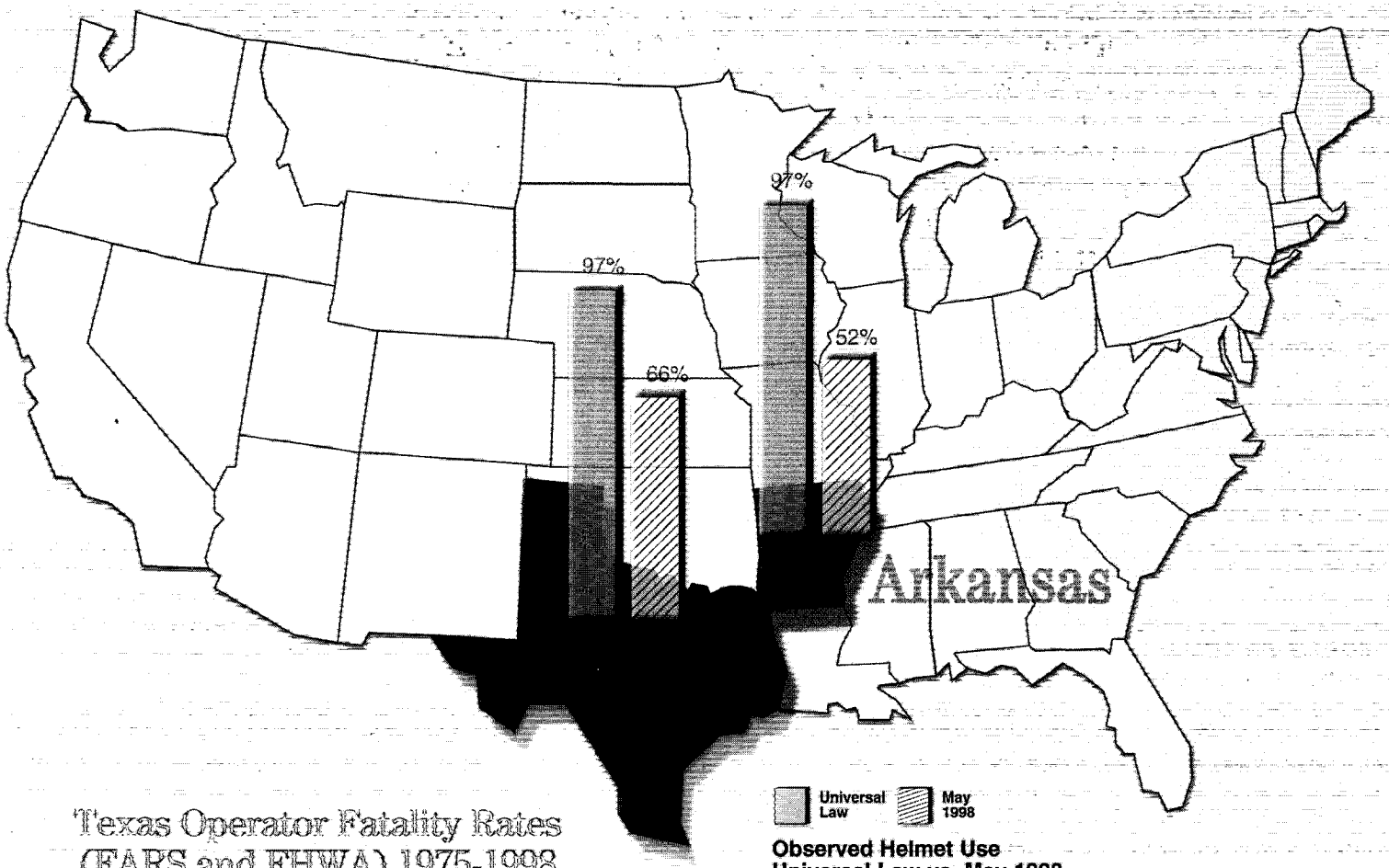
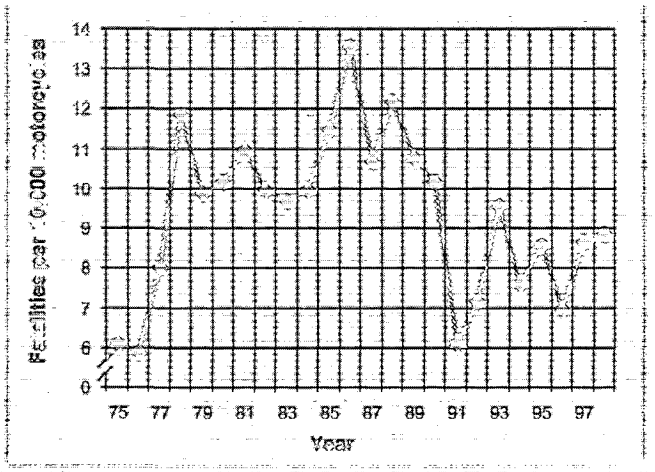
Evaluation of
Motorcycle Helmet Law Repeal
in Arkansas and Texas



Observed Helmet Use Universal Law vs. May 1998 in Texas and Arkansas

Texas Operator Fatality Rates (FARS and FHWA) 1975-1998



Number (and Percentage) of Head Injuries Among Injured Motorcyclists in Arkansas

	January-July	August-December
1996	51 (18.5%)	36 (21.4%)
1997	56 (20.1%)	56 (26.8%)
1998	99 (31.0%)	66 (23.0%)

August 1, 1997, Arkansas' universal motorcycle helmet law repealed

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16. Abstract

In 1997, Arkansas and Texas became the first states since 1983 to repeal "universal" laws requiring all motorcycle riders to wear helmets. Helmet use under the universal law was 97 percent in statewide surveys (1996 in Arkansas and 1997 in Texas). By May of 1998, observed helmet use had fallen to 52 percent in Arkansas and to 66 percent in Texas. Helmet use among all reported injured motorcyclists in Texas dropped from over 90 percent before the law change in 1997 to 69 percent in the remainder of the year and to 57 percent in 1998. Helmet use of injured young riders still covered by the helmet law also declined. Helmet use among motorcyclists receiving EMS services in Arkansas dropped from about 55 percent in 1996 and in 1997 before the law change, to 33.5 percent in the remainder of 1997 and to 29 percent in 1998. Arkansas EMS data showed an increase in the number of motorcyclists with head injuries. Texas Trauma Registry data showed that the proportion of cases involving head injury increased and that the cost per case of treating head injury increased substantially after the law change. Arkansas motorcycle operator fatalities increased by 21 percent comparing 1998 with 1996. Texas motorcycle operator fatalities increased by 31 percent comparing 1998 with 1996.

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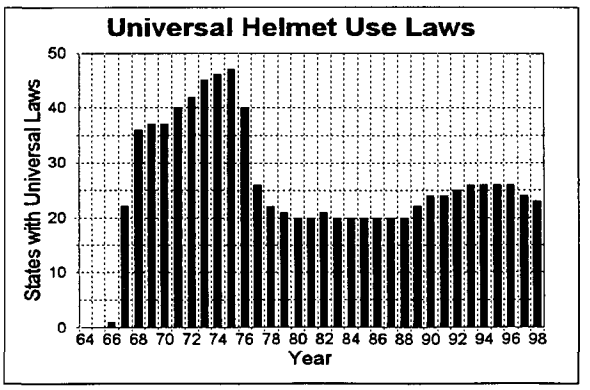
The motorcycle safety standard issued by the Secretary of Transportation in 1967 included the requirement that states adopt laws that mandate helmet use by all motorcycle riders. Twenty-two states had universal helmet use laws in effect by the end of 1967 and 14 more states added laws in 1968. By 1975, 47 states and the District of Columbia had adopted universal helmet use laws. That year, however, Congress dropped its requirement that federal-aid highway construction funds be withheld from states without universal helmet laws. By 1978, half of the states had repealed their universal helmet laws or amended them to cover only riders below a specified age. Three additional states did the same between 1979 and 1983. On the other hand, between 1982 and 1992 seven states instituted or reenacted universal helmet use laws. At the end of 1992, 25 states and the District of Columbia had universal helmet use laws in effect. Another 22 states had laws applicable only to young riders, while three states had no helmet law at all.



In 1997, Arkansas and Texas modified their mandatory helmet use laws. Effective August 1, 1997, Arkansas required helmet use only for riders under age 21, and effective September 1, 1997, Texas required helmet use only for riders under age 21 and for older riders who have not completed a rider education course or who do not have at least $10,000 medical insurance coverage.

This report examines data from Arkansas and Texas to assess the effects of their helmet law changes on helmet use, motorcyclist injuries and fatalities, and motorcyclist injury costs. The report also presents anecdotal information from several motorcyclists who crashed after the laws were changed.

(Continue on additional pages)

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July 1974

Helmet Use

Helmet use decreased substantially following the Arkansas and Texas law changes as shown both in on-street observations of motorcycle riders and in reports covering motorcycle crash victims.

Observed Helmet Use

Survey date	Arkansas	Texas
Under universal helmet law	97 percent	97 percent
May 1998	52 percent	66 percent

Helmet use under the universal law, when all riders were required to wear helmets, was 97 percent in statewide surveys (1996 in Arkansas and 1997 in Texas). By May of 1998, observed helmet use had fallen to 52 percent in Arkansas and to 66 percent in Texas (observations from a special survey conducted for the study in Arkansas and from the regular statewide survey in Texas).

Helmet Use Among Injured Motorcycle Operators in Texas

	January-August		September-December	
Year	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1994	2,335	91.3	1,043	93.2
1995	2,323	91.6	991	92.2
1996	2,278	92.4	1,001	93.1
1997	2,031	90.8	1,003	69.2
1998	2,326	57.0	1,030	57.8

Helmet use among all reported injured motorcyclists in Texas dropped from over 90 percent before the law change in 1997 to 69 percent in the remainder of the year and to 57 percent during 1998.

Helmet use among motorcyclists receiving EMS services in Arkansas dropped from about 55 percent in 1996 and in 1997 before the law change, to 33.5 percent in the remainder of 1997 and below 30 percent in 1998.

Helmet Use Among Injured Motorcycle Operators in Arkansas

Year	January-July		August-December	
	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1996	276	55.8	168	57.7
1997	279	53.0	209	33.5
1998	313	29.1	238	29.8

Fatalities

Compared to the same months in 1996, motorcyclist fatalities did not change significantly in either Arkansas or Texas in the months immediately following modification of the helmet law. However, fatalities in Arkansas increased by 21 percent in the first full year following repeal (1998) compared to the last full year under the universal law (1996). In Texas, operator fatalities increased by 31 percent over these same periods.

Arkansas Motorcycle Operator Fatalities

Year	January-July	August-December
1996	8	11
1997	13	5
1998	16	7

Texas Motorcycle Operator Fatalities

Year	January-August	September-December
1996	70	31
1997	73	33
1998	86	46

Injuries

Arkansas EMS data show an increase in the number of injured motorcyclists, the number of motorcyclists with head injuries, and the proportion of all injured motorcyclists with head injuries after the law change.

Head Injuries Among Injured Motorcycle Operators in Arkansas

	January-July		August-December	
Year	Number with Head Injuries	Percent with Head Injuries	Number with Head Injuries	Percent with Head Injuries
1996	51	18.5	36	21.4
1997	56	20.1	56	26.8
1998	99	31.6	56	23.5

Texas police accident report data show that the number of injured motorcycle operators increased slightly in 1998 compared to 1994-1996. The increases occurred in fatalities and in B and C level injuries. Serious (A) injuries declined.

Costs

Texas Trauma Registry data show that the proportion of motorcyclists treated for traumatic brain injury increased and that treatment costs for traumatic brain injury cases also increased following the law change. Treatment costs for other injury cases did not change markedly.

Conclusions

In 1990, at the request of Congress, the United States General Accounting Office (GAO) reviewed and evaluated the available information on motorcycle helmets and helmet laws. GAO's 1991 report concluded that "helmet use reduces fatality rates and reduces injury severity among survivors of motorcycle accidents" and that "universal helmet laws have been very effective in increasing helmet use, virtually doubling use compared with experience without a law or with a limited law applying only to young riders. Under universal helmet laws, most states experienced 20 to 40 percent lower fatality rates than during periods without laws or under limited laws." Several studies conducted since 1991 provide more recent evidence of the same effects.

The experience to date in Arkansas and Texas is consistent with these conclusions. Arkansas and Texas data show unambiguously that helmet use dropped substantially after they repealed their universal helmet use laws. Fatalities have increased in both states. There is also good evidence that serious head injuries increased.

