Motorcycle Safety: Recent Trends, Congressional Action, and Selected Policy Options

David Randall Peterman
Analyst in Transportation Policy

January 4, 2008

Congressional Research Service
7-5700
www.crs.gov
RL34305

CRS Report for Congress
Prepared for Members and Committees of Congress

Summary

The U.S. Department of Transportation (DOT) has declared that motorcycle fatalities represent the nation's greatest highway traffic safety challenge. Over the past decade, the number of passenger vehicle auto deaths has declined slightly, even as more drivers have been driving more vehicles more miles. But the number of motorcycle fatalities has more than doubled over the past decade, to 4,810 in 2006—representing 14% of all passenger vehicle occupant deaths. Annual motorcycle fatalities are now more that double the number of annual deaths from aviation, rail, marine, and pipeline accidents combined. While part of this increase can be attributed to an increase in the number of motorcyclists, the number of fatalities is increasing at a greater rate than the overall increase in ridership—the number of fatalities has increased by 116% in the past decade, while the number of registered motorcycles increased by 63%. The increase in fatalities has continued in spite of the National Highway Traffic Safety Administration (NHTSA)'s publication in 2000 of the National Agenda for Motorcycle Safety, a plan for reducing motorcycle accidents and fatalities. The motorcycle industry expects the growth in motorcycle sales to continue, so the total number of motorcycle fatalities may continue to increase, barring new safety measures.

A clear understanding of the factors involved in motorcycle crashes is needed in order to develop effective safety measures to reduce the rate of motorcycle crashes. NHTSA has detailed information about the characteristics of fatal motorcycle crashes, but not about causes of the crashes. The last major study of the causes of motorcycle crashes in the United States was published in 1981. Since that time, the motorcycle rider population and the characteristics of both the motorcycle and passenger vehicle fleet have changed. Congress has authorized another major study of the causes of motorcycle crashes; the results of this study are expected in 2010. Congress has also authorized a motorcycle safety grant program promoting rider education and training and motorist awareness of motorcyclists, and established a Motorcycle Advisory Commission to advise DOT on infrastructure issues of concern to motorcyclists.

According to NHTSA, the single most effective safety measure to reduce motorcycle fatalities is to wear a helmet that meets DOT standards; such helmets are estimated to reduce fatalities by 37%. Helmets also reduce the severity and cost of injuries received in motorcycle crashes. Twenty states and the District of Columbia currently have universal helmet laws requiring all motorcyclists to wear helmets; most other states only require minors to wear helmets. The National Transportation Safety Board has recommended that all states adopt universal helmet laws. Universal helmet laws have been controversial. Congress has twice adopted and then repealed incentives promoting universal helmet laws, most recently repealing the incentives in 1995. These incentives were effective in getting states to adopt universal helmet laws, and the laws proved effective in promoting helmet use. After each repeal, the number of states with universal helmet laws declined. Surveys indicate that 58% of motorcycle riders wore a helmet in 2007, up from 51% in 2006, but down from 64% in 1996. This report will be updated as warranted.

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Introduction

Motorcycle riding, which is both a leisure activity and a form of transportation, is enjoying renewed popularity. Motorcycles first peaked in popularity in 1973, when over 1.5 million were sold;[1] during the 1970s, annual sales of all types of motorcycles averaged over 1 million. After 1980, sales declined, reaching a low point of less than 300,000 annually in the early 1990s. Sales began rising after 1992; sales of on-highway motorcycles rose from 186,000 in 1992 to 662,000 in 2003.[2] The number of motorcycles in use, as measured by motorcycle registration data, has increased by at least 63% since 1997 (from 3.8 million in 1997 to 6.2 million in 2005). According to the motorcycle industry, factors influencing the increase in motorcycle ownership include affluent baby boomers returning to motorcycling after many years of not riding, and rising fuel costs.[3]

This report presents and analyzes crash data, which show that motorcycle fatalities are an increasing share of all motor vehicle fatalities in the United States. It examines the risk characteristics of motorcycles and motorcyclists, and the characteristics of fatal motorcycle crashes. The report then examines what the federal government is doing to try to reduce the rate of motorcycle fatalities. Finally, this report analyzes the issues surrounding what many experts consider to be the single most effective motorcycle safety strategy, the requirement that all motorcyclists wear a helmet that complies with federal safety standards (universal helmet law).

Motorcycle Fatalities are an Increasingly Significant Proportion of all Motor Vehicle Fatalities

The number of motorcycle fatalities has more than doubled over the past decade, from 2,176 in 1996 to 4,810 in 2006. Part of this increase can be attributed to a significant growth in the number of motorcyclists. According to the motorcycle industry, annual sales of on-highway motorcycles have tripled in the past decade. The Federal Highway Administration (FHWA) reports that the number of registered motorcycles increased by over 2 million (63%) during that period. But as **Table 1** shows, the rate of increase in fatal motorcycle crashes (116%) and rider fatalities (115%) is almost double the rate of increase in the number of motorcycles registered (63%).[4] By contrast,

[1] Data from Motorcycle Industry Council, U.S. New Unit Motorcycle Sales, available at http://motorcycles.org/dtm.cfm?pagename=Media%20News%20Bureau&content=E17D5BD1-0830-A549-5AF64CD330007E67&referer=Media%20Releases.

[2] From Motorcycle Industry Council Annual Statistics, cited in NHTSA, *Recent Trends in Fatal Motorcycle Crashes: An Update*, DOT HS 810 606, June 2006, Table 3: "New On-Highway Motorcycle Units Sold by Year and Percent and Cumulative Increases," p. 7.

