Texas A&M Transportation Institute

Save a Life™
Texas Department of Transportation

2022–2027

TEXAS STRATEGIC ACTION PLAN FOR MOTORCYCLES

ACKNOWLEDGMENTS

The Texas Strategic Action Plan for Motorcyclists (TSAP-M) was developed as part of a Texas Department of Transportation (TxDOT) grant (2022-TTI-G-1YG-0015), with initial funding provided by the National Highway Traffic Safety Administration. The TSAP-M focuses on reducing the number of motorcyclist fatalities and injuries on Texas roadways.

The Texas A&M Transportation Institute would like to thank Mona Lisa Fisher, the TxDOT Behavioral Traffic Safety Section motorcycle safety program manager, and the Texas Motorcycle Safety Coalition members for their contributions to the development of the plan. Contributions were also made by the countermeasure focus group participants, who volunteered their time, shared their knowledge, and provided their insight. The TSAP-M would not have been possible without their support, guidance, and passion for improving safety for this vulnerable road user group.

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EXECUTIVE SUMMARY

The 2022–2027 Texas Strategic Action Plan for Motorcyclists (TSAP-M) identifies implementable strategies and action steps to make Texas roadways, infrastructure, and drivers safer for the motorcycling community. The plan was developed over 9 months, from October 2021 to June 2022, as an activity within the Statewide Motorist Awareness and Motorcyclist Safety and Outreach Support project. The Texas Department of Transportation (TxDOT) funded the project (Project 2022-TTI-G-1YG-0015) using National Highway Traffic Safety Administration Section 402 program funds.

Several activities were completed in the development of the TSAP-M, including:

- A review of motorcycle safety research and projects conducted in Texas since 2016.
- Consideration of national and state-level strategic motorcycle safety plans and reports.
- Analysis of motorcyclist fatality and injury crash data.
- Evaluation of input from a panel of experts in different aspects of motorcycle safety in Texas.
- Analysis of survey data collected from motorcycle safety stakeholders.

These activities culminated in the development of a list of potential countermeasures to improve motorcyclists' safety that was evaluated and prioritized by motorcycle safety experts and advocates.

The 5-year plan includes detailed strategies and action steps to reduce the number of motorcyclist fatalities, injuries, and crashes on Texas roadways. The plan guides key stakeholders involved in improving motorcycle safety, including:

- TxDOT.
- The Texas Department of Licensing and Regulation.
- The Texas Department of Public Safety.
- The Texas Motorcycle Safety Coalition.
- Law enforcement officers.
- Local agencies.
- Motorcycle clubs/groups and independent riders.
- Motorcycle manufacturers and dealerships.

Critically, the TSAP-M provides a guide to stakeholders to address motorcycle safety by identifying those countermeasures with the most significant opportunity to reduce motorcyclist fatalities, injuries, and crashes in Texas.

1. Introduction

Motorcycling continues to be a popular mode of transportation for both leisure and work activities throughout the United States because of its fuel efficiency, sense of freedom, interaction among fellow motorcyclists, and interaction with the environment. However, these benefits come at a cost. Motorcycle riding is riskier than operating a passenger vehicle. Data compiled by the National Highway Traffic Safety Administration (NHTSA) showed that nationally, per vehicle miles traveled, the risk of being fatally injured in a motorcycle crash in 2020 was 28 times higher than in a passenger vehicle crash (NHTSA, 2022). In 2020 alone, this increased risk translated into 482 motorcyclist (operator and passenger) fatalities in Texas according to the Texas Department of Transportation (TxDOT) Crash Records Information Service (CRIS) database. Unfortunately, this is not an anomaly. CRIS data further showed that there were 500, 498, 419, and 413 motorcyclist (e.g., operator and passenger) fatalities in 2016, 2017, 2018, and 2019, respectively (TxDOT, 2022). In addition to the number of lives lost, the data are alarming because these fatalities accounted for approximately 14 percent of all motor vehicle fatalities in Texas for 2020, but motorcycles only accounted for 2 percent of the registered vehicles (TxDOT, 2022).[1]

Motorcycling continues to be a popular mode of transportation for both leisure and work activities throughout the United States because of its fuel efficiency, sense of freedom, interaction among fellow motorcyclists, and interaction with the environment.

1.1. Motorcycle Crash Factors

But why is motorcycle riding so risky compared to driving a passenger vehicle? A common approach in transportation safety for understanding risk is to delineate crashes by four factors: human, vehicle, environment, and social factors. These factors can then be considered in terms of time frame relative to a crash: pre-crash, crash, and post-crash. The resultant matrix, first developed by Haddon (Motorcycle Safety Foundation, n.d.), provides a comprehensive view of the array of factors that contribute to crashes. Table 1 presents crash factor examples for motorcyclists.

1 The data used in the analysis of this document were accessed from the TxDOT CRIS database between January 7, 2022, and January 20, 2022. Only TxDOT-reportable crash data were used in the analysis. A crash is TxDOT reportable if it occurred on a public roadway and resulted in an injury, death, or $1,000 or more in damages.

Table 1. Example Matrix for Examining Motorcycle Crash Factors.

Crash Factor Category	Crash Time Frame		
	Pre-crash	Crash	Post-crash
Human	• Alcohol involvement • Speeding • Education and training	• Helmets	• Education and training
Vehicle	• Operational equipment • Motorcycle performance • Safety equipment	• Anti-lock braking systems	• Crash notification system
Environment	• Roadway design • Roadway maintenance • Road hazards	• Safe barriers • Safety zones	• Emergency medical services response
Social	• Peer pressure • Insurance incentives		• Safety culture

The examples within the matrix indicate several prominent pre-crash factors that can be addressed to improve motorcyclist safety:

- **Human**—Relative to the human, the countermeasures suggest that decisions made by motorcyclists prior to crashes are an important aspect of their safety. Examples include consuming alcohol prior to riding and exceeding the posted speed limit. Drivers also share responsibility because alcohol consumption, distraction, and decreased awareness of motorcycles can all contribute to the risk of a motorcycle crash.
- **Vehicle**—More recently, relative to the vehicle, motorcycles can be purchased with rider support systems such as anti-lock brakes and collision warning systems, which are promising methods to reduce the number of motorcycle crashes.
- **Environment**—The environment/infrastructure relates to items such as roadway design, roadway materials, and signing as factors contributing to motorcycle crashes (see Silvestri-Dobrovolny et al. [2021] and Geary et al. [2021] for examples of environmental risk factors). As an example, intersection signal light phasing that allows vehicles to make a left turn in front of opposing vehicles can be a risk factor for motorcyclists in the form of left-turn-across-path crashes.
- **Social**—The impact of social factors on motorcycle crashes has not been investigated sufficiently, but education and outreach efforts across Texas encourage safe riding.

Several factors can raise the probability of negative outcomes in the event of a crash. For example, the effects of a motorcycle crash can be exacerbated significantly if a motorcyclist does not wear personal protective equipment such as a helmet, boots, gloves, jacket, and riding pants, or if a roadside crash barrier is not designed to dissipate crash energy (see Silvestri-Dobrovolny et al. [2021] for a review of crash barrier design and motorcyclist safety). Post-crash impacts can be mitigated through motorcyclist-specific training in first aid and crash scene management, as well as crash notification systems that reduce emergency service response times. Because of the significant risk that motorcyclists face when riding from a wide variety of factors, it is necessary to seek innovative and evidence-based solutions to reduce the number of motorcyclist fatalities, injuries, and crashes.

1.2. Texas Motorcycle Strategic Action Plan

The conceptualization of motorcyclist safety risk factors as presented in the matrix in Table 1 suggests that many factors influence safety for this vulnerable road user group, and there may also be many solutions to address the risk factors. The central purpose of the Texas Motorcycle Strategic Action Plan (TSAP-M) is to identify the array of potential motorcyclist safety solutions, particularly those that can be realistically implemented at a reasonable cost and within a reasonable time frame. The 2022–2027 TSAP-M can serve as a guiding document to motorcyclist safety stakeholders or motorcyclist safety advocates in Texas.

The first TSAP-M released in 2013 included a summary of crashes and crash contributing factors and a list of key focus areas. The countermeasure categories in the plan are consistent with the priority areas set forth in NHTSA's *Uniform Guidelines for State Highway Safety Programs: Highway Safety Guideline No. 3: Motorcycle Safety* (NHTSA, 2006). The 2016–2021 TSAP-M (Texas A&M Transportation Institute [TTI], 2016) expanded the utility of the original by working with key non-motorcyclist stakeholders (e.g., engineering, law enforcement, education, emergency medical services, and judicial agencies) and motorcyclist stakeholders (e.g., motorcycle clubs/groups, recreational riders, and motorcycle dealers) to identify motorcyclist safety countermeasures and then estimate their effectiveness, cost, and implementation time frame. These stakeholders also identified what group or agency should lead the implementation of each countermeasure.

This current document, the 2022–2027 TSAP-M, builds on the success of the prior plans by also identifying a small subset of countermeasures that should be pursued by stakeholders within the next 5 years. This TSAP-M is organized into five main sections:

- "Introduction."
- "Motorcycle Safety Data," which provides critical data on motorcycle safety.
- "Activities in Motorcyclist Safety from 2016 to 2020," which describes recently funded and conducted motorcycle safety efforts in Texas.
- "Motorcyclist Safety Activities Identification and Ranking," which identifies countermeasures to improve motorcyclist safety.
- "Conclusion."

Initial evidence of the extent of the motorcyclist safety problem in Texas is that there were between 413 and 500 motorcyclist fatalities on Texas roads between 2016 and 2020.

In Texas, the term *motorcycle* includes motorcycles, mopeds, scooters, motorbikes, three-wheelers (ATVs), and four-wheelers. Unless otherwise noted, all Texas referenced crash data were obtained from the CRIS.

2. Motorcyclist Safety Data

The identification, development, and implementation of countermeasures to improve motorcyclist safety can be informed by an understanding of the nature and extent of the motorcyclist safety problem. This section identifies several primary factors that either contribute to or are associated with motorcyclist safety from 2016 to 2020 (the last year of available data as of this writing). *Analysis of Motorcycle Crashes in Texas, 2010–2017* provides the latest full review of motorcyclist safety data (2010 to 2017) conducted by Shipp et al. (2018).

The TSAP-M references primarily one data source, which is widely available and contains validated and reliable data for both vehicle and motorcycle crashes: the CRIS. The CRIS is maintained by TxDOT and contains crash data based on the Texas Peace Officer's Crash Report (CR-3) form filled out by law enforcement officers at each crash. In Texas, the term *motorcycle* includes motorcycles, mopeds, scooters, motorbikes, three-wheelers (ATVs), and four-wheelers. Unless otherwise noted, all Texas referenced crash data were obtained from the CRIS.

2.1. Definitions

This document uses the following definitions for several prominent data terms:

- **Motorcyclist**—both the operator of the motorcycle and the passenger unless otherwise noted.
- **Operator/passenger**—the motorcycle driver and the passenger/second person on a motorcycle.
- **Fatality**—a death resulting from injuries sustained from a crash at the scene or within 30 days of the crash.
- **Suspected serious injury**—a severe injury that prevents continuation of normal activities. It can include the following:
    - Severe laceration resulting in exposure of underlying tissues/muscle/organs or resulting in significant loss of blood.
    - A broken or distorted extremity (arm or leg).
    - Crush injuries.
    - Suspected skull, chest, or abdominal injury other than bruises or minor lacerations.
    - Significant burns (second- and third-degree burns over 10 percent or more of the body).
    - Unconsciousness when taken from the crash scene.
    - Paralysis.

2.2. What Is the Extent of the Motorcyclist Crash Problem?

Motorcyclists are considered a vulnerable road user group for a variety of reasons, including the fact that there is relatively little protection offered by a motorcycle, unlike a vehicle driver who is surrounded by a well-engineered structure. Initial evidence of the extent of the motorcyclist safety problem in Texas is that there were between 413 and 500 motorcyclist fatalities on Texas roads between 2016 and 2020 (see Figure 1). The minor decline in motorcyclist fatalities from 2016 to 2020, a reduction of 18, only considers overall fatalities and does not account for the influence of additional factors, such as population change. When fatalities are examined as a rate per 100,000 registered motorcycles, the rate of motorcyclist fatalities is the greatest in 2020. The number of motorcyclist fatalities remains high from 2016 to 2020, regardless of population size. In addition, even with a reduction in the number of registered motorcycles over time, the number and rate of motorcyclist fatalities remain high.

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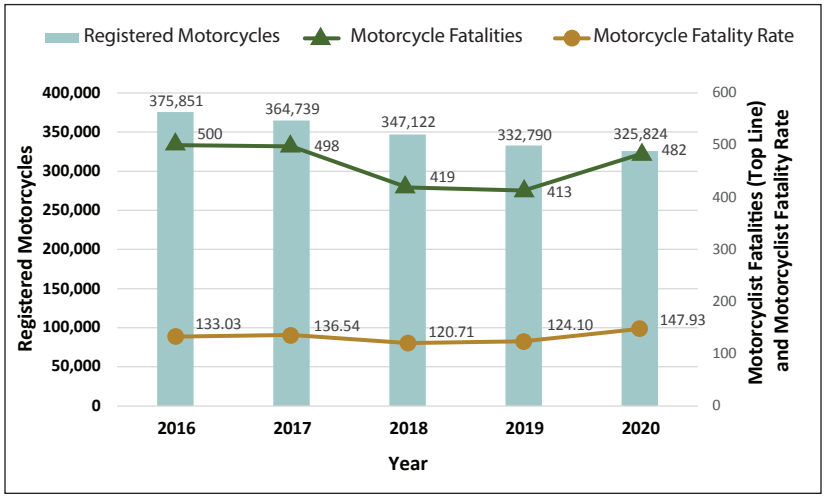

Figure 1. Number of Registered Motorcycles, Motorcyclist Fatalities, and Fatality Rate per 100,000 Registered Motorcycles in Texas between 2016 and 2020 (TxDOT, 2022).

Additional evidence of the magnitude of the motorcyclist safety problem in Texas is the proportion of motorcyclist fatalities to all motor vehicle fatalities. Table 2 indicates that motorcyclists accounted for 11.4 to 13.4 percent of all motor-vehicle-related fatalities in Texas between 2016 and 2020. Similarly, motorcyclists accounted for 11.4 to 12.9 percent of all suspected serious injuries in Texas between 2016 and 2020. The relatively high proportion of both fatalities and suspected serious injuries of motorcyclists to motorists over time further establishes the notion that motorcyclists are a continuing vulnerable road user group and that significant opportunities to improve their safety exist.

Table 2.Proportion of Motorcyclist Fatalities and Suspected Serious Injuries to All Motor Vehicle Fatalities and Suspected Serious Injuries in Texas from 2016 to 2020 (TxDOT, 2022).

