Methodology for Determining Motorcycle Operator Crash Risk and Alcohol Impairment

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ABSTRACT

Alcohol-involvement continues to be a prominent factor in motorcycle crashes. Automobile drinking and driving has been researched extensively, and the connection between drivers' blood alcohol concentration (BAC) and crash risk is well-understood. There is not sufficient research to understand the effects of BAC on motorcycle operation, which is very different from automobile operation. Though there are BAC data available for some crash-involved riders, there is essentially no data on the incidence of alcohol involvement in the motorcycle-riding population. The National Highway Traffic Safety Administration contracted with the Pacific Institute for Research and Evaluation and the Head Protection Research Laboratory to conduct a study of potential methods by which the effects of alcohol on motorcycle operation can be measured. Various research methods were reviewed in the literature, and an expert panel was convened for detailed discussion and prioritizing of possible methods. Methods examined include "field" studies that collect actual highway data, as well as driving simulator and closed course studies that collect data in a controlled setting. This presentation will discuss the various methodologies, the advantages and disadvantages of each, and the study findings regarding priorities for future research.

BACKGROUND

Drinking Rider Problem

In 2004, 4,008 motorcyclists were killed and an additional 76,000 were injured (NHTSA *Traffic Safety Facts*, 2004) in traffic crashes. Motorcyclist fatalities have been steadily increasing since 1997 when 2,116 fatalities were recorded.

It is apparent that alcohol use continues to be a significant problem in motorcycle crashes. In fatal crashes in 2004, a higher percentage of motorcycle operators had blood alcohol concentration (BAC) levels of 0.08 grams per deciliter (g/dL) or higher than any other type of motor-vehicle driver. The percentages for vehicle operators involved in fatal crashes were 27 percent for motorcycles, 22 percent for passenger cars, 21 percent for light trucks, and 1 percent for large trucks.

Also, in 2004, 28 percent of all fatally injured motorcycle operators had BAC levels of 0.08 g/dL or higher. An additional 6 percent had lower alcohol levels (0.01 – 0.07). And 41 percent of 1,672 motorcycle operators who died in single-vehicle crashes had BAC levels of 0.08 g/dL or higher.

In 2000, the National Agenda for Motorcycle Safety (NAMS) cited alcohol as a "prominent factor in serious motorcycle crashes" (NAMS, 2000). It states that we need a better understanding of the following:

- Why alcohol continues to play a role in motorcycle crashes more frequently than in those of other vehicles;
- Alcohol use and substance abuse patterns of motorcyclists;
- The role of alcohol and substance abuse in motorcycle crashes.

Project Objectives and General Approach

This report summarizes the results of a NHTSA-sponsored project to assess alternative methodological approaches for determining the effects of varying BAC levels on the likelihood of alcohol-impaired motorcyclists being involved in a crash. Some of the methodologies examined provide information on alcohol's impairing effects on motorcycle operation. Others would provide a measure of relative risk of crash involvement through the comparison of crash data with population-at-risk data.

The basic approach involved the contractor developing a literature review document and providing it as a background document to a panel of national experts. The panel was subsequently invited to a workshop to discuss, compare, contrast, and rate various methods of data collection.

One way in which to determine the relative risk of being involved in a crash when a motorcyclist has been drinking would be to collect and analyze both motorcycle exposure data and complimentary motorcycle crash data. The crash data becomes the numerator and the exposure data is the denominator for use in statistical comparisons and analysis. Currently, there is no national resource for *both* crash and exposure data for motorcyclists. Of course, crash data are reasonably well documented. Generally the more serious the crash outcome, the better documented the crash is. The Fatality Analysis Reporting System (FARS) is NHTSA's nationwide resource for fatal crash data. There is no comparable data set for motorcycle exposure data.

Another way to understand the effects of various levels of alcohol on motorcycle operation would be to measure impairment directly through use of a simulator or on a closed course.

