

CHAPTER 2 – SAFETY CRASH DATA ANALYSIS

Crash Data

To better understand conditions and risks and to identify potential improvement strategies for people walking and biking in Collier County, six years of bicycle and pedestrian crash data (2011–2016) were mapped and analyzed using data from the Collier County Crash Data Management System (CDMS).³ The primary purposes of the review were to note any changes in trends and to identify where the most severe crashes and crash clusters occur. The MPO conducted a similar analysis in 2014. The two analyses generally agree with each other and identify similar high-crash areas, suggesting that the challenges remain consistent and opportunities for safety-focused projects throughout Collier County continue to be a primary need. Smart Growth America’s *Dangerous by Design 2019* highlights this challenge, noting that Florida has the highest pedestrian danger index in the US.⁴

Between 2011 and 2016, there were 808 reported bicycle and pedestrian crashes that resulted in 33 fatalities, 119 serious injuries, and 460 total injuries. Approximately 80% of all reported crashes occurred on a collector or arterial roadway; these roads have higher posted speed limits and greater volumes of traffic than local, residential roads. As shown in Figure 3, bicyclists accounted for 60% (485) of the reported crashes, and 40% (323) involved pedestrians.

The number of bicycle crashes has declined in each of the last four years. Pedestrian crashes increased from 2011

to 2014 before declining in 2015 and 2016. Analysis of the reasons for these decreases is beyond the scope of this Plan; however, an average annual number of 81 bicycle crashes and 54 pedestrian crashes still represents a sizeable absolute number of crashes and indicates that further opportunities and challenges to improving safety remain.

Traffic Speed and Crash Severity

The arterial roadways in Collier County form the backbone of the transportation network, functioning to move large volumes of traffic efficiently and effectively and allow the rapid movement of people and goods,

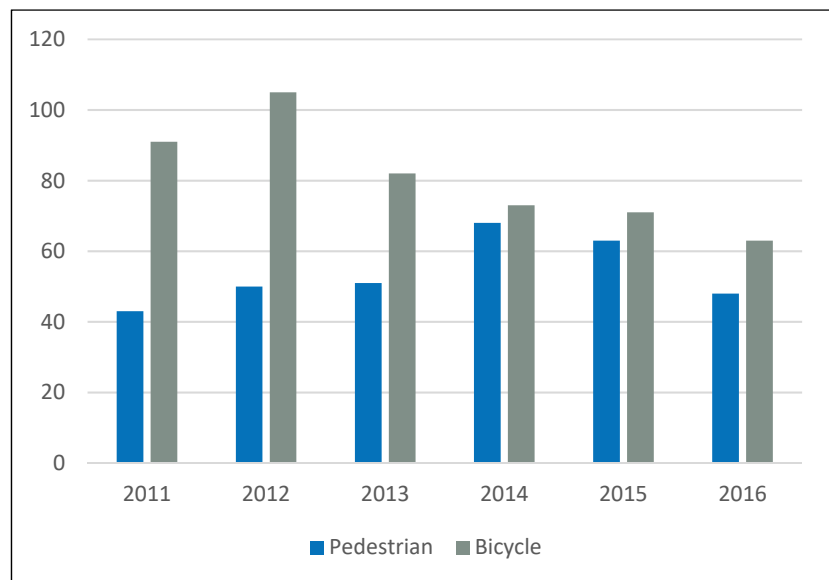


Figure 3. Total Bicycle and Pedestrian Crashes, 2011–2016

³ Collier County Crash Data Management System, 2011–2016.

⁴ Smart Growth America, *Dangerous by Design 2019*, p. 26.



providing the necessary infrastructure for a successful economy. Most of these roads have posted speed limits between 35 and 50 miles per hour (mph) and have four to six through lanes with multiple turning lanes, which results in very large intersections. These roadways also provide important bicycle and pedestrian throughfares due to the lack of publicly-accessible collector roads, yet they present obstacles of varying degrees of difficulty to pedestrians and bicyclists who are using or crossing these roads. In total, 80% of reported bicycle and pedestrian crashes occurred on arterials and collectors. Figure 5 shows the major arterials and collectors with bicycle facility gaps in Collier County.

Many studies have determined that vehicle speed is a critical factor in the survivability of a pedestrian or bicyclist involved in a crash with a motor vehicle. Figure 4 depicts the likelihood of a pedestrian being fatally or severely injured, rising dramatically as the speed of the vehicle increases.

