National Highway Traffic Safety Administration

Motorcycle Safety 5-Year Plan

U.S. Department of Transportation
National Highway Traffic Safety Administration

NHTSA

National Highway Traffic Safety Administration
Motorcycle Safety
5-Year Plan

Table of Contents

EXECUTIVE SUMMARY

This document is intended to serve as a plan for National Highway Traffic Safety Administration activities to address the safety of motorcyclists. Motorcycle safety is a complex and far-reaching topic, and to be successful NHTSA must work in conjunction with its partners and utilize data-driven approaches to reduce the risk to motorcyclists and all road users.

The plan is broken down into four sections. The initial section identifies current data needs for the Agency and data acquisition strategies to improve countermeasure development processes. The second section covers efforts to improve the Agency's support of State activities. The third section examines opportunities to improve support for law enforcement agencies as they pertain to motorcyclist safety. Finally, the fourth section identifies strategies as they pertain to the Agency's Federal agenda. All four sections acknowledge the challenges currently facing the Agency, and propose strategies to address them.

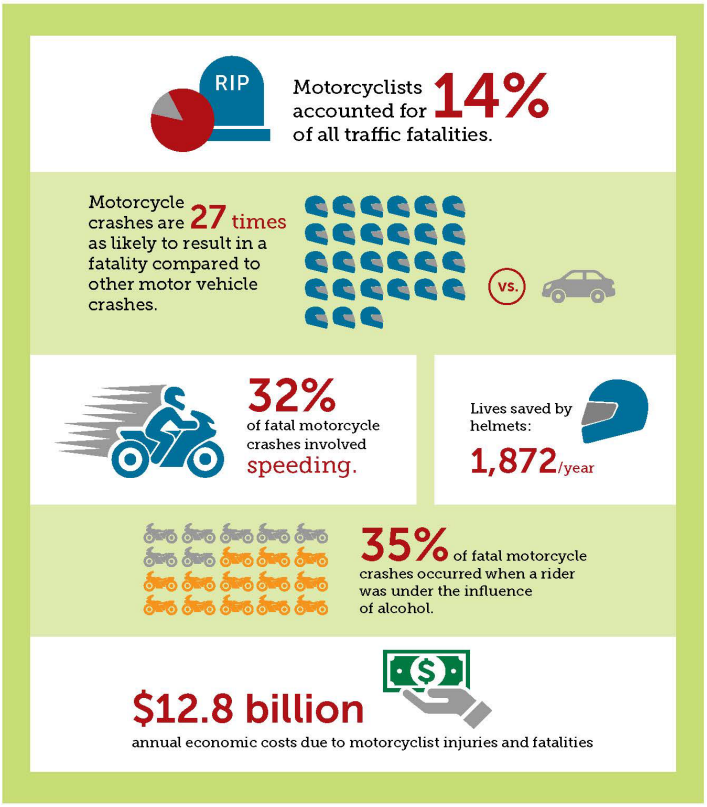
Motorcycle safety encompasses a wide spectrum of road users, including those who have never operated a motorcycle. From the perspective of crash causes, motorcyclists can be segmented into several distinct groups, each facing unique challenges in addressing motorcyclist safety. Each section represents a comprehensive approach to addressing the identified challenges. For example, under State Support, efforts will include initiatives that support policymakers, highway safety office personnel, motorcyclists, and non-riding motorists.

This strategic plan is intended to be a dynamic guide rather than a static statement. Concerns raised here will be addressed in accordance with NHTSA priorities and available resources. In the years ahead, NHTSA will revisit and adjust this approach in response to new information and emerging issues that affect the safety of motorcyclists.

INTRODUCTION

Motorcycle safety is at a unique juncture. Overall traffic fatalities are increasing, and motorcyclist fatalities also continue to increase and are near their highest level in over 35 years. In 2017, there were 5,172 motorcyclists killed in motor vehicle traffic crashes. Compared to the 2,116 killed in 1997, the past 20 years have seen a 144-percent increase in motorcyclist fatalities. It should be noted that despite the absolute increase in motorcyclist fatalities, the fatality rate for motorcyclists as measured per 100,000 registered motorcycles has decreased almost 27 percent since 1988.[1]

Figure 1-1



Source: NCSA, 2019

Despite significant gains in roadway and vehicle design, including motorcycle design, crashes continue to place a considerable burden on our Nation's health care system. The $242 billion cost of motor vehicle crashes represents the equivalent of nearly $784 for each of the 308.7 million people living in the United States.[2]

Those not directly involved in motor vehicle crashes pay for over three-quarters of all crash costs, primarily through insurance premiums, taxes and congestion-related costs such as travel delay, excess fuel consumption, and increased environmental impacts. In 2010, these costs, borne by society rather than by crash victims, totaled over $187 billion.[3]

---

[1] Blincoe, L. (2015, May). *The Economic Impact of Motor Vehicle Crashes, 2010 Revised* (DOT HS 812 013). Washington, DC: National Highway Traffic Safety Administration.

[2] Blincoe et al.

[3] Blincoe et al.

Recent data further indicated that deaths and injuries from motorcycle crashes are continuing to account for a larger portion of this public health problem. Per registered vehicle, the fatality rate for motorcyclists in 2015 was six times the fatality rate for passenger car occupants, and in contrast to passenger vehicles, motorcycle crash-related fatalities have remained close the 2008 peak value, and injuries are almost double of what they were in 1998.

Motorcycles pose unique risks to riders in terms of their crashworthiness because of the following factors: the absence of external protection that an enclosed vehicle structure provides, the lack of internal restraints such as seat belts and air bags, acceleration and speed capability, the propensity for riders to be thrown in a crash, and the relative instability of a two-wheeled vehicle.

Table 1-1. Motorcyclist Fatalities, Injuries, and Casualty Rates, 1989-2017

Year	Registered Motorcycles	Vehicle Miles Traveled (Millions)	Motorcyclists Killed	Fatality Rate per 100,000 Registered Motorcycles	Fatality Rate per 100 Million VMT	Motorcyclists Injured	Injury Rate per 100,000 Registered Motorcycles	Injury Rate per 100 Million VMT
1989	4,420,420	10,371	3,141	71.06	30.29	83,000	1,888	805
1990	4,259,462	9,557	3,244	76.16	33.94	84,000	1,979	882
1991	4,177,365	9,178	2,806	67.17	30.57	80,000	1,925	876
1992	4,065,118	9,557	2,395	58.92	25.06	65,000	1,601	681
1993	3,977,856	9,906	2,449	61.57	24.72	59,000	1,494	600
1994	3,756,555	10,240	2,320	61.76	22.66	57,000	1,528	561
1995	3,897,191	9,797	2,227	57.14	22.73	57,000	1,475	587
1996	3,871,599	9,920	2,161	55.82	21.78	55,000	1,428	557
1997	3,826,373	10,081	2,116	55.3	20.99	53,000	1,374	522
1998	3,879,450	10,283	2,294	59.13	22.31	49,000	1,262	476
1999	4,152,433	10,584	2,483	59.8	23.46	50,000	1,204	472
2000	4,346,068	10,469	2,897	66.66	27.67	58,000	1,328	551
2001	4,903,056	9,633	3,197	65.2	33.19	60,000	1,229	625
2002	5,004,156	9,552	3,270	65.35	34.23	65,000	1,293	677
2003	5,370,035	9,576	3,714	69.16	38.78	67,000	1,250	701
2004	5,767,934	10,122	4,028	69.83	39.79	76,000	1,324	755
2005	6,227,146	10,454	4,576	73.48	43.77	87,000	1,402	835
2006	6,678,958	12,049	4,837	72.42	40.14	88,000	1,312	727
2007	7,138,476	21,396	5,174	72.48	24.18	103,000	1,443	481
2008	7,752,926	20,811	5,312	68.52	25.52	96,000	1,238	461
2009	7,929,724	20,822	4,469	56.36	21.46	90,000	1,130	430
2010	8,009,503	18,513	4,518	56.41	24.4	82,000	1,024	443
2011	8,437,502	18,542	4,630	54.87	24.97	81,000	965	439
2012	8,454,939	21,385	4,986	58.97	23.32	93,000	1,099	434

Year	Registered Motorcycles	Vehicle Miles Traveled (Millions)	Motorcyclists Killed	Fatality Rate per 100,000 Registered Motorcycles	Fatality Rate per 100 Million VMT	Motorcyclists Injured	Injury Rate per 100,000 Registered Motorcycles	Injury Rate per 100 Million VMT
2013	8,404,687	20,366	4,692	55.83	23.04	88,000	1,052	434
2014	8,417,718	19,970	4,594	54.58	23	92,000	1,088	459
2015	8,600,936	19,606	5,029	58.47	25.65	88,000	1,028	451
2016	8,679,380	20,445	5,337	62.05	26.10	-	-	-
2017	-	-	5,172	-	-	-	-	-

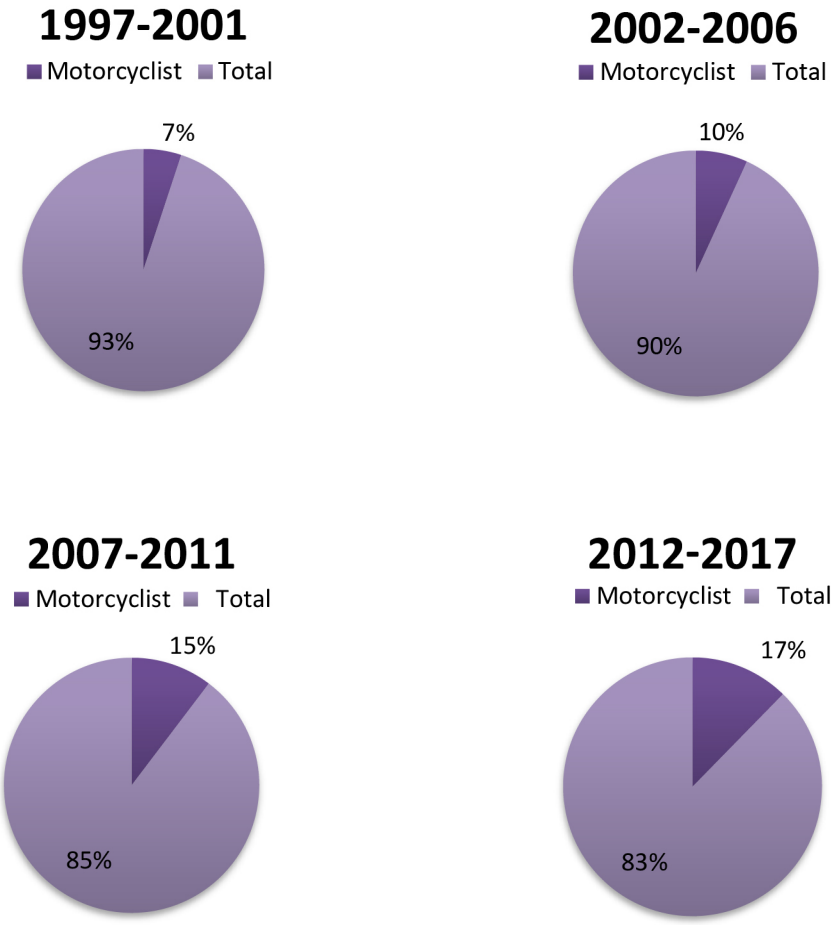
Source: NCSA, 2017

As one can see from Table 1-1, motorcycle riding and ownership has surged in recent years, and this growth has been accompanied by increases in motorcyclist fatalities and injuries. Despite historically high numbers of registered motorcycles on America's roads, the fatality rate per 100,000 registered motorcycles has stabilized and has shown modest reductions over the past 10 years. When using the best available estimates of vehicle miles traveled (VMT) as a metric for exposure,[4] the fatality rate has declined modestly since 2006, and is half of what it was in 1975. It is unclear to what this historic decline can be attributed, but a combination of factors, such as helmet use rates, increases in trained riders and the improvements in motorcycle technology like Antilock Braking Systems (ABS) and Electronic Stability Control (ESC) may have contributed.