The methodologies under consideration for this project should ultimately permit addressing the questions regarding the likelihood of being involved in a crash at various BAC levels—questions such as "Are motorcycle riders more vulnerable at lower BAC levels compared to drinking automobile drivers?" The methodologies considered may also allow more effective targeting of countermeasures to those who drink and ride, by answering questions such as "Are younger riders at a greater risk of crash involvement after drinking compared to older riders at similar BAC levels?"

METHOD

Literature Search

The literature was reviewed for previous work in several areas including: motorcycle fatal and injury crash statistics, alcohol involvement in crashes, population-at-risk studies, roadside sampling, crash risk studies, motorcycle riding simulators, alcohol impairment, and other factors in injury outcome. (e.g., crash type, helmet use).

Expert Panel

Another important part of this project was an expert panel meeting to discuss the issues involved in satisfying the project objectives. The panel's selection was in part driven by the literature search. That is to say, the project staff attempted to involve many of the very researchers who had previously worked in one or more of the areas in question. These included motorcycle safety, alcohol, survey technique, law enforcement, risk assessment, and related fields. In addition, panel members included representatives from motorcycle safety and motorcycle rider organizations.

The selected panel members attended a workshop on April 4–5, 2002. A detailed draft report of the workshop discussions and findings was prepared and circulated to the panel members for additional input and editing. Prior to the introduction of the methodologies discussed by the panel, it is important for the reader to understand the concepts of crash data and comparison data and how each are necessary to understand the potential effects of alcohol impairment on motorcycle operation. A common measure of the influence of alcohol on crash risk is that of the "relative risk" of crashing while impaired, compared to that of crashing while unimpaired. The most commonly used relative risk measures for drinking and driving show the risk of being involved in a fatal crash at a given BAC. These relative risk values are created by determining the proportion of drivers in fatal crashes at a given BAC and dividing that by the proportion of non-crash involved drivers in the population at risk who are operating at that same BAC. The result is the relative risk of being involved in a fatal crash at that BAC level.

$$\frac{\textbf{Crash Data Variable}}{\textbf{Population-at-Risk Data Variable}} = \textbf{Relative Risk}$$

Table 1 shows the relative risk of being involved in a crash as reported by Compton, et al. (2002). The relative risk of crash for automobile drivers begins to increase at low BAC levels and increases more than two-fold at BACs ≥ .07%.

Table 1. Relative Crash Risk by BAC

BAC Level	Crash Risk	BAC Level	Crash Risk
0.00	1.00	0.13	12.60
0.01	1.03	0.14	16.36
0.02	1.03	0.15	22.10
0.03	1.06	0.16	29.48
0.04	1.18	0.17	39.05
0.05	1.38	0.18	50.99
0.06	1.63	0.19	65.32
0.07	2.09	0.20	81.79
0.08	2.69	0.21	99.78
0.09	3.54	0.22	117.72
0.10	4.79	0.23	134.26
0.11	6.41	0.24	146.90
0.12	8.90	0.25+	153.68

By plotting the relative risk for a range of BAC levels, the increasing effects of alcohol on crash risk can be observed as BAC increases. Figure 1 shows a relative risk curve from Compton et al., 2002.