Fatality or Injury	2016	2017	2018	2019	2020
Motorist vehicle fatalities	3,794	3,726	3,656	3,623	3,893
Motorcyclist fatalities	500	498	419	413	482
Proportion of all motor vehicle crash fatalities that involved motorcycles	13.2%	13.4%	11.5%	11.4%	12.4%
Motorist suspected serious injuries	17,618	17,571	14,975	15,858	14,660
Motorcyclist suspected serious injuries	2,012	2,107	1,934	1,812	1,857
Proportion of all motor vehicle crash suspected serious injuries that involved motorcyclists	11.4%	12.0%	12.9%	11.4%	12.7%

2.3. Where Do Texas Motorcyclist Fatalities and Injuries Occur?

2.3.1. Urban versus Rural

Categorizing motorcyclist fatalities and suspected serious injuries according to geographic location can provide guidance to safety stakeholders regarding where motorcyclist safety countermeasures could be focused. TxDOT CRIS data define *urban* as a location within the limits of a city or town with a population of 5,000 or more residents and *rural* as a location that cannot be classified as urban. Figure 2 and Figure 3 depict the number of motorcyclist fatalities and suspected serious injuries, respectively, for both urban and rural locations between 2016 and 2020. The primary findings from these data indicate that there are markedly more motorcyclist fatalities and suspected serious injuries in urban areas than in rural areas across all years, that the difference in motorcyclist fatalities between urban and rural areas decreased between 2016 and 2020, and that there was a general decline in motorcyclist suspected serious injuries in urban areas from 2016 to 2020.

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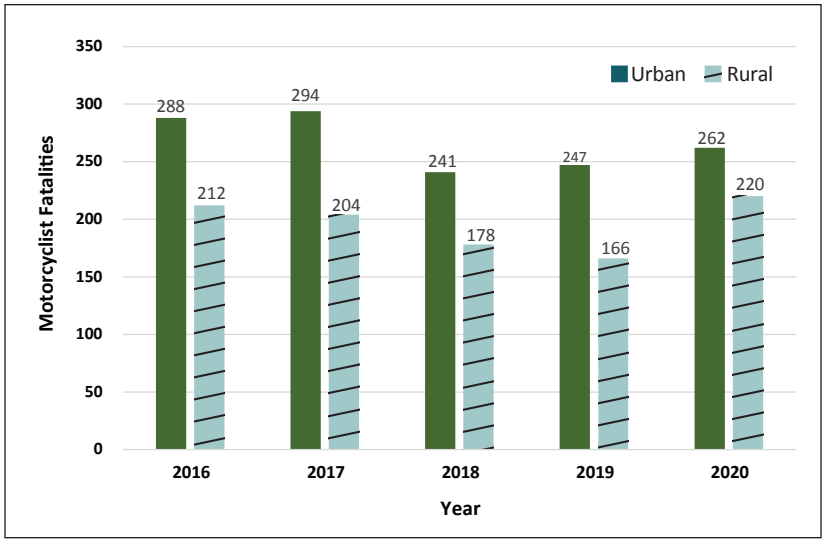
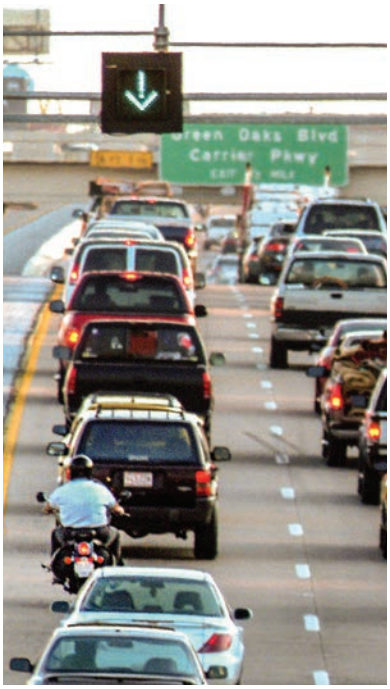


Figure 2. Motorcyclist Fatalities for Urban and Rural Locations for 2016 to 2020 (TxDOT, 2022).



Harris County exhibited the greatest number of motorcyclist fatalities and suspected serious injuries, and Houston, the most populous city in Texas, is located within Harris County.

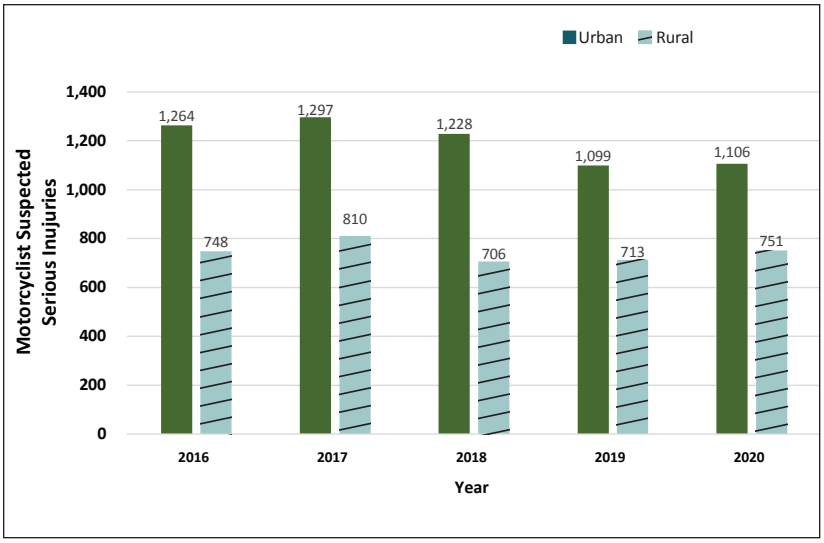


Figure 3. Motorcyclist Suspected Serious Injuries for Urban and Rural Locations for 2016 to 2020 (TxDOT, 2022).

2.3.2. County

Determining where to implement motorcyclist safety countermeasures can also be informed through an understanding of what counties in Texas exhibit the greatest motorcyclist safety problem. Table 3 presents the 10 counties of the 254 in Texas with the highest number of motorcyclist fatalities from 2016 to 2020. Data within the table indicate that most of the counties with the greatest motorcyclist safety problem are also those with major urban cities. For example, Harris County exhibited the greatest number of motorcyclist fatalities and suspected serious injuries, and Houston, the most populous city in Texas, is located within Harris County. Table 4 presents the 10 Texas counties with the highest number of motorcyclist suspected serious injuries. The Texas counties exhibiting a high number of suspected serious injuries are nearly identical to the counties exhibiting a high number of fatalities. For example, the top five counties in both tables are identical and appear in the same order, and overall, nine counties appear in both tables.

Table 3. Top 10 Texas Counties with the Highest Number of Motorcyclist Fatalities.

Rank (by Population)	County	Major City	County Population	Fatalities
1	Harris	Houston	4,703,708	323
2	Dallas	Dallas	2,647,627	183
3	Tarrant	Fort Worth	2,063,496	170
4	Bexar	San Antonio	2,006,193	109
5	Travis	Austin	1,285,526	75
9	El Paso	El Paso	851,888	69
11	Montgomery	Conroe	609,172	55
6	Collin	Plano	1,047,901	51
7	Denton	Denton	904,005	49
17	Galveston	Galveston	341,146	49

Table 4. Top 10 Texas Counties with the Highest Number of Motorcyclist Suspected Serious Injuries.

Rank (by Population)	County	Major City	County Population	Suspected Serious Injuries
1	Harris	Houston	4,703,708	1,165
2	Dallas	Dallas	2,647,627	831
3	Tarrant	Fort Worth	2,063,496	678
4	Bexar	San Antonio	2,006,193	507
5	Travis	Austin	1,285,526	476
7	Denton	Denton	904,005	254
6	Collin	Plano	1,047,901	247
11	Montgomery	Conroe	609,172	222
9	El Paso	El Paso	851,888	202
16	Bell	Killeen	362,093	179

2.4. What Are the Primary Motorcyclist Crash Types?

2.4.1. Single versus Multiple Vehicle

A *single-vehicle crash* is defined as a motorcyclist colliding with an object that is not another motor vehicle or running off the road, while a *multi-vehicle crash* is defined as a motorcyclist colliding with another motor vehicle.

A *single-vehicle crash* is defined as a motorcyclist colliding with an object that is not another motor vehicle or running off the road, while a *multi-vehicle crash* is defined as a motorcyclist colliding with another motor vehicle. Table 5 presents the number of multi-vehicle crashes involving motorcycles of all severities (i.e., fatalities and suspected serious injuries) from 2016 to 2020 and multi-vehicle crashes as a percentage of all crashes (i.e., multi-vehicle and single vehicle). The data indicate that the majority of crashes involved a motorcyclist and another motor vehicle. However, on average 46 percent of all motorcycle crashes did not involve another vehicle, which clearly suggests that motorcyclist safety countermeasures must continue to focus on both motorcyclists and motorists.

Table 5. Number of Multi-vehicle Crashes of all Severities and Percentage of Multi-vehicle Crashes to Single-Vehicle (e.g., Motorcycle) Crashes.

Year	Number of Multi-vehicle Crashes Involving Motorcycles (All Injury Severities)	Percentage of Motorcycle Crashes That Were Multi-vehicle
2016	4,749	53%
2017	4,779	55%
2018	4,268	55%
2019	4,159	55%
2020	3,858	52%

2.4.2. Run off the Road

A *run-off-the-road crash* is defined as a motorcycle crash in which the manner of collision is a motorcycle traveling off a roadway, onto a shoulder, or onto a median, and not involving a crash with another vehicle.

A *run-off-the-road crash* is defined as a motorcycle crash in which the manner of collision is a motorcycle traveling off a roadway, onto a shoulder, or onto a median, and not involving a crash with another vehicle. Figure 4 and Figure 5 show the number of motorcyclist fatalities and suspected serious injuries in run-off-the-road crashes for both urban and rural locations, respectively. Motorcyclist fatalities and suspected serious injuries from run-off-the-road crashes in both urban and rural areas did not abate between 2016 and 2020. An indication of this is that fatal run-off-the-road crashes involving motorcycles accounted for 39 percent of all fatal motorcyclist crashes in Texas in 2016 and decreased slightly to 36 percent in 2020. Approximately 48 percent of motorcyclists were killed in run-off-the-road crashes that occurred in urban areas compared to rural areas between 2016 and 2020. In contrast, approximately 54 percent of motorcyclists who suffered suspected serious injuries in run-off-the-road crashes did so in rural areas, compared to urban areas, during the same time period.

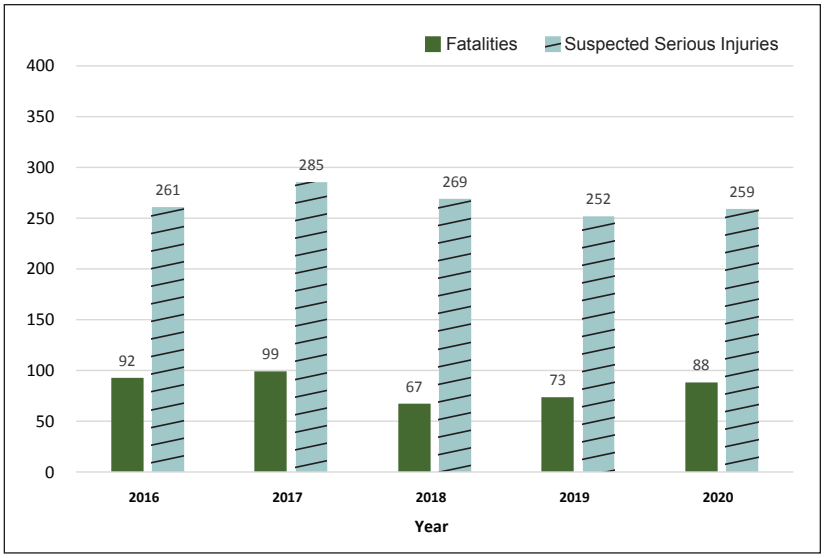


Figure 4. Run-off-the-Road Motorcyclist Fatalities and Suspected Serious Injuries for Urban Locations.

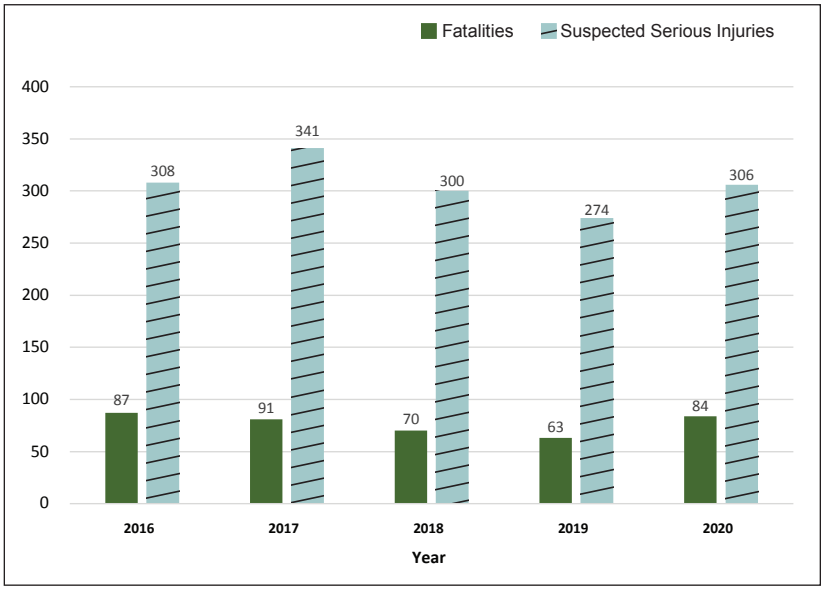


Figure 5. Run-off-the-Road Motorcyclist Fatalities and Suspected Serious Injuries for Rural Locations.

Motorcyclist fatalities and suspected serious injuries from run-off-the-road crashes in both urban and rural areas did not abate between 2016 and 2020.

2.4.3. Head On

A *head-on crash* was defined as a motorcycle crash in which the manner of collision is a motorcycle and another vehicle both traveling straight but in opposite directions. Between 2016 and 2020, generally there were more head-on collisions that resulted in motorcyclist fatalities and suspected serious injuries in rural areas than in urban areas. In addition, the number of motorcyclist fatalities and suspected serious injuries for head-on crashes in either urban or rural areas has not abated over time. Figure 6 and Figure 7 provide graphs of head-on fatalities and suspected serious injuries for both urban and rural areas, respectively.

