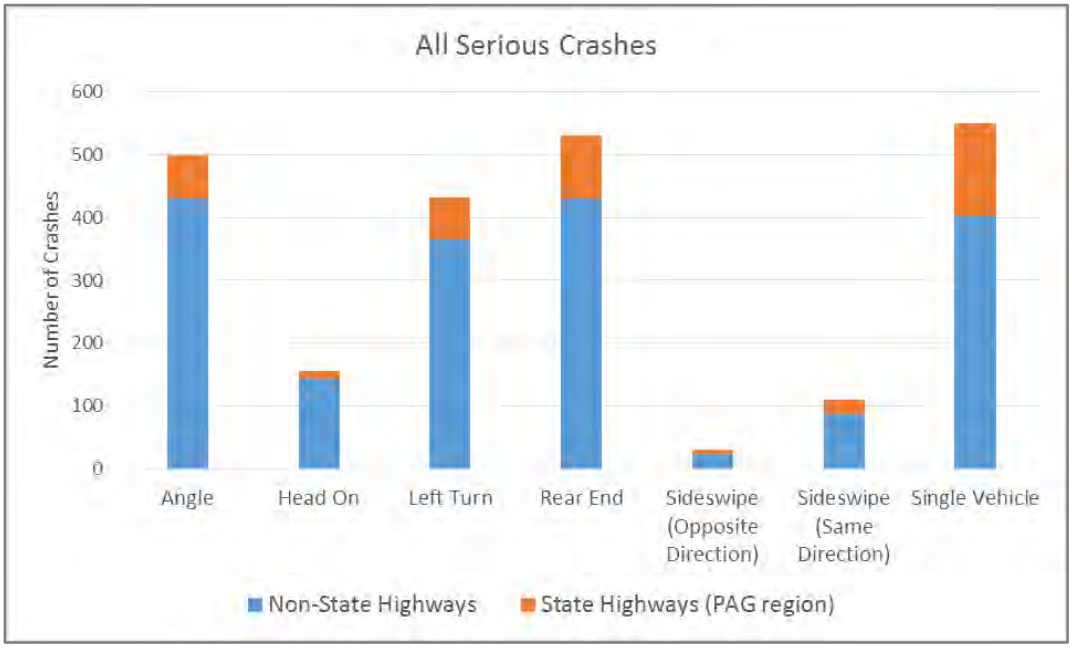


Table 3.5: Crash Rates by Year

	Crash Rate Per Year				
	2009	2010	2011	2012	2013
Pascua Yaqui	0	36.06	0	0	0
South Tucson	15.32	11.98	3.98	19.99	7.82
Tohono O'odham	56.57	46.75	12.18	15.25	11.9

Figure 3.5 shows the total number of crashes in the PAG region for seven major crash types – angle, head on, left turn, rear end, sideswipe (opposite direction), sideswipe (same direction), and single vehicle. As seen in the figure, the highest number of serious crashes in the region during the study period were single vehicle crashes, followed by rear end and angle crashes. Additional crash type information is included in Appendix C.

Figure 3.5: Number of Crashes by Crash Type (PAG Region)



Because of the significant seasonal population in the Tucson area comprised of both winter visitors and college students, the crash rates were also calculated by season for each jurisdiction. The seasons were assumed to be as follows:

- Winter (November – January)
- Spring (February – April)
- Summer (May – July)
- Fall (August – October)

In addition, to calculate the crash rates, the VMT per season had to be estimated. Because the population fluctuates and driving habits change during different times of the year, it is unlikely that the VMT are distributed evenly throughout the year. Further, although some jurisdictions may have slightly differing patterns than others, a single seasonal factor (per season) was applied throughout the region for consistency.

Using a 2005-2006 seasonal variation chart for traffic volumes published by PAG, the following seasonal factors were calculated:

- Winter – 1.00
- Spring – 1.05
- Summer – 0.97
- Fall – 0.98

Figure 3.6 shows the crash rates for each of the jurisdictions by season. As with the earlier results, data for Pascua Yaqui, South Tucson, and Tohono O'odham are shown separately in Table 3.6 because of their high crash rates. All jurisdictions are included in the PAG Region Total rates shown in the figure.

Figure 3.6: Crash Rates by Season (2009 – 2013)

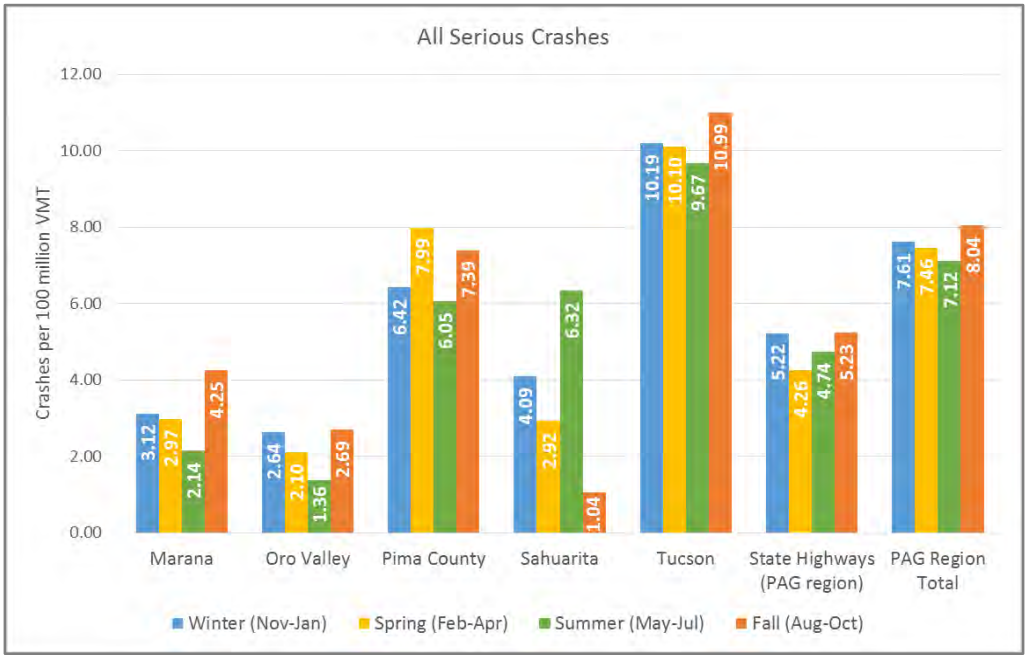


Table 3.6: Crash Rates by Season (2009 – 2013)

	Crash Rate per Season			
	Winter	**Spring**	**Summer**	**Fall**
Pascua Yaqui	0	0	0	33.61
South Tucson	22.07	3	13	9.65
Tohono O'odham	28.51	18.8	36.17	20.14

The highest crash rate for the region is in the fall season and the lowest crash rate is in the summer. Further, the lowest number of crashes in any season occurred during the summer and the highest number of crashes occurred during the fall when considering all roadways in the PAG region. For non-state highways in the region, the highest number of crashes occurred during the spring, and for PAG region state highways, the highest number of crashes occurred during the winter.

Overall, the crash rates for serious crashes in the PAG region has decreased during the five-year study period, and is similar to the crash rates statewide. It was found that crash rates on non-state facilities are higher than those on state facilities both within the region and statewide, as shown:

- 8.71 crashes/100 MVMT for non-state facilities (PAG region)
- 4.84 crashes/100 MVMT for state facilities (PAG region)
- 9.77 crashes/100 MVMT for non-state facilities (statewide)
- 4.86 crashes/100 MVMT for state facilities (statewide)

The overall serious crash rate in the PAG region decreased 13% between 2009 and 2013, and the total number of serious crashes decreased 11%. Regional analysis of less severe crashes is not feasible due to different reporting policies, and although data quality has improved, there are still some concerns in certain areas.

3.3.1 City of Tucson Property Damage Only Reporting

Since December 2010, the City of Tucson Police Department (TPD) has not responded to property damage only (PDO) collisions, resulting in those crashes being significantly under-reported and not being included in the TPD or ADOT ALISS databases. This is due to a reduction in the police force that has resulted from budgetary constraints. Parties involved in a PDO collision can self-report in person or via TPD's webpage. Note that some PDO crashes are still reported by TPD; for example, if an officer on patrol comes upon a crash, said officer will typically stop to offer help as needed, whether or not the crash includes an injury.

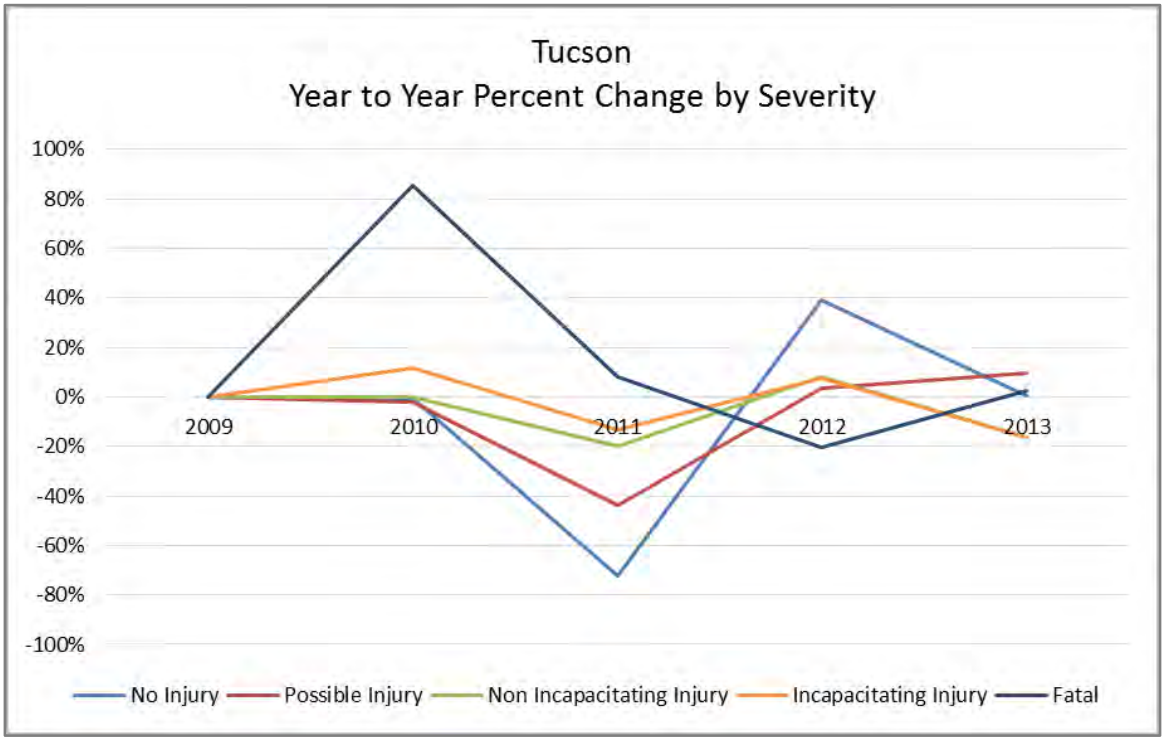
An online search was conducted to determine if other law enforcement agencies do not respond to PDO crashes. Based on this review, Las Vegas Metropolitan Police Department appears to be the only other agency with this practice based on the review. Policies and procedures for both TPD and Las Vegas Metropolitan PD are provided at the links below.

- City of Tucson: Tucson Police Department - Property Damage Only Collisions webpage
- Las Vegas Metropolitan Police Department: Las Vegas Police Department - Property Damage Only Traffic Accidents FAQs webpage

In addition to the under-reporting of PDO crashes, a review of the Tucson area crashes shows a potential correlation between the lack of PDO reporting and a reduction in reporting of possible injury and non-incapacitating injury crashes. This may be due to the fact that when officers were previously responding to PDO crashes, a portion of those crashes were ultimately upgraded to possible injury and non-incapacitating injury crashes.

The natural conclusion from this analysis is that by not responding to PDO crashes, Tucson is leaving gaps in its data and potentially demonstrating a less severe crash problem than currently exists. This missing data may also affect the City's eligibility for federal safety funds.

Figure 3.7: Tucson Yearly Crash Severity Trends

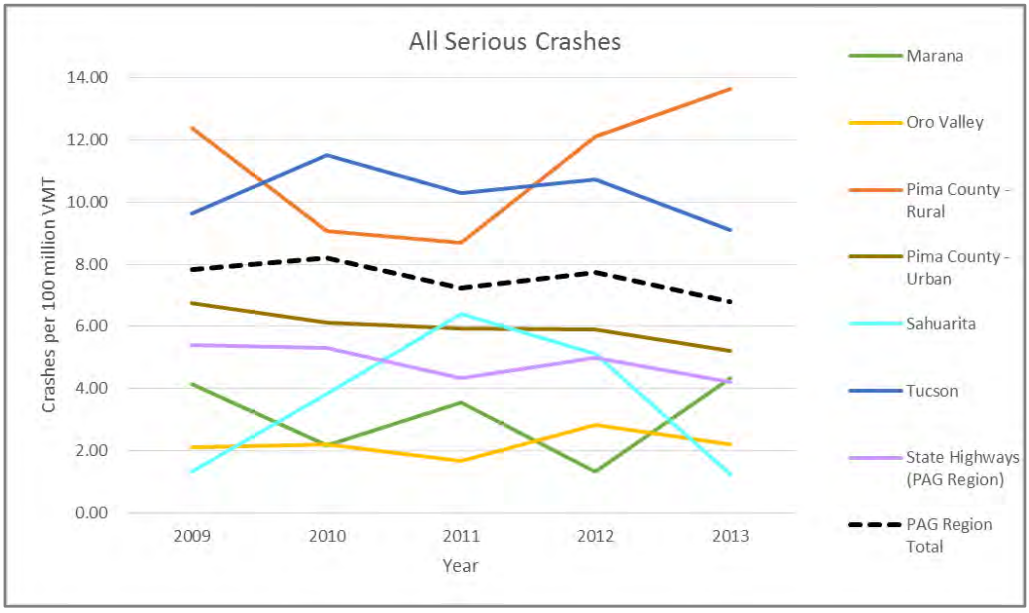


3.3.2 Pima County – Rural Versus Urban Crashes

The Pima County jurisdiction includes roadways within both rural and urban areas. To provide a better understanding of potential issues and emphasis areas in the County, analyses were completed for the urban and rural areas separately. The VMT for the rural and urban areas of the County were calculated based on ADOT GIS data provided for 2013. It was found that approximately 19% of the total VMT occurs on rural roadways in the County and 81% occurs on the urban roadways. Figure 3.8 shows the crash rates by year with the Pima County roadway facilities separated into rural and urban facilities.

As seen in the figure, the crash rates for rural Pima County are significantly higher than those for urban Pima County in each year of the study. Furthermore, the crash rates in the rural areas are higher than the overall PAG region, and in three of the five years, are higher than the City of Tucson. However, the crash rates for urban Pima County are significantly lower than those for the City of Tucson. Crash rates for urban Pima County have generally declined during the study period, while the crash rate in 2013 for rural Pima County (13.65 crashes/100 MVMT) was the highest during the study period.

Figure 3.8: Crash Rates by Year (with Pima County Split)



3.3.3 Additional Analyses

In addition to the region-wide analyses, results were tabulated and summarized for each of the PAG member jurisdictions. Using data similar to that shown in Figure 3.1 and Table 3.4, a Safety Report Card was created for each jurisdiction. However, instead of comparing crash rates to the statewide data, the crash rates are compared to the overall PAG region data. The report cards are included in Appendix D.

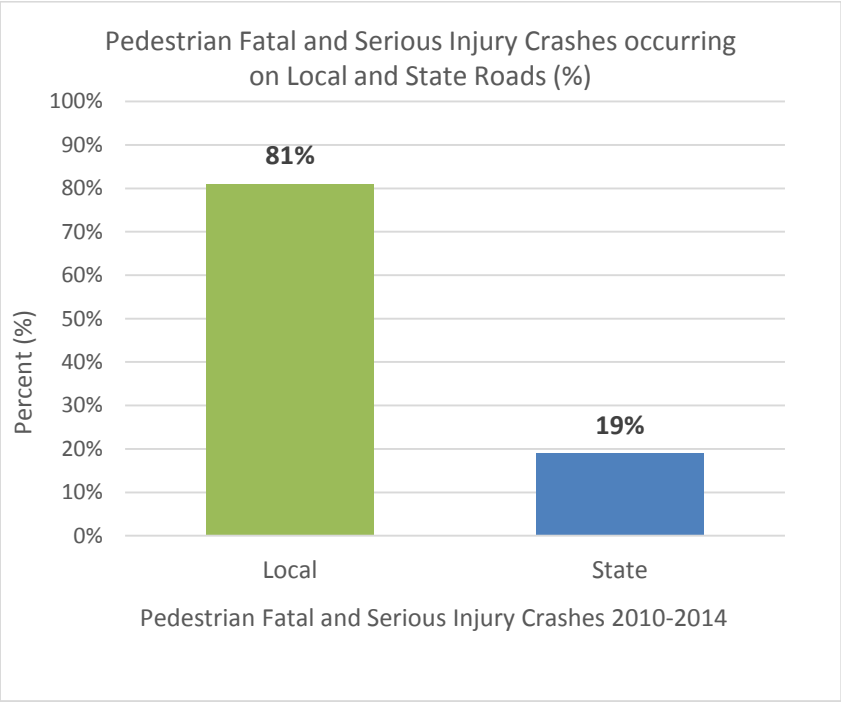
Also included with the report card for each jurisdiction is information about crash types. Data shown includes the number of crashes and the percentage of the total crashes comprised by each of the crash types. Note that as with pedestrian and bicycle crashes, VMT might not be the best measure for comparing crash rates for different types of crashes between jurisdictions. In the case of crash types, a jurisdiction with more intersections might tend to have more left turn crashes than one with fewer intersections, or a jurisdiction with more two-lane, undivided roadways may have more rear-end crashes than one with mostly divided roadways.

Statewide analyses of crashes on local agency and state roads were completed to show comparisons between the two for different types of injury crashes and users. Figure 3.9 shows a comparison between local and state roads for pedestrian fatal and serious injury crashes. Figure 3.10 is a comparison of pedestrian fatal crashes on state and local roads. Figure 3.11 is a comparison of bicycle fatal and serious injury crashes between local and state roads. Figure 3.12 is a comparison of just bicycle fatal crashes between local and state roads. Figure 3.13 compares all injury severity crashes between local and state roads. Figue 3.14 compares a combination of serious injury and fatal crashes between local and state roads juxtaposed with the percent of HSIP funding spent on local vs. state roads. Figure 3.15 compares all crashes between local and state roads.

This information is imperative to ensure that safety funding and projects are distributed according to the needs identified by the safety data itself. Furthermore, reporting requirements associated with the use of Highway Safety Improvement Program (HSIP) funds "requires that State DOTs document their safety performance targets required under 23 U.S.C. 150 (d) and the basis on which those targets were

established in their annual HSIP report, and describe progress to achieve those safety performance targets in future HSIP reports." [1]Achieving reduction in fatalities and injuries in accordance with the targets established in the Arizona SHSP and the associated PAG STSP must be facilitated through improvements in safety investment decision making that uses safety data as its guiding source. Simply put, safety fund investment to achieve desired improvements must take place where improvement opportunities exist. The data shows that those opportunities exist largely on local roadways in Arizona. This is true for all crashes and is especially prevalent among vulnerable road users as demonstrated in Figure 3.9, which shows that the majority of pedestrian fatal and serious injury crashes occur on local roadways. However, while a majority of the safety improvement opportunities exist on local roadways, the distribution of dedicated Highway Safety Improvement Program funding in Arizona is in conflict with what the data reveals, with roughly 80% of HSIP funding spent on state roads and 20% spent on local roads.

Figure 3.9: Pedestrian Fatal and Serious Injury Crashes, Local and State Roads, Statewide



[1] "Highway Safety Improvement Program, Final Rule." *Federal Register Vol. 81 Issue 50* (15 March 2016): 13722-13742. Print.

Figure 3.10: Pedestrian Fatal Crashes, Local and State Roads, Statewide

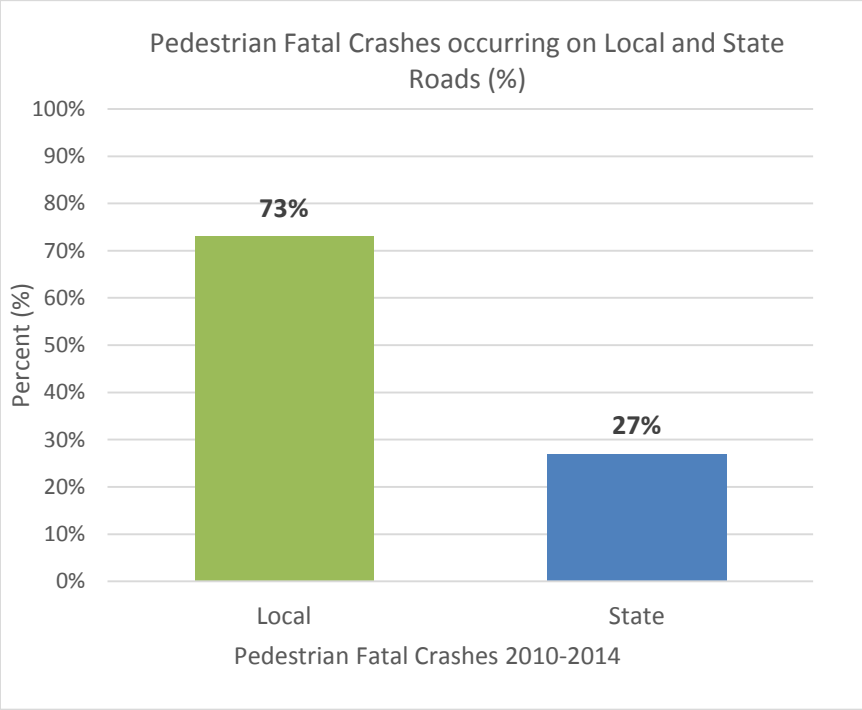


Figure 3.11: Bicycle Fatal and Serious Injury Crashes, Local and State Roads, Statewide

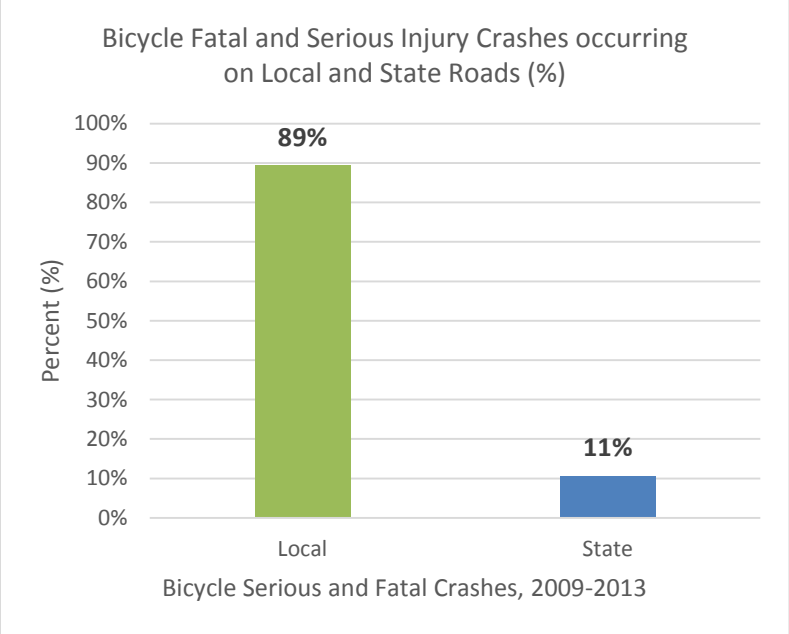


Figure 3.12: Bicycle Fatal Crashes, Local and State Roads, Statewide

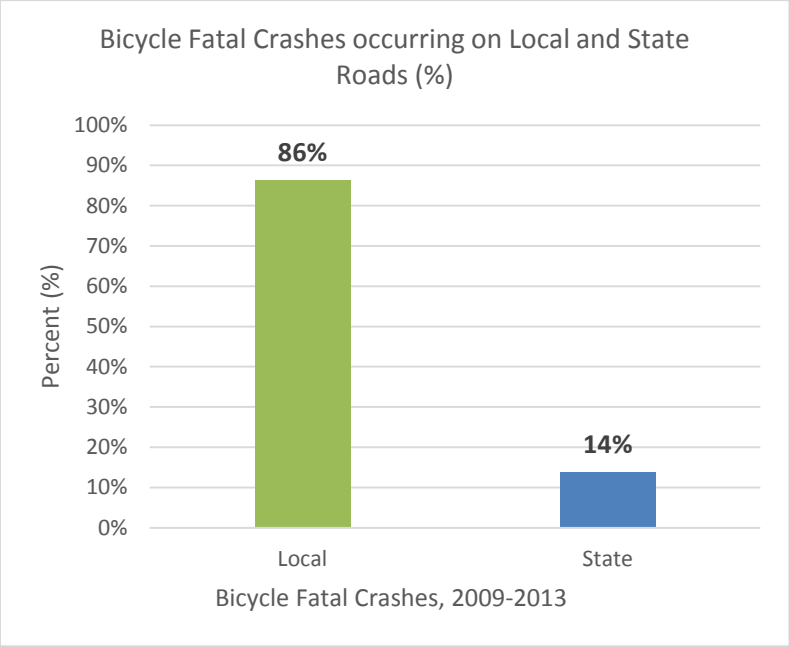


Figure 3.13: Injury Severity, Local and State Roads, Statewide

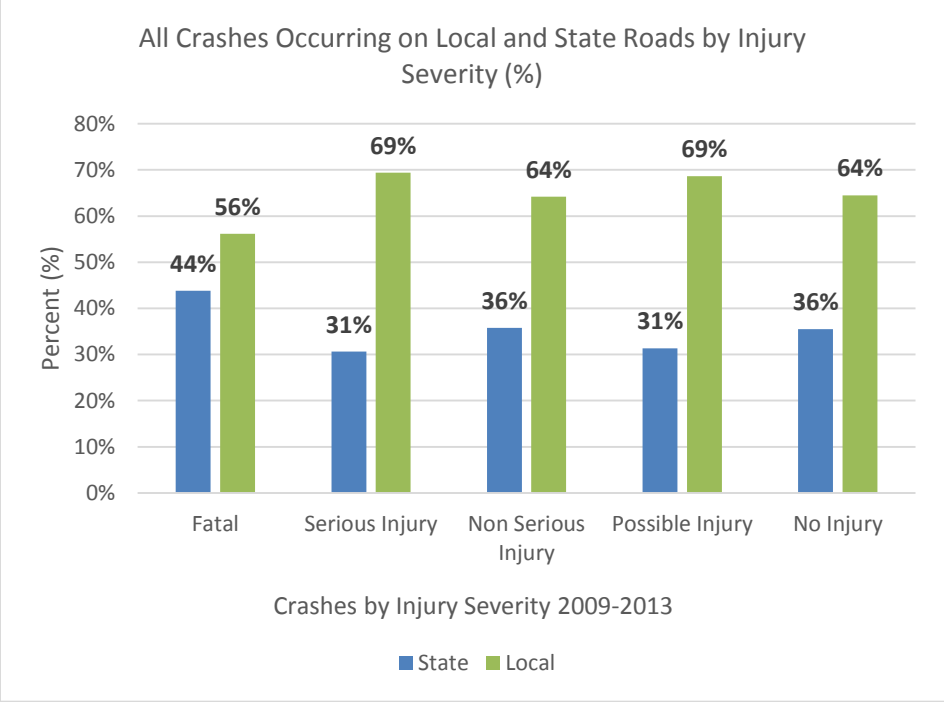


Figure 3.14: Fatal and Serious Crashes & HSIP Spending on Local and State Roads, Statewide

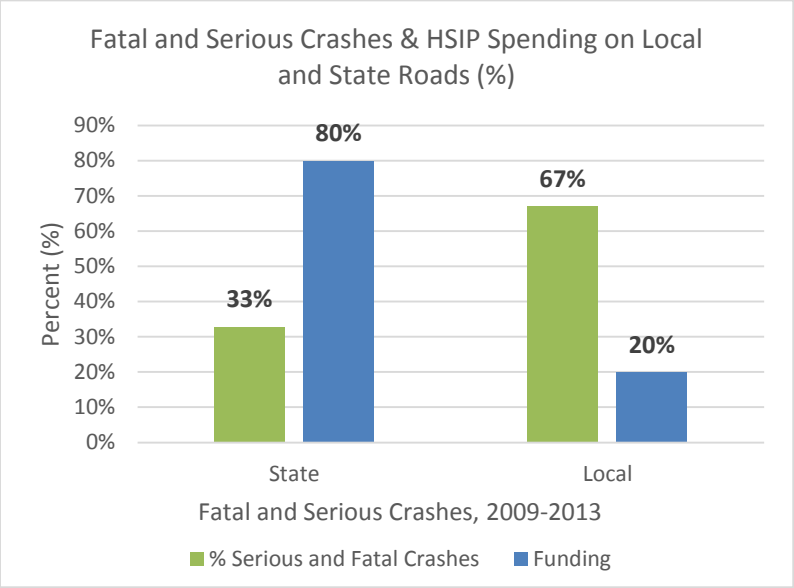
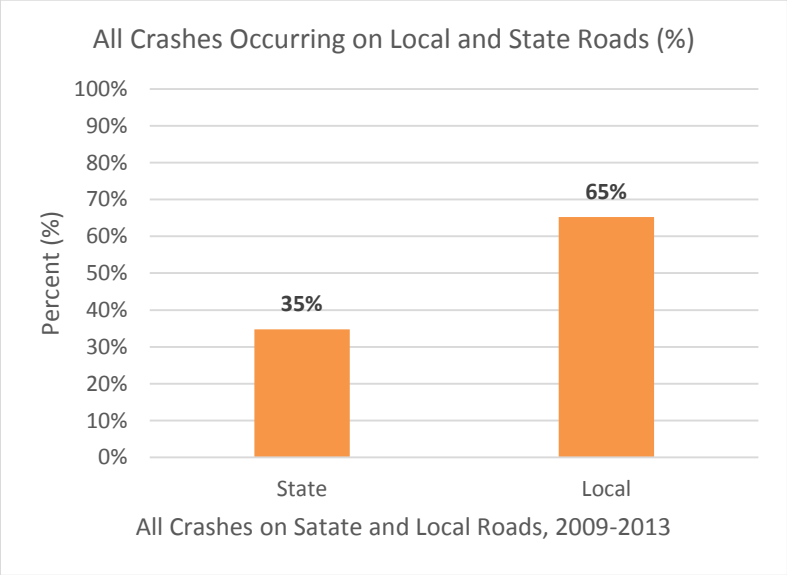


Figure 3.15: All Crashes on Local and State Roads, Statewide



4 NETWORK SCREENING & SAFETY NEEDS PRIORITIZATION

Network screening of a roadway system is a data-driven analysis of the crash data for intersections and segments. The screening identifies high priority crash locations that may benefit from safety improvements. Crash data is spatially attributed to individual intersections or segments in order to assess the number of incidents at each facility, and the severity of those incidents.

The goal of network screening is to develop a list of specific sites that are ranked by priority. Priority is typically determined by crash frequency, rate, and severity, but other factors can be incorporated into the analysis as appropriate. This priority list is then used to plan and implement safety projects at individual locations or system-wide.

4.1 CURRENT PAG NETWORK SCREENING METHODOLOGY

Intersection and segment analysis for the PAG region is currently modeled after the Pima County Safety Management System (SMS) Program. The SMS program was developed by Pima County to prioritize intersections and segments in the unincorporated Pima County road network using available network data and crash data from the previous three years. The network data required for the SMS program is average daily entering volume for intersections, and average daily traffic volume and roadway length for segments. The number and severity of crashes that occurred at each intersection is required for the intersection analysis. For the segment analysis the number and frequency of crashes that occurred along the segment and at intermediate intersections is required.

Once the necessary crash data is obtained, it is used to create prioritized lists for each of the following facility types: unsignalized intersections with four or more crashes, signalized intersections, roadway segments with less than or equal to 10,000 vehicles per day, and roadway segments with more than 10,000 vehicles per day. There are three variables that determine the priority ranking for each facility: crash frequency, crash rate and severity index. The value and rank of crash frequency, crash rate, and severity index are calculated for each location. Rank for each is calculated as the highest number has the highest rank (i.e. the location with the highest crash frequency is ranked number 1 for crash frequency). Crash rate is expressed as crashes per million entering vehicles or crashes per million vehicle miles for intersections and segments, respectively. The Severity Index (SI) was developed by the National Safety Council and is calculated using the following formula:

$$SI = \frac{5.8(N_k + N_a) + 2(N_b + N_c) + N_{pd}}{T}$$

Where:

N_k=Number of fatal crashes

N_a=Number of crashes where the most severe injury was an incapacitating injury

N_b=Number of crashes where the most severe injury was a non-incapacitating injury

N_c=Number of crashes where the most severe injury was a possible injury

N_{pd}=Number of property damage only crashes

T=Total number of crashes

The rank of the three variables (frequency, rank, severity) are added together, using equal weighting for each variable, to obtain a “priority index” for each location. The priority index is then ranked to obtain the final priority list for each facility type. As with the individual rankings, the lowest total priority index value is ranked highest.

4.1.1 PAG Intersection Crash Analysis

PAG reviews and corrects the ADOT provided crash data for incorrect or missing latitude and longitude values. Although the crash reports include whether or not a crash is intersection- or junction-related, there is inconsistency in police officer responses to this prompt. Therefore, PAG uses an alternative method to determine intersection-related crashes. Intersections are classified into one of the five following categories: Single Point Urban Interchange, Signalized Intersection, Collector or above intersecting with Collector or above, Local road intersecting with a Collector or above or Local road intersecting with a Local road. Each intersection is assigned a radius, which is used as a threshold to identify the crashes that occur at that intersection. In other words, any crash that occurs within the radius, measured from the center of the intersection, is assumed to be an intersection-related crash, regardless of how the reporting officer classified the crash. The radii are as follows: Single Point Urban Interchange – 350 feet, Signalized Intersection – 250 feet, Collector or above intersecting with Collector or above – 125 feet, Local road intersecting with a Collector or above – 50 feet, and Local road intersecting with a Local road – 25 ft. Traffic counts are assigned to the intersection using PAG's annual traffic count database. Intersections with more than 15 crashes, or more than 3 crashes per year, are exported and used to create a priority ranking table using the same process as outlined by the Pima County SMS program. The top 10 ranked signalized intersections for the PAG region resulting from the priority index ranking are shown in Table 4.1 below. Note: ADEV stands for Average Daily Entering Volume.

Table 4.1: PAG Top 10 Signalized Intersections

			Severity					Crashes (2009-2013)			
Intersection	**Agency**	**ADEV**	**1**	**2**	**3**	**4**	**5**	**Frequency Rank**	**Rate Rank**	**SI Rank**	**PI Rank**
Oracle Rd / River Rd	Tucson	77794	0	38	26	13	2	3	22	113	1
Flowing Wells Rd / Wetmore Rd	Pima County	43733	0	21	12	8	1	47	30	83	2
22nd St / Pantano Rd / Pantano Pw	Tucson	52735	0	13	22	10	0	38	52	79	3
Benson Hwy / Tucson Bl / Irvington Rd	Tucson	42491	0	20	16	6	2	42	15	120	4
Park Av / Irvington Rd	Tucson	43467	0	15	19	8	0	47	29	111	5
Pantano Rd / Speedway Bl	Tucson	64356	0	18	19	10	0	33	94	86	6
Kolb Rd / Golf Links Rd	Tucson	83516	0	29	20	12	0	14	93	108	7
Alvernon Wy / 22nd St	Tucson	73796	0	26	29	9	1	10	47	159	8
Grant Rd / Silverbell Rd / Ironwood Hill Dr	Tucson	41535	0	22	9	7	0	64	39	118	9
Kolb Rd / Broadway Bl	Tucson	87050	0	27	34	11	0	5	58	165	10

4.2 SPATIAL ANALYSIS

4.2.1 Intersections

ArcGIS was used to spatially analyze the locations using the available data. ADOT crash data was obtained for the study years, 2009-2013, and was attributed to each intersection using the distance threshold corresponding with each intersection classification (as discussed in the previous section).

Priority ranking tables were developed for signalized and unsignalized intersections, using the 2009-2013 crash data. Locations were initially ranked based on crash statistics using crashes with injury severity 2-5 (no property damage only (PDO) incidents). Intersections were then ranked based on all crashes for the region (including PDO incidents). A subset of these lists were developed looking only at crashes from 2011-2013, corresponding with the new Tucson Police Department policy to not respond to PDO crashes. Those lists were compared to show the impacts of not including PDO incidents in the crash data. The results showed that the rankings are highly affected when PDO crashes are ignored. For instance, the intersection of Pantano Road and Golf Links Road ranks at number 16 on the priority list without PDO crashes; however, that same intersection ranks at number 133 on the priority list with PDO crashes.

4.2.2 Segments

The roadway shapefile used in the spatial analysis was the Highway Performance Monitoring System (HPMS) network. This network provided key information for the segments, including average daily traffic, number of lanes, median presence, and functional classification. Crashes were attributed to segments if they fell within 100 feet of the segment (to account for slight variations in geocoding). Crashes that had already been attributed to intersections were removed from the shapefile for the segment analysis. PAG provided the US Census urban boundaries layer, which highlights the urban areas across the state and in the PAG region specifically. This layer was used to spatially differentiate between urban and rural segments. A unique segment ID and the agency that the segment lies in were attributed to each segment in the network.

Priority ranking tables were developed for urban and rural segments, using the 2009-2013 crash data. Segments were ranked in two separate tables, one which includes PDO crashes and one that does not. Safety Performance Functions (SPFs) were developed for segments based on urban vs. rural, 2 lanes vs. more than 2 lanes, and median vs. no median (see Section 4.3).

4.2.3 Bicycle Analysis

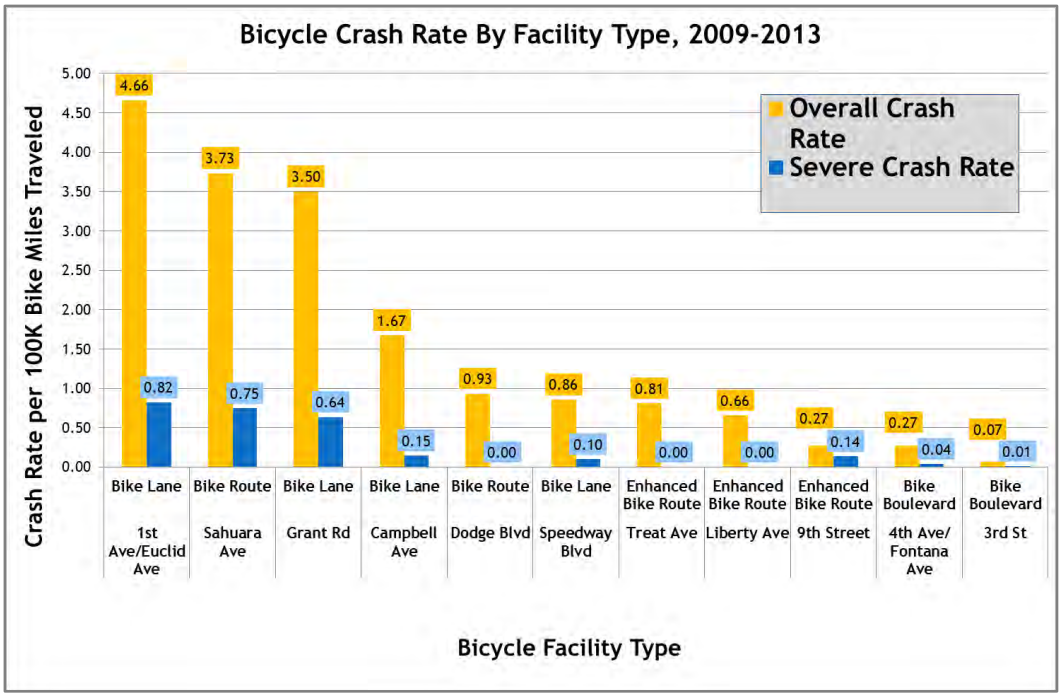
PAG provided a network shapefile that identified all of the bicycle lanes, routes and related facilities in the region. Bicycle facilities include:

- Bike Boulevard – lower volume, lower speed street with improvements that prioritize bike travel
- Enhanced Bike Routes – lower volume street with improvements that prioritize bike travel
- Bike Route – lower volume streets with “Bike Route” signs
- Bike Lane – painted lane on higher volume street with higher speeds

A segment analysis was conducted based on type of bicycle route, number of bicycle crashes along that route, and average daily bicycle traffic. PAG annually collects bicycle and pedestrian volumes at approximately 80 selected locations throughout the region using jurisdiction staff and trained volunteers. Using the available data, overall and serious injury crash rates were determined for 11 various bicycle facilities per 100 thousand bicycle miles traveled. Serious Injury crash rates include only crash data related

to bicycle crashes that resulted in an incapacitating or fatal injury. Figure 4.1 below shows the results of that analysis. Shared-use paths and any bicycle crashes that did not include a vehicle were not analyzed because they are not included in the ALISS database. Bike lanes and bike routes were found to have the highest crash rates. Enhanced bike routes and bike boulevards had significantly lower crash rates, crash frequency, and injury severity. This is likely due to lower volumes and speeds, traffic diverters (e.g. turn restrictions), and treatments to help cyclists cross busy streets, such as HAWKs and BikeHAWKs (aka Pedestrian Hybrid Beacons).

Figure 4.1: Bicycle Crash Rate by Facility Type, 2009-2013



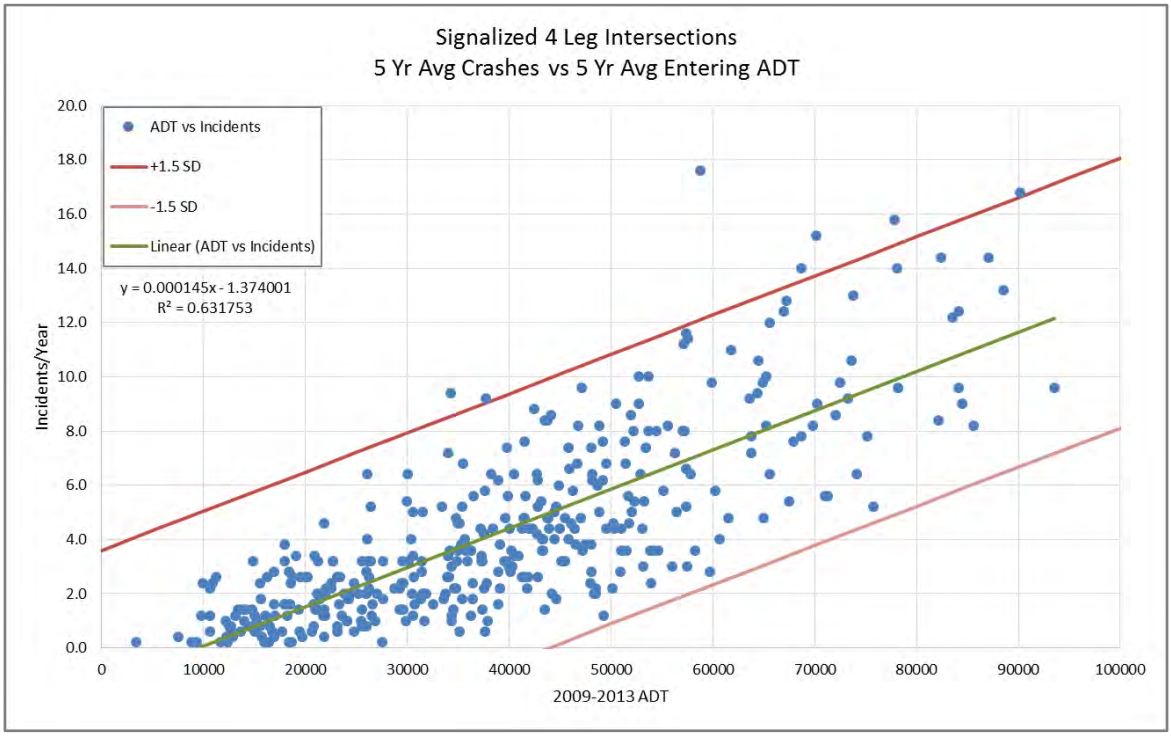
4.3 Safety Performance Functions

Safety Performance Functions (SPFs) are equations developed based on crash data, roadway facility characteristics, and average annual daily traffic (AADT). SPFs predict the average number of crashes per year expected at a location and can be used to identify locations where safety performance is better or worse than a similar typical location. SPFs can also provide a baseline for a location when conducting a before and after study to evaluate a deployed safety countermeasure.

4.3.1 PAG Region

Additional intersection spatial analysis included identifying intersections that were 3- and 4-legged. The process was semi-automated, but required additional manual effort to ensure accuracy. A count of road segments was found for each intersection buffer, using the intersection shapefile provided by PAG, then the locations were manually verified. This effort was done to support the development of SPFs SPFs were developed for 3-leg signalized and 4-leg signalized intersections. The SPF developed for 4-leg signalized intersections in the PAG region is shown in Figure 4.2 below.

Figure 4.2: PAG Region 4-Leg Signalized Intersection SPF



4.3.2 Comparison of Priority Ranking and SPFs

Historically, priority ranking has been the primary method for determining project necessity and applicability at locations in a network. While this method has proven effective, Safety Performance Functions have been able to provide a more sophisticated level of analysis. Furthermore, development of SPFs at the regional and local level can allow those agencies to employ a "proactive" approach to traffic safety, as opposed to the historical "reactive" approach. SPFs and similar predictive analysis techniques are the future of traffic safety planning and engineering. For this reason it is valuable to note the pros and cons that are associated with their use.

Development of an SPF requires advanced statistical analysis, such as the Empirical Bayes approach, which helps provide a more accurate crash prediction equation. In particular, the Empirical Bayes approach accounts for regression to the mean. Regression to the mean is a statistical phenomenon occurring between imperfectly correlated variables in a nonrandom sample that causes natural variations in data to appear to be changes in trends. This level of statistical analysis is necessary to ensure that projects are programmed at the most "deserving" locations, and that before and after performance of these projects are tracked accurately. This accuracy also allows the potential for CMF development for new safety treatments.

SPF models are able to incorporate numerous facility/site characteristics, including lane width, shoulder width, radius/degree of horizontal curves, presence of turn lanes, and traffic control. Using these features, SPFs can be developed specifically for a jurisdiction or they can be calibrated from existing SPFs for equivalent facility types.

Because of the sophisticated features provided by SPFs, they require more effort and cost to develop than the priority ranking currently used by PAG. Data management and spatial analysis requirements are greater and development of a region-wide SPF can cost upwards of $20,000. Furthermore, the use of an SPF software will likely require training for all potential users.

5 TRANSPORTATION SAFETY RESOURCES

Roadway users in the PAG region experience high connectivity to local jurisdictions due to Interstate 10, Interstate 19, and various state and local routes that span across jurisdictions. Because of the high interconnectivity in the region, collaboration between agencies is important to ensure that all safety resources and funding options are available to all jurisdictions in the region. Stakeholders play a key role in identifying and often maintaining safety resources, as well as promoting the goals and vision of the safety plan.

5.1 STAKEHOLDER IDENTIFICATION

According to the Arizona SHSP, "Effective implementation of the SHSP vision, goals and Emphasis Area strategies requires extensive coordination and collaboration among all stakeholders." Stakeholder selection is driven by the 4 E's of safety; Engineering, Education, Enforcement and Emergency Medical Services. Representatives from governing agencies, law enforcement agencies, universities, advocacy groups and the general public provide input on traffic safety strategies and resources for the region. The following stakeholders were involved in the development PAG Regional Strategic Transportation Safety Plan:

Local Governments – City of South Tucson, City of Tucson, Pima County, Town of Marana, Town of Oro Valley, Town of Sahuarita, Pascua Yaqui Tribe, Tohono O'odham Nation

Law Enforcement Agencies - Tucson Police Department, Oro Valley Police Department, Pima County Sheriff's Department, Arizona Department of Public Safety

Transportation Departments - Tucson Department of Transportation, Pima County Department of Transportation, Arizona Department of Transportation, FHWA

Universities, Private Sector, Other - University of Arizona, TransView, National Oceanic and Atmospheric Administration/National Weather Service

Multiple stakeholder meetings were held throughout the duration of the project to gather input regarding project status, comments and suggestions.

5.2 CURRENT PROGRAMS

The following section contains a list of existing programs/resources pertaining to vehicle, bicycle, and pedestrian safety.

5.2.1 Vehicle Safety Programs

Pima County DOT Safety Management System

The Pima County Department of Transportation (PCDOT) Traffic Engineering Division (TED) completes an annual review of crash data from the previous year as part of their Safety Management System (SMS)

Program, which reviews the crashes on unincorporated Pima County roads. The emphasis of TED and SMS has historically been on spot treatments for specific locations. Spot treatments are assigned through a priority ranking system and can include projects ranging from signing and marking to design-build. Recently, this emphasis has begun to shift to system-wide crash prevention and studies. Some examples of system-wide projects that are currently in the works as a result of the SMS program include an intersection control selection tool, enhanced pedestrian midblock crossings, advance flashing warning beacons, a guardrail improvement program and a sign replacement program, among others.