The evidence supports the conclusion that universal helmet laws are effective: they increase helmet use and decrease motorcyclist injuries and fatalities. They also restrict individual actions by requiring all motorcyclists to wear helmets. Accepting increased deaths and injuries, along with their attendant costs, versus restricting individual actions are at the core of the public policy debate regarding universal motorcycle helmet laws.

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I. INTRODUCTION

In 1997, Arkansas and Texas became the first states since 1983 to repeal laws requiring all motorcycle riders to wear helmets. (More precisely, each state revised its law to require helmet use only for certain motorcycle riders.) These states thus provide a recent opportunity to examine the consequences when most motorcyclists are no longer required to wear helmets.

This report examines data from Arkansas and Texas to assess the effects of their helmet law changes. The report assesses changes in helmet use, motorcyclist injuries and fatalities, and motorcyclist injury costs. The report also presents several case studies: anecdotal information from several motorcyclists who crashed after the laws were changed.

Following this introduction, the report is organized as follows:

- Chapter II, Background, describes how states have enacted, repealed, modified, re-enacted, and re-repealed motorcycle helmet laws and summarizes previous evaluations of the effects of enacting and repealing these laws.
- Chapter III, Data, describes the data that were assembled and used.
- Chapter IV, National Trends, provides national data on motorcycle registrations, travel, and casualties.
- Chapter V, Helmet Use, describes changes in motorcycle helmet use.
- Chapter VI, Fatalities and Injuries, describes changes in motorcycle rider casualties.
- Chapter VII, Injury Costs, presents the limited data on changes in the costs of treating motorcyclist injuries.
- Chapter VIII, Crash Case Studies, presents information from police reports and interviews on several Arkansas and Texas motorcycle crashes after repeal in which a motorcyclist was injured or killed.
- Chapter IX, Conclusions and Discussion, summarizes and discusses the study results.
- Chapter X, References.
- Appendix, State Helmet Law History, summarizes the history of motorcycle helmet laws in each state.

II. BACKGROUND

Motorcycle helmet use laws have been one of the most contentious measures affecting the motoring public. For more than 35 years, states have enacted, amended, repealed, and re-enacted these laws, usually amid intense public debate. Congress has passed legislation affecting state motorcycle helmet laws four times during this period.

Following four years during which no states enacted, amended, or repealed helmet use laws, Arkansas and Texas amended their helmet use laws in 1997. Prior to then, both states required all motorcycle riders to wear helmets. Effective August 1, 1997, Arkansas required helmet use only for riders under age 21, and effective September 1, 1997, Texas required helmet use only for riders under age 21 and for older riders who have not completed a rider education course or who do not have at least $10,000 medical insurance coverage. In 1998, Kentucky also repealed its universal helmet law. Effective July 15, 1998, Kentucky required helmet use only for riders under age 21, riders operating with a learner's permit or with less than one year of riding experience, and riders without health insurance. Effective in June 1999, Louisiana repealed its universal helmet law.

This study evaluates the initial effects of the law changes in Texas and Arkansas, the two states that amended their laws in 1997. To provide the appropriate context for these results, this chapter reviews the history of motorcycle helmet use laws in the United States and summarizes the effects of enacting, amending, and repealing helmet use laws.

LEGISLATIVE HISTORY

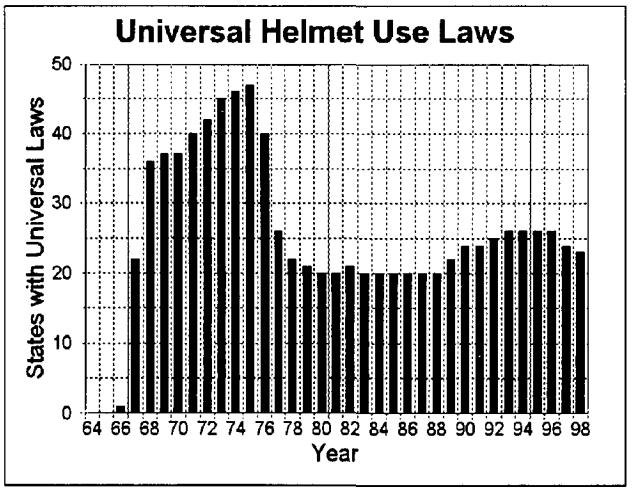
1966-1975: Most States Enact Universal Helmet Use Laws in Response to a Federal Requirement

Prior to 1966, no state had enacted a motorcycle helmet use law. The Highway Safety Act of 1966 (P.L. 89-564) changed this situation abruptly. The Act required the Secretary of Transportation to set uniform standards for state highway safety programs. One of these standards, issued in 1967, dealt with motorcycle safety. It included the requirement that states adopt universal helmet use laws -- laws that mandate helmet use by all motorcycle riders. States that failed to comply would lose a portion of their federal-aid highway construction funds.

States immediately began to enact and implement universal helmet laws. Twenty-two states had universal helmet use laws in effect by the end of 1967 and 14 more states added laws in 1968. By 1975, 47 states and the District of Columbia had adopted universal helmet use laws. The Appendix documents each state's helmet law history. Figure 1 tracks the number of states with a universal helmet law in effect at the end of each year, beginning in 1966.

From the first, helmet use laws generated controversy. The Illinois law, effective in 1967, was repealed in 1969 after being declared unconstitutional by the Illinois Supreme Court.

Figure 1



Michigan enacted a universal helmet law in 1967, repealed it in 1968, and enacted it again in 1969. Kansas enacted a universal helmet law in 1967, amended it to cover only riders under 21 in 1970, and reinstated universal coverage in 1972. Oklahoma did likewise, enacting a universal helmet law in 1967, amending it to cover only riders under 21 in 1969, and reinstating universal coverage in 1975 (finally amending it again in 1976 to cover only riders under 18).

1976-1980: Half the States Repeal or Amend their Universal Helmet Use Laws after Congress Eliminates Sanctions

In 1975, under the authority of the Highway Safety Act of 1966, the Secretary of Transportation was prepared to penalize the three states (California, Illinois, and Utah) still lacking universal helmet laws by withholding the specified portion of their federal-aid highway construction funds. This action prompted Congress to amend the Highway Safety Act. Congress eliminated the Secretary's ability to establish a motorcycle helmet law requirement or to impose penalties on states without universal motorcycle helmet laws. Freed of the Federal requirement, many states reconsidered their laws. By 1978, 25 states had repealed their universal helmet laws or amended them to cover only riders below a specified age (typically 18). Two more states did the same in 1979 and 1980, respectively, reducing the total number of states with universal helmet laws to 19 and the District of Columbia.

1981-1988: Period of Stability

In contrast to the furious pace of the preceding 15 years, the 1980s saw little legislation. In 1983, Wyoming became the twenty-eighth state to repeal its universal law and require use only by riders under 18. In 1982, Louisiana re-enacted the universal use law it had repealed in 1976.

1989-1994: Gradual Re-enactment and Congressional Encouragement

Two very disparate states -- Oregon and Texas -- re-enacted universal helmet use laws in 1989. Nebraska and Washington followed suit in 1990, as did Maryland in 1992. California, a state with more then 10 percent of the nation's registered motorcycles and one of only two states that had never had a helmet use law applicable to adults, implemented a universal law in 1992 following extensive debate and publicity. From 1992 to 1996, 25 states and the District of Columbia had universal helmet use laws in effect. Another 22 states had laws applicable only to young riders (usually those under the age of 18), while three states (Colorado, Illinois, and Iowa) had no helmet law at all.

During this time Congress once again took an interest in motorcycle helmets. In April 1990, Senators Moynihan and Chafee requested the United States General Accounting Office (GAO) to review and evaluate the available information on helmet effectiveness in preventing deaths and serious injuries, the effect of helmet laws on helmet use and motorcycle rider fatalities, and the costs to society of injuries to unhelmeted motorcyclists. GAO conducted the requested review and reported to Congress in July 1991. The report concluded that "helmet use reduces fatality rates and reduces injury severity among survivors of motorcycle accidents" and that "universal helmet laws have been very effective in increasing helmet use, virtually doubling use compared with experience without a law or with a limited law applying only to young riders. Under universal helmet laws, most states experienced 20 to 40 percent lower fatality rates than during periods without laws or under limited laws." The report recommended that "because there is convincing evidence that helmets save lives and reduce society's burden of caring for injured riders, the Congress may wish to consider encouraging states to enact and retain universal helmet laws. The Congress could return to the use of penalties [as in the 1966 Act], use incentives (e.g., making additional funds available to states that have universal laws), or use a combination of penalties and incentives" (GAO, 1991, p. 31).

With the GAO report findings as support, Congress used both *a carrot and a stick* to promote universal helmet laws as part of the Intermodal Surface Transportation Efficiency Act of 1991, commonly known as ISTEA. The *carrot* was additional federal funding for states. ISTEA provided special "incentive" grants to states with both universal motorcycle helmet laws and passenger vehicle safety belt use laws. A state qualified for a first-year grant by having these two laws in effect. In subsequent years, the state also was required to exceed minimum motorcycle helmet and safety belt use levels (helmet use of 75 percent in the second year and 85 percent in the third year). Twenty-three states and the District of Columbia received grants for one or more of the fiscal years 1992, 1993, and 1994 for which the grants were authorized.

As the *stick*, ISTEA provided that states without both a universal motorcycle helmet law and a safety belt use law by October 1, 1993, would have a portion of their fiscal year 1995 Federal-aid highway funds transferred to their highway safety programs. As most states had safety belt use laws in place, the provision's main goal was to encourage states to enact universal helmet laws.

The *carrot and stick* had little effect on state motorcycle helmet laws. Maryland has been the only state to enact a universal helmet law since 1992. At the end of fiscal year 1995, twenty-three states had safety belt use laws but did not have universal helmet laws by October 1993 and consequently saw the specified portion of their Federal-aid highway funds transferred in that fiscal year. Three additional states had a universal helmet law but lacked a safety belt use law, and two states lacked both laws.

1995-1998: Congress Acts Again; Three States Drop Universal Helmet Laws

In November 1995, as part of the National Highway System Designation Act, Congress repealed the ISTEA transfer provision for states lacking universal helmet laws, effective with fiscal year 1996. Efforts to amend or repeal universal helmet laws grew in many states. Arkansas and Texas dropped their universal helmet laws in 1997 and Kentucky did the same in 1998. As of May 1999, 22 states had universal helmet laws in effect. Another 25 states had laws applicable only to some riders (typically riders under a specified age), while three states had no helmet law at all. Louisiana then repealed its universal law effective June 1999.

STUDIES OF HELMET USE LAW EFFECTS

The effects of state helmet law enactment and repeal have been studied in great detail. GAO's 1991 review summarizes all studies available in 1990. The GAO study and studies that have appeared since the GAO review are discussed below.

1991 GAO Review of Helmet Use Law Studies

GAO conducted a broad search for studies as of 1990 and discovered 46 that were published between 1975 and 1990, used data from the United States, and "contained original data or original analyses and met minimum criteria for methodological soundness" (GAO, 1991, p. 2).

GAO found nine studies that included data on helmet use in states with and without universal laws. These studies:

> *"reported that helmet use under universal laws ranged from 92 to 100 percent, while without a law or under a limited law [requiring only some riders to wear helmets], helmet use generally ranged from 42 to 59 percent. These data also indicated low helmet use among young riders in states with limited helmet laws"* (GAO, 1991, p. 4).

GAO found twenty studies that compared motorcycle rider fatality rates under universal helmet laws with rates during periods before enactment or after repeal of these laws.

> *"These studies consistently showed that fatality rates were lower when universal helmet laws were in effect; most rates ranged from 20 to 40 percent lower. Several of these studies compared periods before a helmet law was enacted, while it was in effect, and*

after it was repealed. They showed that the decreases in fatality rates when laws were enacted were matched by comparable increases when the laws were repealed" (GAO, 1991, p. 4)].

GAO found thirteen studies with data on some aspect of the societal costs of motorcycle accidents.

"These studies indicated that nonhelmeted riders were more likely to (1) need ambulance service, (2) be admitted to a hospital as an inpatient, (3) have higher hospital charges, (4) need neurosurgery and intensive care, (5) need rehabilitation, and (6) be permanently impaired and need long-term care" (GAO, 1991, p. 4).