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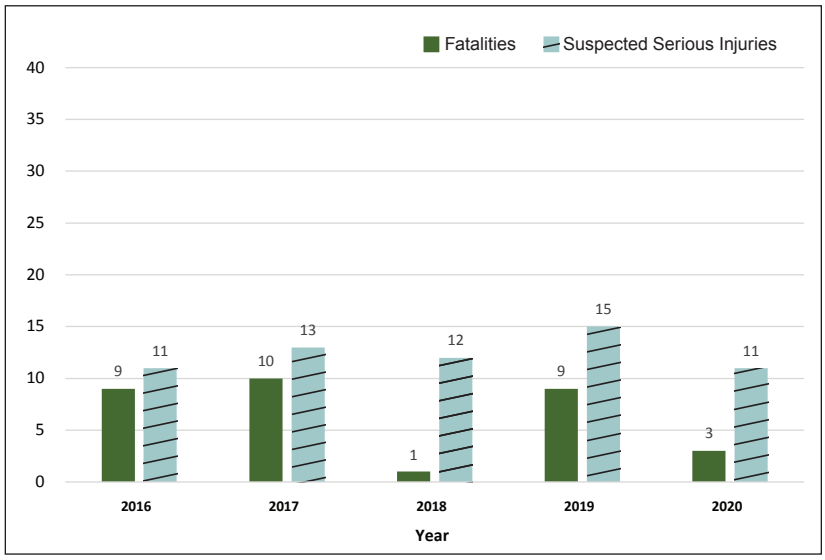

Figure 6. Motorcyclist Fatal and Suspected Serious Injuries for Head-On Crashes in Urban Areas between 2016 and 2020.

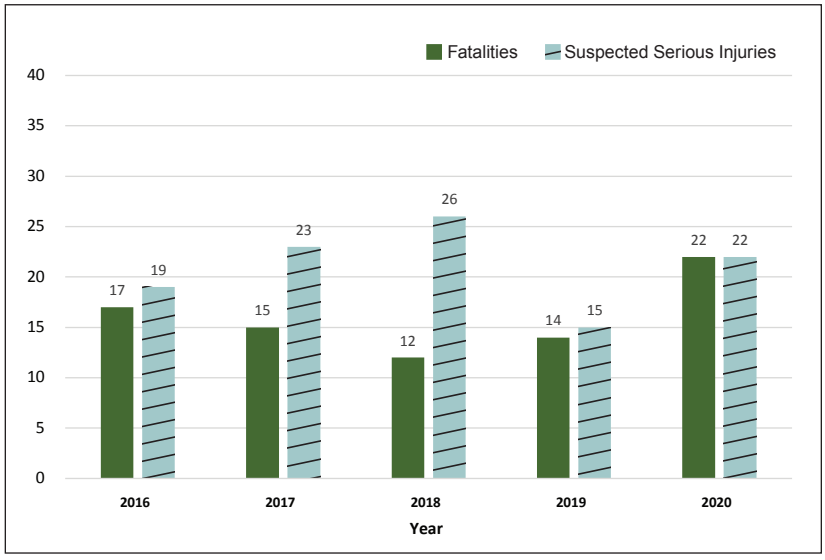

Figure 7. Motorcyclist Fatal and Suspected Serious Injuries for Head-On Crashes in Rural Areas between 2016 and 2020.

2.4.4. Intersection

Figure 8 and Figure 9 indicate that motorcyclist fatalities and suspected serious injuries at intersections occurred predominantly in urban locations from 2016 to 2020. There were approximately two times as many intersection-related motorcyclist fatalities in urban areas than in rural areas. The number of intersection-related suspected serious injuries was higher than the number of fatalities across all years examined. There were approximately 2.5 to nearly 5 times as many intersection-related suspected serious injuries in urban areas as in rural areas.

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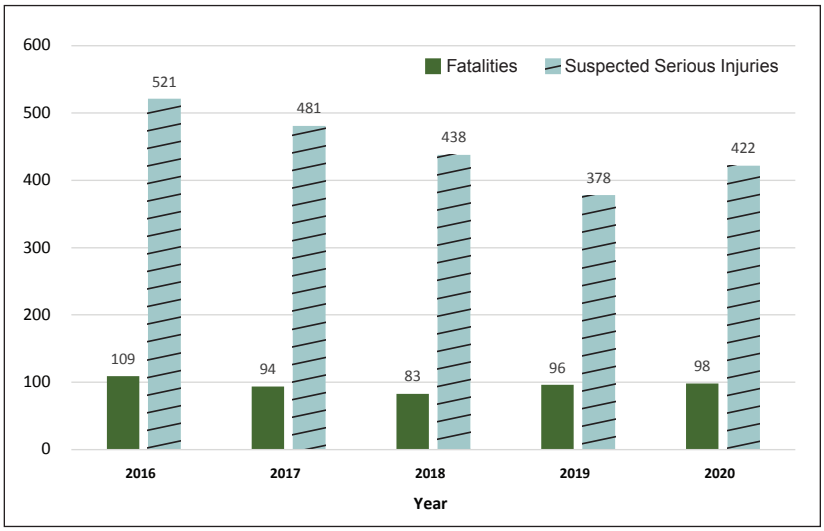

Figure 8. Number of Motorcyclist Fatal and Suspected Serious Injuries for Intersection-Related Crashes in Urban Areas between 2016 and 2020.

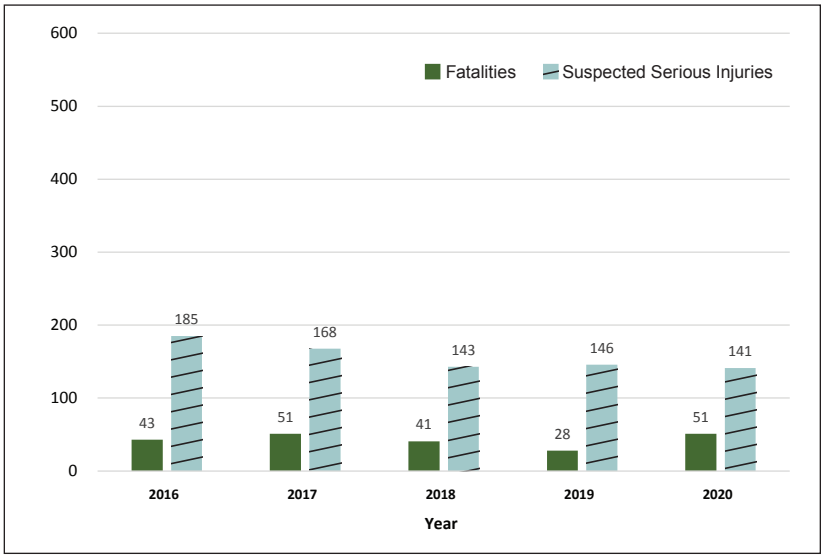

Figure 9. Number of Motorcyclist Fatal and Suspected Serious Injuries for Intersection-Related Crashes in Rural Areas between 2016 and 2020.

2.5. Which Motorcyclists Are Being Killed and Injured?

Generally, for every 1 motorcycle passenger killed in Texas, approximately 18 motorcycle operators were killed. The exception was in 2019 when the ratio of motorcycle operator to passenger fatalities increased to nearly 25.

2.5.1.Operators and Passengers

The majority of motorcyclist fatalities from 2016 to 2020 were associated with the person operating the motorcycle (i.e., operator). Generally, for every 1 motorcycle passenger killed in Texas, approximately 18 motorcycle operators were killed. The exception was in 2019 when the ratio of motorcycle operator to passenger fatalities increased to nearly 25 (see Table 6). Similarly, the majority of suspected serious injuries sustained from 2016 to 2020 were to the motorcycle operator. For nearly every 1 passenger who sustained a suspected serious injury in Texas, approximately 12 motorcycle operators sustained suspected serious injuries (see Table 7).

Table 6. Number of Motorcycle Operator and Passenger Fatalities from 2016 to 2020.

Motorcyclist	2016	2017	2018	2019	2020
Operator	467	468	399	397	456
Passenger	33	30	20	16	26
Total	500	498	419	413	482

Table 7. Number of Motorcycle Operator and Passenger Suspected Serious Injuries from 2016 to 2020.

Motorcyclist	2016	2017	2018	2019	2020
Operator	1,864	1,927	1,780	1,664	1,727
Passenger	148	180	154	148	130
Total	2,012	2,107	1,934	1,812	1,857

2.5.2. Age

Figure 10 illustrates the number of motorcyclist fatalities by age group for 2016 through 2020. The figure is formatted to facilitate an examination of the year within each age group, which can indicate any increases or decreases in fatalities across years within each age group. The data indicate that on average, there is a tendency for a bi-modal curve across age groups, with a higher number of younger motorcyclists (i.e., 21–29 years old) and middle-aged motorcyclists (i.e., 50–59 years old) suffering fatalities. However, riders in the 30–39 and the 40–49-year-old age groups also experienced a high number of fatalities. When examined by year, in several cases the number of fatalities for motorcyclists aged 21–69 years old tended to decrease after 2016 and then rose again in 2020 to nearly initial levels, suggesting that the longer-term safety improvement for riders in these age groups was not sustained.

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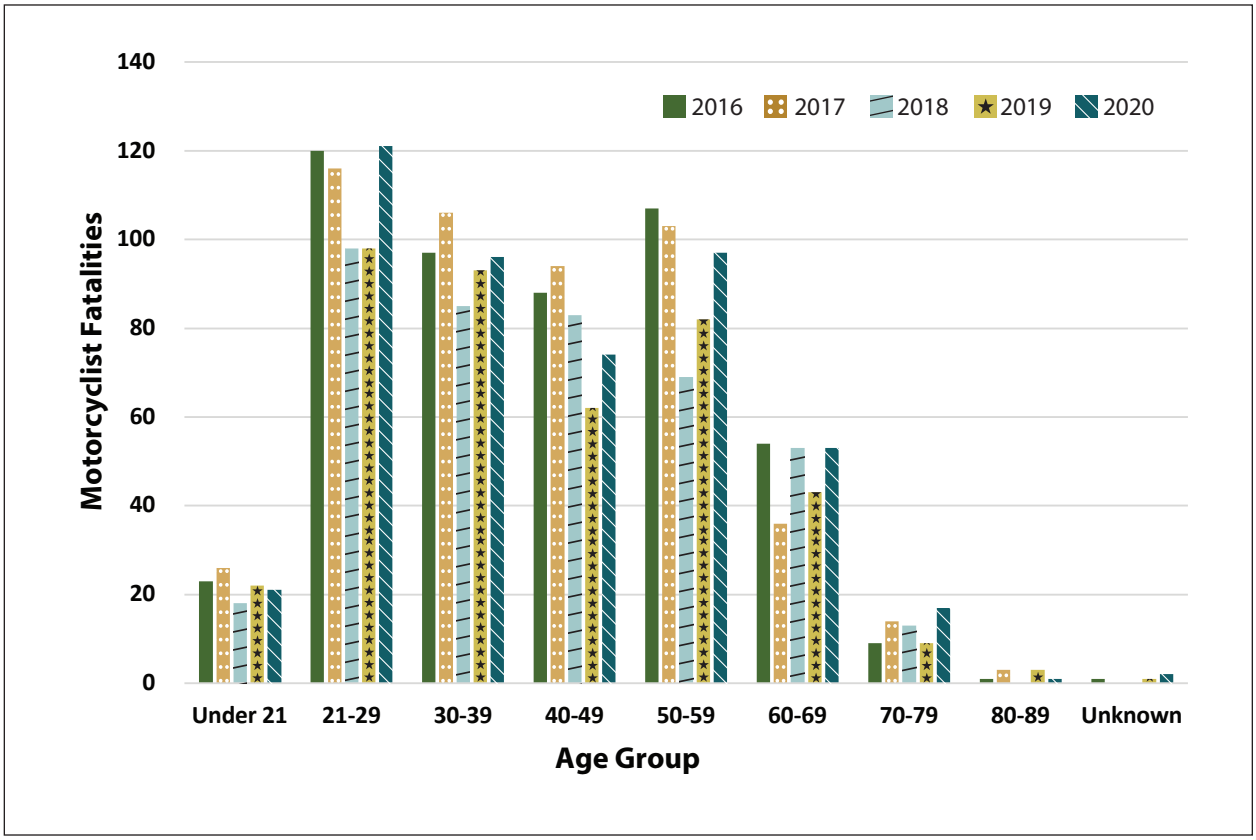


Figure 10. Number of Motorcyclist Fatalities across Age Groups from 2016 to 2020.

Figure 11 indicates that the pattern of motorcyclist suspected serious injuries from 2016 to 2020 did not follow a typical bi-modal curve. Instead, the number of suspected serious injuries was high for motorcyclists 20–29 years old, and there was a gradual drop across increasing age groups. Two noticeable declines in the number of suspected serious injuries occurred over the 2016–2020 time frame for motorcyclists in the 40–49 and the 50–59-year-old age groups.

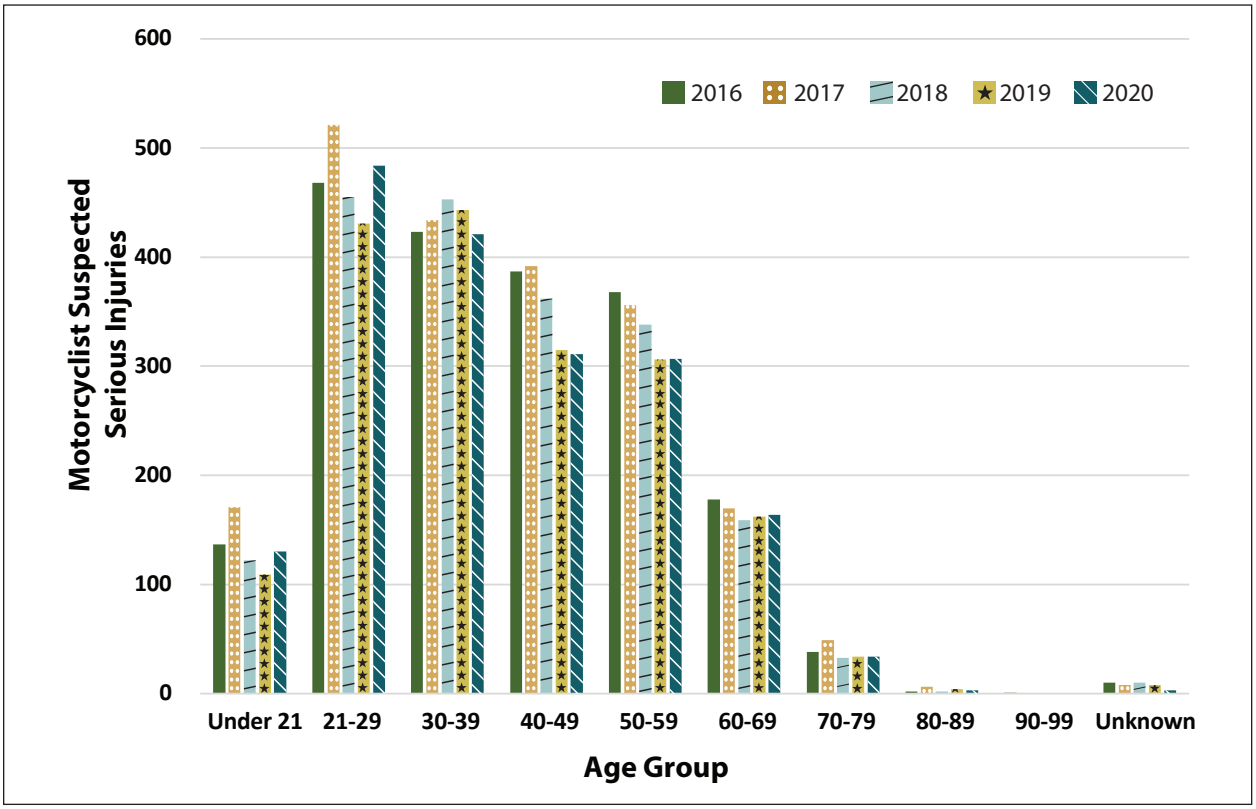


Figure 11. Number of Motorcyclist Suspected Serious Injuries across Age Groups from 2016 to 2020.

