THE NATURE OF THE ALCOHOL REDUCTION IN U.S. FATAL CRASHES IN THE 1980'S

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SUMMARY

In 1988, an estimated 23,350 people were killed in alcohol-related traffic crashes. During the 1980's, there was evidence of a reduction of alcohol involvement in fatal crashes. Using discriminant function analysis techniques in order to estimate alcohol involvement when it is not reported, the reduction of alcohol in fatal crashes from 1982 through 1988 was studied using the Fatal Accident Reporting System (FARS). While the reductions in alcohol occurred under most circumstances, they were more notable for teenaged drivers, females, surviving drivers, teenaged pedestrians, older drivers, and in daytime crashes.

Reasons for the reduction in alcohol are discussed in terms of: (1) public awareness of the problem during that time period; (2) tougher laws and better enforcement of existing laws by state and local governments; (3) the raising of the drinking age to 21 in all states; and (4) socio-economic and demographic factors.

BACKGROUND

While it is fairly well known that alcohol is involved in about half of the traffic fatalities in the U.S. (NCSA, 1989), it is not generally known that an additional half million people are injured in alcohol related crashes each year (NHTSA, 1988a). Of the 20 million motor vehicle crashes that occur each year, most of them property damage only, the police report alcohol involvement in about 10% (NSC, 1988). The probabilities tell us that at least two out of every five Americans will be involved in an alcohol related crash at some time in their lives (NHTSA, 1989a).

About 2 million drivers are arrested each year for driving while intoxicated (DWI), but the chance of being arrested per drunk driving trip varies from about 1 in 200 to 1 in 2000 depending upon the local community enforcement (Greenfeld, 1988). Surveys indicate that on any weekend night, 3 out of every 100 drivers on the road are legally drunk (Lund and Wolfe, 1989).

The average blood alcohol concentration (BAC) of drinking drivers involved in fatal crashes is about .17 grams of alcohol per deciliter of blood (g/dl).
While about half of the drinking drivers in fatal crashes have a BAC of .17 g/dl or greater, close to 80% have a BAC of .10 g/dl or greater (NHTSA, 1989b). The legal limit in most states is .10 g/dl. In a recent survey of drivers jailed for drunken driving offenses (most of them multiple offenders), over a quarter had consumed at least 20 beers or 13 mixed drinks in the 3 to 4 hours before their arrest (Greenfeld, 1988). There is substantial scientific evidence contained in a review of the state of knowledge that the relative risk of being involved in a crash increases at BACs of .05 g/dl and is as much as 25 to 35 times the risk of a sober driver at a BAC of .17 g/dl (NHTSA, 1985).

METHODOLOGY

Other than the references cited for the above facts, most of the information on alcohol involvement in fatal motor vehicle crashes comes from the Fatal Accident Reporting System (FARS) (NHTSA, 1989c). FARS contains a set of standard data elements from a census of all motor vehicle crashes resulting in a fatality within 30 days of the crash (NHTSA 1988b). The data are collected, coded and entered onto an electronic file by personnel in each State, DC and Puerto Rico. That file is quality controlled, maintained and analyzed by the National Highway Traffic Safety Administration (NHTSA). FARS was initiated in 1975 and now contains data on over 600,000 fatal crashes over a 15 year period. There are about 100 distinct data elements collected on the crash, the roadways, the vehicles and the people involved in these crashes for each case. The state personnel collecting the data are under contract to NHTSA and use police accident reports and other existing files for their data sources.

FARS has been used not only to define the problems associated with traffic fatalities, but to evaluate the effectiveness of minimum drinking age 21 laws, safety belt usage laws and more recently, the effect of the 65 mph speed limit. A new data element collected in FARS, beginning in 1987, is the death certificate number of each person who was killed (on the FARS master file only, not the public file). These numbers will be matched in the near future with those in the Multiple Cause of Death (MCOD) file maintained by the National Center for Health Statistics in order to obtain important data on that fatality which heretofore had not been available in FARS (i.e., specific cause of death; race; occupation; whether injury was work related; whether an autopsy was performed).

In order to explore the alcohol problem more thoroughly, especially with regard to fatal crashes, the FARS file was analyzed in some detail. Blood Alcohol Concentration (BAC) test results for driver fatalities in FARS are the best available evidence of trends in the role of alcohol in fatal crashes. They are available for nearly 75% of all drivers killed. However, driver fatalities are only 58% of all traffic fatalities and 45% of all drivers involved in fatal crashes. For only 22% of the surviving drivers in fatal crashes are alcohol test results reported in FARS. Thus, statistics on alcohol levels of surviving drivers in fatal crashes have not been reliable.

To obtain a more complete picture of alcohol involvement in fatal crashes, a methodology was developed that estimates the BACs of drivers who were not tested, or for whom BAC test results are not known (Klein, 1986a). The methodology calculates the proportion of drivers with known BACs as a function of specific driver and crash parameters. That proportion is then applied with the same personal and crash characteristics to drivers.
for whom there is no BAC data using the statistical technique of discriminant function analysis.