Studies Since 1990

Several studies have appeared since GAO's review. Some investigate the effects of recently-enacted helmet laws in California, Nebraska, Texas, and Washington. One uses new data to examine effects in several states. Others provide new data on the effectiveness of helmets in preventing injury.

California's universal helmet law became effective in January 1992. Kraus, Peek, and Williams (1995) observed helmet use at 60 locations in seven California counties, twice before and four times after California's law became effective. They concluded that helmet use increased from about 50 percent in 1991 to more than 99 percent in 1992.

Kraus et al. (1994) compared California's motorcycle crash experience in 1991, before the law, with 1992, after the universal law. Motorcycle fatalities statewide decreased 37 percent, from 523 in 1991 to 327 in 1992. The fatality rate per registered motorcycle decreased 26 percent.

Kraus and Peek (1995) studied injured motorcyclists treated at 18 hospitals in 10 California counties between January 1, 1991 and December 31, 1993 (2037 patients in 1991, before the law, and 2753 in 1992 and 1993, after the law). Helmet use among these injured motorcyclists rose from 30 percent in 1991 to 86 percent in 1992 and 88 percent in 1993. Both the severity and number of head injuries per rider decreased after the law.

Nebraska's universal helmet law became effective in January 1989; a previous universal law had been declared unconstitutional by the Nebraska Supreme Court and was repealed in 1977. Mulleman, Mlinek, and Collicott (1991) observed a 26 percent reduction in crashes per registered motorcycle in the following year, compared to the five previous years and to five adjoining states without universal helmet laws. They also studied all motorcyclists with reported crash injuries in two urban counties during 1988 and 1989 (421 in 1998 and 250 in 1989). They found that the universal law produced sharp declines in the numbers and rates of injuries, hospital transports, hospital admissions, severe injuries to the head, and deaths.

Texas enacted a universal helmet use law in 1968, repealed it in 1977 and required helmet use only for riders under 18, and re-enacted a universal helmet law in 1989. Lund, Williams, and Womack (1991) present data showing that helmet use increased from less than 50 percent just before the 1989 universal law to 90 percent immediately after the law became effective and to 95 percent two months later.

Mounce et al. (1992) found an 11 percent reduction in serious injury crashes per registered motorcycle after the law, using police-reported data. Hospital data from the first nine months after the law showed that motorcyclists injured after the law suffered less serious injuries and were less likely to have head or face injuries than motorcyclists injured before the law. Fleming and Becker (1992) found a 13 percent reduction in fatalities and in severe injuries in the first 12 months after the universal law was reinstated, after using time series methods to control for long-term declines in motorcycle fatalities. They found a 57 percent decrease in head-related fatalities and a 55 percent reduction in severe head-related injuries among hospital-admitted motorcyclists.

Washington's universal helmet law became effective in June 1990. Mock et al. (1995) analyzed 992 motorcycle crash victims admitted to the Seattle region's only level 1 trauma center from 1986 through 1993. They found that severe head injuries decreased from 20 percent of all admitted patients before the law to 9 percent after the law. Mortality among admitted patients decreased following the law.

Multi-state. As part of the 1991 ISTEA legislation, Congress required NHTSA to study the effects of safety belt and motorcycle helmet use in crashes. NHTSA conducted the analysis using its Crash Outcome Data Evaluation System (CODES) data system, in which seven states linked data from their police crash reports, emergency medical services, hospital emergency departments, hospital discharge files, claims and other sources. NHTSA's 1996 Report to Congress found that "motorcycle helmet effectiveness ranged from 9 percent in preventing any kind of injury to 35 percent in preventing a fatality." "The average inpatient charge for motorcycle crash victims receiving inpatient care was $14,377 for those who used helmets, and $15,578 for those who did not" (NHTSA, 1996).

Additional analyses of the CODES data showed that helmet use for motorcycle riders involved in crashes ranged from 80 to 98 percent in three CODES states with universal helmet laws and from 30 to 49 percent in three CODES states without universal laws. Helmets were found to be 36 percent effective in preventing death and 65 percent effective in preventing brain injuries in a crash (NHTSA, 1998a).

Sosin, Sacks, and Wilson (1990) used National Center for Health Statistics Multiple Cause of Death data to study motorcycle fatalities from 1979 through 1986. They found that 53 percent of the 28,749 motorcycle fatalities were associated with head injuries. Rates per population for motorcycle fatalities associated with head injury (adjusted by age, sex, and race) were almost twice as high in states without universal helmet laws as in states with universal helmet laws. Fatalities per registered motorcycle also were greater in states without universal helmet laws. In the two states that dropped universal coverage during the study period, motorcyclist fatalities per

population rose substantially: by 184 percent in South Carolina and by 73 percent in Wyoming. In Louisiana, the one state that introduced a universal law, the population based motorcyclist fatality rate fell 44 percent.

Helmet effects. Kelley et al. (1991) studied 398 motorcycle crash victims in eight Illinois medical centers from April through October 1988. Illinois had no helmet law at that time. They concluded that unhelmeted patients had higher overall injuries (measured by the Injury Severity Score) and more frequent head and neck injuries than helmeted motorcyclists.

Kraus et al. (1995) studied 174 fatally injured and 379 nonfatally injured crash-involved motorcyclists in Los Angeles County, California, in 1988-1989, before California's universal helmet law. They concluded that "those not using helmets where helmet use is voluntary are a higher risk population than helmet users. They are more likely to be involved in crashes but, because they are unhelmeted, less likely to be protected against serious head injury."

Rowland et al. (1996) studied 86 fatally injured and 386 hospitalized motorcyclists in the state of Washington in 1989 (when Washington's helmet law covered only riders under age 18). They concluded that "motorcycle helmet use is strongly and independently associated with reduced likelihood and severity of head injury, reduced overall injury severity, and reduced probability of motorcycle-related hospitalization and death attributable to head injury."

Sakar, Peek, and Kraus (1995) studied 173 fatally injured motorcyclists in Los Angeles County, California between July 1, 1988, and October 31, 1989. They concluded that head and cervical spine injuries were more frequent in unhelmeted than in helmeted fatally injured motorcyclists.

Summary

The studies since the GAO report confirm GAO's conclusions with more recent data. All studies concluded that universal motorcycle helmet laws raise helmet use to 90 percent or higher from pre-law levels of 50 percent or lower. Universal laws reduce motorcycle fatalities, fatality rates, and severe head injuries. The studies also confirm that helmets reduce the probability of injury, of head injury, and of fatality for crash-involved motorcyclists.

III. DATA

Data for the study were obtained from the following sources. The data are discussed in more detail in the chapters where they are used.

Motorcyclist fatalities, 1975-1998, from NHTSA's FARS

Motorcycle registrations, 1975-1998, from FHWA

Motorcycle miles of travel, 1975-1998, from FHWA

Arkansas motorcycle crashes, 1996-1998, from the Arkansas EMS Pre-Hospital Care data file (statewide excluding Little Rock)

Arkansas Hospital Discharge Data, 1996-1997, from the Arkansas Department of Health, who also matched EMS and Hospital Discharge records

Arkansas helmet use observations: statewide observations in 1996 from the Arkansas occupant protection survey; observations made in selected counties in November 1997 and May 1998 for this project

Texas motorcycle crashes, 1994-1998, from the Texas Department of Public Safety (DPS)

Texas Trauma Registry data, 1996-1997, from the Texas Department of Health, which also matched motorcycle crash data from the Texas DPS with Trauma Registry cases

Texas helmet use observations: statewide observations in 1997 and 1998 from the Texas Transportation Institute's occupant protection survey; observations made in selected cities in November 1997 for this study

Oklahoma motorcycle crashes, 1996-1997, from the Oklahoma EMS Pre-Hospital Care data file.

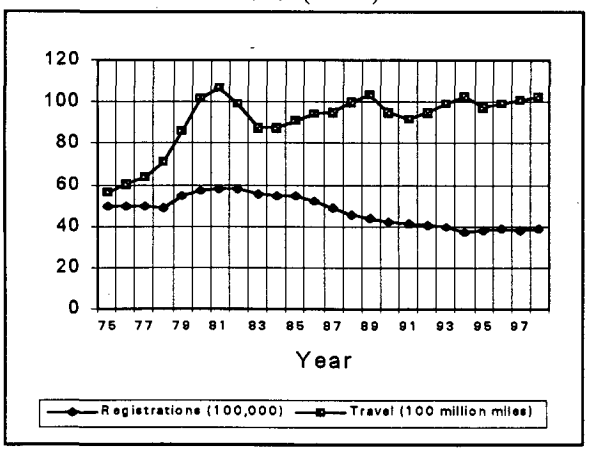
IV. NATIONAL TRENDS

Motorcycle registration, travel, and casualty trends in the United States differ considerably from passenger vehicle trends. This chapter examines these trends briefly to provide context for the Arkansas and Texas experience.

REGISTRATIONS AND TRAVEL

Table 1 shows the number of registered motorcycles reported for the United States (as well as Arkansas and Texas) for the years 1975 through 1998 and the estimated national annual miles of travel for motorcycles. Figure 2 shows the national trend data graphically.

Figure 2. US Motorcycle Registrations and Travel (FHWA)



Motorcycle registrations peaked in 1981 at 5.8 million then declined gradually but steadily until about 1994. Registrations in more recent years have been relatively steady. The 1998 motorcycle registration level of approximately 3.9 million is 33 percent below the 1981 peak. Motorcycle travel, on the other hand, has fluctuated between about 9 and 10 billion miles annually since reaching that level in 1981. This means that the average annual miles driven per registered motorcycle have increased from 1,134 in 1975 to 1,833 in 1981 and to 2,645 in 1998. The smaller number of registered motorcycles and the larger annual mileage per motorcycle suggests that the typical motorcyclist in 1998 rides more miles and may be a more experienced motorcycle operator than the typical motorcyclist 20 years ago.

Motorcycle registrations in Texas peaked in 1981, at the same time as registrations nationally, and then declined substantially. Texas registrations in 1998 were 56 percent below the 1981 peak. Registrations in Arkansas were somewhat more variable but also have declined substantially since 1980. Registrations in 1998 were 38 percent below the 1980 level. Figures 3 and 4 illustrate Arkansas and Texas motorcycle registration trends. Accurate motorcycle travel data by state are not available.

FATALITIES AND INJURIES

Table 2 gives the number of motorcycle operators killed in the United States each year from 1975 to 1998, the proportion that were helmeted, and the fatality rates per 10,000 registered motorcycles and per mile traveled. Figures 5 and 6 display the information graphically.

Table 1. Motorcycle Registrations and Travel, 1975-1998

Year	Registrations - US	Registrations - Arkansas	Registrations - Texas	Travel - US (million miles)
1975	4,964,070	36,954	273,863	5,629
1976	4,933,332	33,096	270,089	6,003
1977	4,933,256	31,351	285,735	6,349
1978	4,867,855	31,399	218,966	7,158
1979	5,422,132	33,462	291,510	8,637
1980	5,693,940	34,153	316,318	10,214
1981	5,831,132	30,432	338,141	10,690
1982	5,753,858	25,976	337,756	9,910
1983	5,585,112	23,804	326,293	8,760
1984	5,479,822	28,161	312,393	8,784
1985	5,444,404	28,886	281,027	9,086
1986	5,198,993	24,114	252,382	9,397
1987	4,885,772	20,077	229,704	9,506
1988	4,584,284	16,608	211,668	10,024
1989	4,420,420	15,142	191,520	10,371
1990	4,259,462	14,556	174,334	9,557
1991	4,177,365	14,000	185,167	9,178
1992	4,065,118	13,906	164,147	9,557
1993	3,977,856	13,809	143,772	9,906
1994	3,756,555	14,374	146,948	10,240
1995	3,767,029	17,217	130,117	9,797
1996	3,871,599	16,490	148,815	9,920
1997	3,826,373	14,331	133,423	10,076
1998	3,879,450	21,070	149,175	10,260

Source: FHWA

Table 2. United States Motorcycle Operator Fatalities and Fatality Rates, 1975-1998

