

Spotlight on
Highway Safety



Motorcyclist Traffic Fatalities by State

2017 PRELIMINARY DATA

Prepared for
**Governors Highway
Safety Association**

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SUMMARY

Motorcyclist fatalities in the United States are expected to have decreased by 5.6 percent in 2017 compared with 2016, a reduction of approximately 296 fatalities, based on preliminary data submitted to the Governors Highway Safety Association (GHSA).

Motorcyclists continue to account for a considerable proportion of U.S. road trauma. According to the National Highway Traffic Safety Administration's National Center for Statistics and Analysis (NHTSA's NCSA), in 2016 there were 5,286 motorcyclists killed on U.S. roadways. This was a 5.1 percent increase from 2015. In addition, in 2016, motorcyclist fatalities occurred 28 times more frequently than passenger vehicle fatalities in motor vehicle crashes when accounting for vehicle miles traveled (VMT) (NCSA, 2018).

NCSA reported that 28 percent of the total motor vehicle fatalities in 2016 were alcohol-impaired driving crashes across the U.S. Alcohol-impaired driving fatalities for all vehicles increased by 1.7 percent, from 10,320 in 2015 to 10,497 in 2016. Twenty-five percent of motorcycle riders involved in fatal crashes in 2016 were under the influence of alcohol. This is the highest percentage of alcohol-impaired drivers than any other vehicle types (Figure 5). In addition, 37 percent of motorcycle riders who were killed in single-vehicle crashes in 2016 were alcohol-impaired (NCSA, 2017).

Since 2010, GHSA has requested preliminary motorcyclist fatality data from State Highway Safety Offices (SHSOs) to predict motorcyclist deaths in advance of the final counts provided by Fatality Analysis Reporting System (FARS) data. In January 2018, GHSA requested [preliminary state motorcyclist fatality data for 2017](#), and final counts for 2016. In addition, a series of questions was included in this request to determine potential motorcyclist fatality trends and explanations for these trends.

Motorcyclist fatality counts were obtained from state traffic record systems. Responses were collected from all 50 states and the District of Columbia. Responses to questions are based on the respondent's experience and content knowledge as a subject matter expert for the state, not scientific analyses.

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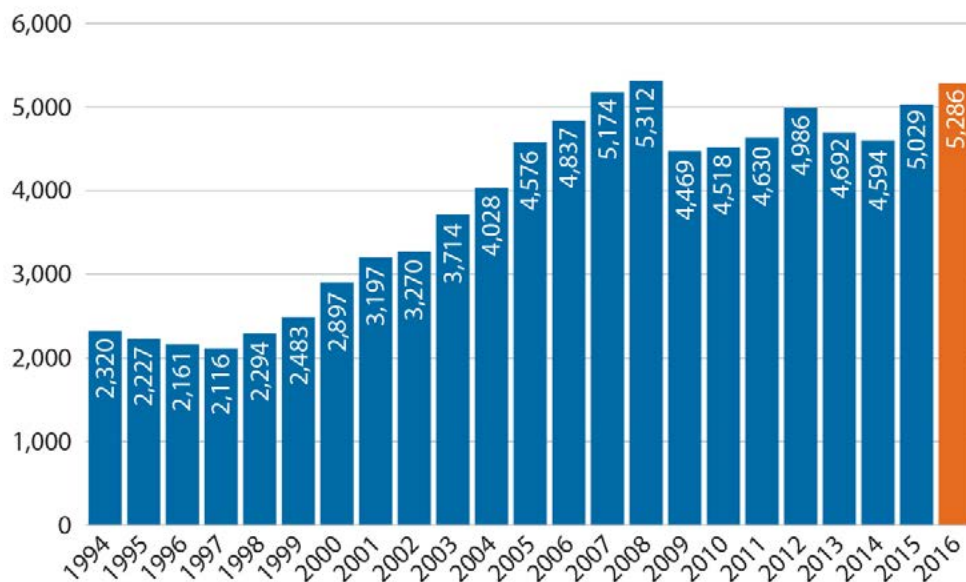
INTRODUCTION

There are three major classifications of motorcycles: street (including two- and three-wheeled motorcycles), off-road and dual purpose. Motorcycles categorized as street bikes include cruisers, sport-bikes, scooters, and mopeds. Each category of motorcycle allows for varying stability, performance, rider visibility and handling. In general, motorcycles require more agility, coordination and alertness when riding and provide less protection when involved in a crash. There is a higher risk of injury for the motorcyclist since motorcycles lack the enclosure of a passenger vehicle. In addition, because motorcycles are much smaller than other motor vehicles, they are often less visible to other road users.

Motorcyclists continue to account for a considerable proportion of U.S. road trauma. According to NCSA, 5,286 motorcyclists were killed on U.S. roadways in 2016, which is a 5.1 percent increase from 2015 (NCSA, 2018). In 2016, motorcyclist fatalities occurred 28 times more frequently than passenger vehicle fatalities in motor vehicle crashes when accounting for VMT (NCSA, 2017).

Motorcyclist fatalities increased steadily from 1997 through 2008. Motorcyclist fatalities increased to an all-time high of 5,312 in 2008 before dropping to 4,469 in 2009. The number of motorcyclist fatalities then fluctuated in the ensuing six years, before reaching 5,286 in 2016. (Figure 1). The number of motorcyclist fatalities recorded in 2016 represents the second highest number of motorcyclist fatalities in the past two decades, according to FARS.

Figure 1. Motorcyclist Fatalities, 1994-2016



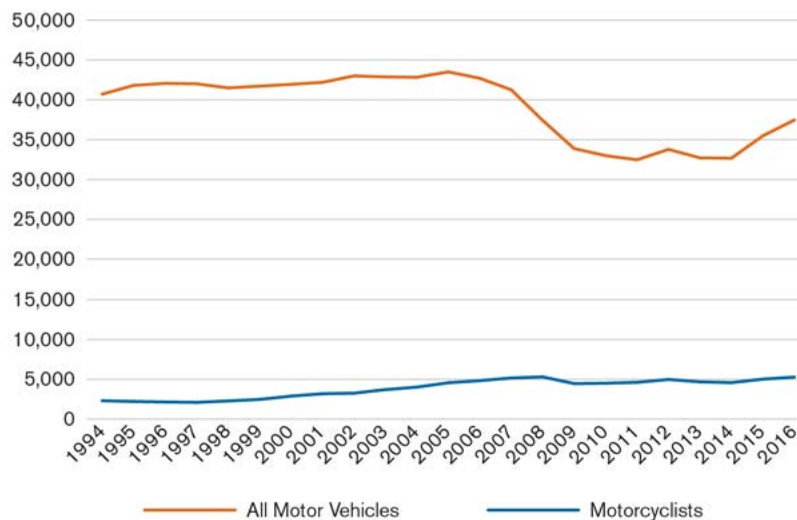
Source: Fatality Analysis Reporting System (FARS)

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While motorcyclist fatalities consistently increased from 1997 to 2008, all motor vehicle fatalities began trending downwards from 2005 to 2008 (Figure 2). It is difficult to determine the cause for these changes, although several factors have been identified as influencing motorcyclist fatality rates. These factors include weather (Hedlund, 2014) and economic stability (Hedlund, 2010), which may affect the number of motorcycle registrations and, in turn, the number of motorcycle miles driven. The decline in fatalities for passenger vehicles and trucks may be attributed to the implementation of safety improvements including air bags, increased seat belt use and other passenger vehicle safety features.