[3] According to a periodic industry survey of motorcycle owners, the median age of motorcycle owners rose from 33 in 1990 to 40 (1998) and on to 42 (2003), and the average engine displacement of their vehicles rose from 690 cubic centimeters (1998) to 866 (2003). Pat Murphy, Vice President, Research & Technology Standards, Motorcycle Industry Council, *Trends and Safety Statistics*, 2006, available at http://www.ntsb.gov/Events/symp_motorcycle_safety/agenda.htm.

[4] To know whether motorcycle fatalities are increasing simply because more motorcycles are in use or whether other factors are involved, the number of fatalities needs to be compared to some measure of exposure to risk of crashing. The preferred measure of exposure is the number of vehicle miles traveled (VMT). However, there is concern that official data on motorcycle VMT is inaccurate. This led NHTSA to switch from using VMT to the number of registrations as the basis of measure of exposure (though the accuracy of motorcycle registration data is also uncertain). The Federal Highway Administration, which collected motorcycle VMT data from the states, began working with the states in 2007 to improve the accuracy of motorcycle VMT data.

as **Table 1** also shows, the number of passenger vehicle crashes and fatalities has declined (by 2% and 3% respectively) over the past decade, even though the number of vehicles registered has increased by 5%.

Table 1. Crash Trends, 1997-2005

	1997	2005	Change
Motorcycle Registrations	3,826,373	6,227,146	63%
Passenger Vehicle Registrations	129,748,704	136,568,083	5%
Motorcycles Involved in Fatal Crashes	2,160	4,655	116%
Passenger Vehicles Involved in Fatal Crashes	48,687	47,867	(2%)
Motorcycle Rider Fatalities	2,116	4,553	115%
Passenger Vehicle Occupant Fatalities	32,448	31,415	(3%)
Motorcycles Involved in Fatal Accidents per 100,000 Vehicles Registered	56.45	74.75	32%
Passenger Cars Involved in Fatal Accidents per 100,000 Vehicles Registered	24.11	18.52	(23%)

Sources: Registration data from the Federal Highway Administration, DOT, *Highway Statistics*, 1997 and 2005 editions, Table VM-1; Involvement in fatal crash numbers and rates from NHTSA, DOT, *Traffic Safety Facts 2005*, Table 3, p. 17; Fatalities from ibid, Table 4, p. 18. "Passenger vehicle" includes both passenger cars and light trucks.

In 2006 motorcycles represented less than 3% of all passenger vehicles registered and less than 1% of all VMT, while motorcyclist fatalities represented 14% of all fatalities suffered by operators or passengers in passenger vehicles.[5] Among the factors that contribute to the higher rate of fatal crashes of motorcycles compared to passenger vehicles are the characteristics of both motorcycles and the motorcycle operator population.

Motorcycles are inherently riskier than passenger vehicles. They are more complex to steer and less stable in braking and maneuvering. They also tend to be less noticed by other motorists compared to other passenger vehicles. In a crash motorcycles offer little protection to their occupants compared to a passenger vehicle occupant, who is enclosed in a metal frame, is required by law to be wearing a seat belt, and whose vehicle (if manufactured after 1996) is required by law to have airbags to protect the occupants of the front seat. Virtually the only protection available to a motorcyclist in a crash is a helmet and protective clothing, neither of which is required in most states. Also, an estimated 90% of motorcycle operators are male, compared to the passenger vehicle driver population, which is 50% female.[6] Males are involved in motor vehicle accidents at a higher rate than females.[7] As a result of both vehicle characteristics and operator characteristics, the rate of motorcycle involvement in fatal crashes, both by the number of registered vehicles and by VMT, is several times that of passenger vehicles (see **Table 2**).

[5] 30,521 occupants of passenger cars or light trucks and and 4,810 motorcyclists were killed in motor vehicle crashes in 2006. NHTSA, DOT, *2006 Traffic Safety Annual Assessment—A Preview*, DOT HS 810 791, July 2007, Table 1.

[6] Federal Highway Administration, *Highway Statistics 2005*, (Washington, DC, 2006), Table DL-20.

[7] In 2005 the percentage of licensed male drivers involved in fatal crashes was three times greater than the percentage of licensed female drivers. NHTSA, DOT, *Traffic Safety Facts 2005*, DOT HS 810 780, (Washington, DC, May 2007), "Table 5: Drivers Involved in Crashes and Involvement Rates Per Licensed Driver by Sex and Crash Severity, 1975-2005."

Table 2. Number and Involvement Rate of Vehicles Involved in Fatal Crashes, 2005[8]

	Number	Rate Per 100 Million VMT	Rate Per 100,000 Registered Vehicles
Passenger Cars	25,029	1.55	18.52
Light Trucks	22,838	2.01	24.05
Motorcycles	4,655	43.22	74.75

Source: NHTSA, DOT, *Traffic Safety Facts 2005*, DOT HS 810 780, (Washington, DC, May 2007), Table 3, p. 17.

Characteristics of Fatal Motorcycle Crashes[9]

There were 4,489 fatal motorcycle crashes in 2005, which resulted in the deaths of 4,553 motorcyclists. Over half (53% in 2004) of motorcyclist deaths occur on weekends, and about half occur on rural roads. Forty-five percent of the motorcyclists killed in crashes in 2004 were not wearing a helmet. Speeding was judged to be a contributing factor for 37% of the fatalities. In 25% of the crashes, the motorcyclist either did not have a drivers license or lacked a motorcycle endorsement on their license. Over a quarter (27%) of the motorcyclists killed in crashes in 2005 were legally intoxicated (i.e., had an amount of alcohol in their blood (blood alcohol content, or BAC), at or above 0.08[10]).

