Improving Motorcycle Safety in Hawaii: Recommendations Based on a Survey of Motorcycle Owners and Operators

KARL KIM AND MARK R. WILLEY

A study on motorcycle safety was conducted for the Hawaii Department of Transportation by the Department of Urban and Regional Planning, University of Hawaii. The study is based on a telephone survey of 494 motorcycle owners and operators that was conducted in August 1989. Trends in motorcycle accidents are described, results from the attitudinal study are given, and several legislative, administrative, and programmatic recommendations for improving motorcycle safety in Hawaii are proposed, including restoring Hawaii's mandatory helmet law and requiring motorcycle safety education courses for all new riders. A disproportionately large share of those involved in fatal motorcycle accidents was found to be neither licensed nor insured. Some ways that licensing and registration systems might be enhanced to improve motorcycle safety in Hawaii are suggested.

After the problem of motorcycle accidents in Hawaii is described, trends in motorcycle crashes and motorcycle-related deaths are discussed. Then a survey of motorcycle owners and operators conducted by the Department of Urban and Regional Planning, University of Hawaii, is described. An examination of licensing and registration laws in Hawaii is also included. It is concluded that there are three types of actions that can be taken to improve motorcycle safety in Hawaii: legislative actions refer to the enactment of new laws such as mandating helmet use or motorcycle education; administrative actions involve improving or enhancing current regulatory actions already in place, such as improved licensing and enforcement of existing traffic safety laws; and programmatic actions refer to the creation and enhancement of a variety of programs on education, public information, and further study and analysis of motorcycle accidents in Hawaii.

MOTORCYCLE ACCIDENTS IN HAWAII

In 1988 there were 11,544 registered motorcycles in Hawaii and 21,940 licensed operators. Motorcycles made up approximately 5 percent of all registered motor vehicles and accounted for 2.2 percent of major traffic accidents (damage over $300). However, a disproportionately large share of all traffic fatalities, 11 percent, resulted from motorcycle accidents. This percentage has grown greatly since the mandatory helmet law was repealed in 1977. At that time, only 4 percent of all traffic fatalities resulted from motorcycle accidents.

Department of Urban and Regional Planning, University of Hawaii at Manoa, Porteus Hall 107, 2424 Maile Way, Honolulu, Hawaii 96822.

In Hawaii, motorcyclists face twice the risk of being involved in an accident than the average automobile driver. Data in 1981 showed 251 accidents per 10,000 automobiles and 502 accidents per 10,000 motorcycles. Although this ratio narrowed by 1987 to 295 accidents per 10,000 automobiles and 442 accidents per 10,000 motorcycles, the accident ratio for motorcyclists was still far greater than that for other motor-vehicle operators.

There is also reason to believe that the problem of motorcycle accidents in Hawaii is more serious than it is in other states. In 1987 there were an estimated 509 motorcycle accidents in Hawaii, resulting in 13 fatalities. This amounted to 442 accidents and 11.3 fatalities per 10,000 motorcycle registrations. These figures are both above the 1987 national averages of 305.5 and 8.65 (*1*).

As shown in Table 1, the current fatality rate per 10,000 motorcyclists is 2.5 times greater than the average fatality rate recorded during the 9 years that Hawaii had a mandatory helmet law. The repeal of the helmet law in Hawaii has meant an increase in the number of fatalities due to lack of helmet use. In the 4 years before repeal of the act in 1977, there was not one fatality from failure to use a helmet. In the years following repeal there has been a 900 percent increase in fatalities without helmets. Average annual fatalities among helmet users, on the other hand, increased only 16 percent. The 250 percent jump in fatality rates among the total motorcycle population has been largely due to lack of helmet use.

Historically, the majority of persons killed in motorcycle accidents have been young men. The 25-years-and-under age group accounted for only 6.8 percent of Hawaii's licensed motorcycle operators (median age 39 years) but 65.5 percent of all motorcycle fatalities. In addition, since repeal of the helmet law, the proportion of unlicensed operators killed in motorcycle accidents has increased greatly. The proportion of fatalities attributed to head injury also has increased, as has the proportion of those killed while under the influence of alcohol. These findings are summarized in Table 2.

The increase in unlicensed operators is troubling, for it means that there are many untrained and uninsured motorcyclists on the road. Approximately 16 percent of those killed in motorcycle accidents died within the first 11 months of having a motorcycle license (Table 3). Lack of training and inexperience are significant factors contributing to the overall motorcycle accident rate in Hawaii.