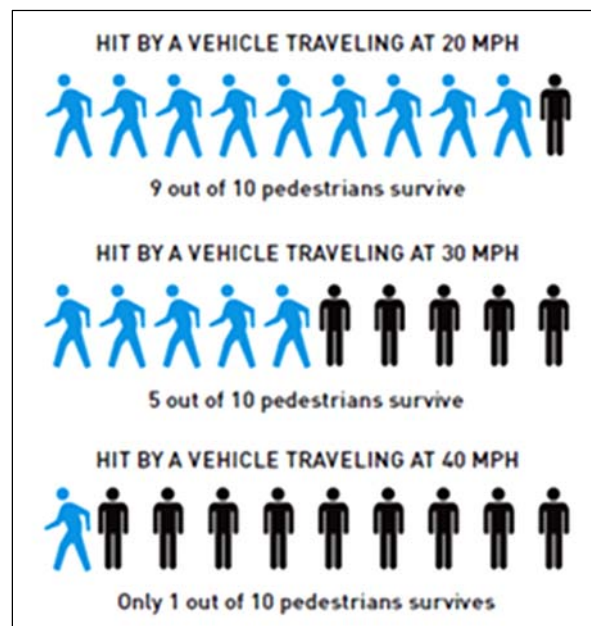


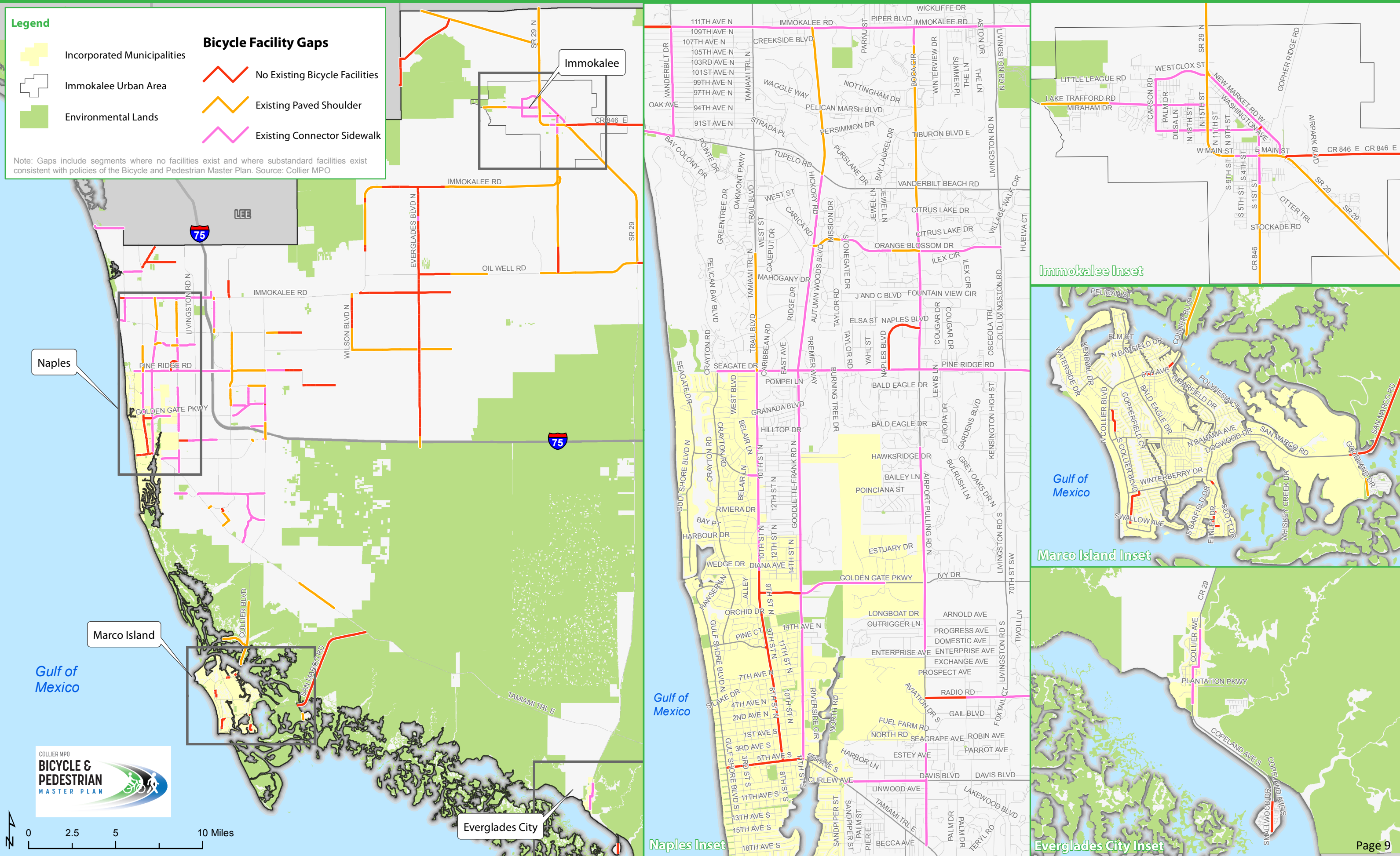
Figure 4. Vehicle Speed Impacts on Pedestrian Survival Rates when Involved in a Crash