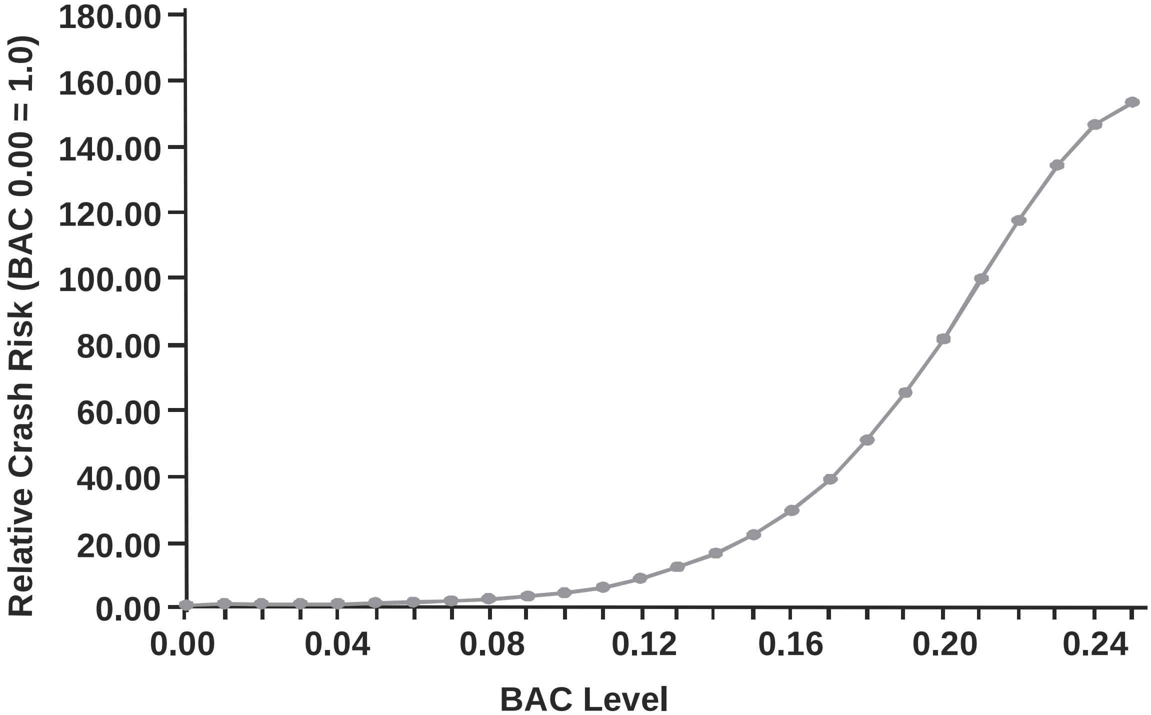

Figure 1. Relative Risk Estimate

The same basic concept could also be used to create curves showing relative risk of potential consequences of alcohol impairment on motorcycle operation, such as injury crashes, simulated crashes on a motorcycle simulator and performance errors on a closed-course performance measure. In all such cases, data for cases in which there *is* a crash (or other measure of driving performance), are compared with cases in which there is *no* crash. It should be noted, when applying the relative risk curve concept to laboratory studies, that these studies would be more indicative of impairment than true crash risk. In the case of simulator or closed course studies it is possible to compare performance measures within a single rider, at various BAC levels, which is generally not possible in other types of studies.

As will be summarized below, the methodologies for understanding the effects of alcohol impairment on motorcycle operation involve collecting both crash data and population-at-risk data. Where potential methodologies do not result in the collection of both types of data, methodologies for collecting crash data must be matched with methodologies for collecting data on the population-at-risk. Because population-at-risk data is used for *comparison* purposes, it will be referred to in this report as “comparison data.”

Table 2 shows methodologies identified as ways to collect data necessary to understand the effects of alcohol impairment on motorcycle operation and crashes. The table begins with methodologies that would require collection of *all* necessary data, followed by methodologies that would pair newly-collected data with currently existing data, and concludes with a methodology that could be done entirely using existing data.