The methodology defines a derived FARS variable: the probability of alcohol involvement for each driver or pedestrian for whom there are no BAC data. The method estimates probabilities that the person's BAC is zero, 0.01-0.09 g/dl, or 0.10 g/dl and greater (Klein, 1986b).

The discriminant function analysis used all known BAC cases for the years 1982 and 1983 to develop the probability variables. The variables found to discriminate among the three categories of BAC were: vehicle type, police alcohol assessment, accident hour, accident type (single vehicle, multiple vehicle, non-occupant), accident location (relation to roadway), day of week (weekday, weekend), injury severity, driver age, driver sex, driving record, driver license status, and driver restraint or helmet use.

This analysis was validated using 1984 FARS data. The variance was less than one percentage point in estimating the proportion of drivers with known BACs in each of the three BAC categories.

RESULTS

The downward trend in alcohol involvement in fatal crashes over the past seven years is shown in TABLE 1 and FIGURE 1. The percent of traffic fatalities that were alcohol related has gone from 57% in 1982 to 50% in 1988 (TABLE 1). More specifically, the percent of drivers in fatal crashes who were drunk (BAC ≥0.10 g/dl) at the time of the crash has decreased from 30.0% in 1982 to 24.6% in 1988 (FIGURE 1). This is an 18% reduction in that proportion. The decrease was especially great for teenaged drivers. While 28.4% of the teenaged drivers in 1982 were drunk, this has dropped to 18.3% in 1988, a 36% reduction (See FIGURE 2). This trend is encouraging, but teenaged driver involvement in fatal crashes on a per mile driven basis remains substantially higher than other driver age groups (Fell, 1987). This downward trend was also generally true for drivers of various types of vehicles involved in fatal crashes.

Other groups and conditions in which there was a greater than average reduction were: teenaged pedestrians killed in collisions (29 %), drivers of vans (32 %), female drivers (24 %), drivers who survived the fatal crashes, (24%) and daytime crashes (19 %) (FIGURE 3).

There was proportionately little alcohol reduction among drivers aged 25 to 34, motorcycle drivers (who have high alcohol involvement to begin with), and pedestrians aged 20-64 (See also FIGURE 3). The proportion of drivers who were drunk also showed only a modest drop in nighttime and single vehicle crashes (6% and 11 %, respectively).
REASONS FOR THE REDUCTION

A number of hypotheses have been presented in the literature to explain the recent drop in alcohol involvement in fatal crashes. The factors that have been suggested include active countermeasures supported by government and private initiatives, demographic, and socio-economic factors. The major ones are:

1. Increased public awareness of the dangers of drinking and driving that resulted from alcohol programs and related activities by federal, state, and local governments; citizen organizations; and widespread media attention (McCarthy and Harvey, 1989).

2. New and tougher state laws, stricter enforcement including sobriety checkpoints, and swifter and surer sentences -- all given media attention -- to deter drinking and driving (Compton, 1983; NHTSA, 1988b; Klein, 1989).

3. An increased minimum legal drinking age in thirty-five states from 1982 through 1988 that has decreased the involvement of alcohol in fatal crashes by the affected drivers (DuMouchel, et al, 1985; Arnold, 1985; Hoxie and Skinner, 1987).

4. Prevention and intervention concepts and programs emphasizing positive alternatives including free rides home, responsible party hosting, bartender and alcohol server training, and the designated non-drinking driver (NHTSA, 1987).

5. A decline in the population of youthful drivers, especially 16 to 24 year olds, who as a group are overrepresented as drinking drivers in fatal crashes per mile driven (Fell, 1987).


There is a clear connection between the change in drinking age and the reduction in teenage drunken driving and teenage drunk pedestrian fatal crashes. The fact that pedestrians over age 20 did not show much decreased alcohol involvement in fatal crashes indicates that the successful alcohol programs are reaching drivers, but not necessarily the population as a whole. Anti-drunken driving programs do not appear to have reached male drivers aged 21 to 35, and seem to have had only a minimal effect on motorcycle drivers.

It should also be noted that while overall alcohol consumption per capita in the U.S. has been decreasing since 1981, per capita consumption of beer has been about level through the 1980's and wine consumption actually increased somewhat. Beer and wine have been shown to be the alcohol beverage of choice for most DWI drivers (Greenfeld 1988).

CONCLUSIONS

Drunken driving continues to be a major factor in fatal motor vehicle crashes although it has declined substantially since 1982. The major reasons for this reduction are a combination of increased public awareness of the risks of drunken driving (both the risk of arrest and of being involved in a crash), the
effect of government programs to reduce drunken driving (increased and more effective enforcement, more responsible alcohol service, and public education), and changes in drinking habits (particularly among teenagers because of changes in the legal drinking age in a majority of states).

There is evidence that media attention to drinking and driving as a public health issue is waning (McCarthy and Harvey, 1989), while at the same time the data also indicate that the reduction in alcohol in fatal crashes has leveled off since the mid-1980's. If drunken driving is becoming socially unacceptable to the American public, there are still certain segments of the population where this is not true.

The degree to which drunken driving will decline in the future will depend on continuing effective programs and initiating new programs. The magnitude of the problem still justifies major involvement by both public health and transportation agencies. Health promotion can play an important role in increasing public concern and stimulating both governmental and social action.