2.5.3. Gender

From 2016 to 2020, motorcyclists killed in crashes were predominately male. Figure 12 depicts the number of male and female motorcyclists killed in crashes between 2016 and 2020. On average from 2016 to 2020, only 8 percent of motorcyclists killed were female.

On average from 2016 to 2020, only 8 percent of motorcyclists killed were female.

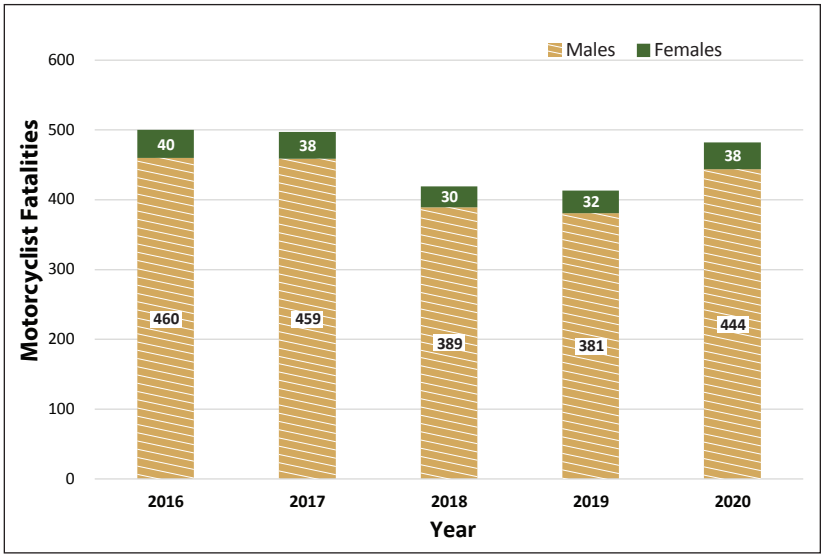


Figure 12. Number of Male and Female Motorcyclists Killed in from 2016 to 2020.

2.6. Are Riders Wearing Helmets?

Wearing a U.S. Department of Transportation (USDOT)–approved helmet has long been recognized as a significant element contributing to improved motorcyclist safety and improved crash outcomes. TxDOT CRIS data showed that the percentage of motorcyclists killed who were not wearing a helmet compared to all motorcyclists killed for 2016, 2017, 2018, 2019, and 2020 was 54, 51, 49, 45, and 49, respectively. On average across those years, 50 percent of motorcyclists killed were not wearing a helmet.

On average across those years, 50 percent of motorcyclists killed were not wearing a helmet.

Generally, the number of motorcyclists who were killed and not wearing a helmet was greatest in the young age group (i.e., 20–29 years old) and decreased with continuing increases in age.

2.6.1. Age

When developing countermeasures to improve motorcyclist safety relative to helmet use, it is useful to understand what age groups exhibit the largest number of fatalities associated with non-helmet use. Figure 13 shows the number of motorcyclist fatalities for those not wearing a helmet by age group for each year. Generally, the number of motorcyclists who were killed and not wearing a helmet was greatest in the young age group (i.e., 20–29 years old) and decreased with continuing increases in age. The figure also presents the number of motorcyclists killed who were not wearing a helmet by year. There were no significant reductions in the number of riders killed who were not wearing a helmet from 2016 to 2020, which indicates a continued need to encourage helmet use.

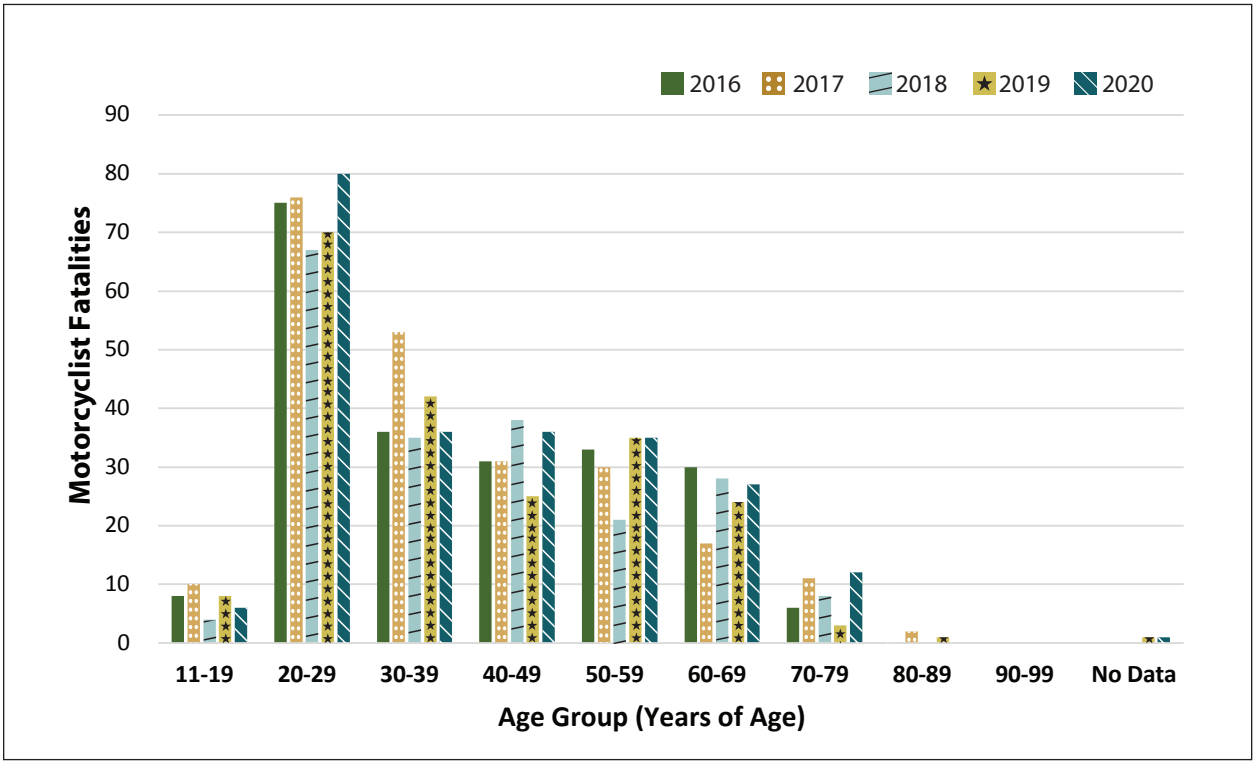


Figure 13. Number of Motorcyclist Fatalities for Those Not Wearing Helmets by Age Group and Year.

2.6.2. Gender

Examining the data by motorcyclist gender can provide greater insight into what groups of motorcyclists are being killed and not wearing a helmet. Figure 14 shows the proportion of male motorcyclists killed who were not wearing a helmet compared to all male motorcyclists killed (with and without a helmet) for each year. The same type of data is shown for females. The data indicate that on average from 2016 to 2020, 49 percent of male motorcyclists killed were not wearing a helmet at the time of the crash, while on average, 58 percent of female motorcyclists killed were not wearing a helmet at the time of the crash. There is no significant reduction in the proportion of males to females killed who were not wearing a helmet over time.

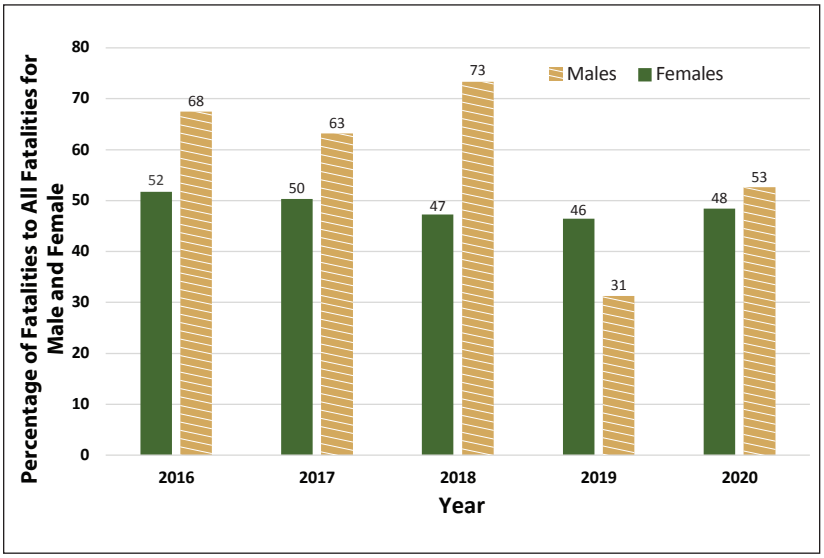


Figure 14. Percentage of Male and Female Motorcyclist Fatalities for Those Not Wearing a Helmet Compared to All Male and Female Motorcyclist Fatalities by Year.

On average, from 2016 to 2020, 49 percent of male motorcyclists killed were not wearing a helmet at the time of the crash, while on average, 58 percent of female motorcyclists killed were not wearing a helmet at the time of the crash.

The trend for unlicensed riders killed rose to 51 percent in 2020.

2.7. Are Motorcyclists Licensed?

From 2010 to 2014, motorcyclists killed without a valid motorcycle license were around 41 percent in Texas. In 2015, there was a notable increase in the percentage of motorcyclists killed who did not have a valid motorcycle license to 47 percent. In 2016, the proportion of motorcyclists killed who did not have a valid motorcycle license dropped to 43 percent, which is very similar to pre-2015 levels. However, as seen in Table 8, the trend for unlicensed riders killed rose to 51 percent in 2020.

Table 8. Licensure Status for Motorcyclists Killed from 2016 to 2020.

Licensure Status	2016	2017	2018	2019	2020
Total with Class M	227	224	189	177	180
Total licensed without Class M	181	172	149	156	201
Unlicensed	36	48	36	36	44
No data/unknown	3	4	1	3	4
Other/out of state	20	19	24	25	27
Total motorcyclist fatalities	500	498	419	413	482
Percentage without Class M or unlicensed	43	44	44	46	51

2.8. Are Motorcyclists Riding While Intoxicated?

Table 9 presents the average blood alcohol concentration (BAC) by year for motorcyclists killed or motorcyclists who suffered a suspected serious injury (i.e., when a BAC greater than 0.0 was detected). Both of these averages are nearly twice the legal limit in Texas, indicating that motorcyclists who are killed or injured chose to ride after consuming alcohol and/or other drugs and that they consumed more than just one or two drinks prior to their crash.

Table 9. Average BAC by Year for Motorcyclists Killed or Who Suffered a Suspected Serious Injury from 2016 to 2020.

Year	Motorcyclist Fatality BAC	Motorcyclist Suspected Serious Injury BAC
2016	0.15	0.16
2017	0.15	0.16
2018	0.15	0.15
2019	0.15	0.15
2020	0.16	0.15

Table 10 presents the average, median, maximum, and 85th percentile BAC for motorcyclists killed and motorcyclists who suffered a suspected serious injury from 2016 to 2020. When all reported BACs greater than 0.0 are ranked from lowest to highest, the median represents the middle BAC. The median is not biased due to exceptionally high or low values like an average. The maximum represents the highest BAC observed in the ranked data, while the 85th percentile represents the highest BAC value when the top 15 percent of the BAC values are omitted. The latter is an approach used to better identify high BACs without the bias induced by very high maximum BACs. As the table shows, the average and median BAC values are similar for both motorcyclist fatalities and motorcyclist suspected serious injuries. The maximum BAC for a motorcyclist fatality was 0.55, or nearly 7 times the legal limit, while the maximum BAC for a motorcyclist suspected serious injury was 0.33, or about 4 times the legal limit. When examining the data without the very high BAC values, the 85th percentile for both fatalities and suspected serious injuries was 0.23 and 0.24, respectively, both of which are nearly 3 times the legal limit in Texas. Collectively, the results indicate that motorcyclists who are killed or sustain suspected serious injuries are generally intoxicated at levels significantly higher than the legal limit in Texas.

Collectively, the results indicate that motorcyclists who are killed or sustain suspected serious injuries are generally intoxicated at levels significantly higher than the legal limit in Texas.

Table 10. Average, Median, Maximum, and 85th Percentile BAC for Motorcyclists Killed or Suffering a Suspected Serious Injury from 2016 to 2020.

Measure	Motorcyclist Fatality BAC	Motorcyclist Suspected Serious Injury BAC
Average	0.15	0.15
Median	0.16	0.16
Maximum	0.55	0.33
85th percentile	0.23	0.24

Summer and fall exhibited the greatest number of fatal and suspected serious injuries, but the motorcyclist safety problem exists all year in Texas.

2.9. When Do Motorcycle Crashes Occur?

2.9.1. Month

Figure 15 depicts the total number of fatal and suspected serious injury crashes in Texas from 2016 to 2020 by month. In all calendar months, the number of fatal and suspected serious injury motorcycle crashes exceeded 100, and in 7 calendar months they exceeded 200. Summer and fall exhibited the greatest number of fatal and suspected serious injuries, but the motorcyclist safety problem exists all year in Texas.

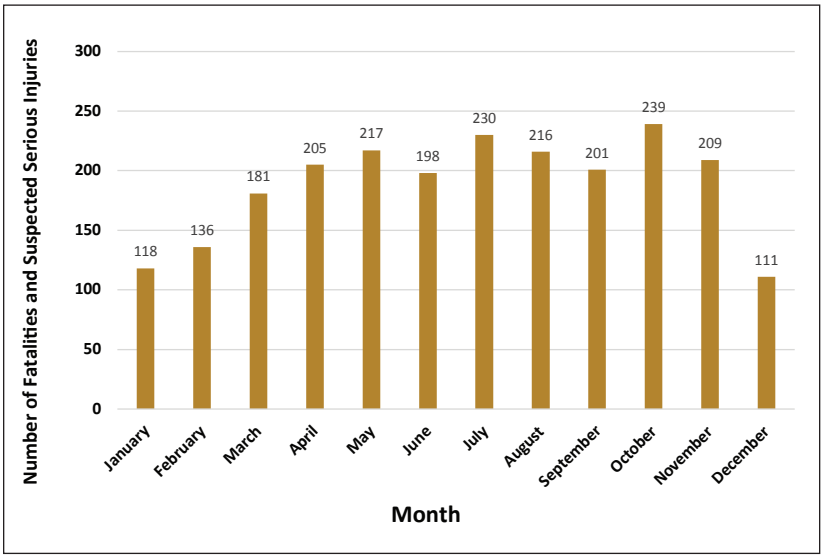


Figure 15. Number of Fatal and Suspected Serious Injury Crashes by Month Aggregated from 2016 to 2020.