Year	Operator Fatalities	Percent Helmeted	Fatalities per 10,000 Motorcycles	Fatalities per 10M VMT
1975	2,727	63.5	5.49	4.84
1976	2,825	59.7	5.73	4.71
1977	3,488	59.9	7.07	5.49
1978	3,847	50.3	7.90	5.37
1979	4,067	46.5	7.50	4.71
1980	4,309	43.8	7.57	4.22
1981	4,152	44.7	7.12	3.88
1982	3,726	46.8	6.48	3.76
1983	3,594	44.3	6.43	4.10
1984	3,902	45.4	7.12	4.44
1985	3,898	43.9	7.16	4.29
1986	3,790	45.9	7.29	4.03
1987	3,411	43.1	6.98	3.59
1988	3,140	43.1	6.85	3.13
1989	2,687	43.9	6.08	2.59
1990	2,791	47.5	6.55	2.92
1991	2,405	47.3	5.76	2.62
1992	2,079	58.8	5.11	2.18
1993	2,110	59.1	5.30	2.13
1994	1,970	56.5	5.24	1.92
1995	1,914	58.8	4.91	1.95
1996	1,853	58.6	4.79	1.87
1997	1,845	59.3	4.82	1.83
1998	1,981	56.1	5.11	1.93

Source: FARS; operators of mopeds, off-road motorcycles, motor scooters, etc., are excluded

Figure 3. Arkansas Motorcycle Registrations (FHWA)

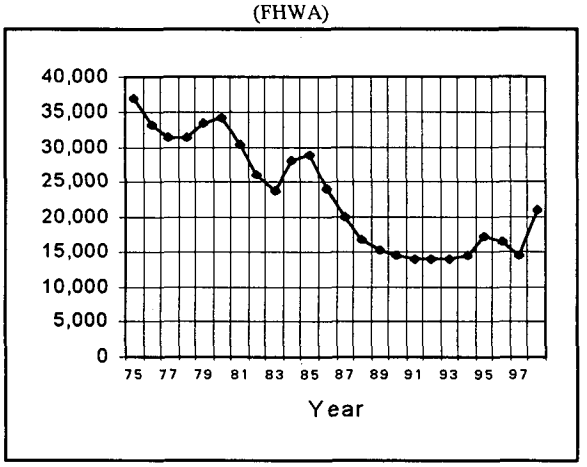
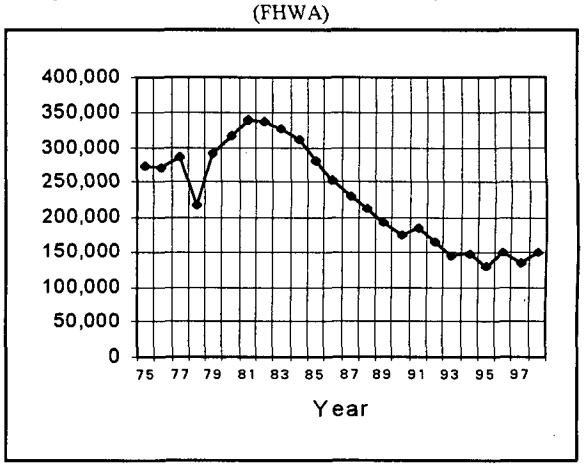


Figure 4. Texas Motorcycle Registrations (FHWA)



T

able 2 and Figure 5 show that motorcycle operator fatalities peaked in 1980, at about the same time that motorcycle registrations were highest, and also have declined gradually but steadily since then. Table 2 and Figure 6 show that fatality rates also peaked at the same time (1977 for fatalities per mile and 1978 for fatalities per registered motorcycle) and also declined subsequently. Measured in either way, motorcycling has become safer in the last two decades.

Figure 5. Motorcycle Operator Fatalities (FARS)

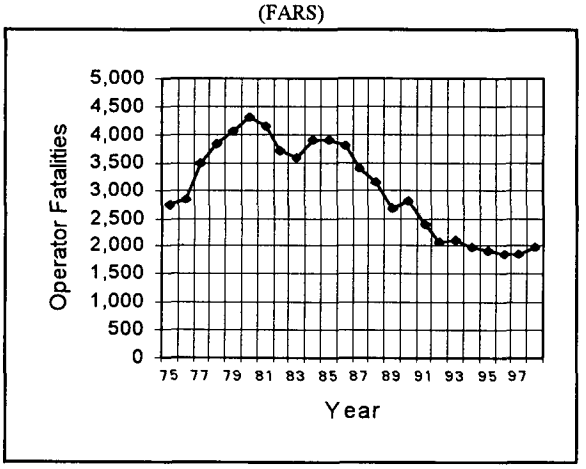
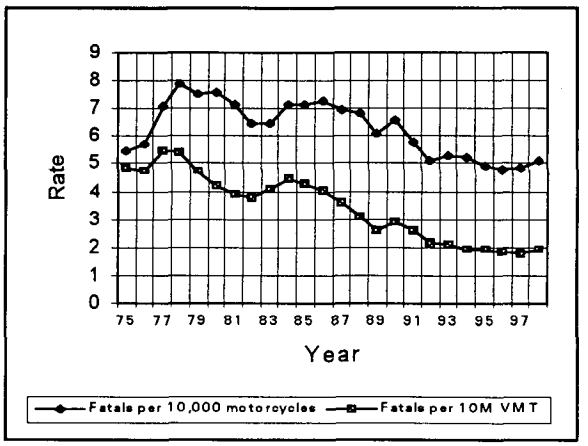


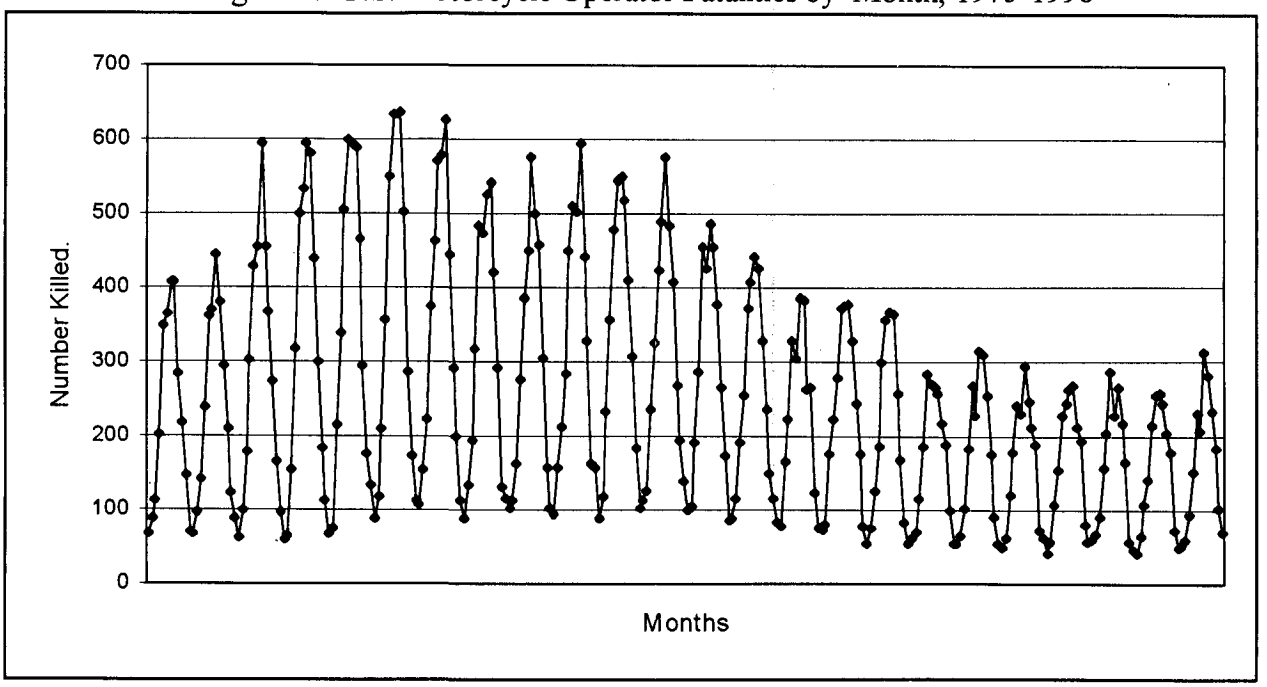
Figure 6. Motorcycle Operator Fatality Rates (FARS)



Since 1988, NHTSA's General Estimates System has used information from police crash reports to estimate the number of motorcyclists with any police-reported injury. The estimated number of injured motorcycle riders annually has decreased by almost 50 percent during this time, from 105,000 in 1988 to 49,000 in 1998 (NHTSA, 1999). Since these estimates are based on a relatively small sample of motorcycle crashes, the actual number of injuries may differ from the estimates by as much as 20 percent (see NHTSA, 1999, p. 192). Nevertheless, they provide additional evidence that motorcycling has become safer since 1988.

Motorcycle travel is far more common in warm weather than in cold. Figure 7 illustrates this by showing the number of motorcycle operators killed in the U.S. each month from 1975 through 1998. As expected, many more fatalities occurred during the warmer months when ridership is greater. The peaks in the figure generally are in the month of July while the valleys are in December or January. Helmet use also changes with the season, with higher use generally found during the winter than the summer months.

Figure 7. U.S. Motorcycle Operator Fatalities by Month, 1975-1998



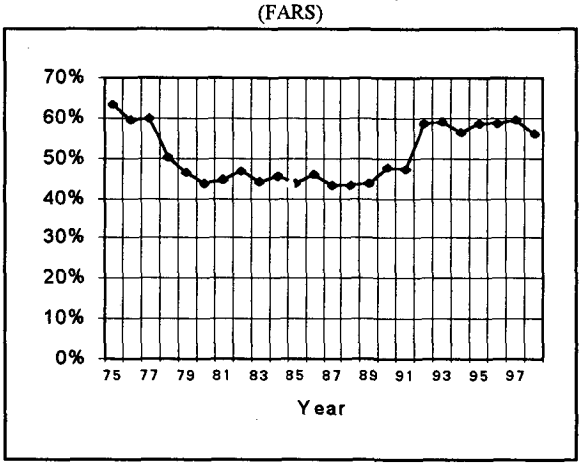
HELMET USE

The percentage of fatally injured operators who were helmeted began to decline in 1978, reached a low in 1987-1988, and has been climbing since. Figure 8 shows the trend graphically. The substantial increase in 1992 may be influenced by California, where the universal helmet law became effective on January 1, 1992.

Observed helmet use by fatally injured motorcycle operators will be lower than helmet use observed for all motorcycle operators on the road for two reasons. First, helmeted operators in a severe crash are less likely to die than unhelmeted operators. Second, some studies have found that operators who do not wear helmets are more likely to be involved in crashes (see Kraus et al. 1995). While the second effect cannot be estimated, the first can. The following example illustrates the effect.

Assume that helmets are 29 percent effective in preventing fatal injuries to motorcycle operators in severe crashes, as estimated by NHTSA (Wilson, 1989). Assume also that 50 percent of operators wear helmets and that an equal number of helmeted and unhelmeted operators suffer a severe crash. Of each 1,000 operators involved in a severe crash, the 500 unhelmeted operators will all die, but 29 percent, or 145, of the 500 helmeted operators will survive. The fatalities will then consist of 500 unhelmeted and 355 helmeted victims. Helmet use among the fatalities will be 355/855, which is 42 percent, less than the 50 percent use rate for operators on the road.

Figure 8. U.S. Operator Fatality Helmet Use
(FARS)



V. HELMET USE

Helmet use decreases following the Arkansas and Texas law changes were apparent both in on-street observations of motorcycle riders and in reports covering motorcycle crash victims.

OBSERVED HELMET USE

Arkansas

Motorcycle helmet use in Arkansas was observed in the summer of 1996 as part of a statewide occupant protection survey. Helmet use was recorded for 30 minutes each at 288 sites randomly selected throughout the state; 177 motorcyclists were observed (Peters, 1996). Helmet use was recorded in November 1997 and May 1998 for this evaluation, using counties and sites from the Peters survey that typically produced the most motorcyclists and that were generally geographically representative of the state. Observations were made in five counties using six or seven locations in each county. Only 11 motorcyclists were observed in the November survey while 122 were observed at the same sites in May 1998.

Helmet use in the 1996 statewide survey was 97 percent. By November 1997, two months after the law change, 82 percent of the 11 observed cyclists were helmeted. In May 1998, helmet use had dropped to 52 percent with an additional 2 percent wearing a fake helmet (i.e., headgear that simulates the appearance of a helmet but without substantial protective value).