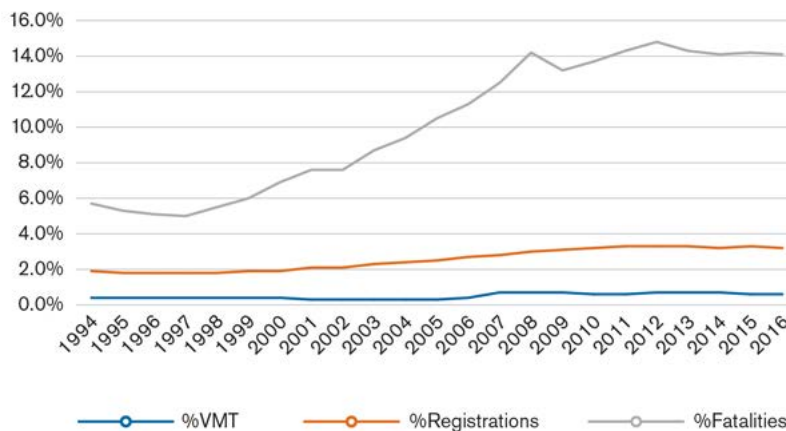
Figure 2. Motorcyclist vs. All Motor Vehicle Fatalities, 1994-2016



Source: FARS

Motorcyclist fatalities as a percent of total motor vehicle fatalities also increased from 1994 to 2008, with an 8.4 percentage point increase from 5.7 percent in 1994 to 14.1 percent in 2016 (Figure 3).

Figure 3. Motorcyclist Fatalities as a Percent of VMT, Registrations, and Total Motor Vehicle Deaths



Source: Fatalities, FARS; VMT and Registrations, Federal Highway Administration (FHWA)

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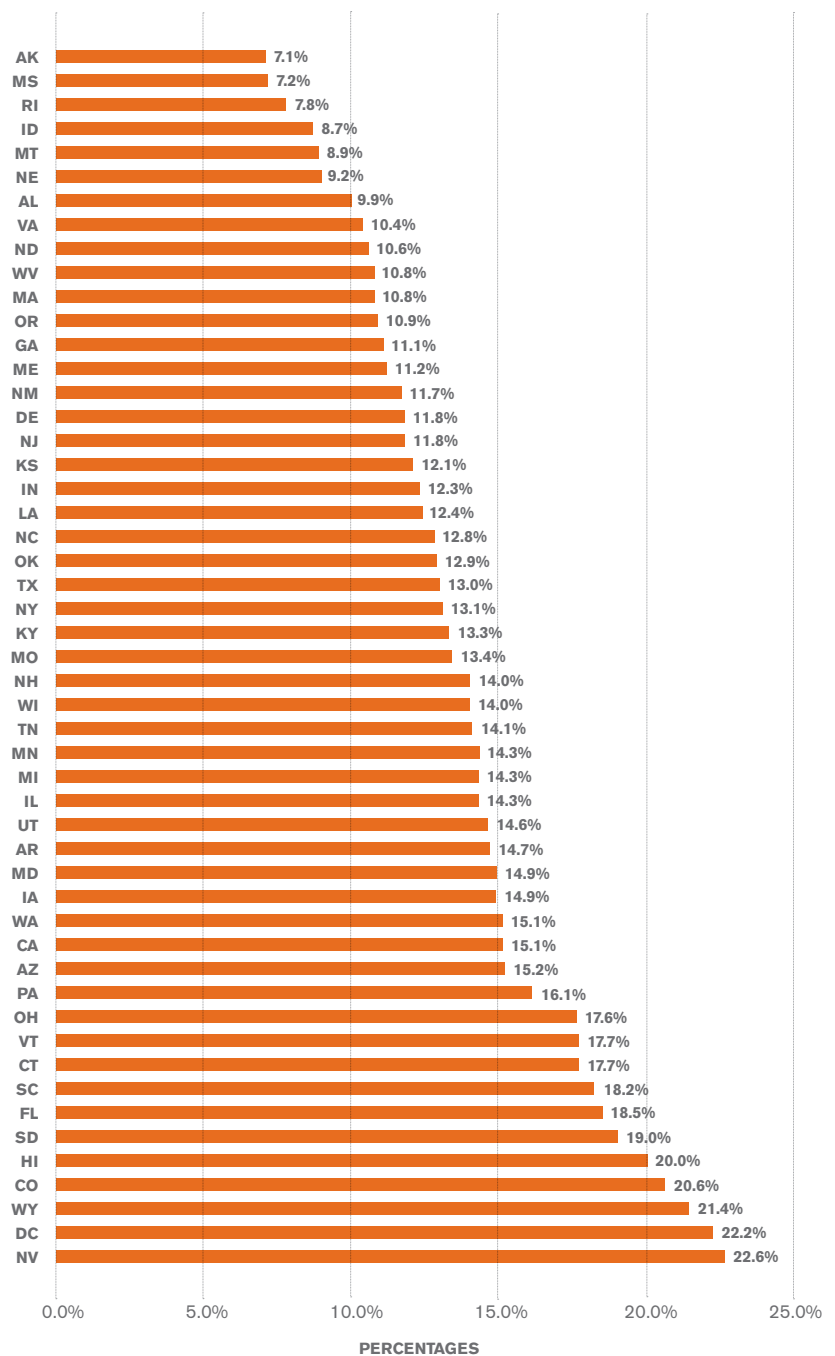
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Motorcyclist miles traveled as a percent of total motor vehicle miles traveled showed a 0.3 percent increase, from 0.4 percent in 1994 to 0.7 percent in 2016 (FHWA, 2016). In 2007 motorcycle vehicle miles traveled nearly doubled from 12,049 (millions of vehicle miles) to 21,396 (millions of vehicle miles). During this time all other motor vehicle travel stayed fairly consistent (FHWA, 2007). This may account for the increase in fatalities during this time. From 2012 to 2015, there was a decline in motorcyclist miles traveled as a percent of total vehicle miles traveled; in 2016 FARS data reported a small reversal of this trend.

Motorcyclist registrations as a percent of total vehicle registrations showed a 1.3 percentage point increase, from 1.9 percent in 1994 to 3.2 percent in 2016. A large jump in motorcycle registrations took place from 1998 to 2011 and has remained consistent over the last few years.

Motorcycle deaths as a percent of the total motor vehicle deaths were calculated for each state using 2016 FARS Annual Report File (ARF) data (Figure 4). In 2016, state motorcyclist deaths as a percent of total motor vehicle deaths ranged from 7.1 percent in Alaska to 22.6 percent in Nevada.

Figure 4. Motorcyclist Deaths as a Percent of Total Motor Vehicle Deaths by State, 2016



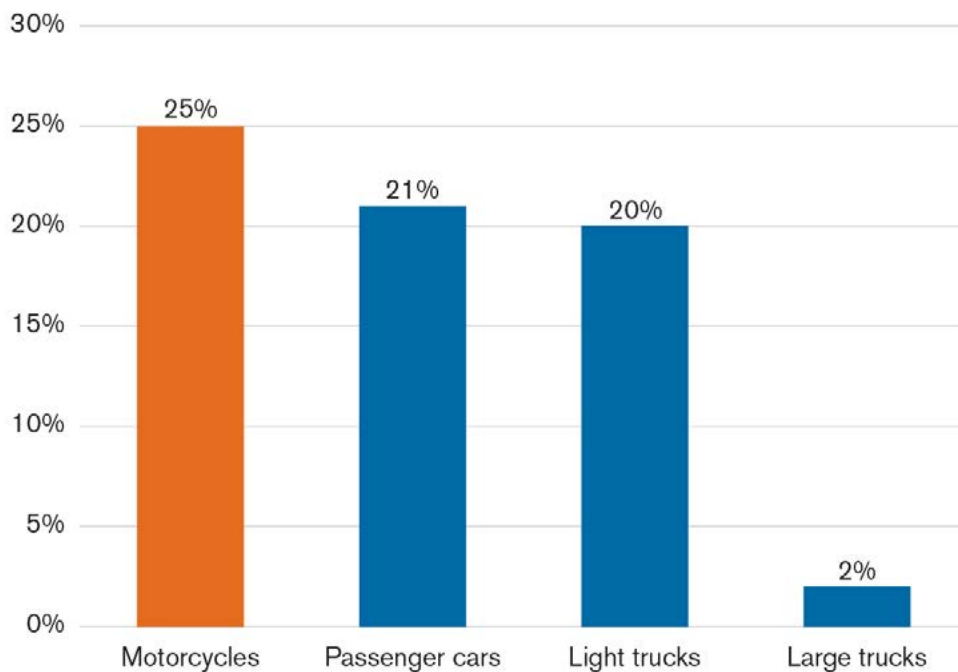
Source: 2016 FARS ARF

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From 2015 to 2016, alcohol-impaired driving fatalities—or those fatalities where the driver was reported to have a blood alcohol content (BAC) of 0.08 g/dL or higher—for all vehicles increased by 1.7 percent, from 10,320 to 10,497. Twenty-five percent of motorcyclists involved in fatal crashes in 2016 were alcohol-impaired. This is the highest percentage of alcohol-impaired drivers than any other vehicle type (Figure 5). Additionally, 37 percent of motorcyclists who were killed in single-vehicle crashes in 2016 were alcohol-impaired and 55 percent of motorcyclists killed in single-vehicle crashes on weekend nights were alcohol-impaired (NCSA, 2018).