Table 2. Brief Description of Methodologies

Method	Description
Laboratory Studies Providing Simulated Crash and Comparison Data:	
Simulation Study	Using a motorcycle simulator with alcohol-dosed subjects. Rider impairment would be measured by comparing performance within rider at various BAC levels.
Closed-Course Study	Alcohol-dosed subjects would ride a motorcycle at low speeds on a closed course. Rider impairment would be measured by comparing performance within rider at various BAC levels.
Field Studies Providing New Crash and Comparison Data:	
Cohort Study	A sample of riders would be selected. Alcohol use (e.g., BACs while riding) would be recorded over time, along with data on any crashes that occur. Data would be collected using various methods, which could include surveys, diaries, and use of an instrumented motorcycle.
Contemporary Case Control	BAC and other information concerning crashes are recorded at the scene (as much as possible) and afterward. Later, similar data are recorded for non-crash-involved riders at or near the same location, time of day and day of week.
Emergency Department	Similar to Contemporary Case Control study except that interviews with riders and BAC testing take place at hospital.
Survey Study	Traditional survey techniques (e.g., phone, mail, or in-person surveys) would be used to collect self-reported data from riders concerning alcohol use and crash histories. Height, weight, and number of drinks could be used to estimate BACs of riders when they were not involved in crashes vs. when they *were* involved in crashes.
Studies Providing Case Data Only:	
Fatal Crash Records	Crash data for motorcyclists would come from Fatality Analysis Reporting System (FARS). This would then be compared to BACs on population-at-risk from a different source.
Injury Crash Records	Crash data would come from records of motorcycle injury crashes. These data would then be compared to BACs on population-at-risk from a different source.
Studies Providing Comparison Data Only:	
Geo-General Comparison Data	Population-at-risk data would come from general roadside surveys, not from specific sites of previous crashes. Oversampling of population-at-risk data makes it possible to control statistically for factors such as age. Crash data would come from elsewhere (e.g., FARS)
Geo-Specific Comparison Data	Population-at-risk data would come from visits to specific sites of previous crashes found in archival data.
Fuel Station Survey	Similar to roadside collection of BACs and other data except that survey takes place when riders stop to refuel. Data are then compared to data from another source (e.g., FARS).
Study Using Entirely Existing Case and Comparison Data:	
Induced Exposure	Using archival data (e.g., FARS) BAC data of crash-involved riders deemed not to be at fault are used for the population-at-risk and compared to BAC data of at-fault riders.

FINDINGS OF EXPERT PANEL

This section discusses the various methodologies under consideration (see Table 2) and summarizes the primary advantages and disadvantages associated with each.

Simulation

This type of study would involve using a motorcycle simulator with alcohol-dosed subjects. Effects of alcohol impairment would be measured by comparing performance within riders at various BAC levels to riders performance at BAC = .00 percent.

Advantages of simulator research include:

- High level of control over study variables;
- Same subjects provide riding data at various BAC levels (including .00);
- Subjects can be compared for motorcycle and automobile simulation, if desired;
- Ability to accurately measure many elements of performance (e.g. speed, lane maintenance, near misses);
- Relative safety of subjects;
- High-quality BAC data.

Disadvantages of simulator research include:

- Limited face validity compared to actual operation of motorcycles;
- Findings on impairment at different BAC levels may not correlate directly with real-world crashes;
- Potential difficulty in motivating subjects to perform realistically;
- Possibility of simulator sickness;
- Differences between simulation and actual motorcycle with respect to motion cues and performance characteristics.

Closed-Course Study

In this type of study, alcohol-dosed subjects would ride a motorcycle at low speeds on a closed course. Effects of alcohol impairment would be measured by comparing performance within riders at various BAC levels to performance at BAC = .00 percent.

Advantages of a closed-course study include:

- Increased face validity due to measurement of actual motorcycle operation;
- Same subjects provide riding data at various BAC levels (including .00);
- Subjects can be compared for motorcycle and automobile operation, if desired;

- Ability to observe and record motorcycle operation e.g., through use of an instrumented vehicle, as compared to more naturalistic riding conditions;
- High level of control over key study variables;
- High-quality BAC data.

Disadvantages a closed-course study include:

- Human subjects protection/liability issues;
- Low-speed operation will have limited correlation with conditions under which severe motorcycle crashes take place.