Table 3. Observed Helmet Use in Arkansas

Time	Observations	Observed Helmet Use
Summer 1996 (pre-law); Peters; statewide	177	97 percent
November 1997 (post-law); selected counties	11	82 percent
May 1998 (post-law); selected counties	122	52 percent

Texas

Motorcycle helmet use was observed in May of 1997 and 1998 by the Texas Transportation Institute (TTI) as part of the annual Texas occupant protection survey. Helmet use was recorded in November 1997 for this evaluation. As in Arkansas, the November observations were conducted at cities and sites used in the TTI survey that typically produced the most motorcyclists and were broadly representative of Texas. The May surveys recorded helmet

use for 1 hour each at 277 sites randomly selected throughout the state. The November observations were made in seven cities using four or five locations in each city. A total of 112 motorcyclists were observed.

Helmet use dropped from 97 percent in May 1997, three months before the law change, to 77 percent three months after the universal helmet law was dropped with an additional 3 percent wearing a fake helmet. By May 1998, helmet use decreased further to 66 percent.

Table 4. Observed Helmet Use in Texas

Time	Observations	Observed Helmet Use
May 1997 (pre-law); TTI; statewide	393	97 percent
November 1997 (post-law); selected cities	112	77 percent
May 1998 (post-law); TTI; statewide	483	66 percent

In both states, the surveys conducted for this study used fewer sites than the statewide surveys. Consequently, the results are not directly comparable and the use rates observed may differ from statewide use rates. The surveys do show clearly that motorcycle helmet use among riders on the road decreased substantially in both Arkansas and Texas shortly after the law changes became effective.

HELMET USE AMONG INJURED CYCLISTS

Helmet use among injured motorcyclists may be lower than helmet use observed on the road for the same two reasons noted in Chapter IV. Helmets prevent many head and face injuries in a crash. However, a helmeted motorcyclist in a crash may receive other injuries, so still may be recorded as injured. And there is some evidence that unhelmeted motorcyclists may be involved in crashes more frequently than helmeted motorcyclists.

Arkansas

Table 5 shows that helmet use among motorcyclists receiving EMS services was about 55 percent in 1996 and in 1997 through July. In August through December 1997, the five months following the law change, helmet use dropped to 33.5 percent. In 1998, the first full year without a universal helmet law, helmet use was 29.0 percent during the months of January-July and 29.8 percent in August -December.

Table 5. Helmet Use Among Motorcyclists Treated by EMS in Arkansas

Year	January-July		August-December	
	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1996	276	55.8	168	57.7
1997	279	53.0	209	33.5
1998	313	29.1	238	29.8

Texas

Table 6 shows similar results for injured motorcyclists in Texas, as reported by the Texas Department of Public Safety (DPS). For operators whose helmet use was known, helmet use was 91 to 93 percent from 1994 through August 1997 and dropped to 69 percent in September through December 1997, the first four months following the law change. In 1998, the first full year following the law change, helmet use was 57.0 percent during January-August and 57.8 percent during September-December.

Table 6. Helmet Use Among Injured Motorcycle Operators in Texas

Year	January-August		September-December	
	Number Injured	Percent Helmeted*	Number Injured	Percent Helmeted*
1994	2,335	91.3	1,043	93.2
1995	2,323	91.6	991	92.2
1996	2,278	92.4	1,001	93.1
1997	2,031	90.8	1,003	69.2
1998	2,326	57.0	1,030	57.8

* Operators with unknown helmet use excluded from helmet use percentages: 310 in 1994, 301 in 1995, 209 in 1996, 358 in 1997, and 270 in 1998.

The Texas DPS data also provide information on helmet use among young motorcyclists who were still required to wear helmets after the Texas law changed. Prior to 1998, the Texas crash data base included operator year of birth but not age. The operators tabulated in Table 7 are those included in Table 6 who would not have turned 21 in the year of their crash. For example, someone born in 1976 would have turned 21 sometime in 1997. Only persons born after

1976 are included in the 1997 row of Table 7. In 1998, the DPS system was changed to record driver age directly. The Table 7 row for 1998, therefore, is for operators who were under the age of 21 at the time of their crash.

Table 7 shows that these young injured motorcycle operators had a somewhat lower helmet use rate under the universal helmet law than older injured operators. After the law change, their helmet use dropped, but not as much as for the older injured operators.

Table 7. Helmet Use Among Injured Young Motorcycle Operators in Texas

Year	January-August		September-December	
	Number Injured	Percent Helmeted*	Number Injured	Percent Helmeted*
1994	333	83.9	186	85.6
1995	330	84.0	137	87.3
1996	268	85.8	131	90.2
1997	230	82.7	125	78.8
1998	288	64.0	120	64.3

* Operators with unknown helmet use excluded from helmet use percentages: 47 in 1994, 41 in 1995, 24 in 1996, 40 in 1997, and 21 in 1998

Texas fatality data provide a longer view on the effects of helmet laws on helmet use. Recall that Texas had a universal helmet law in force from January 1968 through August 1977, a law covering only riders under 18 from September 1977 through August 1989, a universal helmet law again from September 1989 through August 1997, and a law covering only young, untrained, and uninsured riders after September 1, 1997. From 1975 through 1998, the months of January through August had universal helmet laws in place 11 times and not in place 13 times, while the months of September through December had universal laws in place 10 times and not in place 14 times. Table 8 shows the average number of motorcycle operator fatalities by month when the universal laws were or were not in effect and the percentage of the fatally injured operators who were helmeted.

Table 8 shows that helmet use was substantially higher when universal helmet laws were in effect. For example, helmet use by operators killed in Januaries was 87 percent when there was a universal law and 33 percent when there was not. Table 8 also shows for each month, that the average number of operators killed was lower when universal laws were in effect than when they were not. In addition, the Table shows how operator fatalities vary by season: higher in summer months and lower in winter months.

Figure 9 plots the monthly helmet use data of Table 8. It shows how helmet use rises and falls depending on whether a universal helmet law is in effect.

Table 8. Average Number of Operators Killed and Percent Helmeted in Texas for Months With and Without a Universal Helmet Law, 1975-1998

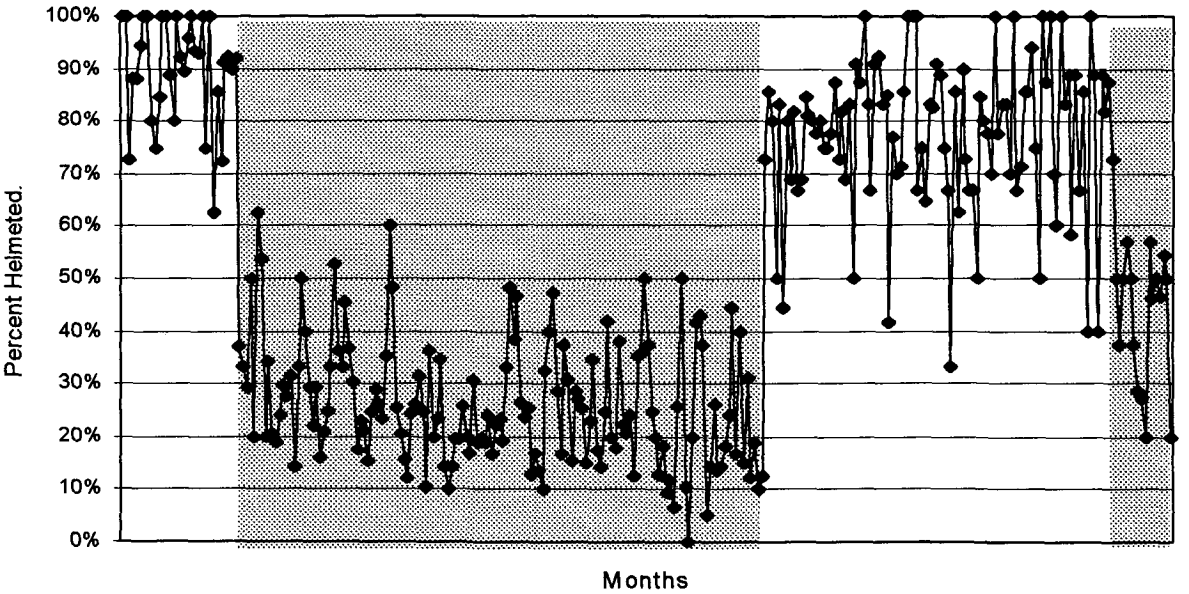
	Average Number of Operators Killed		Percent Helmeted	
Month	Universal Helmet Law	No Universal Law	Universal Helmet Law	No Universal Law
January	6.5	9.4	87	33
February	6.1	11.0	78	37
March	10.1	21.3	83	31
April	12.2	29.8	78	25
May	10.7	32.5	81	21
June	14.5	28.7	84	20
July	16.1	33.8	79	19
August	14.3	35.4	89	19
September	14.9	30.0	78	25
October	13.3	22.1	84	34
November	8.8	17.3	80	32
December	5.6	13.4	75	28

Source FARS 1975-1998

Summary

In both states, universal helmet law repeal clearly led to prompt decreases in helmet use. Observed helmet use in both states dropped within a year from over 95 percent to 52 - 66 percent. Helmet use among treated or injured motorcyclists in both states dropped by about 25 percentage points during the first four or five months following repeal. Helmet use among young injured motorcycle operators in Texas, who were still required to wear helmets after the law change, also dropped immediately after the law change and continued to drop the next year.

Figure 9. Percent of Fatally Injured Texas Motorcycle Operators Helmeted by Month, 1975-1998



Shaded areas contain months without universal helmet law.

VI. FATALITIES AND INJURIES

FATALITIES

Arkansas

Arkansas has relatively few motorcycle fatalities. During the period from 1975 to 1998, Arkansas averaged 24 motorcycle operator fatalities annually compared to 222 annually in Texas. Motorcycle operator fatalities during the winter months are almost nonexistent. Figure 10 plots annual fatalities; data are found in Table 9. Note that the small absolute number of fatalities each year means that there can be large relative changes from year to year quite by chance. For example, fatalities jumped 235% in 1983, from 17 in 1982 to 40. Fatalities then dropped 35% back to 26 in 1984. Overall, Arkansas motorcycle operator fatalities had been decreasing gradually since the early 1980s in line with the national trend. Prior to 1998, they had not exceeded 21 annually since 1990, while only two years before 1990 had fatality counts below 20. Arkansas had a universal helmet law in force throughout this period until August 1, 1997. In 1998, fatalities rose to 23.

Figure 10. Arkansas Operator Fatalities
(FARS)

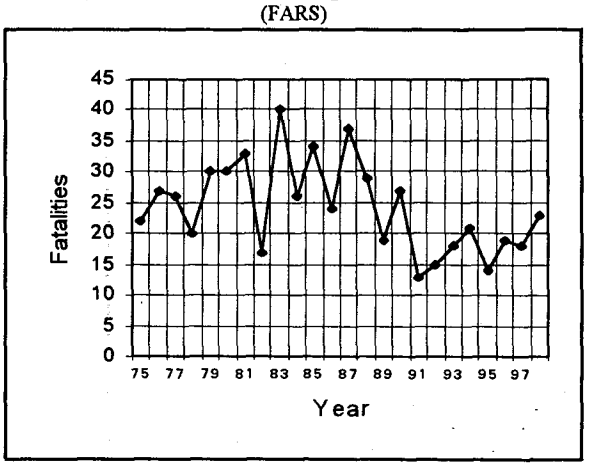


Figure 11. Arkansas Operator Fatality Rates
(FARS and FHWA)

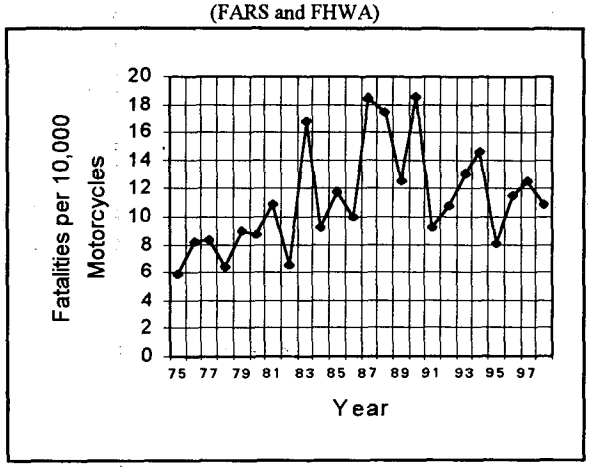


Figure 11 shows the Arkansas trend of fatalities per registered motorcycle; again, data may be found in Table 9. As with the fatality counts, the fatality rates are quite erratic from year to year. Overall, Arkansas fatality rates are somewhat higher in recent years than before about 1985.