In 2017, motorcyclists accounted for 14 percent of all traffic fatalities and 17 percent of all occupant (driver and passenger) fatalities. Of the 5,172 motorcyclists killed in traffic crashes, 94 percent (4,885) were riders and 6 percent (287) were passengers. As Figure 1-2 shows, the proportion of motorcyclist fatalities relative to all traffic-related fatalities has more than doubled over the past 20 years. As the total number of motor vehicle fatalities decreased, the number of motorcyclist fatalities steadily increased.

[4] Motorcycle VMT data are not as reliable as light-vehicle VMT data, for reasons discussed later in this document.

Figure 1-2. Motorcycle Rider Fatalities vs. Other Vehicle Occupant Fatalities by Year, 1997-2017



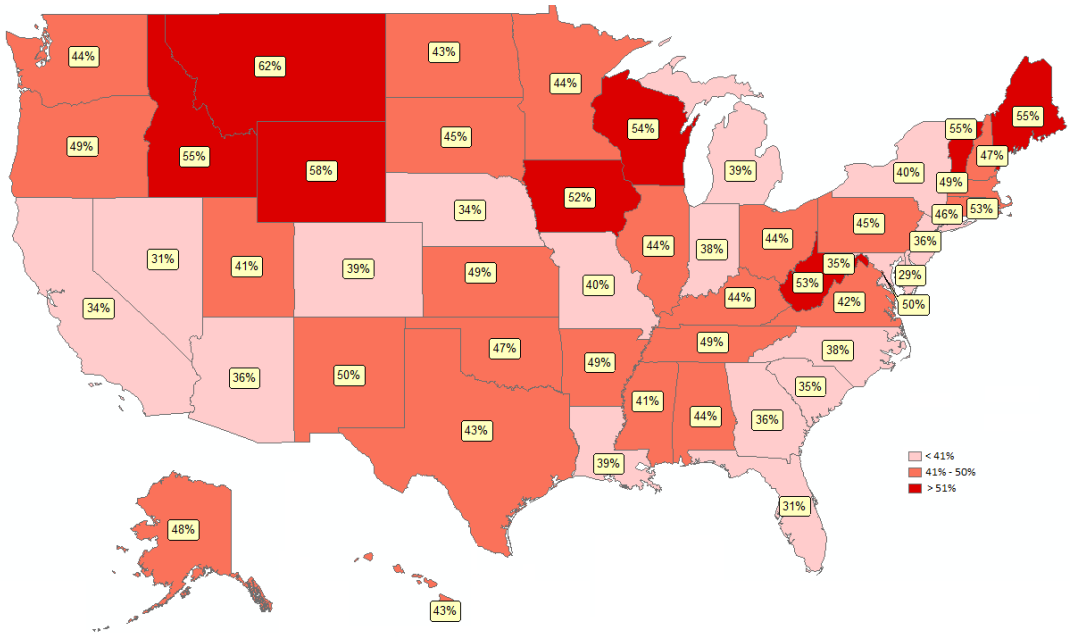
Types of Crashes

The percentage of fatal crashes involving collisions with fixed objects is higher for motorcycles than for other vehicles. In 2017, 23 percent of the motorcycles involved in fatal crashes collided with fixed objects, compared to 16 percent for passenger cars, 13 percent for light trucks, and 4 percent for large trucks. Single-vehicle motorcycle crashes could be indicative of rider error, and thus may be more preventable than other crash types. According to the Hurt Report,[5] in single-vehicle crashes, motorcycle rider error was present as the precipitating factor in about two-thirds of the crashes, with the typical error being a slide-out and fall due to over-braking or running wide on a curve due to excess speed or under-cornering. In two-thirds of the multiple-vehicle crashes, the driver of the other vehicle violated the motorcycle right-of-way and caused the crash. While Figure 1-3 shows many States

[5] Hurt, H.H. Jr., Ouellet, J.V. & Thom D.R. (1981b). *Motorcycle Accident Cause Factors and Identification of Countermeasures* (DOT HS 805 862).

with a majority of single-vehicle fatal crashes, most States show an even split between single- and multi-vehicle fatal crashes; when combined with at-fault for multi-vehicle crashes, rider error may account for roughly two-thirds of all fatal motorcycle crashes.

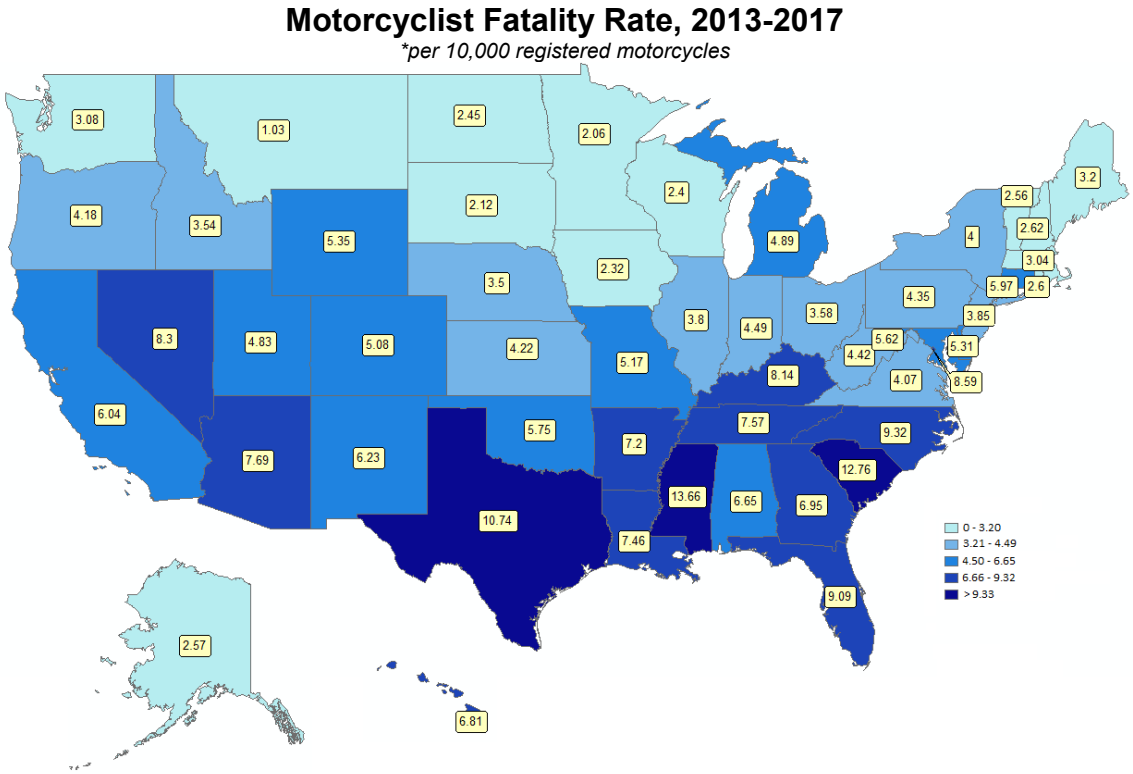
Figure 1-3. Percentage of Fatal Single-Vehicle Motorcycle Crashes, 2014-2017



Motorcyclist Risk Exposure

Compared to passenger vehicles and trucks, estimating VMT for motorcycles is a more difficult task, and an accurate number has thus far not been obtainable on a national level. Motorcycles, for the most part, are not uniformly required to submit to air quality emissions inspections or to report verified mileage on a regular basis. To compensate for this, one must look to proxy measures of motorcycle crash risk exposure, such as population and registration denominators.

Figure 1-4. Motorcyclist Fatality Rate per 10,000 Registered Motorcycles

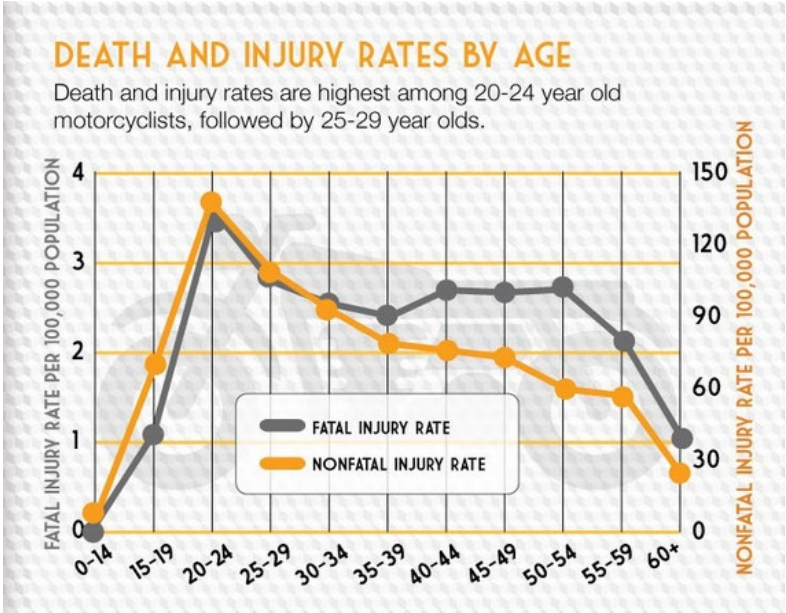


As one can see in Figure 1-4, Sun Belt States have a larger share of overall motorcyclist fatalities as a percentage of registered motorcycles. Those States south of the 37th parallel have longer riding seasons and more motorcycle owners, resulting in more on-the-road risk exposure than their cold-weather State counterparts.

The limitation of utilizing a registration-based proxy for exposure is that little can be definitively gleaned in terms of actual miles ridden. Having a motorcycle registered does not necessarily mean that the bike is ridden. Additionally, in the United States, motorcycling is often a recreational activity, and those that choose to own one motorcycle may be able to afford to own multiple motorcycles.

Demographics: Rider Age

Figure 1-5. Age Involvement in Motorcyle Crashes



Source: NCSA

Age and experience are related to crash involvement. From 2008 to 2017, motorcyclist fatalities decreased by 3 percent. The 40-and-older age group made up 51 percent of motorcyclists killed in 2008 and 53 percent of the motorcyclists killed in 2017. Over the 10-year period from 2008 to 2017, fatalities among the 40-and-older age group increased by 22 percent (from 2,698 to 2,757). In 2008, the average age of motorcycle riders killed in motor vehicle traffic crashes was 40, whereas in 2017 the average age was 42. Furthermore, 50-and-older motorcyclist fatalities increased by 22 percent from 2008 to 2017. Research suggests that the 40-and-older crash-involved segment includes those who rode motorcycles when they were younger, and returned to the sport at middle age—possibly forgoing refresher training—and subsequently acquired much more powerful and larger engine displacement motorcycles.

