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THE RELATIONSHIP BETWEEN DRIVERS IN ALCOHOL-RELATED ACCIDENTS AND CONVICTED DRUNK DRIVERS

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16. Abstract

A 1% sample of Michigan drivers, with 68,950 drivers and 180,423 incidents, was drawn in June, 1982. A subset of drivers with alcohol-related (a-r) accidents, convictions for DUIL or DWI offenses, or breath-test refusals under implied-consent legislation was created. If an accident and a conviction or IC refusal occurred on the same date, only the accident was retained. The resulting file had 4,649 drivers with 3,589 HBD accidents, 2,834 DUIL/DWI convictions, and 155 IC refusals.

A two-way distribution showed that, of drivers having either a-r accidents or drunk-driving (d-d) offenses, only 13.2% had both. Further, if the occurrence of either triggers a countermeasure based on specific deterrence, the maximum percentage of HBD accidents preventable by a 100% effective program is 35.9%. This finding led to the conclusion that countermeasure programs relying on general deterrence must be used to reach the majority of potential drivers in a-r accidents.

The risk of a driver having a subsequent a-r accident was also determined. The occurrence of either a non-accident, d-d offense or the occurrence of an a-r accident elevates the risk of a subsequent accident by a minimum factor of 3.5. The elevated risk makes such drivers candidates for countermeasures based on principles of specific deterrence.

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1.0 INTRODUCTION

Much of the thrust of current efforts to deal with drunk drivers centers on more vigorous enforcement of drunk-driving laws and on stiffer penalties for drivers convicted of violating these laws. There is, of course, an implicit assumption that this approach will help to deter those drivers from becoming involved in alcohol-related crashes at some time in the future.

However, little attention has been given to the mechanisms by which drunk-driving enforcement might reduce alcohol-related crashes. This is a broad and complex subject, of course, but here it can be noted that two general forms of deterrence are recognized. Specific deterrence deals with the effects which actions directed to an individual--fines, incarceration, rehabilitation, and the like--subsequently have in deterring that individual from repeating the behavior for which the sanctions were imposed. General deterrence, on the other hand, is at work when sanctions directed to individuals, or the threat of sanctions against offending members of the public at large, deter undesired behavior by large numbers of the population.

In the traffic safety context, both kinds of deterrence--whether labeled as such or not--are at work. Removal of drunk drivers from the road is a very effective form of specific deterrence in preventing the accident that might have happened on that trip. (There are, however, no data available about the number of accidents thus prevented, and this form of deterrence is not considered further in this report.) Court-mandated screening and treatment programs for convicted drunk drivers are other examples of specific deterrence. Publicity about these programs, and about sanctions likely to be imposed on persons convicted of drunk driving, falls in the category of general deterrence.

Note that the potential effectiveness of specific deterrence depends on, among other things, the extent to which the population being acted upon matches that of the population whose altered behavior is desired. Specifically, the potential effectiveness of sanctions against

drunk-driving offenders[1] for the purpose of reducing subsequent alcohol-related crashes depends strongly on the extent to which the two populations overlap. If the population of drunk-driving offenders were disjoint from the population of alcohol-related crashes--that is, the populations had no drivers in common--then specific deterrence for drunk-driving offenders would be completely ineffective in reducing alcohol-related crashes. In that case, policy makers would have to utilize only general deterrence in their efforts to reduce alcohol-related crashes. Such an extreme outcome is not anticipated, of course, but little is known about this issue.

The central purpose of this investigation, therefore, is to determine the commonality of drivers among the drunk-driving and alcohol-related crash populations. A 1% sample of Michigan drivers, drawn from the Michigan Department of State driving records for another UMTRI project, was used for this purpose and is described in Section 2. The analysis of the dataset together with the findings follow in Section 3.

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[1]The term "drunk-driving offenders" is used broadly to include drivers convicted of DUIL (Driving Under the Influence of Liquor) or DWI (Driving While Impaired). Also included are drivers who refused to take a breath test under implied-consent statutes and did not successfully appeal the resulting license suspension.

2.0 THE 1% SAMPLE DATASET

In June 1982 a 1% random sample of drivers was obtained from the Michigan Department of State Master Driver File as part of a joint MDOS/UMTRI project.[2] Although drivers were sampled, that project required driving-record incidents as the analytical units of interest. Accordingly, incident files were originally built in which each record contained information about the driver and the date and type of each incident, whether conviction, accident, or administrative action undertaken by the Department. Further, each record contained additional, detailed information about the incident appropriate to its type. This Michigan Driver-Incident file contains 180,423 incidents (one record for each incident) and represents 68,950 different drivers.