Cohort Study

In this type of study, a sample of riders would be selected for scientific observation. Alcohol use (e.g., BAC while riding) would be recorded over time, along with data on any crashes that occur. Data would be collected using various methods, which could include surveys, diaries, and use of an instrumented motorcycle to read BAC and other performance data.

Advantages of a cohort study include:

- Theoretically, the best known way to get large amounts of high-quality data on motorcycle operation and alcohol in real-world situations;
- Riders who crash would provide their own comparison data, having generated voluminous data during rides that did not result in a crash.

Disadvantages of a cohort study include:

- Extremely expensive;
- Difficult to assemble a sample of riders who agree to participate which will be representative of all motorcyclists;
- May be possible to circumvent the collection of accurate data;
- Riders may not always use instrumented motorcycle;
- Some self-report data may not be accurate or complete;
- Various potential systems for collecting BAC data could be circumvented, resulting in inaccurate BAC data.
- Would likely take several years and/or many subjects to collect enough crash data;
- Human subjects protection/liability issues, including those related to capturing BAC data without either disabling the ignition or informing the rider in the case of high BACs;
- Office of Management and Budget (OMB) clearance required for any surveys involved. This generally takes at least 6 months and can take considerably longer.

Contemporary Case Control

In this type of study, data concerning crashes are recorded at the scene (as much as possible) and shortly afterward. Later, BAC and other information are recorded for non-crash-involved riders at or near the same location, on the same day of the week and same time of day, as the crash.

Advantages of a contemporary case control study include:

- “Gold” standard used in previous research to assess crash risk
- High-quality, in-depth data, especially BAC data;
- Includes injury and PDO crashes (all crash types).

Disadvantages of a contemporary case control study include:

- Labor-intensive (need fairly large sample sizes for the crash and exposure populations);
- Need for cooperation of various agencies in order to set up logistics;
- Potential difficulties stopping riders selected to provide comparison data;
- Paucity of riders in the population-at-risk;
- Likely will require OMB clearance.

Emergency Department Study

This study would be similar to contemporary case control study except that interviews with riders and BAC testing would take place at a hospital.

Advantages of an emergency department study include:

- Benefits of inclusion of injury crashes (e.g., larger sample, results may generalize to injury crashes);
- Data would likely be more complete and accurate than archival data;
- Emergency department use of blood, rather than breath testing, may allow testing for drugs other than alcohol.

Disadvantages of an emergency department study include:

- Provides crash data only; comparison data would have to come from another source;
- Requires cooperation of hospital administration and staff;
- Dependence on hospital staff for data collection may reduce completeness and accuracy of data collected;
- Some data regarding the crash may need to be collected from elsewhere (e.g., police crash reports, interviews with drivers, etc.).

Survey Study

In this study, traditional survey techniques (e.g., phone, mail, or in-person surveys) would be used to collect self-reported data from riders concerning alcohol use and crash histories. Gender, height, weight, and number of drinks would be used to estimate BACs of riders when they were not involved in crashes vs. when they *were* involved in crashes.

Advantages of a survey study include:

- Possibility of taking advantage of a currently existing survey.

Disadvantages of survey study include:

- Difficulties getting sufficient response rate from a sample of riders representative of all riders;
- Questionable quality, completeness, and accuracy of self-reported data;
- Probably would need OMB clearance.

Fatal Crash Records

Crash data would come from the Fatality Analysis Reporting System (FARS). This would then be compared to BACs on the population-at-risk riders from a different source.

Advantages of a study using fatal crash records include:

- Fatal crash records are already available through FARS with fairly complete BAC data;
- Data collected for fatal crashes are generally more complete and of higher quality than that of injury crashes;
- There is value in using results that are generalizable to fatal crashes because the general public views fatal crashes as more important than non-fatal crashes.