2.9.2. Time of Day

When the numbers of motorcyclist fatalities and suspected serious injuries are evaluated together, a higher percentage occurred during daylight each month of the year (see Figure 16), and there is a distinct trend for more fatalities and suspected serious injuries to occur in daylight conditions throughout late spring, summer, and fall.

The number of fatalities and suspected serious injuries tends to rise in late fall, just as the days are getting shorter.

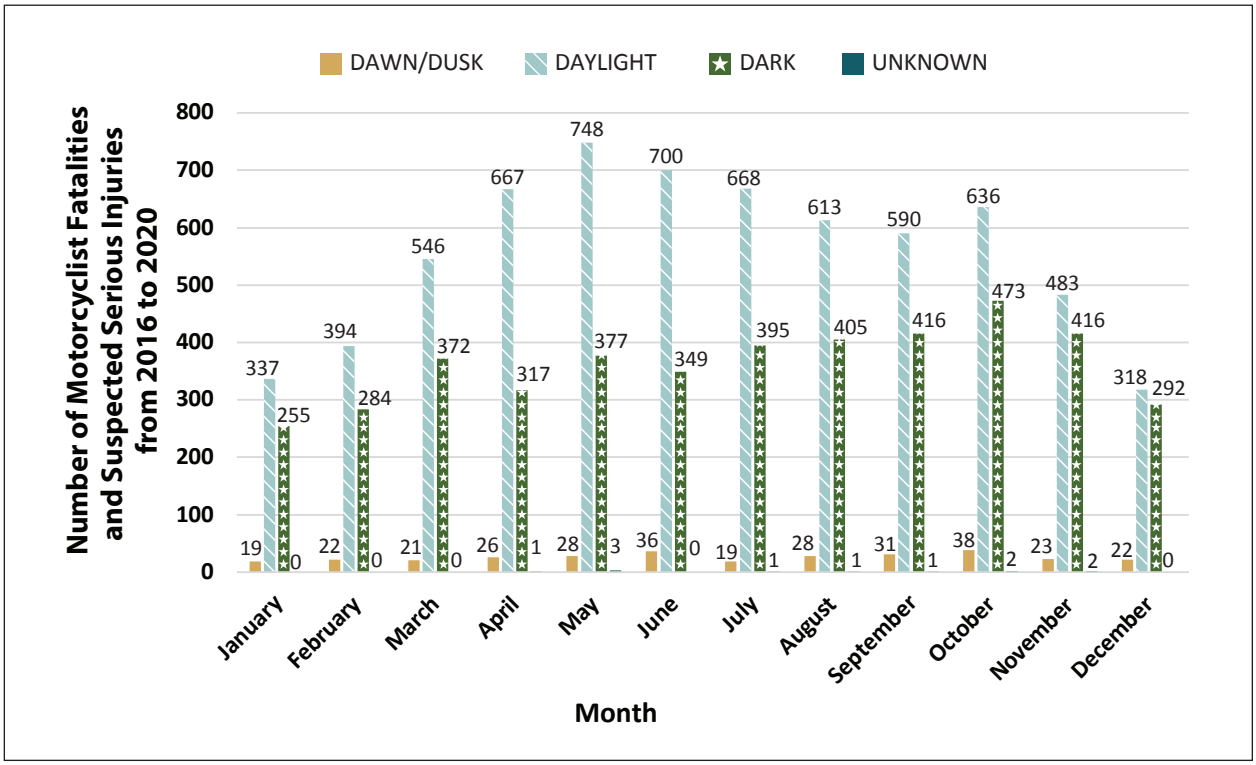


Figure 16. Number of Fatalities and Suspected Serious Injuries by Month and Time of Day Aggregated from 2016 to 2020.

Motorcyclist fatal and suspected serious injury crashes occurred predominately on weekends and in daylight conditions.

2.9.3. Day of Week

Figure 17 shows the number of motorcyclist fatalities and suspected serious injuries from 2016 to 2020 by day of week and lighting conditions (i.e., time of day). Motorcyclist fatal and suspected serious injury crashes occurred predominately on weekends and in daylight conditions.

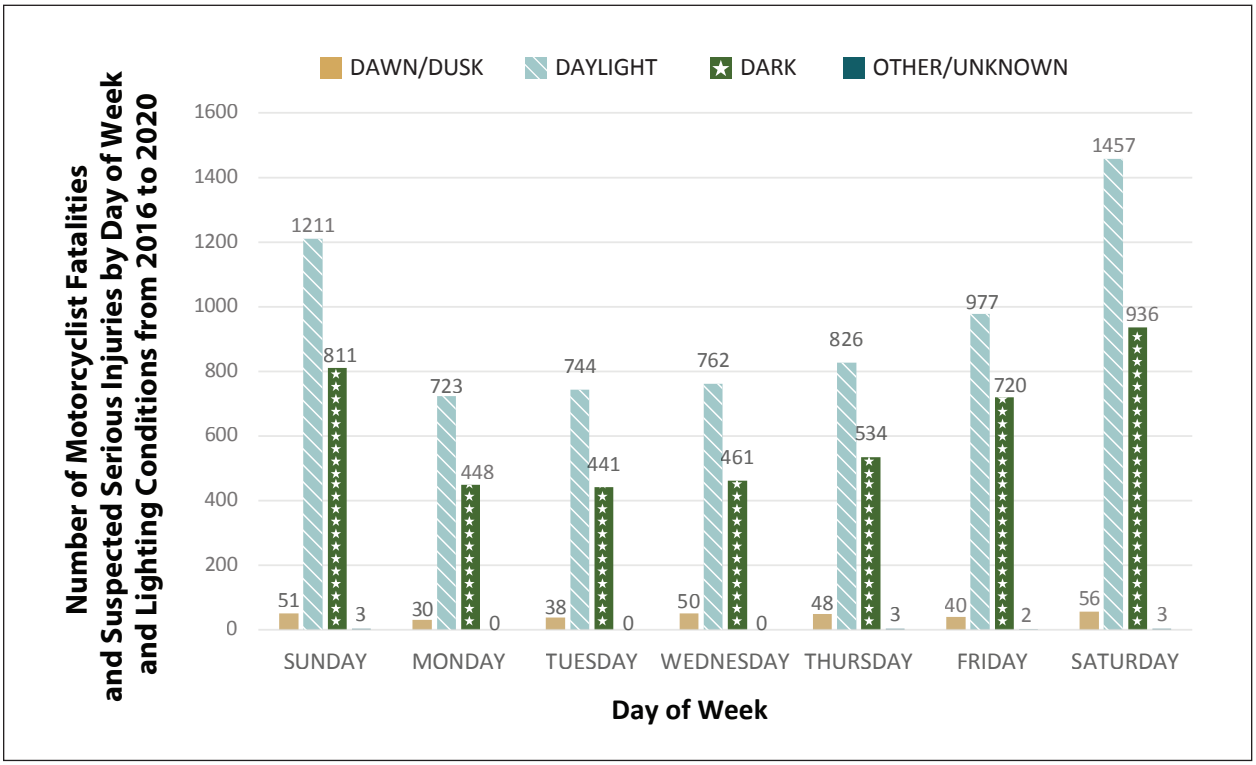


Figure 17. Number of Motorcyclist Fatalities and Suspected Serious Injuries by Day of Week and Light Conditions (i.e., Time of Day) from 2016 to 2020.

2.10. Summary: What Does the Motorcycle Safety Problem Look Like?

From 2016 to 2020, motorcyclists accounted for approximately 12.9 percent of all motor vehicle fatalities and accounted for approximately 12 percent of all suspected serious injuries in Texas. The proportions of fatalities and suspected serious injuries for this vulnerable user group are some of the highest of any group in Texas. Based on the TxDOT CRIS data, several factors were associated with motorcyclist safety that should be considered in future safety efforts:

- About 48 percent of all motorcyclist fatalities occurred as single-vehicle crashes (i.e., no automobile involved), which suggests that both motorcyclists and motorists have a role to play in improving motorcyclists' safety.
- Motorcyclist safety is significantly reduced in urban areas, particularly at intersections.
- The Texas counties with high populations and their associated large urban areas (e.g., Houston, Fort Worth, Dallas, San Antonio, and Austin) exhibit the greatest number of motorcyclist fatalities and suspected serious injuries.
- Male motorcyclists, particularly young males, account for a significant number of motorcyclist fatalities and suspected serious injuries compared to female motorcyclists.
- Alcohol continues to be a significant contributing factor to motorcyclist fatalities and suspected serious injuries, and is a significant obstacle to safe riding.
- A significant number of motorcyclists who were fatally injured did not have a motorcycle license.
- Not wearing a helmet continues to be associated with high fatalities and suspected serious injuries.

The purpose of reviewing these motorcycle safety data is to gain a better understanding of what, where, when, how, and why motorcyclist fatalities and suspected serious injuries have occurred in Texas. By understanding these factors, motorcycle safety stakeholders can select countermeasures that focus on those specific issues and improve motorcyclist safety.

From 2016 to 2020, motorcyclists accounted for approximately 12.9 percent of all motor vehicle fatalities and accounted for approximately 12 percent of all suspected serious injuries in Texas.

3. Activities In Motorcyclist Safety From 2016 to 2021

3.1. Background

The identification of countermeasures to be implemented within the 2022–2027 time frame can also benefit from an understanding of progress made toward the 2016–2021 countermeasures. If significant progress has been made for one countermeasure, resources could then be directed to alternative countermeasures. Since there is a diverse range of motorcycle safety stakeholders, it is not surprising that a wide range of motorcycle safety activities were conducted between 2016 and 2021.

The degree of focus or dispersion of these activities can be difficult to assess without the use of a descriptive framework that provides recommendations regarding the types of motorcycle safety activities that could be conducted. NHTSA provides this framework within the *Uniform Guidelines for State Highway Safety Programs: Highway Safety Program Guideline No. 3: Motorcycle Safety* (NHTSA, 2006). The guideline describes 11 motorcyclist safety components (i.e., focus areas) that motorcycle safety stakeholders could address as well as specific activities within each component. The examination of Texas motorcyclist safety activities from 2016 to 2021 uses the 11 NHTSA components as the descriptive framework.

The 2016–2021 TSAP-M identifies over 50 countermeasures that could be implemented to reduce the number of motorcyclist fatalities, suspected serious injuries, and motorcyclist crashes on Texas roadways. Fourteen of the countermeasures are identified as having the greatest potential impact on reducing motorcyclist fatalities, injuries, and crashes. These 14 countermeasures are prioritized (identified here as Tier 1, Tier 2, and Tier 3) in terms of which ones should be implemented first. Table 11 outlines how the 14 2016–2021 TSAP-M motorcycle safety countermeasures relate to the 11 NHTSA components. In addition, the table identifies the tier to which each of the 14 countermeasures was assigned.

To gain an understanding of motorcycle safety activities conducted between 2016 and 2021, and how they relate to the 11 NHTSA components and the 14 countermeasures identified in the TSAP-M, the project team reviewed publicly available reports, websites, and news releases from state agencies (e.g., TxDOT and the Texas Department of Public Safety [TxDPS]), federal agencies (e.g., NHTSA and NHTSA Region 6), and motorcycle groups and clubs (e.g., Texas Council of Clubs and Independents). The project team also invited members of the Texas Motorcycle Safety Coalition (TMSC) and the public to submit, through an online survey and in response to direct emails and phone calls, short descriptions of known motorcycle safety activities.

The 2016–2021 TSAP-M identifies over 50 countermeasures that could be implemented to reduce the number of motorcyclist fatalities, suspected serious injuries, and motorcyclist crashes on Texas roadways.

Information found and/or submitted regarding statewide motorcyclist safety activities are included in Table 11. When possible, larger local-level activities are also included. A limitation of the approach adopted to gain this information was the inability to identify motorcycle safety activities that may have occurred on a small scale, such as activities at a local level, within groups and clubs, or at small venues. Table 11 categorizes the 2016–2021 activities according to each of the 11 NHTSA primary components and the 2016–2021 TSAP-M Tier 1 to Tier 3 countermeasures. Those activities conducted between 2016 and 2021 that did not directly support one of the 14 countermeasures were included within the appropriate NHTSA component as "additional activities."

3.2. 2016–2022 Motorcycle Safety Activities in Texas

Table 11 lists motorcycle safety activities that state agencies, federal agencies, and motorcycle groups and clubs performed in Texas.

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas.

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Program management	Provide guidance to TMSC.	1	• TMSC created and approved a charter that defines TMSC and outlines TMSC administrative and operating procedures. (TxDOT, 2018, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2018-TTI-G-1YG-0087, https://www.looklearnlive.org/wp-content/uploads/2021/08/TSMSC-Charter-September-7-2020.pdf) • TMSC established a task force that consists of TMSC members who proactively work on motorcyclist safety activities on behalf of the TMSC membership. (TxDOT, 2019, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2019-TTI-G-1YG-0062, https://www.looklearnlive.org/coalition/task-force/)
	Additional activities		• NHTSA developed a document intended to serve as a plan for NHTSA activities to address the safety of motorcyclists. The document identifies data needs, efforts to improve NHTSA's support of state activities for motorcyclist safety, opportunities to improve law enforcement support for motorcyclist safety, and strategies as they relate to NHTSA's federal agenda. (NHTSA, 2017, NHTSA Motorcycle Safety 5-Year Plan, https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13507-motorcycle_safety_plan_050919_v8-tag.pdf) • NHTSA released the Transportation Safety Institute (TSI) course titled Motorcycle Safety—Developing Your Program through Data and Collaboration, which offers techniques to improve motorcycle safety programs through the use of data with a focus on problem identification and intervention development. The program is recommended for any motorcyclist safety advocate but particularly state motorcycle program offices. (NHTSA, 2021)