The analyses to be undertaken in this investigation focus on drivers, however, and not on incidents as such. Accordingly, it was necessary to perform several data-processing operations to obtain the desired dataset.

The events of interest here are (1) alcohol-related accidents, (2) convictions for drunk driving, and (3) refusals to take a breath test under implied-consent statutes. Alcohol-related accidents, identified by the Had Been Drinking (HBD) variable on police accident reports, number 3,629 in the original 1% file. (These are identified by V17=3 in the MDIR file.)

Of the 80 or so different conviction categories contained in the incident file, six identify a total of 3,257 convictions of interest. These, collectively referred to as DUIL/DWI, are listed below with their frequencies:

6	Drove while impaired (attempted).
3	Driving under influence of liquor (attempted).
1902	Drove while impaired.

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[2] C.R. Ford and J.A. Green, Driver Record Analysis System Enhancement, UM-HSRI-82-24, Highway Safety Research Institute, The University of Michigan, Ann Arbor, July 1982.

1339 Driving under influence of liquor.
7 Driving under influence of controlled substance.

Implied-consent refusals to take a breath test are identified in the MDOS Master Driving Record by the Action-Type Codes (V20=3011,3012) crossed with two of the Action-Reason Codes (V22,V23=59,95). These combinations identify 603 implied-consent refusals.

The original MDIR file was processed to produce a file containing the 7489 incidents identified above. The date on which each incident occurred was also included.

The next data-processing operation involved the elimination of multiple incidents that really describe a single drunk-driving episode. For example, an accident in which the investigating officer decides that the driver was drunk can result in the recording of an HBD accident and in an arrest for DUIL/DWI. The defendant might also refuse to take the breath test which generally would be offered in connection with the DUIL arrest. If the defendant is convicted on the DUIL/DWI charge, and if he does not successfully appeal the license suspension dictated by the implied-consent refusal, then all three of the incidents should be recorded on the driver's master record. For the analysis presented in the next section, it was concluded that a single drunk-driving episode should be identified by only one of the possible incidents that might be associated with it.

Therefore the three incidents were ranked in order of their importance to the subsequent analysis, with an HBD accident considered the most important, a DUIL/DWI conviction next most important, and an implied-consent refusal the least important. Then all incidents in the file were ranked within their unique driver/incident-date strata by the hierarchy given above. The highest ranking incident for each unique driver/incident-date stratum was then retained for subsequent analysis.

An example will clarify this procedure. Suppose that P. Driver is found to have the following incidents on his record:

Three unique driver/incident-date strata exist: (1) P. Driver/ February 15, 1979; (2) P. Driver/June 30, 1979; and (3) P. Driver/ January 15, 1980. Stratum 1 has a single incident associated with it,

Incident Reference Number	Incident Date	Incident Type
1	February 15, 1979	IC Refusal
2	June 30, 1979	HBD Accident
3	June 30, 1979	DUIL/DWI
4	June 30, 1979	IC Refusal
5	January 15, 1980	DUIL/DWI
6	January 15, 1980	IC Refusal

an IC Refusal. Stratum 2 has three incidents associated with it, one of each kind, and Stratum 3 contains two incidents, a DUIL/DWI and an IC Refusal. According to the procedure described earlier, only Incident Reference Numbers 1, 2, and 5 are retained for further analysis.

Table 1 provides a description of all of the various combinations of incident types that were found within unique driver/incident-date strata. The first seven strata are well behaved in the sense that their incident combinations are to be expected in the normal course of drunk-driving events. The remaining strata contain incident combinations that are increasingly unlikely to occur on the road, both as indicated by their low frequencies and by the nature of the combinations. Stratum 18, for example, contains one driver who shows four HBD accidents and one DUIL/DWI on the same date on his record. A number of errors in processing--from the on-the-road situation to data entry into the Master Driving Record--might conceivably account for this kind of situation. In any event, only one incident per stratum was carried forward into the driver files for further analysis. Elimination of incidents with the same date reduced the number of incidents by 858, from 7446 to 6588.

The final step in the file-building process created a driver file. All incidents for each driver were aggregated by driver and placed into a separate file having one record for each driver. The file contains 4662 drivers, 4649 of whom have no missing data on the incident dates. The analytical work presented in the next section is based on this file.