The intersection control selection tool, for example, allows users to compare and rank all intersections within the agency based on consistent parameters. The tool identifies existing conditions including AADT on both approach legs, existing control type and crash statistics. It also incorporates Synchro and life cycle costs analysis results. All of these factors are considered to prioritize projects. Priority locations are then selected for further review and project implementation.

Location specific fixes will still be employed where necessary, but the continuation of repeatedly 'fixing' spots that have capacity related issues will be reduced. Additionally, the County is looking to modify the SMS safety analysis program to employ the use of SPFs as a predictive analysis and countermeasure selection tool, as emphasized by the Highway Safety Manual (HSM). More information can be found at the Pima County DOT Safety Management System webpage.

PAG RSA Program

In 2011, PAG began implementation of a regional Road Safety Assessment (RSA) Program, largely modeled after the ADOT RSA Program, which began operation in 2006. RSAs are formal examinations and evaluations of safety aspects of particular intersections or roadway corridors. RSAs can be performed on existing facilities or on facilities that are still in design. All RSAs are performed by an independent, multi-disciplinary team and are led by a person trained in performing RSAs. The RSA team considers the safety of all roadway users, estimates and reports on potential road safety issues, and identifies opportunities for safety improvements. The goal of the PAG RSA Program is to make RSAs at intersections and roadways available for all PAG-member jurisdictions.

Monthly safety meetings of PCDOT and Pima County Sheriff's Office

PCDOT meets regularly with the Pima County Sheriff's Office to discuss recent crashes and other traffic safety concerns, including high crash locations based on trends from the previous month's and previous year's crash data. Review of these high priority locations allows the Sheriff's office to deploy targeted enforcement practices and in some cases leads to engineering studies.

C.A.P.P. (Children Are Priceless Passengers)

Funded by the Governor's Office of Highway Safety (GOHS) and sponsored by Tucson Medical Center, C.A.P.P. is for families in need of a car seat. Class instructors are certified car seat technicians who provide training on how to properly install a car seat in your vehicle. Included in the price of the class is an age and weight appropriate car seat. More information can be found at the C.A.P.P (Children Are Priceless Passengers) webpage.

Pima County Sheriff's Department

The department provides safety inspections for child car seats. Contact information is available on their webpage. More information can be found at the Pima County Sheriff's Department webpage.

Regional Transportation Authority Plan and Safety Working Group

The Regional Transportation Authority (RTA) Transportation Planning Committee provides direction and technical expertise for a variety of regional transportation planning studies, plans and programs. The RTA Plan is managed by the Pima Association of Governments (PAG). RTA Plan goals include improving safety, facilitating cross-town mobility, and reducing congestion.

The RTA Safety Working Group reviews and recommends intersection improvements, pedestrian improvements, signal technology improvements, bus pullout improvements, and at-grade railroad improvements. Recommendations are forwarded through the committee process to the RTA Board for consideration. More information can be found at the RTA Safety webpage.

TransView.org Crash Information

TransView is the official source of traveler information for the Tucson metropolitan area. The webpage contains up-to-the-minute information on current traffic incidents, construction projects, ADOT traffic cameras, and other cameras and images from several locations. In addition, there are safety messages and public service announcements on distracted driving and dust storm safety. More information can be found at the TransView webpage.

Regional Traffic Operations Center

The Regional Traffic Operations Center (RTOC) monitors and controls nearly every traffic signal in the Pima County area. Working partners in the system include ADOT, Pima County, City of Tucson, City of South Tucson, Town of Marana, Oro Valley, and PAG. The City of Tucson manages the RTOC, but monitoring will soon be available to each partner jurisdiction. The system was established in the mid 1970's and is one of the few multi-jurisdictional traffic signal systems in the United States. More information can be found at the City of Tucson Regional Traffic Operations Center webpage.

City of Tucson Police Department START and School Safety & Health Fair

The Tucson Police Department, along with the Tucson Police Foundation, sponsors the "Safe Teen Accident Reduction Training" (START) program, which teaches licensed teens driving skills including off-road recovery, evasive steering, skid recovery and more. More information can be found at the Tucson Police Foundation START program webpage.

The Tucson Police Foundation and the officers of the Tucson Police Department also participate in the Annual Back to School Safety & Health Fair.

5.2.2 Bicycle Programs

Pima County Bicycle and Pedestrian Program

The Pima County Bicycle and Pedestrian Program is responsible for planning, engineering, and improving bicycle and pedestrian facilities throughout unincorporated Pima County. The program is dedicated to improving safety and access for pedestrians and cyclists, and seeks to accomplish this through engineering,

enforcement, encouragement, and evaluation. The program works in partnership with the Tucson - Pima County Bicycle Advisory Committee, Brad P. Gorman Memorial Bikeway Fund, Pima Trails Association, Pima County Department of Environmental Quality, PAG, City of Tucson DOT, Greater Arizona Bicycling Association, and Perimeter Bicycling Association of America. Pima County's Bicycle and Pedestrian Program, which includes its Safe Routes To School Program, works with dozens of schools each year to teach bicycle and pedestrian safety skills. Free bicycle safety classes are popular, with over 600 participants attending Smart Cycling, Commuting, or Kids Safety classes. More information can be found at the Pima County Bicycle and Pedestrian Program webpage.

Tucson Bicycle and Pedestrian Program

The City of Tucson's Bicycle and Pedestrian Program is involved in planning and implementing the City's bikeway and walkway network, identifying and removing barriers to foot and bike travel, educating all road users on "rules of the road," collaborating with the Tucson Police Department on enforcement strategies, installing bicycle parking, and encourage walking and bicycling by initiating and continuing to support key events. Some important local bicycle and pedestrian events are mentioned below. More information can be found at the City of Tucson Bicycle and Pedestrian Program webpage.

- Bike Fest is a variety of bicycle and bicycle-themed events designed for kids, tweens, adults, business owners, bike-to-work commuters, casual cruisers and everyone in between. One such offering is Pedal the Pueblo, which is a clearinghouse of free gifts, incentives and discounts. Bike Fest is held in April to coincide with Bike Month in Arizona. More information can be found at the Bike Fest Tucson webpage.

Figure 5.1: Bike Fest Tucson picture

- The theme of El Grupo, a local bicycle advocacy group, is "empowering youth through bicycles." Its staff and board of directors oversee this multi-faceted group, which offers Team El Grupo development, training rides, youth bicycle camps, academic assistance/tutoring, and fundraising events. More information can be found at the El Grupo Cycling webpage.
- El Tour de Tucson is one of the preeminent bicycle events in the United States. Managed by the Tucson-based Perimeter Bicycling Association of America (PBAA), El Tour consists of rides of varying distances and attracts riders from all over the country and internationally. The ride has been a Tucson tradition since 1983. More information can be found at the El Tour de Tucson webpage.

- The Tucson Bicycle Classic is a three-day USA Cycling stage race, which consists of a time trial, a road race, and a circuit race. The Classic, now in its 29th year, is held in mid-March every year. More information can be found at the Tucson Bicycle Classic webpage.
- Cyclovia Tucson is a twice-a-year event in which motor vehicles are detoured from several miles of city streets for several hours, so anyone can bike, walk, skate and participate in fun, free activities. Helmets and other materials area also distributed at the event. Cyclovia events are cited by the League of American Bicyclists as a primary way to increase bicycle and pedestrian mode share.[2] More information can be found at the Cyclovia Tucson webpage.

Figure 5.2: Cyclovia Tucson picture

- Light the Night is a public charity event championed by a partnership between Tucson's Bicycle and Pedestrian Program, Living Streets Alliance, and Pima Association of Governments. Volunteers hand out front and rear lights to bicyclists, provide free bicycle helmets to youths and provide safety education materials to riders. More information can be found at the Living Street Alliance webpage.

Bicycle events in the PAG region elevate the public's consciousness of biking; however, they also increase the number of bicyclists on the road for the time of the event. Some bicycle events may be larger and cover multiple jurisdictions. For this reason, it is important for agencies to work with event managers and local law enforcement to ensure that bicycle safety and awareness is a top priority.

PAG Bicycle Pedestrian Subcommittee

The PAG Bicycle-Pedestrian Subcommittee assists in identifying the issues and needs related to regional bicycle and pedestrian safety. The group also, recommends project and program improvements for the Transportation Improvement Program, the long-range Regional Transportation Plan, and other available funding programs. The Subcommittee typically meets on the last Wednesday of every third month. More information can be found at the PAG Bicycle Pedestrian Subcommittee webpage.

PAG Tucson Bikeways Map

[2] Lugo, Adonia. "How Ciclovías Can Unfreeze Streets." *The League of American Bicyclists.* The League of American Bicyclists, July 2014. Web. 6 Apr. 2016.

In 2013, Pima Association of Governments partnered with the City of Tucson, Pima County, and the University of Arizona to create and print the Tucson Bikeways Map – a map focusing on low-stress routes for interested but concerned riders. The map highlights bicycle facilities, e.g. shared-use paths, bicycle boulevards, and other routes that prioritize bicycle travel. These routes are typically perceived as more comfortable to new riders or riders that prefer to stay off larger roadways with higher speeds and traffic volumes. The map also shows parks, libraries, and signalized crossings across major roadways. This free, credit card-sized map is available in bike shops and libraries around the region, member jurisdictions, and the University of Arizona. View a PDF of this map at this link to the online Tucson Bikeways Map.

PAG's Bicycle and Pedestrian Count Program

PAG began the bicycle and pedestrian count program in 2008 to better understand the trends and characteristics of cyclists, evaluate planning efforts and to help guide investments. Annually each fall, jurisdiction staff and volunteers count bicyclists and pedestrians at approximately 80 locations throughout the entire region. In addition to the raw count, other data is collected on the cyclists including direction of travel, gender, age, helmet usage, sidewalk riding, and riding the wrong way against traffic. A closely linked additional analysis is the Bicycle and Pedestrian Crash Analysis. The bicycle portion of the analysis, which PAG has conducted annually since 2001, quantifies the number of total crashes, crashes per population and fatal crashes. Many additional factors are evaluated, including general location, daylight conditions, alcohol as a factor, bicyclists and motorist actions and bicyclist and motorist violations. More information can be found at the PAG Bicycle and Pedestrian Count Program webpage.

PAG Bicycle/Pedestrian Diversion Program

This program aims to provide education for bicyclists and pedestrians who receive citations from law enforcement by allowing them to pay a small fee to attend a three-hour safety course. The safety course addresses common infractions by bicyclists and pedestrians from the point of view of all road users, negative outcomes of unsafe behavior, community resources, and more. Following completion of the course, attendees have their citation fines cleared. Bicyclists and pedestrians will only be able to attend the diversion course and have their fines cleared once each calendar year. The program is facilitated by an outside contractor and is managed by PAG. The program directly compliments current enforcement efforts and is supported by local law enforcement. More information can be found at the Diversion Classes webpage.

City of Tucson Fire Department Safety Tips

The department posts bicycle safety tips and a video on bicycle and helmet safety on its webpage. Similar tips are available on the webpage regarding motor vehicle safety, specifically keeping children safe in and around cars. More information can be found at the City of Tucson Public Education and Community Safety webpage.

University of Arizona Police Department Education Campaign

Officers patrol on bicycle within the University community, easily riding over 25 miles per shift. Bicycle units answer calls for police services and monitor pedestrian and bicycle laws. Officers on bike patrol are readily accessible to the public and have easier access to the interior of campus. In 2012, the University of Arizona Police Department, in cooperation with Parking and Transportation Services and the Pima County Bicycle and Pedestrian Program's Bike Ambassadors, began a Bicycle Safety and Education

Campaign to inform community members on bicycle traffic laws, safety and bicycle theft prevention. During this campaign, bicyclists were contacted at various locations around the University campus and were given a "Share the Road" booklet containing traffic laws, safety information and tips for preventing bicycle theft. More information can be found at the University of Arizona Police Department webpage.

5.2.3 Pedestrian Programs

PAG's Walk Safe Drive Safe Campaign

PAG launched the Walk Safe Drive Safe campaign to help increase pedestrian safety in Pima County. The campaign includes PSAs, an online quiz, a Pledge to Be Safe, and Twitter presence. More information can be found at the Walk Safe Drive Safe webpage.

Pedestrian Safety Toolbox

In 2015, PAG created a Pedestrian Safety Toolbox, a clearinghouse available to all jurisdictions within the region that focuses on three distinct areas: Evaluation, Engineering, and Implementation. The resources were primarily derived from national best practices, and can help PAG member jurisdictions identify the types and locations of safety concerns, identify mitigation strategies through a variety of options, and provide a guide to implementing prioritized strategies. More information can be found at the Pedestrian Safety Toolbox webpage.

Tucson Safe Routes To School Program

The City of Tucson funds and operates a Safe Routes To School Program using the services of the Living Streets Alliance, a local non-profit with the mission of promoting healthy communities by empowering people to transform their streets into vibrant places for walking, bicycling, socializing and play. The City recently launched a pilot program in conjunction with Pima County at seven local elementary schools to develop safe routes for children to walk or bicycle to school, and to educate them about walking and bicycling safely. This pilot program is funded by a federal grant, with matching funds from the county and city, which aims to encourage children to engage in more physical activity, and reduce traffic collisions involving children. More information can be found at the Safe Routes to School Tucson webpage.

Pima County Safe Routes To School Program

Pima County and the City of Tucson have launched a pilot program at seven local elementary schools to develop safe routes for children to walk or bicycle to school, and to educate them about walking and bicycling safely. This pilot program is funded by a federal grant, with matching funds from the County and City. It aims to encourage children to engage in more physical activity, and reduce traffic collisions involving children.

In addition to educating children, the program engages parents, teachers, school staffers, transportation officials, law-enforcement officers and school district officials to identify the travel habits of students and develop safe routes for students to use while walking or bicycling to school. Needed facility improvements, such as the addition of bicycle racks or sidewalk ramps, are being identified. Training programs will be implemented for teachers and school staffers, along with enhanced police enforcement measures. Educational and promotional materials will reinforce the message of pedestrian and bicycle safety. More information can be found at the Pima County Safe Routes to School webpage.

PAG Regional Pedestrian Plan

In 2014, PAG partnered with member jurisdictions and other interested parties to update the Regional Pedestrian Plan. The Plan provides detailed pedestrian crash data, looks at the inventory of existing pedestrian facilities on arterials, collectors, and other important roadways, and establishes a method for prioritizing needed pedestrian improvements. The plan also contains a toolbox of best practices. More information can be found at the PAG Regional Pedestrian Plan webpage.

Safe Kids Pima County

The mission of Safe Kids is to prevent unintentional injuries and death to children ages 19 and under through safety education programs, services and products. Safe Kids Pima County is committed to conducting quality research and advocating effective laws that stimulate positive change. Every October, Safe Kids Pima County in partnership with area schools and local Fed-Ex offices, participates in International Walk to School Day. The day engages kids of all abilities, enhances the health of kids, improves the environment and helps raise awareness about creating safe routes to schools. In the spring, Safe Kids Pima County repeats the event with an additional focus on safe biking - Walk and Roll to School Day. More information can be found at the Safe Kids Pima County webpage.

5.3 Safety Funding Process & Improvements

The Highway Safety Improvement Program (HSIP) is a core federal aid program administered by the state DOT with federal oversight. The goal of the program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The federal legislation states that "a highway safety improvement project is any strategy, activity or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem." Candidate projects submitted by local agencies for HSIP funding can address spot locations or systemic treatments. Potential projects are prioritized based on Benefit/Cost ratio, potential crash reduction for fatal and incapacitating injury crashes, and consistency with the state's SHSP emphasis areas.

Previously, SAFETEA-LU legislation designated a set-aside amount for High-Risk Rural Roads (HRRRs). That set-aside has since been eliminated in MAP-21 and replaced with a Special Rule that requires States with an increase in fatality rates on rural roads to obligate a specified amount of HSIP funds on HRRRs. The use of HRRR related HSIP funding would become an option for PAG if Arizona as a whole was found to have an increase in fatalities on rural roads over the most recent two years. The 2009 amount for Arizona was 1.8 million dollars. Similarly, if fatalities and serious injuries per capita for drivers and pedestrians over age 65 increases during the most recent 2-year period for which data are available, a State is required to incorporate strategies focused on older drivers and pedestrians in the next SHSP update

Currently, local agencies can use HSIP applications to pursue both PAG and the ADOT statewide HSIP apportionments to develop safety projects. Arizona HSIP funds are approximately $42,000,000 each year and the PAG allocation is approximately $1,100,000 per year. Beginning in fiscal year 2019, these sub-allocations to COGs and MPOs will go away, and all agencies will compete for the statewide pot of HSIP funds. This is an important reason for the development of this regional STSP: to position the PAG member agencies to better compete for the statewide HSIP funds by identifying and justifying worthy safety projects through a data-driven process. While the data shows that the vast majority of fatal and serious injury crashes in Arizona are happening on local roads, the distribution of dedicated Highway Safety

Improvement Program funding in Arizona is in conflict with what the data reveals, with roughly 80% of HSIP funding spent on state roads and 20% spent on local roads.

Figure 5.3 compares HSIP spending on ADOT Facilities in each of the planning regions in Arizona. Figure 5.4 compares HSIP spending, injury crashes, and fatal crashes in the Tucson metro area to other similar-sized metro areas nationwide.

Figure 5.3: Average Annual HSIP Per Region, ADOT Facilities

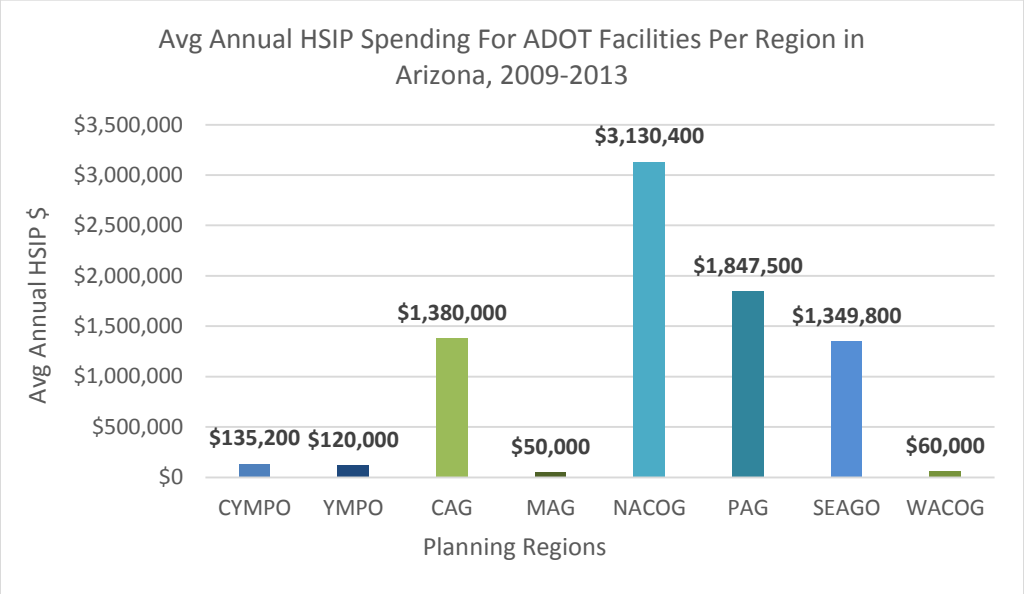
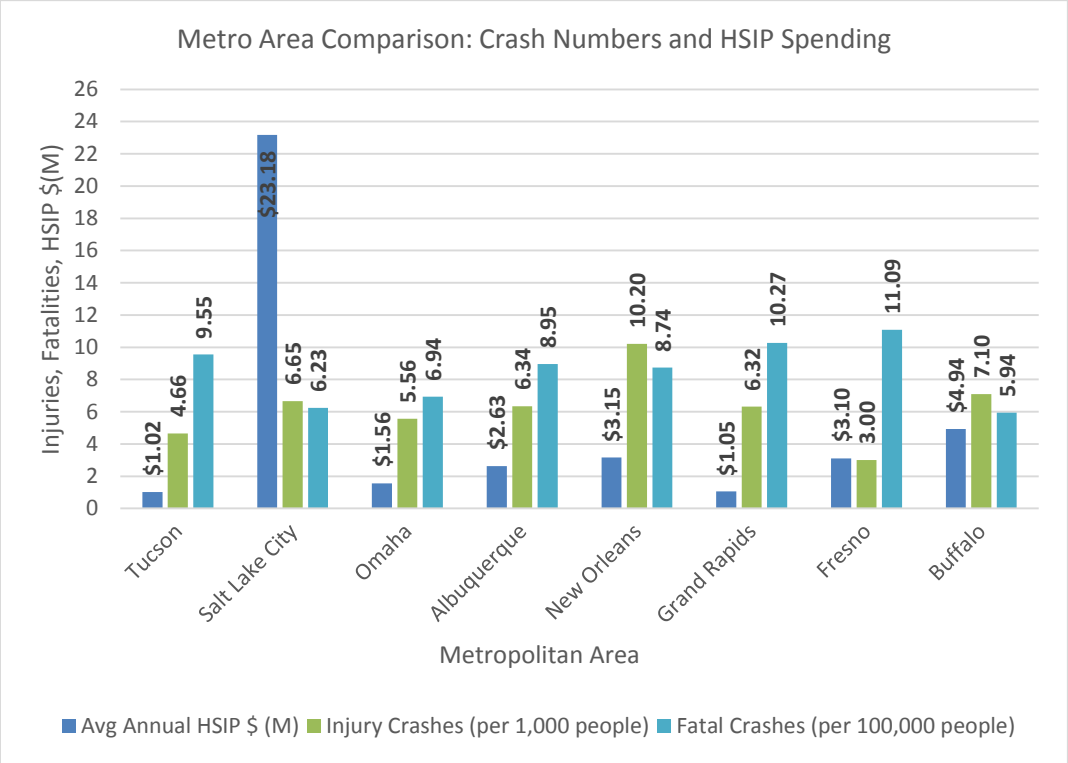


Figure 5.4: Crashes and HSIP Spending, Metro Areas



Local rural agencies are typically at a disadvantage when applying for HSIP funding due to their smaller population. There are various strategies that these agencies can use in order to raise their chances of receiving some of the statewide funding. Typically it is most effective for small governments to look at systemic improvements or combinations of spot improvements at multiple locations to demonstrate enough safety need based on the FHWA criteria. Local agencies can look at crash data on a more regional level and partner with adjacent agencies to develop larger projects.

The Transportation Alternatives Program (TAP) provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, environmental mitigation; recreational trail program projects, and safe routes to school projects. MPO's and local governments submit applications for projects that compete against projects across the state.

The Governor's Office of Highway Safety administers National Highway Traffic Safety Administration funding based on submitted safety projects. Typical projects include law enforcement activities such as targeted DUI checkpoints and improvements to crash data collection.

The state of Arizona taxes motor fuels and collects a variety of fees and charges relating to the registration and operation of motor vehicles on the public highways of the state. These revenues are deposited in the Arizona Highway User Revenue Fund (HURF) and are then distributed to the cities, towns and counties and to the State Highway Fund. These taxes represent a primary source of revenues for highway construction, improvements, and other transportation related expenses.

6 REGIONAL VISION AND GOALS

The U.S. DOT has adopted the national traffic safety vision of "Towards Zero Deaths." Working towards a roadway system with zero fatalities requires fostering a safety culture as it pertains to all modes of travel on the roadway. The Highway Safety Improvement Program was established by Congress to encourage a roadway safety culture at the state level, through the SHSP, and to promote a goal of a reduction of fatal and serious injury incidents on public roads in the state. In Arizona, the state vision is "Towards Zero Deaths by Reducing Crashes for a Safer Arizona" with a goal of reducing the number of fatalities and serious injuries in Arizona by 3 to 7% during a five year period starting in 2013.

6.1 PAG REGION VISION AND GOALS

The vision in the Arizona SHSP lends itself to the SHSP goal, which is to "Reduce fatalities and the occurrence and severity of serious injuries on all public roadways in Arizona," and the SHSP objective, which is "Reduce the total number of fatalities and serious injuries in Arizona by 3 to 7% during the next five years from the 2013 base year."

In accordance with the national and state vision, the safety vision for the PAG region is,

> "Working Together Towards Zero Deaths, Everyone Gets Home Alive"

The PAG regional vision is likely to appeal to the emotions of roadway users and persuade them to make safe choices when using the roadway. The vision also emphasizes the importance of a safety culture by mentioning that everyone, which includes governing agencies, law enforcement agencies, private citizens and others, must "work together" to achieve the vision.

The regional goal for traffic safety is,

> "Reduce the number of fatal and serious injury crashes in the PAG region by 7 to 10% during the next 5 years"

The goal for the PAG region was purposefully developed to be more ambitious than the statewide goal. The intent for the PAG region is to head towards a future of proactive traffic safety techniques, as opposed to reactive. This ambitious goal is meant to be a driving force for that effort. Further, the regional goal is meant to be a tool to help determine the progress of implemented safety techniques over the five year period, and will aid in the selection of strategy adjustments.

7 EMPHASIS AREAS, GOALS AND PERFORMANCE MEASURES

In the 2014 Arizona SHSP 12 emphasis areas and two support areas were defined for improving safety on roadways throughout the state. Further, 5 of the 12 emphasis areas were selected as "Top Focus" emphasis areas based on the highest number of fatalities and serious injuries. These emphasis areas are: 1) Speeding and Aggressive Driving, 2) Impaired Driving (alcohol, drugs, medication, illness, fatigue, physically impaired), 3) Occupant Protection/Restraint (seat belts, child safety seats, helmets), 4) Motorcycles, and 5) Distracted Driving.

The additional emphasis areas include: 6) Roadway Infrastructure and Operations (Lane/Roadway Departure, Intersections/Railroad Crossings), 7) Age Related (Young – Under 25, Older – Over 64), 8) Heavy Vehicles/Buses/Transit, 9) Non-Motorized Users (Pedestrians, Bicyclists), 10) Natural Risks (Weather, Animals), 11) Traffic Incident Management, and 12) Interjurisdictional. Interjurisdictional is the outlier in this list of emphasis areas since it is not related to a specific crash statistic, but rather is a focus on coordination between agencies and safety stakeholders across the state. The SHSP also contains two support areas; the first is Data Improvements, which includes improving and sharing safety data, and the second is Policy Initiatives, which includes providing direction on proposed changes to policies, procedures, or laws.

Recall that the evaluation of the data and the selection of the emphasis areas was based on only fatal and incapacitating injury crashes. A complete description of each and the crash data can be found in the SHSP report and the associated data book (Appendix C of the SHSP, found at the Arizona SHSP webpage.).

7.1 Emphasis Areas

Crash data for the PAG region was evaluated for each of 12 emphasis areas listed in the state plan. However, in order to better understand crash characteristics, the combined factors in several of the state emphasis areas were evaluated separately (i.e. Age Related crashes were split into Young Drivers and Older Drivers). In the regional plan, each emphasis areas are also referred to as contributing factors. The resulting crash rates for each of the contributing factors were compared to the crash rates for the state, as shown in Figure 3.1. Additionally, Figure 3.2 shows the crash rates for the contributing factors separately for state and non-state facilities in the region.

As shown in the figures, the region-wide crash rates are higher than the statewide crash rates for five of the contributing factors: Intersections, Young Drivers, Older Drivers, Pedestrians and Bicycles.

Table 7.1 provides additional information about each of the contributing factors, including a comparison of crash rates on all roadways in the PAG region, non-state facilities in the PAG region, and all roadways statewide. The table also shows the percentage of all serious crashes which are related to the listed factor and the percentage of all serious crashes which were fatal. Both percentages are shown for the PAG region and for the state. Lastly, the table indicates whether the number of crashes increased or decreased during the five-year study period from 2009 to 2013.

The highlighted cells in the table indicate the areas in which the PAG region has performed worse than the state (i.e. where the crash rate or percentage of related crashes is higher in the PAG region than in the state overall). Additionally highlighting shows the factors for which the crash rate generally increased between 2009 and 2013 as well as factors for which a relatively high percentage of serious crashes are fata. In keeping with the data-driven nature of the PAG STSP, the top-focus Emphasis Areas for the region are those areas in which the PAG region has performed worse than the state. However, to provide flexibility for jurisdictions in applying for and obtaining safety funds, all of the contributing factors will be included as safety improvement emphasis areas in the PAG STSP.

Table 7.1: Crash Data by Contributing Factor

		Crash Rate (crashes per 100 mil VMT)			% of Total Related			% of Serious Crashes which are Fatal	
Contributing Factor	Total # Crashes (2009-2013)	PAG region	PAG region non-state facilities	State-wide	PAG region	State-wide	Trend	PAG region	State-wide
Intersections	1,286	3.08	3.73	3.04	41%	41%	Decreasing	8%	10%
Young Drivers	1,101	2.64	3.17	2.43	35%	33%	Decreasing	13%	14%
Nighttime - All	991	2.38	2.57	N/A	32%	N/A	Decreasing	25%	N/A
Nighttime - No Lighting	395	0.95	0.94	0.78	13%	11%	Decreasing	34%	33%
Speeding and Aggressive Driving	851	2.04	2.22	2.42	27%	33%	Decreasing	19%	18%
Occupant Protection	699	1.68	1.71	2.02	22%	27%	Decreasing	26%	27%
Impaired Driving	673	1.61	1.77	1.61	21%	22%	Decreasing	30%	28%
Older Drivers	631	1.51	1.75	1.29	20%	17%	Increasing	16%	19%
Road/Lane Departure	544	1.30	1.21	2.65	17%	36%	Decreasing	31%	24%
Motorcycles	542	1.30	1.55	1.43	17%	19%	Increasing	15%	16%
Pedestrians	397	0.95	1.19	0.79	13%	11%	Decreasing	28%	29%
Distracted Driving	316	0.76	0.94	1.43	10%	19%	Decreasing	5%	11%
Bicycles	210	0.50	0.66	0.40	7%	5%	Decreasing	7%	9%
Heavy Vehicles	142	0.34	0.34	0.76	5%	10%	Increasing	22%	22%
Weather - All	85	0.20	0.20	0.23	3%	3%	Increasing	13%	17%
Weather - Precipitation	81	0.14	0.19	0.21	3%	3%	Increasing	12%	16%
Work Zone	26	0.06	0.06	0.10	1%	1%	Decreasing	12%	13%
Animals	7	0.02	0.01	0.03	0%	0%	Flat	0%	12%
Weather - Dust/Wind	4	0.01	0.01	0.03	0%	0%	Flat	25%	23%

Nine Emphasis Areas were selected as top-focus Emphasis Areas for the 2015 PAG STSP, as described below. The areas were selected based on number of crashes, crash rates, historic trends, and percentage of overall crashes. The emphasis areas are discussed below along with the reasons each was selected.

Vulnerable Users – 1) Pedestrians, 2) Bicyclists:

The Pedestrians and Bicyclists emphasis areas both have higher crash rates in the PAG region when compared to the statewide crash rates, and both also have a higher percentage of total serious crashes in the PAG region compared to statewide. Both emphasis areas do not exceed fatal crashes compared to the statewide percentage, but they are very close with Pedestrians at 28% vs. 29% statewide, and Bicyclists at 7% vs. 9% statewide. In addition, bicycle and pedestrian facilities are expected to be added and improved throughout the region, so pedestrian and bicycle volumes are expected to increase.

Age-Related: 3) Older Drivers (age 65 and older), 4) Young Drivers (under age 25)

Both the crash rate and the percent of total serious crashes for Older Drivers (age 65 and older) is higher in the PAG region compared to statewide. Although the percent of fatal crashes for this emphasis area is below the statewide percentage at 16% vs. 19% statewide, it is still very close to the statewide statistic. Additionally, the number of crashes contributed by Older Drivers increased over the five-year study period.

Like Older Drivers, Young Drivers (under 25 years old) are also a major emphasis area in the PAG region with a higher crash rate in the region compared to statewide. Young Drivers also contributed significantly to the total serious crash count with 35% of all serious crashes involving Young Drivers – the second highest of all of the contributing factors. The fatal crash percentage is also nearly equal to the statewide percentage – 13% for the PAG region and 14% statewide.

5) Motorcycles

The crash rate for Motorcycles is higher than the statewide crash rate at 1.55 vs. 1.43 crashes per 100 million VMT statewide, while the percent of total serious crashes and fatal crashes are slightly below the statewide statistics. The number of Motorcycle crashes also increased during the five-year study period.

6) Intersections

Intersections contributed the most to overall serious crashes with over 40% of serious crashes occurring at intersections. The crash rate for Intersections is also considerably higher than the statewide crash rate for both the PAG region and non-state facilities in the PAG region. The percent of fatal crashes is slightly below the statewide percentage at 8% vs. 10% statewide.

7) Road/Lane Departure

While the crash rate and contribution to overall serious crashes for Road/Lane Departure is lower than the statewide statistics, the percent fatal crashes in the PAG region is 31% vs. the much lower 24% statewide.

8) Nighttime Crashes

In the PAG region, 32% of all serious crashes occurred at night, with 13% of those occurring at night on roadways without lighting. Of the serious nighttime crashes, 25% are fatal, and 34% of nighttime serious crashes with no lighting are fatal. The crash rate for Nighttime Crashes with no lighting is much higher than the statewide crash rate at 0.94 vs. 0.78 statewide.

9) Impaired Driving

Impaired driving accounts for 21% of all serious crashes in the area, and 30% of Impaired Driving serious crashes are fatal – the third highest percentage of the emphasis areas. The PAG region non-state facilities crash rate is much higher than the statewide crash rate, while the overall PAG region crash rate is equal to the statewide crash rate.

7.2 Performance Measures

The following performance measures will be implemented by PAG to evaluate safety performance moving forward:

- Number of fatal crashes
- Number of incapacitating injury crashes
- Crash rate for fatal crashes (number of crashes per 100 MVMT)
- Crash rate for incapacitating injury crashes (number of serious injury crashes per 100 MVMT)
- Non-motorized fatal and serious injury crashes

These measures can be monitored for the overall region, for each of the Emphasis Areas, and/or for each of the other safety improvement areas (contributing factors which are non-emphasis areas). Performance measures may also be monitored by member jurisdictions.

In addition to the measures listed above, the region may reevaluate the percentages shown in Table 7.1. Recall that those statistics include the percentage of all crashes related to each of the contributing factors and the percentage of serious crashes which are fatal. Monitoring these statistics would allow the region to compare to previous performance within the region as well as overall statewide performance. The FHWA recommends a 5-year rolling average for crash monitoring.

On March 15, 2016, the FHWA released the final rule for "National Performance Management Measures: Highway Safety Improvement Program" in the Federal Register. By the release date, PAG's Strategic Transportation Safety Plan was nearing completion. To facilitate future incorporation of the final rule, this demonstration exhibit was created. Below is a brief summary of the rule and a demonstration of PAG's performance using the methods established in the rule. This demonstration should not be construed as PAG's reporting on the safety final rule, but rather provides context of PAG's ability to do such reporting in the future. Utilizing the performance- and target- setting methodologies laid out in the final rule will help guide safety implementation efforts.

The rule, which went into effect April 14, 2016, established the procedures, data, reporting requirements, and potential consequences for safety performance at State DOT and MPO levels. In general, this rule is designed to further the use of data to better inform transportation planning and programming with the aim of reducing fatalities and serious injuries.

<u>Key provisions in the rule:</u>

- 5 Performance Measures are required:
    1. Number of Fatalities
    2. Rate of Fatalities per 100 million VMT
    3. Number of Serious Injuries
    4. Rate of Serious Injuries per 100 million VMT
    5. Number of Non-motorized Fatalities and Serious Injuries
- Annual update frequency
- Performance measures encompass all public roads regardless of ownership or maintenance responsibility
- A target must be set for each of the 5 performance areas
- 5-year rolling averages are used to soften variability in data

Targets:

- States shall establish targets for the State as a whole
    - May establish targets for non-urbanized and urban areas separately
- State targets will be included in the annual HSIP report and shall reflect the anticipated performance for the following calendar year
- MPOs may elect to adopt the State targets or establish their own or a combination of the two
- States and MPOs must coordinate in establishing targets
- Targets will be identical when common performance measures exist between the State Highway Safety Office and the State's Highway Safety Plan

Implementation:

- States have one year from the effective date to establish targets
- MPOs have 180 days to establish targets or adopt the State targets after the State's targets are final
- First HSIP report with final rule targets due April 14, 2017

Progress Assessment:

- Only the State is assessed on progress towards targets
- Only statewide performance is reviewed (urban vs. non-urban option not included in assessment)
- States have "met" or "made" significant progress if four out of five target are met, or performance is better than baseline
- Assessment made one year after target date
- For states that have not met or made significant progress, the following fiscal year all HSIP apportionment must be programmed for HSIP projects and the State must submit an implementation plan
- This reduces the flexibility of State DOTs with movement of obligation authority.
- MPO's are to report their targets to the State in an agreed upon manner

Data use:

- FARS is to be used for fatal data
- State crash database is to be used for serious injury data
- States will use HPMS to calculate VMT and MPOs will use their transportation model

Following the procedures and data requirements as described in the final rule, Table 7.2 summarizes the performance findings in the PAG region.

Table 7.2: 5-Year Rolling Average, PAG region

Year Range	Fatalities	Fatality Rate per 100 million VMT	Serious Injuries	Serious Injury Rate per 100 million VMT	Non-Motorized Fatalities and Serious Injuries
2005-2009	130	1.647	958.6	12.141	140.2
2006-2010	123.6	1.611	891	11.613	139.6
2007-2011	112.6	1.466	802.6	10.452	133.6
2008-2012	108.2	1.391	737	9.474	132.6
2009-2013	100	1.271	675	8.579	123.4
2010-2014	99		634.8		115

PAG STSP targets for the region include a reduction range from 7% to 10% in five years. The graphs in Appendix E illustrate the trend in five year rolling averages and plot the target ranges for each of these five performance measures.

8 TRANSPORTATION SAFETY STRATEGIES

Several potential strategies to improve the safety performance in the Emphasis Areas are listed below. The list was developed with stakeholder input, and includes proven strategies which have been implemented in the region as well as those which have been successfully implemented in other regions or nationwide. The list is not comprehensive, but is provided as a toolbox of ideas which project owners may draw from when considering safety improvements. Engineering, education, and enforcement strategies are provided, and in some cases, include ongoing programs and policies which have already been implemented in the PAG region. This toolbox should be refined in the future to include new strategies that are developed and remove ineffective strategies. The strategies below include each of the nine proven safety countermeasures listed by the FHWA Office of Safety.

Note that strategies not on this list are still eligible for use in safety improvement projects and when pursuing funding for safety. Further, the following strategies can be used to address any of the emphasis areas. Inclusion of a strategy in the list below does not mean to suggest that PAG jurisdictions are no already employing the strategy.

- Engineering – Planning
    - Include safety as an explicit project evaluation criteria to encourage submittal of TIP projects that include safety elements for all modes
    - Identify new practices and promote “best practices” that integrate safety into planning and design
    - Enhance the PAG RSA Program
        - Conduct safety assessment reviews during the design phase
        - Prioritize improvements based on screening for high crash risk intersections
    - Use predictive safety modeling to guide improvement plans
- Engineering – Design/Implementation

- Provide/improve street lighting at critical locations (e.g. uncontrolled arterial crosswalks, intersections)

8.1 VULNERABLE USERS

- Engineering – Planning
  - Develop and implement a Complete Streets program for new roadways and/or improvements to existing roadways
  - Develop a Bicyclist Safety Assessment (BSA) program that focuses on crash analysis and mitigation, including implementation of countermeasures at high risk intersections of roadways and bike paths
  - Identify high risk locations for potential implementation of enhanced pedestrian or bike crossings with a favorable benefit/cost ratio
    - This may include the use or refinement of the ranking system currently used by the City of Tucson
  - Develop a system to evaluate whether certain midblock and/or multi-lane uncontrolled crosswalks should remain, be improved, or be removed
  - Seek funding to support safety programs for improving bicycle safety
  - Consider roundabouts for new intersections and intersection improvement projects
  - Develop/implement standards for implementation of protected-only left turn phasing or similar methodologies, including "Ped Minus Left" phasing (permissive left turns are allowed unless there is a conflicting pedestrian call, at which point, left turns have a red arrow and operate as protected only)
- Engineering – Design/Implementation
  - Evaluate and install controlled pedestrian or bike crossings (e.g. HAWKs/Pedestrian Hybrid Beacon, TOUCANs, RRFBs)
  - Install medians and pedestrian refuge islands
  - Consider removing free-flow right turn conditions
    - Reconstruct the intersection; or
    - Install stop/signal control for channelized right turn movements
  - Provide bicycle detection at signalized intersections
  - Provide sidewalks, multi-use paths, and/or marked crosswalks
  - Provide separated bike lanes and other bicycle-friendly infrastructure such as bike lanes, bike boulevards, and off-road multi-use paths where possible
  - Improve sight distance and/or visibility between motor vehicles and pedestrians
  - Continue to utilize the Safe Routes to School program
  - Develop and implement access management standards
  - Consider road diets (roadway reconfiguration) where appropriate
  - Improve intersection geometry to include shorter and/or protected crossings for pedestrians and/or cyclists
  - Evaluate traffic control to determine if safety improvements can be implemented
  - Consider the use of nighttime speed limits
  - Implement Pedestrian Safety Corridors where enhanced signing and increased enforcement highlight areas of pedestrian safety
- Education
  - Develop/maintain training and public information campaigns for bicycle and pedestrian safety

    - Improve public awareness and education to promote safer behavior by all roadway users relative to bicycle traffic
    - Develop public relations campaigns highlighting the risks of distracted driving/cycling/walking
    - Continue to promote the use of bike and pedestrian safety lights
    - Promote use of helmets by all bicyclists, regardless of age
    - Educate cyclists on how to cross streetcar (and other rail) tracks
- Enforcement/Policy
    - Increase enforcement of existing laws designed to promote pedestrian safety, such as jaywalking and vehicles failing to stop for pedestrians at marked and unmarked crosswalks
    - Increase enforcement of existing laws designed to promote bicycle safety, such as wrong-way riding and vehicles encroaching in bicycle facilities, i.e. driving in bike lane
    - Support efforts for mandatory helmet laws
    - Support efforts requiring use of hands-free devices
    - Require all cyclists to wear retroreflective clothing or incorporate retroreflective tape/paint on bicycle

8.2 Older Drivers

- Engineering – Planning
    - Develop/implement standards for implementation of protected-only left turn phasing
- Engineering – Design/Implementation
    - Implement the use of approach and departure lighting to facilitate transitions to and from low light situations
    - Improve visibility of traffic control devices (e.g. retroreflectivity of signs, larger sign sizes/fonts, reflective pavement markers, lighting)
    - Construct roadway infrastructure improvements to reduce the number and/or severity of lane departure crashes (e.g. paved/graded shoulders, enhanced friction on horizontal curves, gradual side slopes, guardrail, FHWA safety edge)
    - Minimize potential for colliding with another object for vehicles which run off the road (i.e. implement forgiving roadside concepts)
    - Install signal backplates with retroreflective borders
    - Evaluate and improve sight distance (as needed)
    - Consider the use of nighttime speed limits where appropriate
- Education
    - Increase availability and awareness of alternative transportation options
    - Promote insurance and other incentives for safe driving
- Enforcement/Policy
    - Support efforts to require more frequent testing of older drivers (e.g. vision, medical) for license renewals
    - Support efforts for primary enforcement of restraint laws

8.3 Motorcycles

- Engineering – Planning
    - Research, identify, and implement effective policies to improve motorcycle safety at the region and local government levels
    - Seek funding to support motorcycle-related safety projects/programs

    - Develop/implement standards for protected-only left turn phasing
    - Determine all 2-center curve locations on rural roads and prioritize for remediation
- Engineering – Design/Implementation
    - Evaluate and improve sight distance (as needed)
    - Use traffic control devices to better delineate the edge of roadway, particularly in dark areas and/or along horizontal curves (e.g. signs, Raised Pavement Markers (RPMs), edgelines, vertical delineators, rumble strips)
- Education
    - Improve public awareness and education for motorists and other safety stakeholders related to motorcyclists
    - Enhance rider training programs to improve motorcycle safety
    - Promote safer driving behaviors for motorcyclists (i.e. helmet use)
- Enforcement/Policy
    - Develop and execute enforcement programs to improve motorcycle safety
    - Continue/enhance use of driver feedback signs to alert drivers and potentially reduce travel speeds and/or speed differentials
    - Support efforts for mandatory helmet laws

8.4 INTERSECTIONS

- Engineering – Planning
    - Implement systemic improvements based on identifying characteristics of high risk intersections
    - Consider roundabouts for new intersections and intersection improvement projects
    - Develop/implement standards for implementation of protected-only left turn phasing or similar methodologies, including “Ped Minus Left” phasing (permissive left turns are allowed unless there is a conflicting pedestrian call, at which point, left turns have a red arrow and operate as protected only)
    - Evaluate the safety performance of non-traditional intersection designs (e.g. indirect left turns, continuous flow intersections, diverging diamond interchanges, Florida T signals) and consider their implementation where appropriate
    - Develop/implement standards for implementation of Flashing Yellow Arrow Phasing with protected left turns during peak travel hours and permitted left turns during low-volume hours
- Engineering – Design/Implementation
    - Improve intersection geometry by adding/lengthening turn lanes or removing/minimizing skew
    - Evaluate and improve sight distance (as needed)
    - Evaluate traffic control to determine if safety improvements can be implemented
    - Reassess/revise clearance intervals (yellow and all-red) as needed
    - Install signal backplates with retroreflective borders
    - Develop and implement access management standards
    - Consider removing free-flow right turn conditions (i.e. reconstruct the intersection or install stop/signal control for channelized right turn movements)
    - Implement the use of approach and departure lighting to facilitate transitions to and from low light situations
- Education
    - Develop public relations campaigns highlighting the risks of distracted driving

- Enforcement/Policy
    - Conduct targeted enforcement of high crash risk intersections
    - Enhance speeding and red-light-running enforcement where appropriate
        - Consider automated enforcement where allowed by law
    - Continue/enhance use of driver feedback signs to alert drivers and potentially reduce travel speeds and/or speed differentials
    - Support efforts requiring the use of hands-free devices
    - Support efforts for primary enforcement of restraint laws

8.5 YOUNG DRIVERS

- Engineering – Planning
    - Promote technology which monitors young driver behavior
    - Identify best practices for promoting and/or implementing Safe Driving pledge campaigns
    - Develop/implement standards for protected-only left turn phasing

- Engineering – Design/Implementation
    - Consider the use of nighttime speed limits where appropriate
- Education
    - Strengthen driver education
    - Promote stronger parental/guardian education and engagement in the licensure process for young drivers
    - Enhance outreach campaigns to young drivers and their families about safe driving behavior and programs (such as the Tucson Police Department's START program)
    - Develop public relations campaigns highlighting the risks of distracted driving
    - Increase availability and awareness of alternative transportation options
    - Promote insurance and other incentives for safe driving
- Enforcement/Policy
    - Support efforts requiring the use of hands-free devices
    - Enhance speeding and red-light-running enforcement where appropriate
        - Consider automated enforcement where allowed by law
    - Continue/enhance use of driver feedback signs to alert drivers and potentially reduce travel speeds and/or speed differentials
    - Support efforts for primary enforcement of restraint laws

8.6 ROAD/LANE DEPARTURE

- Engineering – Design/Implementation
    - Improve visibility of traffic control devices (e.g. retroreflectivity of signs and object markers, reflective raised pavement markers, shorter striping refresh cycle to improve reflective bead content, lighting)
    - Use traffic control devices to better delineate the edge of roadway, particularly in dark areas and/or along horizontal curves (e.g. signs, RPMs, edgelines, vertical delineators, rumble strips)
    - Construct roadway infrastructure improvements to reduce the number and/or severity of lane departure crashes (e.g. paved/graded shoulders, enhanced friction on horizontal curves, gradual side slopes, guardrail, FHWA safety edge)

    - Minimize potential for colliding with another object for vehicles which run off the road (i.e. implement forgiving roadside concepts)
    - Evaluate locations where curve warning signs are used for consistency with MUTCD standards (compliance date December 31, 2019)
    - Rank rural roads for safety shoulder installation
- Education
    - Increase public education on corrective roadway-departure driving techniques
        - Consider expanding TPD's START program
    - Develop public relations campaigns highlighting the risks of distracted driving
- Enforcement/Policy
    - Continue/enhance use of driver feedback signs to alert drivers and potentially reduce travel speeds and/or speed differentials
    - Support efforts requiring the use of hands-free devices
    - Support efforts for primary enforcement of restraint laws

8.7 NIGHTTIME

- Engineering – Planning
    - Develop programs to assess compliance of older street lighting systems with current standards
    - Develop a PAG region warrant for segment and intersection safety lighting
    - Develop a systematic screening and priority for access control
- Engineering – Design/Implementation
    - Implement the use of approach and departure lighting to facilitate transitions to and from low light situations
    - Improve visibility of traffic control devices (e.g. retro-reflectivity of signs and object markers, reflective raised pavement markers, shorter striping refresh cycle to improve reflective bead content, lighting)
    - Use traffic control devices to better delineate the edge of roadway, particularly in dark areas and/or along horizontal curves (e.g. signs, RPMs, edgelines, vertical delineators, rumble strips)
    - Install signal backplates with retroreflective borders
    - Consider the use of nighttime speed limits where appropriate
- Education
    - Continue to promote the use of bike and pedestrian safety lights
- Enforcement/Policy
    - Continue/enhance use of driver feedback signs to alert drivers and potentially reduce travel speeds and/or speed differentials
    - Support efforts to require more frequent testing of older drivers (vision, medical) for license renewals

8.8 IMPAIRED DRIVING

- Engineering – Design/Implementation
    - Implement wrong-way detection systems to reduce wrong-way crashes on freeways
    - Use traffic control devices to better delineate the edge of roadway, particularly in dark areas and/or along horizontal curves (e.g. signs, RPMs, edgelines, vertical delineators, rumble strips)

    - Improve visibility of traffic control devices (e.g. retro-reflectivity of signs and object markers, reflective raised pavement markers, shorter striping refresh cycle to improve reflective bead content, lighting)
    - Construct roadway infrastructure improvements to reduce the number and/or severity of lane departure crashes (e.g. paved/graded shoulders, enhanced friction on horizontal curves, gradual side slopes, guardrail, FHWA safety edge)
    - Minimize potential for colliding with another object for vehicles which run off the road (i.e. implement forgiving roadside concepts)
- Education
    - Improve public awareness of and access to alternate forms of transportation including transit and ride-share services
    - Conduct targeted outreach, such as the "Know Your Limit" program, which aims to educate those who are drinking (specifically, young people) about the effects of how much alcohol they have consumed
    - Partner with employers to suggest policies and procedures aimed at reducing impaired driving by their employees
    - Develop materials for educating target groups for impaired driving including mass-media campaigns on DUI dangers and penalties
- Enforcement/Policy
    - Conduct high visibility DUI saturation patrols/DUI abatement
    - Promote policies and practices that result in the imposition of meaningful penalties for impaired-driving convictions
    - Support efforts for primary enforcement of restraint laws

9 SAFETY PROJECT DEVELOPMENT

Safety is often seen as an "extra" or "add-on" or even a nuisance to incorporate into a project, when in fact it should be "mainstreamed" and explicitly considered on every project. One way to incorporate safety into future projects is to incorporate design stage RSAs as a part of every project. As part of its RSA Program, PAG currently conducts design stage RSAs for all RTA projects; it is recommended that RSAs be conducted on all design projects in the region.