Table 1-3. Motorcyclist Fatalities, by Engine Size (cc), 2008 and 2017

Year	Engine Displacement (cc)										Total	
	Up to 500		501-1,000		1,001-1,500		1,501 & Higher		Unknown			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2008	261	5%	2,208	42%	1,765	33%	566	11%	512	10%	5,312	100%
2017	376	7%	1,873	36%	1,367	26%	1,155	22%	401	8%	5,172	100%

Crash Protection: Helmets

Unlike passenger cars, motorcycles lack occupant protection equipment that has been shown to reduce the risk of injury or fatality, such as seat belts and air bags. Sixty percent of motorcyclist fatalities are caused by head injury, and, according to NHTSA research,[6] the use of a helmet offers a motorcyclist the best protection from fatal and non-fatal head injuries.

[6] Lawrence, J., Kerns, T., Burch, C., Thomas, A., & Bell, E. (2009). *Motorcycle Helmet Use and Head and Facial Injuries: Crash Outcomes in CODES-Linked Data* (DOT HS 811 208).

NHTSA estimates that helmets saved the lives of 1,872 motorcyclists in 2017. If all motorcyclists had worn helmets, an additional 749 lives could have been saved. Helmets are estimated to be 37-percent effective in preventing fatal head injuries to motorcycle riders and 41 percent for motorcycle passengers. In other words, for every 100 motorcycle riders killed in crashes while not wearing helmets, 37 of them could have been saved if all 100 had worn helmets.

Figure 1-6. Helmet Use Laws (as of 2019)

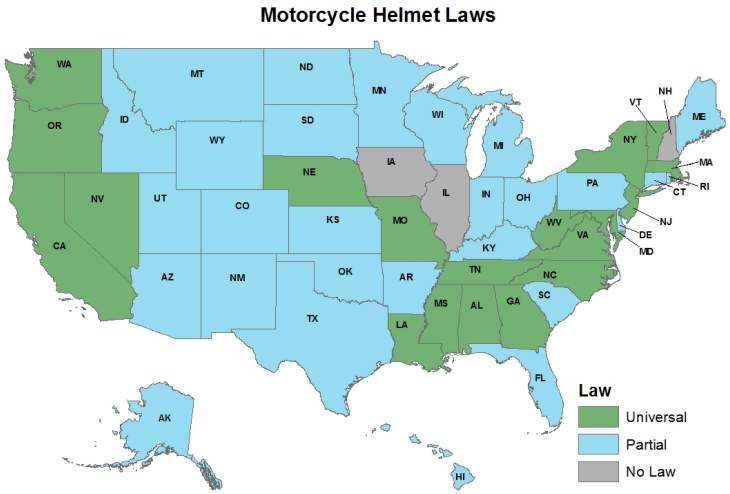
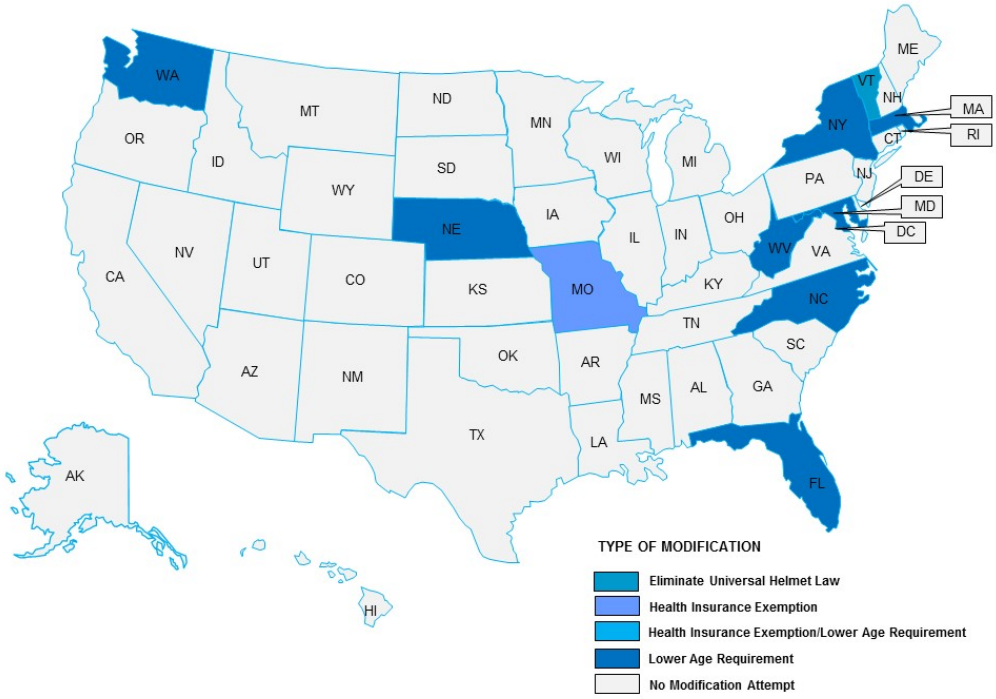


Figure 1-7. Helmet Law Modification Attempts in 2018



Unfortunately, helmet use is far from universal among those involved in crashes. Motorcycle helmet use laws covering all riders (universal helmet laws) have shown to be the most effective countermeasure for increasing helmet use. Currently, 19 States and the District of Columbia have such laws. Legislative proposals regarding motorcycle helmet use often generate strong debate between injury prevention advocates and others who oppose mandatory helmet laws for a variety of reasons.

Each year, legislation to repeal or weaken mandatory helmet use laws is introduced in a number of States. In 2018, there were at least 10 attempts to weaken existing motorcycle helmet laws. Louisiana was the last State to enact a universal helmet law (2004), and since then, numerous States have attempted to weaken or eliminate their helmet laws. Michigan was the most recent State to weaken its law (2013).

While less than half of States currently have universal helmet laws, many more States had such laws previously. In 1967, States were required to enact helmet use laws to qualify for certain Federal safety programs and highway construction funds. By the early 1970s, nearly each State had a universal motorcycle helmet law. However, in 1976 this policy was amended and by 1980 almost half the States had repealed their universal helmet laws.

In 2013, Michigan became the most recent State to relax its helmet law and make helmet use optional for riders over the age of 21. Closely mirroring the effects witnessed in other helmet-law-repeal States, Michigan experienced a drop in helmet use and an immediate 18-percent increase in motorcyclist fatalities.

Funding for State Motorcycle Safety Programs

NHTSA currently administers nearly $570 million in annual grant funding to States for highway safety behavioral programs. Under Congressional mandates, much of this funding is distributed through formula grants based on population and roadway mileage. The Section 402 State and Community Highway Safety Grant Program is one such formula grant that provides roughly $230 million annually to States to increase safe driver behavior, including motorcycle safety.

In addition to the formula apportionment, States can also apply for grants under the Section 405 National Priority Safety Program. This category of grant programs includes funding for specific purposes, such as occupant protection, traffic safety information system improvements, impaired driving, distracted driving, graduated driver licensing, non-motorized safety, and motorcycle safety. Section 405 dedicates 1.5 percent of total funds for motorcyclist safety incentive grants. A State must satisfy two out of six eligibility criteria to receive funds, and by law the use of funds is limited to advancing motorcycle rider training and motorist awareness programs.

States with motorcycle safety problems that fall outside of those parameters allowable under the Section 405 Motorcyclist Safety Incentive grant, such as impaired riding, speeding, personal protective equipment, etc., can use other resources such as Section 402 Highway Safety Grant funds.

Foundational Programming

In 1997, NHTSA partnered with the Motorcycle Safety Foundation (MSF), a national nonprofit organization promoting safe motorcycling, to provide the leadership and resources to create the *National Agenda for Motorcycle Safety (NAMS).*[7] NAMS is a strategic planning document that provides a shared national vision of motorcycle safety consisting of input from a broad, multidisciplinary spectrum of stakeholders. Developing this framework involved participation by industry, research, training experts, rider communities, law enforcement, health care, media, and insurance companies. The result was a collaborative document that examines components of motorcycle safety programs at the Federal, State, and local levels and offers strategies for broad-based support and action. It serves as a comprehensive national blueprint, which all interested parties can use to promote and enhance motorcycle safety.

In 2006, NHTSA worked with stakeholders to develop an implementation guide for the NAMS, and in 2013 NHTSA analyzed and ranked the NAMS recommendations according to potential effectiveness in addressing the motorcycle safety problem. Motorcyclist fatalities are nearing their highest in recorded history. Rider demographics are changing, and aging and returning riders are now overrepresented in fatalities, surpassing their younger cohorts. Rider attitudes toward personal safety have changed, as have the methods for conveying safety messages. However, while demographics and attitudes may have changed, NHTSA's core objectives for motorcycle safety remain as identified in 1997:

- Increasing access to rider education programs;
- Increasing the proportion of motorcyclists who are properly licensed;
- Reducing the number of motorcyclists riding while impaired;
- Increasing motorcyclists' visibility/conspicuity;
- Increasing enforcement of motorcyclist safety laws;
- Incorporating motorcyclist safety into the design of roadways;
- Increasing the survivability of motorcyclists who are involved in crashes;
- Increasing the use of personal protective equipment;
- Increasing helmet use; and
- Increasing motorists' awareness of motorcyclists' riding behaviors.

NHTSA continues to address these problems, but seeks new strategies and approaches where needed. As the following pages will outline, new sources of data and evolving technologies, as well as new challenges, will drive NHTSA's agenda for the next several years.

[7] MSF. (2000). National Agenda for Motorcycle Safety, Motorcycle Safety Foundation of America, Irvine.

Current Challenges and Opportunities

DATA

A data-driven approach to behavioral safety interventions requires current, accurate, high-quality data. Motorcycles account for only 3 percent of the U.S. registered vehicle fleet, yet motorcyclists account for over 14 percent of all traffic fatalities. With limited Federal funding to reach a small target population of motorcycle riders, the quality of data underlying safety programs will significantly impact the effectiveness of interventions. The collection and acquisition of better data, both on the Federal and local levels, as it relates to motorcyclists, will help ensure that worthy investments are made.

Challenges

Identifying Rider Risk Exposure

One key – but elusive – measurement regarding motorcycle safety is exposure to traffic risks. That is, how many miles and under what conditions do motorcyclists travel? With an understanding of motorcyclist exposure as well as crashes and associated injuries and fatalities, safety experts can adjust countermeasures to address the greatest risks. To date, only two proxy measures have been available to estimate motorcyclist exposure: aggregate motorcycle registration data and annualized average daily traffic data.

Aggregate motorcycle registration data can provide a picture of concentrations of motorcycles within a geographic area, but they are inherently unable to provide a complete picture of the extent to which motorcycles are exposed to crash risk. This data does not account for riders that may own multiple motorcycles, or for the annual mileage that each motorcycle is ridden. It therefore gives an incomplete assessment of overall exposure to traffic risk.