These observations about motorcycle accidents and fatalities suggest a number of problems. The first problem relates to the effects of repealing the helmet law. Helmets are de-

TABLE 1 MOTORCYCLE STATISTICAL SUMMARY FOR HAWAII

Year	Motorcycle Registration	Number of Accidents	Accident Rate*	Number of Fatalities	Fatality Rate*	Accident/ Fatality Ratio
1962	4,173	213	510	10	24.0	21.3
1963	5,590	313	560	5	8.9	62.6
1964	7,270	428	589	9	12.4	47.6
1965	9.827	512	521	13	13.2	39.4
1966	12,016	643	535	20	16.6	32.2
1967	10,558	575	544	8	7.6	71.9
1968[a]	9,646	543	563	8	8.3	67.9
1969	8,579	346	403	5	5.8	69.2
1970	10,834	429	396	6	5.5	71.5
1971	10,033	427	426	6	6.0	71.2
1972	10,321	446	432	4	3.9	111.5
1973	10,343	417	403	3	2.9	139.0
1974	10,447	386[b]	369	4	3.8	96.5
1975	8,373[c]	396	473	9	10.7	44.0
1976	9,134	444	486	6	6.6	74.0
1977[d]	9,408	518	551	11	11.7	47.1
1978[e]	9,771	619	634	23	23.5	26.9
1979	9,986	599	600	20	20.0	30.0
1980	9,696	562	580	10	10.3	56.2
1981	10,700	537	502	15	14.0	35.8
1982	11,317	508	449	13	11.5	39.1
1983	8,563	481	562	19	22.2	25.3
1984	10,199	409	401	15	14.7	27.3
1985	10,607	412	388	10	9.4	41.3
1986	11,055	463	419	12	10.9	38.4
1987	11,515	509	442	13	11.3	39.1
1988	11,544	702[f]	608[f]	18	15.6	39.0[f]

* Rate per 10,000 motorcycles

[a] 1968, the year mandatory helmet use was implemented

[b] 1974, the year reportable accident damage was increased from $100 to $300

[c] 1975, the first year under no-fault insurance

[d] 1977, motorcycle helmet use law repeal effective June 8, 1977

[e] 1978, the first complete year after motorcycle helmet use repeal

[f] Accident estimates assuming 1 fatality per 39 accidents

signed to protect the motorcyclist from injury and death; increased nonuse has meant increased injury and death. A second problem relates to issues of licensing, training, enforcement, and operator skill. There are many factors associated with motorcycle safety. A mandatory helmet law is only part of the picture. The data on motorcycle deaths show that younger, more inexperienced, and unlicensed operators account for a disproportionately larger share of accidents and fatalities. A third type of problem relates to the disproportionate costs associated with the higher fatality and injury rates likely to result from operating a motorcycle.

UNIVERSITY OF HAWAII STUDY

The major data source for the University of Hawaii study was a telephone survey of motorcycle owners and operators conducted in 1989 between August 14 and September 14. Participants were drawn from two data files: motor vehicle registrations and operator licenses (supplied by the state of Hawaii and city and county of Honolulu). A combined data set listing those registered owners with active operator licenses was also constructed. The purpose of the study was to address the following areas: (a) questions about motorcycle registration,

TABLE 2 CHARACTERISTICS OF FATAL MOTORCYCLE ACCIDENTS IN HAWAII (*5*)

Variable Category	Before Repeal (1973-1976)	After Repeal (1977-1988)	Total (1973-1988)
Male	100%	95.9%	96.0%
Age	21.5 years	23 years	23 years
Licensed	72.7%	48.5%	51.0%
Owners	45.5%	62.1%	61.4%
Helmet Used	100%	37.4%	42.6%
Speeding	53.8%	42.6%	40.6%
Drunk	31.8%	39.6%	38.0%
Head Injury	50.0%	56.2%	54.0%

TABLE 3 LICENSING OF PERSONS KILLED IN MOTORCYCLE ACCIDENTS IN HAWAII, 1973–1988

Number	Time with License	%
92	no license	45.5
33	less than one year	16.3
70	over one year	34.7
7	unknown	3.5

licensing, and use; (b) questions about attitudes toward helmet use and helmet laws; and (c) questions about improving motorcycle safety in Hawaii.