Local agency design guidelines and policies should be evaluated for opportunities to include systemic safety improvements such as centerline/shoulder rumble strips, curve delineation, sidewalks and lighting. Since systemic safety improvement projects can incorporate longer corridors and larger geographic areas, they typically can generate more favorable benefit/cost ratios within the HSIP application due to a higher number of fatal and incapacitating injury crashes occurring over a greater coverage area. Other safety additions to policies and guidelines could include:

- Construct bus pullouts at select transit stops
- Adopt Complete Streets policies
- Prioritize funding for safety improvement projects as a key component of transportation project development through the TIP and 2045 Regional Access and Mobility Plan (RMAP) processes and ensure that HSIP funding is fully utilized in the region

10 Transportation Safety & Regional Transportation Plan

An important consideration during selection of projects for the long-range transportation plan is the ability of the project to ultimately help improve safety conditions for the region. It is critical to develop transportation improvements that reduce the number of injuries and fatalities so that people can safely travel throughout the region, no matter the mode of transportation. Traffic safety programs, projects and policies included in a Long-Range Transportation Plan also have a higher likelihood of being implemented. To help address these issues, potential long-range plan projects should be ranked, in part, based on a history of known safety issues along identified corridors.

The PAG 2045 Regional Mobility and Accessibility Plan (RMAP) includes goals and targets for improving safety in the region by reducing roadway fatalities by 30 percent over the next 30 years. This is the first step in achieving the region's vision of ensuring that everyone can get to their destinations safely with no more deaths on regional roadways. To reduce traffic injuries and fatalities, this plan recommends $50 million in safety funding over the next 30 years. The plan also includes a number of specific strategies for improving roadway safety, such as implementing Complete Streets policies and incorporating roadway safety assessments (RSAs) in the design of transportation projects. Table 10.1 shows sample bicycle and pedestrian projects that may be included in the 2045 RMAP.

Table 10.1: 2045 RMAP Sample Bicycle and Pedestrian Projects

Project Name	Description
Pedestrian Mobility Improvements	A flexible category of projects that includes sidewalk construction, safety improvements, ADA ramps, lighting, landscaping, refuge islands and other pedestrian improvements. Candidate locations are identified in the PAG 2014 Regional Pedestrian Plan. The proposed investment level in this category would make significant progress on improving pedestrian conditions in the region.
Safe Routes to School	A category of projects that emphasizes making it safer for students to travel to and from school by bike or on foot.
Bike Lanes Connectivity	This project looks to fill gaps in the bike lane system, including providing protected bike lanes where appropriate. Locations are identified in the 2009 Tucson Regional Plan for Bicycling.
The Loop	The Loop is a collection of shared-use paths around Tucson that also connect Rillito River Park, Santa Cruz River Park and Pantano River Park with the Julian Wash and the Harrison Greenway. This project represents a completion of the entire 131-mile Loop network.
Shared-Use Paths	Shared-use paths provide safe and comfortable recreational and mobility options for bicyclists, pedestrians and other non-motorized travelers. This project proposes to expand the network of shared-use paths throughout the region.
Signalized Pedestrian & Bike Crossings	One of the major safety challenges for bicyclists and pedestrians is having safe crossing opportunities. This project proposes improving bike and pedestrian safety by installing more than 150 additional bike and pedestrian crossing signals (such as HAWK beacons) in the region over the next 30 years.

Low Stress Bike Routes	Low stress bike routes, such as bike boulevards, are low-volume, low-speed streets optimized for bicycle travel with traffic reduction, traffic calming, signage and safe crossings at intersections with major streets. This project proposes adding over 150 additional miles of bike boulevards to provide a better connected low-stress bike network.

Overall safety strategies that should be considered for inclusion in the 2045 RMAP include:

1) Integrate Vision Zero into all levels of transportation planning with the aim of ultimately eliminating all roadway fatalities.

2) Promote safe and efficient incident response and clearance through development and implementation of a formalized regional traffic incident management program.

3) Maintain the roadways, sidewalks, and bicycle and transit facilities through filling potholes, sweeping debris and maintaining traffic signals. Execute timely responses to safety concerns regarding the transportation network.

4) Support the development of a comprehensive performance measurement program for the region whereby safety and security issues are identified and addressed promptly.

5) Incorporate emergency service agencies in the transportation planning and implementation processes in order to ensure delivery of transportation security to the traveling public.

6) Evaluate and encourage the installation of applicable emergency traffic signal preemption equipment at signalized intersections, fire station roadway access points and other locations.

7) Include Road Safety Assessments (RSA) as part of projects addressing safety issues. RSAs should be addressed during the scoping and design process to incorporate safety features in all projects as early as possible and in order to avoid project retrofits.

8) Increase the use of Intelligent Transportation System (ITS) strategies in work zones, including dynamic message signs and dynamic lane merge systems that provide real-time traveler information and real-time response to lane merging conditions. Use of ITS strategies in work zones is intended to improve safety and operations.

9) Prioritize funding for safety improvement projects as a key component of transportation project development through the TIP and RMAP processes and ensure that HSIP funding is fully utilized in the region consistent with the emphasis areas of the regional Strategic Transportation Safety Plan.

10) Develop strategies to improve safety for drivers, bicyclists and pedestrians at major intersections. Add more bicycle and pedestrian friendly features, such as islands, to slow traffic and provide pedestrian refuge and bikeways in large intersections.

11) Investigate reducing vehicle travel speeds in areas where drivers and pedestrians interact and where older drivers and pedestrians need more time to make decisions.

12) Make it easier for drivers and pedestrians to notice, read and understand visual information by reducing the clutter of signs, creating better access management, and improving signs and lighting to make the roadway more intuitive.

13) Support an education and outreach campaign that creates a serious dialogue about "traffic safety culture" within the region with a goal toward affecting behavior and improving safety by reducing indifference or complacency.

14) Improve roadway lighting, particularly in areas with high levels of bicycle and pedestrian activity, using dark sky compliant luminaires (such as full cut-off fixtures) where appropriate.

15) Continue to expand the use of bike and pedestrian crossing signals (such as HAWKs and TOUCANs) in order to improve road safety and increase crossing opportunities on arterial roads.

11 Implementation Plan Recommendations and Considerations

Phase 2 of the PAG STSP is the implementation portion of the plan. Phase 2 includes obtaining/developing a user-friendly software tool to enable PAG and its member agencies to analyze crash data through network screening and location specific diagnostics. Network screening and diagnostics analyses will help identify high priority locations at the project level; these locations will then be further evaluated through development of Project Assessments (PAs). Phase 2 will also develop the evaluation framework for the STSP, to include how strategies will be tracked, how the STSP will be evaluated, how often the plan will be updated, and how Performance Measures will be utilized/addressed.

11.1 Crash Data Analysis Software

PAG and PCDOT have the resources and expertise to conduct network screening for intersection and segment crashes. They currently use a Priority Index (PI) Ranking to identify potential high crash locations. The PI Ranking combines crash frequency, rate, and severity into a composite index for intersections and for segments. While this network screening methodology continues to be useful, PAG and PCDOT would like to incorporate HSM statistical techniques to identify locations with higher than expected crash frequencies, severities, and other crash characteristics (e.g., crash type, day/night crash frequencies, etc.). Phase 2 of the PAG STSP will identify/develop a crash data analysis tool that will:

- Provide a web-based analysis tool to allow ease of access for all PAG member agencies
- Develop a suite of safety performance functions (minimum 10 SPFs) for common intersection and segment configurations that could include:
    - Signalized intersections (3SG, 4SG)
    - Unsignalized intersections (3ST, 4ST)
    - 2-lane undivided rural road segments (2U)
    - 5-lane urban arterials (4D, 5T)
- Allow for incorporation and calibration of existing HSM SPFs

- Identify intersections and segments with higher than expected crash frequencies and severities using Empirical Bayes regression to the mean corrections and the Level of Service of Safety (LOSS) concept
- Generate diagnostics to identify location crash characteristics that are significantly different than expected (e.g., abnormal frequency of left-turn crashes, nighttime crashes, serious injury crashes, vehicle type, driver condition, etc.)
- Identify appropriate countermeasures to address safety issues
- Analyze corridors and identify crash issues/patterns on segments and intersections within the corridor
- Use crash analysis and diagnostic findings for RSAs
- Calculate benefit/cost ratios to be used in HSIP funding applications
- Simplify and automate the HSIP application process, which currently is difficult for agencies with limited manpower and technical resources to successfully navigate
- Provide a platform to easily update crash data from PAG/ADOT on a yearly basis
- Provide reports that can be exported to Excel and PDF format
- Include at least 12 licenses to be used by PAG and its member agencies

11.2 Spatial Analysis Tools

Crash maps/heat maps can be developed to provide a visualization of crash patterns. These maps assist in identifying locations for targeted enforcement and education campaigns. Anticipated heat maps include:

- Driver violations (speeding, impaired, etc.)
- Road departure crashes
- Vulnerable user crashes (pedestrians, bicyclists)
- Nighttime crashes

11.3 Safety Project Assessments

After a software package has been acquired and implemented, it will be used to evaluate high crash risk locations in more detail. This process will result in the identification of 10-12 high priority safety projects. A consultant team will develop PAs for these projects to be funded by HSIP funds. As part of each Project Assessment (PA), a project specific HSIP application will be prepared in accordance with the latest ADOT procedures.

12 Next Steps

This report documents Phase 1 of the PAG Strategic Transportation Safety Plan. This report is just the first step in formalizing strategic safety planning efforts in the region. Moving forward, PAG will conduct ongoing monitoring and evaluation of regional safety performance to determine the effectiveness of safety projects and programs, comparing safety performance to safety targets. This monitoring and evaluation will include:

- Regular reporting of safety performance, to include tracking of number and rate of fatal and serious injuries and non-motorized fatal and serious injuries, as prescribed in the National Safety Performance Final Rule
- Comparison of these fatal and serious injuries to the targets based on the 5-year rolling average of these crash severities
- Before and after safety project analyses as available and appropriate
- Expanding and refining the safety strategies list to best suit the region's safety needs as more local data is gathered and more experience is gained

Phase 2 is the implementation of this Safety Plan (a separate project). Using Phase 1 as the framework to guide investment of funds, PAG will work closely with its member agencies and other safety stakeholders to implement safety projects and programs to help achieve safety targets. Data is the performance metric by which safety investment should be linked nationally, statewide, and in the PAG region. If funds are not programmed for the appropriate projects, programs, and locations, safety targets will be difficult to achieve. Data-driven implementation of this plan is the key to realizing changes in safety performance in the PAG region. With Phase 1 and 2 of this Safety Plan, PAG will establish a sustainable safety program that:

- Ensures that safety project locations are appropriately identified
- Establishes data-driven understanding of what safety issues are taking place and why
- Develops and delivers projects that will help achieve safety goals
- Mainstreams safety into project development and programming in the region
- Ultimately reduces fatalities and serious injuries in the region

13 APPENDIX A: CONTRIBUTING FACTOR DETAILED DATA

Fatal Crashes - Older Drivers	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	1	0	1	3	3,160	0.26
Oro Valley	0	1	1	0	0	2	2,490	0.22
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	7	3	4	7	3	24	23,905	0.28
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	1	0	0	0	1	348	0.79
Tohono O'odham	1	1	0	0	0	2	500	1.10
Tucson	4	7	9	7	7	34	47,216	0.20
Unknown	1	0	0	0	0	1		
Local Roads Total	13	14	15	14	11	67	79,211	0.23
State Highways (PAG region)	6	9	4	8	6	33	35,073	0.26
PAG Region Total	**19**	**23**	**19**	**22**	**17**	100	114,284	0.24
State Total	**135**	**155**	**170**	**133**		745	824,337	0.25

*State totals are from 2008-2012

Incapacitating Injury Crashes - Older Drivers	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	1	0	0	1	1	3	3,160	0.26
Oro Valley	0	0	0	2	0	2	2,490	0.22
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	15	17	21	22	21	96	23,905	1.10
Sahuarita	0	1	1	1	0	3	1,072	0.77
South Tucson	0	0	0	4	1	5	348	3.94
Tohono O'odham	0	0	1	2	1	4	500	2.19
Tucson	54	66	67	73	67	327	47,216	1.90
Unknown	0	0	0	0	0	0		
Local Roads Total	70	84	90	105	91	440	79,211	1.52
State Highways (PAG region)	19	15	11	21	25	91	35,073	0.71
PAG Region Total	**89**	**99**	**101**	**126**	**116**	531	114,284	1.27
State Total	**609**	**580**	**641**	**660**		3,128	824,337	1.04

*State totals are from 2008-2012

Fatal Crashes - Young Drivers	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	6	6	5	7	9	33	23,905	0.38
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	1	1	0	0	2	500	1.10
Tucson	7	8	14	12	15	56	47,216	0.32
Unknown	0	0	0	0	0	0		
Local Roads Total	13	15	20	19	25	92	79,211	0.32
State Highways (PAG region)	12	8	8	15	7	50	35,073	0.39
PAG Region Total	**25**	**23**	**28**	**34**	**32**	142	114,284	0.34
State Total	**183**	**147**	**212**	**206**		1,016	824,337	0.34

*State totals are from 2008-2012

Incapacitating Injury Crashes - Young Drivers	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	3	0	3	1	4	11	3,160	0.95
Oro Valley	2	1	1	1	2	7	2,490	0.77
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	39	43	37	41	34	194	23,905	2.22
Sahuarita	0	2	3	0	0	5	1,072	1.28
South Tucson	0	1	1	2	0	4	348	3.15
Tohono O'odham	2	4	1	2	2	11	500	6.03
Tucson	110	139	126	123	90	588	47,216	3.41
Unknown	1	1	1	1	0	4		
Local Roads Total	157	191	173	171	132	824	79,211	2.85
State Highways (PAG region)	26	34	25	26	24	135	35,073	1.05
PAG Region Total	**183**	**225**	**198**	**197**	**156**	959	114,284	2.30
State Total	**1256**	**1255**	**1183**	**1125**		6,303	824,337	2.09

*State totals are from 2008-2012

Fatal Crashes - Bicycles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	1	0	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	2	0	0	0	2	4	23,905	0.05
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	2	0	2	1	2	7	47,216	0.04
Unknown	0	0	0	0	0	0		
Local Roads Total	4	0	3	1	4	12	79,211	0.04
State Highways (PAG region)	0	0	1	0	1	2	35,073	0.02
PAG Region Total	**4**	**0**	**4**	**1**	**5**	14	114,284	0.03
State Total	**25**	**19**	**23**	**18**		104	824,337	0.03

*State totals are from 2008-2012

Incapacitating Injury Crashes - Bicycles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	1	0	0	0	1	2	3,160	0.17
Oro Valley	0	0	1	1	1	3	2,490	0.33
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	10	7	4	3	6	30	23,905	0.34
Sahuarita	0	0	0	1	0	1	1,072	0.26
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	31	35	18	35	23	142	47,216	0.82
Unknown	0	0	0	0	0	0		
Local Roads Total	42	42	23	40	31	178	79,211	0.62
State Highways (PAG region)	3	6	1	2	6	18	35,073	0.14
PAG Region Total	**45**	**48**	**24**	**42**	**37**	196	114,284	0.47
State Total	**225**	**221**	**236**	**202**		1,085	824,337	0.36

*State totals are from 2008-2012

Fatal Crashes - Distracted Driving	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	2	0	0	1	0	3	23,905	0.03
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	1	0	1	500	0.55
Tucson	1	1	2	1	2	7	47,216	0.04
Unknown	0	0	0	0	0	0		
Local Roads Total	3	1	2	3	3	12	79,211	0.04
State Highways (PAG region)	2	0	0	1	0	3	78,725	0.01
PAG Region Total	**5**	**1**	**2**	**4**	**3**	15	157,936	0.03
State Total	**99**	**88**	**69**	**60**	**N/A**	469	824,337	0.16

*State totals are from 2008-2012

Incapacitating Injury Crashes - Distracted Driving	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	2	0	1	1	2	6	3,160	0.52
Oro Valley	0	0	0	2	0	2	2,490	0.22
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	16	8	10	9	14	57	23,905	0.65
Sahuarita	0	0	0	0	1	1	1,072	0.26
South Tucson	0	0	0	2	1	3	348	2.36
Tohono O'odham	1	0	0	2	0	3	500	1.64
Tucson	32	40	47	38	30	187	47,216	1.09
Unknown	1	0	0	0	0	1		
Local Roads Total	52	48	58	54	48	260	79,211	0.90
State Highways (PAG region)	9	7	10	9	6	41	78,725	0.14
PAG Region Total	**61**	**55**	**68**	**63**	**54**	301	157,936	0.52
State Total	**762**	**732**	**720**	**604**	**N/A**	3,842	824,337	1.28

*State totals are from 2008-2012

Fatal Crashes - Heavy Vehicles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	2	3	2	0	7	23,905	0.08
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	1	0	1	500	0.55
Tucson	1	3	0	1	2	7	47,216	0.04
Unknown	0	0	0	0	0	0		
Local Roads Total	1	5	3	4	3	16	79,211	0.06
State Highways (PAG region)	1	4	4	4	2	15	78,725	0.05
PAG Region Total	**2**	**9**	**7**	**8**	**5**	31	157,936	0.05
State Total	**105**	**90**	**109**	**100**	**N/A**	499	824,337	0.17

*State totals are from 2008-2012

Incapacitating Injury Crashes - Heavy Vehicles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	2	3	4	4	3	16	23,905	0.18
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	1	1	0	1	0	3	500	1.64
Tucson	13	13	18	8	11	63	47,216	0.37
Unknown	0	0	0	0	0	0		
Local Roads Total	16	17	22	13	15	83	79,211	0.29
State Highways (PAG region)	7	10	3	1	7	28	78,725	0.10
PAG Region Total	**23**	**27**	**25**	**14**	**22**	111	157,936	0.19
State Total	**392**	**375**	**406**	**363**	**N/A**	1,777	824,337	0.59

*State totals are from 2008-2012

Fatal Crashes - Impairment	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	2	2	3,160	0.17
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	1	0	0	0	1	33	8.23
Pima County	8	10	14	19	15	66	23,905	0.76
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	1	0	0	0	1	348	0.79
Tohono O'odham	3	5	1	0	0	9	500	4.93
Tucson	3	15	13	17	11	59	47,216	0.34
Unknown	0	0	0	0	0	0		
Local Roads Total	14	32	28	36	28	138	79,211	0.48
State Highways (PAG region)	14	10	8	17	12	61	78,725	0.21
PAG Region Total	**28**	**42**	**36**	**53**	**40**	199	157,936	0.35
State Total	**264**	**236**	**254**	**268**	**N/A**	1,353	824,337	0.45

*State totals are from 2008-2012

Incapacitating Injury Crashes - Impairment	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	1	1	0	0	2	4	3,160	0.35
Oro Valley	0	1	0	0	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	31	23	16	18	14	102	23,905	1.17
Sahuarita	0	1	0	1	0	2	1,072	0.51
South Tucson	1	1	1	1	0	4	348	3.15
Tohono O'odham	7	2	1	2	2	14	500	7.68
Tucson	52	42	48	56	45	243	47,216	1.41
Unknown	0	3	1	0	0	4		
Local Roads Total	92	74	67	78	63	374	79,211	1.29
State Highways (PAG region)	21	20	19	23	17	100	78,725	0.35
PAG Region Total	**113**	**94**	**86**	**101**	**80**	474	157,936	0.82
State Total	**759**	**660**	**688**	**641**	**N/A**	3,499	824,337	1.16

*State totals are from 2008-2012

Fatal Crashes - Intersections	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	2	0	0	2	4	3,160	0.35
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	5	3	5	7	3	23	23,905	0.26
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	7	16	15	10	10	58	47,216	0.34
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	12	21	20	17	15	85	79,211	0.29
State Highways (PAG region)	3	6	2	7	3	21	35,073	0.16
PAG Region Total	**15**	**27**	**22**	**24**	**18**	106	114,284	0.25
State Total	**156**	**164**	**186**	**173**	**N/A**	885	824,337	0.29

*State totals are from 2008-2012

Incapacitating Injury Crashes - Intersections	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	6	1	3	2	2	14	3,160	1.21
Oro Valley	0	2	1	1	2	6	2,490	0.66
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	29	32	28	30	37	156	23,905	1.79
Sahuarita	0	1	3	2	1	7	1,072	1.79
South Tucson	1	2	0	3	0	6	348	4.73
Tohono O'odham	2	0	2	1	1	6	500	3.29
Tucson	148	180	164	161	144	797	47,216	4.62
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	186	218	201	200	187	992	79,211	3.43
State Highways (PAG region)	43	51	30	41	23	188	35,073	1.47
PAG Region Total	**229**	**269**	**231**	**241**	**210**	1,180	114,284	2.83
State Total	**1,613**	**1,593**	**1,689**	**1,622**	**N/A**	8,276	824,337	2.75

*State totals are from 2008-2012

Fatal Crashes - All Motorcycles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	8	6	4	10	5	33	23,905	0.38
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	1	0	0	0	0	1	500	0.55
Tucson	1	8	9	7	4	29	47,216	0.17
Unknown	0	0	0	0	0	0		
Local Roads Total	10	14	13	17	10	64	79,211	0.22
State Highways (PAG region)	1	2	4	5	5	17	78,725	0.06
PAG Region Total	**11**	**16**	**17**	**22**	**15**	81	157,936	0.14
State Total	**129**	**95**	**148**	**144**	**N/A**	673	824,337	0.22

*State totals are from 2008-2012

Incapacitating Injury Crashes - All Motorcycles	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	3	1	3	2	2	11	3,160	0.95
Oro Valley	0	0	0	1	1	2	2,490	0.22
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	21	22	16	19	32	110	23,905	1.26
Sahuarita	0	1	3	1	0	5	1,072	1.28
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	48	46	47	60	54	255	47,216	1.48
Unknown	1	0	0	0	0	1		
Local Roads Total	73	70	69	83	89	384	79,211	1.33
State Highways (PAG region)	18	14	15	15	15	77	78,725	0.27
PAG Region Total	**91**	**84**	**84**	**98**	**104**	461	157,936	0.80
State Total	**729**	**669**	**664**	**738**	**N/A**	3,625	824,337	1.20

*State totals are from 2008-2012

Fatal Crashes - Natural Risks_Animals	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	0	0	0	0	0	23,905	0.00
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	0	0	0	0	0	0	47,216	0.00
Unknown	0	0	0	0	0	0		
Local Roads Total	0	0	0	0	0	0	79,211	0.00
State Highways (PAG region)	0	0	0	0	0	0	78,725	0.00
PAG Region Total	**0**	**0**	**0**	**0**	**0**	0	157,936	0.00
State Total	**4**	**1**	**2**	**4**	**N/A**	12	824,337	0.00

*State totals are from 2008-2012

Incapacitating Injury Crashes - Natural Risks_Animals	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	1	0	0	0	1	2	23,905	0.02
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	1	0	0	1	2	500	1.10
Tucson	0	0	0	0	0	0	47,216	0.00
Unknown	0	0	0	0	0	0		
Local Roads Total	1	1	0	0	2	4	79,211	0.01
State Highways (PAG region)	1	1	1	0	0	3	78,725	0.01
PAG Region Total	**2**	**2**	**1**	**0**	**2**	7	157,936	0.01
State Total	**23**	**16**	**11**	**18**	**N/A**	87	824,337	0.03

*State totals are from 2008-2012

Fatal Crashes - Natural Risks_Weather	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	0	0	0	0	0	23,905	0.00
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	2	1	0	1	1	5	47,216	0.03
Unknown	0	0	0	0	0	0		
Local Roads Total	2	1	0	1	1	5	79,211	0.02
State Highways (PAG region)	0	3	2	1	0	6	78,725	0.02
PAG Region Total	**2**	**4**	**2**	**2**	**1**	11	157,936	0.02
State Total	**27**	**31**	**23**	**17**	**N/A**	120	824,337	0.04

*State totals are from 2008-2012

Incapacitating Injury Crashes - Natural Risks_Weather	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	3	1	1	0	5	23,905	0.06
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	1	0	0	0	0	1	500	0.55
Tucson	5	18	8	8	6	45	47,216	0.26
Unknown	0	0	1	0	0	1		
Local Roads Total	6	21	10	9	6	52	79,211	0.18
State Highways (PAG region)	2	10	2	2	6	22	78,725	0.08
PAG Region Total	**8**	**31**	**12**	**11**	**12**	74	157,936	0.13
State Total	**87**	**159**	**92**	**96**	**N/A**	586	824,337	0.19

*State totals are from 2008-2012

Fatal Crashes - Nighttime Lighted	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	1	4	2	9	16	23,905	0.18
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	1	0	0	0	1	348	0.79
Tohono O'odham	1	0	0	0	0	1	500	0.55
Tucson	5	13	9	15	10	52	47,216	0.30
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	6	15	13	17	19	70	79,211	0.24
State Highways (PAG region)	10	5	6	8	4	33	35,073	0.26
PAG Region Total	**16**	**20**	**19**	**25**	**23**	103	114,284	0.25
State Total							824,337	

*State totals are from 2008-2012

**Pascua Yaqui, Tohono O'odham, and statewide populations are from 2010. All others are from 2011.

Incapacitating Injury Crashes - Nighttime Lighted	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	2	0	0	0	1	3	3,160	0.26
Oro Valley	1	0	0	0	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	11	5	9	8	6	39	23,905	0.45
Sahuarita	0	0	0	1	0	1	1,072	0.26
South Tucson	2	1	1	2	1	7	348	5.52
Tohono O'odham	0	1	0	0	0	1	500	0.55
Tucson	66	82	49	72	56	325	47,216	1.89
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	82	89	59	83	64	377	79,211	1.30
State Highways (PAG region)	12	10	16	14	12	64	35,073	0.50
PAG Region Total	**94**	**99**	**75**	**97**	**76**	441	114,284	1.06
State Total							824,337	

*State totals are from 2008-2012

**Pascua Yaqui, Tohono O'odham, and statewide populations are from 2010. All others are from 2011.

Fatal Crashes - Nighttime Not Lighted	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	1	0	0	0	1	33	8.23
Pima County	9	9	3	11	13	45	23,905	0.52
Sahuarita	1	0	0	0	0	1	1,072	0.26
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	4	1	0	0	5	500	2.74
Tucson	3	5	5	4	8	25	47,216	0.15
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	13	19	9	15	21	77	79,211	0.27
State Highways (PAG region)	8	12	13	18	5	56	35,073	0.44
PAG Region Total	**21**	**31**	**22**	**33**	**26**	133	114,284	0.32
State Total						608	824,337	0.20

*State totals are from 2008-2012

**Pascua Yaqui, Tohono O'odham, and statewide populations are from 2010. All others are from 2011.

Incapacitating Injury Crashes - Nighttime Not Lighted	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	1	0	1	3	3,160	0.26
Oro Valley	0	0	0	1	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	25	20	18	13	16	92	23,905	1.05
Sahuarita	0	2	2	0	0	4	1,072	1.02
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	2	2	0	1	2	7	500	3.84
Tucson	18	14	15	24	16	87	47,216	0.50
Unknown	0	0	1	0	0	1		
Non-State Roadway Total	45	39	37	39	35	195	79,211	0.67
State Highways (PAG region)	15	19	11	8	14	67	35,073	0.52
PAG Region Total	**60**	**58**	**48**	**47**	**49**	262	114,284	0.63
State Total						1,261	824,337	0.42

*State totals are from 2008-2012

**Pascua Yaqui, Tohono O'odham, and statewide populations are from 2010. All others are from 2011.

Fatal Crashes - Non Daylight	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	1	0	1	3	3,160	0.26
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	1	0	0	0	1	33	8.23
Pima County	12	10	7	16	22	67	23,905	0.77
Sahuarita	1	0	0	0	0	1	1,072	0.26
South Tucson	0	1	0	0	0	1	348	0.79
Tohono O'odham	2	5	2	0	0	9	500	4.93
Tucson	9	21	18	22	24	94	47,216	0.55
Unknown	0	0	0	0	0	0		
Non-State Roadway Total	24	39	28	38	47	176	79,211	0.61
State Highways (PAG region)	21	17	21	27	10	96	35,073	0.75
PAG Region Total	**45**	**56**	**49**	**65**	**57**	272	114,284	0.65
State Total	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	824,337	**N/A**

*State totals are from 2008-2012

Incapacitating Injury Crashes - Non Daylight	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	4	1	2	1	3	11	3,160	0.95
Oro Valley	2	0	0	1	0	3	2,490	0.33
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	41	34	31	24	27	157	23,905	1.80
Sahuarita	0	2	3	1	0	6	1,072	1.53
South Tucson	2	2	1	2	1	8	348	6.31
Tohono O'odham	5	3	0	2	2	12	500	6.58
Tucson	99	117	86	112	83	497	47,216	2.88
Unknown	1	1	1	0	0	3		
Non-State Roadway Total	154	160	124	143	116	697	79,211	2.41
State Highways (PAG region)	31	38	31	26	31	157	35,073	1.23
PAG Region Total	**185**	**198**	**155**	**169**	**147**	854	114,284	2.05
State Total	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	824,337	**N/A**

*State totals are from 2008-2012

Fatal Crashes - Occupant Protection	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	0	0	2	3	3,160	0.26
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	7	10	7	14	12	50	23,905	0.57
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	4	7	0	0	1	12	500	6.58
Tucson	4	9	10	13	9	45	47,216	0.26
Unknown	0	0	0	0	0	0		
Local Roads Total	15	27	17	27	24	110	79,211	0.38
State Highways (PAG region)	19	15	10	17	10	71	78,725	0.25
PAG Region Total	**34**	**42**	**27**	**44**	**34**	181	157,936	0.31
State Total	**313**	**300**	**325**	**324**	**N/A**	1,670	824,337	0.56

*State totals are from 2008-2012

Incapacitating Injury Crashes - Occupant Protection	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	1	0	2	0	2	5	3,160	0.43
Oro Valley	2	1	0	2	0	5	2,490	0.55
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	30	22	19	30	13	114	23,905	1.31
Sahuarita	0	1	3	0	0	4	1,072	1.02
South Tucson	0	0	1	0	0	1	348	0.79
Tohono O'odham	4	5	0	2	2	13	500	7.13
Tucson	44	50	47	51	45	237	47,216	1.38
Unknown	0	3	1	1	0	5		
Local Roads Total	81	82	73	86	62	384	79,211	1.33
State Highways (PAG region)	39	26	25	20	24	134	78,725	0.47
PAG Region Total	**120**	**108**	**98**	**106**	**86**	518	157,936	0.90
State Total	**940**	**854**	**780**	**777**	**N/A**	4,405	824,337	1.46

*State totals are from 2008-2012

Fatal Crashes - Pedestrians	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	2	0	0	3	3,160	0.26
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	1	0	0	0	1	33	8.23
Pima County	5	2	1	4	6	18	23,905	0.21
Sahuarita	1	0	0	0	0	1	1,072	0.26
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	1	0	0	1	500	0.55
Tucson	8	10	18	7	19	62	47,216	0.36
Unknown	0	0	0	0	0	0		
Local Roads Total	14	14	22	11	25	86	79,211	0.30
State Highways (PAG region)	5	5	7	7	0	24	35,073	0.19
PAG Region Total	**19**	**19**	**29**	**18**	**25**	110	114,284	0.26
State Total	**121**	**155**	**152**	**130**	**N/A**	682	824,337	0.23

*State totals are from 2008-2012

Incapacitating Injury Crashes - Pedestrians	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	1	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	13	5	9	10	4	41	23,905	0.47
Sahuarita	0	1	0	0	0	1	1,072	0.26
South Tucson	1	1	0	2	2	6	348	4.73
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	47	49	29	52	31	208	47,216	1.21
Unknown	0	0	0	0	0	0		
Local Roads Total	61	56	38	65	37	257	79,211	0.89
State Highways (PAG region)	8	6	7	2	7	30	35,073	0.23
PAG Region Total	**69**	**62**	**45**	**67**	**44**	287	114,284	0.69
State Total	**337**	**320**	**318**	**340**	**N/A**	1,694	824,337	0.56

*State totals are from 2008-2012

Fatal Crashes - Road/Lane Departure	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	1	1	3,160	0.09
Oro Valley	0	1	0	0	0	1	2,490	0.11
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	12	9	8	11	12	52	23,905	0.60
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	1	0	0	0	1	348	0.79
Tohono O'odham	2	5	0	1	1	9	500	4.93
Tucson	4	12	5	9	6	36	47,216	0.21
Unknown	0	0	0	0	0	0		
Local Roads Total	18	28	13	21	20	100	79,211	0.35
State Highways (PAG region)	16	9	11	19	11	66	78,725	0.23
PAG Region Total	**34**	**37**	**24**	**40**	**31**	166	157,936	0.29
State Total	**392**	**339**	**364**	**388**	**N/A**	1,932	824,337	0.64

*State totals are from 2008-2012

Incapacitating Injury Crashes - Road/Lane Departure	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	0	0	1	2	3,160	0.17
Oro Valley	3	1	0	2	0	6	2,490	0.66
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	30	30	18	16	18	112	23,905	1.28
Sahuarita	0	1	1	1	0	3	1,072	0.77
South Tucson	0	1	1	0	0	2	348	1.58
Tohono O'odham	5	3	1	2	2	13	500	7.13
Tucson	30	19	16	23	15	103	47,216	0.60
Unknown	2	4	2	0	0	8		
Local Roads Total	70	60	39	44	36	249	79,211	0.86
State Highways (PAG region)	23	25	30	24	27	129	78,725	0.45
PAG Region Total	**93**	**85**	**69**	**68**	**63**	378	157,936	0.66
State Total	**1,383**	**1,225**	**1,106**	**1,074**	**N/A**	6,047	824,337	2.01

*State totals are from 2008-2012

Fatal Crashes - Speeding	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	12	6	12	13	14	57	23,905	0.65
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	3	6	0	0	1	10	500	5.48
Tucson	4	9	8	12	6	39	47,216	0.23
Unknown	0	0	0	0	0	0		
Local Roads Total	19	21	20	25	21	106	79,211	0.37
State Highways (PAG region)	10	8	8	17	10	53	78,725	0.18
PAG Region Total	**29**	**29**	**28**	**42**	**31**	159	157,936	0.28
State Total	**245**	**222**	**251**	**244**	**N/A**	1,312	824,337	0.44

*State totals are from 2008-2012

Incapacitating Injury Crashes - Speeding	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	3	0	2	1	1	7	3,160	0.61
Oro Valley	2	1	1	1	0	5	2,490	0.55
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	40	30	30	31	31	162	23,905	1.86
Sahuarita	0	1	0	1	0	2	1,072	0.51
South Tucson	2	0	1	2	1	6	348	4.73
Tohono O'odham	5	3	0	2	1	11	500	6.03
Tucson	69	70	81	59	59	338	47,216	1.96
Unknown	0	3	2	1	0	6		
Local Roads Total	121	108	117	98	93	537	79,211	1.86
State Highways (PAG region)	29	44	24	30	28	155	78,725	0.54
PAG Region Total	**150**	**152**	**141**	**128**	**121**	692	157,936	1.20
State Total	**1,207**	**1,173**	**1,115**	**1,130**	**N/A**	5,979	824,337	1.99

*State totals are from 2008-2012

Fatal Crashes - Work Zone	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	0	0	0	0	0	3,160	0.00
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	0	1	0	0	1	23,905	0.01
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	0	2	0	0	0	2	47,216	0.01
Unknown	0	0	0	0	0	0		
Local Roads Total	0	2	1	0	0	3	79,211	0.01
State Highways (PAG region)	0	0	0	0	0	0	78,725	0.00
PAG Region Total	**0**	**2**	**1**	**0**	**0**	3	157,936	0.01
State Total	**4**	**8**	**6**	**7**	**N/A**	38	824,337	0.01

*State totals are from 2008-2012

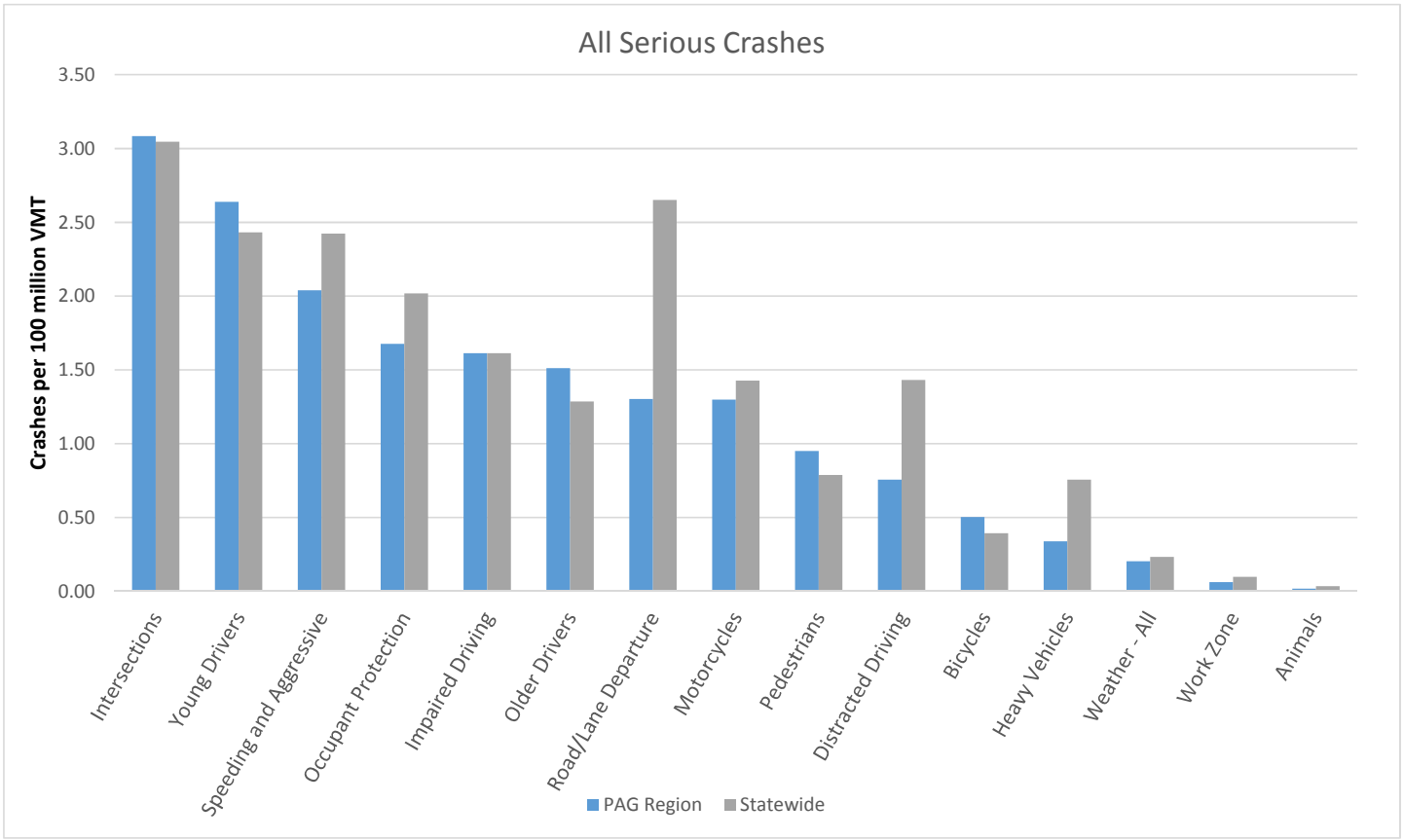
Incapacitating Injury Crashes - Work Zone	Crashes per Year					Total Crashes*	Total daily kVMT	Crashes per 100 million VMT
	2009	2010	2011	2012	2013			
Marana	0	1	0	0	0	1	3,160	0.09
Oro Valley	0	0	0	0	0	0	2,490	0.00
Pascua Yaqui	0	0	0	0	0	0	33	0.00
Pima County	0	0	1	2	0	3	23,905	0.03
Sahuarita	0	0	0	0	0	0	1,072	0.00
South Tucson	0	0	0	0	0	0	348	0.00
Tohono O'odham	0	0	0	0	0	0	500	0.00
Tucson	2	4	3	1	1	11	47,216	0.06
Unknown	0	0	0	0	0	0		
Local Roads Total	2	5	4	3	1	15	79,211	0.05
State Highways (PAG region)	2	4	1	1	0	8	78,725	0.03
PAG Region Total	**4**	**9**	**5**	**4**	**1**	23	157,936	0.04
State Total	**49**	**37**	**32**	**30**	**N/A**	258	824,337	0.09

*State totals are from 2008-2012

14 APPENDIX B: CRASH DATA BY SEVERITY

Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	PAG	State	PAG	State	PAG	State
Intersections	1,286	9,161	3.08	3.04	41%	41%
Young Drivers	1,101	7,319	2.64	2.43	35%	33%
Speeding and Aggressive	851	7,291	2.04	2.42	27%	33%
Occupant Protection	699	6,075	1.68	2.02	22%	27%
Impaired Driving	673	4,852	1.61	1.61	21%	22%
Older Drivers	631	3,873	1.51	1.29	20%	17%
Road/Lane Departure	544	7,979	1.30	2.65	17%	36%
Motorcycles	542	4,298	1.30	1.43	17%	19%
Pedestrians	397	2,376	0.95	0.79	13%	11%
Distracted Driving	316	4,311	0.76	1.43	10%	19%
Bicycles	210	1,189	0.50	0.40	7%	5%
Heavy Vehicles	142	2,276	0.34	0.76	5%	10%
Weather - All	85	706	0.20	0.23	3%	3%
Weather - Precipitation	81	618	0.14	0.21	3%	3%
Work Zone	26	296	0.06	0.10	1%	1%
Animals	7	99	0.02	0.03	0%	0%
Weather - Dust/Wind	4	88	0.01	0.03	0%	0%
TOTAL	**3,138**	**22,289**	**7.52**	**7.41**		
Urban Areas	2,605	16,434	6.27	5.46	83%	74%
Rural Areas	533	5,855	1.28	1.95	17%	26%
Tribal Lands	113	965	0.27	0.32	4%	4%



Five-Year Summary: Fatal Crashes

Fatal Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	PAG	State	PAG	State	PAG	State
Intersections	106	885	0.25	0.29	23%	24%
Young Drivers	142	1,016	0.34	0.34	30%	27%
Speeding and Aggressive	159	1,312	0.38	0.44	34%	35%
Occupant Protection	181	1,670	0.43	0.56	39%	45%
Impaired Driving	199	1,353	0.48	0.45	43%	36%
Older Drivers	100	745	0.24	0.25	21%	20%
Road/Lane Departure	166	1,932	0.40	0.64	35%	52%
Motorcycles	81	673	0.19	0.22	17%	18%
Pedestrians	110	682	0.26	0.23	24%	18%
Distracted Driving	15	469	0.04	0.16	3%	13%
Bicycles	14	104	0.03	0.03	3%	3%
Heavy Vehicles	31	499	0.07	0.17	7%	13%
Weather - All	11	120	0.03	0.04	2%	3%
Weather - Precipitation	10	100	0.02	0.03	2%	3%
Work Zone	3	38	0.01	0.01	1%	1%
Animals	0	12	0.00	0.00	0%	0%
Weather - Dust/Wind	1	20	0.00	0.01	0%	1%
TOTAL	**468**	**3,744**	**1.12**	**1.24**		
Urban Areas	325	2,054	0.78	0.68	69%	55%
Rural Areas	143	1,690	0.34	0.56	31%	45%
Tribal Lands	43	455	0.10	0.15	9%	12%

Five-Year Summary: Incapacitating Injury Crashes

Incapacitating Injury Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	PAG	State	PAG	State	PAG	State
Intersections	1,180	8,276	2.83	2.75	44%	45%
Young Drivers	959	6,303	2.30	2.09	36%	34%
Speeding and Aggressive	692	5,979	1.66	1.99	26%	32%
Occupant Protection	518	4,405	1.24	1.46	19%	24%
Impaired Driving	474	3,499	1.14	1.16	18%	19%
Older Drivers	531	3,128	1.27	1.04	20%	17%
Road/Lane Departure	378	6,047	0.91	2.01	14%	33%
Motorcycles	461	3,625	1.11	1.20	17%	20%
Pedestrians	287	1,694	0.69	0.56	11%	9%
Distracted Driving	301	3,842	0.72	1.28	11%	21%
Bicycles	196	1,085	0.47	0.36	7%	6%
Heavy Vehicles	111	1,777	0.27	0.59	4%	10%
Weather - All	74	586	0.18	0.19	3%	3%
Weather - Precipitation	71	518	0.12	0.17	3%	3%
Work Zone	23	258	0.06	0.09	1%	1%
Animals	7	87	0.02	0.03	0%	0%
Weather - Dust/Wind	3	68	0.01	0.02	0%	0%
TOTAL	**2,670**	**18,545**	**6.40**	**6.16**		
Urban Areas	2,280	14,380	5.49	4.78	85%	78%
Rural Areas	390	4,165	0.94	1.38	15%	22%
Tribal Lands	70	510	0.17	0.17	3%	3%

15 APPENDIX C: CRASH DATA BY CRASH TYPE

Fatal Crashes
by Crash Type

Fatal Crashes	Angle		Head On		Left Turn		Rear End		Rear to Rear		Rear to Side		Sideswipe Opposite		Sideswipe Same		Single Vehicle	
	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 1,000 people	Total Crashes	Crashes per 1,000 people	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT
Marana	2	0.17	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.26
Oro Valley	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.11
Pascua Yaqui	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pima County	12	0.14	8	0.09	10	0.11	6	0.07	0	0.00	0	0.00	0	0.00	4	0.05	55	0.63
Sahuarita	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
South Tucson	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.79
Tohono O'odham	1	0.55	1	0.55	0	0.00	1	0.55	0	0.00	0	0.00	0	0.00	0	0.00	12	6.58
Tucson	20	0.12	6	0.03	15	0.09	9	0.05	0	0.00	0	0.00	1	0.01	3	0.02	41	0.24
Unknown	0		0		0		0		0		0		0		0		1	
PAG Region Total	43	0.04	25	0.03	30	0.03	35	0.04	0	0.00	0	0.00	1	0.00	17	0.02	183	0.19
State Total																		

Fatal Crashes	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT
Local Roads Total	35	0.12	15	0.05	25	0.09	16	0.06	0	0.00	0	0.00	1	0.00	7	0.02	114	0.39
State Highways (PAG region)	8	0.06	10	0.08	5	0.04	19	0.15	0	0.00	0	0.00	0	0.00	10	0.08	69	0.54
PAG Region Total	43	0.10	25	0.06	30	0.07	35	0.08	0	0.00	0	0.00	1	0.00	17	0.04	183	0.44
State Total																		