Source: Seattle.gov. Vision Zero

Because the difference in speed between vehicles and bicyclists/pedestrians is a primary factor in the severity of injuries, much of the current focus in bicycle and pedestrian safety is on funding education and enforcement campaigns to train drivers to obey the speed limit, slowing down traffic, or separating modes. A recent study by the Insurance Institute for Highway Safety concluded that “lowering the speed limit in urban areas is an effective countermeasure to reduce speeds and improve safety for all road users.”⁵

⁵ Insurance Institute for Highway Safety, “Lowering the Speed Limit from 30 to 25 mph in Boston: Effects on Vehicle Speeds,” Wen Hu, August 2018.

Figure 5: Major Arterials and Collectors in Collier County





The 2015 Pedestrian/Bicycle Safety Audit (from Commercial Drive to Guilford Road on US-41 and Airport Road from US-41 to Estey Avenue) completed by the Florida Department of Transportation (FDOT) stated that reducing the speed on US-41 from 45 mph to 35 mph and “modifying the “look” of the corridor to emphasize multi-use characteristics along with controlling speeds by design with tighter turning radii and narrower lanes will aid in slowing motorists down. This will assist in driver reaction times, not only for pedestrians and bicyclists, but also for reducing vehicle-vehicle collisions. Reducing speeds will reduce the probability of a pedestrian fatality”.⁶ As shown in Figure 4, a reduction of speed from 40 mph to 30 mph lowers the probability of a pedestrian fatality from 90% to 50%.’

High-Crash Corridors

FDOT periodically releases a report on the Top 50 Bicycle and Pedestrian High-Crash locations in each District. The most recent District 1 list, partially shown in Table 2 and Figure 6, includes five locations in Collier County—three on US-41, one on Airport Road, and one on SR-29 in Immokalee.