Table 1
Types of Unique Driver/Incident-Date Strata

Stratum Reference	Number of Incident Types in Combination			Number of Strata
	HBD	DUIL/DWI	IC	
1	1	0	0	3168
2	0	1	0	2479
3	0	0	1	165
4	1	1	0	308
5	1	0	1	25
6	0	1	1	342
7	1	1	1	51
8	2	0	0	15
9	2	1	0	11
10	0	2	0	11
11	2	0	1	2
12	2	1	1	2
13	2	0	1	2
14	1	2	0	1
15	1	2	1	2
16	3	1	1	2
17	4	0	0	1
18	4	1	0	1
Total	-	-	-	6588

3.0 ANALYSIS OF THE DRIVER FILE

The general characteristics of the driver file are first given in this section. The distribution of drivers by the number of arrests and alcohol-related accidents follows, together with the implications for countermeasures in terms of the deterrence issues discussed in the Introduction. The final section contains the probabilities for the occurrence of an alcohol-related accident based on the occurrence of prior offenses and accidents, and the implications for countermeasures based on specific deterrence are discussed.

3.1 GENERAL CHARACTERISTICS

The one-way distributions of the drivers by the variables of interest are given in Table 2. It should be remembered that in this table--and all analyses in the balance of the report--drivers with two or more incidents on the same date have had all but one of the same-date incidents removed. Comparison of these distributions with similar data from other sources must, therefore, be undertaken with caution.

Also of interest is the time period covered by the events in this file. The general policy of the Department of State is that DUILs are purged after 10 years, DWIs and implied-consent refusals formerly were purged after seven years, but this changed to 10 years effective April 1983. HBD accidents are also generally kept for seven years. There are exceptions to these rules, however. If an offense forms part of the reason that a current license denial is still in effect, then that record is retained irrespective of its date. Record purging occurs quarterly, effective on the 15th day of the first month of the quarter.

Table 3 presents some of the significant information regarding date of occurrence for the first and last of the various incidents. The earliest, latest, and average dates are given, and the standard deviations of the first dates are given in years.

Table 2
Oneway Distributions of Drivers

Number of Incidents	HBDs		DUILs		ICRefusals	
	N	%	N	%	N	%
0	65,943	95.6	66,696	96.7	68,795	99.8
1	2,539	3.7	1,693	2.5	147	0.2
2	378	0.5	360	0.5	7	0.0
3	72	0.1	89	0.1	0	0
4	13	0.0	19	0.0	1	0.0
5	4	0.0	10	0.0	-	-
6	1	0.0	2	0.0	-	-
7	-	-	1	0.0	-	-
8	-	-	0	0.0	-	-
9	-	-	1	0.0	-	-
Total	68,950	100.0	68,950	100.0	68,950	100.0

Table 3
Significant Dates for Accidents and Offenses

Event	Dates			
	Earliest	Latest	Average	Std.Dev. (years)
First HBD	4/17/75	2/28/82	7/30/78	1.91
Last HBD	5/2/80	5/2/80	5/2/80	-
First DUIL/DWI	5/2/34	4/27/82	6/14/77	3.27
Last DUIL/DWI	11/26/80	11/26/80	11/26/80	-
First IC Refusal	3/6/71	4/4/82	2/18/78	3.18
Last IC Refusal	3/31/79	3/31/79	3/31/79	-

The table shows that the average date of the first incident of any type occurred in 1977 or 1978, and the standard deviations are seen to range from 1.9 years to 3.3 years. Thus the driver experience presented here generally occurs in the second half of the 1970s.

3.2 DISTRIBUTION OF DRIVERS BY ACCIDENTS AND OFFENSES

The central purpose of this investigation is to determine how the population of drivers who became involved in HBD accidents compares with that of drivers apprehended for drunk-driving offenses not associated with the occurrence of accidents. Offenses, as noted earlier, are defined for this report to include broadly DUIL and DWI convictions (and a few convictions on substantially similar charges) and also Implied Consent Refusals resulting in license suspension.

Table 4 gives the entire distribution of the 68,950 drivers in the 1% sample file by the number of HBD accidents and by the number of offenses. Inspection of this table shows that 35 drivers show two HBD accidents and two drunk-driving offenses on their record, and that 34 drivers exhibit three or more accidents and three or more offenses. Further, 13 of the 34 drivers are in the two-HBD/three-offenses cell, and 10 are in the three-HBD/two-offenses cell. Therefore, both for clarity and convenience, all of the drivers having two or more HBD accidents and two or more offenses have been grouped together. The collapsed distribution is shown in Table 5.