Incapacitating Injury Crashes
by Crash Type

Incapacitating Injury Crashes	Angle		Head On		Left Turn		Rear End		Rear to Rear		Rear to Side		Sideswipe Opposite		Sideswipe Same		Single Vehicle	
	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 1,000 people	Total Crashes	Crashes per 1,000 people	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT	Total Crashes	Crashes per 100mil VMT
Marana	5	0.43	2	0.17	4	0.35	8	0.69	0	0.00	1	0.03	0	0.00	1	0.09	5	0.43
Oro Valley	5	0.55	1	0.11	2	0.22	2	0.22	0	0.00	0	0.00	0	0.00	1	0.11	6	0.66
Pascua Yaqui	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pima County	75	0.86	52	0.60	50	0.57	86	0.99	2	0.01	0	0.00	2	0.02	19	0.22	160	1.83
Sahuarita	0	0.00	1	0.26	3	0.77	1	0.26	0	0.00	0	0.00	0	0.00	0	0.00	3	0.77
South Tucson	2	1.58	1	0.79	0	0.00	3	2.36	0	0.00	0	0.00	1	0.79	0	0.00	2	1.58
Tohono O'odham	1	0.55	2	1.10	1	0.55	8	4.39	0	0.00	0	0.00	2	1.10	1	0.55	16	8.77
Tucson	341	1.98	84	0.49	306	1.78	322	1.87	0	0.00	2	0.00	18	0.10	64	0.37	202	1.17
Unknown	1		0		0		0		0		0		0		0		9	
PAG Region Total	500	0.51	156	0.16	432	0.44	530	0.54	2	0.00	4	0.00	31	0.03	110	0.11	551	0.56
State Total																		

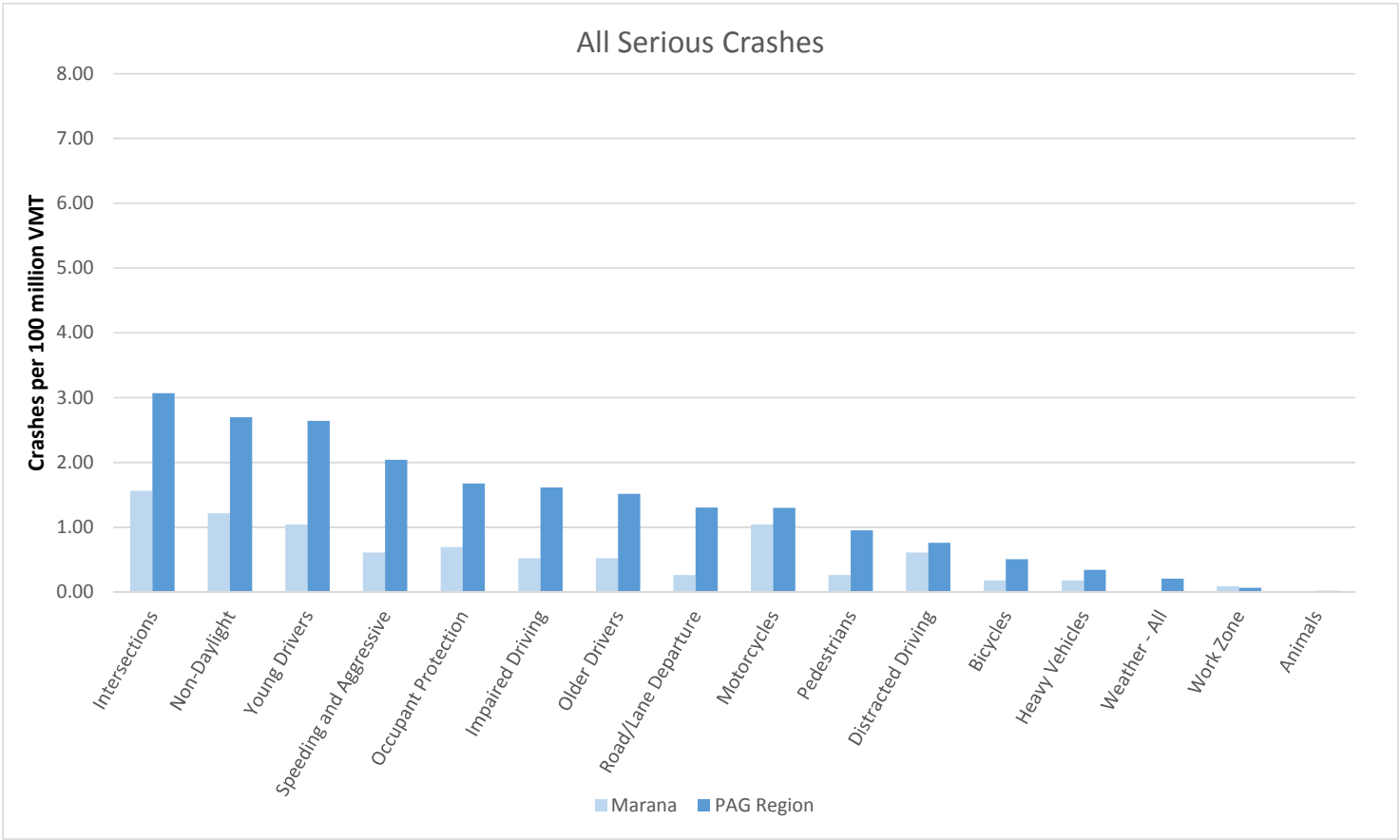
Incapacitating Injury Crashes	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT	Total Crashes*	Crashes per million VMT
Non-State Highways	430	1.49	143	0.49	366	1.27	430	1.49	2	0.01	3	0.01	23	0.08	86	0.30	403	1.39
State Highways (PAG region)	70	0.55	13	0.10	66	0.52	100	0.78	0	0.00	1	0.01	8	0.06	24	0.19	148	1.16
PAG Region Total	500	1.20	156	0.37	432	1.04	530	1.27	2	0.00	4	0.01	31	0.07	110	0.26	551	1.32
State Total																		

16 APPENDIX D: JURISDICTION SAFETY REPORT CARDS

2009-2013

Five-Year Summary: Fatal and Incapacitating Injury Crashes

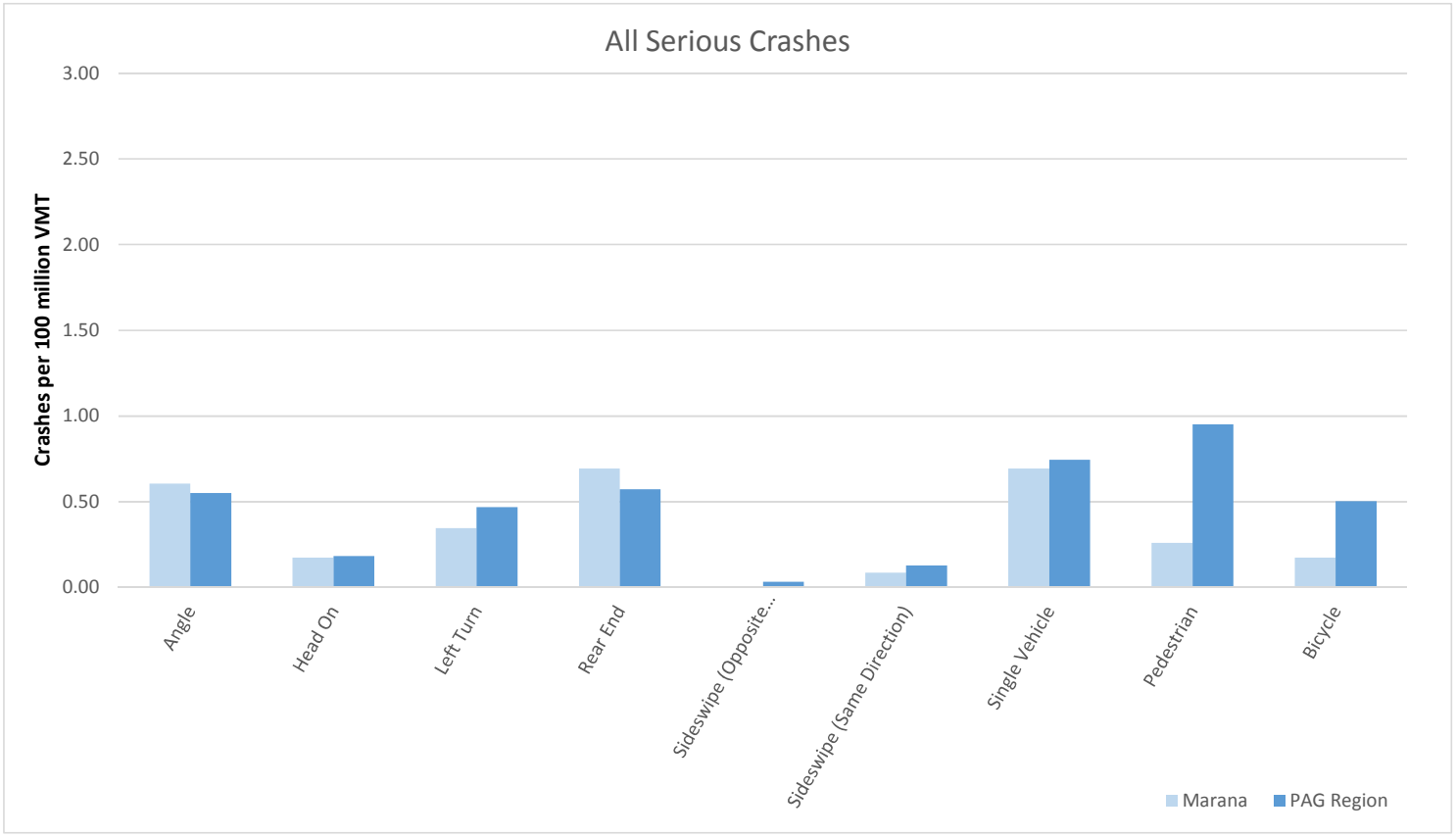
All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Marana	PAG	Marana	PAG	Marana	PAG
Intersections	18	1,281	1.56	3.07	50%	41%
Non-Daylight	14	1,126	1.21	2.70	39%	36%
Young Drivers	12	1,101	1.04	2.64	33%	35%
Speeding and Aggressive	7	851	0.61	2.04	19%	27%
Occupant Protection	8	699	0.69	1.68	22%	22%
Impaired Driving	6	673	0.52	1.61	17%	21%
Older Drivers	6	631	0.52	1.51	17%	20%
Road/Lane Departure	3	544	0.26	1.30	8%	17%
Motorcycles	12	542	1.04	1.30	33%	17%
Pedestrians	3	397	0.26	0.95	8%	13%
Distracted Driving	7	316	0.61	0.76	19%	10%
Bicycles	2	210	0.17	0.50	6%	7%
Heavy Vehicles	2	142	0.17	0.34	6%	5%
Weather - All	0	85	0.00	0.20	0%	3%
Weather - Precipitation	0	81	0.00	0.19	0%	3%
Work Zone	1	26	0.09	0.06	3%	1%
Animals	0	7	0.00	0.02	0%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**36**	**3,138**	**3.12**	**7.52**		



2009-2013

Five-Year Summary: Fatal and Incapacitating Injury Crashes

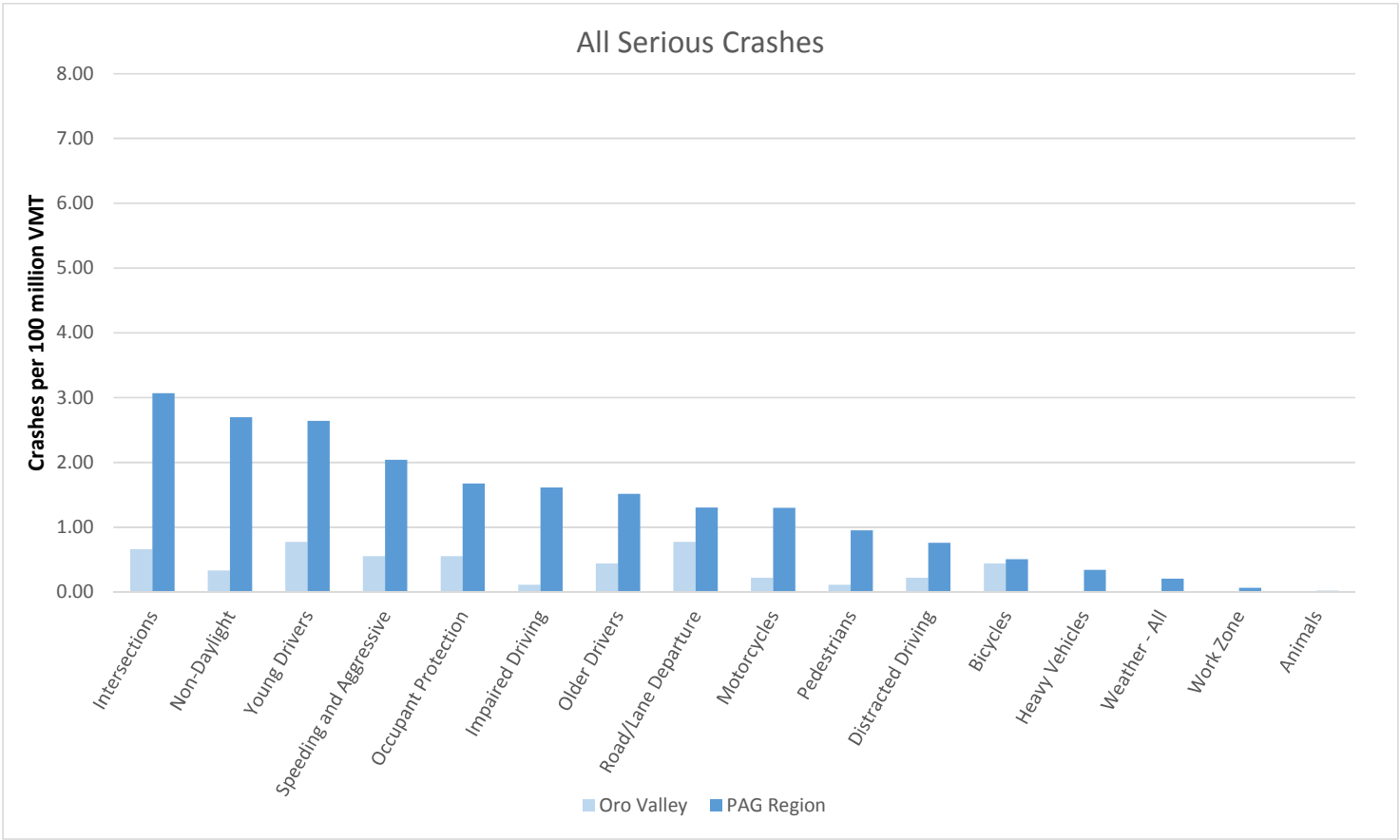
All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Marana	PAG	Marana	PAG	Marana	PAG
Angle	7	543	0.61	0.55	19%	17%
Head On	2	181	0.17	0.18	6%	6%
Left Turn	4	462	0.35	0.47	11%	15%
Rear End	8	565	0.69	0.57	22%	18%
Sideswipe (Opposite Direction)	0	32	0.00	0.03	0%	1%
Sideswipe (Same Direction)	1	127	0.09	0.13	3%	4%
Single Vehicle	8	734	0.69	0.74	22%	23%
Pedestrian	3	397	0.26	0.95	8%	13%
Bicycle	2	210	0.17	0.50	6%	7%
TOTAL	**36**	**3,138**	**3.12**	**7.52**		



2009-2013

Five-Year Summary: Fatal and Incapacitating Injury Crashes

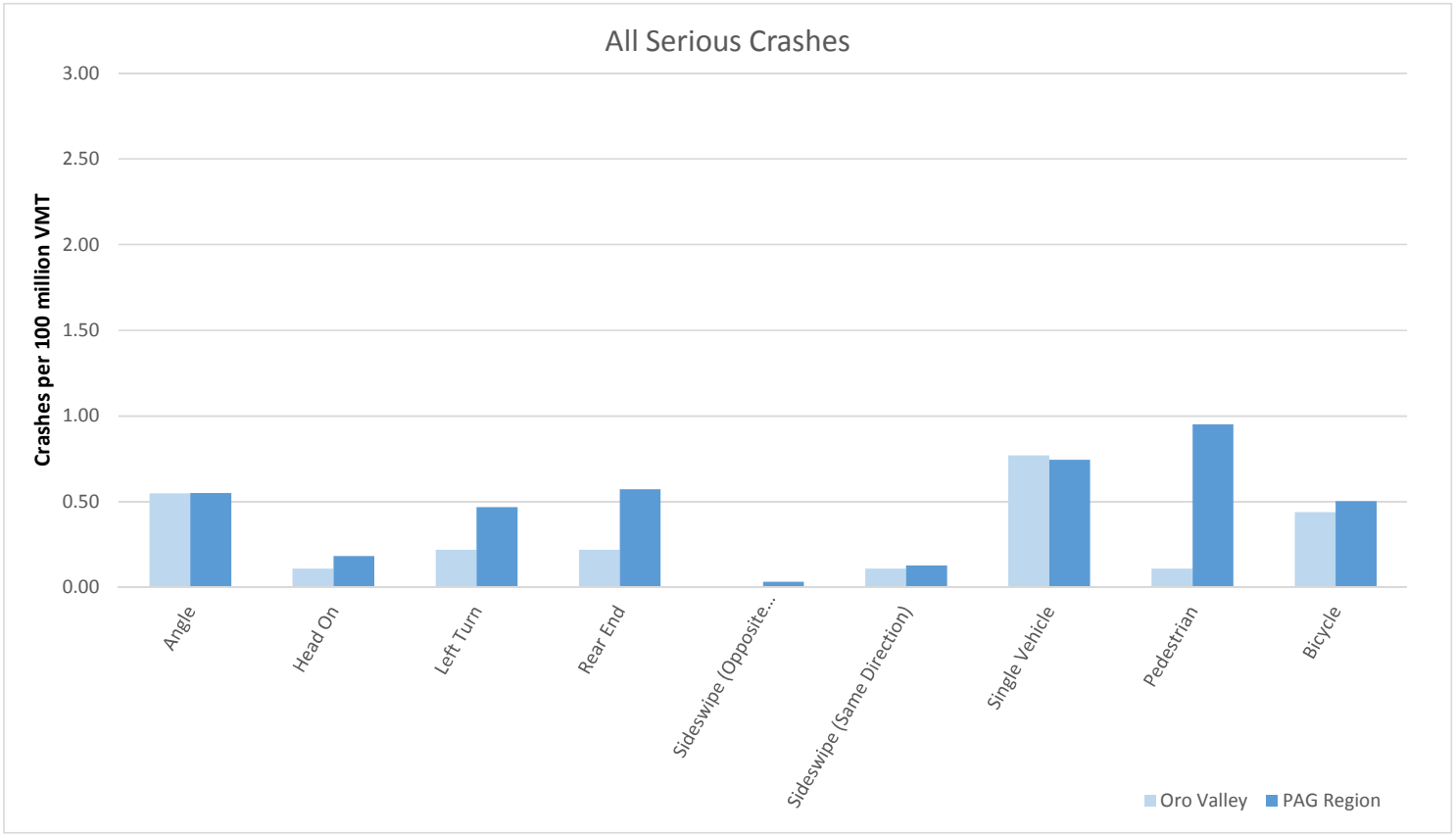
All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Oro Valley	PAG	Oro Valley	PAG	Oro Valley	PAG
Intersections	6	1,281	0.66	3.07	30%	41%
Non-Daylight	3	1,126	0.33	2.70	15%	36%
Young Drivers	7	1,101	0.77	2.64	35%	35%
Speeding and Aggressive	5	851	0.55	2.04	25%	27%
Occupant Protection	5	699	0.55	1.68	25%	22%
Impaired Driving	1	673	0.11	1.61	5%	21%
Older Drivers	4	631	0.44	1.51	20%	20%
Road/Lane Departure	7	544	0.77	1.30	35%	17%
Motorcycles	2	542	0.22	1.30	10%	17%
Pedestrians	1	397	0.11	0.95	5%	13%
Distracted Driving	2	316	0.22	0.76	10%	10%
Bicycles	4	210	0.44	0.50	20%	7%
Heavy Vehicles	0	142	0.00	0.34	0%	5%
Weather - All	0	85	0.00	0.20	0%	3%
Weather - Precipitation	0	81	0.00	0.19	0%	3%
Work Zone	0	26	0.00	0.06	0%	1%
Animals	0	7	0.00	0.02	0%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**20**	**3,138**	**2.20**	**7.52**		



2009-2013

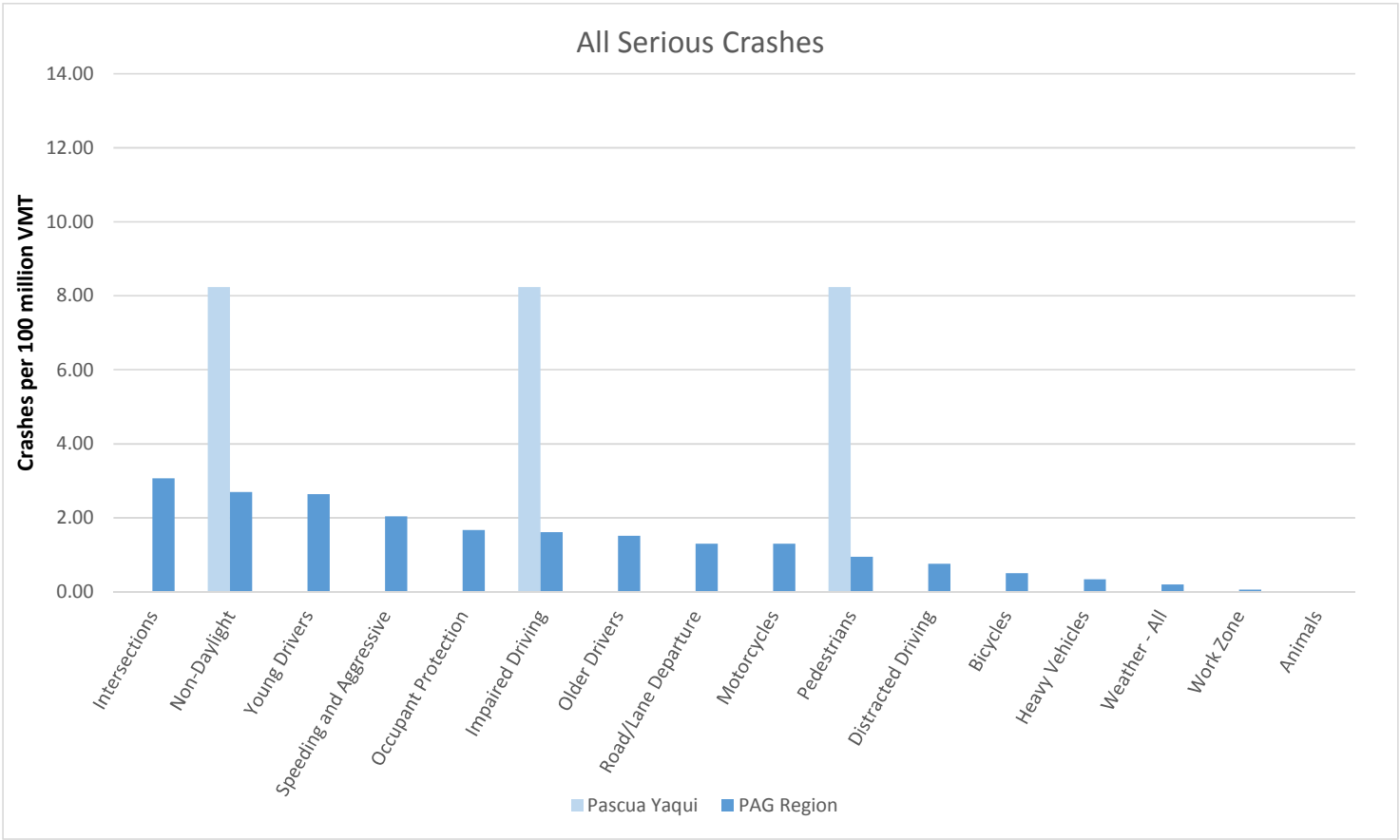
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Oro Valley	PAG	Oro Valley	PAG	Oro Valley	PAG
Angle	5	543	0.55	0.55	25%	17%
Head On	1	181	0.11	0.18	5%	6%
Left Turn	2	462	0.22	0.47	10%	15%
Rear End	2	565	0.22	0.57	10%	18%
Sideswipe (Opposite Direction)	0	32	0.00	0.03	0%	1%
Sideswipe (Same Direction)	1	127	0.11	0.13	5%	4%
Single Vehicle	7	734	0.77	0.74	35%	23%
Pedestrian	1	397	0.11	0.95	5%	13%
Bicycle	4	210	0.44	0.50	20%	7%
TOTAL	**20**	**3,138**	**2.20**	**7.52**		



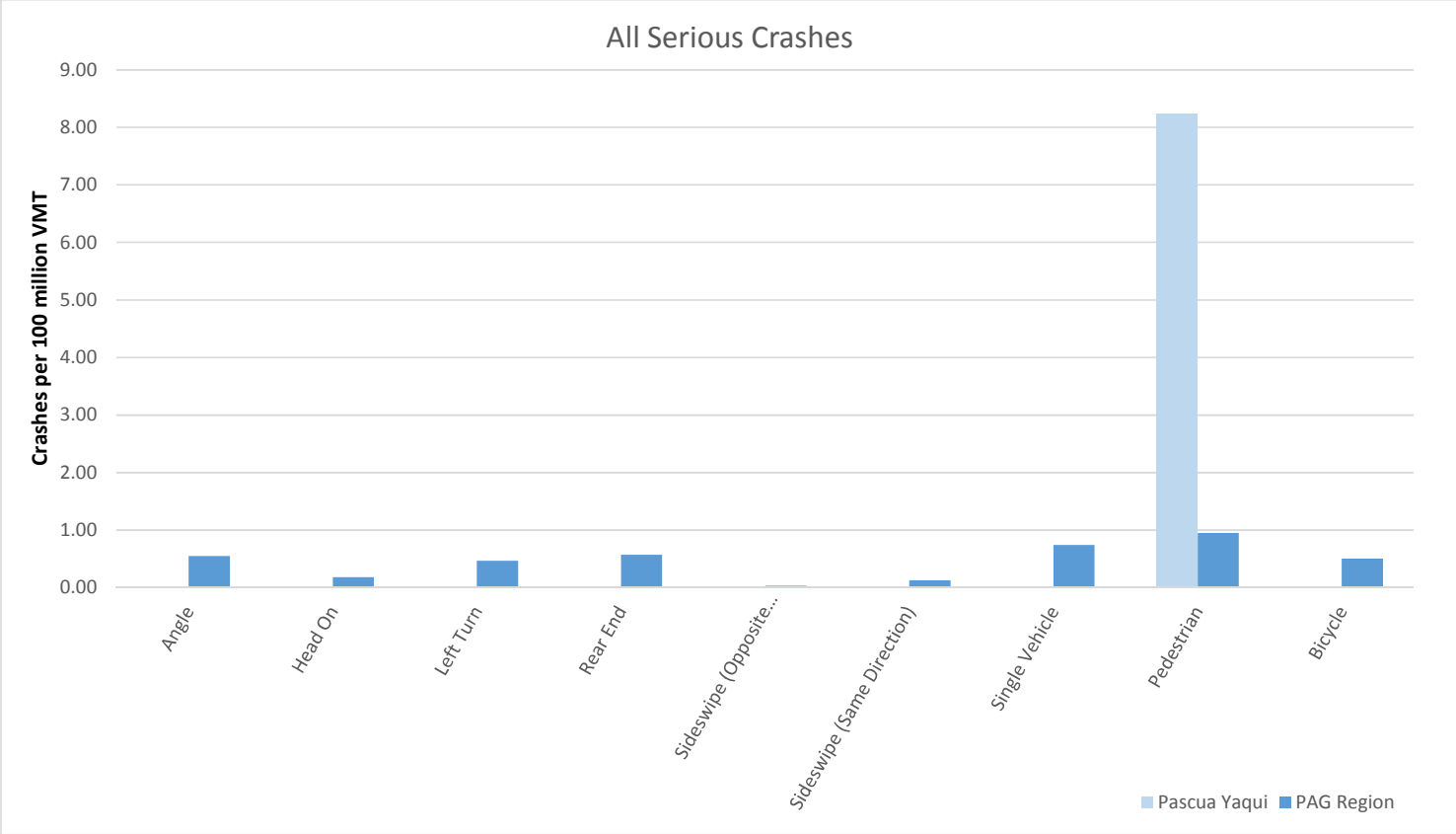
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Pascua Yaqui	PAG	Pascua Yaqui	PAG	Pascua Yaqui	PAG
Intersections	0	1,281	0.00	3.07	0%	41%
Non-Daylight	1	1,126	8.23	2.70	100%	36%
Young Drivers	0	1,101	0.00	2.64	0%	35%
Speeding and Aggressive	0	851	0.00	2.04	0%	27%
Occupant Protection	0	699	0.00	1.68	0%	22%
Impaired Driving	1	673	8.23	1.61	100%	21%
Older Drivers	0	631	0.00	1.51	0%	20%
Road/Lane Departure	0	544	0.00	1.30	0%	17%
Motorcycles	0	542	0.00	1.30	0%	17%
Pedestrians	1	397	8.23	0.95	100%	13%
Distracted Driving	0	316	0.00	0.76	0%	10%
Bicycles	0	210	0.00	0.50	0%	7%
Heavy Vehicles	0	142	0.00	0.34	0%	5%
Weather - All	0	85	0.00	0.20	0%	3%
Weather - Precipitation	0	81	0.00	0.19	0%	3%
Work Zone	0	26	0.00	0.06	0%	1%
Animals	0	7	0.00	0.02	0%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**1**	**3,138**	**8.23**	**7.52**		



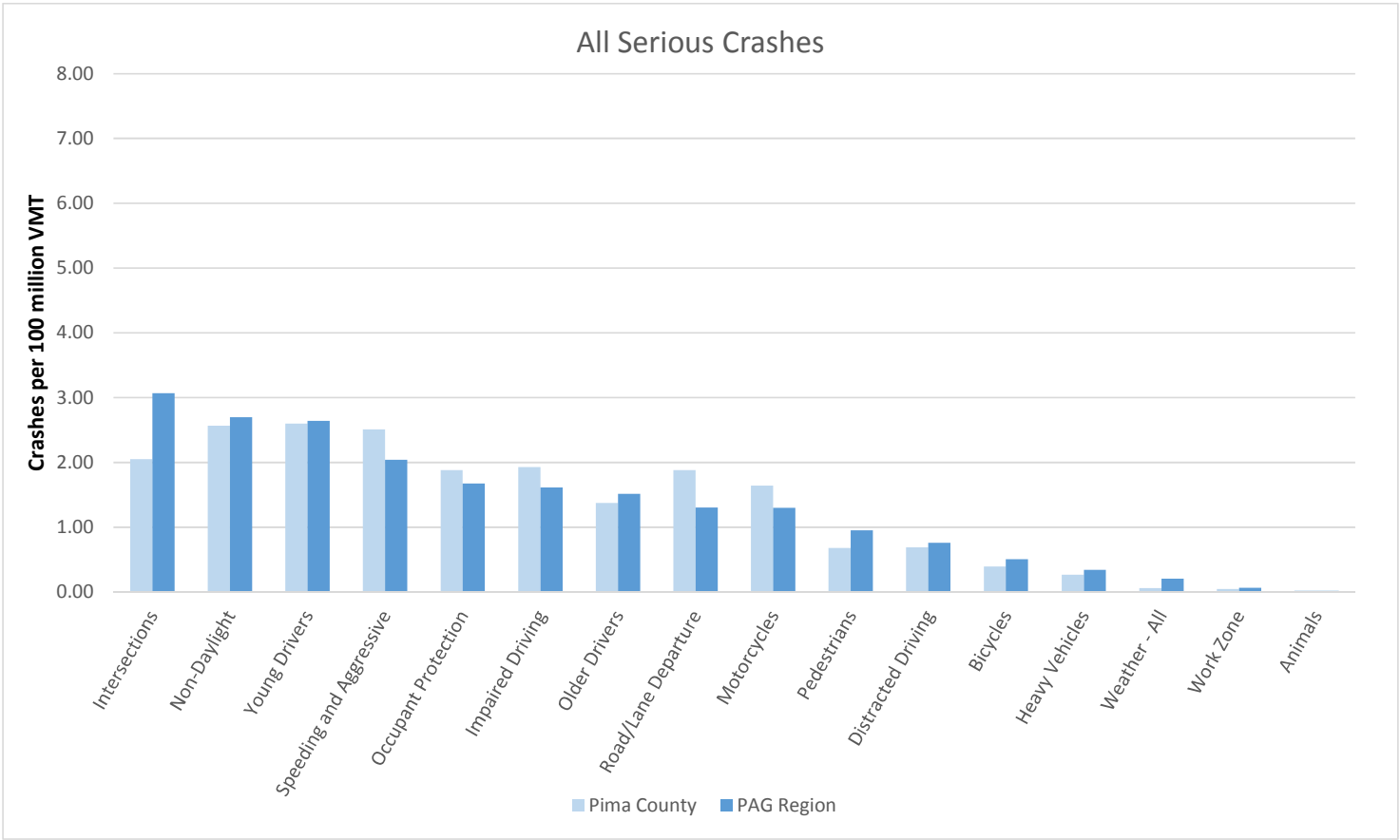
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Pascua Yaqui	PAG	Pascua Yaqui	PAG	Pascua Yaqui	PAG
Angle	0	543	0.00	0.55	0%	17%
Head On	0	181	0.00	0.18	0%	6%
Left Turn	0	462	0.00	0.47	0%	15%
Rear End	0	565	0.00	0.57	0%	18%
Sideswipe (Opposite Direction)	0	32	0.00	0.03	0%	1%
Sideswipe (Same Direction)	0	127	0.00	0.13	0%	4%
Single Vehicle	0	734	0.00	0.74	0%	23%
Pedestrian	1	397	8.23	0.95	100%	13%
Bicycle	0	210	0.00	0.50	0%	7%
TOTAL	**1**	**3,138**	**8.23**	**7.52**		



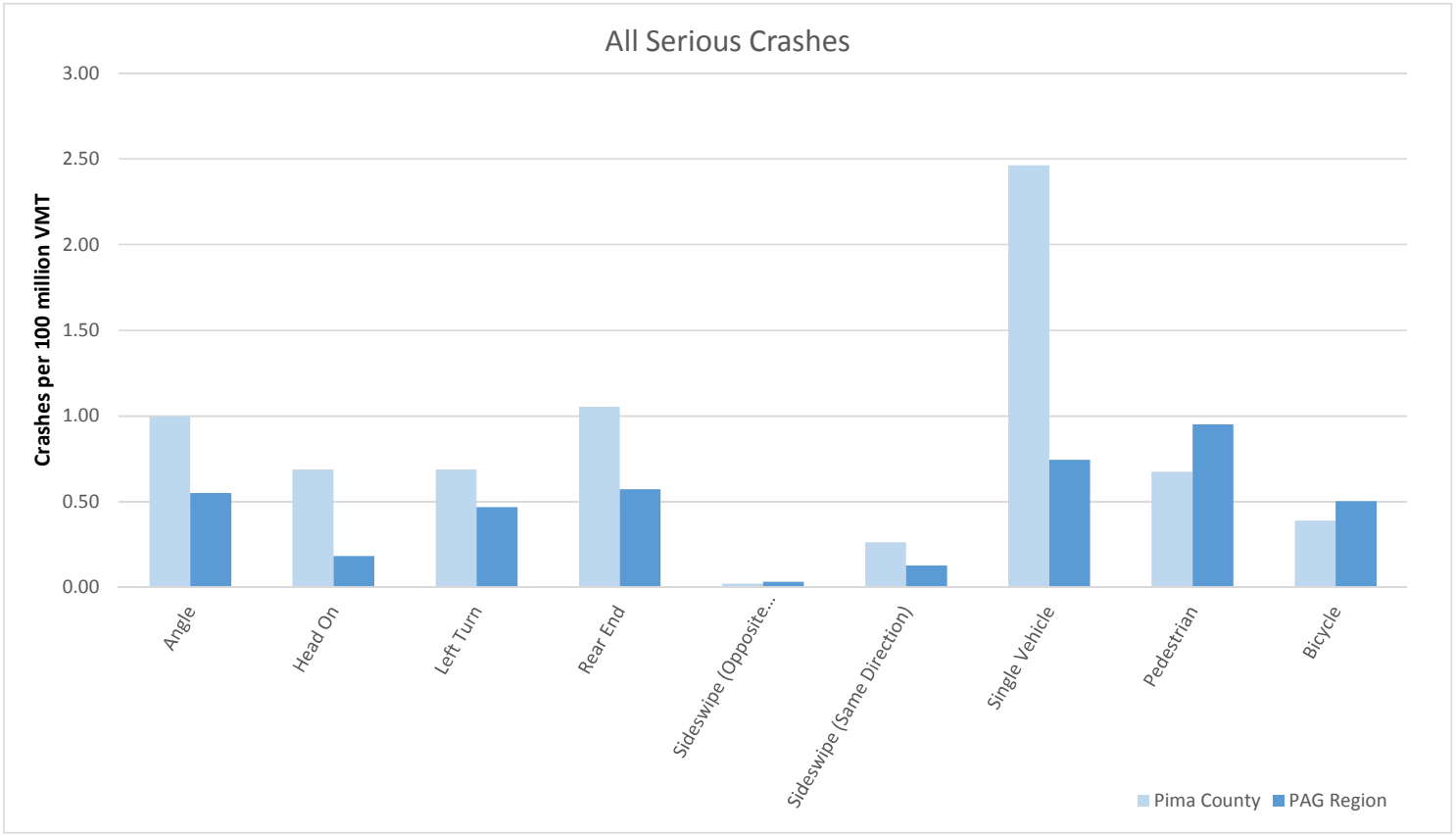
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Pima County	PAG	Pima County	PAG	Pima County	PAG
Intersections	179	1,281	2.05	3.07	29%	41%
Non-Daylight	224	1,126	2.57	2.70	37%	36%
Young Drivers	227	1,101	2.60	2.64	37%	35%
Speeding and Aggressive	219	851	2.51	2.04	36%	27%
Occupant Protection	164	699	1.88	1.68	27%	22%
Impaired Driving	168	673	1.93	1.61	28%	21%
Older Drivers	120	631	1.38	1.51	20%	20%
Road/Lane Departure	164	544	1.88	1.30	27%	17%
Motorcycles	143	542	1.64	1.30	23%	17%
Pedestrians	59	397	0.68	0.95	10%	13%
Distracted Driving	60	316	0.69	0.76	10%	10%
Bicycles	34	210	0.39	0.50	6%	7%
Heavy Vehicles	23	142	0.26	0.34	4%	5%
Weather - All	5	85	0.06	0.20	1%	3%
Weather - Precipitation	4	81	0.05	0.19	1%	3%
Work Zone	4	26	0.05	0.06	1%	1%
Animals	2	7	0.02	0.02	0%	0%
Weather - Dust/Wind	1	4	0.01	0.01	0%	0%
TOTAL	**609**	**3,138**	**6.98**	**7.52**		



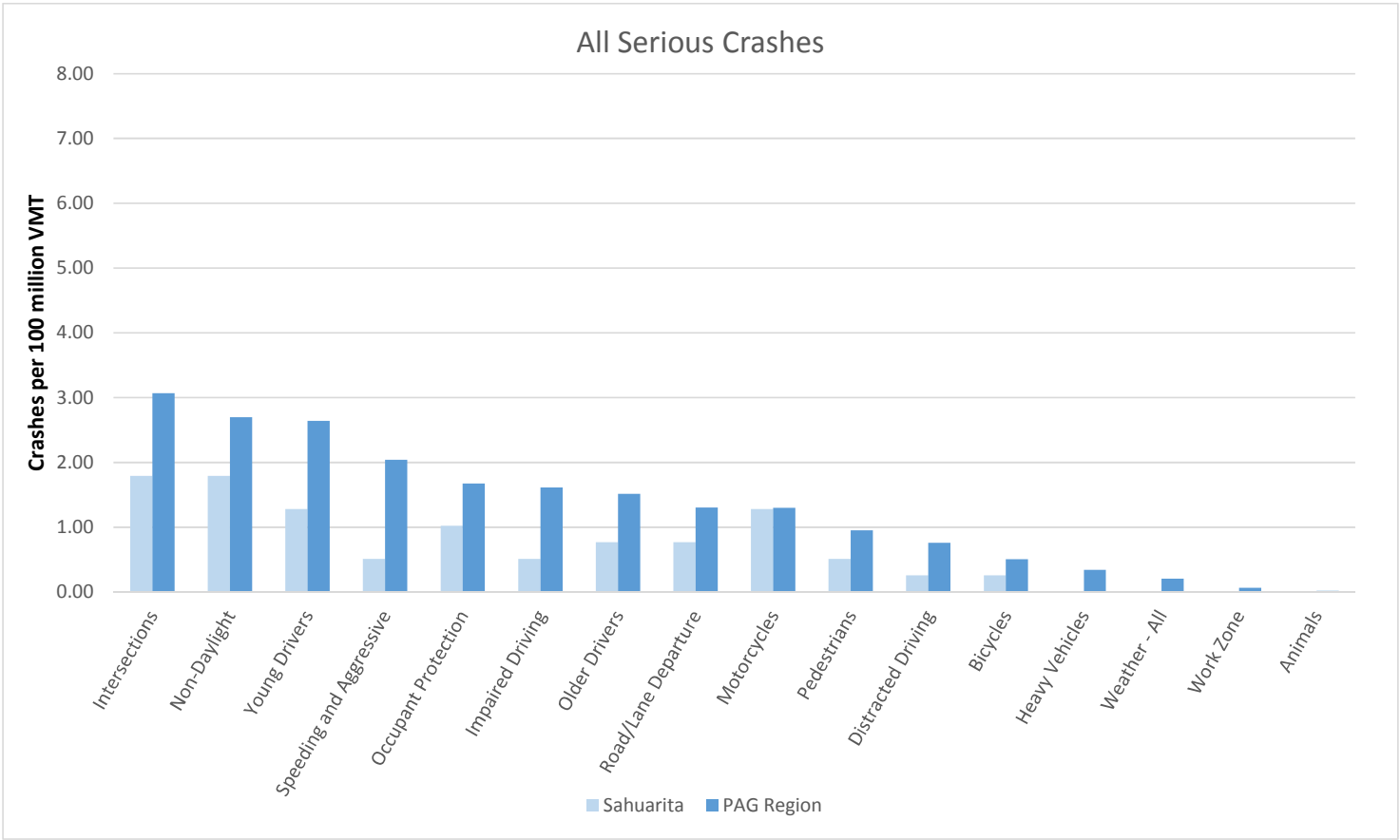
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Pima County	PAG	Pima County	PAG	Pima County	PAG
Angle	87	543	1.00	0.55	14%	17%
Head On	60	181	0.69	0.18	10%	6%
Left Turn	60	462	0.69	0.47	10%	15%
Rear End	92	565	1.05	0.57	15%	18%
Sideswipe (Opposite Direction)	2	32	0.02	0.03	0%	1%
Sideswipe (Same Direction)	23	127	0.26	0.13	4%	4%
Single Vehicle	215	734	2.46	0.74	35%	23%
Pedestrian	59	397	0.68	0.95	10%	13%
Bicycle	34	210	0.39	0.50	6%	7%
TOTAL	**609**	**3,138**	**6.98**	**7.52**		



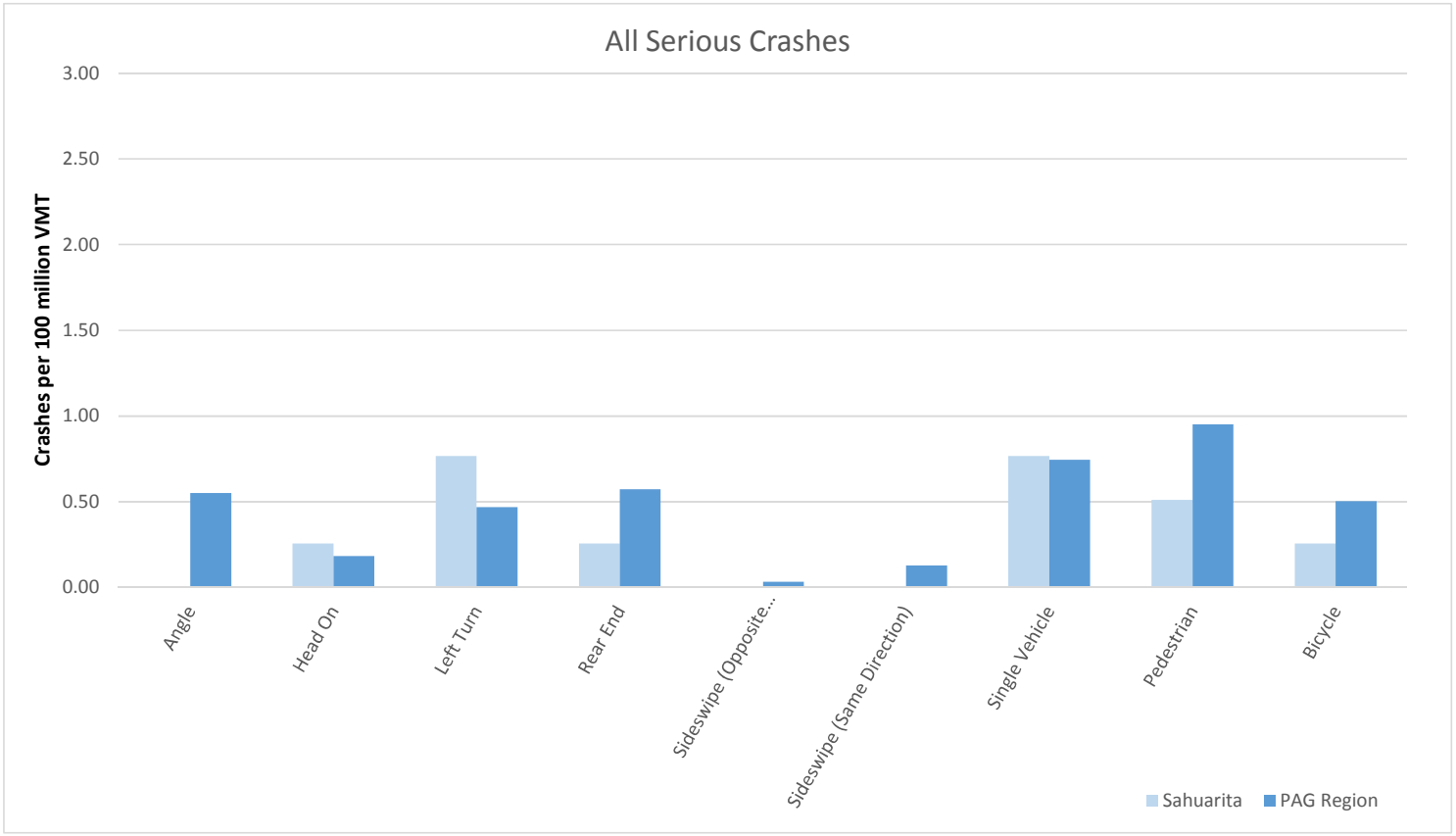
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Sahuarita	PAG	Sahuarita	PAG	Sahuarita	PAG
Intersections	7	1,281	1.79	3.07	50%	41%
Non-Daylight	7	1,126	1.79	2.70	50%	36%
Young Drivers	5	1,101	1.28	2.64	36%	35%
Speeding and Aggressive	2	851	0.51	2.04	14%	27%
Occupant Protection	4	699	1.02	1.68	29%	22%
Impaired Driving	2	673	0.51	1.61	14%	21%
Older Drivers	3	631	0.77	1.51	21%	20%
Road/Lane Departure	3	544	0.77	1.30	21%	17%
Motorcycles	5	542	1.28	1.30	36%	17%
Pedestrians	2	397	0.51	0.95	14%	13%
Distracted Driving	1	316	0.26	0.76	7%	10%
Bicycles	1	210	0.26	0.50	7%	7%
Heavy Vehicles	0	142	0.00	0.34	0%	5%
Weather - All	0	85	0.00	0.20	0%	3%
Weather - Precipitation	0	81	0.00	0.19	0%	3%
Work Zone	0	26	0.00	0.06	0%	1%
Animals	0	7	0.00	0.02	0%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**14**	**3,138**	**3.58**	**7.52**		