Figure 5. Percent of Alcohol-impaired Drivers Involved in Fatal Crashes by Vehicle Type, 2016



Source: 2016 FARS ARF

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2017 GHSA SURVEY

Since 2010,¹ GHSA has requested preliminary motorcyclist fatality data from State Highway Safety Offices to predict motorcyclist deaths in advance of the final counts provided by FARS data. In January 2018, GHSA requested preliminary state motorcyclist fatality data for 2017 and final counts for 2016. In addition, a series of questions was included in this request to determine potential trends and explanations for these trends within their state.

Responses were collected from all 50 states and the District of Columbia. Motorcyclist fatality counts were obtained from state traffic record systems. Responses to questions are based on the respondent's experience and content knowledge as a subject matter expert for the state, not scientific analyses.

MOTORCYCLIST FATALITIES, 2016 AND 2017

State-reported motorcyclist fatalities for 2016 and preliminary counts for the calendar year 2017 were provided by all 50 states and the District of Columbia (Table 1). The increase or decrease in number and percent change from 2016 to 2017 were calculated for each state. Please note, the 2017 numbers are likely incomplete and subject to change.

Based on the unadjusted, preliminary 2017 data, the number of motorcyclist fatalities across the country decreased by 8.6 percent. Motorcyclist fatalities increased in 18 states, remained the same in two states, and decreased in 30 states and the District of Columbia in 2017. Seven states reported increases of 20 percent or more. Fourteen states reported a decrease of 20 percent or more. The largest increase was reported by Rhode Island with a 175 percent increase, from four in 2016 to 11 in 2017. The largest decrease was reported by the District of Columbia with a 66.7 percent decrease, from six fatalities in 2016 to two fatalities in 2017. The average change in motorcyclist fatalities for all 50 states and the District of Columbia in 2017 was +1.6 percent.

Adjustments were calculated for likely under-reporting of the 2017 yearly totals. Preliminary counts for 2016 were not collected in 2017; therefore, the adjusted rate for the state 2017 preliminary counts was calculated using the 2015 adjusted rate. To project the adjusted final number of motorcyclist fatalities in 2017 (4,990), GHSA used an undercount of four percent (Retting 2016). Using this adjusted rate, GHSA projects 2017 motorcyclist fatalities decreased by 5.6 percent from 2016.

¹ 2016 preliminary data was not collected for a 2017 report.

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Table 1

Motorcyclist Fatalities by State for 2016 and 2017

Source: State Highway Safety Offices

*Prior to adjustment for expected under-reporting.

State	2016	2017 (Preliminary)	Change from 2016 to 2017	
			#	%
Alabama	114	78	-36	-31.6%
Alaska	6	6	0	0.0%
Arizona	144	165	21	14.6%
Arkansas	79	66	-13	-16.5%
California	566	406	-160	-28.3%
Colorado	125	103	-22	-17.6%
Connecticut	52	51	-1	-1.9%
Delaware	15	10	-5	-33.3%
District of Columbia	6	2	-4	-66.7%
Florida	574	504	-70	-12.2%
Georgia	170	126	-44	-25.9%
Hawaii	24	29	5	20.8%
Idaho	23	26	3	13.0%
Illinois	154	162	8	5.2%
Indiana	100	144	44	44.0%
Iowa	60	44	-16	-26.7%
Kansas	53	56	3	5.7%
Kentucky	113	90	-23	-20.4%
Louisiana	92	95	3	3.3%
Maine	18	24	6	33.3%
Maryland	76	76	0	0.0%
Massachusetts	42	45	3	7.1%
Michigan	152	142	-10	-6.6%
Minnesota	52	53	1	1.9%
Mississippi	50	37	-13	-26.0%
Missouri	127	120	-7	-5.5%
Montana	17	22	5	29.4%
Nebraska	21	26	5	23.8%
Nevada	74	54	-20	-27.0%
New Hampshire	18	15	-3	-16.7%
New Jersey	69	80	11	15.9%
New Mexico	45	49	4	8.9%
New York	119	136	17	14.3%
North Carolina	152	141	-11	-7.2%
North Dakota	12	11	-1	-8.3%
Ohio	199	147	-52	-26.1%
Oklahoma	88	79	-9	-10.2%
Oregon	55	53	-2	-3.6%
Pennsylvania	191	184	-7	-3.7%
Rhode Island	4	11	7	175%
South Carolina	187	141	-46	-24.6%
South Dakota	22	16	-6	-27.3%
Tennessee	145	131	-14	-9.7%
Texas	495	491	-4	-0.8%
Utah	41	39	-2	-4.9%
Vermont	11	13	2	18.2%
Virginia	80	115	35	43.8%
Washington	81	64	-17	-21.0%
West Virginia	29	26	-3	-10.3%
Wisconsin	85	77	-8	-9.4%
Wyoming	24	17	-7	-29.2%
Total	5,251	4,798 *	-453	-8.6%

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MOTORCYCLIST CRASH TRENDS AND PATTERNS: STATE RESPONSES

In addition to state motorcyclist fatality data, GHSA requested that states report various trends in motorcyclist deaths. State responses included trends related to overall increases and decreases, age, sex, crash type, and day of week.

Overall increases or decreases in motorcyclist fatalities

All states except Alaska and Maryland reported a change in motorcyclist fatalities. The majority of the states reported declines in motorcyclist fatalities, which likely contributes to the overall projected decline in motorcyclist fatalities for 2017.

Eighteen states reported increases in motorcyclist deaths from 2016 to 2017 (Table 1). Trends reported by the states where increases occurred included contributing factors such as speed and crossing the highway center line. For example, Nebraska reported crashes where multiple fatalities occurred as a result of these factors when typically, multiple deaths in a single motorcyclist crash are rare. Another trend reported by the states was an increase in registered motorcycles in 2016, which may account for an increase in motorcyclists on the roadway.

Thirty states and the District of Columbia reported declines in fatalities from 2016 to 2017. Common trends among states that reported fewer fatalities in 2017 include a decrease in the number of registered riders or motorcycle VMT. For example, Tennessee reported a decrease in VMT from 2016 to 2017, which was the first drop in that metric in nearly five years. Nevada reported five moped deaths in 2017, which is the lowest number of moped fatalities in Nevada since 2013. A new law that went into effect in Nevada in January 2017 requiring mopeds to be registered may have resulted in fewer moped riders on Nevada roadways in 2017 and could also have influenced the decline in motorcyclist deaths.

These accounts of state trends for 2016 and 2017 motorcyclist fatalities are a testament to the year-to-year variability of motorcyclist deaths across the country, and the difficulty to control for contributing factors in this regard.