Annual VMT is a measure commonly used by transportation and highway safety agencies to assess system performance and crash risks for all road users. VMT estimates are derived from a variety of sources, including roadway sensor data, but do not provide an accurate gauge of motorcycle travel. Passenger car and motorcycle travel patterns differ, so measurements using roadway sensors may be biased depending on their location, and therefore not provide an accurate representation of overall motorcycle travel.

More accurate measures of motorcycle VMT are challenging. One method could be to take annual odometer readings from motorcycles – potentially during periodic vehicle inspections. However, access to such data is complicated by a lack of

consistency in State inspection requirements. New methods or technologies could provide a breakthrough in estimating annual motorcycle VMT.

Identifying Motorist Interactions With Motorcyclists

Very little research has been conducted in the United States regarding the effect of motor vehicle drivers' skills and attitudes on motorcycle safety. Consequently, little information is available regarding the crucial moments leading up to a crash or potential crash-related interactions between drivers and motorcyclists. Because of its narrow profile, a motorcycle can be easily hidden in a car's blind spots (door/roof pillars) or masked by objects or backgrounds outside a car (bushes, fences, bridges, etc.). Many right-of-way violations by motorists are characterized by the phenomenon known as 'looked but failed to see.' Identifying interventions to prevent these types of crashes represent a significant challenge. For example, more needs to be known about whether drivers look at the motorcycle, recognize the motorcycle, and appropriately appraise the motorcycle's speed, direction or intention prior to entering an intersection.

Another interaction issue involves obstructions to a passenger car driver's field of vision, such as the vehicle A-pillars (to the right and left of the windshield), rear-view mirrors or other design features. This phenomenon, known as obscuration,[8] may be exacerbated by efforts to strengthen A-pillars to better protect in rollover crashes. While obscuration is likely to remain a problem, opportunities exist for the public to become aware of and adjust to the problem.[9]

A mainstay in States' outreach messaging to non-riding motorists has been the slogan *Share the Road*. Widely used for years by stakeholders, feedback from several States suggests that the prevailing problem is neither a lack of empathy among motorists, nor a lack on the part of motorists to see motorcyclists. Instead, the problem is non-riding motorists lack of familiarity with motorcycling behaviors and characteristics. One example is that motorcyclists are allowed and trained to maneuver within a lane as a means of increasing their visibility. This maneuver could be confused by motorists as a sign of aggression or recklessness. Another example is that many motorcyclists downshift in certain situations to slow down, instead of using a brake and activating the rear brake light. To the uninitiated, this can pose a danger to both riders and motorists.

Intelligent Transportation Systems and Motorcycle Safety

Intelligent Transportation Systems (ITS) apply a range of sensing, analytical, control and communication technologies to improve transportation safety and efficiency. Substantial investments have been made in ITS technologies that affect passenger car and commercial vehicle safety, but fewer ITS technologies are available that specifically address motorcyclist safety. NHTSA worked with the Federal Highway

[8] http://wardsauto.com/news-analysis/new-pillars-enhance-safety-impede-visibility
[9] https://one.nhtsa.gov/Research/Human-Factors/Visibility

Administration's (FHWA) ITS Joint Program Office (JPO) on a synthesis of data, literature, and research pertaining to motorcycle safety and ITS to identify gaps and opportunities for additional research. The results were released in 2019. Examples of ITS technologies considered in this synthesis include:

- Adaptive Front Lighting
- Advanced Driver Assistance Systems
- Alcohol Detection and Ignition Interlock
- Animal Detection System
- Antilock Braking System
- Brake Assist
- Collision Warning and Avoidance Systems
- Curve Speed Warnings
- Daytime Running Lights
- Driver Status Monitoring
- Electronic Licenses, Smart Cards
- Electronic Stability Program
- Following Distance Warning
- Helmet-Mounted Displays
- Inter-Vehicle Communication System
- Lane Keeping and Departure Warning Systems
- Linked Braking Systems
- Pedestrian Detection System
- Rearview Displays
- Road Surface Condition Monitoring
- Roll Stability
- Speed Limiting Systems
- Vehicle Diagnostics
- Vision Enhancement
- Visibility Improving Helmet
- Air Bags
- Air Bag Jackets
- Automated Crash Notification Systems
- Crash Data Recorder
- Emergency Hazard Lights
- Impact Sensing Cut-off Systems
- Pre-Crash System
- Lane-Change Warnings
- Motorcycle Detection System
- Pop-up Hood
- Automated Enforcement
- Intelligent Speed Adaptation
- Navigation Systems

Non-Fatal Data Collection and Use

State Highway Safety Offices (HSOs) collect and analyze various types of data in their efforts to understand traffic risks and prescribe effective countermeasures. In recent years, the range of data sources available for such analyses have expanded to include informal data, geospatial analyses, multi-variate analyses, and other non-crash-related datasets, as well as conventional police-reported crash information.

States are currently required to submit to FHWA a Strategic Highway Safety Plan (HSP) that contains actionable and time-dependent countermeasures as a condition of programming certain funds, though States are given discretion as to what types of data and analysis strategies are used. As a condition for grant funding from NHTSA, States must include performance measures in their annual HSP.

Federal regulation 23 CFR 1300.11 requires States to develop annual performance plans that include at least one performance measure for each goal in the HSP. States are also encouraged to conduct comprehensive analyses of their program activities to improve their intervention investments.

Conventional crash data are very useful for identifying priorities for State traffic safety investments. However, additional sources of information can improve the safety benefits achieved by these investments by segregating audiences, identifying specific behavioral objectives and adjusting outreach messages. Examples of these additional information sources include attitude surveys and measures of motivations, intentions, social norms, and perceived vulnerabilities. Though not required for grant purposes, NHTSA encourages states to utilize these and other data sources to optimize their return on safety program investment.

Few States are now conducting motorcycle safety-specific surveys, such as observational surveys of helmet use or personal protective equipment (PPE) use (protective jackets, pants, boots and gloves) as well as the attitude and perception surveys described above. Training on survey design, survey data collection, sampling, and survey instrument selection could be useful for motorcycle program officials and may encourage further use of these tools.

Additionally, State and/or community assessments are a vital component of any problem identification process. These assessments provide a framework for reviewing the resources that can be utilized in a motorcycle safety program, including relationships with various professions from law enforcement to university researchers, information sources that can be used for problem identification, and the availability of funding. A structured assessment is very useful for identifying gaps and creating new partnerships.

Strategies

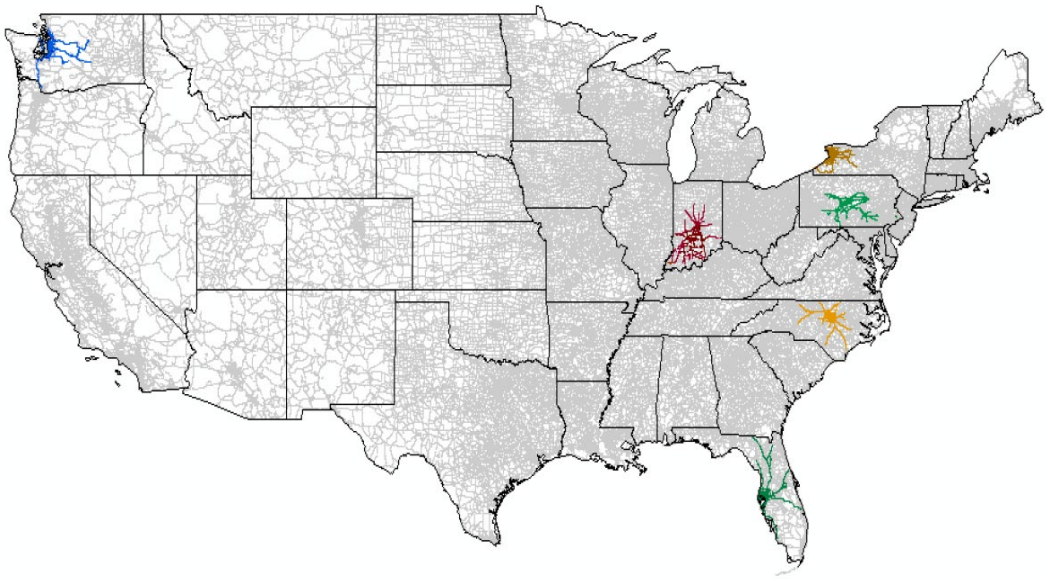
Feedback from State HSOs indicates a desire for specialized training opportunities that are short in duration and applied in nature. As is the case for other traffic safety programs, motorcycle program managers have a need for better linking and analyses of available data sources, but oftentimes lack the training and resources to do so. NHTSA can support this need by providing training on data analysis, the use of informal data sources, and promoting use of new data sources as they become available.

Roadway Information Database

FHWA provides data that can be used to identify behavioral intervention opportunities. One such database is the Strategic Highway Research Project

(SHRP2) Roadway Information Database (RID) (Figure 1-8).[10] For six sample areas across the Nation (see graphic), this database includes the most comprehensive collection of inventoried roadway elements available in the United States. These elements include, but are not limited to: horizontal curvature, grade, cross-slope, lanes (number, width, type), Manual on Uniform Traffic Control Devices (MUTCD) signage, guardrails, median presence, and lighting presence. Since roadway conditions can substantially affect motorcycle safety, these data could support a comprehensive safety assessment of driver behavior and crash risk, especially the risk of lane departure and intersection collisions. NHTSA and FHWA are exploring opportunities for conducting such analyses.

Figure 1-8. FHWA Roadway Information Database (RID) Locations



Miles collected in the mobile data collection project

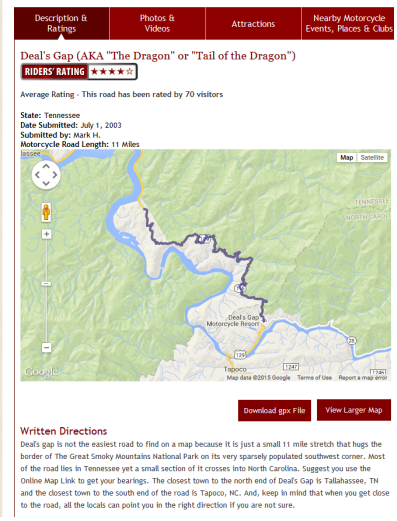
NDS site	Miles collected
Florida	4,366 miles
Indiana	4,635 miles
New York	3,570 miles
North Carolina	4,558 miles
Pennsylvania	3,670 miles
Washington	4,277 miles

[10] www.ctre.iaState.edu/shrp2-rid/

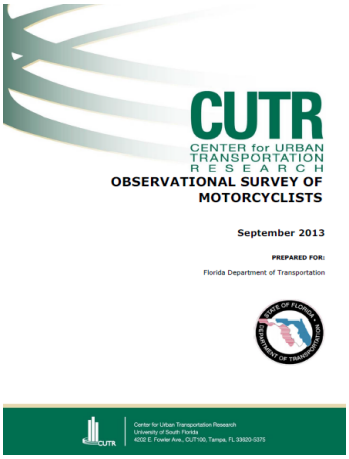
Informal Databases

NHTSA encourages States to look for opportunities to utilize informal databases to inform policy and programmatic investment decisions. One example is NHTSA's use of user-derived content to help understand where motorcyclists are choosing to ride. NHTSA recently procured the user-derived database that supports the website www.MotorcycleRoads.com and will conduct analysis based on user reviews of particular motorcycling routes. Analyses will examine roadway conditions, motorcycle hazards, volume of reviews, and crashes on identified routes. While not a representative sample of motorcycle travel, this effort will provide States with an additional tool for conducting geospatial analyses of potential high crash-risk locations for motorcycles.