Several methodological issues were identified. The first was the large number of military personnel in Hawaii who must follow helmet use regulations. The rules that the military has adopted are stricter than the voluntary helmet use laws for the state of Hawaii. Therefore, active duty military personnel were excluded to prevent a possible bias of the results in favor of helmet use.

A second problem arose during the attempt to match registered owners with those having active operator licenses. Given the different data entry procedures and systems used by the separate agencies handling licensing and registration, it was impossible to compile a complete computerized list of the registered owners who have operator licenses. Such a compilation would have required that names and addresses be exact matches or that there be some identification field or code, such as Social Security number, common to both files. This was not the case.

An inherent problem in this survey was that it was limited to those listed in a telephone directory. Names were verified directly by matching addresses or at least by matching the last names. Under this procedure, owners and operators who live with people who have the same last name and are listed in a telephone directory were also included. Because there was no means of tracking those whose last names and addresses are not listed in telephone directories, a possible bias of this survey was that it reached an older, more stable population. The more transient, usually younger, groups perhaps were not sampled adequately. However, when compared with other methods of sampling, such as direct observation or personal interviews, the telephone survey was the only cost-effective method that could guarantee an adequate sample size in an unbiased, geographically proportional manner.

Characteristics of Respondents

There were 494 respondents who completed the survey. The composition of the main sample by sex is 94.1 percent (n = 465) men, 5.9 percent (n = 29) women. The age of the respondents ranged from 15 to 72, with the mean, median, and mode being 38 years (n = 28) (on the basis of the city and county of Honolulu's motorcycle license tape, the average motorcycle operator in Hawaii is 40 years old, and the median and mode ages are 39 years).

The ethnic makeup of respondents includes Caucasian (51.8 percent), Japanese (19.0 percent), Hawaiian (9.9 percent), Chinese (7.7 percent), and Filipino (5.5 percent). No other group makes up more than 2 percent.

A large proportion of the respondents are professionals (28.5 percent). Blue-collar workers constitute only 27.3 percent of the sample, which compares with 43.3 percent nationally. Approximately 24 percent of the sample reported yearly earnings between $35,000 and $50,000 ($n$ = 118). The mean income is $31,811 a year, and the median $28,128 a year. The income mode is $36,000 a year ($n$ = 40).

Motorcycle Ownership, Registration, and Use

Excluding military personnel living either on bases or with ship addresses, there are 8,514 registered motorcycle owners and 13,595 licensed operators on Oahu. Of those, only 2,970 were matched through the original data tapes as having both licenses and registrations. This means that only 34.9 percent of Oahu's registered motorcycle owners have licenses, although 90.3 percent of those from the registration list reported on the survey that they have active motorcycle licenses. Of licensed drivers, only 21.8 percent of those on the license data tape were traced as having a registered motorcycle, although 56 percent of those contacted from the same list reported having a registered motorcycle. All subgroups reported high compliance with Hawaii's mandatory insurance law; it is 85.8

percent among registered licensees, 87.5 percent among licensed operators, and 88.1 percent among registered owners.

Honda is the most popular motorcycle (35.8 percent), as it is nationally (50.8 percent), followed by Kawasaki (18.8 percent), Yamaha (15 percent), Harley-Davidson (14.8 percent), and Suzuki (8.5 percent). BMW, Triumph, and other makes account for 5.4 percent of the market.

Most respondents reported having motorcycles with large engine displacements: 34.2 percent have motorcycles with between 450 and 749 cc, and 31.8 percent have motorcycles with more than 750 cc. This is the opposite of the Motorcycle Industry Council data (*1*), which shows that most of the nation's motorcycles (57 percent) have engine displacements smaller than 350 cc.

The data collected show that the major purpose for motorcycle use is commuting to work and school (42.9 percent), which is followed by recreational use (40.5 percent). The average number of miles traveled in a week is 92.25. The mean is 70 mi and the mode, 100 mi (n = 86).

Of the main sample, 87.2 percent (n = 431) reported having motorcycle insurance. Reasons for not having insurance included expense (32.8 percent), lack of necessity (18.8 percent), lack of motorcycle ownership (10.9 percent), and difficulty of obtaining it (7.8 percent). Of those with insurance, 72.9 percent said that they have it because of the law (n = 304), and 27.1 percent said that they have it to protect themselves against liability. Average insurance costs per year were reported as $442.06; median payments are $363, and the mode is $300 ($n$ = 55).