Disadvantages of a study using fatal crash records include:

- Only provides crash data, comparison data would still need to be obtained through other means;
- BAC data better than for injury cases, but still not entirely complete, imputation may be necessary;
- Data limited to fatal crashes;
- Relatively fewer cases than injury crashes;
- Long lag-time between crash and comparison cases (i.e., one year or more) may introduce error in creating relative-risk curves;

- Possibility of the confounding variables (e.g., non-helmet use) that are correlated with higher BAC levels, as well as the likelihood of being involved in fatal crash.

Injury Crash Records

Crash data would come from records of motorcycle injury crashes. This would then be compared to BACs on population-at-risk riders from a different source.

Advantages of a study using injury crash records include:

- More cases than studies of fatal crashes only;
- Allows generalization to injury crash population (most motorcycle crashes involve injury);
- Advantages associated with use of archival data (e.g., data are already being collected).

Disadvantages of a study using injury crash records include:

- Provides only crash records; comparison cases would still need to be obtained through other means;
- Only more serious injuries are likely to be included;
- Accurate and complete BAC data not usually available in existing files;
- Reliable data on the location of the crash may be difficult to obtain.

Geo-General Comparison Data

Population-at-risk data would come from general roadside surveys, not from specific sites of previous crashes. Oversampling of population-at-risk data makes it possible to control statistically for factors such as age. Crash data would come from elsewhere (e.g., FARS).

Advantages of a geo-general comparison data study include:

- Higher likelihood of finding sufficient numbers of motorcycle population-at-risk riders compared to geo-specific and contemporary case control studies, which require obtaining comparison cases from sites of crash cases;
- If multiple comparison cases can be collected for each crash case, it may be possible to more closely match the original case with respect to demographic characteristics of riders;
- Ability to select data collection locations (rather than using crash site) may lead to increased researcher safety;
- Assuming comparison data are paired with archival crash data, the cost of such a study would be lower than the contemporary case control study.

Disadvantages of a geo-general comparison data study include:

- Reduced scientific validity of not collecting comparison data at the site of the crash case;
- Need for cooperation from police and motorists in order to collect data;
- Likely need for OMB clearance for survey;
- Relatively few motorcyclists in traffic stream will require significant time to collect sufficient data.

Geo-Specific Comparison Data

Population-at-risk data in this study would come from visits to specific sites of previous crashes found in archival data.

Advantages of a geo-specific comparison data study include:

- Increased scientific validity of collecting comparison data at or near the crash site, over geo-general comparison data study;
- Assuming comparison data are paired with archival crash data, the cost of such a study would be lower than the Contemporary Case Comparison Study.

Disadvantages of a geo-specific comparison data study include:

- Potential difficulties finding motorcyclists at the crash site several moths later at the same time of day;
- Reduced scientific validity, compared to the contemporary case control study, due to time passed between crash case and comparison case;
- Likely will require OMB clearance.

Fuel Station Survey

Similar to roadside collection of BACs and other data except that survey takes place when riders are stopped to refuel. Data are then compared to data from another source (e.g., FARS).

Advantages of a fuel station study include:

- Eliminates need for traffic stop to collect comparison data;
- Reduces potential costs associated with police agency participation.

Disadvantages of a fuel station study include:

- Potential difficulties getting cooperation from the fuel stations;
- Fueling station customers may not be as representative a sample as motorcyclists in traffic;
- Potential for long periods of downtime between surveys;

- Likely need for OMB clearance for surveys;
- Potential researcher safety issues related to approaching subjects in a relatively uncontrolled environment, and standing in areas with some vehicular traffic.

Induced Exposure Study

Using archival data (e.g., FARS) the BAC distribution of crash-involved riders deemed not to be at fault are used for the population-at-risk and compared to the BAC distribution of at-fault riders.

Advantages of an induced exposure study include:

- All data already exist in archives.