MotorcycleRoads.com Example



Florida routinely conducts standalone observational surveys of motorcyclists



Observational Surveys

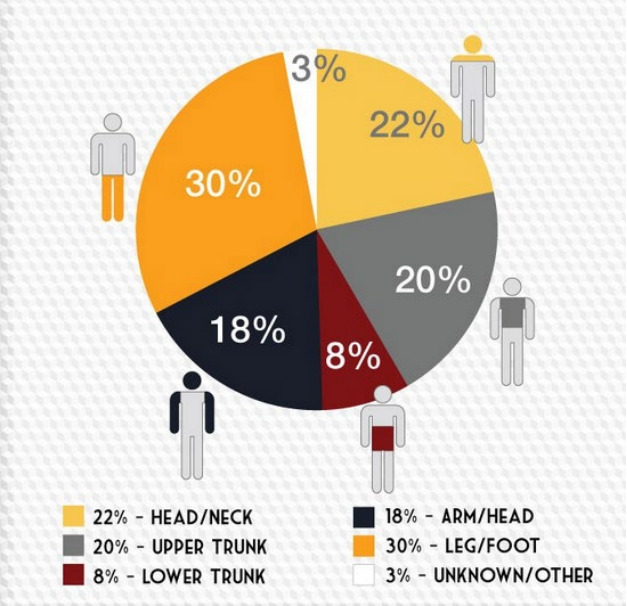
One important improvement to any State motorcycle safety program is the acquisition of better observational data. Many States conduct observational surveys of motorcyclists, either in conjunction with annual seat belt use surveys, or as standalone surveys. Some States that have conducted separate standalone motorcycle observational surveys collect information about PPE, solo or group riders, helmet type, novelty or DOT-compliant helmets, and bike type. At least one State[11] has developed seasonal comparisons of observed PPE use to better coordinate PPE-related countermeasures.

[11] www.cutr.usf.edu/wp-content/uploads/2014/04/5-FL-Observational-Survey-of-Motorcyclist-Behaviors-2013-Final-Report.pdf

Conspicuity and Personal Protective Equipment

Motorcyclists usually separate from the motorcycle at some point during a crash. During a crash, no existing strategy or safety equipment offers the level of injury protection comparable to a Federal Motor Vehicle Safety Standard (FMVSS) 218-compliant helmet. However, not all motorcycle injuries occur to the head. A wide range of PPE is available to provide protection from abrasion and limited impact protection in the event of a crash. Likewise, high-visibility or 'high-viz' features can provide increased levels of conspicuity to other motorists, and a greater likelihood of preventing a crash.

Figure 1-9. Nonfatal Motorcyclist Injuries by Primary Body Part



Despite the benefits of PPE, few riders wear a complete ensemble of abrasion and impact resistant gear, which would include a helmet, jacket, pants, gloves, and boots. Understanding a rider's motivations for wearing gear is a significant step towards developing interventions that encourage PPE use. NHTSA will explore projects that help ascertain those nuanced consumer preferences.

The consumer market for PPE is changing rapidly. The increase of products offered with Kevlar® is providing a new consumer choice that provides crash protection while not looking like conventional leather or brightly colored motorcycle gear. NHTSA is interested in understanding the public's knowledge and acceptance of abrasion-resistant PPE, and barriers to increased use by resistant riding sub-populations.

Finally, as indicated in the original NAMS report, there is a need to better disseminate fundamental motorcycle safety information to riders. NHTSA will continue to convey the benefits of PPE to the riding public, and is currently developing awareness materials and digital media to help convey consumer options for choosing riding gear.

Motorcycle Safety Program Training

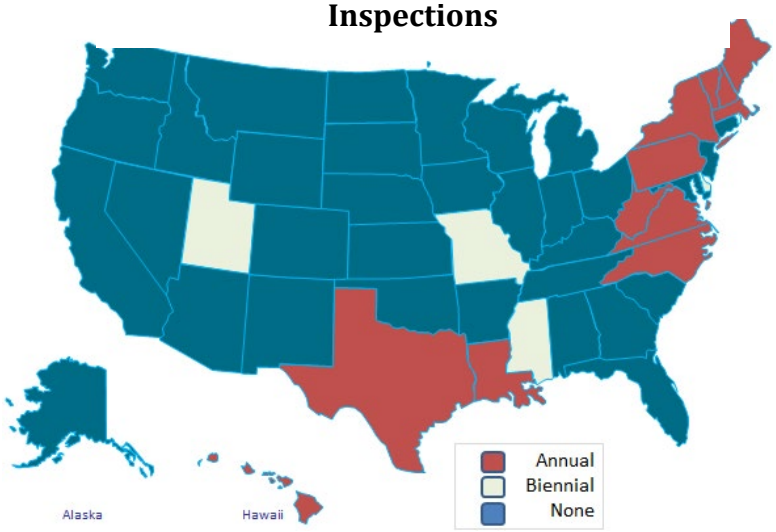
As with other highway safety program areas, effective management of motorcycle programs requires specialized knowledge and understanding. The availability of new data sources and analytical tools and the turnover of program staff creates a continuing demand for training. NHTSA is nearing completion of a revised

Motorcycle Safety Program Management course to be offered to State HSO staff and other motorcycle safety stakeholders. HSO staff will be asked to encourage participation from State motorcycle rider organizations (SMROs), motorcycle dealers, highway engineers, non-profit organizations, HSO grantees, and other stakeholders. The course is specifically designed to engage non-traditional stakeholders and examines new methods of data acquisition and analysis regarding motorcycle safety.

Exposure Data Research

NHTSA will continue to monitor the results of the FHWA Motorcycle Annualized Average Daily Traffic (AADT) Study. While the primary intent of this study is to support the modeling functions of traffic safety engineering, there are likely to be insights from these analyses that will be useful for supporting behavioral interventions through data-driven education and enforcement. NHTSA, in coordination with FHWA, will continue to evaluate future low-cost data-collection techniques to support those efforts.

Figure 1-10. Annual Motorcycle Safety Inspections



One such technique could involve the use of State vehicle safety inspection data. Currently there are 12 States that mandate annual motorcycle safety inspection as a condition for registering motorcycles. This requires owners to ride to a State-certified inspection station for an examination of the motorcycle, including odometer readings. Currently only two States (North Carolina and Virginia) collect and compile the results of these inspections digitally, the other 10 collect the information in a paper format. While these data have not previously been used for this purpose, NHTSA is conducting research on feasibility of using odometer readings as a measure of motorcycle VMT.

Rider Behavior and Crash Avoidance

NHTSA is nearing completion of an Instrumented On-Road Study of Motorcycle Riders. Past naturalistic driving studies have provided a wealth of information on typical driving behaviors and on behaviors that contribute to crash risk. In 2009,

Virginia Tech Transportation Institute conducted a pilot study[12] for NHTSA which demonstrated the feasibility of collecting naturalistic data from motorcycle riders. The purpose of the current project is to collect naturalistic data from 160 motorcyclists whenever they have ridden over the course of 1 year. Riders will volunteer to have their motorcycles equipped with cameras, radar, accelerometers and other sensors that will continually record data during their daily riding. Data from this study are expected to provide valuable insights regarding riding habits, risk behaviors, pre-crash riding behaviors, crash avoidance behaviors and other factors associated with crash risk.

Crash Causation Study

Perhaps one of the more significant projects recently completed that will provide better data is the Motorcycle Crash Causation Study (MCCS). This $3.5 million project managed by FHWA, with additional financial support from NHTSA, State DOTs, and the American Motorcyclist Association, was a comprehensive look at the causes of motorcycle crashes. The project consists of 350 crash investigations, with a corresponding 700 non-crash rider interviews as the experimental control. The objective of the MCCS is to provide insight into the causes of motorcycle crashes. A comprehensive database of approximately 1,600 data elements was created from the crash investigations and non-crash rider interviews. A research effort of this scale has not been conducted in the United States in 30 years, since the release of the Hurt Study.[13]

Data collection began in June 2011 and concluded in early 2016. The OECD protocol[14] utilized in the study stipulates that data collection consist of a census of all injury-causing motorcycle crashes within a single region. For this study, data collection took place in Orange County, California – the same place as the NHTSA pilot and the Hurt Study. This region was chosen for two primary reasons. First, California has a year-round riding season that allows for significant data collection all year. Secondly, the geography and riding population are quite diverse, offering a unique opportunity to investigate many crash types. This includes urban and rural landscapes as well as leisure riders and daily commuters.

The MCCS is unique in that while FHWA collected enormous amounts of data, the primary intent is to provide data that can be widely used by government and non-government research scientists to answer a range of research questions. The final report, to be available in 2019, will consist of basic crash and control data distributions and a high-level comparative analysis with other motorcycle crash

[12] McLaughlin S, Doerzaph Z, Cannon B, *Pilot Study of Instrumentation to Collect Behavioral Data to Identify On-Road Rider Behaviors* (2011) DOT HS 811 442 www.nhtsa.gov/staticfiles/nti/pdf/811442.pdf

[13] Hurt HH, Ouellet JV, Thom DR. *Motorcycle accident cause factors and identification of countermeasures*. Vol 1: Technical report. Los Angeles: Traffic Safety Center, University of California, 1981

[14] www.oecd.org/statistics/data-collection/

data (Hurt Study and NASS/GES). With 1,600 data elements for each crash, the data are robust and offer significant research opportunities.

STATE SUPPORT

Challenges

Educational Material Development

Nationally, nearly 49 percent of motorcycle crashes involve another motor vehicle, which suggests a need for specific messaging to the general motorist population. In 2005, the Federal transportation authorization bill, SAFETEA-LU, established incentive grants to encourage States to develop motorist awareness programs that address motorcycle safety. Most States use a generic *Share the Road* or *Look Twice for Motorcycles* message when developing this material. While NHTSA has periodically developed creative material, most States use their own State-specific material. With limited funding available under the NHTSA Motorcyclist Safety Grant Program (Section 405(f)) for use on motorist awareness campaigns, the additional costs of developing creative material may leave States with a limited budget for placement and distribution of that material. NHTSA is not aware of any instances in which States combined their financial resources to reduce creative development costs for motorcycle safety.

Funding Parameters

Most States are eligible to apply for and receive NHTSA Section 405(f) grant funding, which allows for the development and dissemination of media and material relating to motorist awareness of motorcycles. Under MAP-21, approximately $4 million was available to States under the NHTSA Section 405(f) grant fund. That funding has remained relatively constant under the FAST Act.

By law, Section 405(f) funding is allowed for uses related to either motorcycle rider training or motorist awareness efforts. States looking to address issues related to impaired riding, speeding, personal protective equipment, or other motorcycle safety purposes, are able to utilize other sources of funding that have traditionally been allocated to impaired driving and occupant protection efforts (i.e., Sections 402, and 405(d)). Access to these funds for motorcycle safety has often been limited due to needs for resources for other traffic safety programs.