Attitudes Toward Helmet Use and Helmet Laws

When asked about use of helmets, 60.1 percent reported wearing their helmet all the time (n =297), 13.4 percent stated that they never wear a helmet (n = 66), and 26.5 percent said that they wear it some of the time (n = 131). Of the third group, the average percentage of time that helmets are worn is 54, and the median and mode (n = 29) are 50 percent.

Subjects were asked to give reasons they do or do not wear a helmet. Table 4 shows reasons helmets are worn, and Table 5 shows reasons they are not. Of those who wear helmets, 74.7 percent said that the reason is safety. An additional 9 percent think that they run a higher risk without one, and 6.9 percent stated that the helmet protects them against the elements.

TABLE 4 REASONS GIVEN FOR WEARING A MOTORCYCLE HELMET

Reasons	n	%
Safety Aspects	316	74.7
Higher Risk Without	38	9.0
Protection from Elements	29	6.9
Required to Use	24	5.7
Other Reasons	16	3.8
Total	423	100.0

TABLE 5 REASONS GIVEN FOR NOT WEARING A MOTORCYCLE HELMET

Reason	N	%
Uncomfortable	91	28.4
Impairs Visibility	55	17.2
Inconvenient	50	15.6
Impairs Hearing	32	10.0
Little Risk of Accident	31	9.7
Reduces Pleasure	29	9.1
Helmet is Ineffective	13	4.1
Personal Freedom	12	3.8
Other	7	2.2
Total	320	100.0

Of those reporting that they never or only sometimes wear a helmet, 28.4 percent said that helmets are uncomfortable, 17.2 percent think helmets impair visibility, 15.6 percent called them inconvenient, 10 percent reported that helmets impair hearing, 9.7 percent perceived that there is little chance for an accident, and 9.1 percent said that the helmet reduces the pleasure of riding. Of the remaining responses, 4.1 percent cited the helmet's ineffectiveness and 3.8 percent stressed the need for personal freedom.

In this sample, 60.7 percent reported carrying passengers (n = 300), and 39.1 percent said that they do not. Of those carrying passengers, 226 reported that their passengers wear helmets (77.7 percent).

When asked specifically if Hawaii should require all motorcycle riders to wear a helmet, 45.7 percent answered yes (n = 226), and 53.8 percent responded no (n = 266). On the other hand, when asked if they would support a helmet law if it would lower the costs of motorcycle insurance, 68.8 percent responded yes (n = 340) and 31 percent said no (n = 153). As to what they think can be done to increase helmet use in Hawaii, 44.2 percent said that reduced insurance premiums or other monetary incentives would help, and 43.1 percent said that increased public education about the benefits of helmet use would suffice.

To more closely examine the relationships between the variables, a number of cross tabulations were run comparing frequency of self-reported helmet use and various attitudinal and self-reported behaviors. Chi-square statistics were calculated, and only those results significant at the $p < .05$ level (or below) have been reported.

Attitudes of the subjects about whether Hawaii should have a mandatory helmet law were significantly related to the level of helmet use. Those who reported wearing helmets all the time are more in favor of a helmet law and reduced insurance premiums for helmet users; those who do not wear helmets disagree with both. Helmet use is also significantly related to compliance with the state's insurance requirements.

The frequency of helmet use is considerably higher among subjects who operate Japanese motorcycles (Kawasaki, Honda,

Yamaha, and Suzuki) than those who operate Harley-Davidson, BMW, or Triump motorcycles. Engine displacement also has a significant, although less marked, impact on the frequency of helmet use. Subjects reporting larger engines are somewhat more likely to report a lower frequency of helmet use than those operating small to mid-size motorcycles.

Those who took a motorcycle safety course are also more likely to be helmet users than those who did not receive formal training. Safety helmet use was also significantly related to the sex of the respondent. Women are more likely to wear helmets consistently than men are.

Helmet use is significantly related to the geographic area of residence of Oahu. Use is higher in the urban areas of Honolulu and Ewa, but decreases in the more rural North Shore and Waialua areas of the island.