Five-Year Summary: Fatal and Incapacitating Injury Crashes

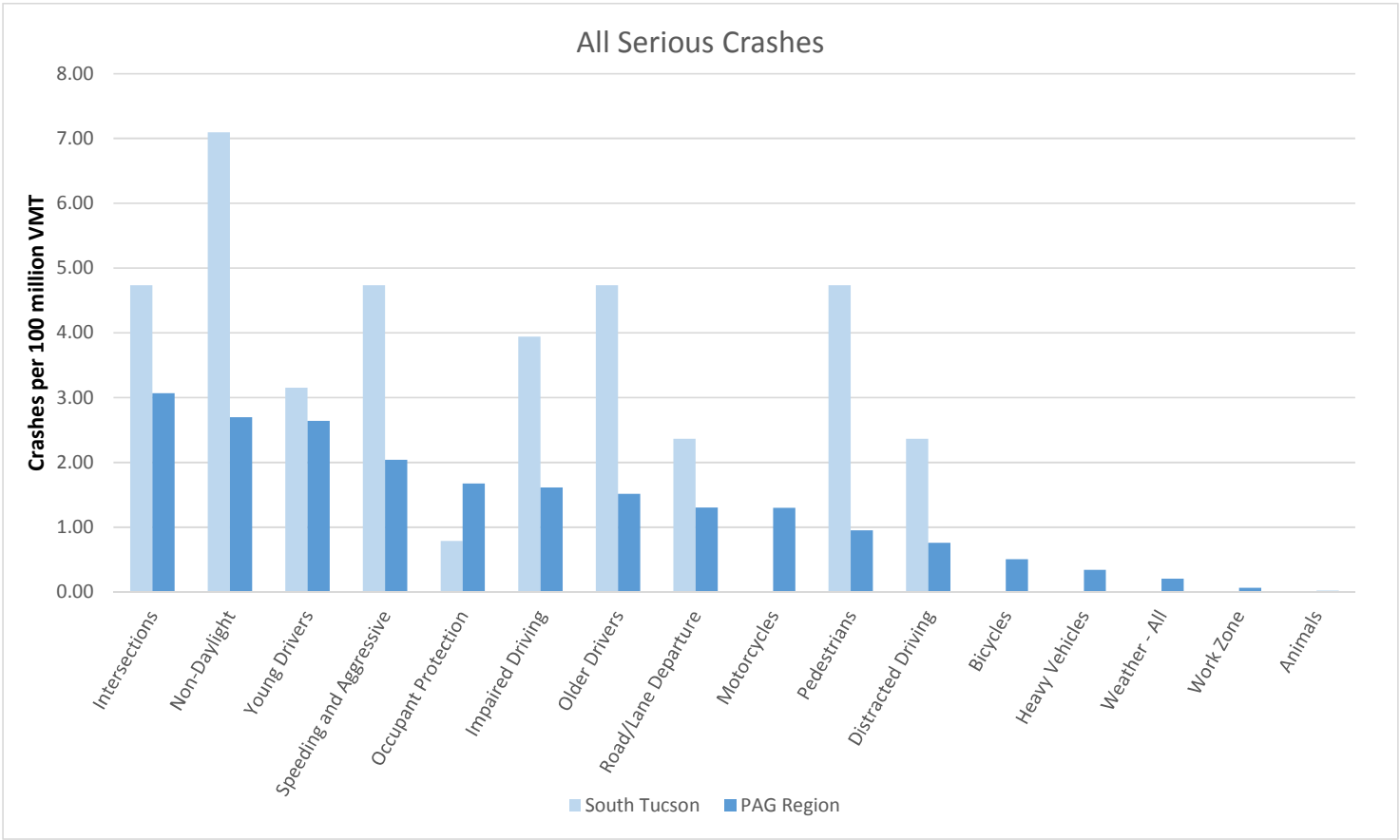
All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Sahuarita	PAG	Sahuarita	PAG	Sahuarita	PAG
Angle	0	543	0.00	0.55	0%	17%
Head On	1	181	0.26	0.18	7%	6%
Left Turn	3	462	0.77	0.47	21%	15%
Rear End	1	565	0.26	0.57	7%	18%
Sideswipe (Opposite Direction)	0	32	0.00	0.03	0%	1%
Sideswipe (Same Direction)	0	127	0.00	0.13	0%	4%
Single Vehicle	3	734	0.77	0.74	21%	23%
Pedestrian	2	397	0.51	0.95	14%	13%
Bicycle	1	210	0.26	0.50	7%	7%
TOTAL	**14**	**3,138**	**3.58**	**7.52**		



2009-2013

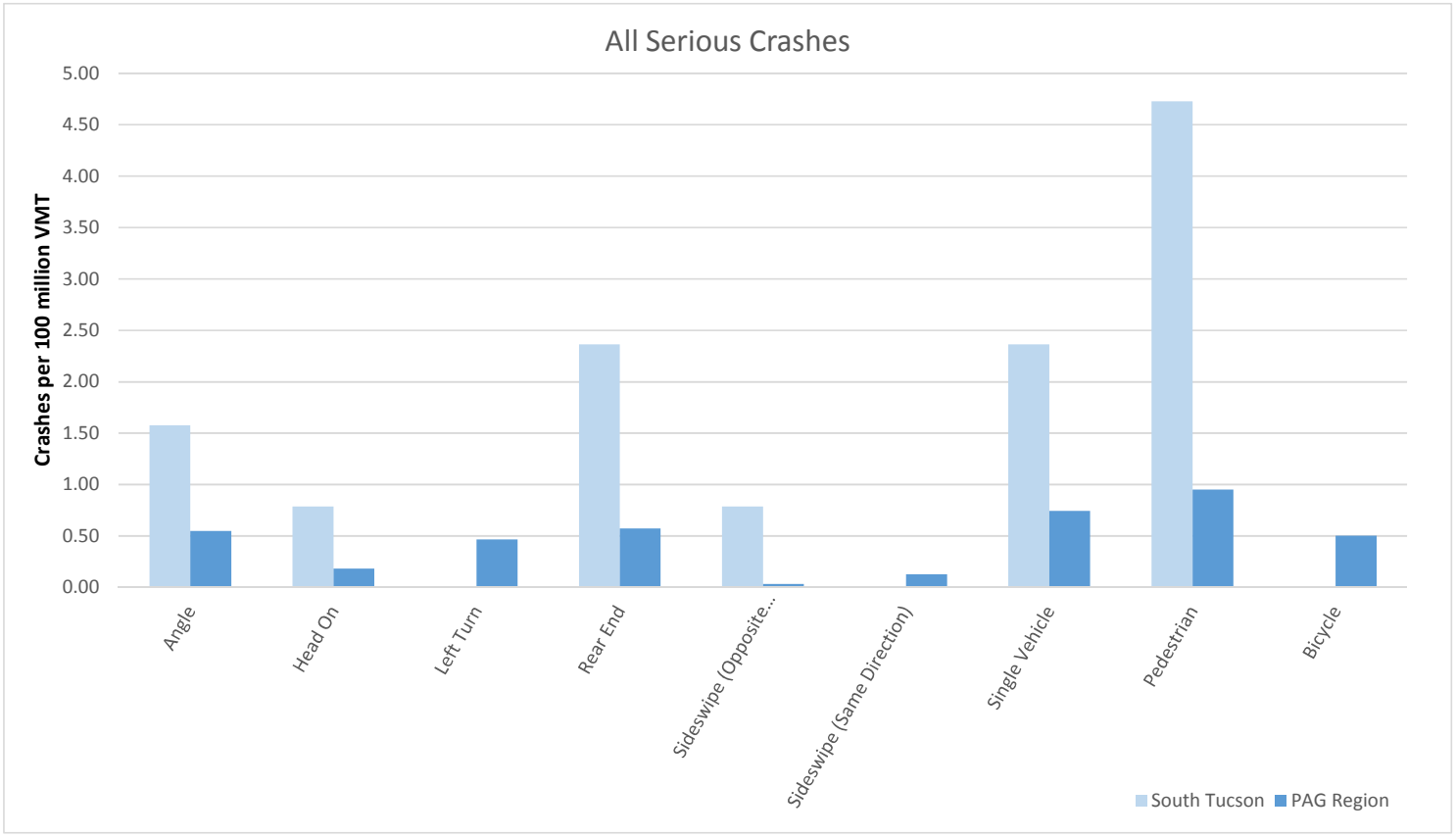
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	South Tucson	PAG	South Tucson	PAG	South Tucson	PAG
Intersections	6	1,281	4.73	3.07	40%	41%
Non-Daylight	9	1,126	7.09	2.70	60%	36%
Young Drivers	4	1,101	3.15	2.64	27%	35%
Speeding and Aggressive	6	851	4.73	2.04	40%	27%
Occupant Protection	1	699	0.79	1.68	7%	22%
Impaired Driving	5	673	3.94	1.61	33%	21%
Older Drivers	6	631	4.73	1.51	40%	20%
Road/Lane Departure	3	544	2.36	1.30	20%	17%
Motorcycles	0	542	0.00	1.30	0%	17%
Pedestrians	6	397	4.73	0.95	40%	13%
Distracted Driving	3	316	2.36	0.76	20%	10%
Bicycles	0	210	0.00	0.50	0%	7%
Heavy Vehicles	0	142	0.00	0.34	0%	5%
Weather - All	0	85	0.00	0.20	0%	3%
Weather - Precipitation	0	81	0.00	0.19	0%	3%
Work Zone	0	26	0.00	0.06	0%	1%
Animals	0	7	0.00	0.02	0%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**15**	**3,138**	**11.82**	**7.52**		



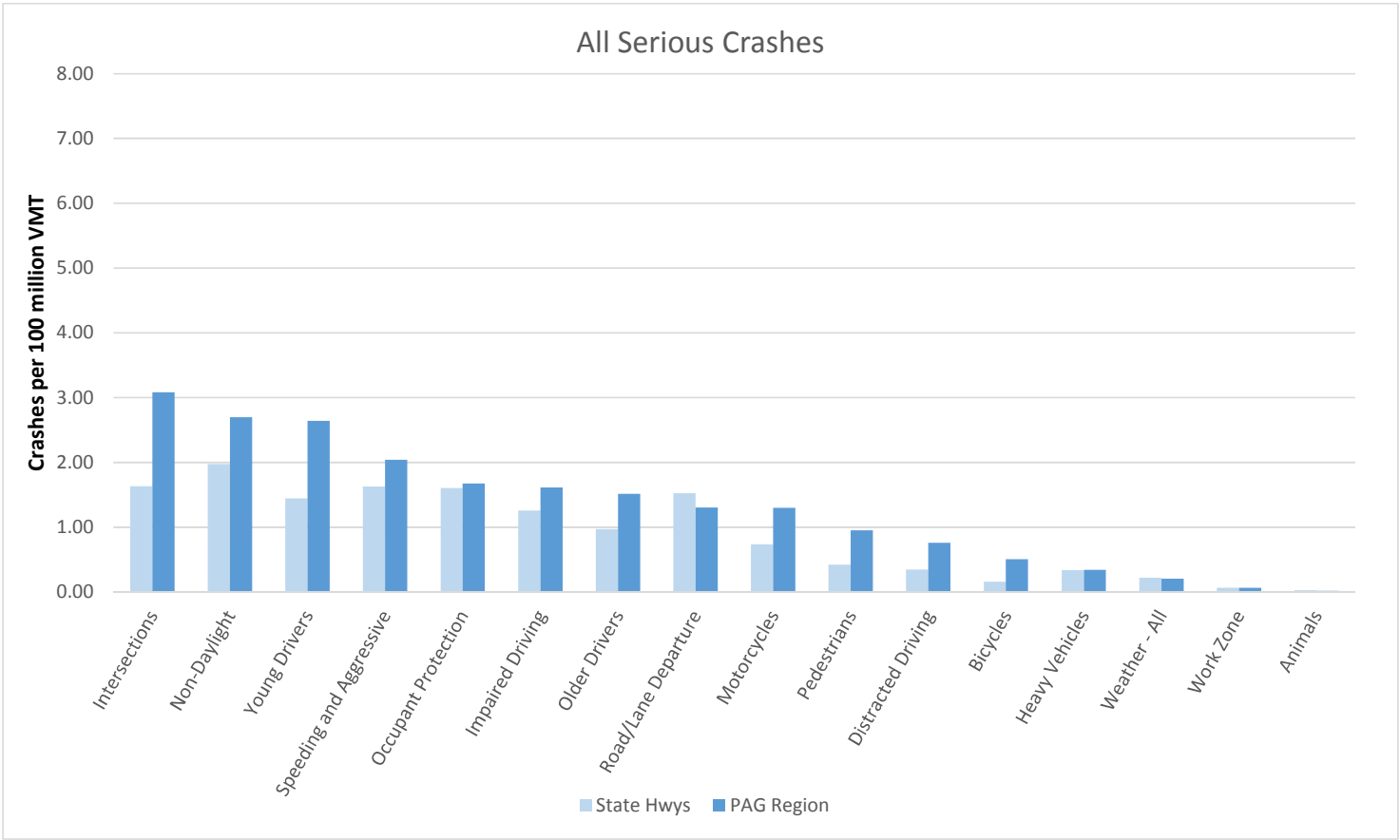
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	South Tucson	PAG	South Tucson	PAG	South Tucson	PAG
Angle	2	543	1.58	0.55	13%	17%
Head On	1	181	0.79	0.18	7%	6%
Left Turn	0	462	0.00	0.47	0%	15%
Rear End	3	565	2.36	0.57	20%	18%
Sideswipe (Opposite Direction)	1	32	0.79	0.03	7%	1%
Sideswipe (Same Direction)	0	127	0.00	0.13	0%	4%
Single Vehicle	3	734	2.36	0.74	20%	23%
Pedestrian	6	397	4.73	0.95	40%	13%
Bicycle	0	210	0.00	0.50	0%	7%
TOTAL	**15**	**3,138**	**11.82**	**7.52**		



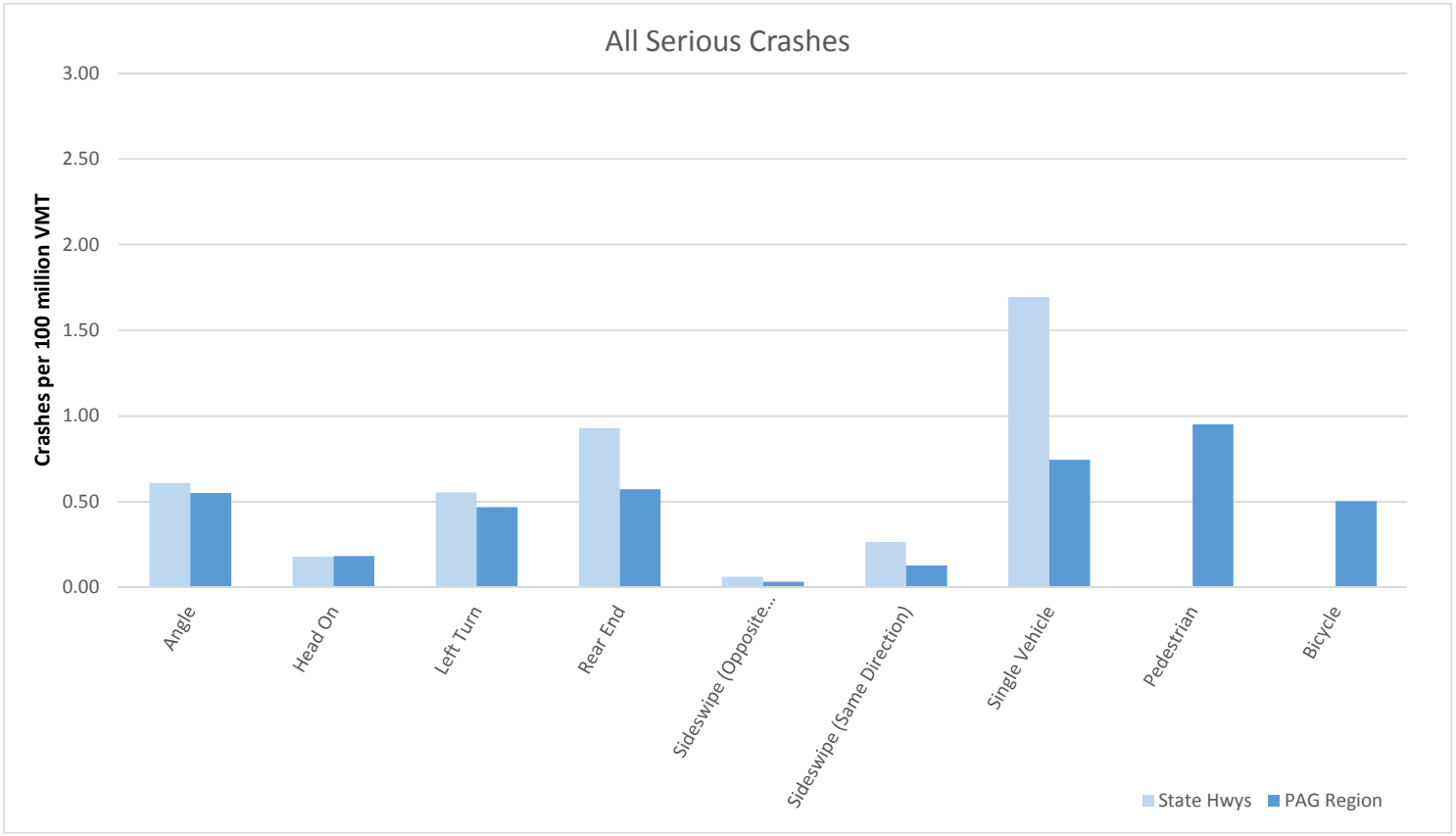
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	State Hwys	PAG	State Hwys	PAG	State Hwys	PAG
Intersections	209	1,286	1.63	3.08	34%	41%
Non-Daylight	253	1,126	1.98	2.70	41%	36%
Young Drivers	185	1,101	1.45	2.64	30%	35%
Speeding and Aggressive	208	851	1.62	2.04	33%	27%
Occupant Protection	205	699	1.60	1.68	33%	22%
Impaired Driving	161	673	1.26	1.61	26%	21%
Older Drivers	124	631	0.97	1.51	20%	20%
Road/Lane Departure	195	544	1.52	1.30	31%	17%
Motorcycles	94	542	0.73	1.30	15%	17%
Pedestrians	54	397	0.42	0.95	9%	13%
Distracted Driving	44	316	0.34	0.76	7%	10%
Bicycles	20	210	0.16	0.50	3%	7%
Heavy Vehicles	43	142	0.34	0.34	7%	5%
Weather - All	28	85	0.22	0.20	5%	3%
Weather - Precipitation	27	81	0.09	0.14	4%	3%
Work Zone	8	26	0.06	0.06	1%	1%
Animals	3	7	0.02	0.02	0%	0%
Weather - Dust/Wind	1	4	0.00	0.01	0%	0%
TOTAL	**621**	**3,138**	**4.84**	**7.52**		



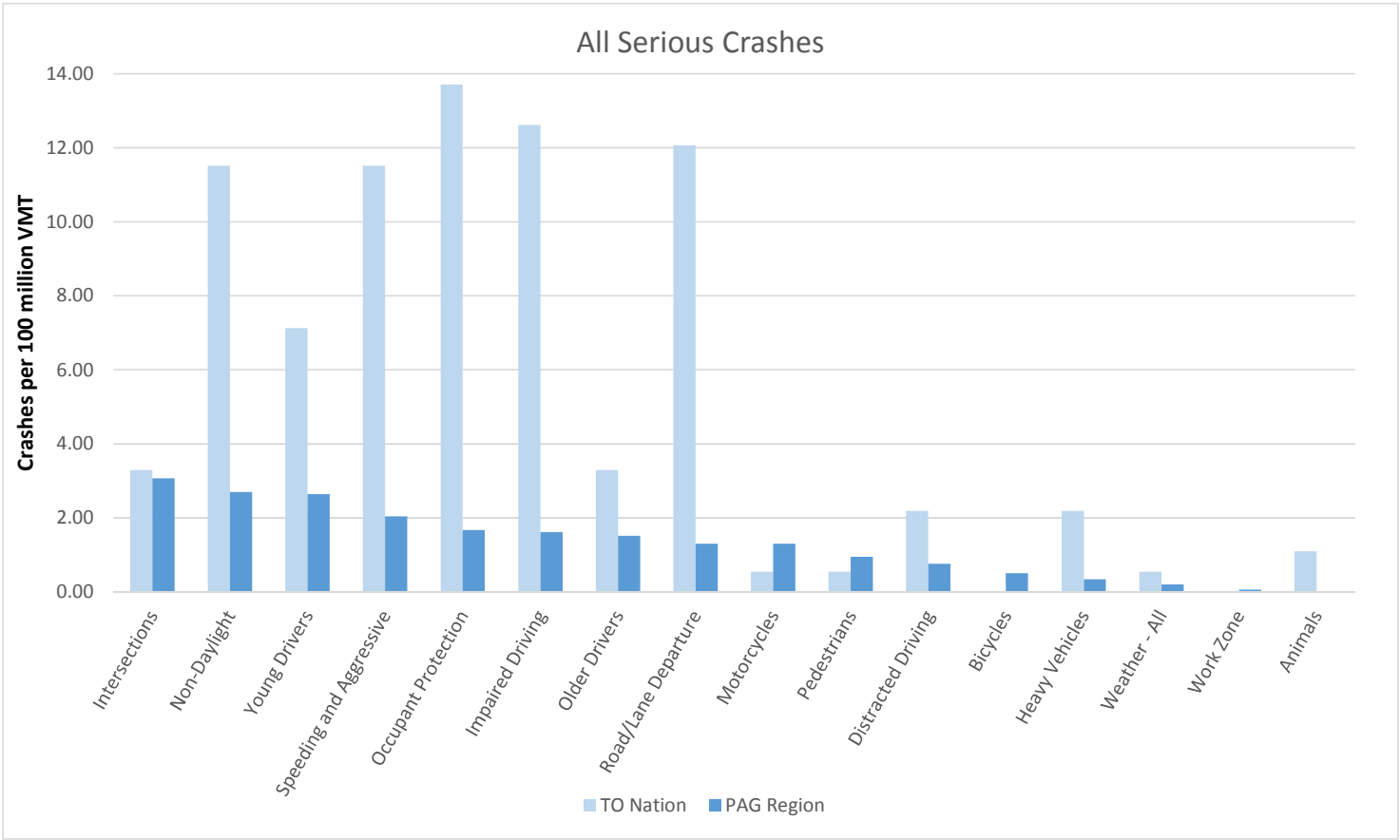
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	State Hwys	PAG	State Hwys	PAG	State Hwys	PAG
Angle	78	543	0.61	0.55	13%	17%
Head On	23	181	0.18	0.18	4%	6%
Left Turn	71	462	0.55	0.47	11%	15%
Rear End	119	565	0.93	0.57	19%	18%
Sideswipe (Opposite Direction)	8	32	0.06	0.03	1%	1%
Sideswipe (Same Direction)	34	127	0.27	0.13	5%	4%
Single Vehicle	217	734	1.70	0.74	35%	23%
Pedestrian	0	397	0.00	0.95	0%	13%
Bicycle	0	210	0.00	0.50	0%	7%
TOTAL	**621**	**3,138**	**4.84**	**7.52**		



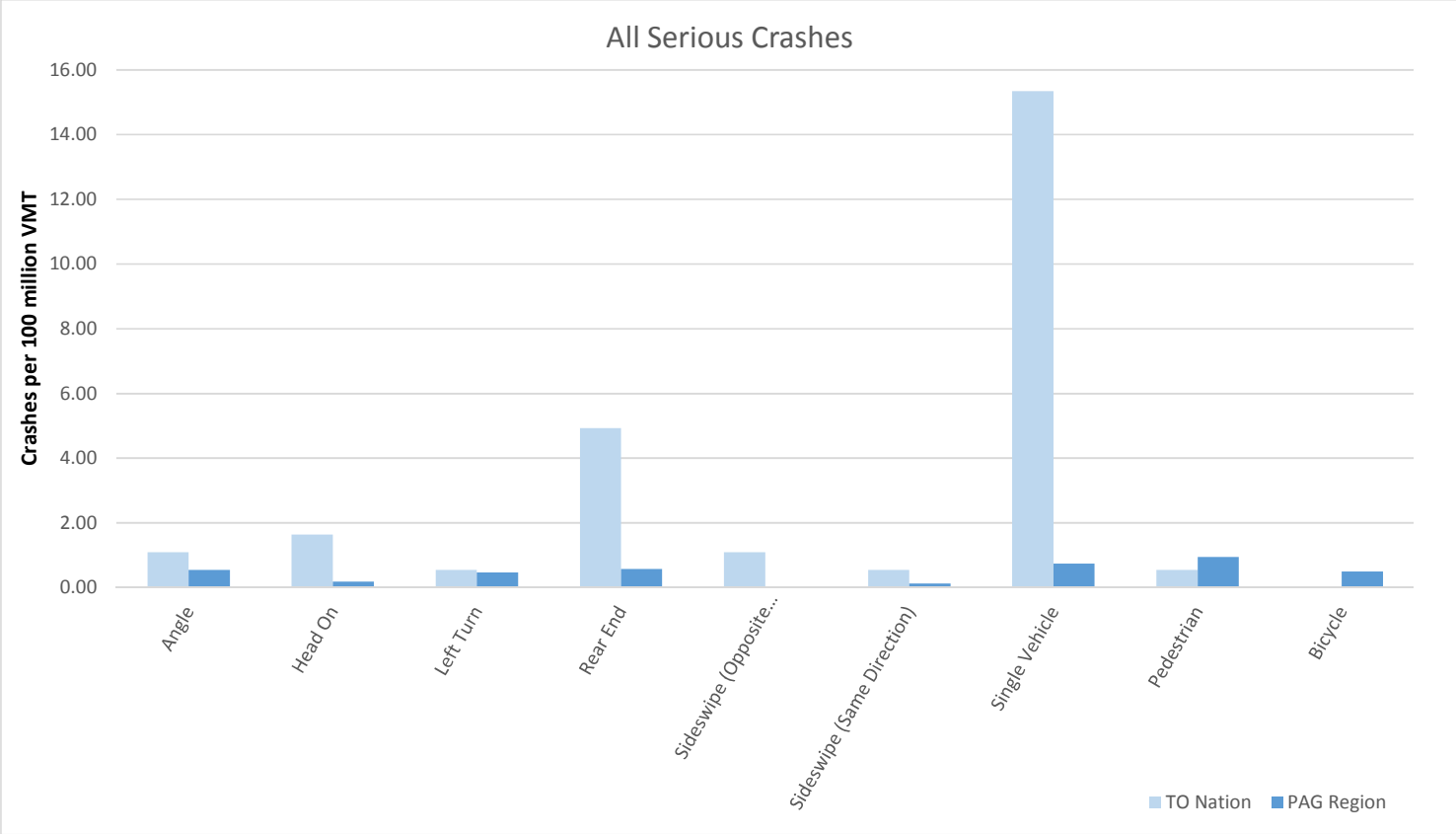
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	TO Nation	PAG	TO Nation	PAG	TO Nation	PAG
Intersections	6	1,281	3.29	3.07	13%	41%
Non-Daylight	21	1,126	11.51	2.70	45%	36%
Young Drivers	13	1,101	7.13	2.64	28%	35%
Speeding and Aggressive	21	851	11.51	2.04	45%	27%
Occupant Protection	25	699	13.71	1.68	53%	22%
Impaired Driving	23	673	12.61	1.61	49%	21%
Older Drivers	6	631	3.29	1.51	13%	20%
Road/Lane Departure	22	544	12.06	1.30	47%	17%
Motorcycles	1	542	0.55	1.30	2%	17%
Pedestrians	1	397	0.55	0.95	2%	13%
Distracted Driving	4	316	2.19	0.76	9%	10%
Bicycles	0	210	0.00	0.50	0%	7%
Heavy Vehicles	4	142	2.19	0.34	9%	5%
Weather - All	1	85	0.55	0.20	2%	3%
Weather - Precipitation	1	81	0.55	0.19	2%	3%
Work Zone	0	26	0.00	0.06	0%	1%
Animals	2	7	1.10	0.02	4%	0%
Weather - Dust/Wind	0	4	0.00	0.01	0%	0%
TOTAL	**47**	**3,138**	**25.77**	**7.52**		



Five-Year Summary: Fatal and Incapacitating Injury Crashes

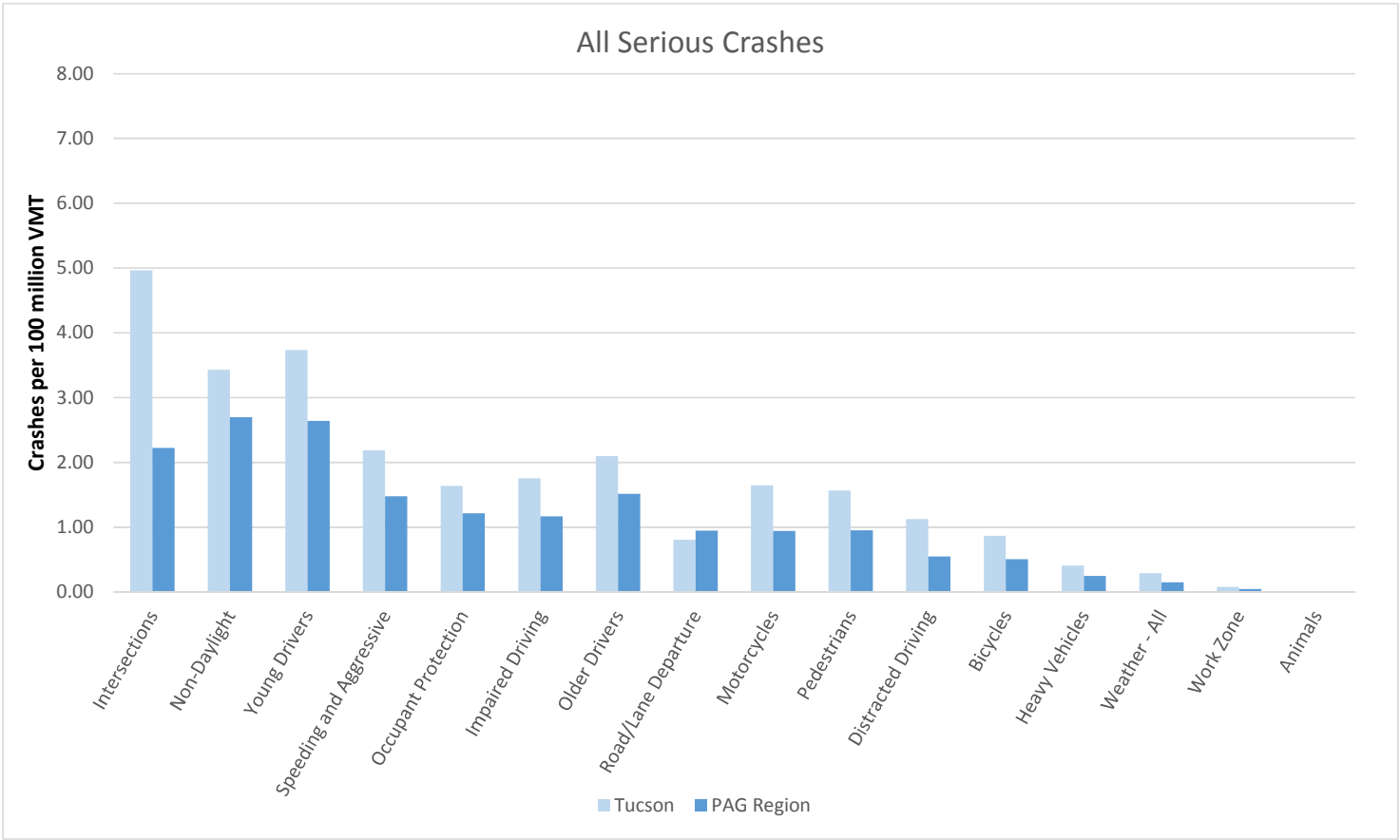
All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	TO Nation	PAG	TO Nation	PAG	TO Nation	PAG
Angle	2	543	1.10	0.55	4%	17%
Head On	3	181	1.64	0.18	6%	6%
Left Turn	1	462	0.55	0.47	2%	15%
Rear End	9	565	4.93	0.57	19%	18%
Sideswipe (Opposite Direction)	2	32	1.10	0.03	4%	1%
Sideswipe (Same Direction)	1	127	0.55	0.13	2%	4%
Single Vehicle	28	734	15.35	0.74	60%	23%
Pedestrian	1	397	0.55	0.95	2%	13%
Bicycle	0	210	0.00	0.50	0%	7%
TOTAL	**47**	**3,138**	**25.77**	**7.52**		



2009-2013

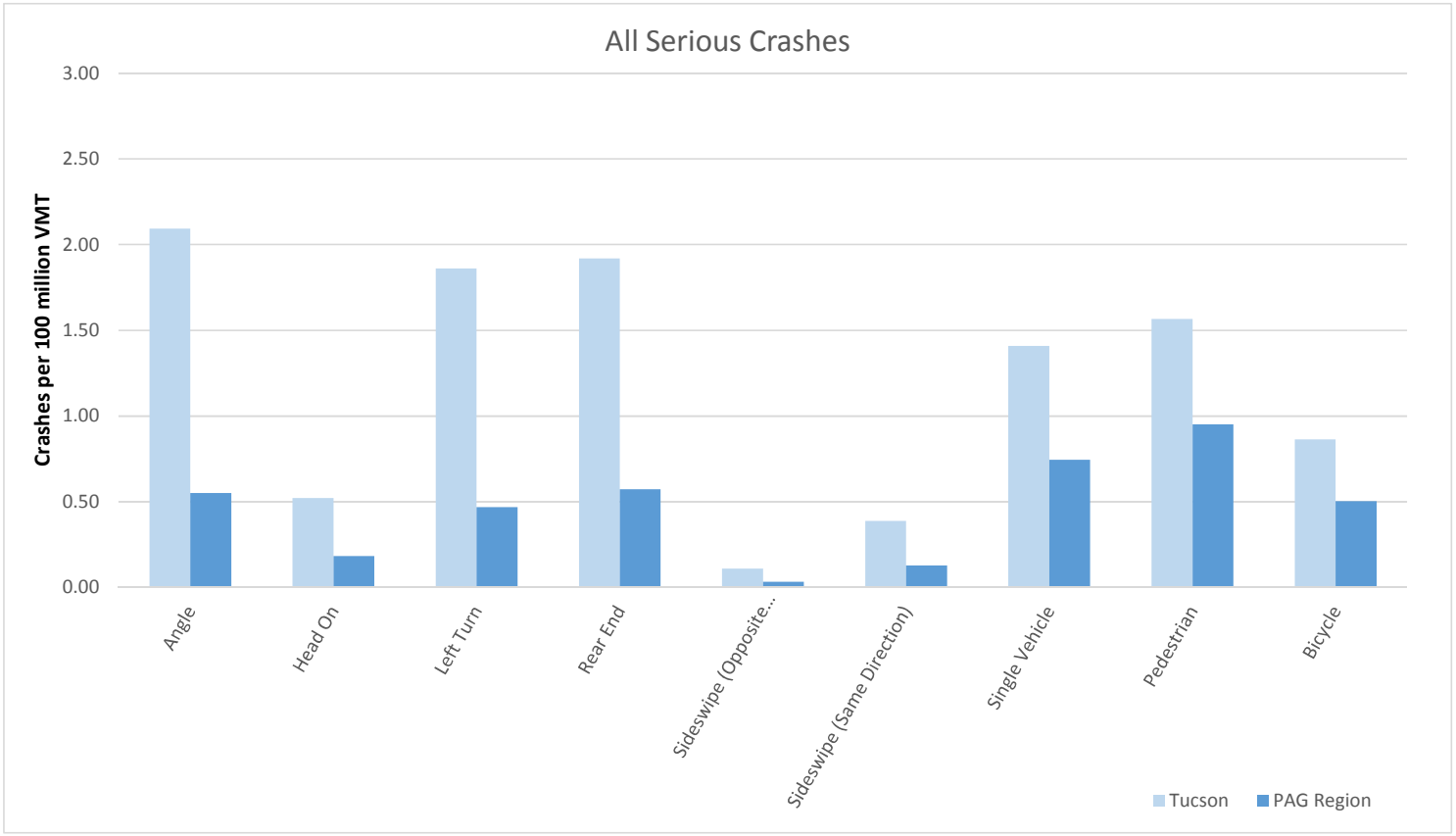
Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Tucson	PAG	Tucson	PAG	Tucson	PAG
Intersections	855	1,281	4.96	2.22	48%	41%
Non-Daylight	591	1,126	3.43	2.70	34%	36%
Young Drivers	644	1,101	3.74	2.64	37%	35%
Speeding and Aggressive	377	851	2.19	1.48	21%	27%
Occupant Protection	282	699	1.64	1.21	16%	22%
Impaired Driving	302	673	1.75	1.17	17%	21%
Older Drivers	361	631	2.09	1.51	20%	20%
Road/Lane Departure	139	544	0.81	0.94	8%	17%
Motorcycles	284	542	1.65	0.94	16%	17%
Pedestrians	270	397	1.57	0.95	15%	13%
Distracted Driving	194	316	1.13	0.55	11%	10%
Bicycles	149	210	0.86	0.50	8%	7%
Heavy Vehicles	70	142	0.41	0.25	4%	5%
Weather - All	50	85	0.29	0.15	3%	3%
Weather - Precipitation	49	81	0.28	0.14	3%	3%
Work Zone	13	26	0.08	0.05	1%	1%
Animals	0	7	0.00	0.01	0%	0%
Weather - Dust/Wind	1	4	0.01	0.01	0%	0%
TOTAL	**1,764**	**3,138**	**10.24**	**7.52**		



Five-Year Summary: Fatal and Incapacitating Injury Crashes

All Serious Crashes	Total Crashes		Crashes per 100 mil VMT		Percentage of Total	
	Tucson	PAG	Tucson	PAG	Tucson	PAG
Angle	361	543	2.09	0.55	20%	17%
Head On	90	181	0.52	0.18	5%	6%
Left Turn	321	462	1.86	0.47	18%	15%
Rear End	331	565	1.92	0.57	19%	18%
Sideswipe (Opposite Direction)	19	32	0.11	0.03	1%	1%
Sideswipe (Same Direction)	67	127	0.39	0.13	4%	4%
Single Vehicle	243	734	1.41	0.74	14%	23%
Pedestrian	270	397	1.57	0.95	15%	13%
Bicycle	149	210	0.86	0.50	8%	7%
TOTAL	**1,764**	**3,138**	**10.24**	**7.52**		