Disadvantages of an induced exposure study include:

- Significantly more difficult to identify a suitable sample of not-at-fault motorcycle riders to act as a comparison group compared to Induced Exposure studies of automobile crashes;
- Likelihood that alcohol increases chances of being involved in a crash where the rider may be deemed as nonculpable leads to underestimates of alcohol's contribution to crashes. This may be more the case for motorcycles than it is for automobiles;
- Archival data (e.g., FARS) may be incomplete and/or inaccurate. BAC data may be missing. Systematic differences in the way BAC data are collected, depending on the nature of the crash, may lead to confounding of variables which contribute to the likelihood of being included in the crash sample. For example, studies show drinking riders are more likely to ride un-helmeted, and un-helmeted riders are more likely to be killed in crashes. Therefore, drinking riders may be overrepresented in crashes due to the helmet variable.

RESEARCH PRIORITIES

As part of the Expert Panel meeting, panelists were asked to assign priorities to each methodology discussed. A high priority would mean that panelists felt that the methodology was among the best candidates for future research funding because it provided a high likelihood of providing scientifically valid data. No attempt was made to reach a consensus on these priorities, and there was some disagreement as to the relative priorities of each methodology. Panelists used their own system for expressing their priorities, making it impossible to calculate "scores" for each methodology. However an examination of the comments given by panelists provides an excellent sense of how they viewed each methodology. For example, of the panelists expressing an opinion on the priority of the case control study, one described it as "highly recommended," one described it as high priority if sufficient funding could be obtained to do it properly, one said this it was highest priority, one said it was second highest, and one rated it third highest. One panelist listed it as low priority out of a concern that it may be too difficult to get valid control data.

Project staff, *using panel member comments and priorities*, created a system for prioritizing the various research methodologies discussed within this project. Using the comments made by the attendees of the meeting, both in their listing of priorities and the comments made during the panel meeting, one of three levels of "scientific validity" (low, medium and high) was assigned to each methodology. These levels represent how scientifically valid the results for each methodology would likely be, given the barriers to obtaining complete and accurate data for that methodology. The ratings of scientific validity *contribute* to the assigning of priorities for each methodology. It is important to note, however, that scientific validity was not the only contributing factor to assignment of priorities. The relative cost (low, medium and high) and practicality of a methodology could affect its cost category. Because cost categories were broad and costs were only estimates, it is possible that priorities would be revised if accurate cost figures were available for each methodology.

Highest Priority Methodologies

Methodologies discussed in this section were determined to be the best candidates for future research.

Lowest Cost Category < $250,000

Simulation

Depending upon the type of equipment used, simulation can provide a relatively low-cost method of determining the effects of alcohol impairment on motorcycle operation. Simulation would not provide risk curves directly comparable with those from drinking/driving case-control studies, instead, it permits comparison of rider impairment at different BAC levels. It was suggested that testing a sample of riders at relatively low BACs, performing both simulated low-speed riding tasks and actual low-speed riding tasks, could help establish the validity of simulation in measuring rider performance. In this type of study, impairment curves could be produced by determining the number of crashes or near misses for riders at BACs = .02 percent, .04 percent, .06 percent and .08 percent compared to their performance at BAC = .00 percent.

Induced Exposure

The general consensus regarding an induced exposure study for motorcycles is that this type of study does *not* lend itself well to motorcycle crashes. Determining culpable motorcyclists from nonculpable motorcyclists will require some additional work, and may ultimately not be viable. This method, however, can be accomplished with existing data and probably at very little cost. It was suggested that if an induced exposure study is done, a first step would be to compare any "culpable" group and "non-culpable" group of motorcycle riders to determine whether the two groups were similar with respect to demographic variables. If they are not, then it will be difficult to separate the effects of alcohol from the effects of the general differences between the two samples.

Medium Cost Category $250,000 to $500,000

None.

