



Identifying best practices states in motorcycle rider education and licensing

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Abstract

Problem: After decreasing to a historic low in 1997, motorcycle crash-related fatalities are increasing. Although causes remain unclear, motorcycle rider education and licensing play key roles in reducing motorcycle crashes and injuries. Yet, little is known about what constitutes effective rider training and licensing. This study develops a model of best practices in motorcycle rider education and licensing and combines primary and secondary data to identify states that most closely adhere to this model. Evidence on the validity of the model is also examined. **Method:** States were rated along three areas of best practices: (a) program administration; (b) rider education; and (c) licensing based on 2001 data collected for a National Highway Traffic Safety Administration (NHTSA)-sponsored study. **Results:** Results indicate wide variation in states' adherence to best practices; several states meet most, others very few. When the areas of best practices are considered separately, a state tends to behave similarly on all three. Initial evidence supports the validity of the model, with high best practices states having the lowest rates of motorcycle fatalities. **Impact on Traffic Safety:** As motorcycle-related crashes increase and state and federal support for rider education programs diminishes, it is critical that states identify deficiencies in their program and learn from successful states about efficient, cost-effective strategies for increasing best practices in motorcycle rider education and licensing.

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1. Introduction

Despite significant progress since the enactment of federal motor vehicle and highway safety legislation in 1966, the annual toll of traffic crashes remains high on U.S. roadways. In 2001, traffic crashes continued to account for 95% of all transportation fatalities and 99% of injuries, and represented the leading cause of death for individuals ages 4 through 33 (National Highway Traffic Safety Administration [NHTSA], 2003).

Recent data indicate that deaths and injuries related to motorcycle crashes are becoming a larger portion of this grave public health problem. After decreasing steadily to a historic low in 1997, motorcycle crash-related fatalities have

been increasing since 1997, while injuries have been increasing since 1999. In 2003, 3,661 motorcyclists were killed—an increase of over 70% from 1997.

While the causes of the sudden increase in motorcycle fatalities remain unclear, over the years researchers have identified several factors that are instrumental in reducing fatal motorcycle crashes and motorcycle-related injuries. Factors aimed at crash prevention offer the greatest potential safety benefit for motorcyclists, since they occur before a crash takes place. Injury mitigation and emergency response are also important factors in reducing motorcycle fatalities and injuries, but of less direct benefit to riders since they occur after a crash takes place.

Among crash prevention measures, research points to the key role of motorcycle rider education and licensing. Although evidence of the effectiveness of rider education on crash reduction is mixed, several studies have shown that trained riders tend to have fewer crashes, less severe

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crashes, and overall lower cost of damage resulting from crashes (Billheimer, 1998; McDavid, Lohrmann, & Lohrmann, 1989; Mortimer, 1982). Similarly, properly licensed motorcycle riders are less likely to be involved in fatal crashes than their unlicensed counterparts (Billheimer, 1998).

Despite this emphasis on rider education and licensing, little attention has been paid to what constitutes effective rider training and licensing. Although in 2003 there were 47 state-legislated rider education programs in the United States, each state-sponsored rider education program was administered differently. In addition, all 50 states and the District of Columbia require a license to operate a motorcycle on the highway. However, the degree of coordination between rider education programs and licensing agencies varies widely across states (Baer, Cook, & Baldi, *in press*). The result of this fractured situation is that little systematic is known in terms of potentially effective practices used by states in implementing motorcycle rider education and licensing.

The purpose of this study is to develop a model of best practices in motorcycle rider education and licensing based on current research and reports published by NHTSA, and use detailed rider education and licensing data collected from all 47 states that offer state-legislated motorcycle rider education to identify the states that most closely adhere to this best practices model in terms of efficient and effective program components. In addition, evidence of the validity of the model is assessed by examining the relationship between best practice scores and motorcycle fatalities.

It is important to identify states with cost effective and efficient policies and practices that can be offered as models to be adopted by other states where possible. In this era of competing financial resources, this will allow state rider education and training programs to maximize limited funding while continuing to meet increasing demand.

2. Best practices in rider education and licensing

Research examining the effectiveness of motorcycle rider education on crash and injuries dates to the 1970s (Lawlor & Swain, 1978; Osga & Ellingstad, 1979; Raymond & Tatum, 1977) and continues to this day (Billheimer, 1996). These studies are typically designed to answer the question “are riders who receive training less likely to be involved in crashes than their counterparts who do not?” The evidence has been less than decisive, with most studies finding positive effects of rider education, but other studies finding no effect, or even negative effects (Mortimer, 1982; Raymond & Tatum, 1977).

In retrospect these findings are far from surprising. None of the studies actually measure program effectiveness. It is simply assumed by the authors that rider

instruction is effective. Yet, it is more plausible that some programs do a good job at educating riders while some others do not. Hence, findings of no impact or negative impact of rider education on subsequent crashes may merely reflect poor instructional practices on the part of that program.¹

This last point highlights the crucial importance of effectiveness of rider education practices in trying to understand the impact of rider education. What states do and how they: (a) encourage riders to take state-sponsored motorcycle training; (b) teach them basic riding skills; and (c) encourage riders to become fully and properly licensed, are critical elements to a program’s ability to affect trends in crashes and injury.

Documents and studies highlighting what states should do in terms of rider education and licensing are scant. To date, no integrated, fully fleshed-out model of best practices in rider education and licensing has been developed. Past studies have examined the benefits of rider education (Jonah, Dawson, & Bragg, 1982; Lawlor & Swain, 1978; Satten, 1980), its relationship to severe or fatal crashes (McDavid et al., 1989; Mortimer, 1982, 1988), or whether trained riders were more likely to engage in certain types of behaviors (e.g., obtain a valid license, wear protective gear, abstain from drinking and riding, and avoid other risky riding behavior; Billheimer, 1996; Perrino et al., 2002; Swaddiwudhipong, Boonmak, Nguntra, & Mahasakpan, 1998). However, these studies have been plagued by weak methodological designs (i.e., lack of randomization) and an inability to relate outcome measures to specific features of the rider education and licensing process (Chesham, Rutter, & Quine, 1993; Simpson & Mayhew, 1990).