17 APPENDIX E: 5-YEAR ROLLING AVERAGE GRAPHS

Figure 17.1: Fatalities 5-Year Rolling Average, PAG region

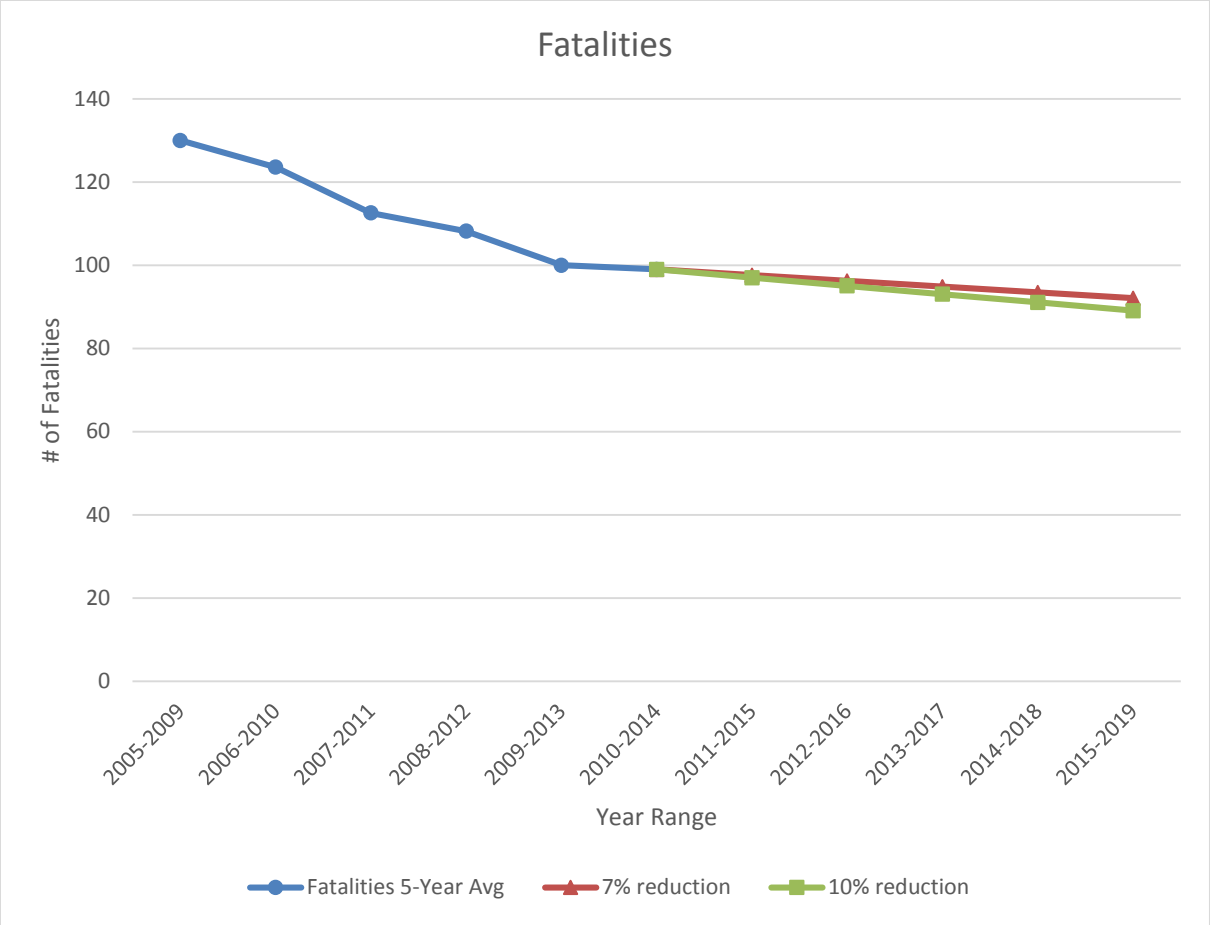


Figure 17.2: Fatality Rate 5-Year Rolling Average, PAG region

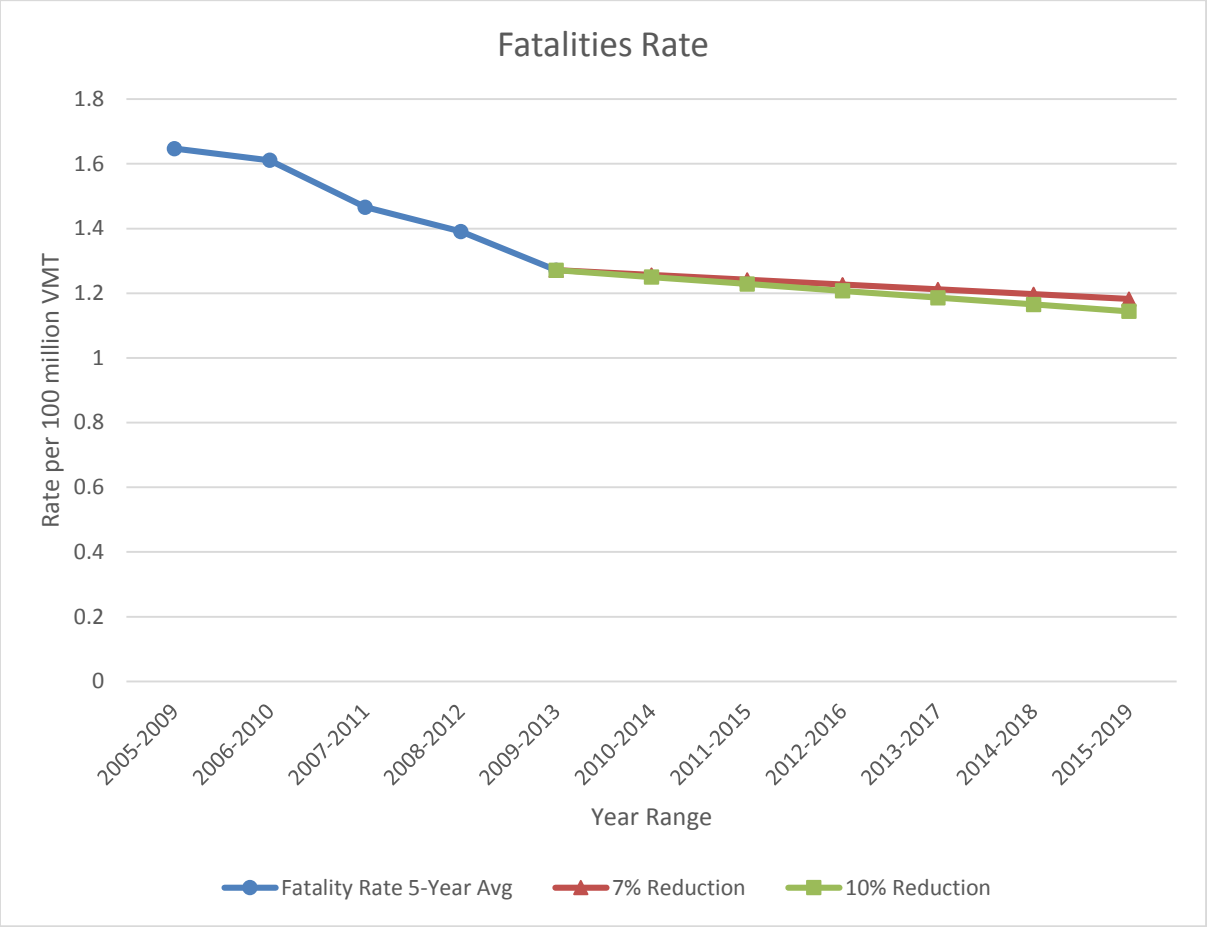


Figure 17.3: Serious Injuries 5-Year Rolling Average

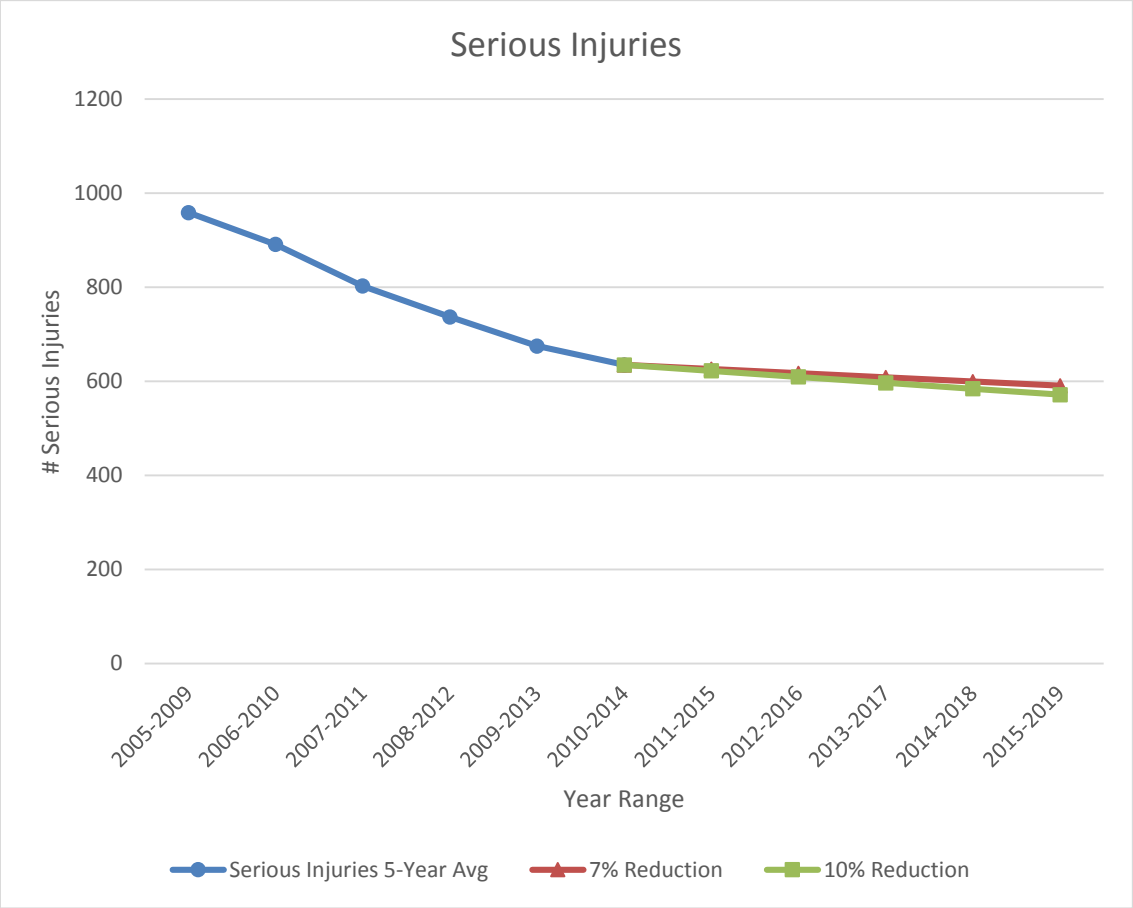


Figure 17.4: Serious Injury Rate 5-Year Rolling Average, PAG region

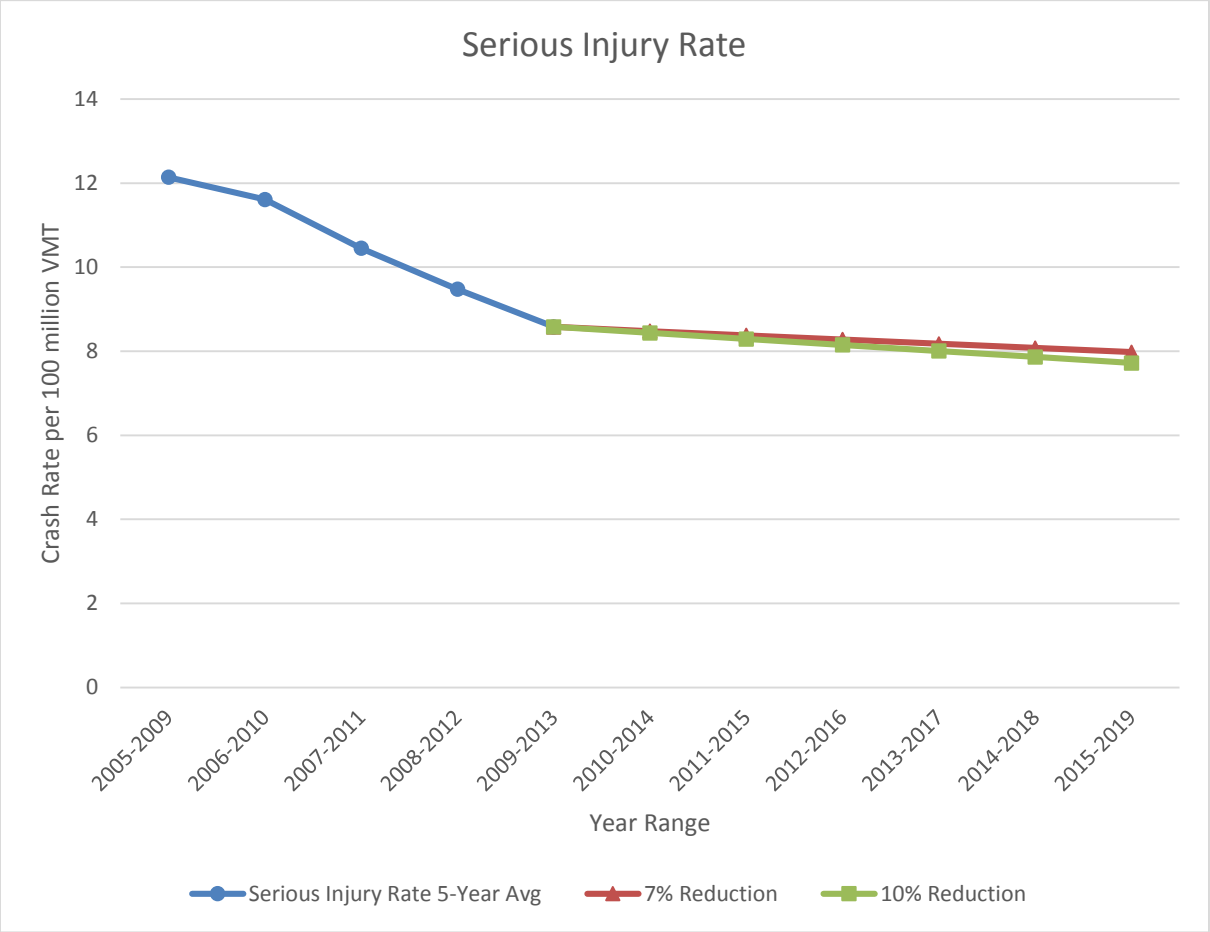
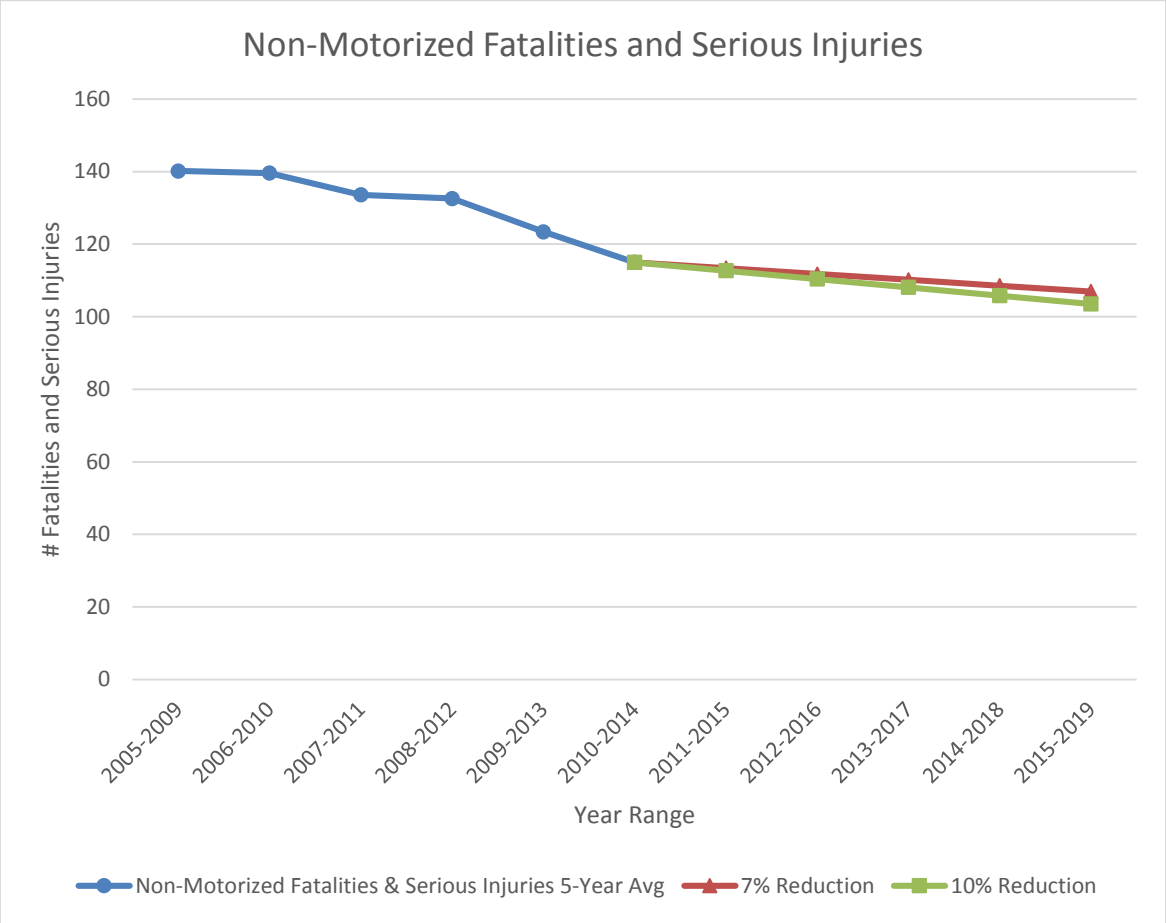
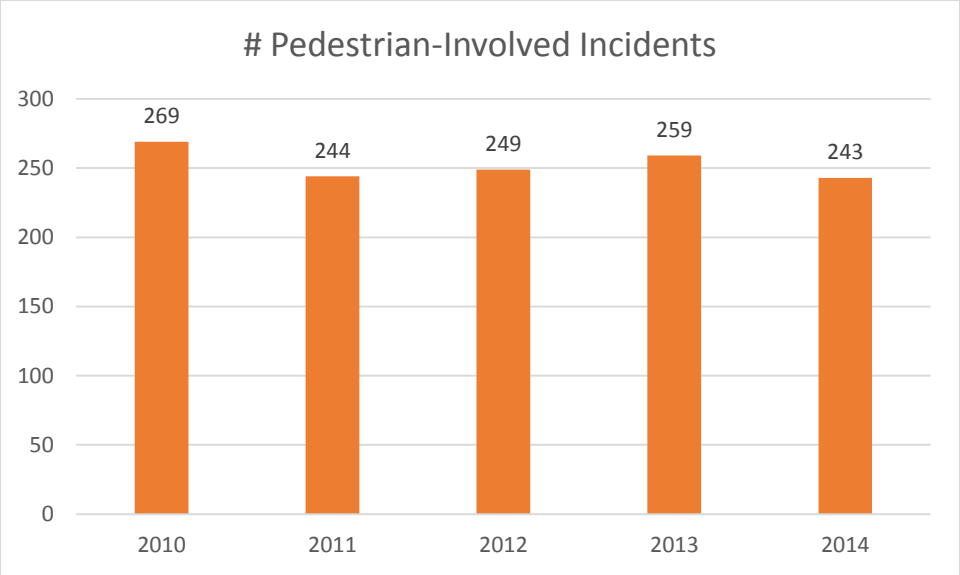


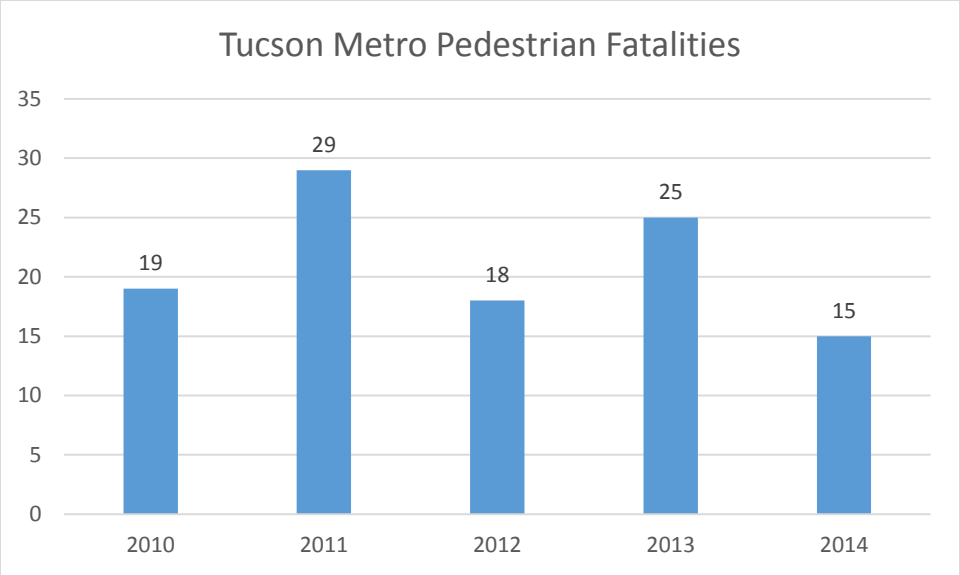
Figure 17.5: Non-Motorized Fatalities and Serious Injuries 5-Year Rolling Average, PAG region



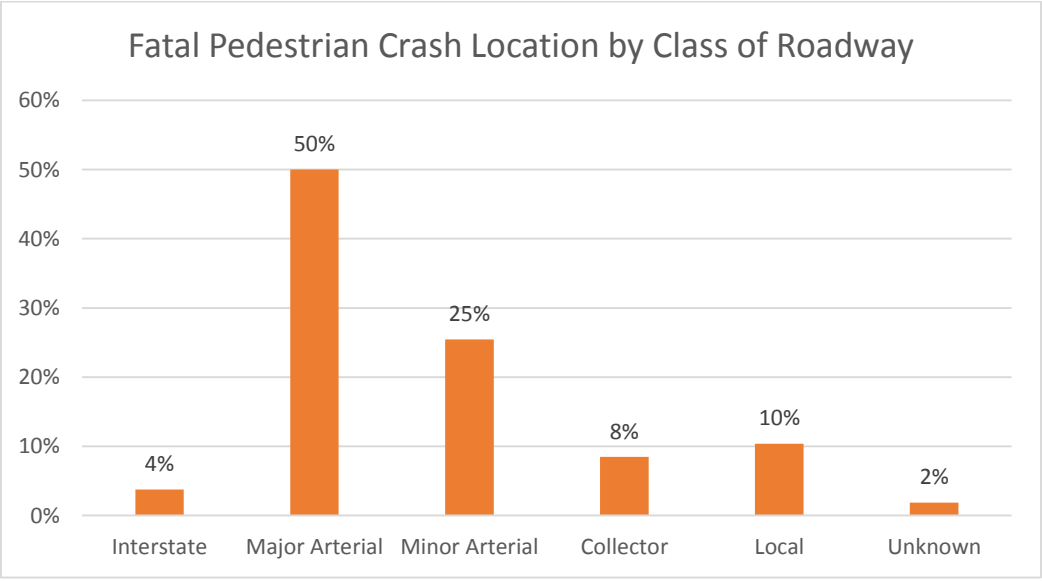
18 APPENDIX F: PEDESTRIAN SUMMARY TABLES, PAG REGION

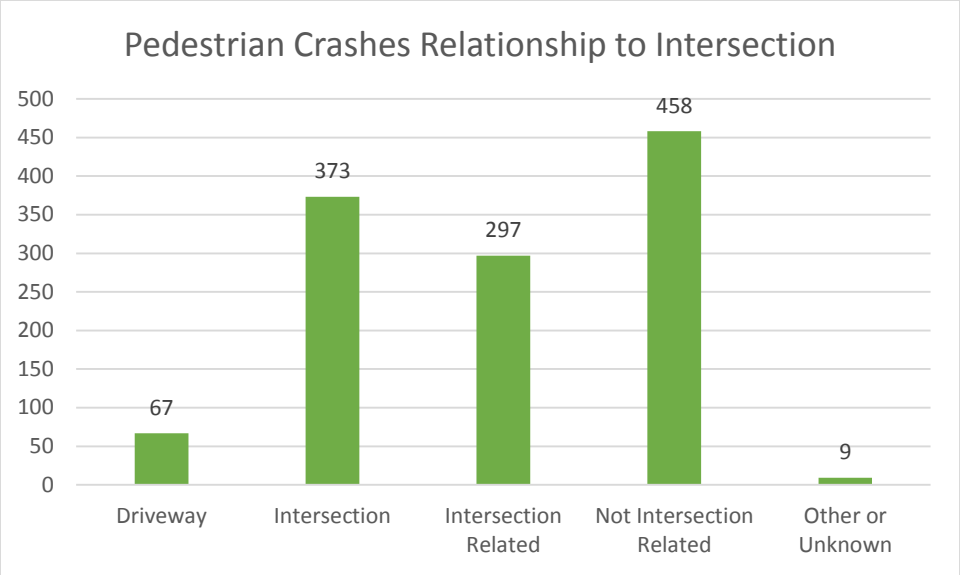


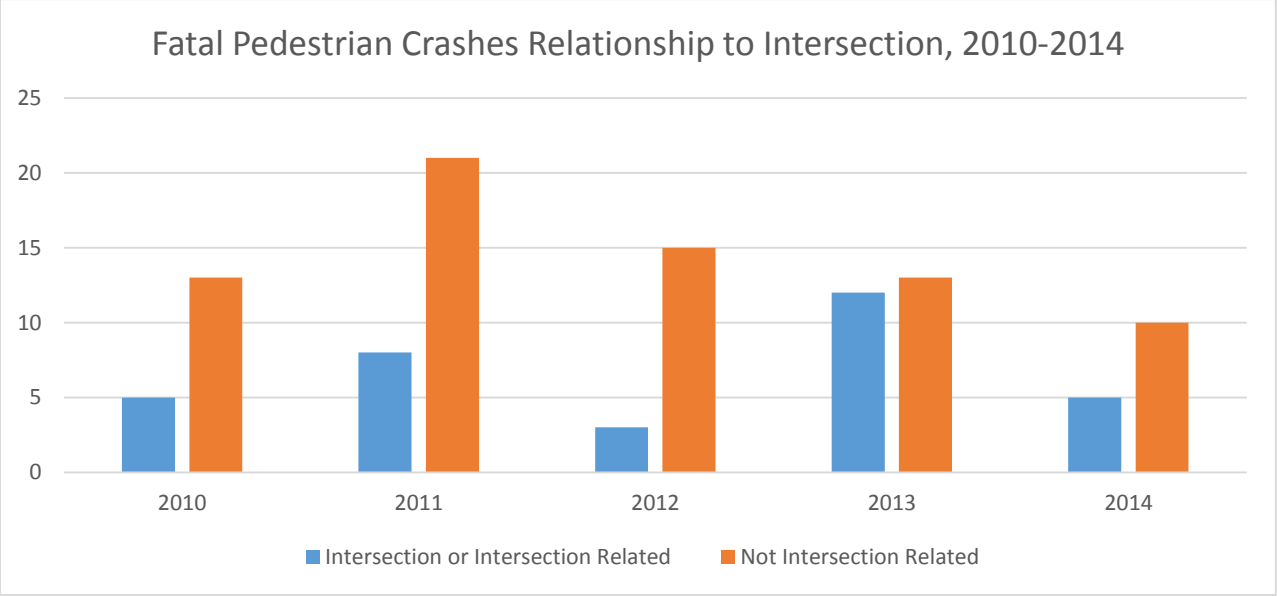
Pedestrians Involved in Crashes by Responding Jurisdiction						
Jurisdiction	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Marana	2	4	8	2	5	21
Oro Valley	1	4	4	1	2	12
Pima County	50	35	41	59	40	225
Sahuarita	3	1	1	2	4	11
South Tucson	5	3	6	5	6	25
Tucson	208	197	189	190	186	970
Total	269	244	249	259	243	1264



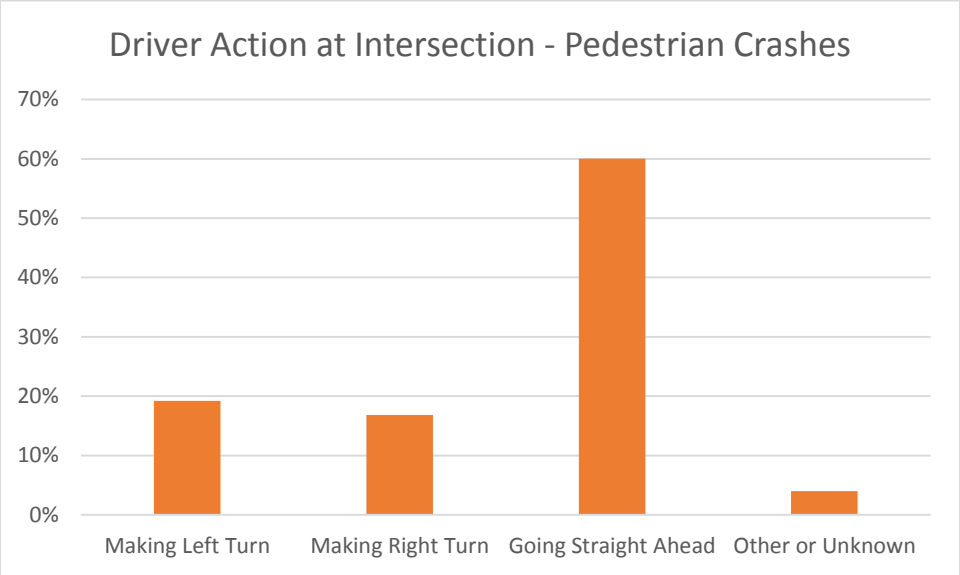
Pedestrians Involved in Crashes by Injury Severity in the Tucson Metropolitan Region 2010-2014						
Injury Status	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
No Injury	24	8	12	18	18	80
Possible Injury	49	43	40	62	69	263
Non-incapacitating Injury	104	110	91	79	90	474
Incapacitating Injury	65	47	72	42	51	277
Fatal	19	29	18	25	15	106
Unknown	8	7	16	33	0	64
Total	269	244	249	259	243	1264

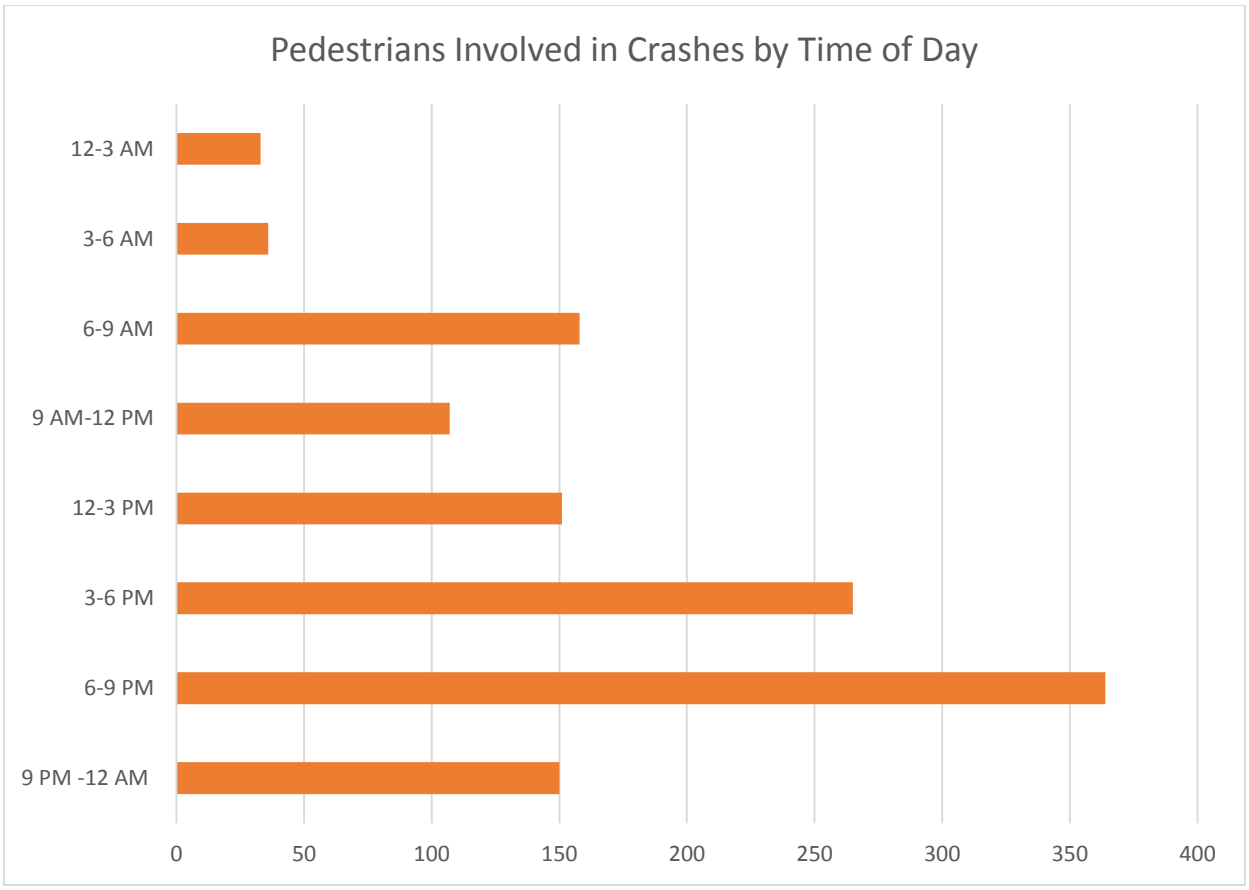


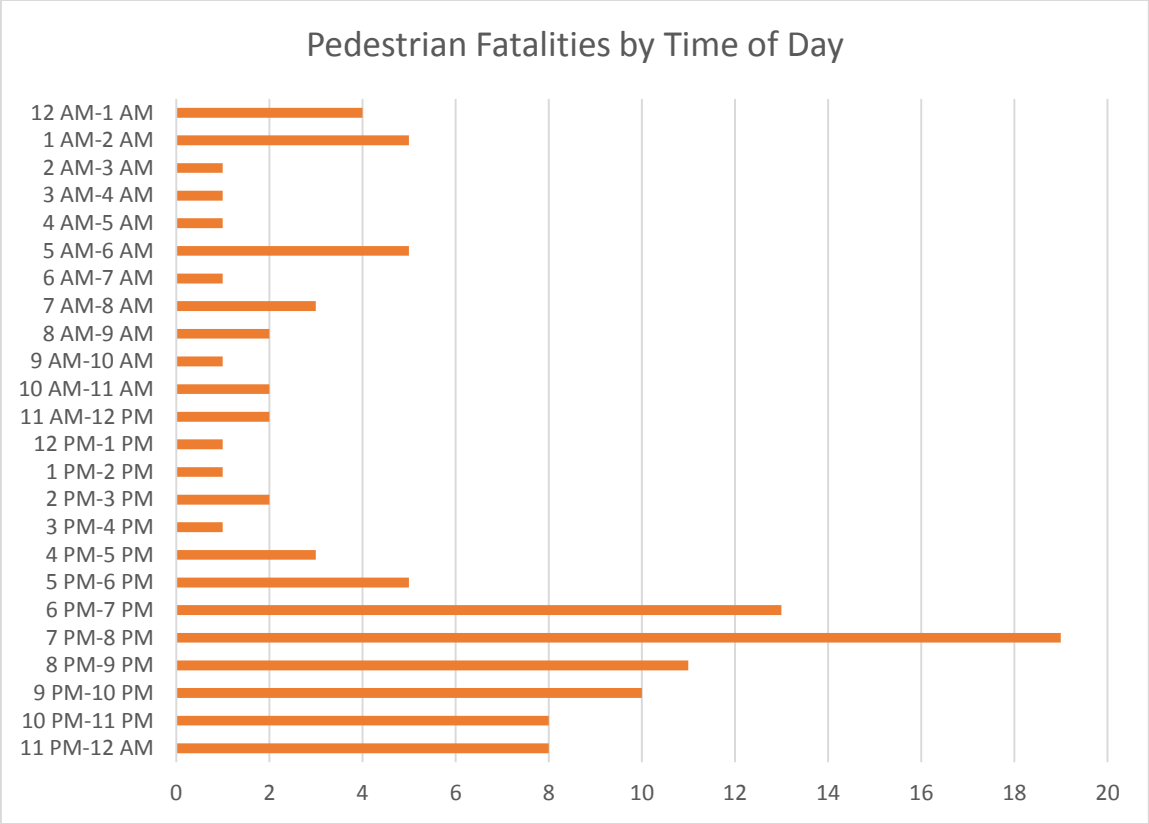

Pedestrian Crashes Relationship to Intersection
500
450
400
350
300
250
200
150
100
50
0
67
373
297
458
9
Driveway
Intersection
Intersection Related
Not Intersection Related
Other or Unknown

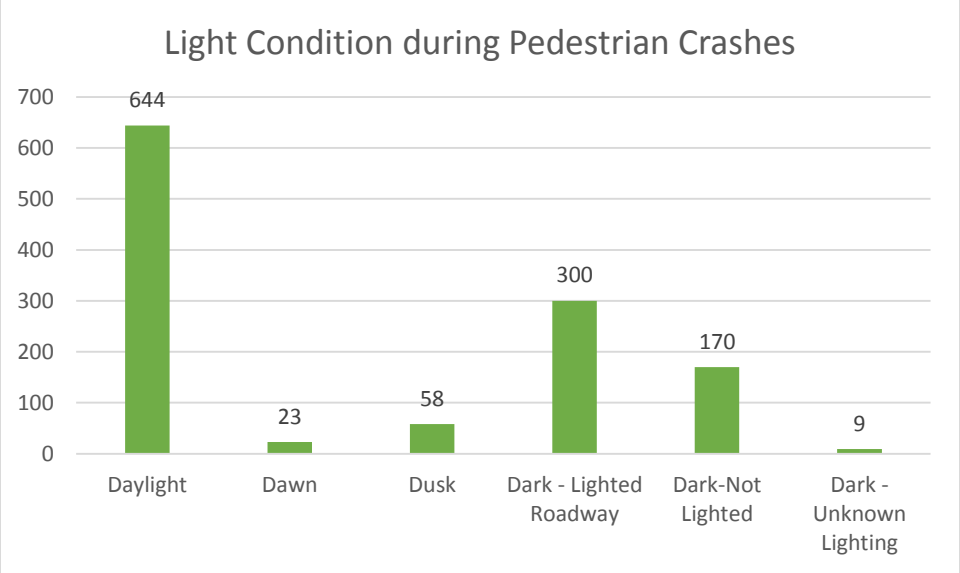

Fatal Pedestrian Crashes Relationship to Intersection, 2010-2014
25
20
15
10
5
0
2010
2011
2012
2013
2014
Intersection or Intersection Related
Not Intersection Related

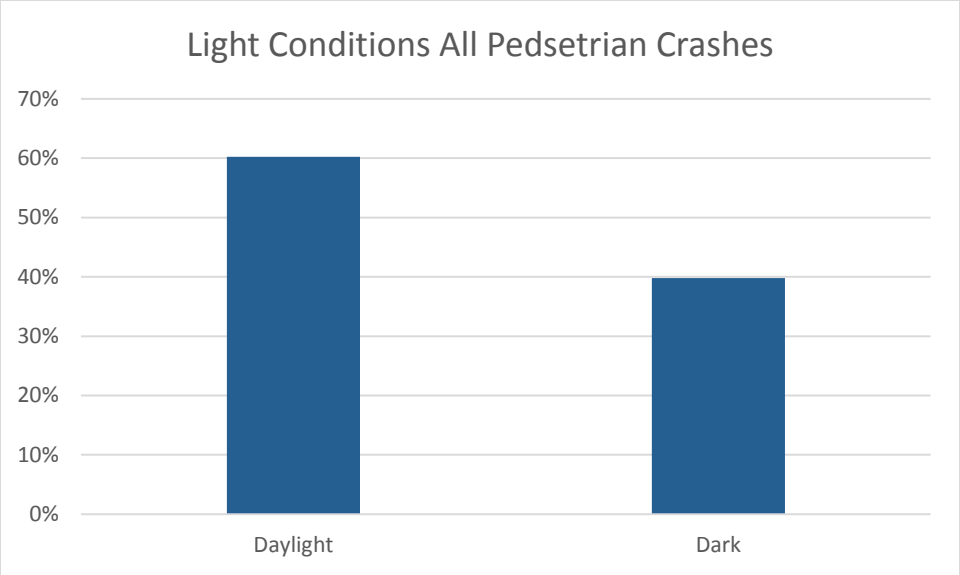
Pedestrian Crash Location	2010	2011	2012	2013	2014	Total
Not Applicable	3	0	0	0	0	3
Marked Crosswalk at Intersection	86	85	70	87	87	415
At intersection but no marked crosswalk	34	26	24	35	29	148
Non-intersection crosswalk	6	7	4	3	9	29
Driveway access crosswalk	7	8	3	4	6	28
School crosswalk	1	2	2	1	2	8
In roadway not in crosswalk or intersection	97	87	103	87	73	447
Median but not on shoulder	0	2	1	1		4
Island	1	0	0	1		2
Shoulder	6	4	6	9	7	32
Sidewalk	7	10	16	8	9	50
Roadside	3	1	2	0	2	8
Outside trafficway	3	3	1	0	1	8
Shared-use path	0	0	0	0	1	1
Dedicated bike lane	3	0	2	4	0	9
Inside building	0	0	0	1	0	1
Other	5	4	5	8	5	27
Unknown	5	4	9	7	6	31
Not reported	2	1	1	3	6	13
Total	269	244	249	259	243	1264

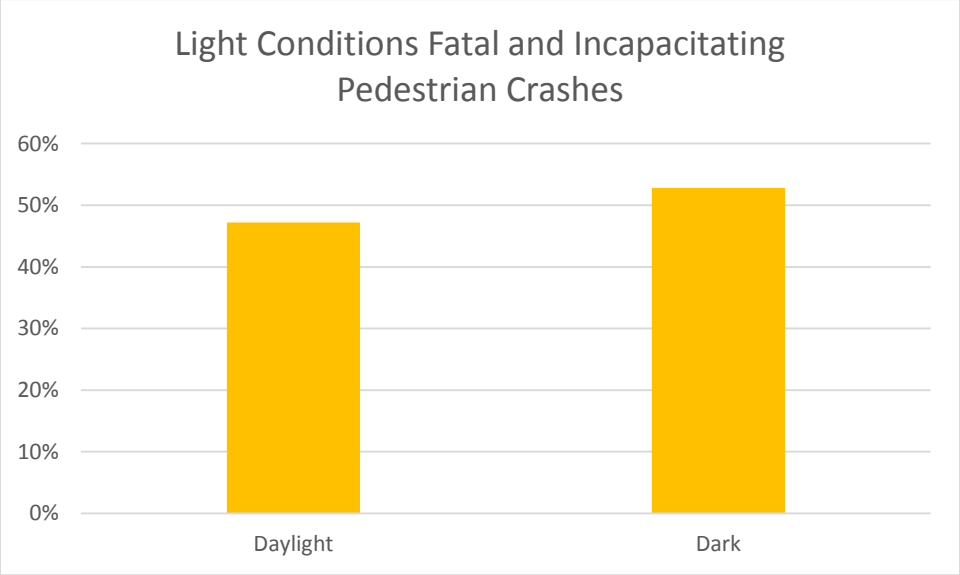


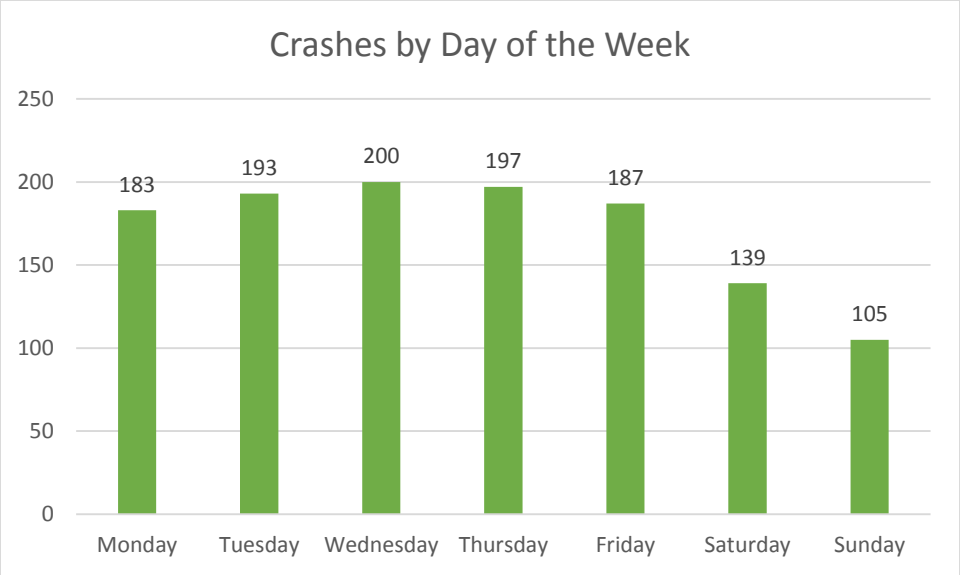

Pedestrians Involved in Crashes by Time of Day
12-3 AM
3-6 AM
6-9 AM
9 AM-12 PM
12-3 PM
3-6 PM
6-9 PM
9 PM -12 AM
0
50
100
150
200
250
300
350
400

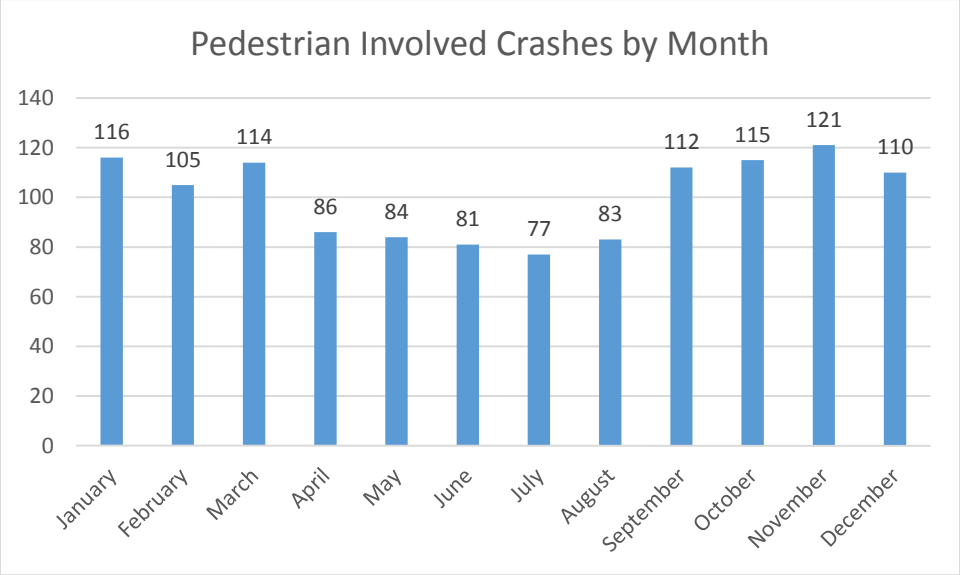

Pedestrian Fatalities by Time of Day
12 AM-1 AM
1 AM-2 AM
2 AM-3 AM
3 AM-4 AM
4 AM-5 AM
5 AM-6 AM
6 AM-7 AM
7 AM-8 AM
8 AM-9 AM
9 AM-10 AM
10 AM-11 AM
11 AM-12 PM
12 PM-1 PM
1 PM-2 PM
2 PM-3 PM
3 PM-4 PM
4 PM-5 PM
5 PM-6 PM
6 PM-7 PM
7 PM-8 PM
8 PM-9 PM
9 PM-10 PM
10 PM-11 PM
11 PM-12 AM
0
2
4
6
8
10
12
14
16
18
20

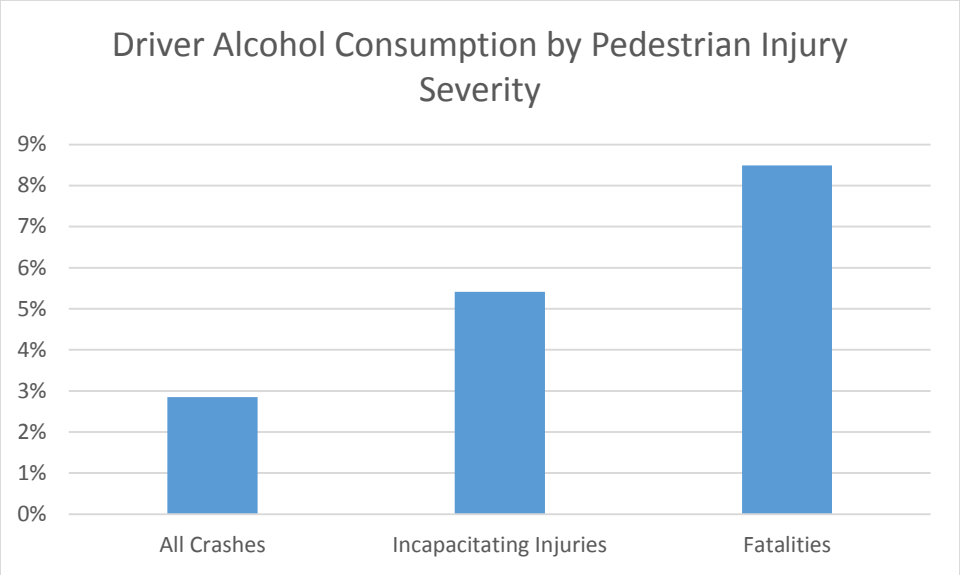

Light Condition during Pedestrian Crashes
700
600
500
400
300
200
100
0
644
23
58
300
170
9
Daylight
Dawn
Dusk
Dark - Lighted Roadway
Dark-Not Lighted
Dark - Unknown Lighting

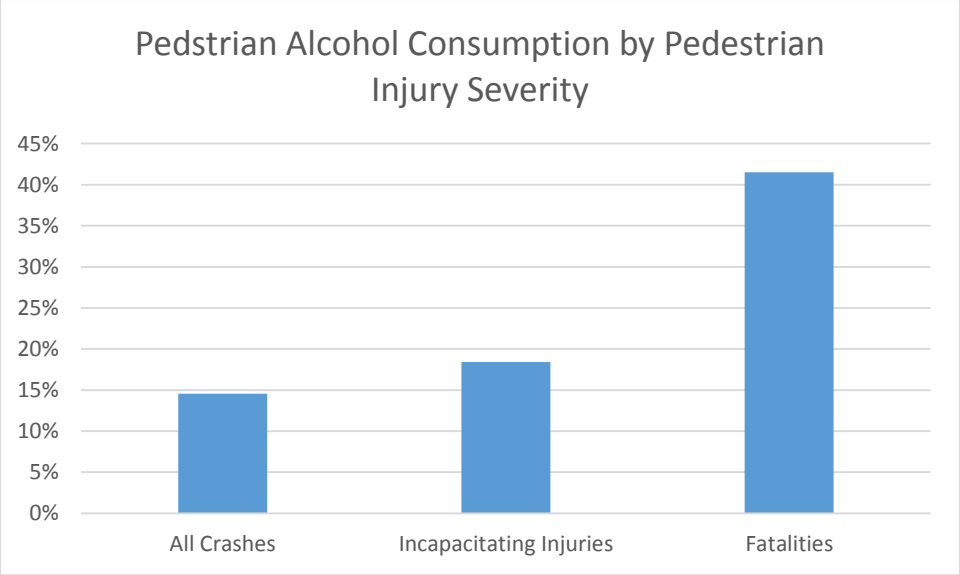

Light Conditions All Pedsetrian Crashes
70%
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

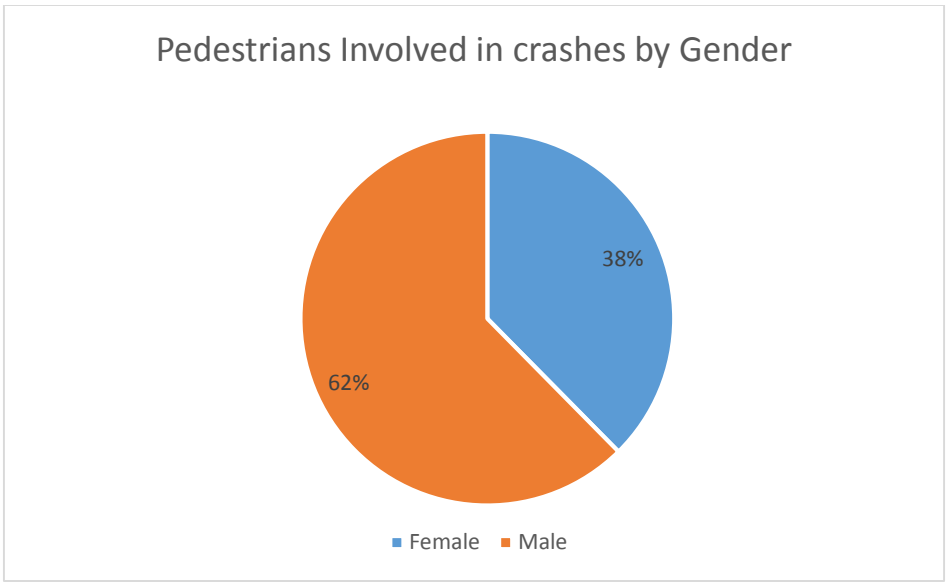

Light Conditions Fatal and Incapacitating Pedestrian Crashes
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

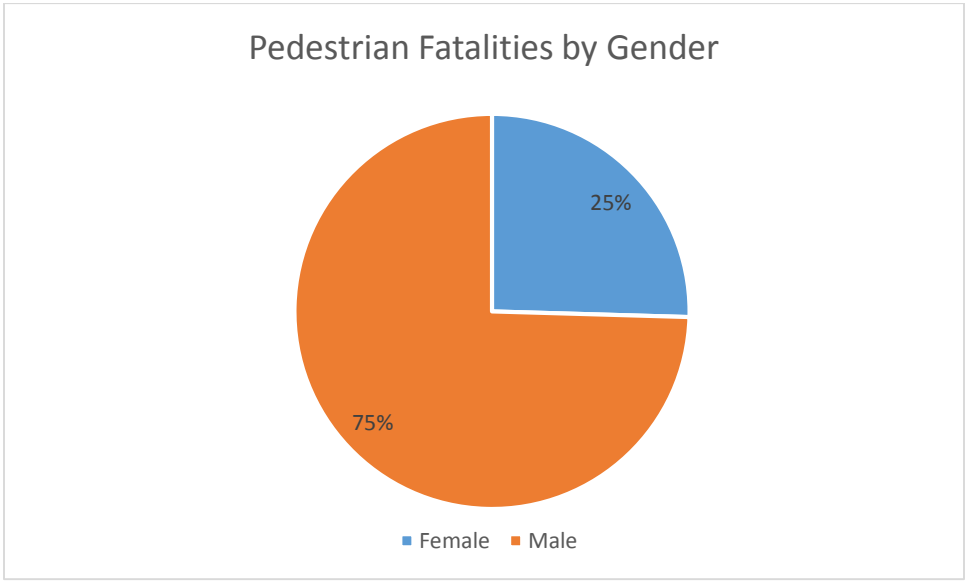

Crashes by Day of the Week
250
200
150
100
50
0
183
193
200
197
187
139
105
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

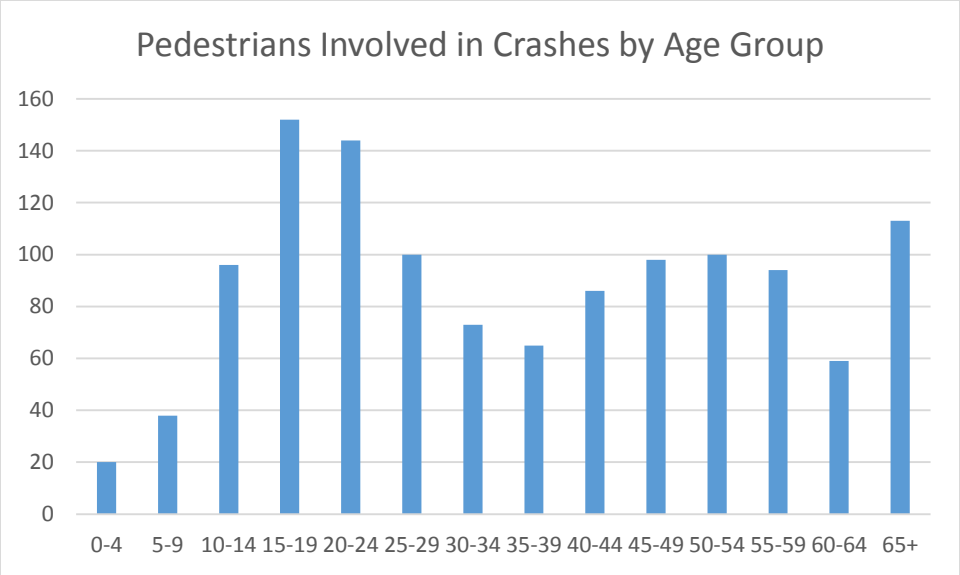

Pedestrian Involved Crashes by Month
140
120
100
80
60
40
20
0
116
105
114
86
84
81
77
83
112
115
121
110
January
February
March
April
May
June
July
August
September
October
November
December

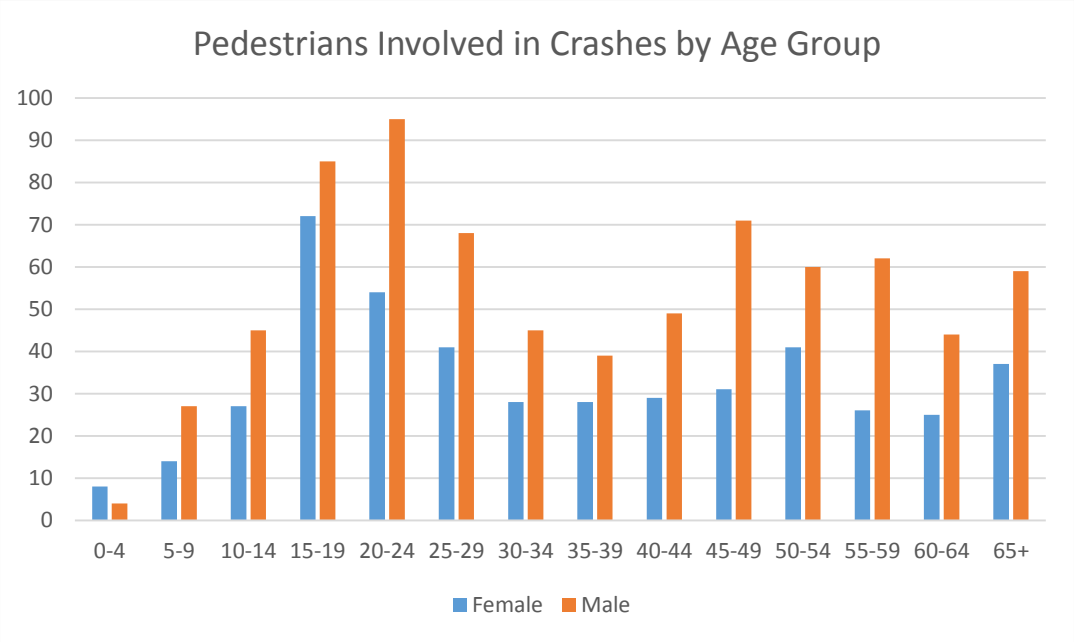

Driver Alcohol Consumption by Pedestrian Injury Severity
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
All Crashes
Incapacitating Injuries
Fatalities