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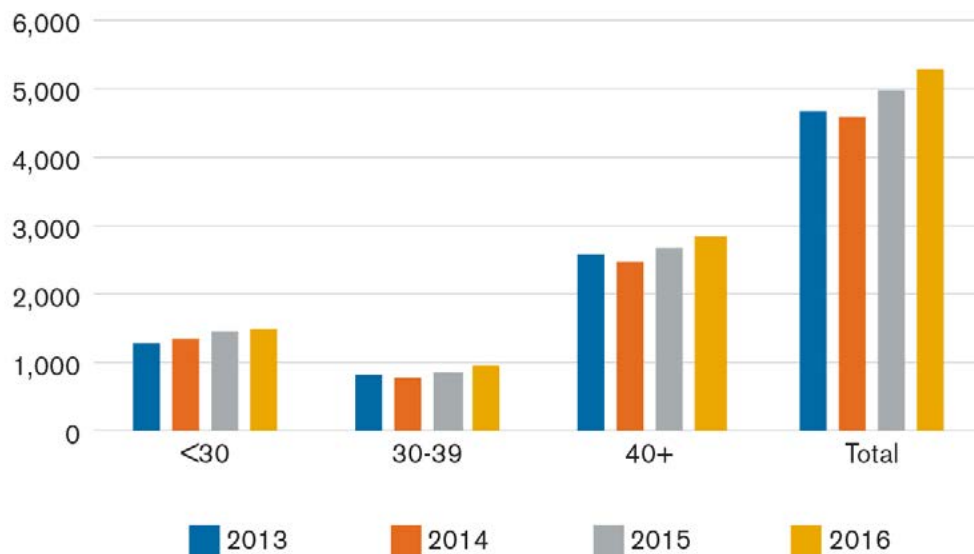
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Age

Recently, there has been a shift from younger riders being overrepresented in motorcyclist fatalities to riders over the age of 40 comprising the greatest share of motorcyclist fatalities nationwide (FARS). Several states reported increases in older driver fatalities in 2017. Sixteen states reported that most motorcyclist crashes and fatalities in their states involve older riders.

This information is supported by the most recent national data reported by FARS. Over the last four years, the 40-and-older age group made up the largest percentage of motorcyclist fatalities, representing 55 percent of all riders killed in 2013 and 54 percent in 2014, 2015 and 2016. The average age of motorcyclists killed in 2013, 2014 and 2015 was 42, rising to 43 in 2016.

Figure 6. Motorcyclist Fatalities by Age Group, 2013-2016



Source: 2013-2016 FARS ARF

Eight states reported younger drivers made up the largest percentage of motorcyclist fatalities in their states. For example, Washington reported the largest group of fatalities continues to be males aged 18-29 on sport bikes. The Insurance Institute for Highway Safety (IIHS) reported an increasing popularity of high-performance motorcycles called “super-sports.” These motorcycles are built for racing, then modified for roadways. They are lighter than other motorcycles and have powerful engines that can reach speeds up to 180 miles per hour. These motorcycles are especially popular with younger riders (IIHS, 2018).

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Sex

Males have been consistently overrepresented in motorcyclist fatalities (FARS). All states reported that males represent the majority of those involved in motorcyclist fatalities. However, female rider fatalities have increased recently (FARS), and motorcycle riding is a growing interest among women. According to the Motorcycle Industry Council, women were reported to comprise 14 percent of owners in 2014, compared to six percent of motorcycle owners in 1990 (IIHS, 2018). States are also reporting these increases. For example, Connecticut reported a dramatic increase in female riders involved in fatal or serious injury crashes, from 4.7 percent in 2014 to 19.2 percent in 2015. However, the state noted that changes in injury crash data reporting in 2015 may be related to the higher total number of operators reported. South Carolina also reported a slight increase in the percentage of female rider fatalities over the past few years.

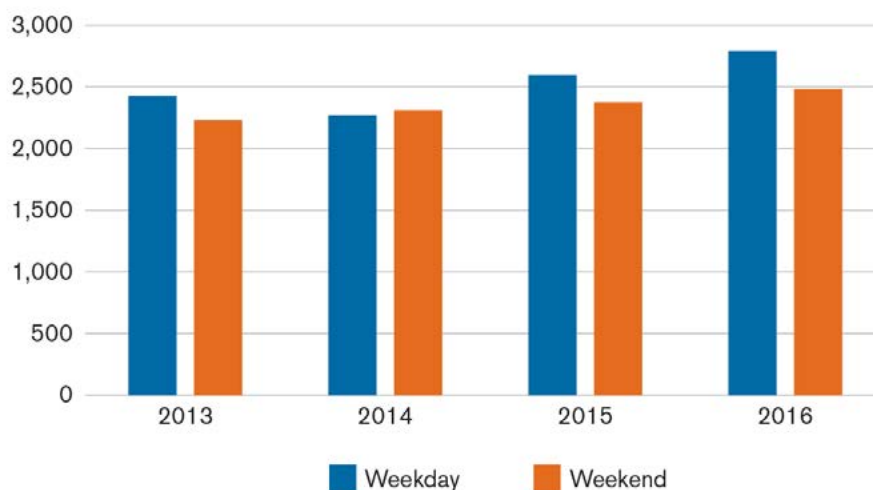
Crash type

According to NCSA, in 2016 motorcycles were more frequently involved in fatal collisions with fixed objects than other vehicle types. Most states reported the majority of fatal motorcyclist crashes were single-vehicle crashes. Older riders may not be taking key factors into account when riding, such as the appropriate motorcycle type for their skill level, which may impact their ability to ride safely. This, in conjunction with alcohol and/or drug consumption, may be increasing the incidence of single-vehicle crashes.

Day of week

Most states reported a large increase in motorcyclist fatalities during the weekday. This is supported by an increasing trend in weekday motorcyclist fatalities reported by FARS over the last four years (Figure 7). Indiana reported a significant increase in weekend motorcyclist fatalities in 2017.

Figure 7. Motorcyclist Fatalities by Day of Week



Source: 2013-2016 FARS ARF

However, when comparing the number of hours between weekday and weekend, there were more than 1.6 times as many motorcyclist fatalities on weekends (19.1 percent) compared to weekdays (11.9 percent) (FARS, 2016).

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CONTRIBUTING FACTORS

Motorcycle riding is considered to be a higher risk than riding in other motor vehicles. There are several contributing factors that may influence rider risk, including weather, helmet use, impaired riding, speed, and unendorsed or unlicensed riders.

Weather

Typically, weather plays a significant role influencing state motorcyclist fatalities. With harsher winters, riding seasons may be shortened, resulting in fewer motorcycle riders on the roadways and therefore fewer motorcyclist crashes and fatalities. When milder winters are reported, the reverse occurs. Idaho and Michigan reported that a harsher winter in 2017 may have led to a delayed or reduced motorcycle riding season. These states showed a decrease in motorcyclist fatalities. Kansas, Kentucky, New York, and Vermont reported a milder or delayed winter that expanded their riding season. These states also showed an increase in motorcyclist fatalities.

The hurricane season for 2017 was particularly harsh, with 17 named storms, 10 hurricanes, and six major (category three or stronger) hurricanes that tore through the Atlantic Basin, a number of storms well above the 30-year average for the season. This placed 2017 among the top 10 most active Atlantic seasons on record, according to Dr. Phil Klotzbach, tropical scientist at Colorado State University. Hurricanes Harvey, Irma and Maria devastated parts of Texas, Florida, and the Caribbean, affecting roadways, bridges and tunnels, and may have impacted motorcycle riding (Belles, 2017).

Helmet Use

According to NCSA, 1,859 motorcyclist lives were saved in 2016 because they were wearing helmets. In addition, if all riders had worn helmets, an additional 802 lives would have been saved (NCSA, 2018). Motorcycle helmets have been shown to decrease the incidence and severity of traumatic brain injury due to motorcycle crashes. According to the Centers for Disease Control and Prevention (CDC), helmets reduce the risk of head injuries from motorcycle crashes by 69 percent and deaths by 37 percent. Previous reports and speculation suggested that helmet use is associated with a higher likelihood of cervical spine injury. A recent study found that there is a significantly lower likelihood of suffering a cervical spine injury among helmeted motorcyclists (Page, 2018). This study found that unhelmeted riders sustained a significantly higher number of vertebral fractures and ligamentous injuries. The study findings confirm that helmet use does not increase the risk of developing a cervical spine fracture and provides some protective advantage. Additionally, a study released in 2016 showed that medical charges and rates of head, facial, and brain injuries among motorcyclists were lower in states with universal helmet laws (Olsen et al., 2016). This provides strong evidence that universal helmet laws reduce motorcyclist injuries, the severity of motorcyclist injuries and motorcyclist fatalities.