The NHTSA Administrator has developed a set of priorities for 1989-1993. On the top of that list is to "raise the national highway safety consciousness." For drunk driving to become socially unacceptable to the whole population, this must be done. But it cannot be done solely by the federal government - nor should it be. Grass roots organizations such as Mothers Against Drunk Driving (MADD), Students Against Drunk Driving (SADD) and Remove Intoxicated Drivers (RID) must continue their effort to affect the enforcement, judicial and media points of view on the problem.

Former U.S. Surgeon General C. Everett Koop recently convened a workshop to address the problem of drunken driving (Public Health Service, 1989). That workshop provided a large number of recommendations for addressing the problem. These ranged from increased research, data gathering, health education, and information dissemination (e.g., Perrine, et al, 1988); to more complete alcoholic beverage labelling and balanced advertising. Workshop participants also recommended federal and state tax reform for alcoholic beverages as has been advocated by other health organizations (APHA, 1986; Cook, 1981; Gerstein, 1984; CPSI, 1989). The workshop participants stated that the reform of alcohol tax policies has the potential of not only reducing alcohol consumption, and subsequently alcohol related trauma, but also in raising critically needed funds for drunk driving countermeasures and enforcement programs.

Of the enforcement measures that appear to have a significant impact, swift and sure license suspension and sobriety checkpoints are most promising. The designated driver program has been socially accepted for years in some Scandanavian countries and must catch on in the U.S. if we can ever hope to separate drinking and driving. Better public transportation and the "free ride home" programs for those who have had too much to drink also have potential.

Finally, if we can ever hope to accurately track the progress we are making in the drunk driving area, we must have better data. As previously stated, only about 1 out of 4 drivers who survive a crash fatal to someone else is ever tested for a BAC. This means that not only is the data incomplete, but that thousands of drinking drivers in these crashes each year go undetected as law breakers. Laws or policies in states requiring the testing of all drivers involved in fatal (or serious) crashes would go a long way toward resolving
these problems and would let the public know that if you are drinking and involved in a serious crash, you are going to be detected.

References


PROBLEM DRINKERS

The reduction of alcohol in fatal crashes seems to have been fairly broad-based. However, there is some evidence from 15 states that have had good alcohol reporting since 1980 that the proportion of drivers with very high BACs has decreased even more. FIGURE 4 shows that in 1982, almost a quarter (23.1%) of the fatally injured drivers in these states had BACs of 0.20 g/dl or greater while that proportion was reduced to 18.2% in 1988. That was a 21% reduction over that period. There was also a 15% reduction for drivers with BACs between 0.10 g/dl and 0.19 g/dl, while there was very little change in the low BAC range (down 7%). As a complement, the proportion of drivers with a zero BAC increased by 23%.

Most experts agree that drivers with a 0.20 g/dl BAC or greater are likely to be problem drinkers or alcoholics. Yet the proportion of drivers at these levels has decreased significantly since 1982 in the 15 state sample.

While the average BAC level of fatally injured drinking drivers in these 15 states has not changed much since 1980 (from .172 g/dl in 1980 to .166 g/dl in 1988), the average BAC level of all dead drivers (including those with zero BAC) has decreased substantially (down 22%, from .106 g/dl in 1980 to .082 g/dl in 1988).

FIGURE 4

PERCENT OF DRIVER FATALITIES IN VARIOUS BAC LEVELS, 1982, 1985, 1988
15 GOOD REPORTING STATES
FIGURE 3

NATURE OF ALCOHOL REDUCTION IN FATAL CRASHES 1982 - 1988

PERCENT DECREASE IN PROPORTION DRUNK (BAC = .10 g/dl +)

<table>
<thead>
<tr>
<th>Category</th>
<th>Decrease</th>
</tr>
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<tbody>
<tr>
<td>ALL DRIVERS</td>
<td>18%</td>
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<tr>
<td>TEEN DRIVERS</td>
<td>36%</td>
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<tr>
<td>VAN DRIVERS</td>
<td>32%</td>
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<tr>
<td>FEMALE DRIVERS</td>
<td>24%</td>
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<tr>
<td>SURVIVING DRIVERS</td>
<td>24%</td>
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<tr>
<td>TEEN PEDESTRIANS</td>
<td>29%</td>
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<tr>
<td>DAYTIME CRASHES (4 AM - 8 PM)</td>
<td>19%</td>
</tr>
<tr>
<td>AGED 25-34</td>
<td>8%</td>
</tr>
<tr>
<td>MOTORCYCLE DRIVERS</td>
<td>10%</td>
</tr>
<tr>
<td>LATE NIGHT CRASHES (MIDNIGHT - 6 AM)</td>
<td>7%</td>
</tr>
</tbody>
</table>
TABLE 1

TRAFFIC FATALITIES
1982 - 1988

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TOTAL</th>
<th>PERCENT</th>
<th>NUMBER</th>
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<tr>
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<td>43,945</td>
<td>57</td>
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<td>42,589</td>
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<td>1987</td>
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<td>1988</td>
<td>47,093</td>
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*ESTIMATES