Approximately half (45%) of the fatal motorcycle crashes in 2005 were single-vehicle crashes; in most of these, the motorcyclist ran off the road. Forty-one percent of the 1,878 motorcyclists who died in single-vehicle crashes were legally intoxicated. In the 56% of crashes involving two or more vehicles, the other vehicle(s) was typically a passenger car or light truck. Of two-vehicle crashes involving a passenger vehicle, 74% of the crashes involved the motorcycle striking the passenger vehicle. In more than one-third of the two-vehicle crashes, the motorist was making a left turn across the path of a motorcyclist.[11]

In looking at the characteristics of fatal motorcycle crashes during the decade 1995 to 2004, changing trends can be ascertained. The percentage of motorcycle operators in fatal crashes who had been drinking (i.e., had any alcohol in their system) declined from 42% to 34%, and the percentage who were legally impaired (BAC of 0.08 or more) declined from 34% to 28%.[12]

[8] As noted in footnote 4, there is concern that official motorcycle VMT numbers are inaccurate. The motorcycle industry, on the basis of a periodic survey of motorcycle owners, estimates motorcycle VMT at roughly twice the official measure, which would produce a fatality rate per VMT of nearly half this figure. But even that rate would still be many times higher than the rates for passenger vehicles.

[9] NHTSA collects data on fatal motorcycle crashes. There is no central database for nonfatal crashes.

[10] Every state has a law making it illegal to drive with a BAC of 0.08 (NHTSA, DOT, *Traffic Safety Facts 2005*, Table 125, p. 186). Every state has a law making it illegal for persons under age 21 to drive with any BAC (NHTSA, DOT, *Sentencing and Dispositions of Youth DUI and Other Alcohol Offenses: A Guide for Judges and Prosecutors*, III. The Laws, "Zero Tolerance Laws," available at http://www.nhtsa.dot.gov/people/injury/alcohol/youthdui/section3.html).

[11] Umesh Shankar, NHTSA, presentation at National Transportation Safety Board Public Forum on Motorcycle Safety, transcript of September 12, 2006 session, p. 52, available at http://www.ntsb.gov/events/symp_motorcycle_safety/Motorcycle_09-12-06_transcript.pdf.

[12] Ibid, p. 31.

Likewise, the share of fatal crashes in which speeding was a factor declined from 43% to 37%.[13] The percentage of motorcycle operator fatalities who were properly licensed increased from 63% to 75%. However, while these rates showed improvement, the actual number of fatal crashes in which alcohol or speeding played a role, and in which the driver was not properly licensed, increased.[14]

Other factors showed little or no change. For example, the rate of helmet use observed in motorcyclists involved in fatal crashes was virtually unchanged from 1995 (56%) to 2004 (57%).

Other trends observed in the 1995-2004 crash data were that motorcyclists involved in fatal crashes were becoming older and riding more powerful motorcycles. The share of fatalities in which the motorcyclist was 40 years old or older rose from 25% (1995) to almost 50% (2004), pushing the average age of motorcyclists involved in a fatal crash up 19%, from 32 (1995) to 38 (2004).[15] The share of fatal crashes involving motorcycles with engine displacements of 1,000 cubic centimeters (cc) or more rose from 30% (1995) to 41% (2004), pushing the average engine displacement of motorcycles involved in fatal crashes up 21%, from 841 cc (1995) to 1,015 cc (2004).

Recent Congressional Action On Motorcycle Safety

Congress has given DOT the mission of reducing traffic deaths. As noted above, the number of passenger vehicle traffic deaths has declined over the past decade, while the number of motorcycle deaths has been increasing. In light of this, DOT has declared that motorcycle fatalities are currently the nation's greatest highway traffic safety challenge.[16]

In the most recent surface transportation reauthorization legislation, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA) (P.L. 109-59, enacted August 10, 2005), Congress included several provisions relating to motorcycle safety. These included funding for a motorcycle crash causation study, the creation of a motorcycle safety grant program, and the creation of a motorcyclist advisory committee.

DOT Motorcycle Crash Causation Study

The precondition for effective crash prevention and crash mitigation strategies is understanding why crashes happen. NHTSA has detailed information about the characteristics of fatal crashes, but without detailed information on the population of motorcyclists who are exposed to the same risks but do not experience fatal crashes, the significance of the factors observed in fatal crashes cannot be established. Such information is acquired through in-depth crash causation studies, where crashes are examined in detail and the at-risk motorcycling population in the same area at

[13] Ibid, p. 30. In 2005, it was down to 34%. NHTSA, *Traffic Safety Facts, 2005 Data, Motorcycles*, DOT HS 810 620, p.4.

[14] For example, the number of motorcycle rider fatalities increased by 80% over this period (from 2,227 to 4,008), so while the number of motorcyclists who died in speeding-related crashes increased by 55% (from 963 to 1,497), this was less than the rate of increase in all fatalities, so the share of all crashes that involved speeding declined.

[15] National Highway Traffic Safety Administration motorcycle crash data indicates that the median age of motorcyclists involved in a fatal crash rose from 29 in 1990 to 36 in 2001. NHTSA, Motorcycle Safety Program, "Recent Trends," January 2003.