Highest Cost Category $500,000 +

Contemporary Case Control

This methodology is probably the most scientifically valid of all methods that might be practically implemented. The Contemporary Case Control methodology was used in the landmark motorcycle crash study conducted by Hurt *et al*. (1981), though this study did not conduct sufficiently detailed alcohol data to generate relative-risk curves. This methodology was used by Borkenstein *et al.* (1974) to create the drinking-driving relative-risk curves that have been used for the past 30 years to understand the effects of alcohol on driving. There was a high level of agreement among panel members and project staff that a Contemporary Case Control study, if conducted properly, would be the best way to determine the relative risks of operating a motorcycle at various BAC levels.

Medium Priority Methodologies

Methodologies discussed in this section should be considered lower in priority than those discussed in the previous section, though they still offer some value in understanding the effects of alcohol on motorcycle operation.

Lowest Cost Category

Closed-Course Study

It was estimated that an off-road study of riders performing low-speed maneuvers at a range of BAC levels could be conducted relatively inexpensively, and would provide good data on the effects of alcohol on motorcycle operation. This study was not rated as scientifically promising partly because simulation has the potential for studying operation at higher (albeit simulated) speeds, which are more representative of those at which most severe crashes occur. Human-subjects protection issues are another reason that simulation might be a better candidate for future research. As mentioned above, it was suggested that a study combining simulation and low-speed off-road riding could be valuable.

Medium Cost Category

Fuel Station Survey with Fatal Crash Records, Fuel Station Survey with Injury Crash Records

Both of these methodologies would rely on drinking-riding exposure data collected at fuel stations where motorcyclists come to refuel. This method of collecting exposure data is taken from the Organisation for Economic Co-operation and Development (OECD) International Methodology for On-Scene In-Depth Motorcycle Accident Investigations. Crash data would come from the area local to the fueling station, either from FARS data or injury data collected from local hospitals. While the exposure data collected in this manner would not be as scientifically valid as that collected using the Contemporary Case Control, method, it may be possible to obtain useful data on the drinking and riding of local riders at a lower cost using the Fuel Station Survey than using other methods. It should also be noted that attempts to conduct a Fuel Station Survey in the United States met with resistance from station owners and fuel companies in California, casting some doubt on the ability to conduct such a study in the United States.

Highest Cost Category

Emergency Department

This methodology would provide roughly the same data as the Contemporary Case Control study, however some of the crash case data would be collected by Emergency Department staff when crash victims arrive at the hospital. Costs would be reduced by avoiding the use of an on-call “Go Team,” however costs would still be relatively high due to the need to collect comparison data in the field. This study was not rated as scientifically valid as the Contemporary Case Control due to concerns over the quality of the crash data that would be collected, compared to the Contemporary Case Control.

Geo-Specific + Fatal Crash Records

This methodology would generate relative risk curves by matching archival crash data from FARS with comparison data collected from motorcyclists at or near the site of the FARS crashes. This methodology was rated as more scientifically valid than the Geo-General + Fatal Crash Records Study due to the increased scientific validity of collecting data at crash sites rather than at random locations in other parts of the City, State or Country. However, due to the nature of the availability of FARS data, the comparison data would probably be collected up to a year after the fatal crash occurrence.

Lowest Priority Methodologies

Lowest Cost Category

None

Medium Cost Category

Survey Study

Although survey research is often used to assess the public’s attitudes about a variety of traffic safety related issues, survey research (other than roadside surveys with BAC testing) was generally considered to be a poor way to gain an understanding of the effects of alcohol on motorcycle operation. The costs would be relatively high while the quality of data to be gained would be suspect because it would depend upon self-reports.

Highest Cost Category

Geo-General + Fatal Crash Records

This methodology would generate relative risk curves from FARS crash data, and comparison data collected through the use of roadside surveys. This methodology does hold some promise for generating reasonably accurate relative-risk curves (see Zador, 2000), but has been placed at a low priority because it is not likely to produce as scientifically valid results as the other methodologies in this cost category.

Cohort Study

The Cohort study, while being highly valid scientifically, is considered too expensive and would take too long to be practical, and is therefore assigned a low priority.

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