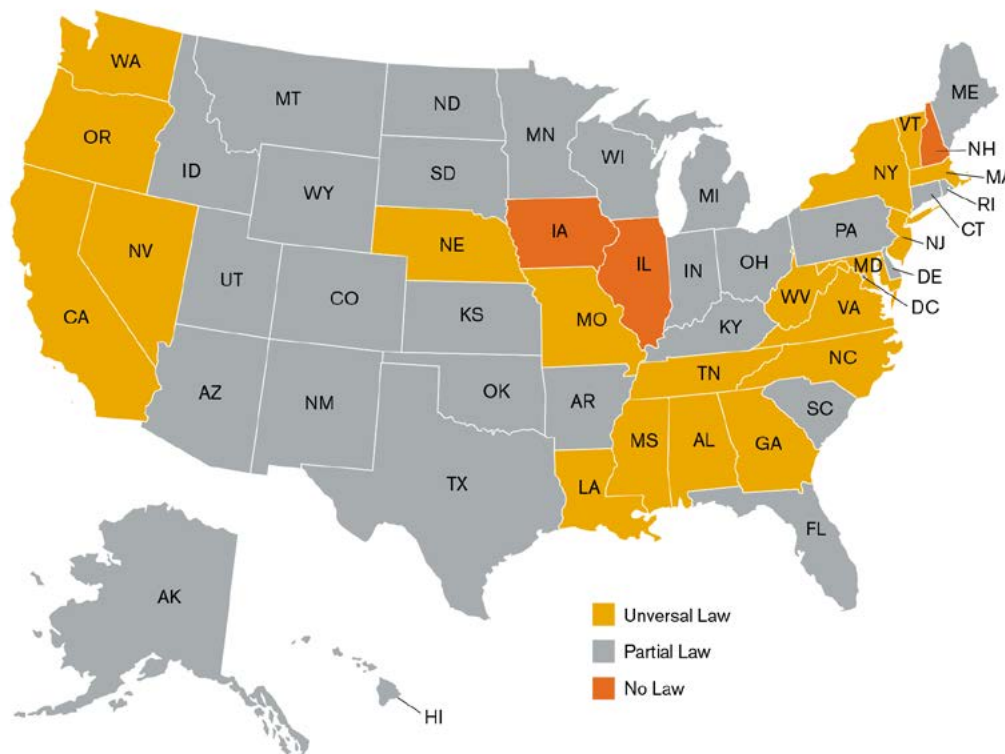
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State helmet laws

Currently, 19 states and the District of Columbia have universal helmet laws requiring all motorcyclists to wear a helmet. Twenty-eight states require only some motorcyclists to wear a helmet (17 and younger, 18 and younger, and 20 and younger). Three states (Illinois, Iowa and New Hampshire) do not have a motorcycle helmet law (GHSA, 2018) (Figure 8).

Figure 8. State Helmet Laws, 2018



Source: Governors Highway Safety Association

The National Occupant Protection Use Survey (NOPUS), conducted by NCSA, reported that U.S. Department of Transportation-compliant motorcycle helmet use was 65.2 percent in 2017, not statistically different from 65.3 percent in 2016. However, helmet use continued to be notably higher in states that require all motorcyclists to be helmeted compared to those that do not. Additionally, helmet use among motorcyclists on expressways and in fast and heavy traffic rose significantly (NCSA 2018). Non-compliant helmet use among riders decreased to 7.7 percent in 2016 from 11.8 percent in 2015, but increased to 8.6 percent in 2017 (NCSA 2017, 2018). State responses reflect these NCSA findings. Florida, Hawaii and Utah reported increases in helmet use. Each of these states have a partial helmet law. Hawaii requires riders 17 and younger to wear a helmet. Hawaii reported a small increase in motorcycle helmet use, from 56.5 percent in 2016 to 59.3 percent in 2017. Hawaii also reported a large increase in moped helmet use, from 18.2 percent in 2016 to 31.4 percent in 2017. Utah also requires riders aged 20 and younger to wear a helmet and reported a slight increase in helmet use, from 60.7 percent in 2015 to 61.0 percent in 2016. Massachusetts requires all riders to wear a helmet

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and reported that 85 percent of motorcyclists over the last three years were helmeted. Tennessee and Washington both have a universal helmet law. Both states reported consistent high helmet use within their state. Tennessee reported 99.4 percent helmet use in 2016. Washington reported that typically helmet use is observed at 95 percent each year.

Delaware and Nebraska reported decreases in helmet use. Delaware requires a helmet to be on the motorcycle for riders aged 18 and younger but does not require the helmet to be worn by the rider. The state reported that officers do not stop many motorcycles during high visibility enforcement (HVE) efforts because they can be difficult to stop, and officers do not want to pursue them for fear of endangering other drivers if a chase ensues. Delaware, like several other states, does not have a way to track helmet use when conducting HVE efforts since there is no section on overtime sheets to indicate helmet use. Nebraska, which has a universal helmet law, reported a decrease in helmet use from 99.7 percent in 2016 to 84.8 percent in 2017. Nebraska also reported an increase in non-DOT compliant helmet use from 10.3 percent to 15.7 percent in the same year.

New Hampshire, one of three states without a helmet law, reported 50 percent of motorcycle riders do not wear a helmet.

Impaired riding

Drivers or motorcycle riders are considered to be alcohol-impaired when their blood alcohol concentrations (BACs) are 0.08 g/dL or higher. In a recent NCSA study (Lacey, 2016), alcohol was determined the largest contributor to crash risk for all vehicle types. For drivers with a BAC of 0.08, the relative risk of crashing is approximately four times that of drivers with no alcohol found in their blood. Although it is commonly believed that riding skills may be more easily impacted by alcohol than are driving skills, relatively little is known about the effects of alcohol on motorcycle operation. A study conducted in 2007 (Voas et al., 2007) found that several relative-risk methods regarding alcohol impairment developed for passenger cars can be adapted to motorcycle studies, however, more research is needed to identify the risk of rider BAC levels in relation to crash involvement. In addition, a 2007 NCSA study measured rider performance under different BACs on a closed course. Results of this study showed BAC levels as low as 0.05 significantly impaired riders' reaction times and the likelihood of lane departure, compared with zero BAC (Creaser et al., 2007).

As previously mentioned, motorcycle riders involved in fatal crashes in 2016 represented the highest percentage of impaired driving fatalities among all vehicle types. According to NCSA, motorcycle riders killed in traffic crashes at night were alcohol-impaired three times more frequently than those killed during the day in 2016 (NCSA, 2018). These 2016 NCSA findings were reflected in the state responses. Indiana, Maryland and Mississippi reported an increase in fatal crashes during the evening or at night. Kentucky reported that one-third of motorcycle crashes involved alcohol impairment. New Hampshire reported that 39 percent of motorcyclist fatalities in 2016 involved alcohol or drugs. This percentage increased to 40 percent in 2017. New York reported that 27 percent of fatal motorcyclist crashes from 2008-2012 were alcohol-related. Oregon reported that there is a general perception by the riding population that impaired driving laws are not actively enforced. For this reason, riders have little concern for compliance due to low expectation of enforcement. West Virginia reported an increase not only in alcohol but also with drug use among motorcycle riders.