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Motorcycle personal protective equipment	Educate riders on gear use (including conspicuity).	1	• TTI conducted a statewide survey to identify the reasons why motorcyclists wear and do not wear gear and what would motivate them to wear gear. Then TTI created/deployed print and social media to encourage gear use. (TxDOT, 2016, Motorcyclists Safety Equipment Use Program, TxDOT Grant 2016-TTI-G-1YG-0082) • Protective personal equipment educational videos, tip sheets, and social media assets were created by TTI and posted to the LookLearnLive.org website. Tip sheets were also handed out at events attended by TTI and TMSC volunteers, sponsored by TxDOT Grant Programs for Motorcycle Safety Education and Outreach. (TxDOT, 2019, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grants 2016–2021)
	Seek guidance to encourage legislation to reinstate the mandatory universal motorcycle helmet law for all operators and passengers.	2	• No known activities.
Motorcycle operator licensing	Update the driver licensing system to improve recording of course completion.	1	• No known activities.
	Study reasons why riders do not obtain a Class M license.	3	• TTI identified reasons why motorcyclists choose to ride without a motorcycle license, and developed messaging to encourage riders to take the Basic Rider and/or Intermediate Course training. (TxDOT, 2019, Not Licensed to Ride: Encouraging Motorcyclists to Complete the Licensing Process, TxDOT Grant 2019-TTI-G-1YG-0097) • Based on information collected in fiscal year 2019 about why motorcyclists choose to ride without a motorcycle license, TTI developed a letter-writing campaign to encourage riders to take the Basic Rider and/or Intermediate Course training. (TxDOT, 2020, Unlicensed to Ride: Encouraging Motorcyclists to Complete the Licensing Process, TxDOT Grant 2020-TTI-G-1YG-0038) • TTI conducted a data linkage and analysis that investigated trained versus untrained rider crashes, continued a mailing campaign to encourage riders to complete training, and subsidized motorcycle training for new riders who participated in before-and-after surveys about their reasons for deciding to pursue training and their experience taking the course. (TxDOT, 2021, Unlicensed to Ride: Encouraging Motorcyclists to Complete Training and Licensing, TxDOT Grant 2021-TTI-G-1YG-0030)

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Motorcycle rider education and training	Improve the rider coach recruiting/ training process, and conduct a quality control of sponsors.	2	• The TxDPS Motorcycle Safety Unit (MSU) increased Motorcycle Safety Foundation Rider Coach Preparation Course availability and locations, and then conducted technical assistance visits for both contract compliance and coach development. (TxDPS Motorcycle Safety Unit, 2016–2019) • TTI conducted an initial instructor recruitment and retention study of reasons instructors become and remain instructors. TTI used study outcomes to develop outreach to recruit and best practices to retain instructors. TTI pilot tested and deployed outreach efforts. (Texas Department of Licensing and Regulation [TDLR], 2021, Increasing Rider Instructor Participation Rates in Texas) • TDLR implemented sponsor contract compliance quality assurance visits to educate school owners and managers on compliance expectations and use of TDLR resources for education, reporting, and compliance. (TDLR, 2021) • The Harley-Davidson Riding Academy added four new rider training programs at dealerships across the state and scheduled annual follow-up visits as a part of the quality process. The field observation visits are designed to help Riding Academy coaches improve their facilitation and coaching skills and to ensure continued quality with regard to both the state-approved core curriculum and the use of techniques learned in the Harley-Davidson® New Rider Course Coach Training. (Harley-Davidson Riding Academy, 2016–2021)
	Create a web services data linkage between the TxDPS MSU student record database and TxDOT CRIS.	3	• No known activities.
	Additional activities		• TTI developed and deployed a Texas-wide tool to help riders identify and select safe roadways, to easily identify factors contributing to motorcyclist safety, and to provide riders with outreach and education messages about safe riding. (TxDOT, 2017, Rider and Roadway Safety Awareness Program, TxDOT Grant 2017-TTI-G-1YG-0077, https://www.looklearnlive.org/routes/) • TTI created and deployed 12 media videos *(Riders Know)* identifying data-driven safety behaviors that motorcyclists should know and to which they should adhere. (TxDOT, 2020, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2020-TTI-G-1YG-0062, https://www.looklearnlive.org/resources/video/)

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Motorcycle rider education and training (continued)	Additional activities		• TTI created and deployed six media videos *(Rider Awareness)* raising motorcyclists' awareness of safety issues and identifying safety solutions. (TxDOT, 2019, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2019-TTI-G-1YG-0062, https://www.looklearnlive.org/resources/video/) • TTI created and deployed six media videos *(It's the Law)* raising motorcyclists' awareness of safety relevant laws. (TxDOT, 2019, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, Grant 2019-TTI-G-1YG-0062, https://www.looklearnlive.org/resources/video/) • TTI conducted the Texas Motorcycle Safety Forum, which is a free event open to provide information/education to all attendees (i.e., motorcyclists and motorists) regarding safe riding, crash data, countermeasures, and safety information. (TxDOT, 2016–2021, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grants) • TTI and TMSC members attended approximately eight motorcyclist and motorist events per year to distribute motorcyclist safety information and data. (TxDOT, 2016–2021, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grants) • TTI conducted four Texas Motorcycle Safety Coalition meetings per year to bring together key motorcyclist safety stakeholders to identify, discuss, and implement motorcyclist safety countermeasures. (TxDOT, 2016–2021. Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grants) • TTI, conducted seven "Improving Your Riding Safety" presentations to motorcycle clubs, groups, and events. Topics covered included crash data, personal responsibility of riders to wear gear, ride sober, ride within skill and speed limits, and being aware of surroundings to avoid the crash. (TxDOT, 2021, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2019-TTI-G-1YG-0051)

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Motorcycle operation under the influence of alcohol and other drugs	Develop Texas-specific motorcycle safety materials on driving under the influence.	3	• No known activities.
	Incorporate motorcycle-specific driving under the influence/driving while intoxicated (DUI/DWI) messages into all current impaired driving campaign materials and law enforcement activities.	3	• NHTSA developed and deployed the impaired riding initiative Cross the Line. (NHTSA, 2021, https://www.nhtsa.gov/campaign/ride-sober)
	Additional activities		• TTI, TMSC members, and attendees of the 2018 Texas Motorcycle Safety Forum identified countermeasures to address impaired riding, a supplement to the 2016–2021 TSAP-M. (TxDOT, 2018, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2018-TTI-G-1YG-0087)
Legislation and regulations	Seek guidance on encouraging legislation to require motorcycle training or endorsement to register a motorcycle.	1	• No known activities.
Law enforcement	Develop data-driven countermeasures and implement selective enforcement where fatal and serious injury motorcycle crashes are occurring.	2	• No known activities.
	Additional activities		• NHTSA released a TSI course titled Motorcycle Safety Law Enforcement Officer. NHTSA developed the course to provide law enforcement officers with an expanded understanding of motorcyclist behavior and enforcement concepts related to motorcycle safety. (NHTSA, 2020)

Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Highway engineering	Encourage the use of motorcycle-specific warning signs in construction zones and locations where road conditions could impact motorcycle operation.	3	• TTI developed and deployed training to TxDOT engineers regarding motorcycle safety risks in work zones and how to address them. (TxDOT, 2018, Develop and Pilot TxDOT Engineer Training Presentation and Materials, TxDOT Grant 2018-TTI-G-1YG-0079) • TTI developed for the American Road and Transportation Builders Association online course materials regarding how to reduce risks to motorcyclists in work zones. (TxDOT, 2019, Reducing Risks to Motorcycles in Work Zones, Year 2, TxDOT Grant 2019-TTI-G-1YG-0070)
	Additional activities		• TTI developed and evaluated concrete barrier containment options for errant motorcycle riders to aid in preventing riders from ejecting over the barrier and to reduce injury severity to the rider during the impact event. (TxDOT, 2019, Roadside Safety Device Analysis, Testing, and Evaluation Program, Test Report FHWA/TX-18/0-6968-R6; also part of a bigger umbrella project, TxDOT 0-6968, 2017–2018, published 2019, https://static.tti.tamu.edu/tti.tamu.edu/documents/0-6968-R6.pdf) • TTI developed a retrofit design for a guard fence system to enhance motorcycle safety. TTI identified components that contributed to severe and fatal injuries, developed and retrofitted design options for motorcycle-friendly guard fence systems, and provided guidance for placement at appropriate high-speed roadway locations. (TxDOT, 2018–2022, Develop a Retrofit Design for Guard Fence System to Enhance Motorcycle Safety, TxDOT Project No. 0 6994)
Motorcycle rider conspicuity and motorist awareness programs	Communicate rider responsibility (i.e., not speeding, appropriate following distance, and lane placement).	2	• TMSC June 22, 2017 meeting participants identified and recommended specific activities that could be implemented to advance the countermeasure. A supplement to the 2016–2021 TSAP-M. (TxDOT, 2017, Statewide Motorist Awareness and Motorcyclist Safety Outreach and Support, TxDOT Grant 2017-TTI-G-1YG-0074) • The Goldwing Road Riders Association Rider Education Program was made available to all chapters and members of the Goldwing Riders of Texas. (Goldwing Riders of Texas) • The BMW club of Dallas/Fort Worth organized a group ride to attend the 2020 Texas Statewide Motorcycle Safety Forum. • The BMW club of Dallas/Fort Worth posted group riding safety information on its website to promote safe riding practices. • Hill Country Riders of Austin posted “All the Gear, All the Time” media on its website in 2020 to educate riders on appropriate gear.

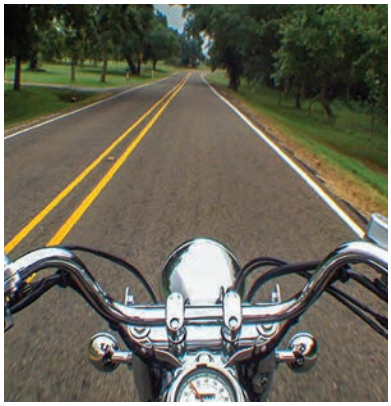
Table 11. Summary of 2016–2021 Motorcycle Safety Activities in Texas. (continued)

NHTSA Motorcycle Safety Program Component	2016–2021 TSAP-M Countermeasure	2016–2021 TSAP-M Priority Tier	Activities Conducted from 2016 to 2021
Motorcycle rider conspicuity and motorist awareness programs (continued)	Additional activities	2	• The Texas Council of Clubs and Independents (TCoC&I) members distributed TxDOT "Watch for Motorcycles" yard signs across Texas from 2016 to 2020. • Beginning in 2007 through the current year, TCoC&I members secured proclamations on motorcycle safety from local mayors, city council members, and the governor. TCoC&I members distributed the proclamation talking points in multiple media outlets. • The Do You See Me Now organization conducted annual rides to promote awareness of motorcyclists, shared motorcyclist safety websites on its website, and distributed "Watch for Motorcycles" yard signs.
Communication program	Additional activities		• Sherry Matthews Group marketing agency conducted motorist awareness campaigns, using mass media public service announcement, distributed materials, and outreach events raised awareness among motorists about watching for motorcycles and sharing the road. (Motorcycle Safety Campaigns [separate federal and state], TxDOT Grants, 2016–2021)
Program evaluation and data	Continue in-depth analysis of crash data to identify crash causation factors.	1	• TTI investigated and documented the complex nature of motorcycle crashes in Texas through construction of a motorcycle crash database and a multi-year analysis of data with an emphasis on the prevention of fatal and incapacitating injury crashes. (TxDOT, 2016, Comprehensive Analysis of Motorcycle Crashes in Texas: A Multi-year Snapshot, TxDOT Grant 2016-TTI-G-1YG-0029, https://www.looklearnlive.org/wp-content/uploads/2020/04/MOTO_ReportRev1a.pdf) • TTI investigated and documented the complex nature of motorcycle crashes in Texas through construction of a motorcycle crash database and a multi-year analysis of data with an emphasis on the prevention of fatal and incapacitating injury crashes. (TxDOT, 2018, Identifying Factors and Trends to Improve Motorcycle Safety in Texas, TxDOT Grant 2018-TTI-G-1YG-0100, https://www.looklearnlive.org/wp-content/uploads/2020/04/MotorcycleAnalysisReportFinal_Final.pdf) • TTI conducted an in-depth analysis of crash data to identify significant motorcycle crash causation factors with a key addition of including motorcycle vehicle miles traveled as a factor. (TxDOT, 2021, Identifying Factors and Trends to Improve Motorcycle Safety in Texas, TxDOT Grant 2021-TTI-G-1YG-0065, https://www.looklearnlive.org/wp-content/uploads/2021/09/motorcycle_reportFinal2021-TTI-G-1YG-0065.pdf) • NHTSA released the Data Visualization—Fatality Analysis Reporting System (FARS) website, which includes a publicly accessible section that provides motorcycle-specific crash data. (NHTSA, 2021, https://cdan.dot.gov/DataVisualization/DataVisualization.htm)

3.3. Conclusions: Recent Activities

The 2016–2021 motorcycle safety activities outlined in Table 11 can be informative to motorcyclist safety stakeholders in Texas when addressing safety efforts within the 2022–2027 TSAP-M. Motorcycle stakeholders could consider several general findings as they develop and deploy motorcyclist safety activities within the 2022–2027 time frame. These include:

- The range and size of activities conducted within the 2016–2021 time frame are significant and represent a strong dedication to motorcyclist safety activities in Texas.
- Given that changes in safety often require sustained efforts, it is a positive finding that several activities were funded over multiple years.
- Most of the safety efforts consisted of the conduct of education and outreach activities with the primary exception of TxDOT, which also actively conducted infrastructure design and build activities relative to highway engineering.
- The number of agencies/organizations funding motorcycle safety efforts is relatively small, with the primary funding agencies/organizations in Texas being TxDOT, TDLR, and TxDPS (TxDPS activities moved to TDLR).
- There are relatively little integration and coordination between organizations and agencies when identifying, developing, and deploying motorcyclist safety activities. Similarly, there is little coordination between motorcyclist safety stakeholders across Texas.
- Several 2016–2021 TSAP-M countermeasures were not addressed.
- Motorcyclist safety activities were not conducted in some of the NHTSA component areas.



Given that changes in safety often require sustained efforts, it is a positive finding that several activities were funded over multiple years.

4. Motorcyclist Safety Activities Identification and Ranking

Improving motorcyclist safety remains a high priority for agencies, organizations, clubs, groups, riders, and motorists in Texas.

4.1. Overview

Improving motorcyclist safety remains a high priority for agencies, organizations, clubs, groups, riders, and motorists in Texas. Analyzing and understanding motorcyclist crash factors facilitate an understanding of the safety problem and can direct stakeholders to the high-priority areas, but safety is a complex issue. Typically, success requires multiple solutions. Potential solutions can vary in approach as indicated by the range of NHTSA's 11 components. Further, each component can be supported by a range of activities that could include, for example, education, outreach, enforcement, and engineering. Potential countermeasures also vary in effectiveness, cost, and time to implement. Motorcycle safety stakeholders must weigh all these elements to prioritize countermeasures that hold the most promise for reducing motorcyclist fatalities, injuries, and crashes given available resources and existing constraints.

A central purpose of the 2022–2027 TSAP-M is to identify countermeasures that can be used to improve motorcyclist safety in Texas. The information contained in the prior sections of this report were used in the process to identify and prioritize motorcycle safety activities to be included in the 2022–2027 TSAP-M. The identification and prioritization of countermeasures were accomplished with input from a range of motorcycle safety stakeholders.

4.2. Countermeasure Prioritization Process

The list of countermeasures was presented at the April 8, 2022, meeting of TMSC for an initial review. Forty meeting attendees were split into four groups to allow for in-depth small-group discussions regarding the safety countermeasures. A fifth group was composed of online attendees, moderated via Microsoft Teams. The five groups reviewed the motorcycle safety countermeasures from the 2016–2021 TSAP-M (TTI, 2016), identified countermeasures they thought should be deleted or combined, and suggested new countermeasures they thought should be added.