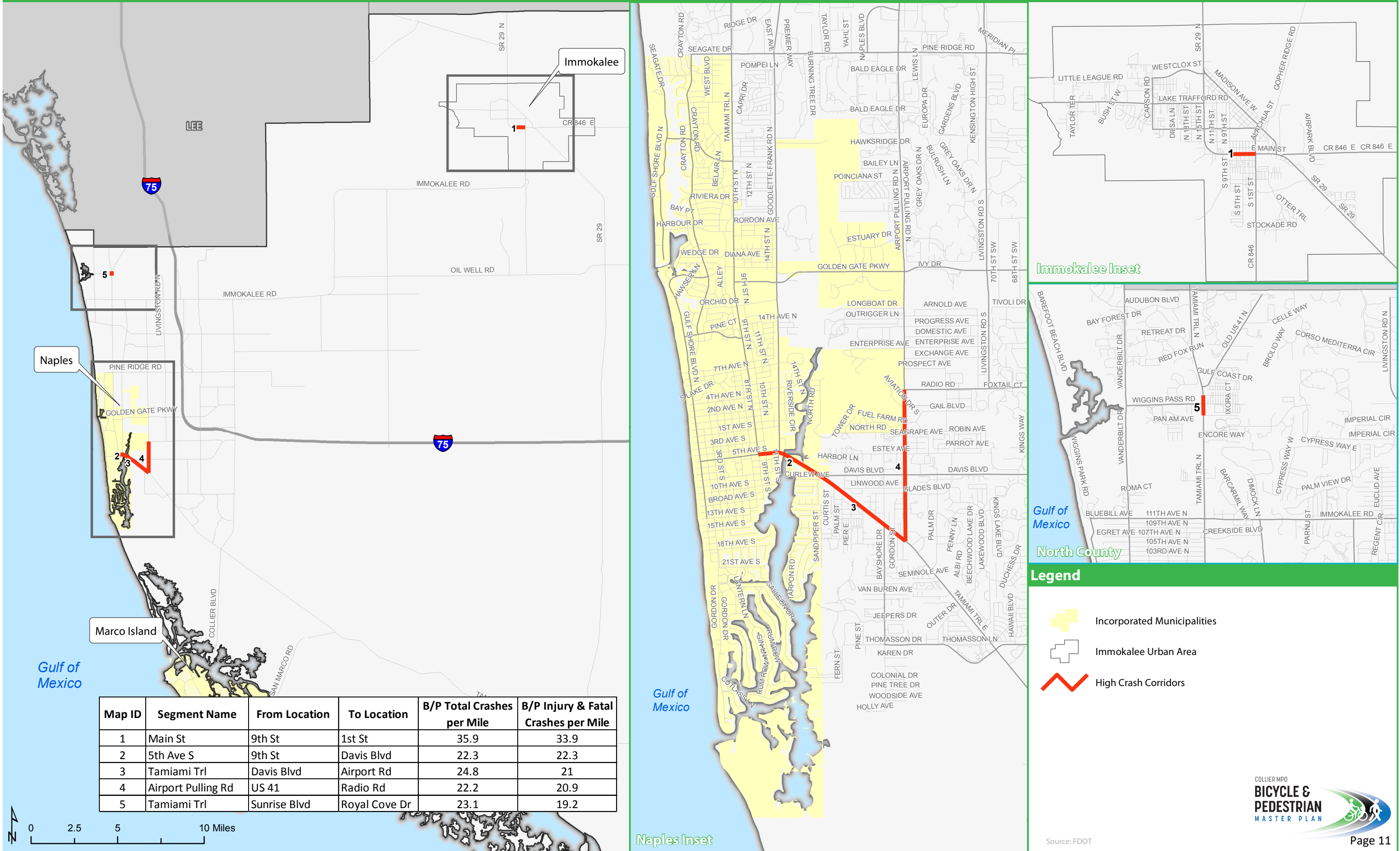
FDOT conducted a Pedestrian/Bicycle Safety Audit (PBSA) on US-41 from Commercial Drive to Guilford Road and on Airport Road from US-41 to Estey Avenue and is implementing a limited range of the recommended improvements in a repaving project on US-41 (FPN 4380591) and at the intersection of Airport Road and Calusa Avenue, but much of the PBSA has not been addressed to date. FDOT also conducted a BPRSA on SR-29 in Immokalee and has constructed several safety improvements.

Table 2. FDOT 2013–2015 Bicycle and Pedestrian High Crash List – Collier MPO

District Rank	County Rank	Miles	Name of Segment	From Location	To Location	Bicycle/Pedestrian Crashes					
						All Injury	Incapacitating Injury	Fatal	Total Per Mile	Incapacitating Injury & Fatal Per Mile	Injury & Fatal Per Mile
4	1	0.5	SR 29 -Main St	9th St	1st St	16	1	1	35.9	4	33.9
8	2	0.5	US 41 - 5th Ave S	9th St	Davis Blvd	11	0	1	22.3	1.9	22.3
11	3	1.3	US 41 - Tamiami Trail	Davis Blvd	Airport Rd	26	2	1	24.8	2.3	21
12	4	1.8	Airport Rd	US41	Radio Rd	29	1	2	22.2	1.7	20.9
16	5	0.3	US 41 - Tamiami Trail	Sunrise Blvd	Royal Cove Dr	4	0	1	23.1	3.8	19.2

⁶ FDOT Pedestrian Bicycle Safety Audit: US41 from Commercial Drive to Guilford Road; Airport Pulling Road from US41 to Estey Avenue, FPN 430582-1, June 2015, p. 22.