[16] DOT, *Action Plan to Reduce Motorcycle Fatalities*, DOT HS 810 855, October 2007, p. 1.

the same time is observed and interviewed. The only large scale in-depth motorcycle crash causation study in the U.S. was conducted almost thirty years ago. Since that time there have been significant changes in the characteristics of the motorcycle rider population, the highway vehicle fleet mix, and the highway environment.

Section 5511 of SAFETEA authorized $2.8 million for the federal share of a motorcycle crash causation study, to be conducted jointly by FHWA and the Oklahoma Transportation Center. NHTSA had begun a smaller-scale motorcycle crash causes and outcomes study prior to the passage of SAFETEA, and after passage of SAFETEA revised that study to serve as a pilot for the larger-scale study. The final report from NHTSA's pilot study is expected in February 2008. The final report of the larger crash causation study is expected in August 2010.

Motorcycle Safety Grant Program

Section 2010 of SAFETEA creates a motorcycle safety grant program. To be eligible for a grant, a state must satisfy any two of six criteria:

- provide a motorcycle rider training course;
- provide a motorcyclist awareness program (aimed at motorists);
- provide an impaired driving prevention program that includes specific measures targeting impaired motorcycle driving;
- achieve a reduction in annual fatalities and crashes involving motorcyclists;
- achieve a reduction in annual fatalities and crashes involving impaired motorcyclists; or
- ensure that all fees collected from motorcyclists for the purpose of funding motorcycle training and safety programs are used for those programs.

States that receive a grant must maintain at least the same level of spending on motorcycle safety as before the grant (that is, the grant must represent additional spending). The program is authorized at $6 million annually ($7 million in FY2009, its final year of authorization). Forty-four states and Puerto Rico received grants in FY2006.

Motorcyclist Advisory Council

Section 1914 directs the Secretary of Transportation to appoint a Motorcyclist Advisory Council to advise the Federal Highway Administrator on infrastructure issues of concern to motorcyclists, including barrier design. This Council has been established and met three times in 2007.[17]

DOT Motorcycle Safety Action Plan

In October 2007 DOT released an action plan to reduce motorcycle fatalities.[18] The key initiatives presented in the plan include conducting the motorcycle crash causation study discussed above,

[17] For transcripts of the meetings and additional information about the Motorcyclist Advisory Council, see http://safety.fhwa.dot.gov/mac/.

[18] DOT, *Action Plan to Reduce Motorcycle Fatalities*, DOT HS 810 855, October 2007.

developing national standards for novice motorcyclist training programs, providing guidance to transportation officials on making roads safer for motorcycles, creating a training program for law enforcement officials on enforcement efforts that can reduce crashes, and initiating a campaign to make motorists more aware of motorcyclists.

Additional Sources of Motorcycle Safety Recommendations

National Agenda for Motorcycle Safety (NAMS)

In 2000, DOT published the National Agenda for Motorcycle Safety (NAMS), a plan for improving motorcycle safety.[19] The document was the result of a cooperative effort between NHTSA and the Motorcycle Safety Foundation, a nonprofit organization funded by motorcycle manufacturers to promote safety.

NAMS discusses a variety of motorcycle safety issues, and makes 82 recommendations, grouped into three categories: Urgent (4 recommendations), Essential (56), and Necessary (22). The Urgent recommendations are

- that comprehensive, in-depth studies of critical questions in motorcycle safety should be begun immediately;
- that efforts to discourage impaired motorcycling should continue;
- that efforts should be made to increase the use of DOT-compliant helmets; and
- that efforts should be made to educate motorists to be more aware of the presence of motorcyclists.[20]

NHTSA published an implementation guide for NAMS in 2006. The guide focuses on the roughly half of the NAMS recommendations it identifies as being directed at the states. It presents examples of things states have done to implement those recommendations.

The NTSB has commended the NAMS, but noted that there is no means of tracking the status of the recommendations, no evaluation of the relative priority of the recommendations within the three categories, and no measures provided to evaluate the effectiveness of the recommendations. The NTSB recommended that NHTSA create a guide for the NAMS recommendations similar to their guide for highway safety measures,[21] which rates the effectiveness, cost, and implementation time of traffic safety measures.

NTSB Recommendations

The NTSB, an independent government agency which investigates accidents and makes non-binding recommendations for safety improvements, has recently begun to examine motorcycle

[19] NHTSA, DOT, *National Agenda for Motorcycle Safety*, DOT HS 809 156, November 2000.

[20] Ibid, p. 61.

[21] NHTSA, DOT, *Countermeasures That Work: A Highway Safety Countermeasure Guide For State Highway Safety Offices*, Second Edition, DOT HS 810 710, March 2007. This guide includes a section on motorcycle safety. It lists the most important objectives for improving motorcycle safety as increasing the use of helmets, reducing alcohol impairment of riders, and increasing the number of riders who are properly licensed and trained.

accidents. In addition to investigating several accidents, NTSB convened a forum in 2006 to hear from a variety of experts on the current status of motorcycle safety issues. Based on this information, in September 2007 NTSB announced several recommendations to promote motorcycle safety. These included the adoption by all states of universal helmet laws specifying DOT-compliant helmets, prioritization of the NAMS recommendations and development of an implementation plan as discussed above, and development of uniform guidelines for collecting accurate motorcycle registration and vehicle miles traveled data.[22]

Selected Options for Improving Motorcycle Safety

There are two main approaches to reducing motorcycle crashes and fatalities: reduce the number of crashes (through rider skills training and reductions in risky behaviors, educating motorists to be aware of motorcyclists, improvements to road design, and improvements to motorcycle stability) and reduce the deadliness of motorcycle crashes (through improvements in rider protective gear, reduction in roadside hazards, and improvements in the crashworthiness of motorcycles). Most of the options available under these strategies are of uncertain value. Vehicle improvements such as anti-lock brakes, stability control, and airbags are costly relative to the price of most motorcycles, and are thought likely to have limited safety impacts. Removal of roadside hazards such as trees, signposts, and other fixed objects is not feasible. One option that is viewed to be of proven value, relatively inexpensive, and can be quickly implemented, is a universal helmet law.[23] That option is controversial, and opponents of universal helmet laws call instead for more and better rider training.