The absence of a model of best practices in rider education makes it difficult for researchers to examine the linkages between rider training and subsequent rider injuries and crashes. Studies that note only whether a rider has completed a rider training course or not ignore variations in the quality and availability of training across state programs (Baer, Baldi, & Cook, *forthcoming*). The primary purpose of this paper is to propose a model of best practices in motorcyclist education and licensing that can serve as a foundation for subsequent research. Using the model as a starting point, researchers can explore its components and also examine the relationship between state best practices and motorcyclist injuries and fatalities.

Given the paucity of research on the features of state programs that contribute to high quality training and licensing, we used reports issued by expert panels in

¹ We should also note that the methodological limitations of these studies could have contributed to their inconsistent findings. None of these studies used experimental designs in which riders are assigned randomly to either trained or untrained conditions. As a result, many other confounding variables (e.g., environmental factors) could have accounted for their results.

motorcycle and traffic safety as our starting point for the model developed in this paper, supplemented by additional scholarly research when available. The National Highway Traffic Safety Administration has issued two key reports outlining recommendations for rider education and licensing practices (NHTSA, 1993, 2000). These reports were developed over many years through the input of various motorcycle safety researchers and administrators and synthesize much of the previous research on effective practices related to motorcycle rider education and licensing. While neither of these documents is comprehensive, they provide a starting point from which to build an integrated model of best practices in motorcycle rider education and licensing. The following section discusses the various components of this model of best practices in rider education and licensing.

2.1. The best practices model

Best practices refers not only to the delivery of course content to students, but also to a sound administrative structure and a comprehensive licensing system (Kraus et al., 1991; NHTSA, 1993). As such, a comprehensive model of best practices should encompass:

- Program Administration
- Rider Education
- Licensing

These three areas form the core of the best practices model developed and evaluated in this article. Program administration refers to the structure and organization of a jurisdiction's rider education and licensing activities. The second area of best practices, rider education, focuses on the details of delivering training efficiently and effectively to motorcycle operators. Finally, licensing practices encourage operators to ride legally and prescribe procedures for ensuring that only skilled riders are licensed to operate motorcycles.

The best practices model for rider education and licensing is presented in Fig. 1. Each of the three main areas in the model is comprised of a series of different practices, all of which are critical for providing quality training and ensuring effective licensing of riders. The key components of the model and supporting evidence are described in greater detail below.

2.1.1. Program administration

Organizational scholars have long noted that the integration of bureaucratic units reduces redundancies within organizations and can increase their efficiency (Perrow, 1972; Scott, 1992). Applied to motorcycle rider education and licensing, integration between agencies should streamline the process of obtaining a license for qualified riders and improve the level of service they offer to their customers. Within the area of program administration, three

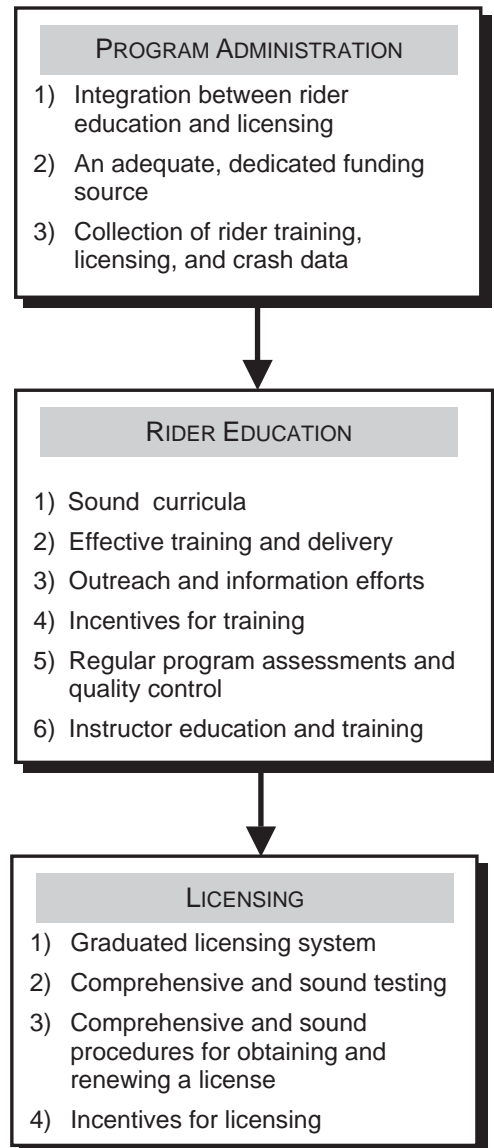


Fig. 1. Overview of Best Practices Model of Motorcycle Rider Education and Licensing.

practices are important for promoting effective training and licensing of riders:

- Integration between rider education and licensing
- An adequate, dedicated funding source
- Collection of rider training, licensing, and crash data

Both motorcyclists and the administrative offices that service them can derive benefits from the integration of rider education and licensing. For riders, linking successful completion of a rider training course to a motorcycle endorsement may encourage individuals seeking licensing to also seek training. When motorcycle rider licensing is distinct from training, novice riders applying for licenses may miss opportunities to improve their skills through rider education classes. This does not imply that rider education classes should be an open avenue for all riders,

regardless of ability, to obtain a license. In contrast, riders who fail to demonstrate the skills required to pass a class can be counseled that they should re-consider their decision to operate a motorcycle. This may not prevent individuals from riding illegally, but at the very least they have been informed that they currently lack the skill set necessary to operate a motorcycle safely.