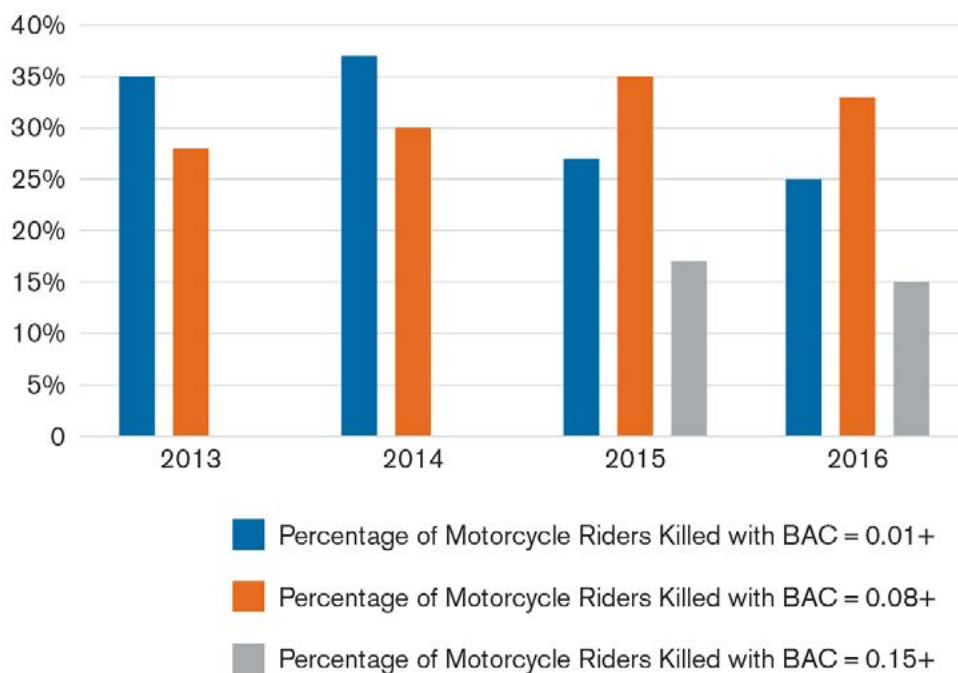
The following chart shows the percentage of motorcycle riders killed with BACs above 0.00 g/dL over the last four years, demonstrating a shift from low BAC levels (0.01 to 0.07 BAC) to higher BAC levels (at or above 0.08) (Figure 9). This could reflect an increasing trend in the amount of alcohol

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one consumes when drinking. In 2017, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) released a study that showed nearly 32 million adults in the US, representing 13 percent of the population age 18 and older, consumed more than two times the number of drinks considered binge drinking on at least one occasion (Gowin, 2017). NIAAA defines binge drinking as a pattern of drinking that brings BAC levels to 0.08 g/dL, which translates to approximately four drinks for women and five drinks for men in about two hours.

Figure 9. Percent of Riders with BACs Above 0.00 g/dL in Fatal Crashes, 2013-2016



Source: 2013-2016 FARS ARF

With the recent legalization of recreational marijuana, there may be a higher number of drivers or motorcyclists that are driving or riding drug-impaired. A 2017 report released by the Insurance Institute for Highway Safety (IIHS) showed that marijuana is showing up more frequently among people involved in crashes. This study reported that after legalizing recreational marijuana use, collision claim frequencies in Colorado, Oregon, and Washington are approximately three percent higher overall than would have been expected without legalization (IIHS, 2017). A well-known 2010 study conducted in the European Union (EU) known as the *Driving Under the Influence of Drugs, Alcohol and Medicines* (DRUID) study, found that drivers positive for delta-9-tetrahydrocannabinol (THC) were estimated to be at elevated crash risk, one to three times that of drivers not positive for THC. A recent NCSA crash risk study found that THC is associated with a significantly elevated risk of crashing, approximately 25 percent (NCSA, 2015); however, these calculations did not account for other factors that may contribute to increased crash risk.

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In recent years, more drivers admit to using marijuana. Results of the 2013–2014 National Roadside Survey of Alcohol and Drug Use by Drivers found that 12.6 percent of weekend nighttime drivers tested positive for THC. This is a 48 percent increase from the 2007 National Roadside Survey results (NCSA, 2015). Marijuana impairs psychomotor skills and cognitive functions associated with driving, including vigilance, time and distance perception, lane tracking, motor coordination, attention to tasks and reaction time (Hedlund, 2017). GHSA, with funding from the Foundation for Advancing Alcohol Responsibility (Responsibility.org), released [*Drug-Impaired Driving: A Guide for What States Can Do*](#). This report stated that in 2015, 57 percent of all fatally-injured drivers were tested for drugs (Hedlund, 2017). Of those tested, 35.6 percent tested positive for marijuana, 9.3 percent tested positive for Amphetamines, and 55 percent tested positive for other drugs. Increased research on this topic, as well as enforcement and education for all drivers and riders, is essential to reducing motorcyclist drug-impaired driving fatalities on U.S. roadways.

Speed

Fatal single-vehicle crashes are typically related to speed and/or distractions (Liu, 2009). Higher speeds are a significant factor in determining injury severity. Motorcycles, especially those that are built with high performance features, are capable of reaching extremely high speeds. These motorcycles are capable of higher acceleration and quicker stops than other motor vehicles. NCSA reported that 33 percent of all motorcycle riders involved in fatal crashes in 2016 were speeding, compared to 19 percent for passenger vehicles (NCSA, 2018).

State responses mirrored these numbers. Five states—Alabama, Delaware, Indiana, Maine and Virginia—reported speed as a primary factor in motorcyclist fatalities. States also reported that younger age groups are typically overrepresented in speed-related crashes. For example, Kansas reported younger male fatalities commonly involve sport or high-performance motorcycles, while older male fatalities involve larger touring motorcycles. Massachusetts reported speed was a factor in 37 percent of all motorcyclist fatalities, and in 70 percent of motorcyclist fatalities involving a rider under age 30. Virginia reported speed-related motorcyclist fatalities increased 56 percent in 2017.

Unendorsed riders

Unendorsed or unlicensed riders are typically those riders without formal education and training. According to NCSA, 27 percent of motorcycle riders involved in fatal crashes in 2016 were riding without valid motorcycle licenses at the time of the collisions, while only 13 percent of passenger vehicle drivers in fatal crashes did not have valid licenses (NCSA, 2018). Idaho, Indiana, Nebraska, Rhode Island, Ohio, and South Carolina reported that unlicensed riders are a problem in their state. In some states, certain gaps need to be addressed regarding motorcycle permit laws. For example, one state reported riders can renew a riding permit and never test for the endorsement. This perpetuates permit-only riding and avoids the formal licensing requirements.

Other Reported Factors

Other reported factors contributing to motorcyclist fatalities included rider inexperience; operator error, including failure to yield; aggressive driving; distracted riding; and “being run off the road” by distracted motor vehicle drivers. Rider inexperience is similar to passenger motor vehicle novice driving. Practice and training are critical when developing the skills needed to become proficient at riding a motorcycle (NCSA, 2005). Alaska reported that typically one or two riders with limited experience per year are killed, for example, military members recently stationed in Alaska who crash during their first riding season.

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Distracted riding appears to be an increasing issue on U.S. roadways. For instance, Virginia reported a significant increase (113 percent) in distracted riding fatalities for 2017. Nebraska and New Hampshire reported the occurrence of increased center lane encroachment fatalities, which may be due to distraction. Tennessee also reported a steady increase of motorcyclist crashes that included some type of distraction since 2013.

Other factors that may influence increased motorcyclist fatalities include motorcycle events where large numbers of riders gather for recreational purposes. South Dakota reported that the month of August, when the Sturgis motorcycle rally takes place, is always the month with the largest number of fatalities. However, these fatalities occur when riders are traveling to or from the event, not during the rally.

STATE EFFORTS TO REDUCE MOTORCYCLIST CRASHES AND FATALITIES

States are currently addressing motorcyclist safety issues through the following efforts:

- increasing helmet use;
- promoting education, training and motorcycle safety programs;
- participating in motorcycle safety advisory committees; and
- collecting data to inform motorcycle safety countermeasures.