Universal Helmet Law

Head injuries resulting in injury to the brain are the leading cause of death in motorcycle crashes. Motorcycle helmets that comply with the federal safety standard are designed to protect the rider in two ways: the hard outer shell of the helmet protects the head from penetrating injuries and abrasion; and the crushable interior padding (expanded polystyrene, also known as styrofoam), by absorbing the force of the head as it comes to a rapid stop in a crash, is intended to allow the head to come to a less rapid stop, and thus protect against injuries caused by the brain hitting the inside of the skull.[24] NHTSA has found that motorcycle helmets are the single motorcycle safety measure whose effectiveness has been specifically proven, and that requiring riders to wear helmets is a relatively low cost measure which can be implemented by a state passing a law requiring all motorcyclists to wear helmets and is relatively easy to enforce.

[22] NTSB, *Motorcycle Safety Recommendation Letters*, September 11, 2007, available at http://www.ntsb.gov/Publictn/2007/AB07-Motorcycle_Safety_Rec-Ltr.htm.

[23] NHTSA, *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*, 2007 (Second Edition), Section 5: "Motorcycle Safety: Countermeasures That Work."

[24] "Your brain has the consistency of gelatin. It's cushioned from everyday jolts and bumps by the cerebrospinal fluid that it floats in, inside your skull. A violent blow to your head can cause your brain to slide forcefully against the inner wall of your skull. Even the sudden stop of a car crash can bounce your brain off the inside of your skull. This can result in bleeding in or around your brain and the tearing of nerve fibers." Mayo Clinic, *Concussion: Causes*, available at http://www.mayoclinic.com/health/concussion/DS00320/DSECTION=3.

Motorcycle Helmets Save Lives and Reduce Brain Injuries

NHTSA estimates that a motorcyclist without a helmet is three times as likely to die in a crash as a motorcyclist wearing a DOT-compliant helmet, and among motorcyclists who survive a crash, those not wearing a helmet are three times as likely to suffer a brain injury as those wearing a DOT-compliant helmet.[25] NHTSA estimates that 728 of the 4,553 motorcyclists who were fatally injured in 2005 could have survived if all motorcyclists had been wearing helmets.[26] Moreover, an older person is more susceptible to incurring a brain injury from a blow to the head than is a younger person, so as the overall motorcycle rider population ages, the protective value of helmets for motorcyclists increases.[27]

Motorcycle Helmets Save Money

The use of motorcycle helmets also has a significant economic impact. Studies of motorcyclists injured in crashes find that the costs of crashes are much lower for motorcyclists wearing helmets. One recent study found that the average cost resulting from an unhelmeted rider being injured in a crash was $302,000, while the average cost resulting from a helmeted rider being injured in a crash was $71,000.[28] Much of the disparity in costs between the helmeted and unhelmeted riders injured in crashes was due to the long-term impacts of the typically more severe head injuries suffered by the unhelmeted riders. The researchers concluded that motorcycle helmet laws have a benefit-cost ratio of nearly 4 to 1.[29] NHTSA estimated that the use of motorcycle helmets saved $1.3 billion in medical expenses in 2002, and that another $853 million could have been saved if all motorcyclists had worn helmets.[30]

Opponents of universal helmet laws portray them as unwarranted limitations on an adult's freedom to take risks. Proponents counter that the costs that can result from not wearing a helmet are not borne only by the motorcyclist who chooses to ride without a helmet. Several studies have found that only about half of motorcycle crash victims have private health insurance.[31] For those without private coverage, a majority of their medical costs are paid by the public. Even for those with private coverage, their insurance may not be sufficient to cover all the costs of their treatment. For those with serious head injuries, the long-term costs of their treatment may be vast, and may be borne by the public. Motorcycle crash victims who are permanently disabled may

[25] NHTSA, DOT, *Motorcycle Helmet Use Laws*, April 2004.

[26] NHTSA, DOT, *2005 Data: Motorcycles*, DOT HS 810 620. Of the 4,008 riders who died in crashes in 2004, 1,794 were not wearing helmets; if all of the unhelmeted riders had been wearing a helmet, NHTSA estimates that about 37% of them could have survived.

[27] Katz and Alexander found that age had a significant impact on recovery from traumatic brain injury, with worse outcomes beginning around age 40. Katz, D. I., and M. P. Alexander, "Traumatic Brain Injury: Predicting course of recovery and outcome for patients admitted to rehabilitation," Archives of Neurology, v. 51, no. 7, July 1994.

[28] Ted R. Miller, Pacific Institute for Research and Evaluation, "Motorcycle Injury Costs and Insurance Coverage," presentation at the National Transportation Safety Board's Public Forum on Motorcycle Safety, September 12, 2006, page 8 , available at http://www.ntsb.gov/events/symp_motorcycle_safety/agenda.htm. Medical treatment represented a minority of those costs; most of the cost was due to absence from work and diminished quality of life.