The second feature of program administration, an adequate and dedicated funding source, ensures that training opportunities will be available from year to year and that students will be able to receive appropriate training from a state certified provider. Finally, the collection of rider training, licensing, and crash data allows states to carefully monitor the impact of program activities by centralizing all information in a single database.

2.1.2. Rider education

The second area of best practices, rider education, focuses on the details of delivering training efficiently and effectively to motorcycle (or would-be motorcycle) operators. The key practices related to rider education include:

- Sound curricula
- Effective training and delivery
- Outreach and information efforts
- Incentives for training
- Regular program assessments and quality control
- Instructor education and training

Across the country, the most recognized curricula for rider education programs are the courses created by the Motorcycle Safety Foundation (MSF). MSF courses are the product of careful planning and consideration and have been adopted by all but one state with administrative agencies responsible for the oversight and administration of motorcycle rider education and safety programs.² Reviews of the effectiveness of the MSF's curriculum have been mixed (Mortimer, 1984, 1988; Satten, 1980), but they emphasize the need for a well-thought-out curriculum.

The second feature of rider education, effective training and delivery, reflects a program's ability to adequately supply training classes to meet demand. A key challenge of many state programs is to meet the demand for classes (Garets, 2002). To satisfy demand, programs should provide training at sites accessible by riders throughout the state and offer classes frequently and with little delay to interested students.

Outreach and information efforts about rider training and safety are important not only for encouraging operators to

enroll in classes, but also for educating the non-riding public about motorcycles on roadways (Billheimer, 1996). While the most expensive ads are not necessarily the most effective, some form of outreach efforts are an important component of increasing the effectiveness of rider education programs (Donovan, Jalleh, & Henley, 1999).

Interviews with individuals enrolled in rider training courses have revealed that incentives are one of the most powerful reasons students elect to take a class (Baer et al., forthcoming). Low course tuition is one strong incentive, as are waivers for licensing tests awarded upon successful completion of a training class. In states that offer licensing waivers, when students apply for a license and present their course completion card, they are allowed to waive the state motorcycle skills and/or knowledge test. A modification of the waiver system is the "one-stop-shop," in which riders receive their motorcycle license at the training site upon successful completion of the course. The "one-stop-shop" is a strong incentive because riders receive their license concurrent with course completion, eliminating the need to make a separate visit to the state licensing agency. Finally, states can offer reductions of points on licenses and insurance discounts for riders who complete a training course.

The importance of regular assessment and quality control is well established in the organization management literature (Mitra, 1998). By implementing regular program assessments and quality control, states can monitor their operations and identify areas in need of refinement and improvement. Since rider training courses are typically held at multiple locations throughout a state, it is imperative that states institute quality control procedures to ensure that all riders receive adequate training and supervision in a standardized format.

The final set of best practices related to rider education concerns instructor education and training. Quality training is dependent in large part on a staff of qualified and competent instructors. Rider training is designed to teach students the fundamentals of safely operating a motorcycle, but this information must be conveyed in a manner that is digestible for students. Effective training should help students adopt an attitude toward riding that values safety and that increases their conscientiousness (Arthur & Doverspike, 2001; Chesham et al., 1993). States should monitor their instructional staff through certification requirements and also provide opportunities for experienced riders to teach classes. New instructors can be recruited through preparation courses and by offering certification reciprocity for instructors trained in other states.

2.1.3. Licensing

All states and the District of Columbia mandate that motorcycle operators who use public roadways must possess a valid motorcycle license or endorsement and that to receive a license, operators must pass a written knowl-

² The State of Oregon recently switched from the MSF curriculum to a curriculum developed by the rider training contractor for the state, TEAM Oregon. Like the MSF's curriculum, TEAM Oregon's was extensively reviewed and produced through the assistance of experts and practitioners in motorcycle safety.

edge test. Beyond these stipulations, states vary in their procedures for licensing riders and for encouraging unlicensed operators to ride legally. Past research (Kraus et al., 1991; Mayhew & Simpson, 2001; Reeder, Alsop, Langley, & Wagenaar, 1999; Reeder, Chalmers, & Langley, 1996; Royal Society for the Prevention of Accidents, 2001) indicates that the following elements should be part of a comprehensive best practices model:

- Graduated licensing system
- Comprehensive and sound testing
- Comprehensive and sound procedures for obtaining and renewing a license
- Incentives for licensing

NHTSA (1993, 2000) has long advocated that states adopt graduated licensing for motorcyclists because it compels novice operators to successfully demonstrate proficiency at several intermediate steps before being granted full riding privileges. Studies of graduated licensing programs for motor-vehicle operators, which impose restrictions on teen drivers, indicate that they may reduce risky driving behavior (Cvijanovich, Cook, Mann, & Dean, 2001; Foss & Goodwin, 2003). Model graduated licensing programs for motorcyclists typically mandate that riders obtain learner's permits with a limited validation period and without automatic renewals. Moreover, riders must follow restrictions on the operation of their motorcycles, such as riding during daylight hours. Riders may also be required to obtain an intermediate license subsequent to their permit and maintain a clean riding record for a specified period of time before they receive a full endorsement.

To carefully measure a rider's proficiency, licensing agencies should implement comprehensive and sound testing practices, requiring applicants to pass both a written knowledge test and a skills test. While there is some debate over the relative merits of off-road versus on-road skills tests (Buchanan, 1988; Jonah, Dawson, & Bragg, 1981; Jonah et al., 1982; Kelsey, Liddicoat, & Ratz, 1986), the merits of sound testing procedures are well established.

In addition to providing comprehensive and sound testing, jurisdictions should also institute comprehensive and sound procedures for riders to obtain and renew motorcycle licenses, such as providing riders with an operator's manual to prepare for testing and mandating that riders under the age of 21 complete a rider education course before receiving a license. Compulsory rider education for minors is essential because teenage motorcyclists often engage in risky behavior that may result in crashes (Lin, Chang, Pai, & Keyl, 2003; Reeder et al., 1996).