Figure 6: FDOT High Crash Corridors





Contributing Factors

Data collected for crashes includes contributing crash factors. Although there is a reliance upon legal judgment and experience regarding contributing factors, assigning cause and effect, and completing forms, understanding contributing crash factors is important in developing strategies to lower the number and lessen the severity of crashes.

Contributing behavioral factors from the CDMS data are shown in Figure 7. At 37% (296), aggressive driving is the most frequent behavioral factor of crashes, and failure to yield is listed as a contributing factor in one-third of crashes (31%, 251) crashes; the data did not state whether the driver or pedestrian/bicyclist had failed to yield. Impaired/intoxicated driving (10%, 78) and distracted driving (10%, 79) were each listed as a behavioral contributing factor. According to the National Highway Traffic Safety Administration (NHTSA), education and enforcement have the greatest impact on changing behavior.

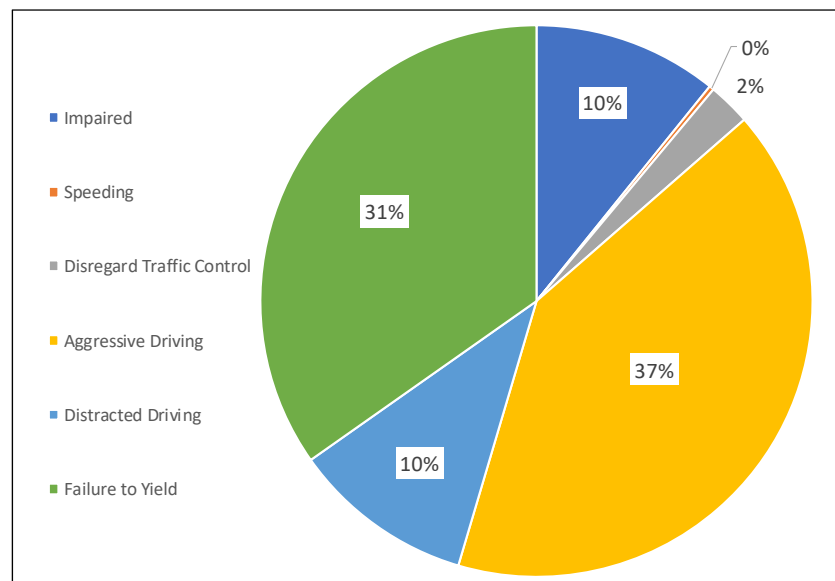


Figure 7. Behavioral Contributing Factors in Reported Crashes

Analysis of the data also looked at two demographic factors—teen drivers and drivers age 65 and over. The data indicate that both age groups are not involved in more crashes than the percent of the county's population that they constitute; teens were involved in 5% of crashes and constitute 5% of the county's population, and drivers age 65 and over were involved in 32% of crashes and constitute 30% of the County's population.

Speeding was indicated as a contributing factor in only two crashes. Speeding is included as a contributing factor only when a law enforcement officer, using radar, detects the driver's speed or determines that the driver was driving too fast for the road conditions.

The Florida Bicycle Association published a booklet containing relevant statistics on safety, the *Florida Pedestrian/Bicycle Law Enforcement Guide, 2017 Edition*,⁷ that identifies the following conditions as common contributing factors in pedestrian-motor vehicle crashes. The guide assigns actions by both pedestrian and driver that contributed to a crash, as shown in Table 3.

Table 3. Pedestrian and Driver Actions as Contributing Crash Factor

Primary Error by Pedestrian	Percent
Failure to yield when crossing roadway	19%
Dash/dart out	14%
Parking lot	7%
Primary Error by Driver	
Failure to yield when crossing roadway	16%
Backing vehicle (failed to detect pedestrian)	8%

Pedestrian and Bicycle Safety Audits

A Road Safety Audit (RSA) is a formal safety performance examination of a roadway or intersection by an independent and multidisciplinary team. The audit qualitatively estimates and reports on potential road safety issues and identifies opportunities to improve safety for all road users. A Pedestrian and Bicycle Safety Audit (PBSA) is a more narrowly-focused audit for pedestrians and bicyclists. Areas of safety concern may be identified by looking at crash data, but a Safety Audit often is the only way to determine what is causing the crashes and to develop appropriate strategies to increase safety.