Updating Program Guidelines

A condition of Section 402 of Title 23 of the United States Code requires USDOT and NHTSA to develop uniform guidelines for State highway safety programs. With the intent of offering guidance to States in formulating their highway safety plans for

efforts that are supported with Section 402 and other grant funds, the guidelines provide a framework for developing a balanced and comprehensive highway safety program. The guidelines also serve as a tool that States can use to assess the comprehensive nature of their programs. Of the 21 guidelines that NHTSA has developed, Guideline Number 3 is dedicated to Motorcycle Safety. Last updated in 2006, Guideline Number 3 addresses the following 11 components of a State comprehensive motorcycle safety program:

- Program Management
- Motorcycle Personal Protective Equipment (PPE)
- Motorcycle Operator Licensing
- Motorcycle Rider Education and Training
- Motorcycle Operation Under the Influence of Alcohol or Other Drugs
- Legislation and Regulations
- Law Enforcement
- Highway Engineering
- Motorcycle Rider Conspicuity and Motorist Awareness Programs
- Communication Program
- Program Evaluation and Data

NHTSA offers States assistance in conducting a Motorcycle Safety Program Technical Assessment as a tool to help identify gaps and opportunities within their own motorcycle safety programs. To date, over half the States have requested and participated in such an assessment, with five States requesting more than one over the past 20 years. NHTSA plans to update Guideline Number 3 in coming years to reflect changes in motorcycle safety issues and methods.

Messaging

Few States have gone beyond *Share the Road* or *Look Twice for Motorcycles* when developing messaging for use in the media. Feedback from several States suggests that *Share the Road* messages may not adequately address the problems contributing to multi-vehicle motorcycle crashes. Research suggests that more specific data-driven behavior messaging is needed. Such messages may require the use of other funds from sources other than the Section 405(f) Motorcyclist Safety Grant Program since under this program funds may only be used for rider education and motorist awareness purposes.

Strategies

Centralized Product Development

The current inventory of creative material and educational messaging for motorcycle safety offers States and other highway safety stakeholders few options when targeting motorist and motorcyclist safety behaviors. NHTSA has initiated a multi-year effort to augment this material. As States begin to include attitudinal and

awareness survey data to assess the nature of their motorcycle crash problem, they will likely need a wider range of material to address identified needs. NHTSA plans to develop new motorcycle safety marketing and educational material to address a more segmented motorcycling audience. With a larger selection of material available from NHTSA, States could focus their limited budgets on placement of those products. NHTSA's emphasis will be on the development of digital and other low-cost media material.

Feedback from States indicate that many devote the majority of their motorcycle safety funds to efforts during the month of May to support Motorcycle Safety Awareness Month. State crash data suggest that other strategies may be more productive. NHTSA encourages States to conduct crash analyses, and to further segment their investments both in terms of timing and type of message being delivered. NHTSA plans to support such efforts with new guidance on interpreting crash data, and information to assist in message segmentation.

Financing Strategies

NHTSA will continue to encourage States to seek funding from all available sources to increase motorcycle safety. In addition to the Section 405(f) Motorcyclist Safety Grant Program, other NHTSA grant funds can be utilized to address motorcycle rider issues, including Section 402, Section 405(d) and Section 164 transfer funds. NHTSA continues to encourage States to use these funds as appropriate to supplement their Section 405(f) efforts and to support a comprehensive data-driven approach to motorcycle safety.

In addition to these eligible NHTSA grant sources for behavioral countermeasures, States may use FHWA Highway Safety Improvement Program (HSIP) funds for data analysis and engineering needs related to motorcycle safety. Under the FAST Act, the HSIP program provides approximately $2.4 billion annually.

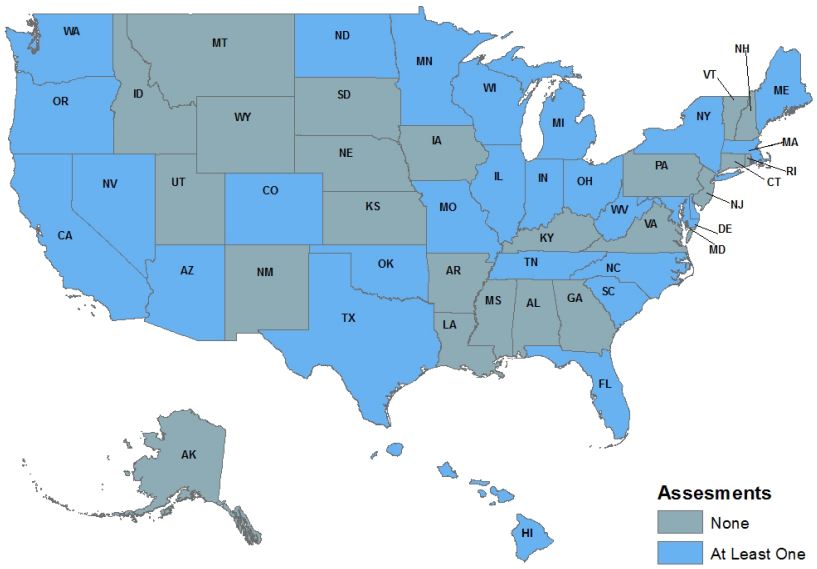
Data-Driven Messaging

Non-riding motorists may not be knowledgeable about certain legitimate rider behaviors (e.g., intra-lane maneuvering, downshifting to brake). As NHTSA examines ways to move beyond *Share the Road* messaging and product development, the agency will focus on a broader range of topics, including:

- Increasing awareness of motorists about normal motorcyclist behaviors (i.e., intra-lane maneuvering to maintain conspicuity);
- Alerting drivers to obscured vision caused by vehicle A-pillars and the need to look twice;
- Educating motorcyclists on how to avoid motion camouflage and "looked but failed to see" errors;

- Increasing awareness of motorists about the need for additional following distance when behind a motorcycle (i.e., motorcycles sometimes downshift rather than applying brakes to slow down and may not always activate a brake signal);
- Increasing general awareness of the hazards of debris in the road for motorcyclists. For example, grass clippings left in the roadway can cause a motorcycle to lose traction since they are comprised of 70 percent water and can be slippery; and
- Educating motorcyclists about how breathable PPE can provide abrasion resistance and assist in maintaining body temperatures and comfort, even in hot weather.

Figure 1-11. Motorcycle Program Assessments by State



Increasing Communication With and Among Program Planners

A recent survey[15] among highway safety offices conducted by the Governors Highway Safety Association (GHSA) indicated that over half of the States' motorcycle safety program coordinators divide their time between motorcycle safety and other programs, such as bicycle and pedestrian safety. Furthermore, feedback indicates that many of those coordinators have fewer than 5 years of experience in motorcycle safety. With constrained training and travel budgets, and few off-the-shelf training opportunities, chances to exchange best practices could benefit motorcycle safety programming. Feedback from the States and motorcycle safety stakeholders indicates a web-based format would be suitable for short webinars on a variety of issues, including:

- Digital media strategies to reach niche target populations;
- Observation survey methodologies;
- Cost comparisons for program initiatives for various States;
- Accessing other grant funds for motorcycle safety (i.e., 405(d)); and
- Data acquisition and data analysis strategies.

[15] Governors Highway Safety Association. Motorcycle Safety: A Survey of State Programs. (2008)

NHTSA will continue to explore opportunities to deliver short and concise programming modules in various formats, including webinars, web content, and e-mail newsletters.

State Assessments

To date, 35 State Motorcycle Safety Program Technical Assessments have been conducted in nearly half of the States (as shown in in Figure 1-11). While there is no requirement for States to request an assessment, feedback from State Highway Safety Offices and Motorcycle Safety Coordinators report that the process is very useful for identifying gaps and allocating motorcycle safety resources. Five States have requested multiple assessments over the past 20 years. However, 22 States have not yet participated in a Motorcycle Safety Technical Assessment and NHTSA will continue to encourage these States to take advantage of this service. NHTSA will also explore options for making the assessment process less costly and more convenient for State participation.

Florida Helmet Demonstration Project

In September 2013, NHTSA awarded the Florida Department of Transportation (FDOT) a 5-year grant utilizing Section 403(b) Federal grant funds to support an initiative to increase motorcycle helmet use within the State. Florida does not have a universal helmet law, but has a relatively high helmet use rate compared to other non-law States. The project is titled "Demonstration to Promote Motorcycle Helmet Use" and its objectives are to:

- Increase observed motorcycle helmet use among motorcyclists in the State;
- Increase the estimated number of lives saved (deaths prevented) as a result of motorcyclists wearing FMVSS No. 218-compliant motorcycle helmets;
- Decrease estimated economic costs incurred by the State as a result of motorcyclists wearing FMVSS No. 218-compliant motorcycle helmets;
- Increase communication and outreach with individual motorcyclists and motorcycle groups/clubs about the benefits of wearing FMVSS No. 218-compliant motorcycle helmets through the implementation of a Statewide strategic communication plan; and
- Increase motorcyclists' perception of their risk of sustaining traumatic brain injury or fatal injury in the event of a motorcycle crash when not wearing a FMVSS No. 218-complaint motorcycle helmet.

Without a universal helmet law, which would require all motorcyclists to wear a helmet or face a fine, Florida is seeking innovative ways to encourage voluntary use of helmets. As outlined in their grant proposal, FDOT plans to conduct direct outreach to motorcyclists at several motorcycle rallies and events.

At the conclusion of this project, NHTSA hopes to have a better picture of the challenges and opportunities (such as non-legislative strategies to increase helmet use) facing States that lack a universal helmet law.

Helmet Repeal Fiscal Analysis Methodology

Of the 19 States that have universal helmet laws requiring all riders to wear a helmet, legislation was introduced in 10 States in 2018 to repeal or substantively amend their universal helmet law, none of which were signed into law. For many States, helmet repeal legislation is a perennial issue. In most State legislatures, all bills require some form of fiscal analysis, but how this analysis is conducted varies widely. NHTSA worked with the National Conference of State Legislatures (NCSL) to highlight the methodologies used by a sample of States to prepare legislative fiscal notes regarding motorcycle helmet legislation.

The goal of the project was to provide a web-based resource to help State legislative fiscal analysts accurately quantify the economic impacts of motorcycle helmet legislation using the most current information on the economic impact of motorcycle crashes. This information can be found at www.ncsl.org/research/transportation/assessment-of-fiscal-notes-connected-to-motorcycle-helmet-legislation.aspx

Exploring Methodology for Identifying Under-Insured Health Care Burden for Each State

The cost of motorcycle crashes extends beyond injuries, fatalities, and lost work productivity to include the costs of emergency response, emergency room costs, and insurance premiums. In terms of medical care costs and productivity losses, the economic burden from motorcycle crash-related injuries and deaths in one year alone is estimated to exceed $12 billion.[16]

NHTSA has tracked the economic impact of motor vehicle crashes for several years, and has conducted analyses such as the aggregate cost savings derived from helmet use. As a means to estimate the total societal cost from motor vehicle crashes, NHTSA conducts quality-of-life valuations. In 2010 the societal harm resulting from all motor vehicle crashes was estimated to be $836 billion. In 2010, motorcycle crashes cost $12.8 billion in direct economic impacts, and $66 billion in societal harm as measured by comprehensive costs.[17]

[16] Naumann, R. B., Dellinger, A.M., Zaloshnja, E., Lawrence, B. A. & Miller, T. R. (2010). Incidence and Total Lifetime Costs of Motor Vehicle Fatal and Nonfatal Injury by Road User Type, United States, 2005. *Traffic Injury Prevention,*
11:4, 353-360, DOI: 10.1080/15389588.2010.486429.
[17] Blincoe, L. J., Miller, T. R., Zaloshnja, E., & Lawrence, B. A. (2015, May). *The economic and societal impact of motor vehicle crashes, 2010 (Revised)* (Report No. DOT HS 812 013). Washington, DC: National Highway Traffic Safety Administration.