[29] Ted R. Miller, Pacific Institute for Research and Evaluation, transcript of the National Transportation Safety Board's Public Forum on Motorcycle Safety, September 12, 2006, p. 46, available at http://www.ntsb.gov/events/symp_motorcycle_safety/symp_motorcycle_safety.htm.

[30] NHTSA, DOT, *Motorcycle Helmet Use Laws*, April 2004.

[31] NHTSA, *Costs of Injuries Resulting from Motorcycle Crashes: A Literature Review*, DOT HS 809 242, November 2002.

receive public support from such sources as Social Security's Disability Insurance, as do the minor children of those who are disabled or die in a crash.

Rates of Motorcycle Helmet Use

The most recent survey of helmet use showed that only 58% of motorcyclists were wearing a DOT-compliant helmet in 2007, up from 51% in 2006 but down from 71% in 2000.[32] The DOT Secretary, herself a motorcyclist who speaks of her crash experience, has called on manufacturers to provide free or discounted DOT-compliant helmets (or rider training safety courses) with the purchase of every new motorcycle in an effort to portray helmets as standard safety equipment.[33] However, given that motorcycle helmet use declines significantly in states after repeal of universal helmet laws,[34] the nationwide decline in helmet usage does not appear to be caused by a lack of availability of helmets, nor is it likely to be reversed by manufacturers offering free or discounted helmets to motorcycle purchasers.

Helmet use is higher in states that require all motorcyclists to wear helmets (universal helmet laws): 97% versus 50% in other states in 2007.[35] Twenty states, the District of Columbia, and Puerto Rico, have universal helmet laws (see **Table 3**). Twenty-seven states require some motorcyclists, usually minors, to wear helmets.[36] Three states have no motorcycle helmet law. Six states have repealed their universal helmet laws since 1997, though one, Louisiana, reinstated its law in 2004.

[32] NHTSA, DOT, *Motorcycle Helmet Use in 2007—Overall Results*, DOT HS 810 840, September 2007. Of the riders wearing helmets, an estimated 16% were wearing helmets that did not meet federal standards. The survey of helmet use is based on visual observations of highway users, so the observers determined whether a helmet met the DOT standards based on its exterior appearance. The actual proportion of noncompliant helmets may have been higher, since some noncompliant helmets may have been close enough in appearance to DOT-compliant helmets to be counted as compliant. State helmet laws generally require that riders wear DOT-compliant helmets.

[33] United States Department of Transportation Office of Public Affairs, "Nation's Top Transportation Official Urges Manufacturers to Provide Free or Discounted DOT Certified Helmets or Rider Safety Training with the Purchase of Every New Motorcycle," DOT 19-07, February 16, 2007.

[34] Ulmer, R.G., & D. F. Preusser, *Evaluation of the Repeal of Motorcycle Helmet Laws in Kentucky and Louisiana*, DOT HS 809 530, October 2003.

[35] NHTSA, *Motorcycle Helmet Use in 2007—Overall Results*, DOT HS 810 840, September 2007. These figures represent total helmet use, both those helmets compliant with federal safety regulations and those that do not comply with federal standards. Observers estimated that 23% of the riders in universal helmet law states, and 8% of those in other states, were wearing helmets that did not comply with federal standards. All helmets sold for street use are required to comply with the DOT standard. There are also helmets that do not comply with the DOT standard, ostensibly sold as novelty helmets not intended for use on the street, which are worn by some motorcyclists.

[36] This requirement is difficult to enforce, since it is difficult to determine at a glance whether a motorcyclist is a minor. Studies of fatal crashes in states where only minors are required to wear helmets have found that fewer than 40% of fatally-injured minors were wearing helmets, in spite of the law (NHTSA, *Traffic Safety Facts: Laws: Motorcycle Helmet Use Laws*, April 2004). A survey of youth behavior found that 37% of high school students who had ridden a motorcycle in the preceding 12 months had rarely or never worn a motorcycle helmet (Centers for Disease Control and Prevention, "Youth Risk Behavior Surveillance—United States, 2005," *Morbidity and Mortality Weekly Report Surveillance Summaries*, June 9, 2006, v. 55, n. SS-05, Table 2).

Table 3. Motorcycle Helmet Law Status for the United States and Territories

Universal Helmet Laws	Partial Helmet Laws	No Helmet Laws
Alabama	Alaska	Illinois
California	Arizona	Iowa
District of Columbia	Arkansas	New Hampshire
Georgia	Colorado	
Louisiana	Connecticut	
Maryland	Delaware	
Massachusetts	Florida	
Michigan	Hawaii	
Mississippi	Idaho	
Missouri	Indiana	
Nebraska	Kansas	
Nevada	Kentucky	
New Jersey	Maine	
New York	Minnesota	
North Carolina	Montana	
Oregon	New Mexico	
Tennessee	North Dakota	
Vermont	Ohio	
Virginia	Oklahoma	
Washington	Pennsylvania	
West Virginia	Rhode Island	
	South Carolina	
American Samoa	South Dakota	
Northern Mariana Islands	Texas	
Puerto Rico	Utah	
Virgin Islands	Wisconsin	
	Wyoming	
	Guam	

Source: National Transportation Safety Board, *Safety Recommendation Letter H-07-38*, October 3, 2007, p. 5, available at http://www.ntsb.gov/recs/letters/2007/h07_38.pdf.