Finally, similar to the features of rider education programs, licensing agencies should offer riders incentives for seeking licensing. Incentives such as reciprocal license waiver and reciprocity for rider education completed in another state have been shown to be a decisive factor in

individuals' decision to seek out training (Baer et al., forthcoming).

3. Method

3.1. Data

To construct a dataset containing detailed information about the program administration, rider education, and licensing practices in each state, we began by linking each of the 13 practices identified in the best practices model to one or more measures. The majority of measures reflected rider education practices (22), with fewer indicators for program administration (4) and licensing (7). Compiling the data for each of the measures was a multi-stage process. In the first stage, data were collected from documents published by the National Association of State Motorcycle Safety Administrators (SMSA), the Motorcycle Safety Foundation (MSF), and annual reports issued by state motorcycle rider education programs.

The MSF and SMSA publish annual reports summarizing the characteristics of rider training programs offered across the country. These reports provide extensive information about training opportunities in each state as well as licensing requirements (Motorcycle Safety Foundation [MSF], 2001a, 2001b; National Association of State Motorcycle Safety Administrators, 2002). State annual reports, issued by a handful of states, generally include details about program finances and course completion data. All documents were reviewed and relevant information for each of the best practices was coded and linked to the corresponding measures. Data were collected for calendar year 2001, the most recent year for which published information was consistently available.

In the second stage of data collection, we searched state program Internet websites for additional information about features related to their program administration, rider education, and licensing. These data were used to supplement the data gathered from the published documents, which, while extensive, still contained some gaps.

Finally, in the third stage of data collection, we sent a summary of the data collected through stages one and two to each of the 47 state motorcycle safety administrators. The administrators were asked to confirm the data recorded in the summary for their state and to supply information for any of the measures for which data had not been located. The majority of state administrators (81%) returned the data summaries, which was then incorporated in the dataset.

3.2. Measures

Table 1 presents the measures used to capture the various components of the best practices model presented above along the three key areas of program administration, rider education, and licensing. This table also presents the

Table 1
Variables and Scoring Rubrics for Best Practices Model

Program Administration

Variables	Value Labels	Score Point
Licensing agency same as rider education agency	No	0
	Yes	1
Ratio of state budget to number of operators	Values in the highest quartile coded as "1," all others as "0".	0
		1
Data available in electronic format	No data available	0
	Some data available	}
	Licensing data only	
	Rider education data only	
All data available	2	
Link between crash data and rider training and licensing data	No	0
	Crash data linked to licensing data only	}
	Crash data linked to rider education data only	
	Crash data linked to both licensing and rider education data	
Total possible score for program administration scale: 6		

Rider Education

Variables	Value Labels	Score Point
State offers novice MSF curricula	No	0
	Yes	1
State offers experienced MSF curricula	No	0
	Yes	1
Average waiting period to take course	None	}
	Less than 1 month	
	1 to 3 months	
	Greater than 3 months	0
Total number of students on waiting list in 2001	Reverse Coded: Values in the highest	}
	quintile coded as "0," all others as "1".	
Courses per licensed operators	Values in the highest quintile coded as "1," all others as "0".	0
		1
Sites per 10,000 licensed operators	Values in the highest quintile coded as "1," all others as "0".	0
		1
Annual budget for public information and education	\$0	}
	\$1 - \$4,999	
	\$5,000 - \$19,999	
	> \$20,000	
Point reductions on license for rider education graduates	No	0
	Yes	1
Adult student cost for novice course	Reverse Coded: Values in the highest	}
	quintile coded as "0," all others as "1".	
No cost for rider education courses to student	No	0
	Yes	1
Reciprocity for rider education completed in another state	No	0
	Yes	1
Skills test waiver for successful completion of state rider education course	No	0
	Yes	1
Knowledge test waiver for successful completion of state rider education course	No	0
	Yes	1
Rider licensed upon successful completion of rider education program	No	0
	Yes	1

Table 1 (continued)

Rider Education		
Variables	Value Labels	Score Point
Program conducts regular, scheduled evaluations	No	0
	Yes	1
Type of evaluation/evaluation process	Review of student/instructor evaluations	}
	Annual report	
	Some other formalized evaluation	
	None	0
State has formal quality control procedures	No	0
	Yes	1
Frequency of quality control implementation	Multiple times per year	}
	Annually	
	Some other set schedule	}
Intermittently, no set schedule		
Instructors are state certified	No	0
	Yes	1
State offers Instructor Preparation Course (IPC)	No	0
	Yes	1
Instructors complete internship/probationary period	No	0
	Yes	1
State has reciprocity for instructors trained in other states	No	0
	Yes	1
Total possible score for rider education scale: 22		

Licensing

Variables	Value Labels	Score Point
Graduated licensing	No	0
	Yes	1
Primary knowledge test	Modified MSF	}
	Local	
	None	
	MSF	1
Primary skills test	None	0
	Alternate MOST	}
MLST		
Local off-street		
Primary operator's manual used	Local on-street	}
	M/C in traffic	
	Modified MOM	}
Local		
	MOM	1
Agency responsible for training examiners	DOT/DMV	}
	DOE	
	Law Enforcement	
	Other state agency	
	Private contractor	
	Rider Ed./ Safety Program	1
Riders under certain age must complete rider education course for license	No	0
	Yes	1
Reciprocal license waivers	No	0
	Yes	1
Total possible score for licensing scale: 8		
Total Possible Score for Overall Best Practices Scale: 36		