The most apparent fact from this table is that most drivers--93.3 percent--have neither an alcohol-related accident nor a drunk-driving offense on their record. This, of course, is not a new finding. Nonetheless, it is well to keep in mind that, though abusive use of alcohol is rightfully considered a top priority traffic safety issue, the vast majority of drivers show no evidence of it on their Michigan driving records. Even if the number of alcohol abusers among drivers is under-reported by a factor of two from this source (no evidence is available which suggests this is the case), it still would be true that 85 percent of Michigan drivers have clean records with respect to

Table 4
Distribution of Drivers by Number of Accidents and Offenses

Number of Offenses	Number of HBD Accidents						
	0	1	2	3	4	5	6
0	64,301	2102	244	41	6	1	1
1	1315	311	81	21	3	1	0
2	244	89	35	10	2	0	0
3	58	26	13	0	2	0	0
4	11	6	3	0	0	2	0
5	10	3	1	0	0	0	0
6	3	1	0	0	0	0	0
7	1	0	0	0	0	0	0
8	0	1	0	0	0	0	0
13	0	0	1	0	0	0	0

Table 5
Collapsed Distribution of Drivers by Number of Accidents and Offenses

Number of Offenses	Number of HBD Accidents		
	0	1	2 or More
0	64,301	2102	293
1	1315	311	106
2 or More	327	126	69

alcohol. This fact should prove useful in efforts designed to get the public at large to support more stringent measures for the small minority of drivers who do abuse alcohol on the highway.

The next points to be observed are central to this inquiry. Of the 4649 drivers with an indication of alcohol abuse on their record, 3417--almost 75 percent--have just one such alcohol-related incident. Further, 86.8 percent of these drivers (4037/4649) have only offenses or only HBD accidents; conversely, 13.2 percent of the drivers have both

kinds of alcohol-related incidents. In terms of all drivers, now including those with no alcohol-related incidents, only 0.89 percent have both HBD accidents and drunk-driving offenses.

Let us now pose the following question: What proportion of alcohol-related accidents are preventable by specific deterrence? The answer depends on both the effectiveness of the deterrent and on the proportion of future HBD-drivers to whom it is applied. The latter depends on the mechanisms by which particular drivers are selected for application of the deterrent.

Let us consider first the obvious case of selecting drunk-driving offenders for special attention of whatever kind. If such is to be effective in preventing an alcohol-related accident, then clearly the offense must precede the accident to be prevented. To get an estimate of the potential number that might be preventable, the distribution of HBD's was obtained for those drivers whose first DUIL/DWI preceded their first accident. The distribution is given in Table 6.

Table 6
Distribution of Drivers with First Offense Preceding First Accident

	Number of HBD Accidents per Driver					Total
	1	2	3	4	5	
Number of Drivers	238	45	13	3	2	301
Number of Accidents	238	90	39	12	10	389

From Table 2 it can be seen that 3007 drivers have from one to six HBD accidents on their individual records, for a total of 3589 accidents on their combined driving records. If we assume--obviously for illustrative purposes only--that the remedial measures directed to the 301 drivers of Table 6 were completely successful in preventing all subsequent HBD accidents, then we can conclude that 2706 drivers would

have experienced 3200 HBD accidents. Thus, even with this optimistic scenario of perfect specific deterrence, the number of HBD drivers is reduced by only 10 percent, and the number of their accidents is reduced by 10.8 percent.

An alternative program of specific deterrence might use the occurrence of an HBD accident as the triggering event rather than the occurrence of a DUIL, DWI, or IC refusal. Let us again adopt the notion of completely effective specific deterrence and assume that a driver experiencing an HBD accident is referred to a program which completely prevents any future HBD accident. Following a procedure similar to that employed before, it can be shown that the number of drivers with HBD's would have been reduced by 15.6 percent. The number of HBD accidents would have been reduced by 29.3 percent.

Finally, if both of the above deterrent strategies are fully employed and are fully effective, the maximum possible reduction in the number of HBD-drivers would have been 23.5 percent. The corresponding maximum number of prevented HBD accidents would have been 35.9 percent.

These findings, of course, are descriptive of past experience and what would have happened under various assumptions. There is no guarantee that the future will replicate the past. The role of alcohol in traffic crashes has been remarkably stable, however, and there is no reason to believe that there will be sudden, dramatic changes in the future.

The implication is that specific deterrence, as discussed earlier, can at best reach only a small proportion of drivers likely to become involved in alcohol-related accidents. General deterrence must be utilized, therefore, to impact the vast majority of potential HBD drivers.