There were 5 motorcycle operator fatalities in Arkansas from August through December 1997, the first five months following the law change. Table 10 gives motorcycle operator fatalities for the 1996, 1997 and 1998. The 5 post-law fatalities in August through December 1997 are substantially less than the 11 from the same months of 1996, but with such small numbers the difference is not statistically significant and may have occurred by chance. The January-July total in 1998 (16) was higher than in the two years earlier, while the August-December 1998 total remained below the comparable period in 1996.

Table 9. Arkansas and Texas Motorcycle Operator Fatalities and Fatality Rates, 1975-1998

Year	Arkansas Operator Fatalities	Fatalities per 10,000 Motorcycles	Texas Operator Fatalities	Fatalities per 10,000 Motorcycles
1975	22	5.95	167	6.10
1976	27	8.16	156	5.78
1977	26	8.29	232	8.12
1978	20	6.37	260	11.87
1979	30	8.97	286	9.81
1980	30	8.78	323	10.21
1981	33	10.84	372	11.00
1982	17	6.54	340	10.07
1983	40	16.80	312	9.56
1984	26	9.23	314	10.05
1985	34	11.77	321	11.42
1986	24	9.95	339	13.43
1987	37	18.43	246	10.71
1988	29	17.46	261	12.33
1989	19	12.55	207	10.81
1990	27	18.55	176	10.10
1991	13	9.29	112	6.05
1992	15	10.79	119	7.25
1993	18	13.03	136	9.46
1994	21	14.61	110	7.49
1995	14	8.13	112	8.61
1996	19	11.54	101	6.99
1997	18	12.58	111	8.62
1998	23	10.92	132	8.85

Source: FARS; operators of mopeds, off-road motorcycles, motor scooters, etc., are excluded

Table 10. Arkansas Motorcycle Operator Fatalities

Year	January-July	August-December
1996	8	11
1997	13	5
1998	16	7

Texas

Texas motorcycle operator fatalities and fatality rates also are given in Table 9 and are plotted in Figures 12 and 13. With about ten times more fatalities annually than Arkansas, the Texas plots are much smoother. Texas operator fatalities rose in the late 1970s, were roughly constant through 1986, dropped sharply through 1991, and have remained quite constant since. Fatality rates changed similarly but more abruptly, rising quickly from 1976 to 1978 and dropping equally quickly from 1988 to 1991. Recall that Texas had a universal helmet law in force from January 1968 through August 1977, a law covering only riders under 18 from September 1977 through August 1989, a universal helmet law again from September 1989 through August 1997, and a law covering only young, or older untrained or uninsured, riders after September 1, 1997. Figures 12 and 13 clearly show lower fatality counts and rates when a universal helmet law was in force.

Figure 12. Texas Operator Fatalities
(FARS)

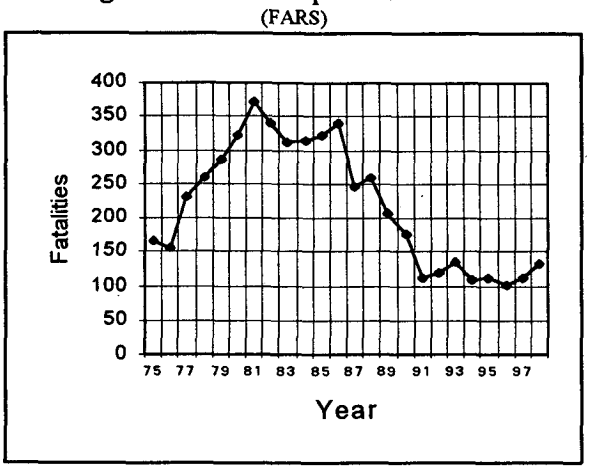
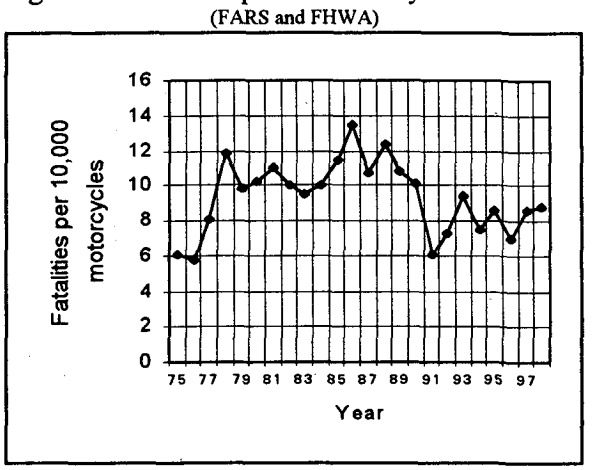


Figure 13. Texas Operator Fatality Rates
(FARS and FHWA)



Texas motorcycle operator fatalities for 1996, 1997 and 1998 are given in Table 11.

Table 11. Texas Motorcycle Operator Fatalities

Year	January-August	September-December
1996	70	31
1997	73	33
1998	86	46

The Table shows that in the first four months following repeal of the universal helmet law (September-December 1997) motorcycle operator fatalities in Texas did not change appreciably from the same period a year earlier. In 1998, however, the annual total of operators killed (132) was 31 percent higher than the number killed in 1996 (101). Increases took place in both the January-August and September-December periods.

INJURIES

Arkansas

Arkansas EMS Pre-Hospital Care data provide a better source of helmet use data on injured motorcyclists than police records. The EMS data include all motorcycle crashes where an EMS response was made except for crashes in Little Rock. In contrast to police reports, EMS data show whether an injured motorcyclist suffered a head injury. Table 12 presents basic information from Arkansas for 1996, 1997 and 1998. Similar data for 1996-1997 were obtained from the neighboring state of Oklahoma, which has had a helmet law applicable only to riders under age 18. These data are shown in Table 13.

In both 1996 and 1997, Arkansas' universal helmet law was in effect during the months of January-July. Table 12 shows that the number of injured motorcyclists was very slightly higher in 1997 than in 1996 (279 compared to 276, an increase of 1 percent). Helmet use dropped slightly and the proportion of motorcyclists with head injuries increased slightly in 1997. The universal helmet law was not in effect in 1998. In the January-July 1998 period, the number injured motorcyclists (313) was 12 percent higher than the 279 injured in the same period in 1997. Also in January-July 1998, helmet use among those injured fell to 29.1 percent from 53.0 percent a year earlier; the number of motorcyclists sustaining head injury increased by 77 percent (56 to 99) and the percent of those sustaining head injury increased to 31.6 percent from 20.1 percent in the same period in 1997.

Arkansas' universal helmet law was in effect during August-December in 1996 but not in 1997 or 1998. Table 12 shows that in 1997 the number of injured motorcyclists increased 24 percent, from 168 in 1996 to 209 in 1997, helmet use decreased substantially from 58 percent in August-December of 1996 to 34 percent during August-December 1997. The number of

motorcyclists with head injuries rose 56 percent from 36 to 56. The proportion of injured motorcyclists with head injuries increased from 21 percent to 27 percent. In the August-December period of 1998, the number of injuries continued to increase and the percentage of the injured who were helmeted continued to decline. The number of victims sustaining head injuries was the same as the year earlier while the percentage of the injured sustaining head injuries was lower than in 1997 but higher than in 1996. In Arkansas in 1998, 12 percent of injured helmeted motorcyclists sustained a head injury compared to 35 percent of unhelmeted motorcyclists.

Table 12. Arkansas EMS Motorcyclist Cases

	January-July			August-December		
	1996	1997	1998	1996	1997	1998
Number Injured	276	279	313	168	209	238
Percent Helmeted	55.8	53.0	29.1	57.7	33.5	29.8
Number with Head Injuries	51	56	99	36	56	56
Percent with Head Injuries	18.5	20.1	31.6	21.4	26.8	23.5

Data exclude Little Rock

Oklahoma, whose helmet law applies only to riders under the age of 18 since 1976, had quite different results. In January through July 1997 compared to 1996 the number of injured riders increased substantially, as did helmet use among those injured. The number of head injuries was about the same, while the proportion with head injuries decreased. During the last five months of 1997 compared to 1996 the number of injured motorcyclists decreased slightly, helmet use increased, and both the number and proportion of motorcyclists with head injuries decreased. In Oklahoma, 21 percent of helmeted motorcyclists sustained head injury compared to 51 percent of unhelmeted motorcyclists. Arkansas' experience with head injury cases is becoming more like its neighbor, Oklahoma.

Table 13. Oklahoma EMS Motorcyclist Cases

	January-July		August-December	
	1996	1997	1996	1997
Number Injured	140	189	128	116
Percent Helmeted	39.8	47.2	40.0	52.4
Number with Head Injuries	61	63	41	32
Percent with Head Injuries	43.6	33.3	32.0	27.6

Texas

Texas police crash reports record all crashes in which a motorcyclist was injured. These reports were the best source of data on helmet use among injured motorcyclists. Table 14, repeated from Chapter V, shows the number of motorcyclists who were injured in crashes (including those fatally injured) during January-August and September-December for 1994-1998. The universal helmet law was in effect through August 1997 and not in effect thereafter. There was an average of 2,314 injured motorcyclists annually in 1994-1996 during the 8-month period January-August and an average of 1,012 in the 4-month period September-December. In 1997, while the universal helmet law was in effect, the number of injured motorcyclists in January-August dropped to 2,031, which is 12 percent lower than the average for the previous three years. In September-December, when the universal law was no longer in effect, there were 1,003 injured motorcyclists, virtually the same as the three-year average. In 1998, injuries during January-August returned close to the historic average and the September-December total again was virtually unchanged.

Table 14. Injured Motorcycle Operators in Texas

Year	January-August		September-December	
	Number Injured	Percent Helmeted*	Number Injured	Percent Helmeted*
1994	2,335	91.3	1,043	93.2
1995	2,323	91.6	991	92.2
1996	2,278	92.4	1,001	93.1
1997	2,031	90.8	1,003	69.2
1998	2,326	57.0	1,030	57.8

* Operators with unknown helmet use excluded from helmet use percentages: 310 in 1994, 301 in 1995, 209 in 1996, 358 in 1997, and 270 in 1998.

The Texas police crash reports do not show whether an injured motorcyclist had a head injury. They do report injury severity as estimated by law enforcement on a 4-point scale: fatal, A (severe -- incapacitating), B (minor -- nonincapacitating), and C (possible) injury. Table 15 separates the injured motorcycle operators of Table 14 by police-reported injury severity. The table shows clearly that after the law change helmet use was lower for operators at all injury levels than in the previous periods under the universal helmet law. Helmet use in September-December 1997 injuries was lower than in the first eight months of the year and during the same period of 1996. Helmet use in 1998 was lower than in comparable periods of earlier years. In general, the more severe injury levels showed greater helmet use decreases.

From Table 15 the change from the 1994-1996 average to 1998 can be calculated for injuries at each severity level. Table 16 presents the results. In January through August 1998, the number of injured operators at each injury level, except A-injuries, increased compared to the 1994-1996 average. The percentage change was greatest for fatalities while small increases occurred in B and C-injuries. A-injuries declined by nine percent. In September through December 1998, a similar pattern was found with increases occurring in fatal, B and C-injuries while A-injuries declined.

Table 15. Injury Severity of Injured Motorcycle Operators in Texas

Fatalities

Year	January-August		September-December	
	Number of Fatalities	Percent Helmeted	Number of Fatalities	Percent Helmeted
1994	77	72.0	33	78.8
1995	69	78.3	43	81.4
1996	70	82.9	31	74.2
1997	73	78.3	33	48.5
1998	86	41.0	46	45.5

A Injuries

Year	January-August		September-December	
	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1994	650	88.9	303	92.1
1995	675	91.4	258	87.6
1996	618	91.0	305	94.1
1997	562	89.2	262	62.1
1998	592	53.3	262	54.6

Table 15. (Continued)

B-injuries

Year	January-August		September-December	
	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1994	1,087	91.8	463	92.7
1995	1,059	91.4	467	94.1
1996	1,074	93.3	426	92.0
1997	942	91.8	461	70.3
1998	1,106	57.3	471	59.1

C-Injuries

Year	January-August		September-December	
	Number Injured	Percent Helmeted	Number Injured	Percent Helmeted
1994	521	93.9	244	95.9
1995	520	92.6	223	94.0
1996	516	92.4	239	93.6
1997	451	93.0	247	76.9
1998	540	63.2	251	60.8

Table 16. Injured Motorcycle Operators, Texas, Change from 1994-1996 Average to 1998

Injury level	January-August	September-December
Fatal	+ 19 percent	+28 percent
A-injury	- 9 percent	- 9 percent
B-injury	+3 percent	+ 4 percent
C-injury	+4 percent	+ 7 percent
Total	+ 1 percent	+2 percent

Summary

In the first full year (1998) following repeal of their universal motorcycle helmet laws, both Arkansas and Texas experienced increases in motorcycle operator fatalities compared with the last year (1996) of the universal law. The number of these fatalities is small in Arkansas but increased by 21 percent going from 19 to 23. In Texas, motorcycle operator fatalities increased by 31 percent going from 101 in 1996 to 132 in 1998. Arkansas EMS data show an increase in the number of injured motorcyclists, the number of motorcyclists with head injuries, and the proportion of all injured motorcyclists with head injuries. Texas police crash report data show that the number of injured motorcyclists increased slightly in 1998 compared to 1994-1996. Lower-level injuries increased. Serious injuries decreased.