Table 2
Descriptive Statistics for Variables in Best Practices Model

Variable	Mean	S.D.	Minimum	Maximum	Valid N
<i>Program Administration</i>					
Licensing agency same as rider education agency	0.30	0.46	0	1	47
Ratio of state budget to number of operators	0.24	0.43	0	1	42
Data available in electronic format	0.72	0.57	0	2	36
Link between crash data and rider training and licensing data	0.43	0.81	0	2	35
<i>Rider Education</i>					
State offers novice MSF curricula	0.47	0.50	0	1	47
State offers experienced MSF curricula	0.13	0.34	0	1	47
Average waiting period to take course	0.83	0.38	0	1	24 ^a
Total number of students on waiting list in 2001	0.83	0.39	0	1	12 ^a
Courses per licensed operators	0.19	0.40	0	1	31
Sites per 10,000 licensed operators	0.19	0.40	0	1	42
Annual budget for public information and education	0.35	0.48	0	1	40
Point reductions on license for rider education graduates	0.20	0.40	0	1	40
Adult student cost for novice course	0.80	0.40	0	1	45
No cost for rider education courses to student	0.09	0.29	0	1	43
Reciprocity for rider education completed in another state	0.45	0.50	0	1	42
Skills test waiver for successful completion of state rider education course	0.91	0.28	0	1	47
Knowledge test waiver for successful completion of state rider education course	0.43	0.50	0	1	47
Rider licensed upon successful completion of rider education program	0.06	0.25	0	1	47
Program conducts regular, scheduled evaluations	0.86	0.35	0	1	37
Type of evaluation/evaluation process	0.38	0.49	0	1	32
State has formal quality control procedures	0.97	0.17	0	1	36
Frequency of quality control implementation	0.67	0.48	0	1	33
Instructors are state certified	0.83	0.38	0	1	41
State offers Instructor Preparation Course (IPC)	0.58	0.50	0	1	43
Instructors complete internship/probationary period	0.63	0.49	0	1	41
State has reciprocity for instructors trained in other states	0.94	0.94	0	1	33
<i>Licensing</i>					
Graduated licensing	0.15	0.36	0	1	47
Primary knowledge test	0.53	0.50	0	1	47
Primary skills test	1.13	0.40	0	2	47
Primary operator's manual used	0.62	0.49	0	1	47
Agency responsible for training examiners	0.09	0.29	0	1	34
Riders under certain age must complete rider education course for license	0.53	0.50	0	1	47
Reciprocal license waivers	0.91	0.28	0	1	47

^a Few states provided information about the average waiting period to take a course or the total number of students on a waiting list in 2001, resulting in a large amount of missing data for these measures. We re-calculated the best practices scores with these two measures excluded and found that it did not change the overall rankings of the states for either the rider education subscale or for the overall best practices scale.

variables operationalizing these measures, along with their scoring rubrics. The majority of variables in the database were coded as dichotomous, with a “1” indicating the presence of a practice consistent with the best practices model and “0” indicating the absence of a practice. A few variables that had more than simple “yes” and “no” for answer categories were coded on a three-point scale based on the distribution of scores across the available categories. Whenever possible, we tried to record measures as continuous rather than as categorical variables to capture the full range of responses. However, some data (e.g., waiting times, annual budget for public information, and education) were reported by the states as both categorical and continuous. When this occurred, we recoded the data as an ordinal variable.

Below we provide additional discussion of the variables used to measure the various components of a state's

practices along the areas of administration, rider education, and licensing.³

3.2.1. Program administration

State program administration practices were assessed through four variables. Program integration (i.e., whether the licensing agency is the same as the rider education agency) was measured by a single dichotomous variable and the adequacy of a state's funding source through the ratio of a state's budget to the number of motorcycle operators. The last two measures under program administration represented a state's capacity for collecting rider training and licensing data. The availability of data in an electronic format and links between crash data and rider training and licensing data were

³ Not all three scales carry the same weight because the best practices model heavily emphasizes activities related to rider education.

scored on a three point scale, with the highest scores assigned to states that maintained extensive data archives.

3.2.2. Rider education

Twenty-two variables were used to measure a state's rider education practices. Since all state programs utilized MSF curricula in their classes, states were evaluated based on whether they offered both novice and experienced courses.⁴ Effective training delivery was measured through four variables, two of which captured the speed at which students were able to enroll in classes. Waiting times for classes and the total number of students on a waiting list in 2001 were both recoded to dichotomous variables, with a "1" assigned to states that demonstrated some speed in meeting the demand for training (3 months or less). Two continuous variables, the ratio of courses to licensed operators and the ratio of sites to operators, were also recoded as dichotomous variables. Positive scores on these variables indicate that a state was in the upper tier of the distribution across all states for offering courses and training sites.

The third feature of rider education best practices, outreach and information efforts, was measured by a dichotomous variable indicating whether the state program expended any funds to advertise their courses. Incentives encouraging operators to enroll in classes were assessed through six dichotomous variables: (a) reductions in points for completion of a rider training course, (b) no cost for courses, (c) reciprocity for rider education completed in another state, (d) skills test waivers and (e) knowledge test waivers for successful completion of rider training, and (f) whether the state had implemented a "one-stop shop." A seventh measure, adult student cost for a novice course, was recoded to a dichotomous indicator based on the distribution of novice course fees across states.

Four variables were used to measure the implementation of regular program assessments and quality control efforts. States were evaluated based on whether they conducted regular, scheduled evaluations, and, if so, the type of evaluation process they employed. Both variables were scored dichotomously. Quality control was assessed through two similar dichotomous measures, one for the implementation of a quality control program and the other for the frequency with which it was administered. The final feature of rider education practices, instructor education and certification, was measured through four dichotomous variables capturing state certification of instructors, the availability of training opportunities for new instructors, internship or probationary requirements, and whether the state offered reciprocity for instructors trained in other states.