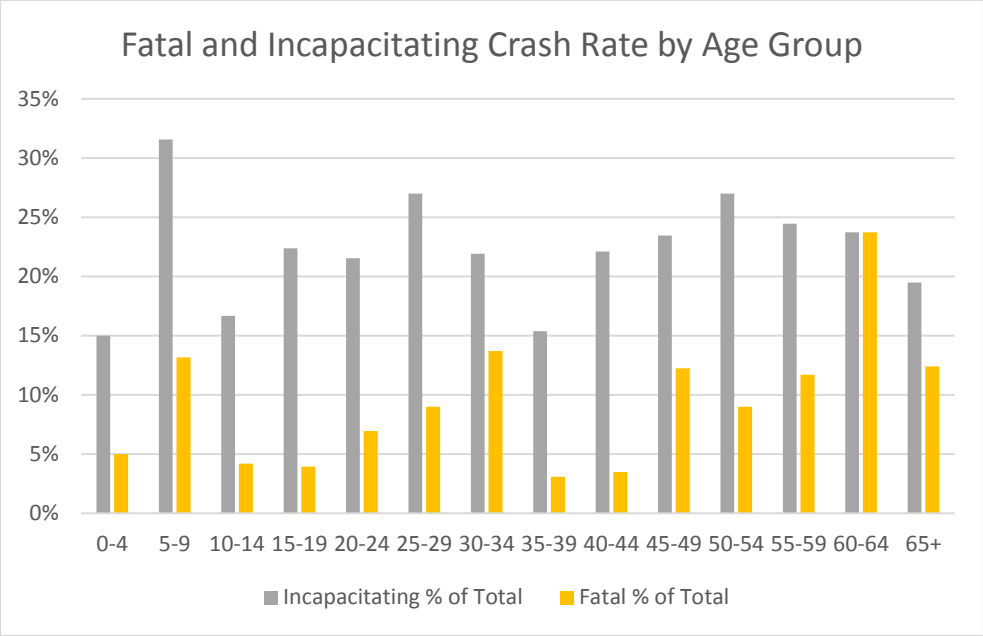

Pedstrian Alcohol Consumption by Pedestrian Injury Severity
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
All Crashes
Incapacitating Injuries
Fatalities


Pedestrians Involved in crashes by Gender
38%
62%
Female
Male

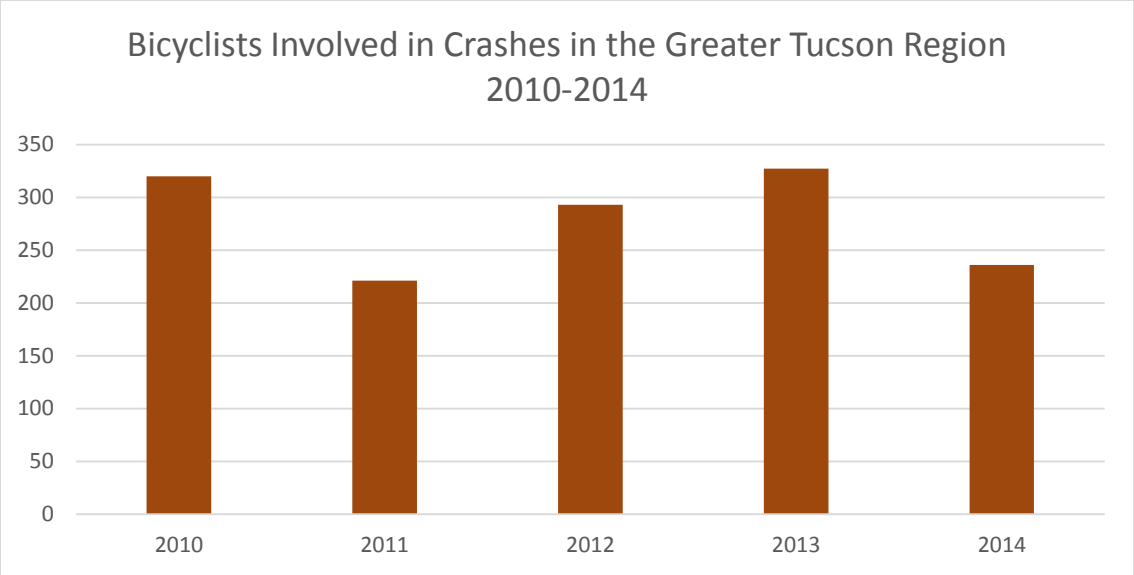

Pedestrian Fatalities by Gender
25%
75%
Female
Male


Pedestrians Involved in Crashes by Age Group
160
140
120
100
80
60
40
20
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+

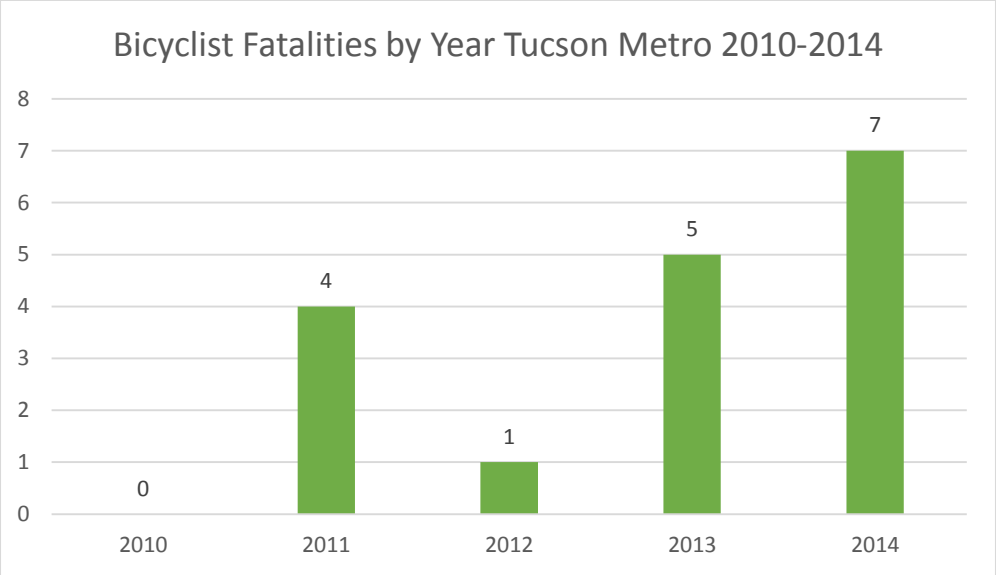

Pedestrians Involved in Crashes by Age Group
100
90
80
70
60
50
40
30
20
10
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
Female
Male


Fatal and Incapacitating Crash Rate by Age Group
35%
30%
25%
20%
15%
10%
5%
0%
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
Incapacitating % of Total
Fatal % of Total

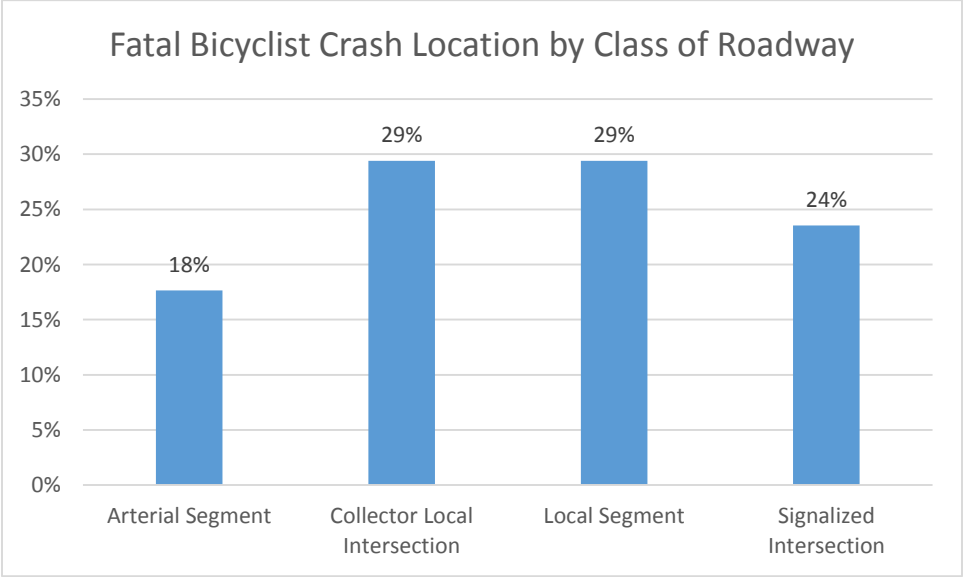
19 APPENDIX G: BICYCLE SUMMARY TABLES, PAG REGION

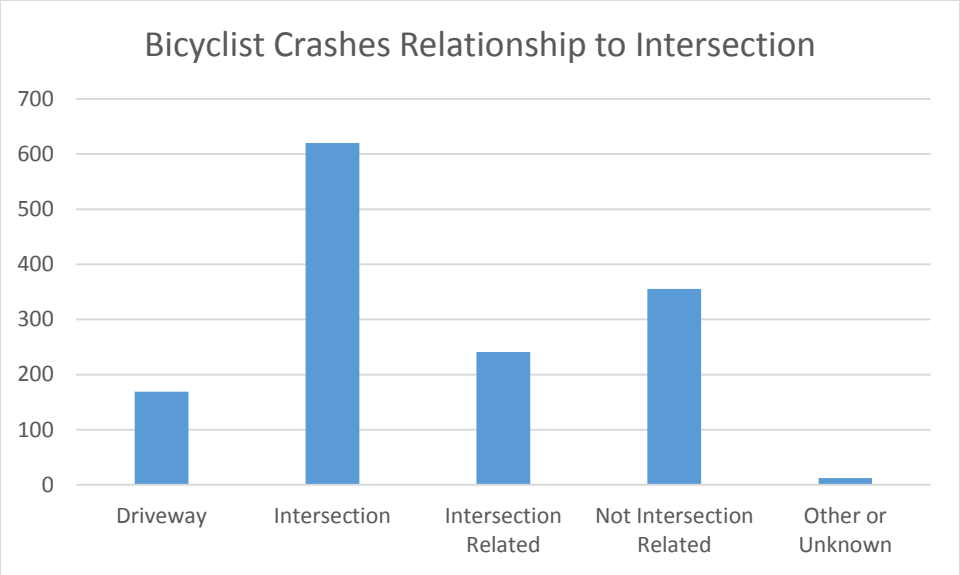


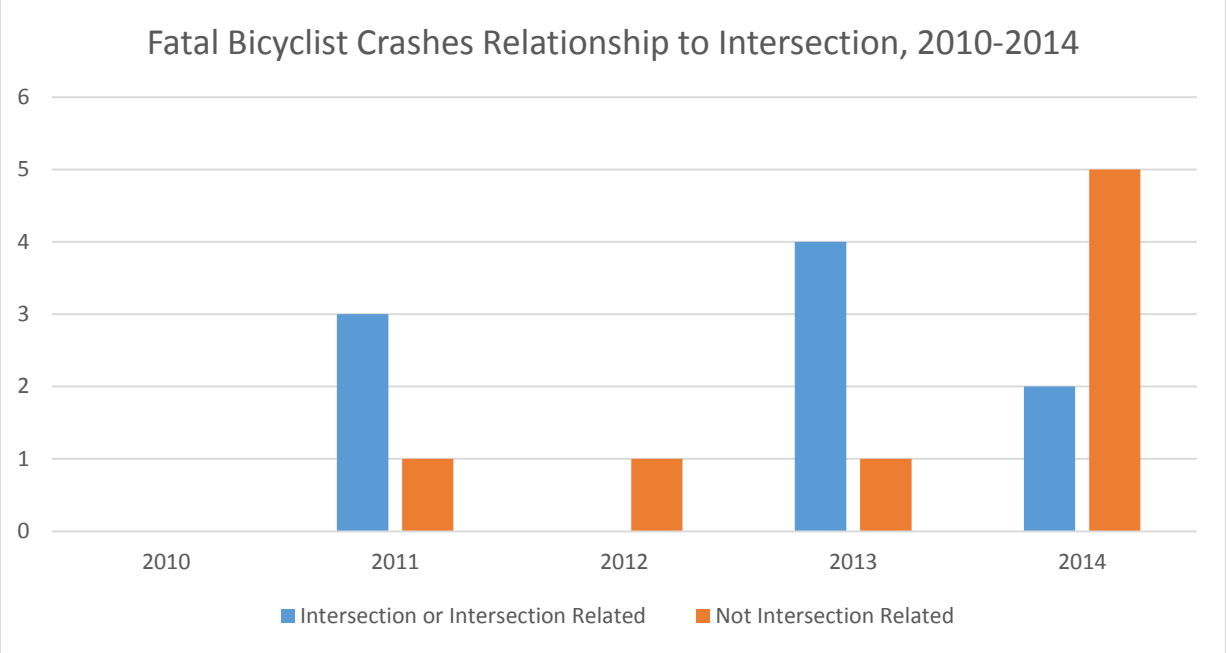
Bicyclists Involved in Crashes by Responding Jurisdiction						
Jurisdiction	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Marana	2	4	8	6	4	**24**
Oro Valley	15	14	15	19	12	**75**
Sahuarita	2	1	5	2	3	**13**
South Tucson	2	2	2	2	4	**12**
Tohono O'Odham Nation - San Xavier District	0	1	0	0	0	**1**
Tucson	256	155	212	225	160	**1008**
Unincorporated Pima County	43	44	51	73	53	**264**
Total	**320**	**221**	**293**	**327**	**236**	**1397**



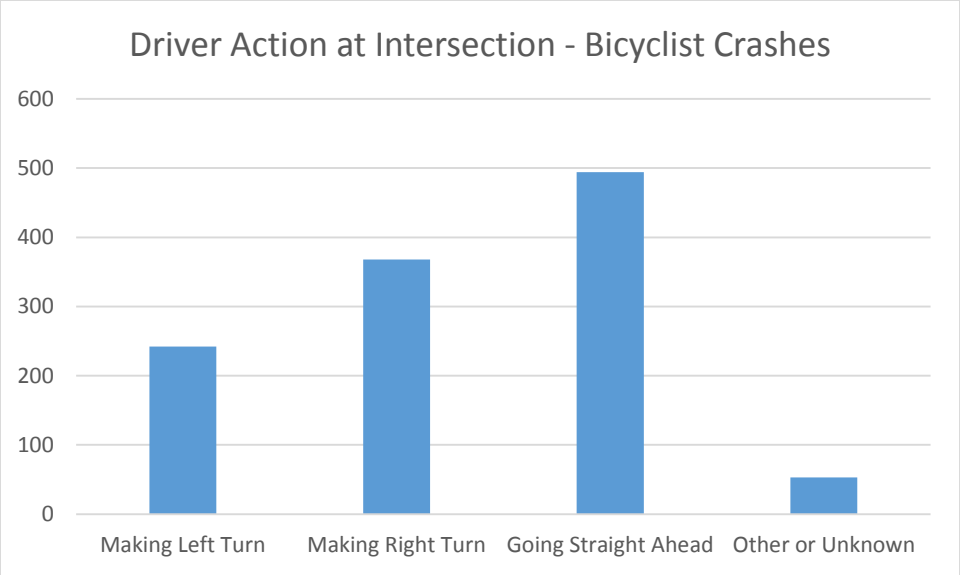
Bicyclists Involved in Crashes by Injury Severity in the Tucson Metropolitan Region 2010-2014							
Year	**No Injury**	**Possible Injury**	**Non-incapacitating Injury**	**Incapacitating Injury**	**Fatal**	**Unknown**	**Total**
2010	38	68	155	48	0	11	**320**
2011	17	54	113	24	4	9	**221**
2012	29	48	161	41	1	13	**293**
2013	37	73	142	38	5	32	**327**
2014	32	79	92	26	7	0	**236**
Total	**153**	**322**	**663**	**177**	**17**	**65**	**1397**

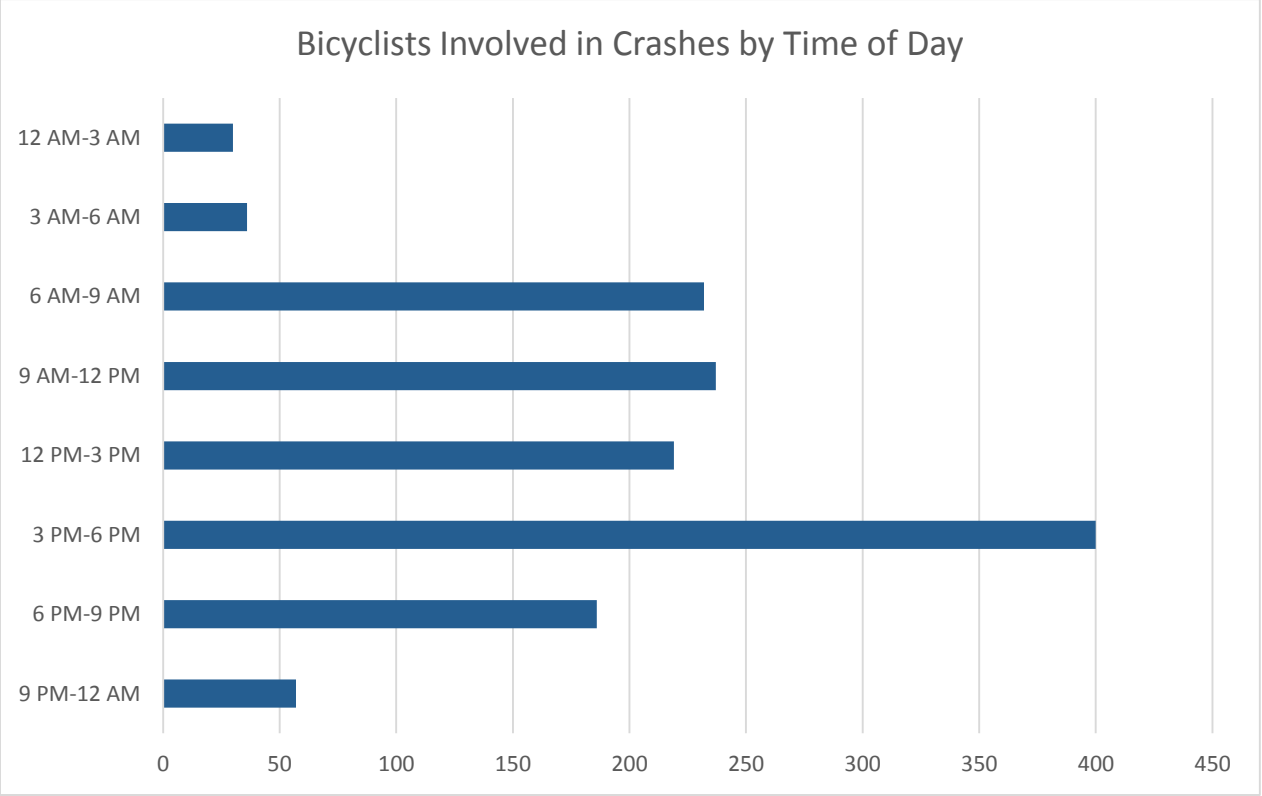


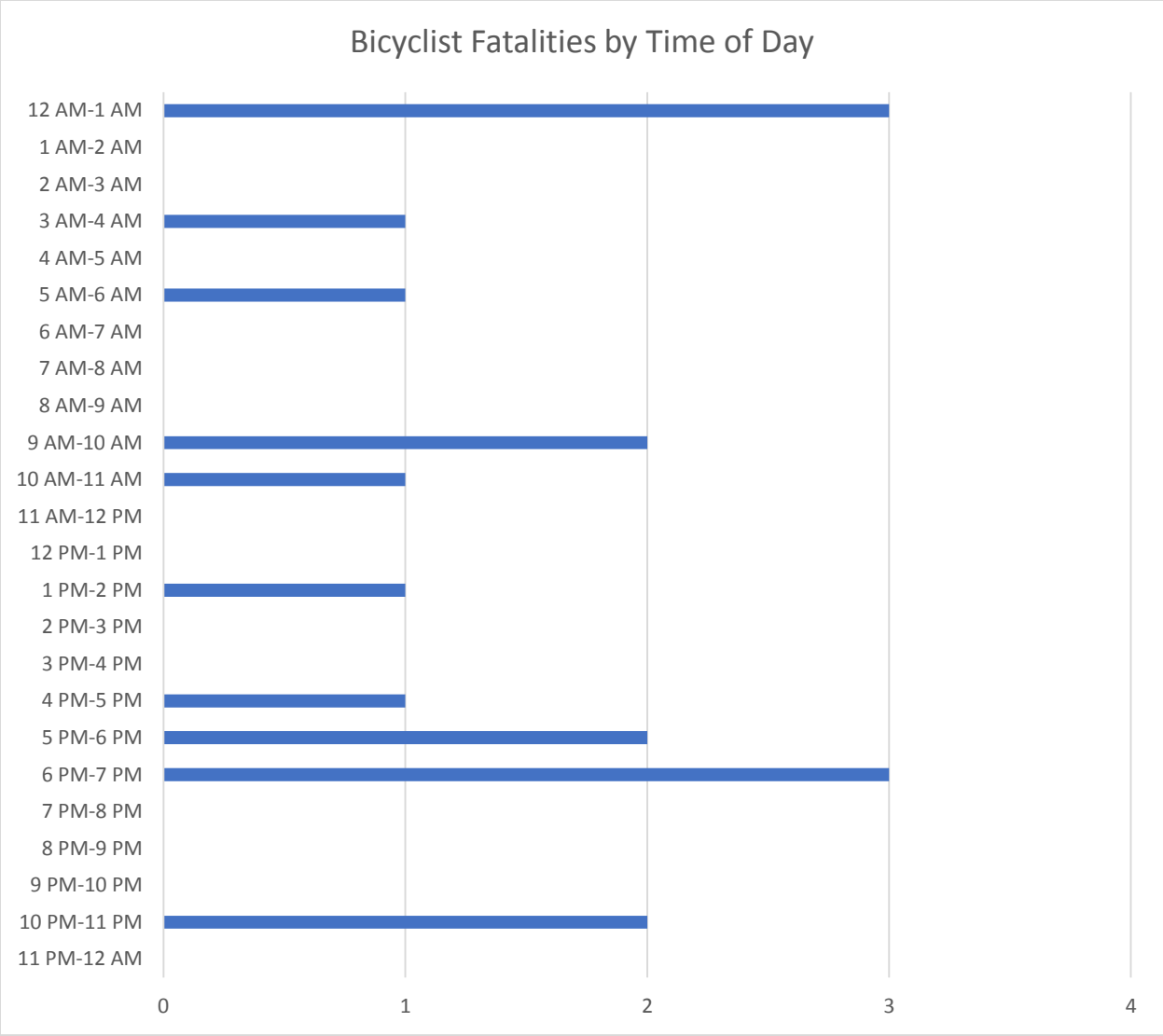

Bicyclist Crashes Relationship to Intersection
700
600
500
400
300
200
100
0
Driveway
Intersection
Intersection Related
Not Intersection Related
Other or Unknown

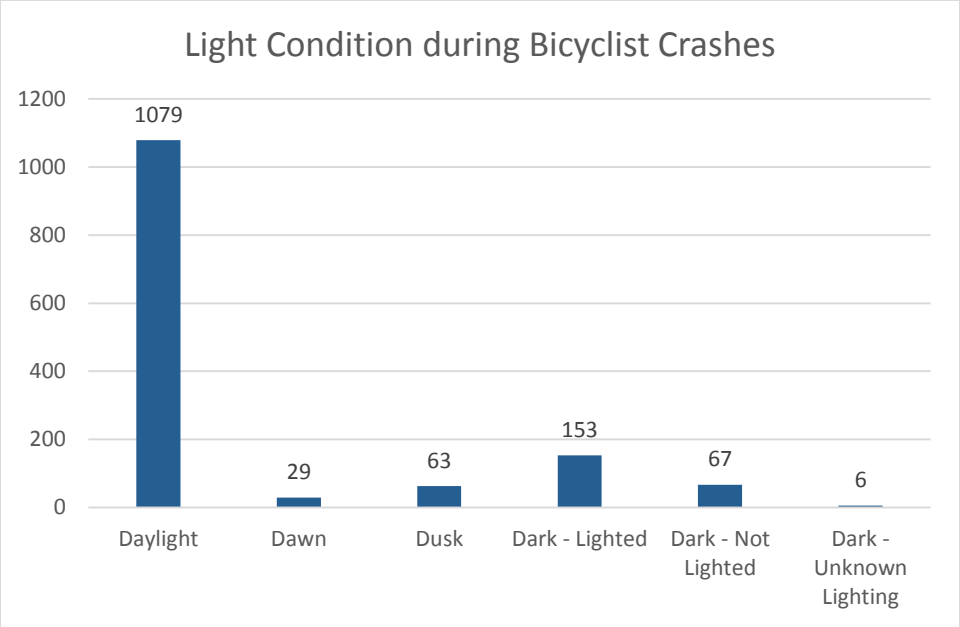

Fatal Bicyclist Crashes Relationship to Intersection, 2010-2014
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
Intersection or Intersection Related
Not Intersection Related

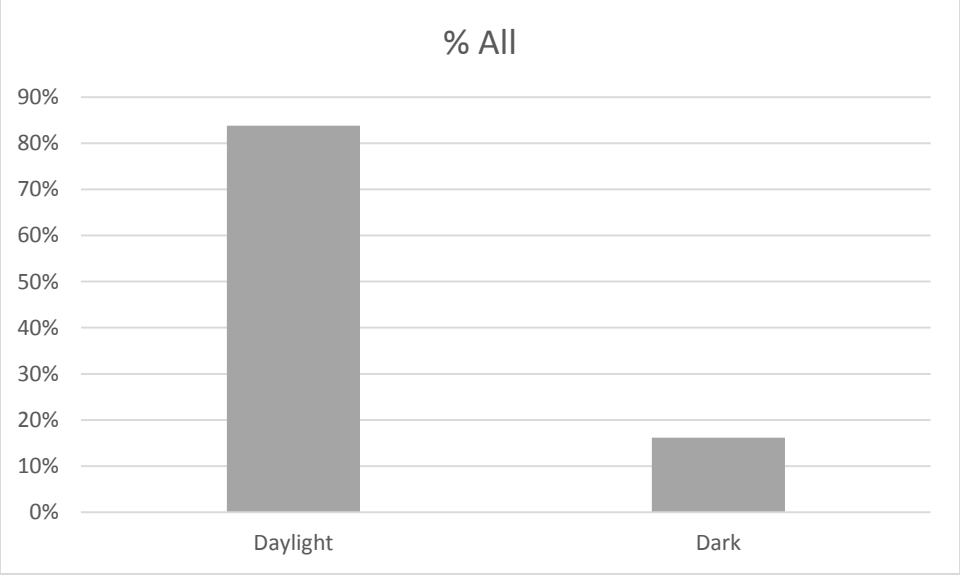
Bike Crash Location	2010	2011	2012	2013	2014	Total
Non Applicable	187	2	1	1	1	192
Marked Crosswalk at Intersection	15	29	44	42	29	159
At Intersection but No Crosswalk	10	14	27	28	24	103
Non Intersection Crosswalk	2	1	1	6	0	10
Driveway Access Crosswalk	4	2	2	4	5	17
School Crosswalk	0	0	1	1	0	2
In Roadway Not in a Crosswalk or Intersection	18	55	68	74	36	251
Median But Not On Shoulder	0	2	1	4	1	8
Shoulder	9	8	19	12	13	61
Sidewalk	6	11	18	14	16	65
Roadside	1	4	4	8	8	25
Outside Trafficway	0	0	0	0	2	2
Dedicated Bike Lane	52	74	81	92	68	367
Shared Use Path or Trails	4	2	5	5	1	17
Other	7	6	7	8	8	36
Unknown	3	8	12	22	17	62
Not Reported	2	3	2	6	7	20
Total	320	221	293	327	236	1397

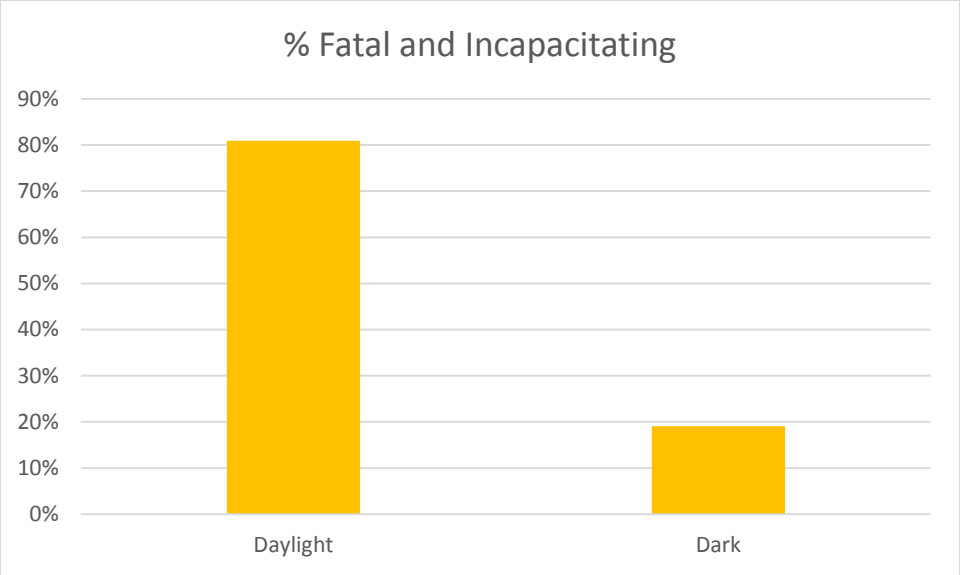

Driver Action at Intersection - Bicyclist Crashes
600
500
400
300
200
100
0
Making Left Turn
Making Right Turn
Going Straight Ahead
Other or Unknown

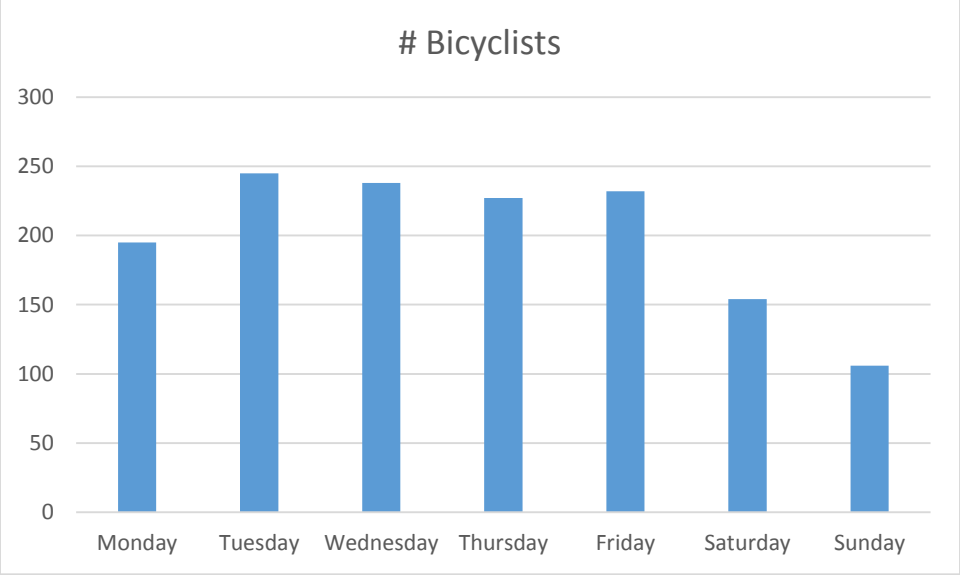

Bicyclists Involved in Crashes by Time of Day
12 AM-3 AM
3 AM-6 AM
6 AM-9 AM
9 AM-12 PM
12 PM-3 PM
3 PM-6 PM
6 PM-9 PM
9 PM-12 AM
0
50
100
150
200
250
300
350
400
450

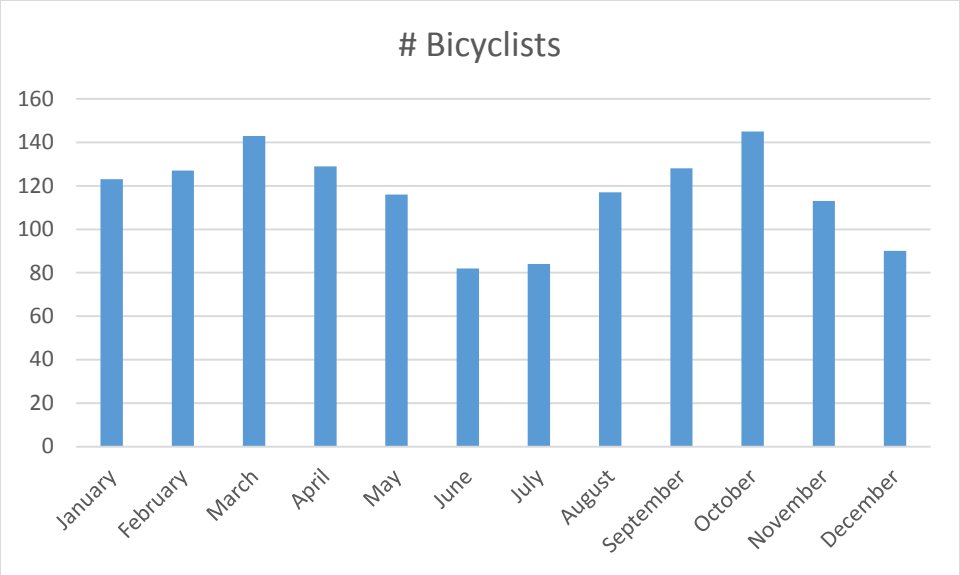

Bicyclist Fatalities by Time of Day
12 AM-1 AM
1 AM-2 AM
2 AM-3 AM
3 AM-4 AM
4 AM-5 AM
5 AM-6 AM
6 AM-7 AM
7 AM-8 AM
8 AM-9 AM
9 AM-10 AM
10 AM-11 AM
11 AM-12 PM
12 PM-1 PM
1 PM-2 PM
2 PM-3 PM
3 PM-4 PM
4 PM-5 PM
5 PM-6 PM
6 PM-7 PM
7 PM-8 PM
8 PM-9 PM
9 PM-10 PM
10 PM-11 PM
11 PM-12 AM
0
1
2
3
4

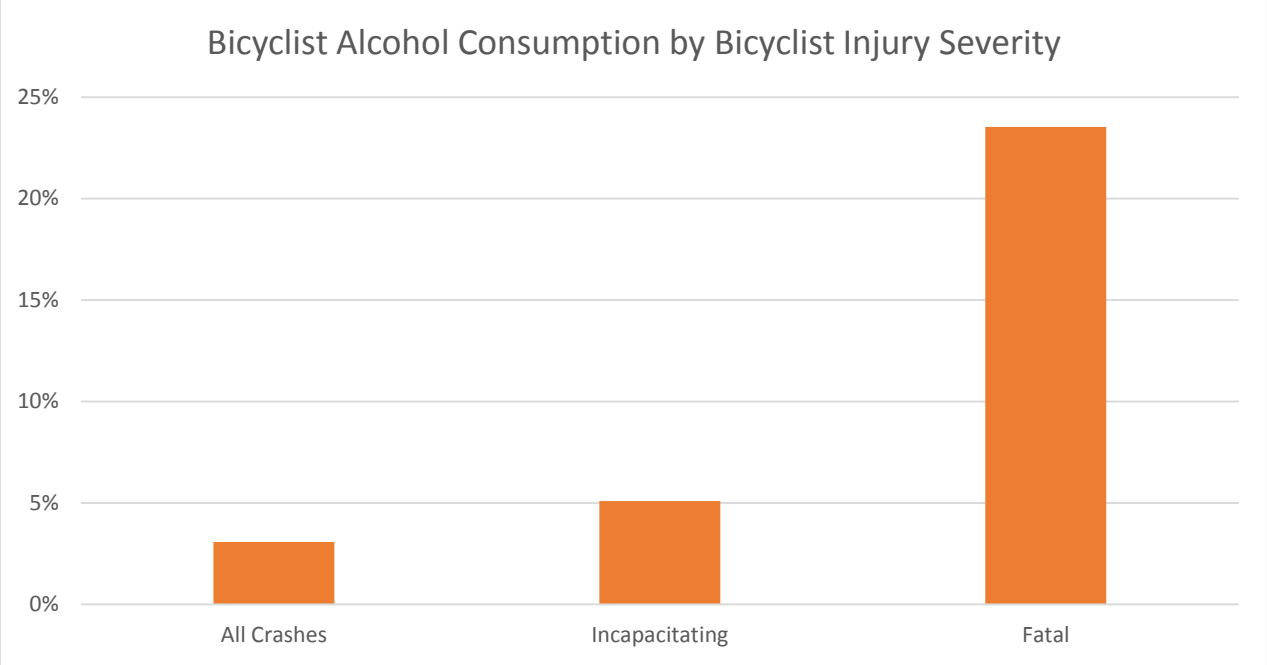

Light Condition during Bicyclist Crashes
1200
1000
800
600
400
200
0
1079
29
63
153
67
6
Daylight
Dawn
Dusk
Dark - Lighted
Dark - Not Lighted
Dark - Unknown Lighting

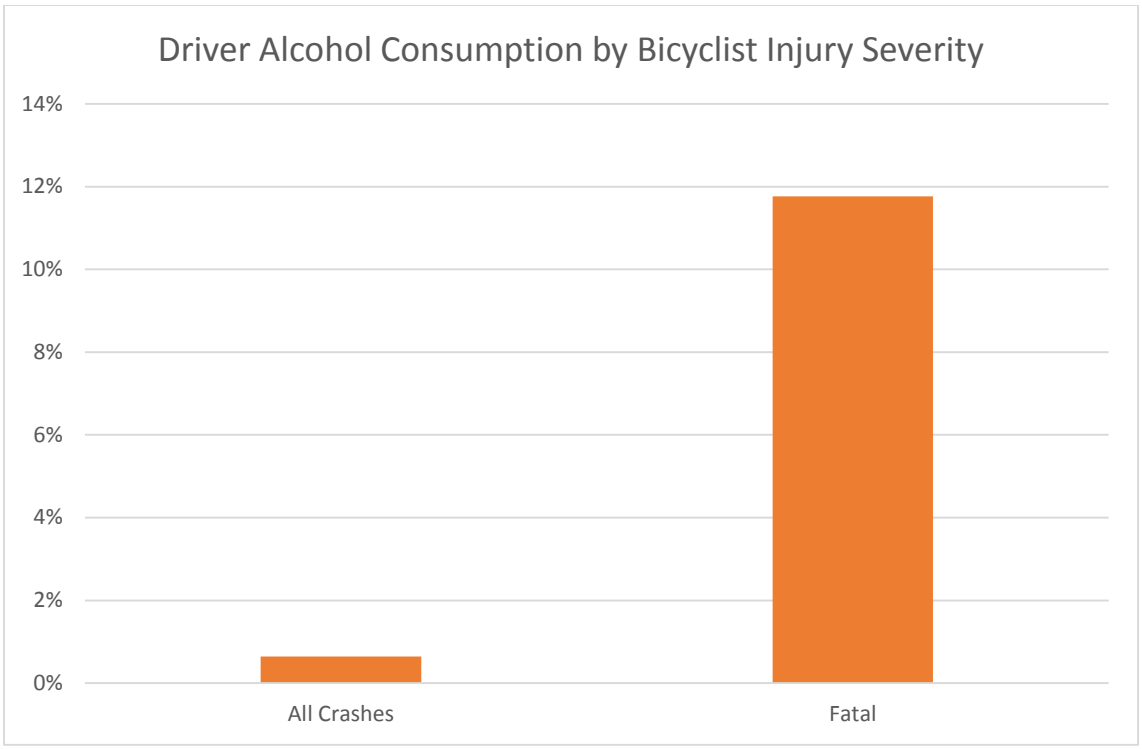

% All
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

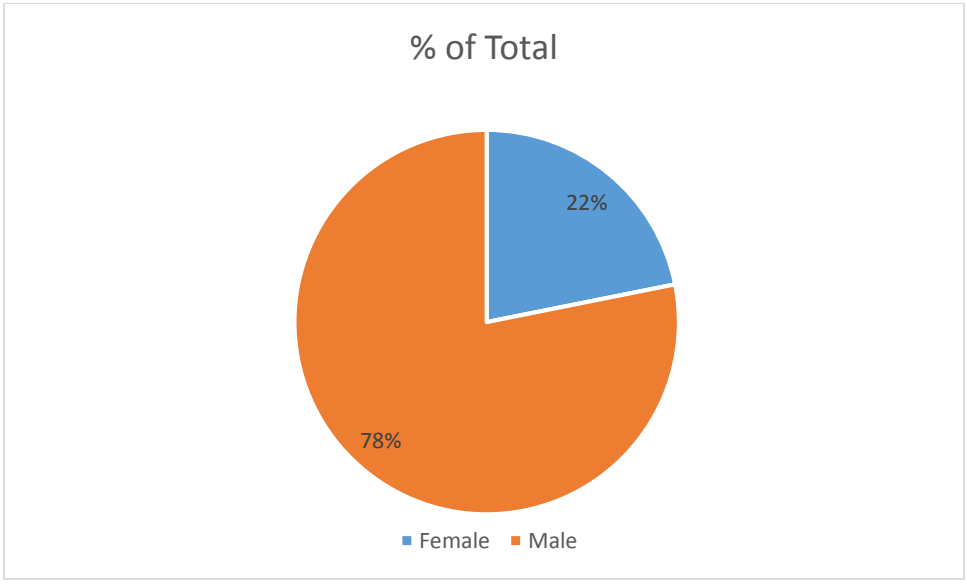

% Fatal and Incapacitating
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

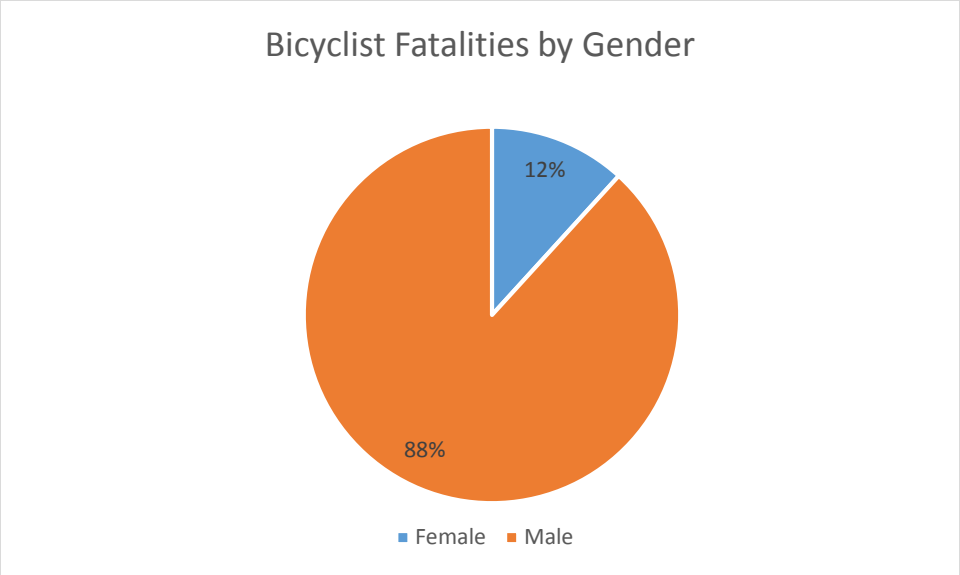

Bicyclists
300
250
200
150
100
50
0
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

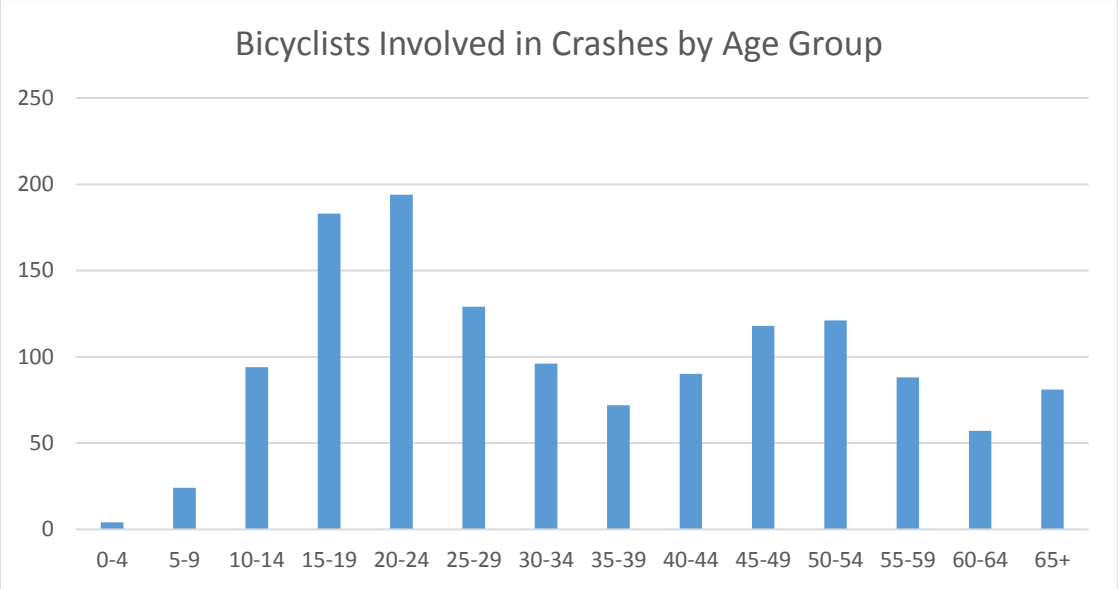

Bicyclists
160
140
120
100
80
60
40
20
0
January
February
March
April
May
June
July
August
September
October
November
December

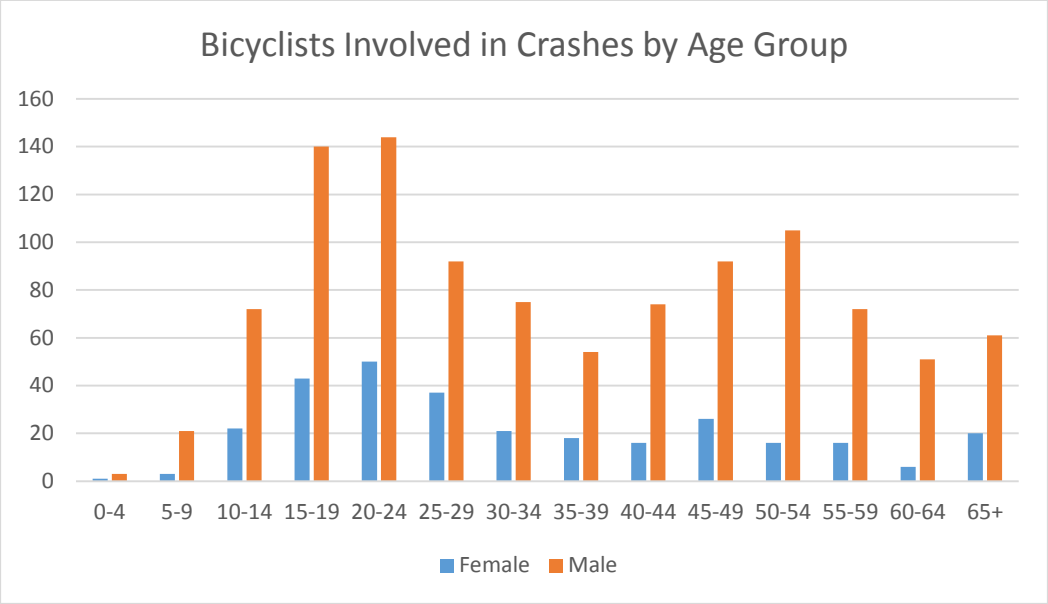

Bicyclist Alcohol Consumption by Bicyclist Injury Severity
25%
20%
15%
10%
5%
0%
All Crashes
Incapacitating
Fatal

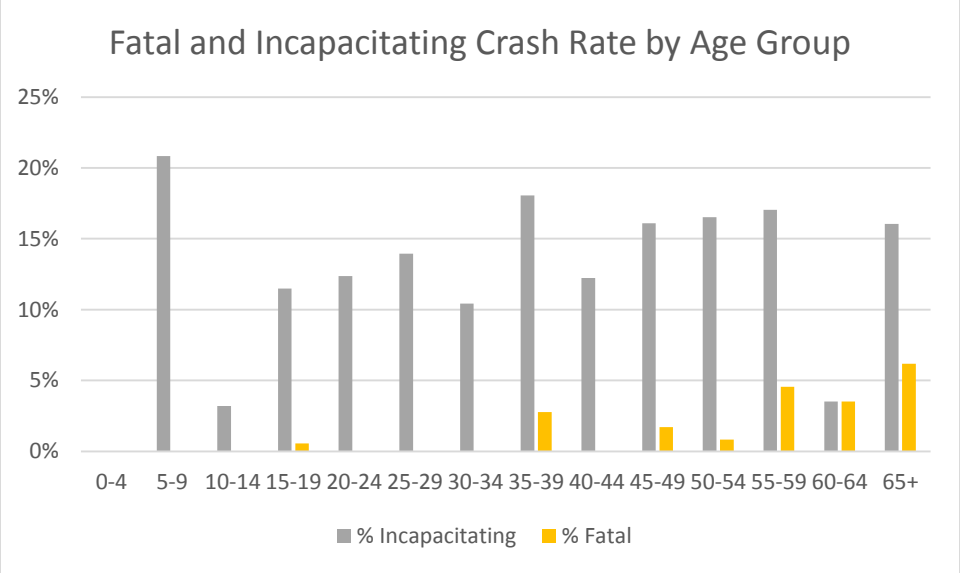

Driver Alcohol Consumption by Bicyclist Injury Severity
14%
12%
10%
8%
6%
4%
2%
0%
All Crashes
Fatal