VII. INJURY COSTS

The Texas Trauma Registry, maintained by the Texas Department of Health, is a trauma reporting and analysis system. Records are entered into the system from hospital and prehospital providers. Approximately 210 hospitals in 1996 and 268 hospital in 1997 provided records to the system.

The Texas DPS file of motorcycle crashes was searched to identify crashes that occurred during September through December of 1996 and 1997 where the report indicated that Emergency Medical Services (EMS) were at the scene or that an involved motorcyclist had been transported to a hospital in some other manner. Descriptive data on these crashes (crash date, time, and location; motorcyclist birth year, race, gender, etc.) were recorded into a file that was forwarded to the Trauma Registry. Trauma Registry staff used the descriptive data for each case to match it with the Trauma Registry hospital case file for the same motorcyclist, when possible. The file of matched cases, with data combined from the DPS and Trauma Registry records, was used to provide summary statistical information.

The Trauma Registry was sent 662 crashes from 1996 and 596 from 1997 for matching. Of the 1996 crashes, 135 (20%) could be matched with a Trauma Registry case; of the 1997 crashes, 102 (17%) were matched. The low number of matches likely resulted from several factors. First, not all hospitals reported to the trauma registry for the years in question. Second, most cases (60%) contained a code that a motorcyclist had been transported to a hospital by private vehicle or some other means, but not by EMS. Many of these cases may not have been hospital admitted and, therefore, did not enter the hospital data set. Third, the police crash reports indicated that motorcyclists in approximately 6 percent of the crashes to which EMS responded were not transported to a hospital. Again, EMS cases not hospital admitted would not appear in the hospital data set. Finally, transcription errors and other inconsistencies between police and Trauma Registry records for a motorcyclist may have prevented a match.

Of the 662 cases for 1996 that were submitted to the registry for matching, 94 percent were helmeted. Helmet use was also 93 percent for the matched cases. Of the 596 cases for 1997 submitted to the registry, 66 percent were helmeted. In the matched cases, helmet use was 51 percent.

Among the matched cases for 1996, 18 percent had traumatic brain injury. The comparable figure for the 1997 matches was 25 percent. As just noted, almost all of the 1996 victims were helmeted Helmet use was 30 percent among the 1997 victims with traumatic brain injury and was 58 percent among those who sustained other types of injury.

Table 17 shows the mean and median dollar amounts of billed hospital charges for cases with and without traumatic brain injury for the 1996 and 1997 matched cases. The table shows a large increase in hospital charges for traumatic brain injury cases in 1997 compared with 1996. The average cost per case increased by 75 percent, from $18,418 to $32,209. The median cost increased by more than 300 percent, from $4,585 to $22,531. The table also shows that the

average cost of treating injured motorcyclists who did not suffer traumatic brain injuries declined slightly from 1996 to 1997 and the median treatment cost for these motorcyclists was essentially unchanged. The data in the table for 1996 are based on 13 cases of traumatic brain injury and 78 cases sustaining other injuries. The 1997 data are based on 15 cases of traumatic brain injury and 47 cases of other types of injuries.

Table 17. Billed Hospital Charges for Motorcycle Crash Injury Cases

Injury Type	Case Cost	1996 (Sept. - Dec.)	1997 (Sept. - Dec.)
Traumatic Brain Injury Cases	Average	$18,418	$32,209
	Median	$4,585	$22,531
Other Injury Cases	Average	$21,296	$19,126
	Median	$11,246	$11,789

Summary

The matched cases from the Texas Trauma Registry for the first four months following universal helmet law repeal compared to the same four months of the previous year show:

- Helmet use declined by more than 40 percentage points.
- Traumatic brain injuries increased to 25 percent from 18 percent.
- Treatment costs for traumatic brain injury cases increased substantially while treatment costs for other cases did not change markedly. The number of cases involved is not large, however.

The relatively low matching rate means that these conclusions from the matched cases may not hold for all injured motorcyclists. However, the Trauma Registry data do provide evidence that helmet use decreased, brain injuries increased, and treatment costs increased following the Texas universal helmet law repeal.

VIII. CRASH CASE STUDIES

To find examples of motorcycle crashes that occurred following the helmet law changes, efforts were made to identify and contact selected motorcyclists who had been injured and relatives or friends of motorcyclists who had been killed in crashes. First, the dates, times, and locations of motorcycle injury and fatal crashes were produced from the Arkansas and Texas crash data files. Then, hard copy police crash reports were requested from law enforcement agencies in locations with more than one crash. Some agencies were unable to release crash reports in response to general inquiries. Others required more detailed information, such as a report number, in order to retrieve a report. Others provided the requested crash reports.

Arkansas provided 9 police reports and Texas provided 51, for a total of 60. Three of the reports described crashes in which two motorcycles were involved, so 63 motorcycles were involved in these crashes. In addition to the motorcycle operators, 10 motorcycle passengers were involved, so the reports covered a total of 73 riders. Six of the motorcyclists were fatally injured while the remainder sustained various nonfatal injuries. Thirty riders wore helmets and 43 did not.

Information was obtained for only a few of these motorcyclists. Some could not be located; others were unwilling to provide information. The crashes described below are those for which some useful information was obtained. They are a small fraction of all fatal and injury crashes in Arkansas and Texas during the months following their helmet law changes.

Fatal Crashes

Study team members attempted to contact friends and family members of the six fatally-injured motorcyclists for which police reports were provided but were successful in only one crash involving two fatalities. Information on the other four fatalities comes from police reports only.

One of the two fatally-injured helmeted riders was wearing a "half helmet," damaged in the crash, and the police officer noted that he was not sure whether or not it met federal standards. The motorcycle operator was evidently hard on the throttle of his old Harley Davidson motorcycle when he crashed. He was in the process of passing a line of slow-moving cars in a no passing zone when the car that was holding up the line turned left into him, just as he pulled even with the car. He was thrown to the roadside across the left leg of the intersection.

The other crash in which a helmeted rider was killed was very severe, the only direct frontal crash among the fatalities. The motorcycle crossed the centerline on a blind curve and struck a car head-on. The crash force was sufficient to deflect the car into the oncoming lane, where it hit a third vehicle which had been traveling behind the motorcycle. Even though both the 26 year old motorcycle operator and his 25 year old wife wore helmets with full face masks, he received incapacitating injuries and she was pronounced dead at the scene.

Two of the four unhelmeted fatalities occurred in a single crash. An aunt of the fatally injured passenger was interviewed.

> She said her 28 year old nephew was a passenger on a 550 cc Yamaha Maxim, owned and operated by his 29 year old brother-in-law. It was December, 1997 in a town in central Texas, about 10 weeks after Texas repealed the law requiring all motorcycle riders to wear helmets, and neither the operator nor the passenger was wearing a helmet. The operator died at the crash site and the passenger was pronounced dead at the hospital emergency room. Both riders suffered severe head trauma in addition to other injuries.
>
> There was testimony at the manslaughter trial of the driver of a van involved in the crash that the van driver might have turned left in front of the oncoming motorcycle intentionally. A witness in a car following the motorcycle testified that the van turned suddenly and crossed at least two lanes before being struck in the right rear by the motorcycle. The 20 year old van driver was unlicenced and an illegal alien. He did not stop to give aid. An officer responding to the crash followed a trail of liquid and discovered the damaged van in an alley where he spotted the driver and three teen aged female passengers outside the van and a fourth young female passenger inside it with serious facial injuries. The van driver, who had a BAC of .063, was charged with two counts of manslaughter for causing the deaths of the motorcycle riders by failing to yield while turning left. He was acquitted in the death of the motorcycle operator (who had a BAC of .22) but convicted in the death of the passenger. His sentence was suspended and he was deported.
>
> The motorcycle passenger did not violate any laws but was the victim of two mistakes: riding without a helmet and accepting a ride with his brother-in-law who had been drinking. According to the aunt, a former victim assistance specialist at the local police department, her nephew's brother-in-law was one of those people who shows no outward signs when he has been drinking, so it was an understandable mistake.
>
> Although he was a passenger on that night, he always loved motorcycles and had owned several since he was licensed to drive. His aunt says he was a sporadic helmet user, wearing one if he was taking a trip or out on the freeway but not wearing a helmet when riding around the neighborhood.
>
> At the time of the crash, he was divorced and living temporarily at his sister's home. He had a three year old son whom he loved and spent as much time with as possible. His aunt describes him as a "good kid, good looking, sweet, and gentle." She tells how he spent many hours helping her to care for her daughter, who required months of constant attention after she had been very nearly killed by her enraged husband. Her point was that her nephew was a very caring person, with a strong sense of duty to his family, all of whom miss him dreadfully.

The central Texas town also was the location of another of the fatal unhelmeted crashes. The crash occurred in January 1998 on a Sunday afternoon..

> The crash was a single vehicle "ran off road", involving a 1994 Harley Soft Tail, owned and operated by a 41 year old airline pilot. The motorcycle failed to negotiate a slight curve in a four lane divided highway. The police report shows that the bike ran off the left side of the roadway and continued running in the grassy median until it struck a light post. The investigating officer concluded that failure to control speed and operating under the influence of alcohol were contributing factors.

The fourth unhelmeted fatality was a passenger in a crash in another Texas town, at 2:30 am on a Saturday. According to a newspaper article, the 38 year old operator sustained incapacitating injuries and his 24 year old passenger was killed.

> The motorcycle was a 1990 Harley Electraglide. The crash occurred on a wide, two-lane roadway with parking allowed on both sides. The motorcycle failed to negotiate a curve to the left and struck a car parked off to the right side of the road. The investigating officer noted failure to control speed as a contributing condition and under the influence of alcohol as another factor that may or may not have contributed. (Although a blood sample was taken from the operator, the report contains no alcohol test results.)

Non-fatal Crashes

A 27 year old electronics technician from Arkansas may be typical of many unhelmeted riders who sustained incapacitating injuries in a motorcycle crash after the helmet law was repealed.

> This rider said he usually wore a helmet, even after the law was repealed on August 1, 1997. About two weeks after it was legal to ride without a helmet, he was going for a ride in the country with a woman he was dating at the time, and as he put it, "like an idiot, I didn't have a helmet on." The woman was not wearing a helmet either.
>
> He knew that it had become legal to ride without a helmet in Arkansas only two weeks before. He said he was "indifferent" to the issue of helmet law repeal, because he felt the previous law was reasonable, and he usually wore his helmet anyway. But it was a warm day, and he thought a helmet would have been uncomfortable. He also wanted to be able to converse with the woman, and helmets make that difficult. "Who would have thought," he said, "that I would have a wreck?" He had been riding since he was a teen and had only one close call in all of that time.

They were still in town, riding at the 35 mph speed limit, when the driver of a car on a side street stopped at the stop sign, looked both ways, and then, incredibly, pulled out right in front of them. There was no time to take evasive action and the motorcycle hit the car broadside.

Both riders sustained incapacitating injuries. The operator had a gash on his head and a concussion which caused him severe head pain. Although he was released from the hospital the same day, someone had to call him every two hours for several days to make sure he did not lapse into a coma. He also sustained a compression fracture of a vertebra, which did not require surgery, but still gives him problems. He has difficulty bending and can't bring his legs up. He says it is mostly a problem when he participates in sports. The doctor categorizes it as a 10 percent disability. He also complains that he has frequent minor illnesses such as colds and flu since the crash. So far, his medical bills have been $5,300, and none has been paid because the insurance company covering the driver of the other vehicle, which was at fault, has not settled yet.

His passenger fractured four vertebrae and required emergency surgery. Her rehabilitation has taken longer. He thinks it was about nine months until she was able to walk again without the aid of a cane or crutches.