⁴ As noted above, Oregon introduced a non-MSF curriculum for novice riders in 2004. The standards for this curriculum, which was developed by the state contractor, TEAM Oregon, meet or exceed those of the MSF's novice training course. Since Oregon continues to offer both novice and experienced courses, the introduction of their new curriculum would not change the best practices scores they were awarded for this measure.

Table 3
Classification of States by Best Practices Scores

Low best practices score states		Medium best practices score states		High best practices score states	
State	Score	State	Score	State	Score
KS	9	ND	18	OR	24
AZ	9	FL	18	DE	23
KY	8	PA	18	ID	23
NJ	8	TN	18	NV	21
WV	7	SD	17	NM	21
WY	7	NE	17	MD	20
RI	4	TX	17	OH	19
SC	3	WI	17	HI	19
		VT	17	WA	19
		VA	16	MN	19
		IN	16		
		NY	16		
		IA	15		
		MO	15		
		CA	15		
		NC	15		
		NH	14		
		MT	13		
		UT	13		
		IL	13		
		AL	13		
		CT	12		
		GA	12		
		LA	12		
		MA	12		
		MI	11		
		OK	11		
		CO	11		
		ME	11		

Mean=14.6; S.D.=4.9.

3.2.3. Licensing

Features of licensing programs were evaluated through six variables, beginning with a dichotomous indicator for whether the state had implemented a graduated licensing system for motorcyclists. Comprehensive and sound testing was assessed through two dichotomous variables capturing the types of knowledge and skills tests used by a state. Since the content of the MSF examination is widely accepted and adopted, one point was awarded to states that used the MSF test over a local or modified MSF version. Regarding the skills test, NHSTA recommendations specify that the examination should be administered on-street so that riders can be evaluated in real-world conditions.⁵ Scores for best practices in the administration of skills tests followed this guideline, awarding two points to jurisdictions

⁵ As noted earlier in our discussion, there are advantages and disadvantages to on-and off-street licensing tests. To ensure that our results were not dependent upon this measure, we re-calculated the best practices scores with the measures of skills tests excluded. We also calculated the best practices scores without the measures of the type of motorcyclist operator's manual, since a modified or local manual could exceed the MSF's criteria. With the exception of Pennsylvania, which moved from the "medium" to the "high" category, the scores for the states remained the same.

Table 4
Best Practices Subscale Scores, by State

State	Program Administration	Rider Education	Licensing
AL	1	10	2
AZ	0	6	3
CA	2	9	4
CO	1	7	3
CT	1	7	4
DE	4	13	6
FL	4	9	5
GA	1	7	4
HI	3	11	5
IA	1	9	5
ID	4	16	3
IL	2	8	3
IN	0	12	4
KS	0	4	5
KY	0	6	2
LA	0	9	3
MA	1	9	2
MD	5	12	3
ME	1	7	3
MI	0	6	5
MN	3	13	3
MO	1	10	4
MT	1	7	5
NC	0	12	3
ND	1	12	5
NE	1	11	5
NH	1	10	3
NJ	0	7	1
NM	3	13	5
NV	1	15	5
NY	3	9	4
OH	1	13	5
OK	1	5	5
OR	5	14	5
PA	1	13	4
RI	0	2	2
SC	0	1	2
SD	0	11	6
TN	1	13	4
TX	1	11	5
UT	1	9	3
VA	2	9	5
VT	1	12	4
WA	3	11	5
WI	1	11	5
WV	0	3	4
WY	1	2	4
	Mean=1.4	Mean=9.3	Mean=3.9
	S.D.=1.4	S.D.=3.5	S.D.=1.2

that mandated on-street tests, one point for off-street tests, and no points for the absence of any skills test.

Practices related to obtaining and renewing a license were assessed through three variables. The adoption of the MSF’s Motorcyclist Operator’s Manual is consistent with NHTSA recommendations and was awarded credit over the use of any other type of operator’s manual. Examiners trained by a state rider education program should have familiarity with motorcycles, so states meeting these criteria were awarded one point. The final two

variables under the licensing area, rider education requirements for minors seeking licensing and reciprocal license waivers, capture incentives for licensing and were measured with dichotomous variables. Table 2 presents the mean, standard deviation, minimum, maximum, and valid number of observations for each of the 33 variables in the model.

4. Results

Overall best practices scores were assigned to each state by summing the total points awarded within the program administration, rider education, and licensing areas. A total of 36 points were possible for the best practices scale and state scores ranged from a low of 3 (South Carolina) to a high of 24 (Oregon). To identify clusters of states with similar practices, the states were classified as “low,” “medium,” and “high” based on the distribution of their overall scores. Scores one standard deviation above the mean were classified as “high” and those one standard deviation below the mean as “low.” All other scores were assigned to the “medium” category. Clusters of states for the overall best practices score are displayed in Table 3, along with the mean and standard deviation for the scale. Overall, 10 states were classified as “high” best practice states: Oregon, Delaware, Idaho, Nevada, New Mexico, Maryland, Ohio, Hawaii, Washington, and Minnesota. These are states that satisfy most of the key best practices identified by our model to some extent. Eight states were classified as “low” best practices scores: Kansas, Arizona, Kentucky, New Jersey, West Virginia, Rhode Island, and South Carolina. These are states that engage in very few of the best practices identified by our model. All other states fall somewhere in the middle in terms of best practices engagement.