As States focus on containing State health care costs, more emphasis may be placed on policy solutions to reduce health care burdens. NHTSA will refine methodologies for measuring the burden of motorcycle crashes and explore the potential of individual State estimates.

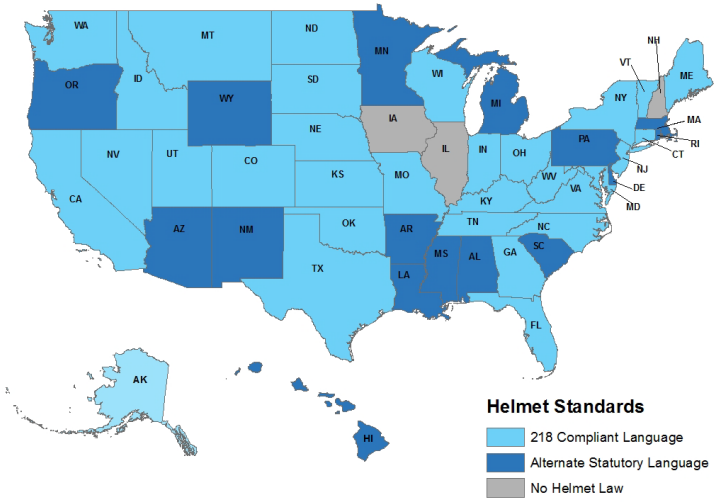
LAW ENFORCEMENT

Challenges

Legislative Barriers to Enforcement of Motorcycle Safety Laws

Motorcycle safety laws vary widely among States. Currently 19 States and the District of Columbia require all motorcycle operators and passengers to wear helmets when riding. Twelve of those States and DC specify that helmets meet FMVSS No. 218, but seven States do not. Meanwhile, 28 other States have partial or age specific helmet use laws, with 16 specifying FMVSS 218. Three States have no helmet use law, as shown in Figure 1-12.

Figure 1-12. Motorcycle Helmet Standards



From a law enforcement perspective, the nuances of helmet use laws can make identifying violations difficult. In States with only partial laws as shown in Figure 1-13, particularly those that mandate helmet use for those under a certain age, those that have only a learner's permit, or those that carry only minimum insurance policies, the ability to detect a violator is so challenging that few citations are written.

Figure 1-13. State Motorcycle Helmet Laws

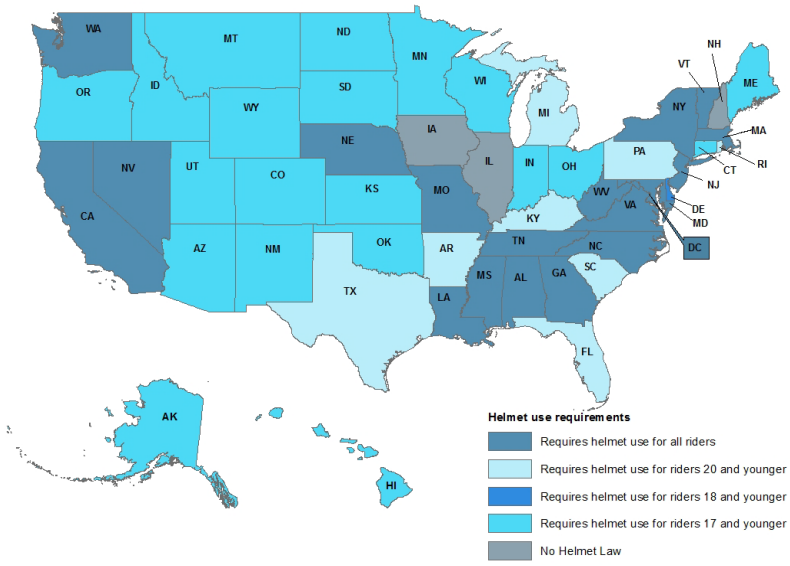
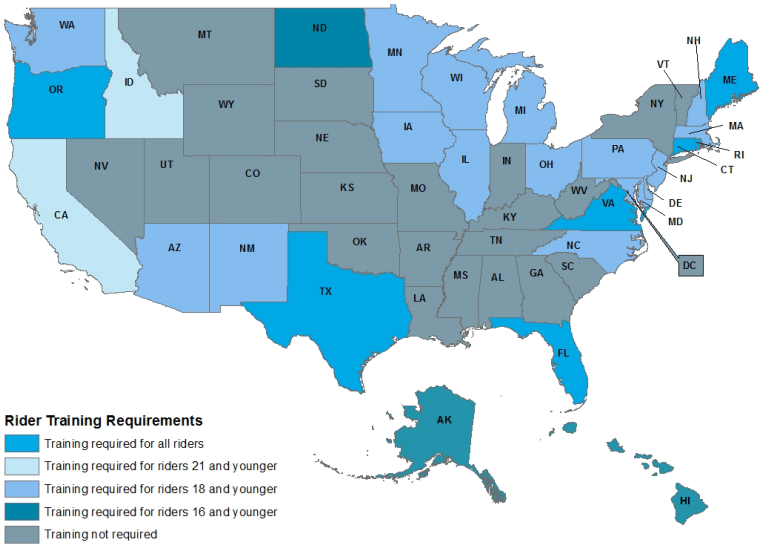


Figure 1-14. Motorcycle Rider Training for New Licenses



Eternal Permit

In many States, a person may acquire a learning permit, and when the permit expires, it can be renewed indefinitely. This option may be a disincentive to acquire a formal motorcycle endorsement. As Figure 1-14 shows, rider training requirements vary from State to State.

Novelty Helmets

The use of novelty helmets increases motorcyclist crash risk relative to the use of helmets that are compliant with FMVSS No. 218. The National Occupant Protection Use Survey (NOPUS) shows that in States where use is required for all motorcyclists, between 8 to 27 percent of motorcyclists have been observed wearing helmets that likely do not comply with FMVSS No. 218.

These helmets, frequently marketed as "novelty" helmets, are seldom certified by the manufacturer as meeting FMVSS No. 218, but are sold to, and used by, on-road motorcycle riders and passengers. Data from a study of motorcycle operators injured in crashes and transported to a shock trauma center indicates that 56 percent of those wearing novelty helmets received head injuries as compared to 19 percent of those wearing DOT-compliant helmets.[18]

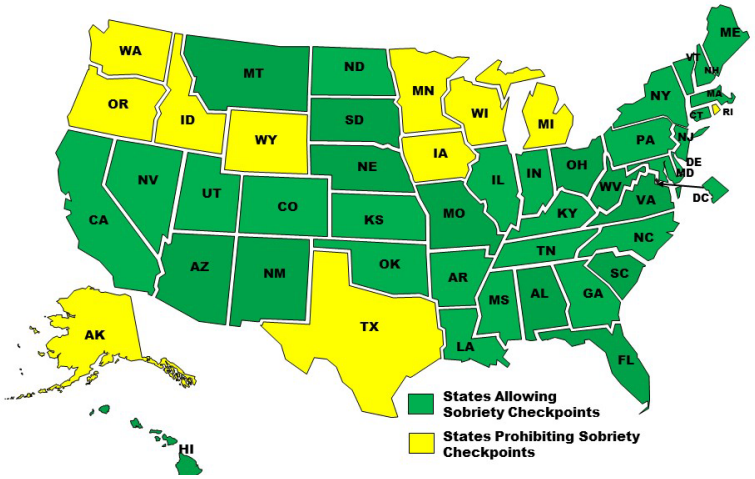
In States where universal helmet use laws often require riders and passengers to wear helmets meeting FMVSS No. 218, helmet users wearing novelty helmets often affix non-OEM labels that mimic the certification labels applied by manufacturers of helmets that are certified as meeting the Standard. Consequently, officials attempting to enforce compulsory helmet use laws that require riders to use helmets meeting FMVSS No. 218 currently find it difficult to enforce them due to the labeling loopholes that are being exploited.

Motorcycle-Only Checkpoints

Under the FAST Act, States are prohibited from using Federal funds for Motorcycle Only Checkpoints (MOCs). Eleven States – Alaska, Idaho, Iowa, Michigan, Minnesota, Oregon, Rhode Island, Texas, Washington, Wisconsin and Wyoming – prohibit checkpoints of any kind by statute and/or judicial action, shown in Figure 1-15.

[18] Lawrence, J., Kerns, T., Burch, C., Thomas, A., & Bell, E. (2009). *Motorcycle Helmet Use and Head and Facial Injuries: Crash Outcomes in CODES-Linked Data* (DOT HS 811 208).

Figure 1-15. States That Allow Sobriety Checkpoints



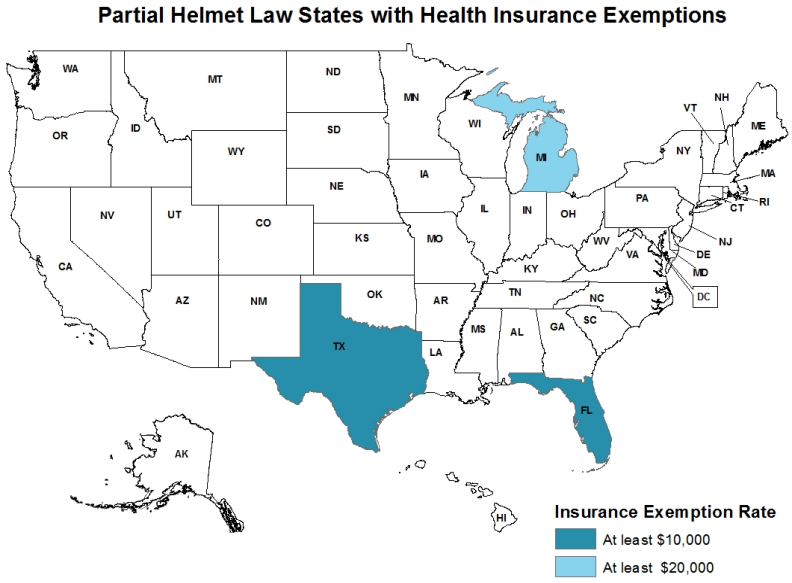
Motorcycle Classifications

The recent increase in new models of three-wheeled motorized vehicles on the market creates additional challenges for law enforcement. Even in those States that have addressed the need to differentiate these vehicles from two-wheeled motorcycles, sometimes with the creation of a new class of vehicle (autocycle), law enforcement must learn the characteristics of each class of vehicle and the requirements for their respective passengers (helmet use, license endorsement requirements, etc.).