He said he does not ride a motorcycle on the street any more because he no longer trusts other drivers to see him. His cycling is now confined to a four wheel ATV, which he rides off-road. Having learned a lesson the hard way, he says he never rides without his helmet since the crash.

Another unhelmeted motorcyclist received head injuries in a complicated incident that involved two motorcycles and two other vehicles.

The crash occurred in a Texas city, at about 4:30 on a Sunday afternoon, at a merge point between a freeway exit ramp and a two-lane one-way frontage road. Two motorcyclists were on the freeway exit ramp; the first was helmeted and the second was not. A car in the left lane of the frontage road slowed down to let the lead motorcycle on the freeway ramp merge ahead of him and the car was hit from behind by a pick-up truck. The pick-up truck then veered left, crossed the divider between the frontage road and ramp, sideswiped the lead (helmeted) motorcyclist, and stopped in the path of the second (unhelmeted) motorcyclist, who struck the pick-up and was thrown over the top of the truck. Although the investigating officer classified injuries to both motorcyclists as non-incapacitating (B) injuries, the motorcyclist who was not wearing a helmet needed transportation to a hospital by EMS.

The unhelmeted rider, is a 41 year old field service technician and was riding a 1996 Harley Davidson. His wife, who was reluctant to give many details because there is an ongoing lawsuit, said that the driver of the truck that started

the chain of events was talking on his cell-phone when he rear-ended the car. Her husband was thrown when he hit the truck, "rolled in a ball," and landed on his back. He suffered head injuries, including a concussion, and also had severe spinal injuries. The helmeted operator of the other motorcycle suffered only scrapes and bruises, because her bike went down and she skidded across the pavement without hitting anything.

Some of the unhelmeted riders escaped serious injury. A 33 year old Texas pharmacist, is one.

His 1996 Honda Goldwing collided with a car at an intersection in a large Texas city. Both the motorcyclist and the driver of the other vehicle claimed that they had a green light, so no citations were issued. Although he was not wearing a helmet, he suffered only a fractured left hand in the crash. When interviewed, he admitted that he felt lucky that he did not sustain any head injuries.

He said he was aware at the time that the state had repealed its helmet law about a month earlier. Although he claimed he always wore his helmet when the law required it, he felt, and still feels, that motorcyclists should have a choice of whether or not to wear a helmet. Despite his crash, he says he only wears his helmet occasionally, when riding in heavy traffic, when he feels the risk of a crash is higher than normal.

At least one rider, who was not seriously injured interpreted his crash as a wake up call, and started to wear a helmet. This rider believes he was "saved by the helmet" on his second crash.

He has walked away from two motorcycle crashes about two months apart, the first one less than two weeks after Arkansas repealed its universal helmet law. He lost control of his Kawasaki sports bike as a car cut in front of him and clipped his front wheel. Although the 36 year old rider was not wearing a helmet, he didn't hit anything, and his injuries were only minor abrasions, so-called "road rash"

He had been in favor of helmet law repeal and usually rode without his helmet when it was no longer required. He noted that most of his fellow sports bike riders continued to wear helmets, but he felt his peripheral vision was better without it. He occasionally wore a helmet when out on the open road but didn't bother wearing one on short trips, which he did not perceive as being very risky. He was only going out to visit a friend a few blocks away when he had his first crash.

After the first crash, his father, who also was interviewed, said he put some pressure on his son to buy a better helmet and to wear it. He even offered to pay for the $190 helmet. The son said he didn't resist a lot, because the crash

convinced him that accidents can happen, and he felt lucky that he had not been hurt more seriously.

Both son and father are convinced that the helmet saved his life in the second crash, which occurred in late October, 1997, on a two-lane state highway in a rural Arkansas county. It was raining at the time and, although he was below the 55 mph posted limit, he said he had closed quickly on a car closely following a van at about 10 mph. The oncoming lane was clear when he pulled out to pass, but just as he was about even with the car, the van suddenly pulled left without signaling, in preparation for a left turn into a driveway. The motorcycle crashed into the van's rear bumper and he was catapulted through the van's rear window. The impact of the crash crushed the front fork of the motorcycle back to the engine. Thanks to the helmet, he suffered only a cut above one eye. He says, "if it were not for the helmet, my head would have been a squashed grape."

He has not ridden a motorcycle since the second crash but thinks he might in the future. He explains that the bike was totaled and he has been busy getting a better job as a car salesman and moving to a new town. When he does ride again, he says he will wear a helmet.

IX. CONCLUSIONS AND DISCUSSION

Conclusions

Motorcycle helmet use decreased substantially in both Arkansas and Texas after their universal helmet laws were dropped. Statewide surveys under the universal laws observed 97 percent helmet use in each state. By May 1998, nine months after the law change, observed helmet use was 52 percent in Arkansas and 66 percent in Texas. Helmet use among injured motorcyclists in both states dropped by about 25 percentage points during the first four or five months after the laws changed. Further declines took place in both states in 1998. Helmet use among young injured motorcycle operators in Texas, who were still required by law to wear helmets, dropped by about 10 percentage points.

Motorcyclist fatalities did not change significantly in either Arkansas or Texas in the 1997 months following their law change compared to the same months of 1996. However, in the first full year following repeal of the universal helmet laws, operator fatalities increased in Arkansas by 21 percent compared with 1996 and by 31 percent in Texas over these same periods.

Arkansas EMS data show an increase in the number of injured motorcyclists, the number of motorcyclists with head injuries, and the proportion of all injured motorcyclists with head injuries after the law change. Texas police crash report data show that the number of injuries increased slightly comparing 1998 with 1996.

Texas Trauma Registry data show that the proportion of treated motorcyclists with traumatic brain injuries increased and treatment costs for traumatic brain injury cases increased substantially following the law change. Treatment costs for other injury cases did not change markedly.

Discussion

GAO's review and the other studies summarized in Chapter II all conclude that universal helmet law repeal produces lower helmet use, more motorcyclist fatalities, and more serious head injuries. The experience in Arkansas and Texas is consistent with these conclusions. Arkansas and Texas data show unambiguously that helmet use dropped substantially. Fatalities increased. There is good evidence that serious head injuries increased.

The societal issue regarding motorcycle helmet laws is very clear and has not changed since GAO's 1991 summary. The accumulated evidence is overwhelming that helmet use reduces motorcyclist fatalities, injuries, and treatment costs and that universal helmet laws increase helmet use substantially. The price for these benefits is that individual actions are restricted: through a universal helmet law, society requires each motorcyclist to take an action -- wear a helmet -- that appears to affect only himself or herself. But a motorcyclist's injury or fatality affects many others, directly and indirectly, as some of Chapter VIII's case studies

illustrate. Family, friends, and co-workers must adapt to the personal consequences of an injury or fatality. Society as a whole bears many of the direct and indirect costs. These issues must be weighed against individual freedom of action.

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APPENDIX. STATE HELMET LAW HISTORY

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
Alabama	11-06-67	All riders.
Alaska	1-01-71	All riders. Repealed effective 7-01-76; helmet use required for riders under 18 and all passengers.
Arizona	1-01-69	All riders. Repealed effective 5-27-76; helmet use required for riders under 18.
Arkansas	7-10-67	All riders. Repealed effective 8-01-97; helmet use required for riders under 21.
California	1-01-85	Helmet use required for riders under 15 1/2. Effective 1-01-92 helmet use required for all riders.
Colorado	7-01-69	All riders. Repealed effective 5-20-77.
Connecticut	10-01-67	All riders. Not enforced until 2-01-74. Repealed effective 6-01-76. Effective 1-01-90 helmet use required for riders under 18.
Delaware	10-01-68	All riders. Repealed effective 6-10-78; helmet use required for riders under 19. Also required that a helmet be carried on the motorcycle for riders 19 and older.
District of Columbia	10-12-70	All riders.
Florida	9-05-67	All riders.
Georgia	8-31-66	All riders.

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
Hawaii	5-01-68	All riders. Repealed effective 6-07-77; helmet use required for riders under 18.
Idaho	1-01-68	All riders. Repealed effective 3-29-78; helmet use required for riders under 18.
Illinois	1-01-68	All riders. Repealed effective 6-17-69 after being declared unconstitutional by the State Supreme Court on 5-28-69
Indiana	7-01-67	All riders. Repealed effective 9-01-77. Effective 6-01-85 helmet use required for riders under 18.
Iowa	9-01-75	All riders. Repealed effective 7-01-76.
Kansas	7-01-67	All riders. Repealed effective 3-17-70; helmet use required for riders under 21. Effective 7-01-72 helmet use required for all riders. Repealed effective 7-01-76; helmet use required for riders under 16. Effective 7-01-82 helmet use required for riders under 18.
Kentucky	7-01-68	All riders. Repealed effective 7/15/98; helmet use required for riders under 21.
Louisiana	7-31-68	All riders. Repealed effective 10-01-76; helmet use required for riders under 18. Effective 1-01-82 helmet use required for all riders. Repealed effective 6-99; helmet use required for riders under 18.

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
Maine	10-07-67	All riders. Repealed effective 10-24-77. Effective 7-03-80 helmet use required for riders under 15.
Maryland	9-01-68	All riders. Repealed effective 5-29-79; helmet use required for riders under 18. Effective 10-01-92 helmet use required for all riders.
Massachusetts	2-27-67	All riders.
Michigan	3-10-67	All riders. Repealed effective 6-12-68. Effective 9-01-69 helmet use required for all riders.
Minnesota	5-01-68	All riders. Repealed effective 4-06-77; helmet use required for riders under 18.
Mississippi	3-28-74	All riders.
Missouri	10-13-67	All riders.
Montana	7-01-73	All riders. Repealed effective 7-01-77; helmet use required for riders under 18.
Nebraska	5-29-67	Never enforced. Declared unconstitutional by State Supreme Court and repealed effective 9-01-77. Effective 1-01-89 helmet use required for all riders.
Nevada	1-01-72	All riders.
New Hampshire	9-03-67	All riders. Repealed effective 8-07-77; helmet use required for riders under 18.

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
New Jersey	1-01-68	All riders.
New Mexico	5-01-67	Helmet use required for riders under 18 and all passengers. Effective 7-01-73 helmet use required for all riders. Repealed effective 6-17-77; helmet use required for riders under 18.
New York	1-01-67	All riders.
North Carolina	1-01-68	All riders.
North Dakota	7-01-67	All riders. Repealed effective 7-01-77; helmet use required for riders under 18.
Ohio	4-02-68	All riders. Repealed effective 7-01-78; helmet use required for riders under 18 and first year operators.
Oklahoma	4-27-67	All riders. Repealed effective 4-07-69; helmet use required for riders under 21. Effective 7-01-75 helmet use required for all riders. Repealed effective 5-03-76; helmet use required for riders under 18.
Oregon	1-01-68	All riders. Repealed effective 10-04-77; helmet use required for riders under 18. Effective 6-16-89 helmet use required for all riders.
Pennsylvania	9-13-68	All riders.
Puerto Rico	7-20-60	All riders.
Rhode Island	6-30-67	All riders. Repealed effective 5-21-76; helmet use required only for passengers. Effective 7-1-92 helmet use required for riders under 21 and first year operators.

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
South Carolina	7-01-67	All riders. Repealed effective 6-16-80; helmet use required for riders under 21.
South Dakota	7-01-67	All riders. Repealed effective 7-01-77; helmet use required for riders under 18.
Tennessee	6-05-67	All riders.
Texas	1-01-68	All riders. Repealed effective 9-01-77; helmet use required for riders under 18. Effective 9-01-89 helmet use required for all riders. Repealed effective 9-01-97; helmet use required for riders under 21 and older riders who have not completed a rider education course or do not have $10,000 medical insurance coverage.
Utah	5-13-69	Helmets required only on roads with speed limits of 35 mph or higher. Effective 5-08-77 helmet use required for riders under 18 on all roads.
Vermont	7-01-68	All riders.
Virginia	1-01-71	All riders.
Washington	7-01-67	All riders. Repealed effective 7-01-77. Effective 7-01-87 helmet use required for riders under 18. Effective 6-8-90 helmet use required for all riders.
West Virginia	5-21-71	All riders.
Wisconsin	7-01- 68	All riders. Repealed effective 3-19-78; helmet use required for riders under 18 and for all riders holding learner's permits.

State	Original Law Effective Date	Original Law Coverage; Subsequent Action; Current Law
Wyoming	5-25-73	All riders. Repealed effective 5-27-83; helmet use required for riders under 18.

Source: NHTSA

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