History of Federal Motorcycle Helmet Use Legislation

Congress's stance on universal helmet laws has varied over time. In 1966, Congress passed legislation to withhold a portion of a state's highway funding if the state had not adopted a

universal helmet law by 1976.[37] At that time, no state had a motorcycle helmet law. By 1975, 47 states had adopted such legislation. The motorcycle fatality rate per 10,000 motorcycles declined from 12.7 (1966) to 6.7 (1976). In 1976, Congress repealed the penalty for failure to have a universal helmet law. Part of the reason given for the repeal was that the penalty was about to be enforced against the three states then lacking such laws (California, Illinois, and Utah). By 1979, 27 states had repealed their mandatory helmet laws in the face of opposition to those laws. The nation's fatality rate per 10,000 motorcycles rose from 6.7 (1976) to 9.1 (1979). In 1991, Congress authorized the Secretary of Transportation to provide grants to states with universal helmet laws; beginning in FY1994, if a state did not have a universal helmet law, a portion of its federal-aid highway funds would be transferred to its federal highway safety program. In 1995, Congress repealed that provision. An amendment was offered to what ultimately became SAFETEA that would have reinstated the transfer of a portion of a state's federal aid highway funds to its safety program; that amendment was defeated.[38]

Opponents and Proponents of Universal Helmet Laws

Many opponents of universal helmet laws do not deny the safety value of helmets. The American Motorcyclist Association, for example, encourages riders to wear helmets (and other protective gear), and does not oppose laws that require minors to wear helmets, believing that "many young motorcyclists and passengers may lack the maturity to make an informed decision regarding the use of motorcycle helmets."[39] They do oppose laws requiring adult motorcyclists to wear helmets, contending that adults are capable of making personal safety decisions for themselves and that society should not mandate personal safety.

Some opponents of universal helmet laws, such as the Motorcycle Riders Foundation and various state chapters of ABATE (depending on the state, "American Bikers Aimed Toward Education" or "American Brotherhood Against Totalitarian Enactments"), contend that the safety benefits of helmets are unproven. They contend that helmets actually pose a danger to the motorcyclist, by restricting the cyclist's peripheral vision and hearing, and by increasing the risk of a neck injury (due to the added weight of the helmet) in a crash.[40] But common to both groups of opponents is the framing of motorcycle helmet laws as primarily an issue of personal liberty and free choice rather than an issue of safety.

In 1991, the General Accounting Office (GAO; now the Government Accountability Office) reviewed dozens of studies of helmet use and found no evidence to support the contentions of helmet opponents that helmets significantly impair motorcyclist vision or hearing, or contributed to neck injuries.[41] Subsequent studies have continued to support these findings.[42] Studies of

[37] The Highway Safety Act of 1966 (P.L. 89-564).

[38] Senate Amendment 605 to H.R. 3, May 11, 2005.

[39] American Motorcyclist Association (AMA), "AMA position in support of voluntary helmet use," available at http://www.amadirectlink.com/legisltn/positions/helmet.asp.

[40] E.g., Steve "Red" Baron, ABATE of California, "Motorcycle Helmets are Not Safe!", no date, available at http://www.bikersrights.com/statistics/notsafe.html; ABATE of Kansas, "Helmetless Riders are Less Likely to Die in Crashes on Florida Roads," no date, but cites 2004 crash data, available at http://www.ksabate8.org/38501/33401.html?*session*id*key*=*session*id*val*.

[41] General Accounting Office, *Highway Safety: Motorcycle Helmet Laws Save Lives and Reduce Costs to Society*, GAO/RCED-91-170, July 1991.

[42] E.g., McKnight, A. J. and A. S. McKnight, "The Effects of Motorcycle Helmets Upon Seeing and Hearing," *Accident Analysis and Prevention*, vol. 27, no. 4, July 1995, pp. 493-501; Ouellet, James V., and Vira Kasantikul, "Motorcycle (continued...)

motorcycle injuries and fatalities find that helmets save lives, reduce the severity of injuries in non-fatal crashes, do not cause additional injuries, and save billions of dollars in medical care and lost wages.[43]

Proponents of universal helmet laws include NHTSA and numerous groups representing the transportation safety, medical, law enforcement, and insurance communities. They note that helmets not only save lives, they also reduce the severity of injuries motorcyclists experience in crashes. They respond to the personal choice argument of helmet law opponents—that each motorcyclist should be free to decide whether to wear a helmet, since the motorcyclist is the one who bears the risk of injury and death—by pointing out that the motorcyclist's choice imposes burdens on others, both financial and emotional.[44] Moreover, they contend that universal helmet laws are necessary, because voluntary helmet usage promotion efforts have not proven to be effective. Conversely, universal helmet laws are easy to enforce and result in relatively high rates of helmet usage.

Opponents of universal helmet laws take issue with the "social burden" argument. They contend that motorcyclists have medical insurance at rates similar to the general population, and that the share of the nation's medical burden that is due to medical costs incurred by motorcycle crashes is insignificant.[45] They further contend that the most effective way to reduce motorcyclist fatalities and injuries is to prevent crashes from occurring, through education of motorcyclists and motorists and through crackdowns on illegal behavior by motorcyclists, such as riding while impaired and riding without proper licensure.

In response to the framing of universal helmet laws as an infringement on personal rights, proponents of universal helmet laws contend that when personal choices impose costs on society and on survivors, personal freedoms must be balanced with protecting individuals from preventable injuries and fatalities. They note that when it comes to transportation safety, Congress has chosen to require adults to take actions to protect themselves. For example, opponents of seat belt use laws also contended that such laws infringed on their personal freedom to drive without a seat belt. However, Congress chose to penalize states that do not have, and enforce, laws requiring motorists to wear seat belts, even though all cars manufactured since 1996 are required

(...continued)

Helmet Effect on a Per-Crash Basis in the Thailand and Hurt Studies," paper presented at the 2006 International Motorcycle Safety Conference, available at http://www.msf-usa.org/imsc/proceedings/b-Ouellet-EstimatingHelmetEffectiveness.pdf.