% of Total
22%
78%
Female
Male

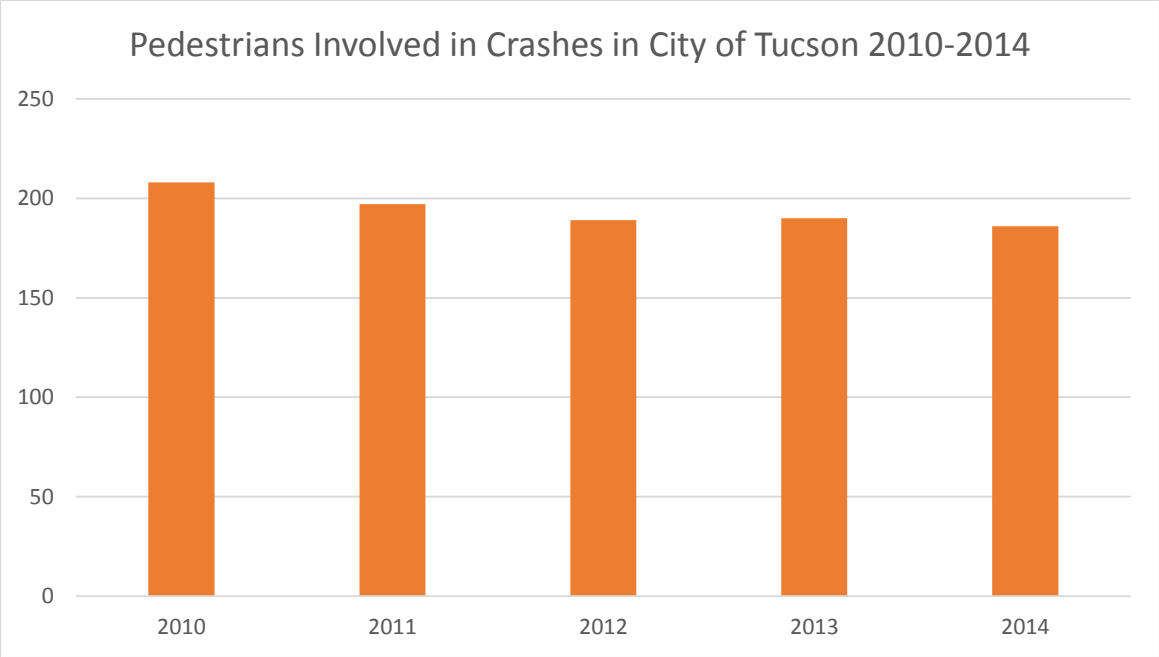

Bicyclist Fatalities by Gender
12%
88%
Female
Male

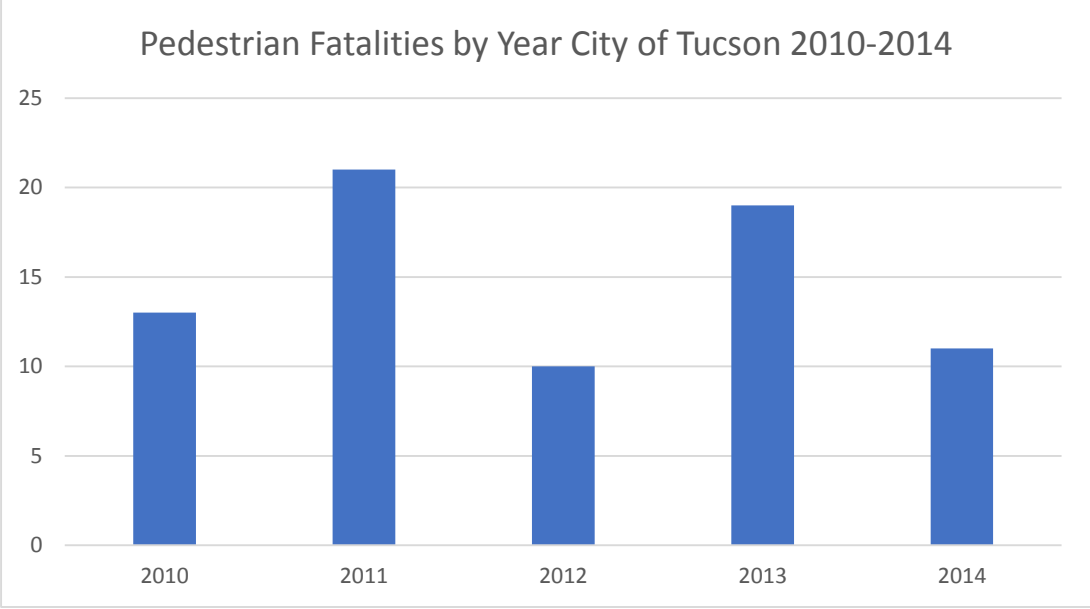

Bicyclists Involved in Crashes by Age Group
250
200
150
100
50
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+


Bicyclists Involved in Crashes by Age Group
160
140
120
100
80
60
40
20
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
Female
Male

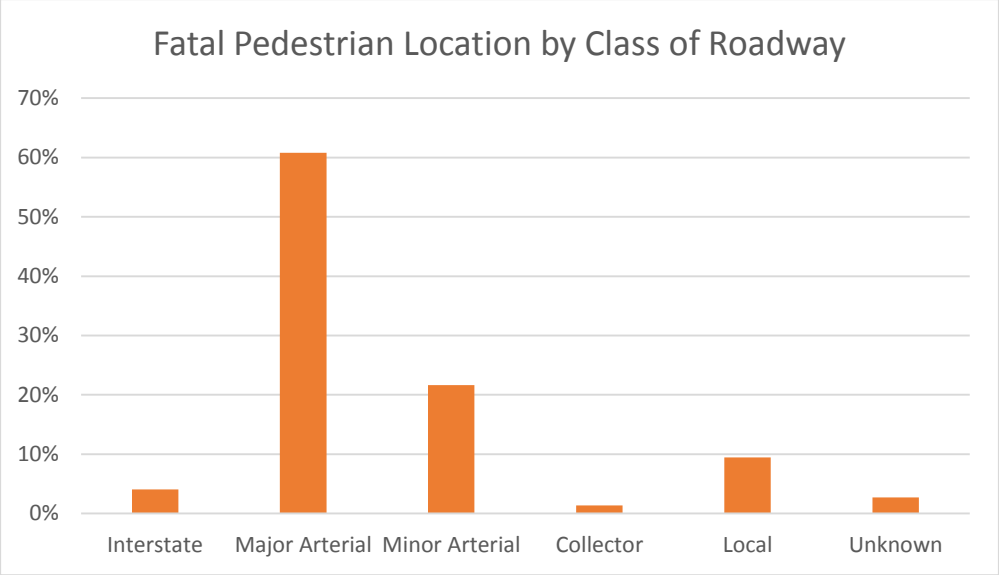

Fatal and Incapacitating Crash Rate by Age Group
25%
20%
15%
10%
5%
0%
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
% Incapacitating
% Fatal

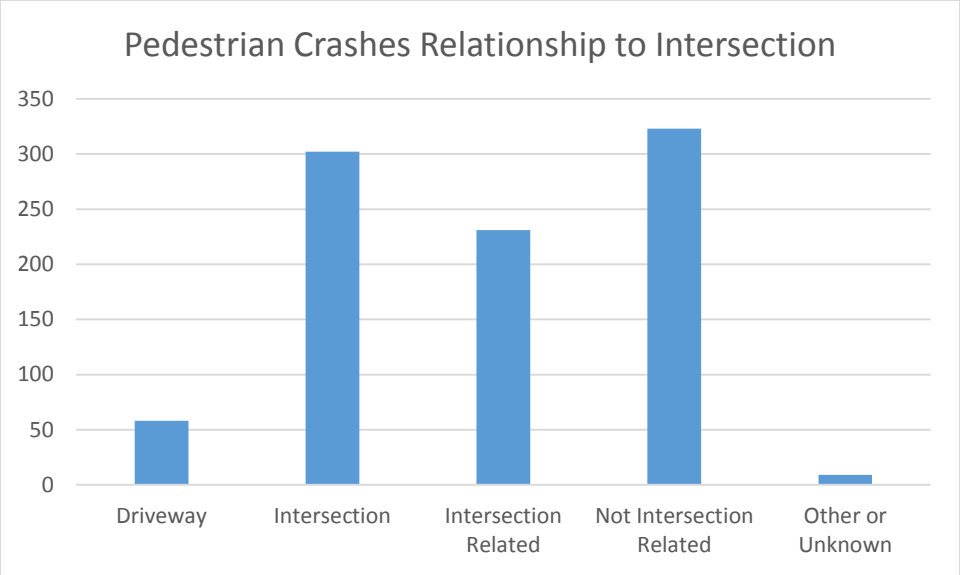
20 APPENDIX H: PEDESTRIAN SUMMARY TABLES, TUCSON ONLY

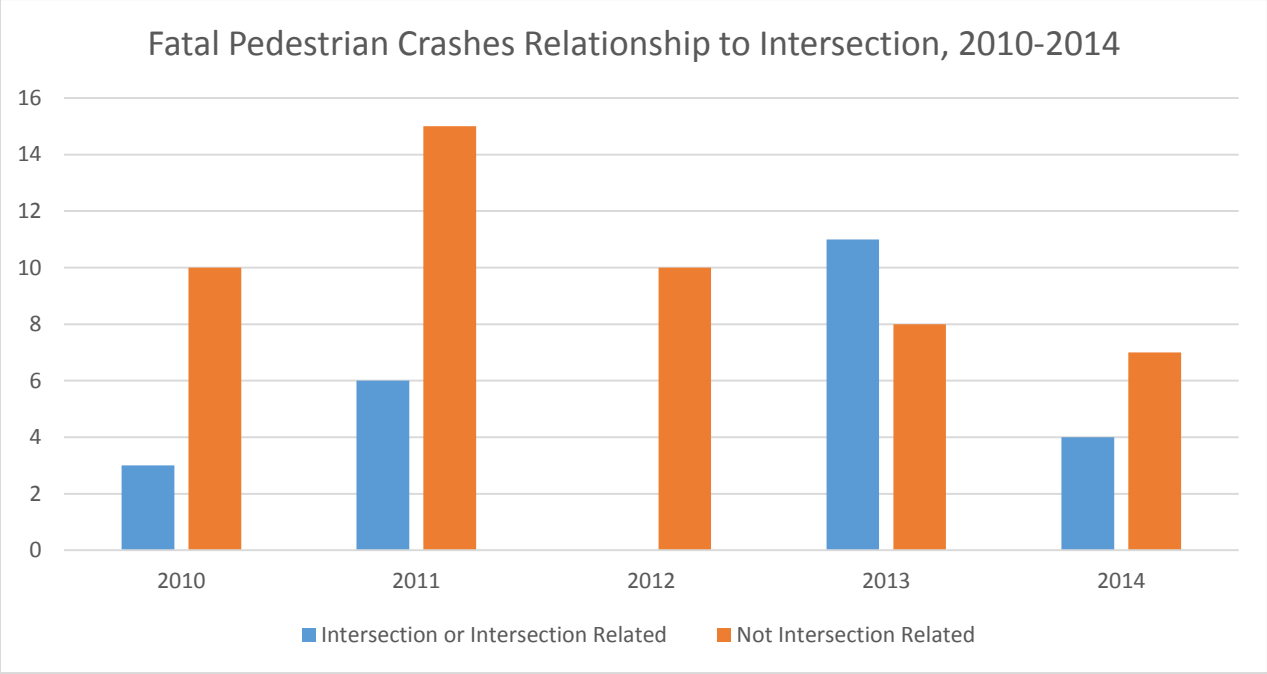

Pedestrians Involved in Crashes in City of Tucson 2010-2014
250
200
150
100
50
0
2010
2011
2012
2013
2014


Pedestrian Fatalities by Year City of Tucson 2010-2014
25
20
15
10
5
0
2010
2011
2012
2013
2014

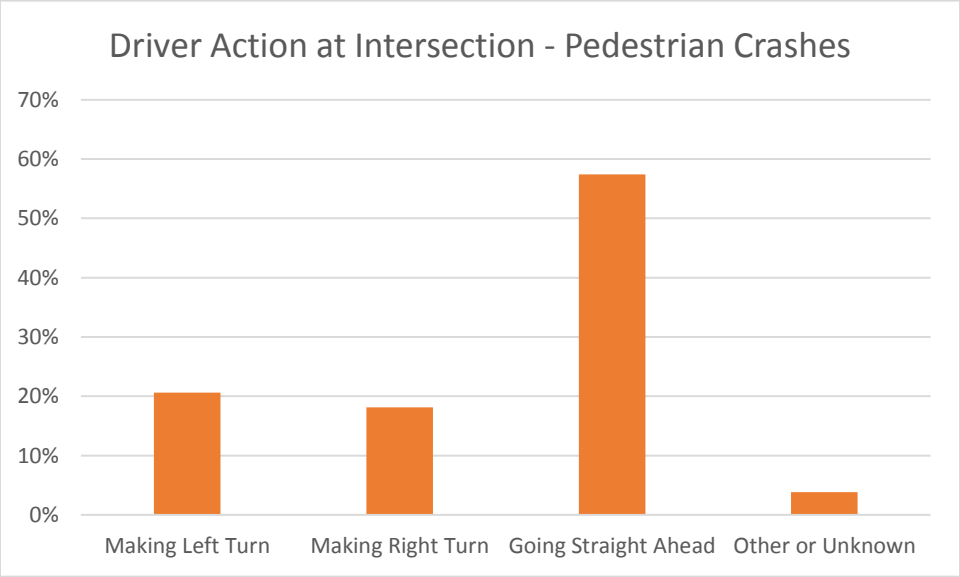
Pedestrians Involved in Crashes by Injury Severity in the City of Tucson 2010-2014						
Injury Status	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
No Injury	16	7	9	13	14	59
Possible Injury	33	34	31	43	50	191
Non-incapacitating Injury	84	98	75	57	69	383
Incapacitating Injury	55	32	54	31	42	214
Fatal	13	21	10	19	11	74
Unknown	7	5	10	27	0	49
Total	208	197	189	190	186	970

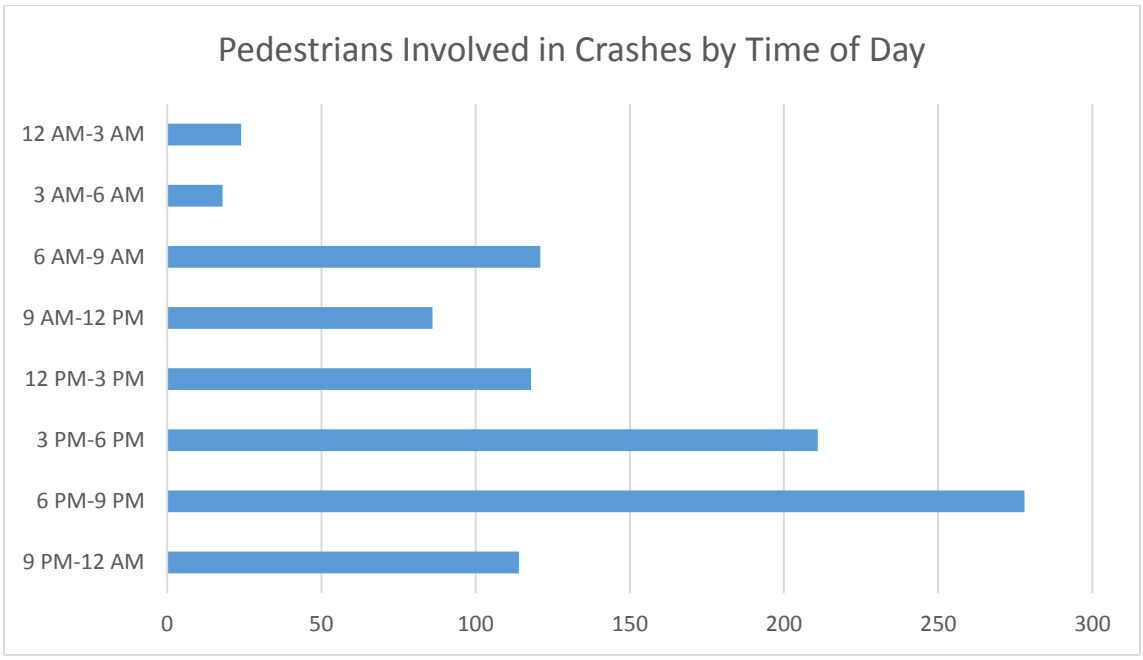


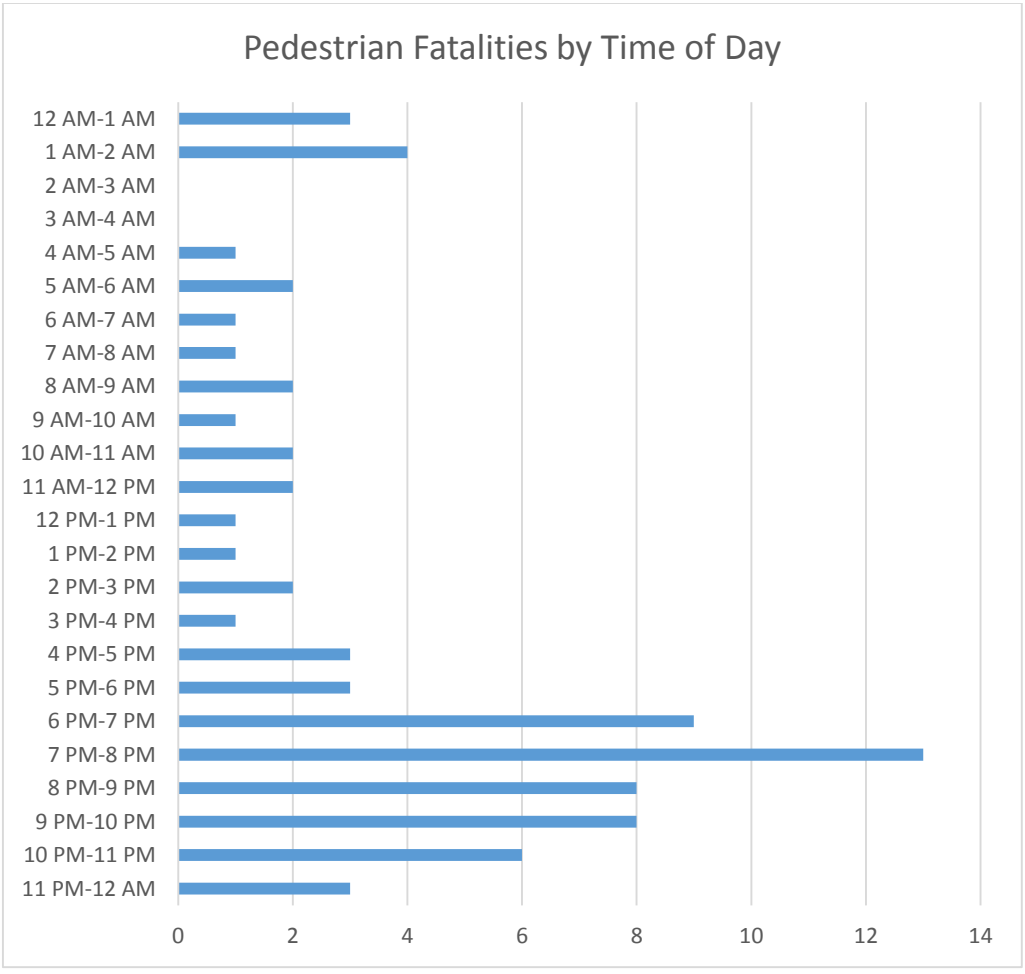

Pedestrian Crashes Relationship to Intersection
350
300
250
200
150
100
50
0
Driveway
Intersection
Intersection Related
Not Intersection Related
Other or Unknown

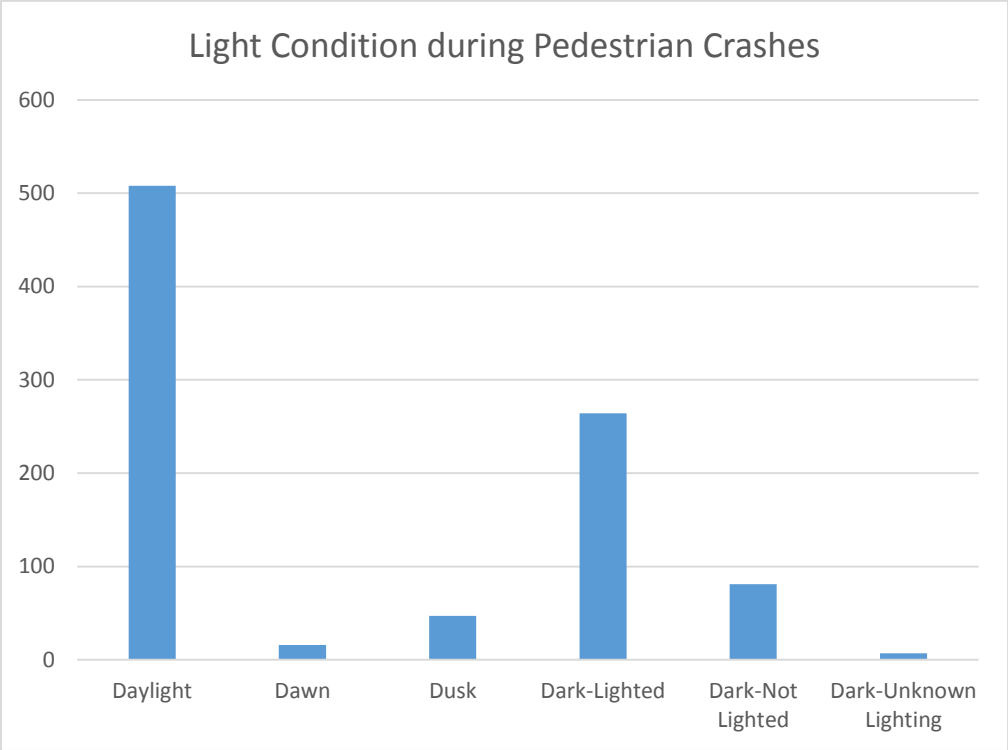

Fatal Pedestrian Crashes Relationship to Intersection, 2010-2014
16
14
12
10
8
6
4
2
0
2010
2011
2012
2013
2014
Intersection or Intersection Related
Not Intersection Related

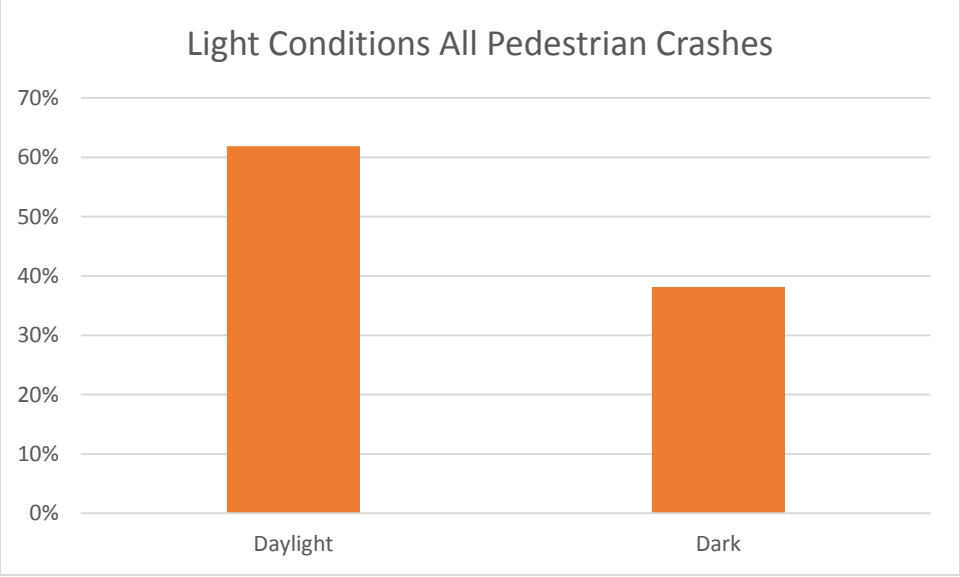
Pedestrian Crash Location	2010	2011	2012	2013	2014	Total
Not Applicable	1	0	0	0	0	1
Marked Crosswalk at Intersection	79	74	56	72	70	351
At Intersection but No Crosswalk	25	23	14	27	23	112
Non Intersection Crosswalk	4	7	4	2	8	25
Driveway Access Crosswalk	6	8	3	3	5	25
School Crosswalk	1	2	2	0	2	7
In Roadway Not in a Crosswalk or Intersection	72	62	77	59	53	323
Median but Not On Shoulder	0	1	0	1	0	2
Island	0	0	0	1	0	1
Shoulder	3	2	2	2	2	11
Sidewalk	7	10	16	8	9	50
Roadside	1	0	2	0	2	5
Outside Trafficway	1	2	1	0	0	4
Dedicated Bike Lane	3	0	1	1	0	5
Inside Building	0	0	0	1	0	1
Other	2	3	4	6	3	18
Unknown	2	3	7	5	4	21
Not Reported	1	0	0	2	5	8
Total	208	197	189	190	186	970

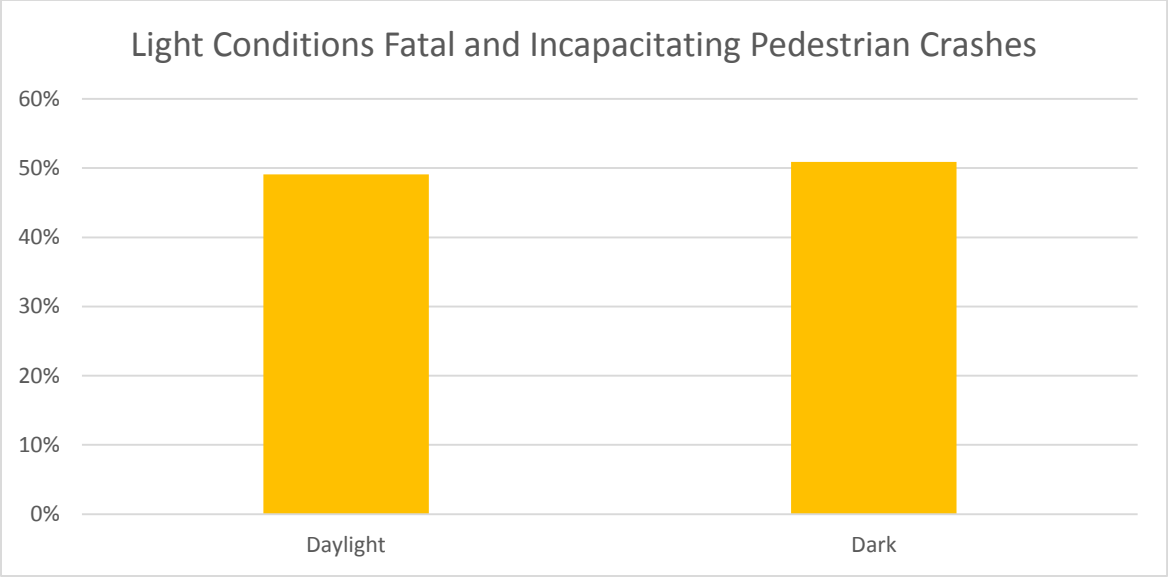


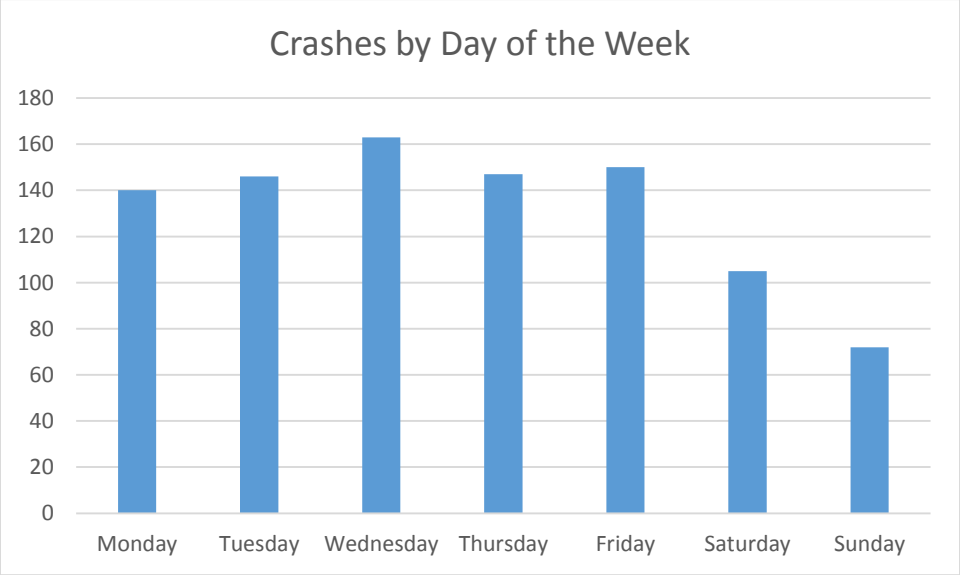

Pedestrians Involved in Crashes by Time of Day
12 AM-3 AM
3 AM-6 AM
6 AM-9 AM
9 AM-12 PM
12 PM-3 PM
3 PM-6 PM
6 PM-9 PM
9 PM-12 AM
0
50
100
150
200
250
300

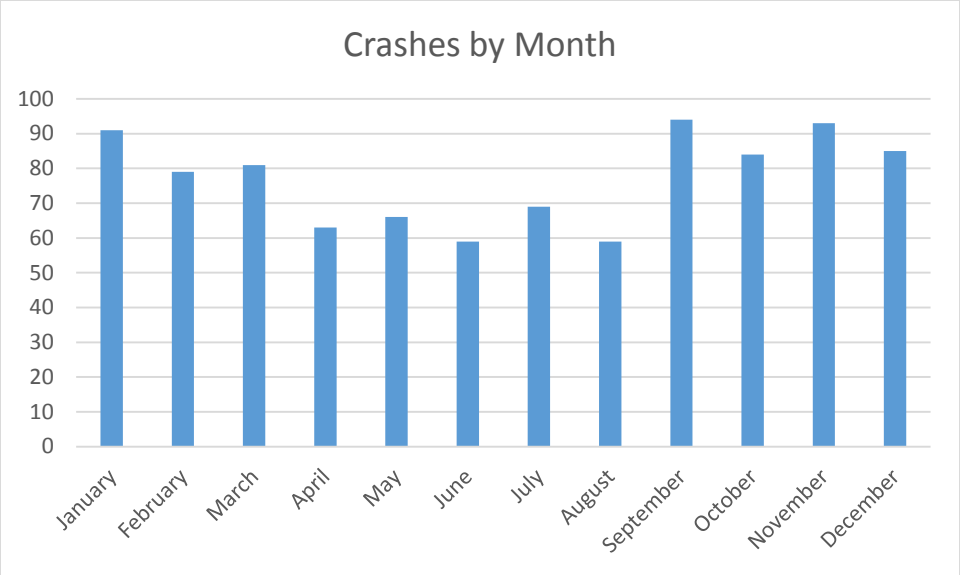

Pedestrian Fatalities by Time of Day
12 AM-1 AM
1 AM-2 AM
2 AM-3 AM
3 AM-4 AM
4 AM-5 AM
5 AM-6 AM
6 AM-7 AM
7 AM-8 AM
8 AM-9 AM
9 AM-10 AM
10 AM-11 AM
11 AM-12 PM
12 PM-1 PM
1 PM-2 PM
2 PM-3 PM
3 PM-4 PM
4 PM-5 PM
5 PM-6 PM
6 PM-7 PM
7 PM-8 PM
8 PM-9 PM
9 PM-10 PM
10 PM-11 PM
11 PM-12 AM
0
2
4
6
8
10
12
14

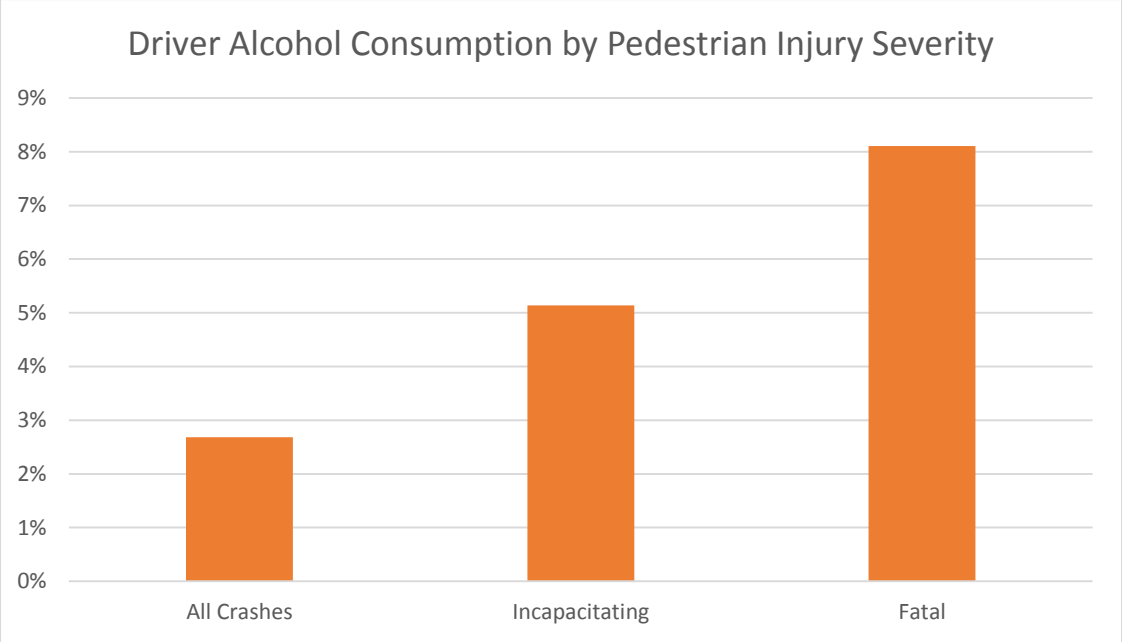

Light Condition during Pedestrian Crashes
600
500
400
300
200
100
0
Daylight
Dawn
Dusk
Dark-Lighted
Dark-Not Lighted
Dark-Unknown Lighting

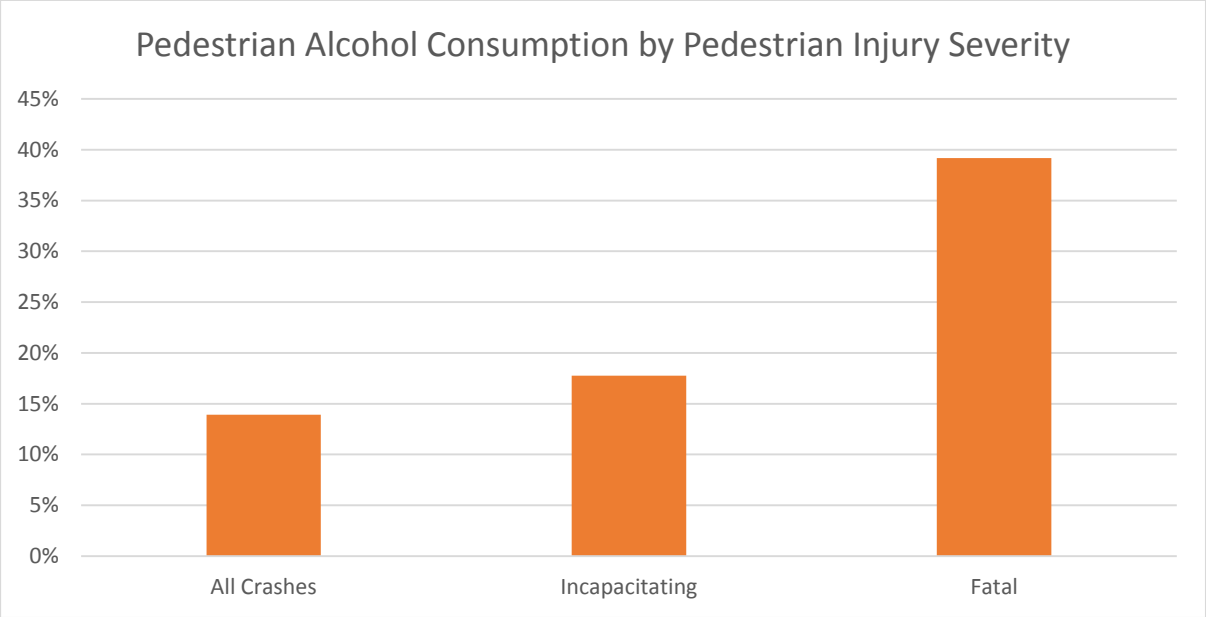

Light Conditions All Pedestrian Crashes
70%
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

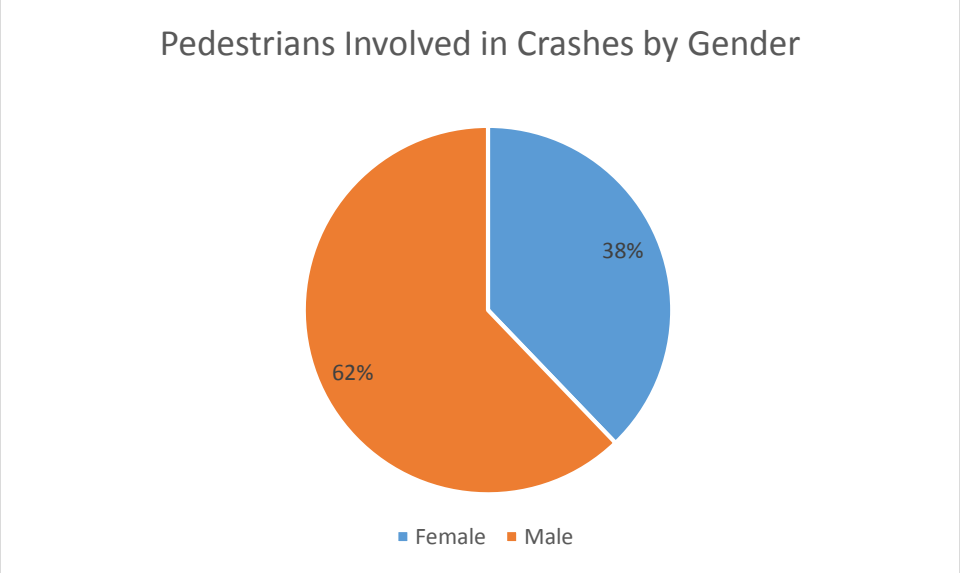

Light Conditions Fatal and Incapacitating Pedestrian Crashes
60%
50%
40%
30%
20%
10%
0%
Daylight
Dark

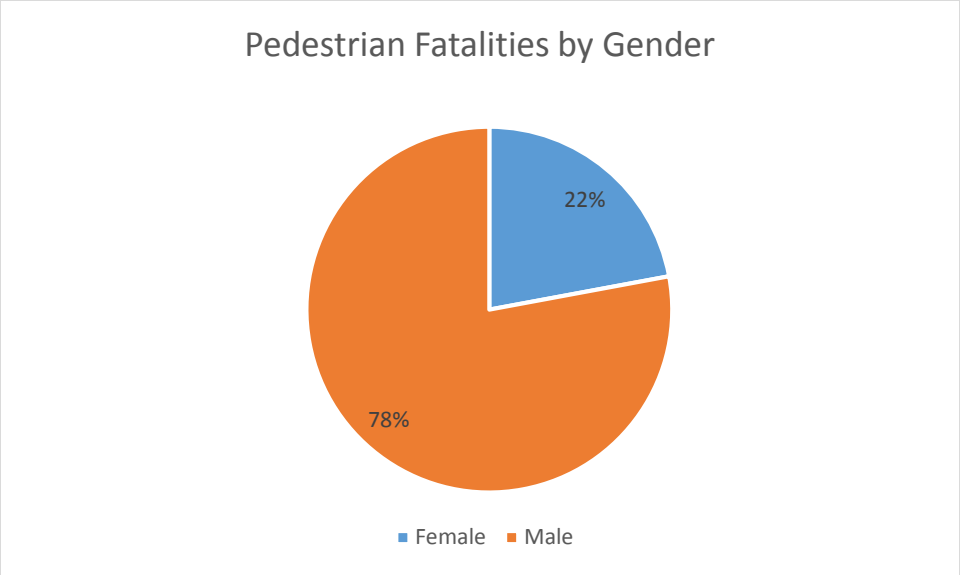

Crashes by Day of the Week
180
160
140
120
100
80
60
40
20
0
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

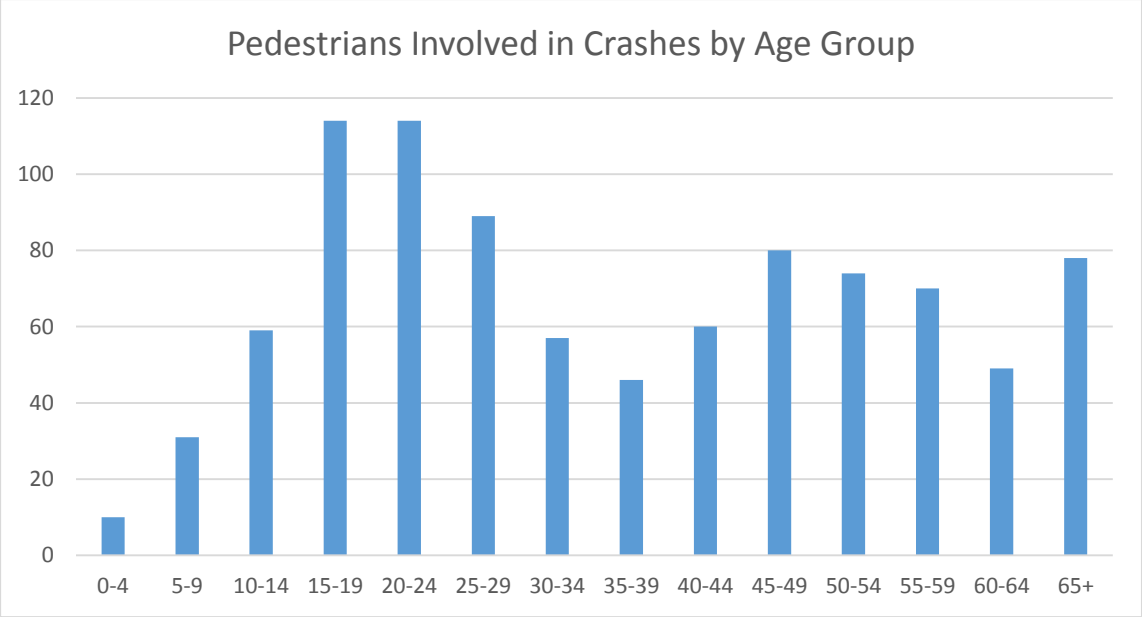

Crashes by Month
100
90
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December

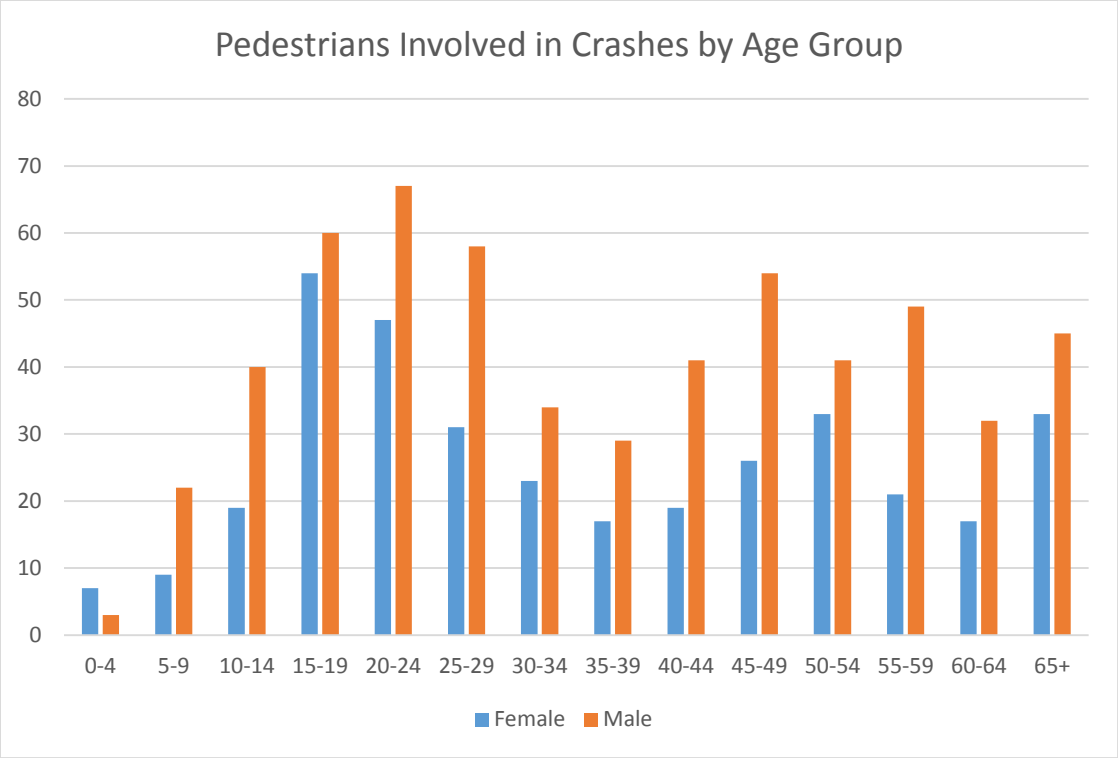

Driver Alcohol Consumption by Pedestrian Injury Severity
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
All Crashes
Incapacitating
Fatal

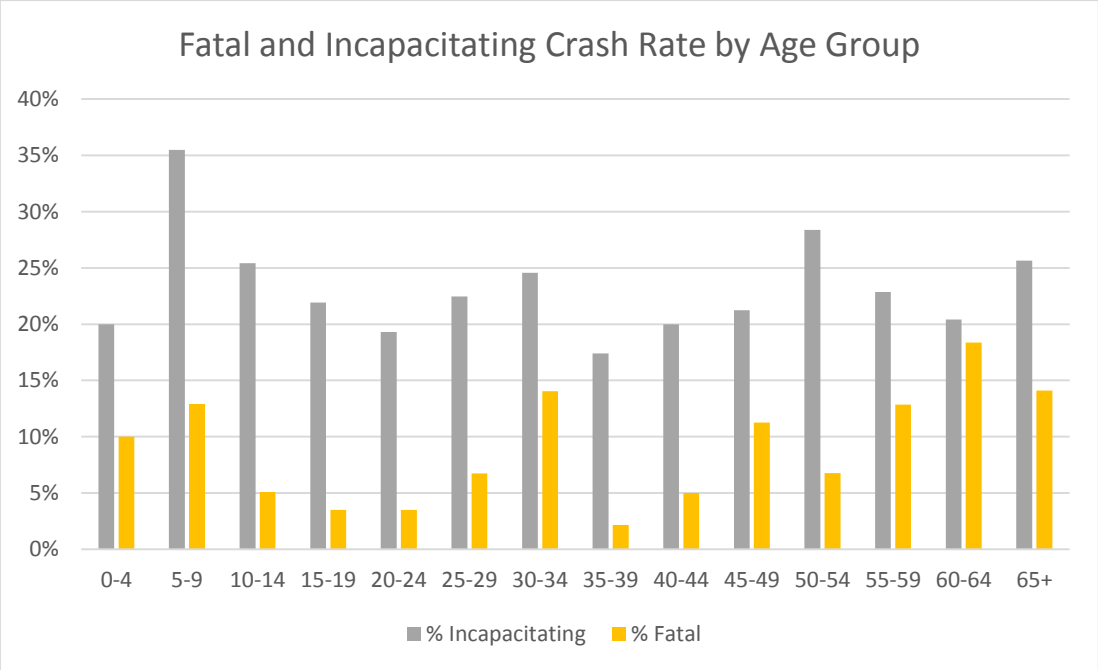

Pedestrian Alcohol Consumption by Pedestrian Injury Severity
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
All Crashes
Incapacitating
Fatal


Pedestrians Involved in Crashes by Gender
38%
62%
Female
Male


Pedestrian Fatalities by Gender
22%
78%
Female
Male


Pedestrians Involved in Crashes by Age Group
120
100
80
60
40
20
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+


Pedestrians Involved in Crashes by Age Group
80
70
60
50
40
30
20
10
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
Female
Male


Fatal and Incapacitating Crash Rate by Age Group
40%
35%
30%
25%
20%
15%
10%
5%
0%
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65+
% Incapacitating
% Fatal