To check the attitudes of the subjects toward risk-taking behaviors, a series of questions was asked about whether drivers engage in hazardous behaviors. Helmet use is significantly related to five of these questions. Operators who reported actions such as accelerating the motorcycle suddenly, cutting in and out of traffic, driving after consuming three alcoholic beverages, having more than five drinks a week, and riding on the median strip are also more likely not to wear helmets. This corroborates earlier studies by Allegrante (*2*) and Hemmerling (*3*), which explained helmet use as a function of attitude and behavior. This finding must also be seen in light of Goeller's work (*4*) in explaining accidents in terms of vulnerabilities. Increasing vulnerabilities and exposure increases the chances that an accident will occur.

One risk-taking behavior—speeding—is not related to helmet use. An explanation is that few people recognize speeding as risky behavior, and the practice is widespread among motorcyclists. Racing was not found to be significantly related to helmet use because neither subgroup admitted doing it.

Attitudes Toward Increasing Motorcycle Safety in Hawaii

In response to a question about the likelihood of being injured in a motorcycle accident, 44.5 percent think it is unlikely, and only 25.9 percent think it is likely or extremely likely. This variable is also significantly related to the respondents' self-assessment of their driving habits: cautious drivers believe their chances of an accident are not likely, but thrillseekers admit that they feel a slightly higher chance that an accident is likely. The most likely accident thought to occur to motorcycle drivers (81.4 percent) is that of being struck by another vehicle. Subjects think that the most common cause of accidents is another person's not seeing them (38.7 percent). Recklessness of the motorcycle operator was the second most stated reason for accidents (35.2 percent). But examination of the Fatal Accident Reporting System (FARS) statistics (*5*) from the Hawaii Motor Vehicle Safety Office shows that the motorcycle operator is responsible for 77 percent of motorcycle fatality accidents. The major cause is speeding or carelessness by the motorcycle operator (54.4 percent).

When asked what can be done to improve motorcycle safety and education in particular, 36 percent said that the state should require a safety education course before licensing (n = 178), and 32.2 percent (n = 159) said that greater public awareness through publicity campaigns is all that is necessary.

Problems in Enforcement of Licensing and Registration Laws

In addition to the telephone survey, an analysis of motorcycle licensing and registration laws was conducted. FARS data (*5*) show that in the 4 years before the mandatory helmet law repeal in 1977, 100 percent of motorcycle fatalities were wearing helmets and 72.7 percent had valid motorcycle licenses. In the last 3 years these numbers have reversed: only 26.8 percent of fatalities were wearing helmets and 29.3 percent had licenses. Further data show that the major causes of accidents have been speeding and losing control of the motorcycle. Both causes of accidents are typical of inexperienced drivers and add credence to studies that link a lack of license to inexperience, and inexperience to increased accident rates (*6–8*).

The problem of unlicensed operators is a matter of law enforcement. Motorcycle riders without licenses are not easy to detect or stop without cause. Currently, under Hawaii Revised Statutes (H.R.S.) 286.132, the penalty for driving without a license is not less than $250 and not more than $1,000, or not more than 1 year in prison.

Under H.R.S. §431:10C-501, no motorcycle is to be driven on any public roadway at any time unless the motorcycle is insured. To obtain insurance, one must have a valid motorcycle license or a valid motorcycle learner's permit and a certificate of successful completion from an approved motorcycle education course (§431:10C-504). Upon obtaining insurance, one is given a liability insurance card that has the name, make, year, and factory number of the motorcycle; policy number; name of the insurer; name of the insured; and the effective dates of the coverage. Under §431:10C-502, this card is to be carried on the person operating the insured motorcycle at all times. To prove that a motorcycle is properly insured, the insured must present this card at the annual safety inspection check, under H.R.S. 286-26. If this insurance card is not displayed, the safety sticker will not be affixed to the vehicle and the certificate of inspection will not be issued. This certificate of inspection is a requirement for registration. The penalty for noncompliance is a fine of not more than $1,000, 30 days' imprisonment, or a 1-year driver's license suspension, or any combination thereof.

Under the current H.R.S. provisions, the procedure exists to give police officers sufficient reason for stopping motorcyclists suspected of driving without licenses and insurance. This just cause is the lack of a current safety sticker on the motorcycle license plate. A related issue would be those without insurance who somehow receive a certificate of inspection. Again, this is an issue of enforcement, for certainly under the H.R.S. provisions it is illegal to approve a safety check without insurance.