The TTI team members then added/deleted countermeasures based on the TMSC feedback and combined similar countermeasures. The modified list of countermeasures was distributed as an online survey to the meeting attendees the following week. The survey asked participants to rank the countermeasures within each of the 11 categories from highest to lowest priority; they were also asked to estimate the approximate effectiveness, cost, and time for the countermeasure that they ranked highest in each category. Finally, participants were asked

to identify the agency or entity that should lead the effort for each of their top-ranked countermeasures. Effectiveness, cost, time, and lead stakeholder information asked of meeting attendees is summarized as follows:

- **Effectiveness**—the potential that a countermeasure was able to reduce the number of motorcyclist fatalities, injuries, and crashes on Texas roadways, estimated by the potential number of motorcyclists it would affect and its likelihood of being accepted/implemented. A score of 0 represented no effectiveness, and 10 represented significant effectiveness.
- **Cost**—an estimate of the approximate price to implement a countermeasure. A score of 0 represented no cost, 1 represented a countermeasure costing about $1,000, 5 represented about $50,000, and 10 represented more than $1 million.
- **Time**—an estimate of how long the implementation of the countermeasure would require before having an effect on motorcyclist safety. A score of 1 represented 1 year, and 5 represented 5 years or more.
- **Lead stakeholder**—an organization or group of individuals that could be responsible for leading the implementation of the countermeasure.

Figure 18 shows the scales for effectiveness, cost, and time presented to meeting attendees.

Effectiveness										
0	1	2	3	4	5	6	7	8	9	10
Cost										
Free	$1K	$5K	$10K	$25K	$50K	$100K	$250K	$500K	$1M	>$1M
Time										
1 year		2 years		3 years		4 years		5+ years		

Figure 18. Effectiveness, Cost, and Time Rating Scales.

In addition to the TMSC meeting attendees, it was important to obtain countermeasure rankings and scale information from individuals with expertise in various aspects of motorcycle safety to benefit from their knowledge, skills, and experiences. Motorcyclist safety stakeholders with expertise in training, data, legislation, law enforcement, engineering, and communications provided their countermeasure rankings and scale responses via two online group discussions, individual interviews, and online surveys. A total of 15 expert panel members responded.

Priority rankings from all stakeholders for each countermeasure were averaged to derive a single prioritization score for each countermeasure. Similarly, scores for the effectiveness, cost, and time scales were averaged for each countermeasure. Table 12 shows the list of countermeasures; their associated average ratings for effectiveness, cost, and time; and the associated lead stakeholders.

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s).

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
I. PROGRAM MANAGEMENT					
High	Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.	7	$50K	2 years	TMSC
High	Locate/increase funding sources for motorcycle safety outreach/education.	8	$250K	2 years	Clubs,* law enforcement agencies (LE), TDLR, TMSC, and TxDOT
Medium	Encourage motorcycle safety project leaders to complete free TSI course Motorcycle Safety: Developing Your Program through Data and Collaboration and/or the course Motorcycle Safety Program Management.	5	$5K	1 year	TMSC

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s). (continued)

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
II. MOTORCYCLE PERSONAL PROTECTIVE EQUIPMENT					
Medium	Provide training to professionals (to law enforcement on helmet violations, to emergency medical services personnel on helmet advocacy, and to professionals with statistics and data).	6	$25K	3 years	Clubs, LE, TDLR, TMSC, and TxDOT
High	Conduct outreach and education on gear use: • Educate riders regarding conspicuity benefits. • Educate riders on the consequences of not wearing personal protective equipment. • Provide education prior to purchasing a motorcycle. • Conduct additional education pushes to coincide with timely topics (e.g., riding seasons and weather-related issues).	6	$100K	3 years	Clubs, LE, TDLR, TMSC, and TxDOT
Medium	Encourage dealer participation to incentivize helmet use (e.g., free helmet with bike purchase).	5	$50K	2 years	Clubs, LE, motorcycle dealer associations, TDLR, TxDOT subgrantees, and TMSC
Medium	Recognize motorcycle clubs that promote gear use.	6	$10K	1 year	Clubs, LE, TDLR, and TMSC
III. MOTORCYCLE OPERATOR LICENSING					
High	Study reasons why riders do not obtain a Class M license.	8	$100K	3 years	Clubs, LE, TDLR, and TMSC
High	Update the driver licensing system to improve recording of rider training completion.	7	$100K	2 years	LE and TDLR
Medium	Create a cross reference between crash records and training (e.g., TDLR-approved courses/ license status).	7	$250K	2 years	LE, TDLR, and TMSC
Medium	Evaluate maintaining the Class J and K motorcycle license restrictions (the J restriction allows an individual to practice riding a motorcycle if a licensed driver who is 21 years of age or older is in sight and watching, and the K restriction allows an individual to ride mopeds but not motorcycles) since the applicant must request this restriction and has already met the minimum standards for full licensing.	6	$25K	2 years	LE, TDLR, and TMSC
Low	Eliminate on-street licensing tests for riders under 18.	6	$10K	2 years	LE, TDLR, and TMSC
Medium	Establish an expiration date of 1 year for official Texas Motorcycle Safety Course Completion Certificate (MSB-8).	8	$50K	2 years	TDLR and TMSC

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s). (continued)

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
IV. MOTORCYCLE RIDER EDUCATION AND TRAINING					
Medium	Create a web services data linkage between the TDLR student record database and TxDOT's CRIS database.	6	$100K	2 years	TDLR, TMSC, and TxDOT
Medium	Perform in-depth analysis of crash data to identify significant crash causation factors and then prioritize and incorporate emphasis areas in problem statements, rider training curricula, and public information campaigns.	8	$100K	2 years	LE, TDLR, TMSC, and TxDOT
High	Improve the instructor recruiting/training process, and conduct quality control of sponsors.	9	$250K	3 years	TDLR, TMSC, schools, and TxDOT
Medium	Identify rider training course performance measures to create an ongoing evaluation process (from crash data) and determine the value and course effectiveness.	7	$100K	3 years	TDLR, TMSC, and TxDOT
High	Conduct outreach to encourage participation in rider education and training programs.	7	$100K	2 years	Clubs, LE, TDLR, TMSC, and TxDOT
Medium	Conduct a comprehensive statewide quality assurance program that includes instructor support and guidance, formal updates and technical assistance, and peer review.	7	$100K	3 years	TDLR
Medium	Expand three-wheel rider courses and availability.	6	$250K	3 years	TDLR
Medium	Encourage and develop outreach to promote recurring training.	6	$250K	3 years	Clubs, LE, TDLR, and TMSC
Medium	Develop outreach to publicize 1-day riding courses.	7	$50K	3 years	Clubs, TDLR, TMSC, and TxDOT
Medium	Develop a rider grant program for people who have trouble affording the course.	6	$100K	3 years	TDLR
Medium	Increase course content on collision avoidance and roadway hazards.	6	$250K	2 years	

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s). (continued)

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
V. MOTORCYCLE OPERATION UNDER THE INFLUENCE OF ALCOHOL OR OTHER DRUGS					
High	Incorporate motorcycle-specific DUI/DWI messages into all current impaired-driving campaign materials and law enforcement activities.	7	$50K	2 years	Clubs, LE, TDLR, TMSC, and TxDOT subgrantees
High	Conduct motorcycle safety campaigns on DUI riding. Consider using free materials from NHTSA, the Motorcycle Safety Foundation, the American Motorcyclist Association, and TTI.	6	$100K	3 years	Clubs, LE, TDLR, and TMSC
Medium	Encourage and recognize motorcycle groups that self-police on DUI/DWI (and have a culture of zero tolerance for drinking and riding).	7	$50K	2 years	Clubs, LE, TDLR, TMSC, and TxDOT subgrantees
Medium	Establish/increase funds to support motorcycle campaigns during motorcycle safety awareness month and during national mobilizations.	6	$250K	2 years	Clubs, TMSC, and TxDOT
Medium	Enable Texas A&M AgriLife to continue to provide free impaired-riding presentations to clubs and schools	6	$100K	1 year	Clubs and TMSC
VI. LEGISLATION AND REGULATIONS					
Medium	Encourage reinstatement of the mandatory universal motorcycle helmet law for all operators and passengers.	9	$100K	2 years	Clubs, LE, TMSC, and TxDOT
Medium	Seek guidance on encouraging legislation to require motorcycle training or endorsement to register a motorcycle.	7	$100K	1 year	Clubs, LE, and TDLR
High	Monitor fund allocations to ensure that funds from the motorcycle safety account continue to be used for allowable motorcycle safety tasks (e.g., training and awareness education).	9	$50K	2 years	Clubs, TDLR, TMSC, and Texas Legislature
High	Encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses.	8	$50K	2 years	LE, schools, TDLR, TMSC, and TxDOT
High	Increase fines and penalties for riding without a motorcycle license (requires legislative change).	7	$250K	2 years	TDLR

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s). (continued)

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
VII. LAW ENFORCEMENT					
Medium	Develop data-driven countermeasures and implement selective enforcement where fatal and serious injury motorcycle crashes are occurring.	7	$100K	4 years	LE, TDLR, TMSC, and TxDOT
High	Identify motorcycle enforcement (e.g., impaired riding, proper license, excessive speed, and helmet use for minors) as a specific component of STEP grants.	8	$500K	3 years	LE, TDLR, and TxDOT
Medium	Develop educational programs for justice system personnel/legislators on motorcycle laws.	7	$50K	2 years	LE, TDLR, TMSC, and TxDOT
Low	Train law enforcement in the detection of impaired riders (e.g., alcohol-impairment detection, enforcement, and sanctions).	9	$50K	1 year	
Medium	Incorporate motorcycle-specific messages into current enforcement activities.	6	$10K	2 years	LE
Medium	Promote a free TSI Motorcycle Safety Law Enforcement Course to law enforcement agencies in Texas	7	$10K	2 years	LE
VIII. HIGHWAY ENGINEERING					
High	Continue to improve highway engineering (e.g., increased sign use, increased use of motorcyclist-safe barriers, and increased use of high-friction treatments).	7	$1M	3 years	Clubs, TDLR, TMSC, and TxDOT
Medium	Improve consistent use of road surface warning signs in construction zones.	8	$250K	1 year	TMSC and TxDOT
IX. MOTORCYCLE RIDER CONSPICUITY AND MOTORIST AWARENESS PROGRAMS					
High	Increase rider education for preventative riding behaviors: • Communicate rider responsibility (i.e., not speeding, appropriate following distance, and lane placement). • Wearing high-visibility gear.	7	$250K	2 years	Clubs, LE, NHTSA, TDLR, TMSC, and TxDOT
Medium	Evaluate the Share the Road messages to determine effectiveness in raising awareness among other vehicle drivers; modify and develop new material.	7	$500K	3 years	Clubs, TDLR, TMSC, and TxDOT
X. COMMUNICATION PROGRAM					
Medium	Expand TMSC's contact database; use TMSC for peer-to-peer contact at community events.	6	$25K	3 years	Clubs and TMSC
Medium	Expand existing outreach plans using realistic and measurable goals for messages regarding sharing the road, licensing, etc.	7	$100K	2 years	Clubs, LE, TMSC, and TxDOT
Medium	Communicate/share national motorcycle safety resources and programs available from NHTSA, FHWA, and USDOT.	7	$50K	3 years	Clubs, LE, TDLR, TMSC, and TxDOT

Table 12. Countermeasure Priority, Effectiveness, Cost, Timeline, and Lead Stakeholder(s). (continued)

Priority	Countermeasure	Effectiveness	Cost	Time	Lead Stakeholder(s)
XI. PROGRAM EVALUATION AND DATA					
High	Continue in-depth analysis of crash data to identify crash causation factors; prioritize and incorporate emphasis in problem statements, rider training curricula, and public information campaigns; based upon these data, bring stakeholders together to collaborate on key factors that each entity can advance; create a plan with measurable goals.	8	$250K	2 years	Clubs, LE, TDLR, TMSC, TxDOT, and TDLR
Medium	Explore adding motorcycle-specific fields to the crash report; identify needed fields (e.g., trike designation and type of helmet the rider was wearing), and compare and contrast two- versus three-wheel motorcycle crashes.	7	$100K	2 years	LE, TMSC, and TxDOT
Medium	Develop evaluation protocols in concert with the creation of strategies and countermeasures that can determine the value and effectiveness of implemented strategies and countermeasures.	7	$500K	2 years	
Medium	Share and communicate the effectiveness of strategies and countermeasures so other organizations, agencies, and communities can use them as best practices and adapt for their use.	7	$250K	2 years	
Medium	Officer education on accurate data collection/ reporting of motorcycle crashes (including explanation in narrative).	7	$50K	2 years	TMSC and TxDOT
Low	Create public access portal for CRIS data.	4	$50K	2 years	Clubs, LE, TDLR, and TMSC
Medium	Conduct crash analysis: • On multivehicle and intersection-related fatal motorcycle collisions. • On geographic trends and driver-at-fault collisions. Focus future activities on those areas.	7	$500K	1 year	

**Clubs refer to motorcycle riding clubs (e.g., H.O.G.) and organizations (e.g., Texas Council of Clubs and Independents).*

4.3. Effectiveness, Cost, and Time Frame

4.3.1. Challenges Associated with Addressing Multiple Countermeasures

As Table 12 shows, Texas motorcyclist safety stakeholders have a demonstrated history of implementing a wide variety of countermeasures to reduce motorcyclist injury and fatality rates. The development and implementation of any countermeasure to address this vulnerable road user group are welcome.

However, there are several challenges when a wide variety of countermeasures are developed and deployed, as opposed to the development and deployment of just a few within one or two focused areas. These include the following items:

- The resources (e.g., funding and effort) to support the development and deployment of many countermeasures can be insufficient to make a substantial impact on motorcyclist safety. In essence, resources may be spread too thin across too many countermeasures to make a meaningful impact in any one area or across many areas.
- The development and deployment of multiple countermeasures are often accomplished by smaller groups working independently. This independence can stifle the ability of stakeholders to benefit from interacting with other stakeholders and for sharing the burden of countermeasure development and deployment.
- Consistent and broad-based messaging of one, or just a few, countermeasures across a wider range of the population will likely have a greater impact on behaviors as opposed to multiple countermeasures.

For these reasons, motorcyclist safety stakeholders across Texas are encouraged to address just a few high-priority countermeasures, as opposed to a wide range of countermeasures.

Motorcyclist safety stakeholders across Texas are encouraged to address just a few high-priority countermeasures, as opposed to a wide range of countermeasures.

4.3.2. High-Priority Countermeasures

As part of the motorcyclist safety activities identification and ranking, stakeholders ranked each countermeasure as high, medium, or low. Table 13 presents the 15 priorities ranked as "high" from Table 12 along with the corresponding NHTSA component.

Table 13. High-Priority Countermeasures, Associated NHTSA Component, and Countermeasure Reference Code.