[43] Many such studies are cited in the "Personal Protective Equipment" section of NHTSA's 2000 report, the *National Agenda for Motorcycle Safety*; in the introductory section of Ouellet and Kasantikul's "Motorcycle Helmet Effect on a Per-Crash Basis in the Thailand and Hurt Studies"; and in the NTSB's safety recommendation letter to states without universal helmet laws.

[44] In 1972, a federal court in Massachusetts told a motorcyclist who objected to a universal helmet law: "The public has an interest in minimizing the resources directly involved. From the moment of injury, society picks the person up off the highway; delivers him to a municipal hospital and municipal doctors; provides him with unemployment compensation if, after recovery, he cannot replace his lost job; and, if the injury causes permanent disability, may assume responsibility for his and his family's subsistence. We do not understand a state of mind that permits plaintiff to think that only he himself is concerned." This decision was affirmed by the US Supreme Court. Cited by Insurance Institute for Highway Safety, "Q&As: Motorcycle helmet use laws: #9: How have courts resolved challenges to helmet use laws?," available at http://www.iihs.org/research/qanda/helmet_use.html.

[45] American Motorcyclist Association (AMA), "AMA position in support of voluntary helmet use: Responses to Claims Made by Helmet Law Advocates," op. cit.

to have airbags to protect front seat occupants.[46] NHTSA estimates that over 15,000 lives are saved each year as a result of people wearing seat belts.[47]

In some cases, Congress has attempted to protect adults from their inclination to take risks, even at the cost of imposing burdens on bystanders. For example, Congress has required that locomotive horns be sounded at all highway-rail grade crossings, including those already equipped with warning lights and gates, because statistics have shown that collision rates are higher when the horns are not sounded. In response to criticism of the regulation, DOT contended that it was "appropriate to protect even the unwise from the consequences of their misdeeds where those consequences are especially severe—and where society as a whole may bear the burden of those consequences."[48]

In a survey of motor vehicle occupants, NHTSA found that 81% favored universal helmet laws. Support was high even in states without universal helmet laws (75% in states with less than universal requirements, 79% in the three states with no requirements). While support was higher among those who did not ride motorcycles (83%), 51% of the motorcyclists in the survey favored universal helmet laws.[49]

Motorcyclist Training Courses

Opponents of universal helmet laws contend that motorcyclist training courses are the preferred means to reduce the incidence of motorcycle fatalities. Virtually all groups support the provision by some means of motorcyclist training courses. The NAMS report declared that motorcycle rider education and training is the "centerpiece of a comprehensive motorcycle safety program."[50] A spokesman for The Motorcycle Riders Foundation predicted that "once [SAFETEA] is passed and we can have access to training and improved education of motorcyclists, you will see this fatality rate go down."[51]

The long-term safety benefit of motorcyclist training programs has not been conclusively demonstrated. An evaluation of California's training program in the 1990s found that the crash rate for novice riders who had taken the training course was less than half that of novice riders without the training for the first six months after the training; after that, the difference diminished.[52] The program appeared to provide no significant safety benefit for riders with more than 500 miles of prior riding experience. While training programs can improve riders' bike-

[46] The presence of the penalties is so effective that every state except New Hampshire has adopted such laws.

[47] NHTSA, Traffic Safety Facts 2005, "Lives Saved by Restraint Use and 21-Year-Old Minimum Legal Drinking Age Laws, and Additional Lives That Would Have Been Saved at 100 Percent Safety Belt and Motorcycle Helmet Use, 1975-2005," DOT HS 810 631, p. 205.

[48] 68 Federal Register 70594. Studies have indicated that most of the 360 or so deaths at grade crossings each year (a fraction of the annual number of motorcycle fatalities) are caused by the misbehavior or bad judgement of motorists who ignore or circumvent warning lights and crossing gates. Some communities complained that millions of citizens were being subjected to noise pollution from train horns in an effort to protect a relatively few irresponsible people from the consequences of their actions.

[49] NHTSA, DOT, *Motorcycle Helmet Use Laws*, March 2005, p. 2.

[50] NHTSA, DOT, *National Agenda for Motorcycle Safety*, DOT HS 809 156, November 2000, p. 17.

[51] Jeff Hennie, vice-president for governmental affairs, Motorcycle Riders Foundation, quoted in "Bikers a Surprising Force in Grass-Roots Lobbying," by Isaiah J. Poole, *CQ Weekly*, May 16, 2005, p. 1287.

[52] J.W. Billheimer, "Evaluation of California Motorcyclist Safety Program," *Transportation Research Record*, no. 1640, 1998, pp. 100-109.

handling and traffic negotiation skills, they may have little impact on riders' judgement and propensity to take risks. As NHTSA has noted:

> There is no evaluation of rider education and training effectiveness or measures to determine if program effectiveness has been compromised due to the lack of resources. It is assumed, yet unknown, that the current programs are teaching necessary skills to survive in traffic.[53]

Author Contact Information

(name redacted)
Analyst in Transportation Policy
[redacted]@crs.loc.gov, 7-....

[53] NHTSA, DOT, *National Agenda for Motorcycle Safety*, DOT HS 809 156, November 2000, p. 18.