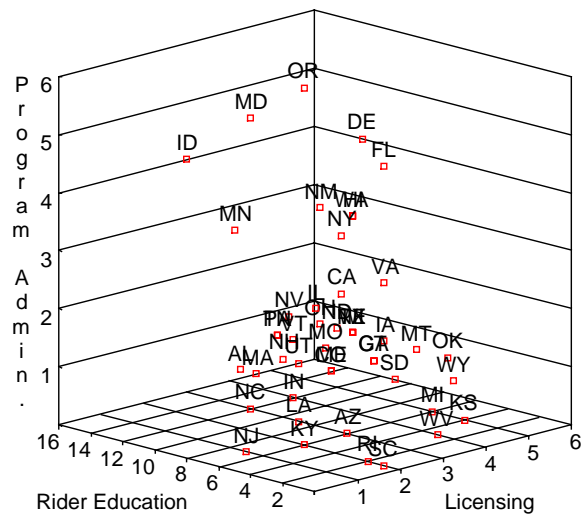


Fig. 2. Relationship Among Program Administration, Rider Education, and Licensing Best Practices, by State.

Table 5
Descriptive Statistics for Selected State Characteristics, by Best Practices Scores

Variable	Low Best Practices			Medium Best Practices			High Best Practices		
	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
Motorcyclist fatalities per 100,000 population	8	1.4	0.6	29	1.3	0.6	10	1.2	0.4
Per capita vehicle miles traveled	8	10,873.2	3048.5	29	10518.0	1757.1	10	9854.8	1504.0
Registered motorcycles per 100 population	8	1.6	0.6	29	1.9	0.8	10	1.9	0.7
Licensed motorcyclists per 100 population	8	4.7	2.2	28	4.9	2.2	10	4.5	1.4

In addition to calculating overall best practices scores, subscale scores for the three areas of program administration, rider education, and licensing were also computed. Subscale scores reveal greater detail about the features of a state’s rider education and licensing activities and are especially valuable for comparing across the three dimensions of the best practices model. Subscale scores for each state are presented in Table 4. For the program administration scale, scores ranged from a low of 0 (12 states) to a high of 5 (Maryland and Oregon) out of 6 possible points. The rider education scale was comprised of more variables and was scored out of 22 possible points. Idaho had the highest score for this scale (16) and South Carolina the lowest (1). Finally, scores on the licensing best practices subscale ranged from 1 (New Jersey) to 6 (Delaware and South Dakota) out of eight possible points.

The extent to which best practices in one area (e.g., administration) co-vary with best practices in the other two areas (e.g., rider education and licensing) is presented in Fig. 2. This figure is a three-dimensional representation of the relationship among the three subscales.

Oregon and Delaware, the top two states in overall best practices, also scored consistently high across the three subscales. Idaho, the third ranking best practices state, was boosted by its rider education subscale score (16, the highest of all the states) but scored lower in licensing (3). Nevada and New Mexico, the remaining two states in the top five of overall best practices, also reported strong features of their rider education programs (15 and 13, respectively), but scored lower on program administration (1 and 3, respectively). The delivery of rider training in Nevada was not negatively affected by the organization of the program. South Dakota was the only state that scored the highest on one of the subscales (tying with Delaware at 6 for licensing practices) but was not in the highest tier for overall best practices. At the other end of the distribution, South Carolina and Rhode Island scored equally low on all three subscales. Overall, these results suggest a fair amount of consistency across the three subscales in the way states meet various best practices. States are either likely to engage highly in all three areas of best practices, or engage little in all three.

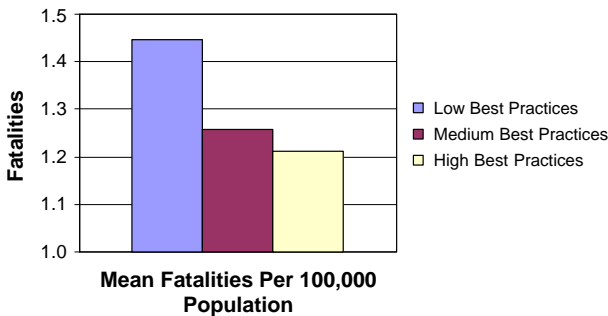


Fig. 3. Motorcyclist Fatalities by Best Practices Score.

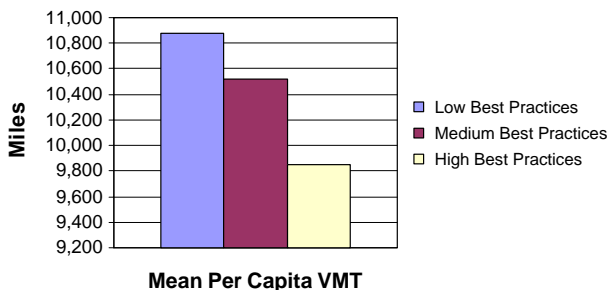


Fig. 4. Per Capita Vehicle Miles Traveled (VMT) by Best Practices Score.

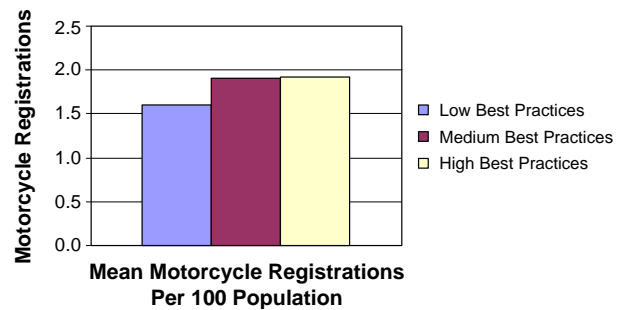


Fig. 5. Registered Motorcycles Per 100 Population by Best Practices Score.

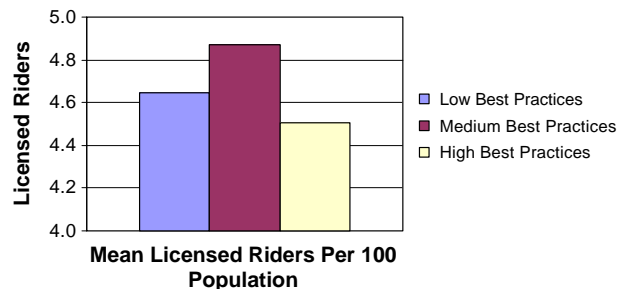


Fig. 6. Licensed Motorcycle Riders Per 100 Population by Best Practices Score.