A general lack of enforcement throughout the entire system toward motorcycles, the lack of effective punitive measures, and the lack of prosecution for offenses (on the part of operators and inspectors) may have contributed to the increase in unlicensed and uninsured operators.

RECOMMENDATIONS

Three types of recommendations come from this study: legislative, administrative, and programmatic.

Legislative

The major legislative recommendations involve restoring the mandatory helmet law and mandating motorcycle safety education courses for new riders.

According to the telephone survey results, 60.1 percent of the motorcyclists on Oahu always wear their helmets. At the same time, there is more opposition to than support for mandatory helmet laws. Among owners and operators, 53.7 percent oppose a mandatory helmet law, and 45.7 percent support such a law. However, support for the law increases to 68.8 percent if, as a result of the law, motorcycle insurance premiums are reduced. The study found that fatality rates have increased by more than 2.5 times since repeal of the helmet law. These findings suggest that although enactment of a mandatory helmet law may encounter opposition, there might be added support if the helmet law were linked to reduced motorcycle insurance premiums.

According to the survey, opposition to the helmet law is most likely to come from nonusers of helmets and owners and operators of larger motorcycles. Another possible area for legislative action involves mandatory motorcycle education for new riders. In reviewing the fatality data, it was determined that a disproportionately large share of the fatal accidents involved inexperienced, younger operators. Finally, this study has determined that there has been a significant increase in the proportion of unlicensed operators killed in motorcycle crashes. Approximately 45.5 percent of all fatalities involved those without motorcycle licenses.

The fact that younger, inexperienced operators have a higher chance of being killed or injured in a motorcycle accident points to the need for mandatory education for new riders. Operating a motorcycle is, by nature, a complex and dangerous activity requiring an adequate skill level, so there may be cause for legislation requiring that younger, inexperienced riders receive more training and education.

When owners and operators were asked what could be done to increase motorcycle safety in Hawaii, the most popular answer (36 percent of all respondents) was to require education courses. Although most owners and operators think that the most common cause of a motorcycle accident is that of being struck by another vehicle, data show that the motorcycle operator is usually at fault. Mandating motorcycle education courses would be effective if in fact the skill levels were to increase. Education courses are required for motorcycle insurance, and they should be required for licensing, building the licensing procedures into the course.

Administrative

There are two types of administrative actions that could contribute to improved motorcycle safety in Hawaii. The first pertains to licensing and registration procedures and laws already on the books, and the second relates to data and information management.

Enforcement of motorcycle safety laws in Hawaii is weak. Laws require that operators be licensed and insured, but there is substantial evidence that these laws are routinely broken. First, there is a large and growing number of fatalities involving unlicensed and uninsured riders. Second, about 10 percent of those with registered motorcycles admit that they do not have a license. Approximately 88 percent of the registered owners reported having motorcycle insurance. These self-reported estimates may actually overstate the true amount of licensing and insurance.

Police departments need to step up enforcement of a variety of motorcycle and traffic safety laws. The survey found that motorcyclists admit to a variety of risky and illegal driving actions including speeding, driving under the influence, and cutting in and out of traffic. Although unlicensed operators are difficult to detect, stopping operators of motorcycles without current safety stickers may be a way to identify uninsured or possibly unlicensed operators.

Much has also been said about Honolulu's motorcycle licensing procedures, mainly centering on the administration of the test and the general perceived unfairness of the instructors. Critics have cited these concerns as reasons for Hawaii's high number of accidents involving unlicensed drivers. However, this low license rate is a national trend and can be viewed as an attitudinal shift related to the overall risks of enforcement and penalties.

Yet Hawaii still has much room for improvement in its motorcycle licensing procedures. One alternative is the complete adoption of the Motorcycle Operating Licensing Plan developed by the Motorcycle Safety Foundation and NHTSA. A major component of this plan is the Motorcycle Operators Manual, a 35-page manual providing applicants with information ranging from basic preriding cycle inspection and protective gear to how to deal with dangerous road surfaces and how to handle on-street emergency situations. Also included are licensing and safety requirements specific to each state. In comparison, Hawaii currently offers only six pages on motorcycle information in the Hawaii Drivers Manual (*9*). Only four of those six pages cover basic rules for operating a motorcycle. Forty-nine sample test questions are included in the manual 70 pages behind the section on motorcycles, and 15 pages in the front of the manual describe the current skills test. Also lacking is mention of the mandatory insurance requirements or the availability and advantages of the Motorcycle Safety Course.