3.3 SPECIFIC DETERRENCE: FURTHER IMPLICATIONS

The implications of the preceding section should be kept in perspective. Without further consideration, they might suggest that the potential effectiveness of policies and programs to reduce alcohol-

related accidents based on specific deterrence is low enough that they not be undertaken. In my judgment, this would not be an appropriate response.

One can argue generally that the health and economic consequences of alcohol abuse on the highway are so deleterious that any promising programs should be implemented and evaluated. It can also be noted that alcohol abuse, though detected in the traffic context, frequently has far broader effects in the life of the abuser and his family with respect to employment, criminal activity, and health. Programs that successfully impact a driver's alcohol use on the highway may also have many other beneficial effects in his lifestyle.

The purpose here, however, is not to debate the wisdom of undertaking specific-deterrence programs but rather to investigate whether subsets of the population can be identified which have high risks to alcohol-related accidents.

Table 7 provides the distribution of drivers having one or more HBD accidents after a DUIL/DWI offense; the data cover 1,2,3, and 4 or more offenses. These data, together with those in Tables 2 and 4, can be used to investigate the risk of several subsets of interest. Estimates of the desired (conditional) probabilities are obtained by dividing the number of drivers having HBD accidents by the total number of drivers satisfying the prior condition. For example, the estimated probability of any driver having an HBD accident is the sum of the number of drivers having exactly one accident plus the number having two, etc. divided by the total number of drivers from which these were chosen. In this example, 3007 drivers are observed (Table 2) to have one or more HBD accidents, and the total number of drivers is 68,950, giving the estimated probability of 0.0436. This can also be expressed as saying that about one Michigan driver in 23 was involved in an alcohol-related accident during the years covered by these master driving records.

It is not possible to associate a definite, standardized period of time with all of the probabilities of interest. Although this would be desirable, the values of these probabilities relative to each other are the more important issue here. However, as noted in Section 3.1, HBD accidents are generally removed from the master driving records after

seven years, so this is a good estimate of the time period covered. It is also noteworthy that the mean time between the first and second HBD accident, for the 468 drivers having two or more such accidents, is 1.83 years with a standard deviation of 1.53 years. For the 301 drivers whose first HBD accident followed their first drunk-driving offense, the mean elapsed time between offense and accident is 2.95 years with a standard deviation of 2.58 years.

Table 7
Distribution of Drivers Having At Least One HBD Accident Following Nth Drunk-Driving Offense

Number of Offenses (N)	HBD Accident after Nth Offense?		Total Drivers
	No	Yes	
1	1903	351	2254
2	446	76	522
3	126	16	142
4 or more	38	5	43

On the assumption noted earlier, namely that the future is likely to look much like the past (particularly in the years immediately ahead), the estimated probabilities of the future emerge from the observed relative frequencies of the past. Table 8 presents the probabilities of a driver having a subsequent alcohol-related accident under several assumptions regarding his prior offense and accident experience. It can be seen that a driver having no prior drunk-driving offenses on his record has a probability of having an HBD accident of 0.0359. This increases sharply--by a factor of 4.3--to 0.1557 for a driver having one prior drunk-driving offense on his record. For two prior offenses, the probability of having a subsequent HBD accident is about the same as for one prior offense. It drops to just over 0.11 for three and four or more prior offenses.

Somewhat the same general pattern is also seen to hold for the probability of an HBD accident occurring given the occurrence of a prior HBD accident. It jumps sharply to 0.1556--almost the same value as for

Table 8
Conditional Probability of a Subsequent HBD Accident
Under Various Prior Conditions

Condition	Probability
No prior information about offenses or accidents	0.0436
No prior drunk-driving offenses	0.0359
One prior drunk-driving offense	0.1557
Two prior drunk-driving offenses	0.1456
Three prior drunk-driving offenses	0.1127
Four or more prior drunk-driving offenses	0.1163
One prior HBD accident	0.1556
Two prior HBD accidents	0.1923
Three prior HBD accidents	0.2000
Four prior HBD accidents	0.2778

one prior offense--if one HBD accident has occurred earlier. However, unlike for increasing numbers of prior offenses, the probability increases gradually for increasing numbers of prior accidents.

These data demonstrate conclusively that prior evidence of alcohol abuse while driving places such drivers at elevated risks of having a subsequent HBD accident. The information used in this analysis is readily available from the driver's master record. Apart from considerations about the cost of administering programs and the benefits to be derived from them, drivers in the identified high-risk groups are excellent candidates for specific deterrence.