5. Validity of the best practices model

The best practices model is designed to help motorcycle safety administrators, policymakers, and researchers identify the factors that contribute to high quality rider education and licensing. Hence, to be helpful, the model needs to demonstrate validity (that is, some semblance that it works). While extensive empirical evaluation lies beyond the scope of this article, in this section we present preliminary evidence for the validity of the model. In particular, we examine the relationship between best practices and motorcyclist fatalities through bivariate and multivariate analyses. Our guiding hypothesis is that if the model presented above is valid, then we should expect motorcyclist fatalities to decrease as best practices scores increase, and this should hold both at the bivariate level and when controlling for other factors.⁶

For each of the 47 states in the analyses, we coded the number of registered motorcycles per 100 population, the number of licensed operators per 100 population, vehicle miles traveled per capita (per capita VMT), and the number of motorcyclist fatalities per 100,000 population. Vehicle registrations, licensed operators, and per capita VMT have been found to be critical covariates of fatalities and injuries in past aggregate-level analyses (Michener & Tighe, 1992; Muller, 2004). Data for these indicators were collected for 2001, the year for which the best practices data were also collected. Data about the number of licensed motorcycle riders in a state were drawn from the database constructed for this study, while data for the three other measures were extracted from databases maintained by the Bureau of Transportation Statistics.⁷ The Fatality Analysis Reporting System (FARS) produced by NHTSA was the source of the number of motorcyclist fatalities in each state in 2001. Table 5 reports the means and standard deviations for these four variables across the three groups of best practices scores (low, medium, and high).

Inspection of these descriptive statistics, as illustrated graphically in Figs. 3–6, provides initial support for the validity of the model. Motorcycle fatalities are lowest in high best practices states and highest in low best practices states. Furthermore per capita VMT are lowest in high best practices states and highest in low best practices states. High best practices states are also the ones with the most registered motorcycles per 100 population. There does not seem to be a relationship between licensed motorcycle riders per 100 population and best practices scores.

⁶ One should note, however, that many factors affect fatalities, ranging from road condition, weather, traffic pattern, and rider characteristics, and that the expected relationship between best practices in rider education and licensing should not be expected to be a strong one.

⁷ Data about the number of motorcycle operators in a state are difficult to obtain because of the different classification systems used across the country. Our measure is based on the number reported by each state and published in the MSF's *Cycle Safety Information* (MSF, 2001), one of the primary data sources used in creating the best practices dataset.

Table 6

OLS Regression of State-Level Motorcyclist Fatalities on Selected State Characteristics

Variable	Model	
	Parameter Estimate	Standard Error
Best Practices score (logged)	−0.16	0.17
Vehicle miles traveled (logged)	0.93	0.18
Registered motorcycles (logged)	0.33	0.23
Licensed motorcyclists (logged)	−0.19	0.25
Intercept	−6.93	1.06
Adjusted R ²	0.80	

To further assess the validity of the best practices model on motorcycle fatalities, we regressed the number of motorcycle fatalities in each state in 2001 on the following four variables: best practices score, Vehicle Miles Traveled, number of registered motorcycles, and number of licensed motorcycle operators (raw counts). All variables in the model were logged to avoid potential problems with restricted range and skewed distributions, and because we do not expect the effect of these variables to be linear. While this model is far from being a complete model of the correlates of motorcycle fatalities, we were limited by the small sample size (n=47) and ensuing degrees of freedom in the number of covariates that could be included. Hence, these results should be seen as exploratory rather than definitive.

Results of the regression analysis, presented in Table 6, provide further evidence of the validity of the best practices model, with best practices score having a negative relationship with motorcycle fatalities, net of the other variables in the model.⁸ No tests of statistical significance are reported since these analyses are based on population data, not sample data. Hence, any difference observed is a “true” difference. This means the higher a state’s best practices scores, the lower its rate of motorcycle fatalities, even when controlling for vehicle miles traveled, number of registered motorcycles, and number of licensed motorcycle operators.

6. Summary

This article developed a model of best practices in motorcycle rider education and licensing based on current research and reports published by NHTSA, and used detailed rider education and licensing data collected from all 47 states that offer state-legislated motorcycle rider education to identify the states that most closely adhere to this best practices model in terms of efficient and effective program components.

The model identified 13 best practices organized around the three areas of program administration, rider education, and licensing. Results indicated wide variation in the extent to which states adhere to these best practices, with several

⁸ No tests of statistical significance are reported since these analyses are based on population data, not sample data. Hence, any difference observed is a “true” difference.

states meeting most of these best practices in some form or another, and others meeting very few. Most states fell somewhere in the middle. Furthermore, results indicated that when looking at the three areas of best practices separately (i.e., program administration, rider education, licensing), most states tended to behave similarly on all three. States that engaged in best practices in rider education were also the ones most likely to engage in best practices in licensing and in program administration, and vice versa.

The preliminary evidence presented both through bivariate and multivariate regression analyses indicated support for the best practices model developed in this article, with high best practices states having lower motorcycle fatality rates than their lower scoring counterparts.

In an era of decreasing state and federal support for motorcycle safety programs, combined with a resurgence of motorcycle highway fatalities that reverses a decade-long trend, a focus on efficient and cost-effective crash-prevention measures is critical. While motorcycle rider education and licensing has been repeatedly identified as a crash-prevention measure, little attention has been paid to what constitutes effective rider training and licensing. This article provided an initial step in introducing a detailed model of best practices by which to assess state performance. States can use these results to identify where they stand and compare their performance with other states in an effort to learn from them and improve their own program. Subsequent research should aim at refining the components included in our best practices model and to further investigate the empirical relationship between state practices and motorcyclist fatalities.

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