The 2015 FDOT PBSA for Airport Road and US-41 included a detailed data analysis of the 72 pedestrian and bicycle crashes on US-41 and Airport Road. Bicycle crashes (85%) are more predominant than pedestrian crashes (15%) in the study area. Half of the crashes (51%) occurred at a driveway, 23% at a signalized intersection, and 17% mid-block. The study also noted that 61% of the individuals involved in the crash were listed as Hispanic; Hispanics and Latinos comprise only 26% of the county's residents, according to 2013 Census data.

Bicycle crashes typically are occurring during daylight hours involving males riding on the sidewalk and being struck while crossing a driveway, often approaching from the driver's right, but there is also a pattern of crashes with bicyclists approaching from the driver's left. Bicycle crashes occurring in a bike lane typically were bicyclists traveling the wrong way. Bicycle crashes at a signal typically were daytime crashes involving a right-turning vehicle. Overall, crash conflicts involving turning vehicles were significantly higher on the south side of US-41 than on the north side; and on Airport Road more often on the east side of the road.

Pedestrian crashes typically involve males crossing mid-block at night and often under the influence of alcohol. Pedestrian crashes occurring at signals often are attributed to pedestrians not using the pushbuttons or failing to wait for pedestrian signals before crossing the intersection.

⁷ Florida's Integrated Report Exchange System (FIRES) and USF Center for Urban Transportation Research (CUTR) data collection and analysis.



The PBSA also identified a recurring engineering issue—channelized right-turn lanes and conflicts with pedestrians and cyclists. The Airport Road intersection with Davis Boulevard, for example, is described as having been redesigned and ready for the construction phase to add a southbound right-turn lane. The proposed design includes a channelized right-turn lane that will provide an unsignalized right-turn movement or YIELD control and an unsignalized pedestrian movement across the channelized turn lane. FDOT notes that this could contribute to pedestrian/bicycle crashes at this location, as seen at other locations. The YIELD condition and the wider turning radius of the right-turn lanes encourage higher turning speeds by motorists.

FDOT suggests modifying the proposed design to include a signalized crosswalk across the entire north leg by removing the channelized right-turn lane and providing signalized control for the southbound right-turn movement. At the very least, the design should be modified to include signalized control of the southbound right-turn lane with a right-turn signal overlap phase.

Economic Costs of Crashes

A NHTSA study⁸ estimated the economic⁹ and comprehensive¹⁰ costs of those severely or fatally injured in a motor vehicle crash involving at least two motor vehicles. Table 4 lists the combined NHTSA and FDOT estimated costs per injury type and multiplies these figures by the number of fatal and severe bicycle and pedestrian injuries shown in the data collected for this Plan to develop an order of magnitude of the total economic and comprehensive costs associated with bicycle and pedestrian crashes.

Table 4. Economic and Comprehensive Cost of Bicycle and Pedestrian Crashes 2011–2016*

Economic Cost			
Type	NHTSA/FDOT Cost per Crash	2011–2016 Bike/Ped Crashes	2011–2016 Total Cost of Crashes
Severe Injury	\$1.0 million	119	\$ 119 million
Fatal injury	\$1.4 million	33	\$ 46 million
Comprehensive Cost			
Type	Each Cost	Crashes	Total Cost
Severe Injury	\$ 5.6 million	119	\$ 666 million
Fatal injury	\$ 9.1 million	33	\$ 300 million

*Costs expressed in 2010 economics using a 3% discount rate.

⁸ NHTSA, “The Economic and Societal Impact of Motor Vehicle Crashes,” 2010 (revised 2015).

⁹ Economic costs are total of goods and services expended to respond to a crash, treat injuries, repair or replace damaged property, litigate restitution, administer insurance programs, and retrain or replace injured employees; also includes health and environmental congestion impacts and value of workplace and household productivity lost.

¹⁰ Comprehensive costs are total societal harm resulting from a crash; includes value of lost quality-of-life as measured and economic impacts that result from crash.



Enforcement

The Collier County Sheriff's Office Traffic Unit periodically conducts high-visibility enforcement (HVE) details targeting high-crash corridors. For example, in September 2018, enforcement campaigns were held in the following locations:

- Airport Road from Davis Boulevard to US-41
- US-41 from Davis Boulevard to Rattlesnake Hammock Road
- N 15th/Main Street from New Market Road west to Immokalee Road
- SR-29 S at Farm Worker Way

HVE details are funded through a contract with the University of North Florida in partnership with FDOT's focused initiative to improve pedestrian and bicycle safety. The goal of this enforcement effort is to increase awareness of and compliance with traffic laws that protect the safety of pedestrians and bicyclists. Enforcement efforts focus primarily on educating drivers, pedestrians, and bicyclists. However, violations may result in warnings or citations depending on the circumstances.