NHTSA Component	Countermeasures	Countermeasure Reference Code in Following Figures
I. Program management	Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.	I-A
	Locate/increase funding sources for motorcycle safety outreach/education.	I-B
II. Motorcycle personal protective equipment	Conduct outreach and education on gear use: • Educate riders regarding conspicuity benefits. • Educate riders on the consequences of not wearing personal protective equipment. • Provide education prior to purchasing a motorcycle. • Conduct additional education pushes to coincide with timely topics (e.g., riding seasons and weather-related issues).	II-A
III. Motorcycle operator licensing	Study reasons why riders do not obtain a Class M license.	III-A
	Update the driver licensing system to improve recording of rider training completion.	III-B
IV. Motorcycle rider education and training	Improve the instructor recruiting/training process and conduct quality control of sponsors.	IV-A
	Conduct outreach to encourage participation in rider education and training programs.	IV-B
V. Motorcycle operation under the influence of alcohol or other drugs	Incorporate motorcycle-specific DUI/DWI messages into all current impaired-driving campaign materials and enforcement activities.	V-A
	Conduct motorcycle safety campaigns on DUI riding. Consider using free materials from NHTSA, the Motorcycle Safety Foundation, the American Motorcyclist Association, and TTI.	V-B
VI. Legislation and regulations	Monitor fund allocations to ensure that funds from the motorcycle safety account continue to be used for allowable motorcycle safety tasks (e.g., training and awareness education).	VI-A
	Encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses.	VI-B
	Increase fines and penalties for riding without a motorcycle license (requires legislative change).	VI-C

Table 13. High-Priority Countermeasures, Associated NHTSA Component, and Countermeasure Reference Code. (continued)

NHTSA Component	Countermeasures	Countermeasure Reference Code in Following Figures
VII. Law enforcement	Identify motorcycle enforcement (e.g., impaired riding, proper license, excessive speed, and helmet use for minors) as a specific component of STEP grants.	VII-A
VIII. Highway engineering	Continue to improve highway engineering (e.g., increased sign use, increased use of motorcyclist-safe barriers, and increased use of high-friction treatments).	VIII-A
IX. Motorcycle rider conspicuity and motorcycle awareness programs	Increase rider education for preventative riding behaviors: • Communicate rider responsibility (not speeding, appropriate following distance, and lane placement). • Wearing high-visibility gear.	IX-A
XI. Program evaluation and data	Continue in-depth analysis of crash data to identify crash causation factors; prioritize and incorporate emphasis in problem statements, rider training curricula, and public information campaigns; based upon these data, bring stakeholders together to collaborate on key factors that each entity can advance; create a plan with measurable goals.	XI-A

In an effort to address the challenges associated with addressing multiple countermeasures as identified previously, it is necessary to identify a subset of high-priority countermeasures. One method to obtain a subset of the high-priority countermeasures is to identify those countermeasures that are perceived as being the most effective and the least costly, and that will require the least amount of time to implement. These countermeasures likely represent the greatest value and potential benefit for motorcyclists, motorcyclist safety stakeholders, and funding agencies.

To facilitate this understanding, Figure 19 shows the relationship between ratings of perceived effectiveness and cost, Figure 20 shows the relationship between ratings of perceived effectiveness and time, and Figure 21 shows the relationship between ratings of cost and time. The dotted green circle in each figure identifies the two countermeasures that were perceived to be best by stakeholders. The blue circle in each figure identifies additional high-priority countermeasures.

It is clear that VI-A (monitor fund allocations to ensure that funds from the motorcycle safety fund account continue to be used for allowable motorcycle safety tasks [e.g., training and awareness education]) and VI-B (encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses) are perceived to have the greatest effectiveness and the least cost, and to be implementable in the least amount of time because they were consistently ranked best for cost, effectiveness, and amount of time to implement.

Figure 19 shows the relationship between ratings of perceived effectiveness and cost.

4.3.2.1 Countermeasure Effectiveness by Cost

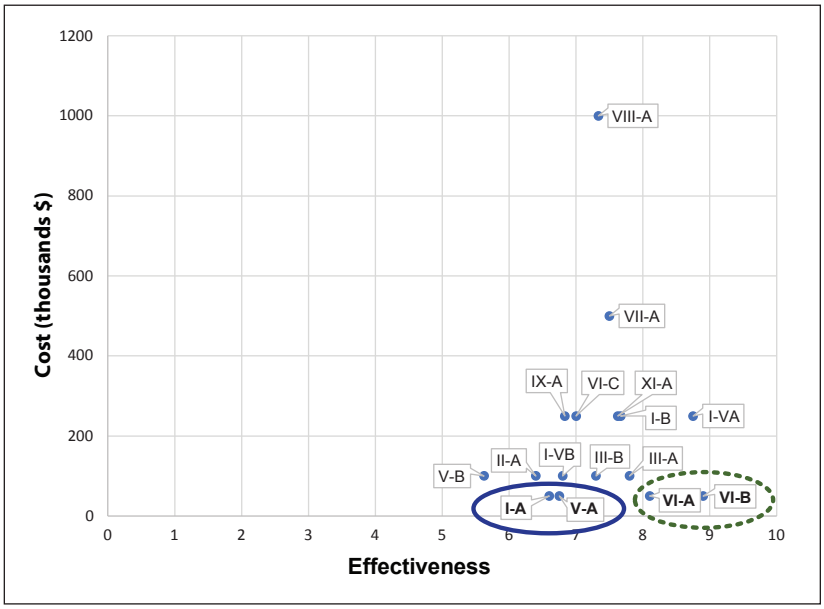


Figure 19. Relationship between Countermeasure Perceived Effectiveness by Cost.

Stakeholders perceived the following countermeasures (dotted green circle) were the best for effectiveness and cost:

- **VI-A. Legislation and regulations.** Monitor fund allocations to ensure that funds from the motorcycle safety fund account continue to be used for allowable motorcycle safety tasks (e.g., training and awareness education).
- **VI-B. Legislation and regulations.** Encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses.

Additional high-priority countermeasures (circled in blue) were also identified for consideration:

- **I-A. Program management.** Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.
- **V-A. Motorcycle operation under the influence of alcohol or other drugs.** Incorporate motorcycle-specific DUI/DWI messages into all current impaired-driving campaign materials and enforcement activities.

4.3.2.2 Countermeasure Effectiveness by Time

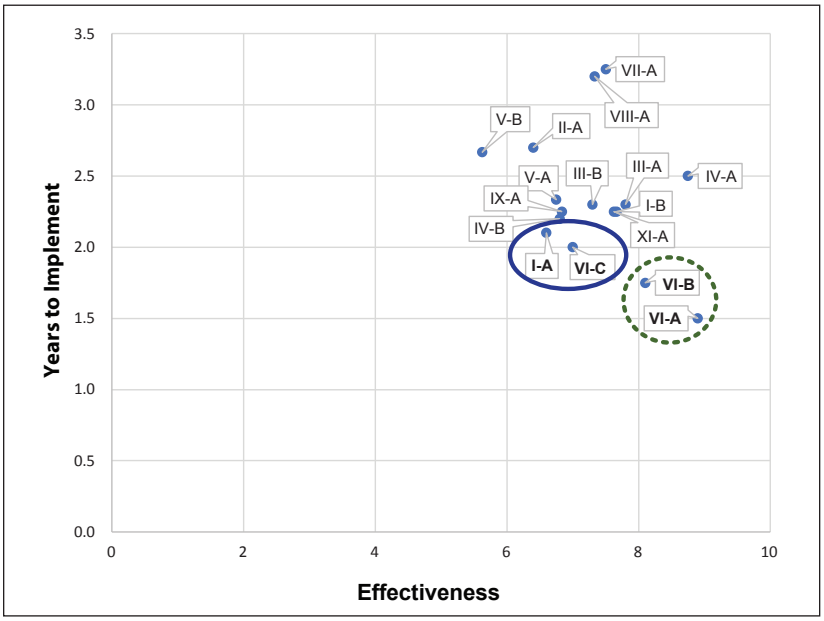


Figure 20. Relationship between Countermeasure Perceived Effectiveness by Time.

Figure 20 shows the relationship between ratings of perceived effectiveness and time.

Stakeholders perceived the following countermeasures (dotted green circle) were the best for effectiveness and time:

- **VI-A. Legislation and regulations.** Monitor fund allocations to ensure that funds from the motorcycle safety fund account continue to be used for allowable motorcycle safety tasks (e.g., training and awareness education).
- **VI-B. Legislation and regulations.** Encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses.

Additional high-priority countermeasures (circled in blue) were also identified for consideration:

- **I-A. Program management.** Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.
- **VI-C. Legislation and regulations.** Increase fines and penalties for riding without a motorcycle license (requires legislative change).

4.3.2.3 Countermeasures Years to Implement by Cost

Figure 21 shows the relationship between ratings of cost and time.

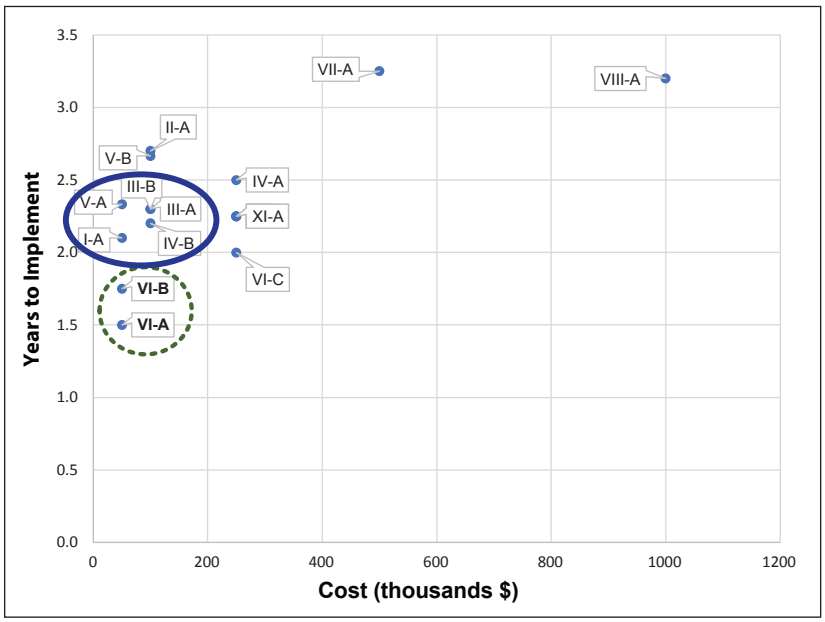


Figure 21. Relationship between Countermeasure Cost by Years to Implement.

Stakeholders perceived the following countermeasures (dotted green circle) were the best for cost and years to implement:

- **VI-A. Legislation and regulations.** Monitor fund allocations to ensure that funds from the motorcycle safety fund account continue to be used for allowable motorcycle safety tasks (e.g., training and awareness education).
- **VI-B. Legislation and regulations.** Encourage legislation change to allow any nationally certified instructor trainers to conduct motorcycle safety instructor courses.

Additional high-priority countermeasures (circled in blue) were also identified for consideration:

- **I-A. Program management.** Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.
- **III-A. Motorcycle operator licensing.** Study reasons why riders do not obtain a Class M license.
- **III-B. Motorcycle operator licensing.** Update the driver licensing system to improve recording of rider training completion.

- **IV-B. Motorcycle rider education and training.** Conduct outreach to encourage participation in rider education and training programs.
- **V-A. Motorcycle operation under the influence of alcohol or other drugs.** Incorporate motorcycle-specific DUI/DWI messages into all current impaired-driving campaign materials and enforcement activities.

4.3.3. Additional High-Priority Countermeasures

Monitoring fund allocations (VI-A) may not substantially impact motorcyclist safety but will certainly ensure that funds are expended according to Texas rules and policy. Relative to encouraging legislation to allow nationally certified instructors to instruct in Texas (VI-B), this is currently allowed if an instructor passes the Texas Motorcycle Instructors License from TDLR. A modification of this countermeasure might include TDLR policy change to support a different licensing process. Both countermeasures also do not engage a high number of motorcyclist safety stakeholders. Both of these countermeasures are valuable, but it is beneficial to identify additional countermeasures without challenges and that can be addressed by a wide range of stakeholders.

Several additional countermeasures (identified by a blue circle in Figure 19, Figure 20, and Figure 21) were also perceived as being low cost, effective, and relatively quick to implement. Two that rated highly in two graphs were:

- **I-A. Program management.** Provide guidance to TMSC, if funding continues, to keep it moving in the right direction, including (a) enlisting support by formal and informal motorcycle groups on safety initiatives, (b) increasing participation by all segments of the motorcycle community, and (c) expanding the reach of the Motorcycle Safety Forum.
- **V-A. Motorcycle operation under the influence of alcohol or other drugs.** Incorporate motorcycle-specific DUI/DWI messages into all current impaired-driving campaign materials and enforcement activities.

Monitoring fund allocations (VI-A) may not substantially impact motorcyclist safety but will certainly ensure that funds are expended according to Texas rules and policy.

Motorcyclist safety stakeholders are encouraged to consider addressing the high-priority countermeasures as well as the additional high-priority countermeasures.

Four additional countermeasures that ranked highly in at least one graph included:

- **III-A. Motorcycle operator licensing.** Study reasons why riders do not obtain a Class M license.
- **III-B. Motorcycle operator licensing.** Update driver licensing system to improve recording of rider training completion.
- **IV-B. Motorcycle rider education and training.** Conduct outreach to encourage participation in rider education and training programs.
- **VI-C. Legislation and regulations.** Increase fines and penalties for riding without a motorcycle license (requires legislative change).

These additional high-priority countermeasures can be implemented fairly quickly, with relatively low funding rates, and can have a direct impact on motorcyclist safety. Motorcyclist safety stakeholders are encouraged to consider addressing the high-priority countermeasures as well as the additional high-priority countermeasures.

5. Conclusion

The 2022–2027 TSAP-M identifies implementable countermeasures to make Texas roadways, infrastructure, drivers, and motorcyclists safer for the motorcycling community. The TSAP-M identifies those countermeasures with the greatest opportunity to reduce motorcyclist fatalities, injuries, and crashes in Texas. Safe motorcycling practices by motorcyclists and cooperation from all roadway users will contribute to reducing the number of motorcyclist fatalities, injuries, and crashes. Raising awareness among motorists to understand the safety challenges that motorcyclists face, such as size and visibility, is just one component in the motorcycle safety challenge. Equally important is educating riders to practice safe motorcycling behaviors, such as lane placement, wearing a helmet and proper gear, and riding sober. If Texas is going to continue to reduce the number of motorcyclist fatalities, injuries, and crashes, it must seek an integrated approach and implement solutions that hold the greatest potential for positive change.

Safe motorcycling practices by motorcyclists and cooperation from all roadway users will contribute to reducing the number of motorcyclist fatalities, injuries, and crashes.

TTI2235.9123.AUG2022

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Published: August 2022