Increasing Helmet Use

Several states have been unsuccessful in their attempts to propose universal helmet laws due to belief by riders that that this type of law is an infringement of their right to choose whether or not they want to wear a helmet. This is an ongoing struggle between rider rights groups and motorcycle safety advocates. Continued efforts to pass helmet and other motorcycle laws are underway in several states.

Promoting education, training and motorcycle safety programs

Most states sponsor motorcycle safety training classes and scholarships along with public awareness campaigns. Public awareness campaigns include the use of highway billboards, variable message signs (VMS), radio ads, lawn signs, and public appearances at local and state fairs. Many of these public awareness campaigns take place prior to and during the riding season. For example, Indiana sponsors “The Miracle Ride,” a large motorcycle charity event each year with motorcycle traffic safety messages. Louisiana intends to sponsor a motorcycle awareness campaign in 2018, which will facilitate a motorcycle awareness and safety rally in partnership with the Louisiana State Police.

State motorcycle programs focus on risk mitigation regarding key motorcycle riding issues such as speed, impaired riding, distracted riding and reducing invalid licensure. In addition, most states participate in the promotion of intermediate and advanced education and training. This includes increased availability of motorcycle safety classes as well as promotion and marketing strategies to licensed riders

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to take “follow-on” or subsequent training after obtaining their motorcycle license to improve their riding skills. Additional training beyond what is required for licensing has been shown to increase key skills to be a safe rider. A NCSA study conducted in 2013 measuring the effect of sight distance training on the visual scanning of motorcycle riders indicated that there may be a relationship between rider experience, rider training and feedback, and visual behavior while riding a motorcycle. For example, on a curved section of the open road course, beginner or untrained riders did not look far ahead enough to stop safely twice as often as more experienced riders (NCSA, 2013).

Several states participate in national traffic safety campaigns that include elements of motorcyclist safety. Six states currently participate in the “Just Drive” campaign to educate riders and motorists about the dangers of distracted driving. Alaska, Florida, Kentucky, New Jersey, Pennsylvania, and Tennessee reported participating in the “Share the Road” program, which conducts a very focused and limited media campaign at the beginning of the motorcycle season to encourage both motorcyclists and the general motoring public to be on the lookout for each other. Kentucky and Washington reported participating in their state “Vision Zero” program.

In addition to these state initiatives, some states are implementing additional strategies working with their local military and law enforcement to reduce motorcyclist fatalities. For example, the Alaska Highway Safety Office works with the two major military installations in the state to provide annual motorcycle crash data for their motorcycle education program. North Carolina has implemented a “BikeSafe” Program, which is a rider training program conducted by law enforcement officers in a non-threatening, non-enforcement environment.

Some states are enacting legislative changes and conducting local research to encourage safe riding. The Michigan Legislature recently passed a law increasing motorcycle registration and endorsement fees to fund a separate state safety and education awareness fund, which will be dedicated to creating and maintaining a program that promotes motorcyclist awareness, safety and education. Michigan also implemented an Impaired Motorcyclist Prevention campaign in 2017 that included phone surveys and focus groups to inform local media campaigns. New York State passed a law in 2017 requiring motorcycle safety and awareness to be a mandatory component of the pre-licensing course and testing for new drivers.

Participating in advisory committees

States reported that advisory committees are helpful regarding the development and implementation of motorcyclist safety initiatives. These committees often include members of law enforcement, SHSOs, advocacy groups, education and training personnel, healthcare representatives and other stakeholders, representing the differing views and opinions that exist within the local community. Therefore, strategies developed by these committees are often more palatable for the communities when implemented.

Several states reported participating in motorcycle safety advisory committees or workgroups. These committees generally assess current issues regarding motorcyclist safety and recommend potential countermeasures. States that reported participating in motorcycle advisory committees include Delaware, Florida, Minnesota, New Mexico, New York, Oklahoma, Oregon, South Carolina and Wisconsin. Some committees are mandated by the state legislature. For example, Delaware participates in the Motorcycle Riders Education Advisory Committee. This committee is the result of a legislative resolution and comprises members of the legislature, state agencies and the public. The committee monitors the Motorcycle Rider Education Program, assesses the future needs of the

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program, and provides recommendations. Florida created the Florida Motorcycle Safety Coalition (a.k.a. Ride Smart Florida), which is the communication and outreach extension of the Florida Motorcycle Safety Program and serves to help implement the state's Motorcycle Safety Strategic plan (MSSP) goals and strategies.

Collecting data to inform motorcycle countermeasures

To establish more efficient and effective motorcycle safety program countermeasures, states are relying on motorcycle data to inform outreach and enforcement campaigns and mobilizations. For example, Florida rigorously collects and analyzes various sources of information relevant to motorcyclist safety to develop strategies to reduce motorcycle crashes. Kentucky uses data gathered by an epidemiologist to construct maps identifying counties with high numbers of motorcycle crashes to inform media outreach efforts. Minnesota maintains a running narrative of preliminary information on motorcycle crash fatalities, which is shared with the media, rider groups, instructors, members of the state motorcycle safety advisory taskforce, and Toward Zero Deaths partners. Virginia has robust motorcyclist crash data from their Traffic Records Electronic Data System (TREDS), which is used to inform their motorcycle safety campaigns.

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DISCUSSION: WHAT MORE CAN BE DONE TO REDUCE MOTORCYCLIST FATALITIES

Several factors may have influenced the projected 5.6 percent decline in motorcyclist fatalities during 2017, including decreases in registration and the reduction of riding seasons due to weather. Although these preliminary counts show a decrease in fatalities, it is evident that sustained efforts are needed to continue the downward trend toward zero deaths on our roadways. As previously mentioned, many states have developed programs or strategies to reduce motorcycle deaths and injuries on U.S. roadways; however, most states reported that much more needs to be done.

Increasing helmet use through the adoption of universal helmet laws

States that currently do not have a mandatory helmet law reported that mandatory universal helmet laws would likely decrease motorcyclist crashes and fatalities. Mandating helmet use, skills testing and training for all motorcycle riders were considered the greatest needs and the most important factors influencing the number of motorcyclist injuries and fatalities. However, states often face opposition to universal helmet laws from riders who believe these laws infringe on their rights. This provides a significant obstacle to reducing motorcyclist deaths. Florida reported the need for better research on motorcyclist safety issues to inform strategies to overcome legislative obstacles. Washington reported the need for messaging focused on true crash causation factors as delineated in evidence-based research. Some states suggested increased penalties in the form of withholding funds for states without a universal helmet law, since penalties are currently in place for state noncompliance across other highway safety program areas.

Support for motorcycle safety features

Continued support from SHSOs for motorcycle safety features encourages the purchase of motorcycles equipped with critical and often life-saving components. One of the most impactful motorcycle safety features is an antilock braking system (ABS) (IIHS, 2018). An ABS reduces the risk of a motorcycle crash through preventing a rider's wheels from locking up, which often results in a serious fall. The rate of fatal crashes is 31 percent lower for motorcycles equipped with antilock brakes than for the same models without them (Teoh, 2013). The Highway Loss Data Institute (HLDI) reports that collision insurance claims for motorcycles with ABS are filed 20 percent less frequently than for motorcycles without ABS, and 31 percent when the ABS bikes have combined controls (IIHS, 2018).

Increased education, awareness and training

Certain types of motorcycles can be riskier than others depending on skill level and the physicality of the rider. Education and awareness of the differences between various types of motorcycles and the appropriate skill level required for these different motorcycles is important when purchasing a motorcycle, especially for new or returning riders. Supersport motorcycles have driver death rates about four times as high as that of cruisers and standards (IIHS 2018). These bikes are built on racing platforms, and their combination of light weight and high-horsepower engines allows for extremely high speeds. Touring and sport-touring bikes have similar rates as cruisers and standards. The need for increased training and education in this regard was a common response from states. Vermont reported that with the increased popularity of three-wheeled motorcycles, there is also need for specific education and training for these vehicles.