Although already listed under programmatic recommendations, it is again necessary to recommend administratively that licensing procedures be incorporated into the Motorcycle Safety Foundation's education course as much as possible. This action can be seen as streamlining the current system and providing the necessary checks on both skill levels and insurance requirements in a more timely and convenient manner to persons either taking or administering the tests.

The second administrative recommendation involves improving the data management system with which to check and cross-check consistency in terms of licensing, ownership, and insurance. This would be facilitated by the addition of a unique field—such as a Social Security number—that appears on the ownership record and the operator's license record. This would

enable a more accurate matching of owners and operators. Computerized matching could also be used to confirm that registered motorcycles are also insured.

Programmatic

Three types of programmatic recommendations emerge: (a) the state would improve and expand the Motorcycle Safety Foundation educational program currently administered through the University of Hawaii, (b) the state should promote motorcycle safety awareness and initiate a public information campaign to increase awareness of penalties for violating motorcycle licensing, registration, and insurance laws and (c) the state should fund further research and evaluation of motorcycle safety issues in Hawaii.

The results of this survey and others show that motorcycle crashes are related to risk-taking behaviors. Existing motorcycle education programs should be improved and expanded as a means of improving the operating skills and performance of motorcyclists. The education courses should be targeted toward younger, inexperienced operators. More research would be useful in terms of analyzing the types of behavioral patterns that younger, inexperienced operators are likely to exhibit. Motorcyle education courses may need to address both operating skills and risk-taking behaviors among operators.

The expansion of motorcycle education programs in Hawaii is seen to have short- and long-term effects. In the short term, a mandatory education program would send a strong message to new and experienced riders that safety is important. In the long run, such a course could help change some of the dangerous practices among motorcycle operators.

Certainly, major new initiatives or programs must be planned and coordinated with the participation of Hawaii's motorcyclists. A general motorcycle safety awareness campaign might also help in the development of effective programs and partnerships among government traffic safety officials, the motorcycle industry, and motorcyclists. Such a partnership is likely to have lasting effects in education, public awareness, and improvements in motorcycle safety laws and programs.

Finally, additional research on the causes of motorcycle accidents and strategies for prevention may be useful. In addition to correlation with other risk-taking behaviors, some further research might also examine concerns such as speeding, alcohol or drug involvement, and the effects of growing traffic congestion and urbanization on motorcycle crashes. Effects to improve the collection of accident and injury and fatality data go hand in hand with the proposed new topics of research. The call for a broadened research agenda implies more than the expenditure of more resources into basic data collection. The motorcylist population is not nearly so large as the automobile-driving population, but the increased risk and severity of injuries associated with motorcycle accidents suggest that additional, detailed studies of causes and remedies are warranted.

REFERENCES

1. *Motorcycle Statistical Annual*. Motorcycle Industry Council, Irvine, Calif., 1988.
2. J. P. Allegrante, *Explaining Safety Helmet Use by Motorcycle Operators Using a Behavioral Intention Model*. University of Illinois, Urbana, 1979.
3. P. M. Hemmerling. *Knowledge and Attitudes as Predictors of Motorcycle Safety Helmet Usage: A Regression Analysis*. Southern Illinois University, Carbondale, July 1975.
4. B. F. Goeller. *A Methodology for Determining Safety Priorities*. Rand Corporation, Santa Monica, Calif., 1969.
5. *Fatal Accident Reporting System*, Motor Vehicle Safety Office, Hawaii Department of Transportation, Honolulu, 1989.
6. *The Effect of Motorcycle Helmet Use Law Repeal—A Case for Helmet Use*. NHTSA, U.S. Department of Transportation, April 1980.
7. H. H. Hurt, J. V. Ouellet, and D. R. Thom. *Motorcycle Accident Cause Factors and Identification of Countermeasures, Vol. 1*. Traffic Safety Center, University of Southern California, Los Angeles, Jan. 1981.
8. J. Anderson, J. Ford, and R. Peck. *Improved Motorcyclist Licensing and Testing Project, Vol. 1*. NHTSA, U.S. Department of Transportation, June 1980.
9. *Hawaii Drivers Manual*. Hawaii Department of Transportation, Honolulu, 1988.

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