Age Requirements

Twenty-seven States have exemptions to their helmet laws based on the rider's age. The ability of an officer to develop probable cause is hindered by the difficulty of determining age of a rider on a moving motorcycle.

Figure 1-16. Helmets and Health Insurance Exemptions



Engine Displacement Laws

Some States only allow the endorsed rider to operate a motorcycle with an engine size similar to that of the motorcycle on which they tested and received their endorsement. Much like States with age-specific requirements, these States with an engine displacement requirement place the burden on the law enforcement officer to know each make, model and engine size.

Insurance Requirements

Florida and Texas have exemptions to their helmet laws that make wearing one optional if the rider is covered by health insurance providing $10,000 in benefits; Michigan requires $20,000, as shown in Figure 1-16. Determining whether such coverage is in place makes it difficult for a law enforcement officer to cite a potential violator.

Challenges to Effective Enforcement of State Motorcycle Helmet Laws

Novelty helmets present challenges to State and local government authorities seeking to enforce helmet use laws. These laws often require that riders use helmets that meet the requirements of FMVSS No. 218. However, because novelty helmets are similar in appearance to FMVSS No. 218-compliant helmets, enforcement officers can find it difficult to identify the difference, especially when the rider is in moving traffic. Moreover, while noncompliance can often be determined with a close visual examination, sometimes verifying compliance requires testing or investigation that is impractical for law enforcement.

Strategies

Training, Training, and More Training

NHTSA is nearing the completion of a motorcycle safety enforcement training course that will be offered as a continuing education component to law enforcement officers through the International Association of Directors of Law Enforcement Standards and Training (IADLEST). This course will supplement existing coursework available to traffic enforcement officers by providing cues for identifying motorcyclist impairment, presenting operational strategies for making safe and efficient traffic stops, and reviewing steps needed for successful adjudication of citations.

NHTSA is also considering educational opportunities for judges and prosecutors to explain the role of Federal Motor Vehicle Safety Standards that apply to motorcycles and provide guidance on addressing safety issues regarding vehicle equipment.

Effective Strategies for Motorcycle Stops

NHTSA offers a document that describes best practices for safely and effectively conducting traffic stops of motorcyclists, effective officer safety strategies and techniques, as well as strategies and techniques for reducing high-speed pursuits involving motorcycles.[19]

Strategies for the Enforcement of Impaired Riding Laws

High-Visibility Enforcement (HVE) is an evidence-based strategy that has been very effective in reducing impaired driving and increasing seat belt use. HVE works as a general deterrent by demonstrating community intolerance for serious safety risks and increasing drivers' perceived likelihood of being apprehended if they disobey the law.

Applying the HVE model to motorcycle safety enforcement may offer significant benefits, but must be done sensitively and equitably to avoid appearances of unfair treatment of motorcyclists. NHTSA is conducting a demonstration program to explore the feasibility of using HVE to enforce impaired riding laws. The project will explore techniques for implementing HVE campaigns without the use of motorcycle-only checkpoints and without creating the impression that motorcyclists are being unfairly targeted for enforcement.

Tools for Identifying Novelty Helmets

NHTSA is exploring strategies to reduce the importation and distribution of novelty helmets, as well as their use in States that require a DOT-compliant helmet. NHTSA

[19] NHTSA, *Effective Strategies for Motorcycle Stops* (2014) DOT HS 812 060 nhtsa.gov/sites/nhtsa.dot.gov/files/812060-effectivestrategiesmotorcyclestops.pdf

continues to seek strategies to increase awareness of the safety benefits of DOT-compliant helmets and to discourage use of novelty helmets. NHTSA will continue to work with stakeholders to develop products that educate consumers on the dangers of novelty helmets.

FEDERAL PROGRAMS

Challenges

Three-Wheeled Vehicles

In recent years, NHTSA noted that two or more models of three-wheeled vehicles were available in the U.S. market. While these vehicles were sold as motorcycles and were certified to meet motorcycle safety standards, they more closely resembled small passenger cars than conventional motorcycles. Although these vehicles were imported and sold in small numbers, the agency is concerned that this vehicle configuration may lead to safety risks. If users treat these vehicles as passenger cars and forego the precautions that are generally associated with motorcycle use, such as the use of helmets and protective gear and special training, then users will have neither the protection associated with conventional motorcycles nor the safety standards associated with passenger cars.

Novelty Helmets

In 2011, NHTSA took steps to make it easier for riders and law enforcement officials to identify non-compliant helmets by amending FMVSS No. 218 to require that certification labels on helmets manufactured after May 13, 2013, include the phrase "FMVSS No. 218", along with the helmet manufacturer's name or brand name of the helmet, the precise model designation, and the word "certified."

While this new requirement makes certification decals more difficult to counterfeit, the full effect of the regulation will not be realized until helmets manufactured prior to the effective date of the new rule are no longer in common use. Since State motorcycle helmet laws typically do not place limits on the age of a helmet, older helmets could be in use for many years.

Strategies

Outreach Regarding Three-Wheeled Vehicles

The market for newly developed variations of three-wheeled vehicles is somewhat specialized, and it is not entirely clear what types of safety information is being conveyed to customers prior to purchase. NHTSA also seeks information about how these vehicles are typically utilized. The agency will continue to explore the importation and licensing implications of three-wheeled vehicles and will take steps

to educate the public on the safety performance of three-wheeled vehicles with partially or fully enclosed cabins. NHTSA believes that consumers who purchase these vehicles may incorrectly assume that these vehicles have the same safety features and crash protection as passenger cars certified to Federal safety standards.

Education on Unsafe Helmets

It is difficult to estimate the number of novelty helmets sold in the United States each year, and even more difficult to ascertain consumer awareness of the lack of crash protection offered by these types of helmets. Though some consumers may buy them to avoid a citation for disobeying a mandatory helmet use law and are fully aware of the safety implications, other consumers may not know the difference between a novelty helmet and a FMVSS 218-compliant helmet. NHTSA will continue to educate the public about riding with unsafe gear, including novelty helmets.

Compliance Enforcement of Federal Motor Vehicle Safety Standards

The Office of Vehicle Safety Compliance (OVSC) conducts NHTSA's compliance enforcement program. The Safety Act establishes a self-certification process by which motor vehicle and equipment manufacturers themselves certify that their products comply with all applicable FMVSS. Motorcycles are subject to a variety of FMVSS, and motorcycle helmets are subject to FMVSS No. 218; Motorcycle Helmets, which establishes minimum levels of safety-related performance. OVSC enforces these standards by randomly selecting and purchasing motor vehicles and equipment from the marketplace and testing these products in independent test labs to see if they meet the requirements of the standard. NHTSA is authorized to conduct investigations to enforce, among other things, compliance with the Federal Motor Vehicle Safety Standards.

OVSC tests approximately 35 motorcycle helmets each year for compliance with FMVSS No. 218. The Office selects helmets for testing that represent a variety of helmet brands, sizes, and coverage area (partial, full, or complete). From 2013-2015, OVSC worked with manufacturers to recall 148,207 motorcycle helmets that did not meet the minimum safety standards.

Innovation in Helmet Design

NHTSA supports innovation in helmet performance. Riders who disregard safety advice and choose not to wear a helmet may do so for a variety of reasons, one of them being that they find wearing a helmet to be uncomfortable – especially in warm weather. Manufacturing helmets with ventilation systems that improve comfort and also meet safety standards is challenging. For example, helmets with ventilation holes may not withstand the "penetration test" required by FMVSS No. 218. However, not all ventilation systems rely on holes in the outer shell.

NHTSA is currently coordinating a Small Business Innovative Research (SBIR) grant to examine the feasibility of a helmet ventilation system that improves comfort while also complying with FMVSS No. 218. The SBIR project is in Phase II, which focuses on building a prototype suitable for usability and safety testing.

NHTSA is also conducting research to examine potential refinements to FMVSS No. 218, including changes that could harmonize some features of the standard with other international standards. As part of this research, NHTSA has conducted impact attenuation tests with an ISO head form, and performed positional stability tests, chin bar impact tests and face shield impact tests.

RESEARCH PRIORITIES

A number of research needs are included in the comprehensive range of initiatives described above. Among those, the following two areas of research are especially important to building a foundation of knowledge from which further significant gains in motorcycle safety can be achieved.

Exposure Data Research

NHTSA will continue to monitor the results of the FHWA Motorcycle Annualized Average Daily Traffic (AADT) Study. While the primary intent of this study is to support the modeling functions of traffic safety engineering, there are likely to be insights from these analyses that will be useful for supporting behavioral interventions through data-driven education and enforcement. NHTSA, in coordination with FHWA, will continue to evaluate future low-cost data-collection techniques to support those efforts.

Connected Motorcycle Research

While much work has already been conducted regarding Vehicle-to-Vehicle (V2V) technologies and its potential to support crash avoidance, much work remains. This includes increased research regarding the feasibility of the technologies for motorcycles. NHTSA's work on the 2012-2013 Safety Pilot Model Deployment (SPMD)[20] supported the development of a future framework for the V2V Safety Communications environment. Included in the test motorcycles were Forward Collison Warning (FCW), Intersection Movement Assist (IMA), Emergency Electronic Brake Lights (EEBL), and Curve Speed Warning (CSW). While all the test data was added to the overall Model Deployment database, NHTSA hopes to conduct

[20] Bezzina, D., & Sayer, J. (2015, June). Safety pilot model deployment: Test conductor team report. (Report No. DOT HS 812 171). Washington, DC: National Highway Traffic Safety Administration.

analysis of the data in the near future. NHTSA currently has and will continue to refine its comprehensive V2V Research Plan, including:

- Identifying motorcycle crash scenarios that can be addressed by V2V technology;
- Recognizing the impact motorcycle operation may have on V2V crash avoidance communications;
- Understanding V2V device functionality in relation to installation on a motorcycle;
- Developing a knowledge base concerning how to inform motorcycle driver of imminent crash situations;
- Estimating how effective V2V safety applications are at addressing motorcycle crashes; and
- Obtaining input from motorcycle manufactures and advocacy groups regarding implementation of V2V in terms of technical, economical, and driver acceptance perspectives.

CONCLUSION

Motorcycles are an important element of our transportation system, contributing to both mobility and recreation for millions of riders in the United States. Motorcyclists continue to be overrepresented in traffic-related fatalities, accounting for 14 percent of all traffic-related fatalities, while representing only 3 percent of the entire registered motor vehicle fleet. With the number of registered motorcycles at an all-time high, it is especially critical that NHTSA remain focused on a comprehensive set of interventions to improve rider safety, while exploring new strategies with the goal of achieving zero fatalities.

This NHTSA Motorcycle Safety Plan provides a comprehensive framework for addressing opportunities to improve motorcycle safety in the coming years. Additionally, the plan informs stakeholders of agency interests and directions. NHTSA appreciates the work of a broad range of government and non-government safety professionals toward preventing motorcycle crashes and injuries. With the help of States, local jurisdictions, national organizations, rider groups, manufacturers, insurers, riders and drivers, we can continue to make progress in making motorcycling safer.

DOT HS 812 488
May 2019

U.S. Department of Transportation
National Highway Traffic Safety Administration

13507-050919-v8