Education Campaigns

The PBSA suggests that bi-lingual education material needs to be incorporated into education outreach. FHWA and NHTSA have free downloadable material including flyers, brochures, posters and Public Service Announcements (PSAs) that can be used. FDOT also recommends using changeable message signs on both Airport Road and US-41 to display to motorists the need to follow the three-foot rule.

Unreported Bicycle and Pedestrian Crashes

Law enforcement crash reports have been the traditional source of bicycle and pedestrian crash statistics. Although these reports provide significant information, studies have concluded that they represent only a portion of the total number of crashes. Many factors contribute to this under-reporting, including the presence and/or severity of injuries, whether an insurance claim is filed, and whether those involved wish to not report the crash.

Many studies show that reported crashes represent only a portion of the total number of crashes.

A literature review done by FHWA found that 60–75% of hospitalized victims of pedestrian- and bicycle-motor vehicle crashes were identified in official motor vehicle crash files. The report also found that for persons receiving only emergency room treatment and not hospitalization, the reported crash percentages ranged from 50–60%.¹¹ A study by Elvik and Mysen in 2007 found that 95% of all fatal pedestrian and bicycle crashes are captured in official crash data; however, the percent of reported crashes declined dramatically with decreasing injury severity to as low as 25% of all crashes.¹² A similar study found that bicyclists who were

¹¹ "Injuries to Pedestrians and Bicyclists: An Analysis Based on Hospital Emergency Department Data," FHWA-RD-99-078 (1999).

¹² Rune Elvik and Ann Borger Mysen, "Incomplete Accident Reporting: Meta-Analysis of Studies Made in 13 Countries," *Transportation Research Record*, 1665, 133-140, 2007.

hospitalized or killed were 1.4 times more likely to be reported in official state crash data than bicyclists who received emergency room treatment but were not admitted.¹³

Street and Sidewalk Lighting

Lighting can be an important safety feature, allowing increased visibility for motorists, pedestrians, and bicyclists. It is important to consider adequate lighting during the design and construction of bicycle and pedestrian infrastructure. Public comments often equate safety with adequate lighting. A survey was administered during the public outreach for this Plan, and the survey and results are provided in Appendix 7. Two survey questions asked respondents what made them feel unsafe when walking or biking. Of the respondents who answered, 30% of pedestrians and 22% of bicyclists noted a lack of lighting as a reason they felt unsafe.

Safety Performance Targets

FDOT has adopted “Vision Zero,” a program that sets the goal of zero traffic fatalities or severe injuries in the state. The Collier MPO adopted FDOT’s safety performance targets in February 2018. By doing so, the MPO can rely upon FDOT’s annual reporting to FHWA on safety performance in the Statewide Transportation Improvement Program (STIP), which greatly simplifies the reporting requirements associated with the MPO’s Transportation Improvement Program (TIP) and Long Range Transportation Plan (LRTP). This Plan also includes other performance measures that are Safety Performance Targets.

Safety is the first national goal identified in the Fixing America’s Surface Transportation (FAST) Act and is of critical importance to the MPO. As part of the FAST Act, FHWA required all state departments of transportation (DOTs) and MPOs to adopt five safety performance targets by the end of February 2018 (Table 5). MPOs could adopt their own targets or those of the State DOT. The five safety performance measures and their associated targets are shown in Table 5. The Safety Performance Target for non-motorized fatalities and serious injuries is also referred to in Chapter 7, Policy and Implementation, under Monitoring and Reporting.

Table 5. Safety Performance Measure Targets

Performance Measure	Performance Target
Number of fatalities	0
Rate of fatalities per 100 million vehicle miles traveled (VMT)	0
Number of serious injuries	0
Rate of serious injuries per 100 million VMT	0
Number of non-motorized fatalities and serious injuries	0

¹³ J. C. Stutts and W. W. Hunter, “Police Reporting of Pedestrian and Bicyclists Treated in Hospital Emergency Rooms,” *Transportation Research Record*, 1635, 88-92, 1998.