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Most states reported that current education, public information and focused enforcement efforts combined with media messaging were insufficient for their needs. Increasing awareness campaigns with focused messaging to “look out for bikes” during known riding seasons was suggested. However, states noted that the cost of paid media makes it difficult for SHSOs to fund motorcyclist safety initiatives. For this reason, earned media is typically the only marketing strategy used to promote current motorcycle programs. It was also noted, especially by those states in the Northeast, that with current unpredictable weather and the riding season expanding, awareness messaging should be year-round. Several states reported an expanding motorcycle riding season because of mild winters. Current funding for motorcycle projects would not support expanding these programs to account for the increased riding season. Increased funds expanding motorcycle countermeasure efforts to accommodate the lengthened riding season would allow for addressing these concerns. Pennsylvania suggested that early education efforts including motorcycle awareness in new driver training classes and other school curricula may increase overall motorcycle awareness.

Reducing impaired-riding fatalities

Most states reported the need for focused efforts on reducing impaired-riding fatalities. Ignition interlocks have proven successful tools when used to separate drinking events from driving for passenger vehicles. A new study conducted by IIHS found that that state laws requiring ignition interlock use for all offenders reduced drunk driving crash fatalities by 16 percent (IIHS, 2018). A recent NCSA study examined the feasibility of ignition interlock use for motorcycles. This study looked at various key issues regarding motorcycle interlocks, including the current availability, secure storage, weather, vibration, battery power, retesting issues, liability, installation, circumvention potential and cost. This study found that adequate and safe motorcycle interlock programs are possible with existing equipment (NCSA, 2017).

Availability of motorcycle interlocks has increased since NCSA's study was published. Nine states—California, Florida, Illinois, Kentucky, Massachusetts, Michigan, Minnesota, South Carolina and Virginia—currently mandate interlocks for motorcycles under specific circumstances. The biggest concerns for this implementation are safety of the rider and liability issues; these concerns can be addressed through modification of current state interlock statutes. Current interlock laws are based on passenger vehicles; the state rules and regulations do not currently modify for motorcycles. Therefore, what is required for passenger vehicles is required for the motorcycle. To accommodate for this, manufacturers are modifying motorcycle devices to comply with these state regulations. However, states may need to consider accommodations for the interlocked motorcycle, such as examining the safety of rolling retests for motorcycles to implement motorcycle interlock programs as a viable countermeasure to reduce motorcyclists' impaired-riding crashes.

Reducing registration/endorsement non-compliance

NCSA reported that motorcycles represented three percent of all registered vehicles in the U.S. in 2016 and accounted for only 0.6 percent of all VMT, yet when taking these factors into account, motorcyclists had the highest fatality rate among all motor vehicle operators. Idaho, Indiana, Nebraska, Rhode Island, Ohio and South Carolina reported that required endorsement for riders and increased enforcement efforts are necessary to reduce the occurrence of poorly-trained or untrained riders. In July 2007, Washington expanded its vehicle impoundment law to include motorcycle riders. A NCSA study conducted to determine the effectiveness of this law change was somewhat inconclusive (NCSA, 2013), showing that while few motorcycles were impounded, motorcycle endorsements still increased. The reason for this increase is unclear. There was also a lower proportion of crashes

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involving unendorsed riders after the law's implementation, but no change in overall crashes. One interpretation is that the law worked, but this does not account for the lack of endorsements. Another interpretation of the results is that the law discouraged unendorsed riders from riding, thus limiting their exposure. It was noted that this law was implemented soon before the national economic recession, which may have affected the results of the study. This matter requires further research.

Graduated licensing for motorcycles

Motorcycle safety advocates have proposed implementing programs for motorcycle riders similar to state graduated driver licensing (GDL) programs for novice drivers. The University of Adelaide in Australia recently published a study providing recommendations for a graduated licensing system for motorcyclists in South Australia, basing this system on their current young driver program (Baldock, 2018). This recommendation provides several recommended restrictions, including zero BAC, no passengers, no phone use while riding, testing on the same type of motorcycle that the motorcyclist will be riding and a lower point threshold than applies to a full license.

Other considerations

Lane sharing/splitting

States reported that due to increased demand from riders, at least 14 states are under pressure to adopt lane sharing/splitting laws. Currently, California is the only state to legally allow lane sharing/splitting. Those in support of lane sharing/splitting argue that this will reduce congestion and is a safer maneuver for motorcycles when avoiding rear-end crashes caused by distracted drivers in stop-and-go traffic (Bergal, 2018). Supporters for this behavior refer to a study conducted in 2015 by the University of California Berkeley that found this behavior to be relatively safe at lower speeds. Several states have attempted to pass these laws, including Arizona, Massachusetts and Washington. Those opposed to legalize lane sharing/splitting argue that it is a risky behavior that can be unsafe and would not reduce motorcyclist fatalities or serious injuries. GHSA has not taken a formal position on legalizing lane-splitting.

Automated vehicles

Automated features are becoming common in today's motor vehicles. The driving population is looking to automated vehicles to solve highway safety issues on our roadways; however, full automation has not been perfected and misguided public reliance on these features can be dangerous. There are blurred aspects of autonomous vehicle accountability when involved in a crash, particularly the liability and legal aspects when crashes occur. Recently, a motorcyclist in California filed lawsuit against General Motors claiming that one of the manufacturer's automated vehicles was guilty of "negligent driving" when it aborted a lane change and struck the rider (Holley, 2018). The rider was injured and unable to work because of this crash. The police report for this crash cited the rider as being at fault, claiming the rider started to pass the vehicle before it was safe to do so. This is one of the first lawsuits involving autonomous vehicles. While this matter requires further research, automated vehicles do have strong potential to increase motorcyclist safety. As lane departure, blind spot, and forward vehicle detection sensor technology in passenger vehicles improve, these features could play a significant role in motorcycle crash avoidance.

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CONCLUSION

Motorcycle riding can be riskier than driving in a passenger vehicle since motorcyclists are directly exposed to other vehicles in the event of a crash. For this reason, states are focused on promoting motorcyclist safety and reducing motorcyclist crashes, serious injuries and fatalities. It is evident that states are working hard to promote motorcyclist safety and training, increase enforcement and awareness and educate the public in an effort to reduce motorcyclist deaths. Motorcyclist fatalities in the United States are expected to have decreased by 5.6 percent in 2017 compared with 2016, a reduction of approximately 296 fatalities, based on preliminary data submitted to GHSA. However, according to FARS data, motorcyclist fatality numbers have fluctuated over the past 10 years, showing several increases and decreases absent of sustained trends. The projected decline in fatalities in 2017 may not be an ongoing trend in this direction. Identifying effective and efficient motorcyclist safety programs is a priority for states, and efforts to increase the effectiveness of these campaigns should be maintained.

All states reported the importance of implementing universal helmet laws. It was noted that this would likely decrease motorcyclist injuries and fatalities. However, continued opposition in this regard can hinder progress in this direction. Efforts to mandate helmet use, skills testing and training for all motorcycle riders are considered the greatest needs and the most important factors influencing the decrease in the number of motorcyclist injuries and fatalities.

States are constantly evolving not only their programs, but also how they implement these strategies. Most states reported that funding for education, public information and focused enforcement efforts combined with media messaging were insufficient to meet their current needs. Impaired driving and driver distraction are ever-increasing issues on our roadways and are significant contributing factors in motorcyclist fatalities. Identifying viable solutions to overcome these issues is a priority. While there are factors that cannot be controlled to impact motorcycle crash rates, such as weather and economic stability, states are looking at the data to inform countermeasures for these factors. With more advanced technology and reliable, available data, some states are using crash information to inform mobilization campaigns and enforcement efforts. Increasing the reliability and accessibility of state data will allow the informed research needed to develop more effective and efficient motorcyclist safety programs.

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