A PRELIMINARY ASSESSMENT OF THE IMPACT OF LOWERING THE ILLEGAL BAC PER SE LIMIT TO 0.08 IN FIVE STATES

National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Mathematical Analysis Division
December 1994

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INTRODUCTION

Most states in the U.S. have passed laws making it illegal *per se* to have a certain blood alcohol concentration (BAC) while driving a motor vehicle. Zador, et al in 1988 [1] analyzed the impact of these per se laws in several states and concluded that they resulted in a 6 percent reduction in fatal crashes during hours of low to moderate alcohol involvement. Klein, 1989 [2], concluded that 6 out of 26 states which implemented illegal per se laws exhibited significant reductions in the rate of driver fatal crash alcohol involvements. Most of these states set the illegal per se limit at 0.10 grams per deciliter (g/dl) (or 0.10 BAC).

In 1983, two states, Oregon and Utah, lowered their illegal per se limit from 0.10 to 0.08 BAC. Since then, nine other states have lowered the illegal per se limit to 0.08. Table 1 lists the states that have implemented legislation establishing the illegal per se limit at 0.08 to date.

TABLE 1
STATES WITH 0.08 BAC PER SE LAWS

State	Effective Date
Utah	August 1, 1983
Oregon	October 15, 1983
Maine	August 4, 1988
California	January 1, 1990
Vermont	July 1, 1991
Kansas	July 1, 1993
North Carolina	October 1, 1993
New Mexico	January 1, 1994
New Hampshire	January 1, 1994
Florida	January 1, 1994

In a 1991 Report to Congress [3], the National Highway Traffic Safety Administration (NHTSA) recommended that if states are considering lowering their illegal per se limit, it should be 0.08 for drivers over the age of 21. Later in 1991, NHTSA released a study of the

effects following the implementation of a 0.08 BAC limit and an administrative license revocation (ALR) law in California [4]. The two laws and their publicity were reported to have reduced alcohol-related traffic fatalities by 12 percent in California during 1990. Following that study, NHTSA issued a second Report to Congress on Alcohol Limits [5]. The second report to Congress recommended that states be encouraged to enact 0.08 as the illegal per se BAC limit. NHTSA's rationale behind recommending a 0.08 BAC limit includes the following:

- It is a level at which critical driving tasks are impaired for the vast majority of drivers [6].
- It is a level at which the risk of a crash increases substantially [7].
- There is evidence that it is an effective measure which will reduce alcohol-related traffic fatalities [4].
- It is a reasonable level to set the limit; the public supports it [5].

In addition, Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. ISTEA provides for incentive grants to states meeting at least five of six criteria. These six criteria are: (1) an expedited administrative process for suspending the license of drunk drivers; (2) legislation setting 0.10 BAC as evidence of driving while intoxicated (DWI), which must drop to 0.08 BAC after three years; (3) a statewide sobriety checkpoint program; (4) a self-sustaining drunk driving prevention program; (5) a program preventing drivers under age 21 from obtaining alcoholic beverages; and (6) a mandatory sentence of 48 consecutive hours in jail or not less than 10 days community service for any person convicted of DWI more than once in any five year period. States may also qualify for supplemental grants under ISTEA. One of the supplemental grants is based on the state meeting the 0.08 BAC criteria in the first three years of the ISTEA incentive program. [8]

Meanwhile, several countries have set BAC limits of 0.08 or less. For example, Austria, Canada, Denmark, France, Italy, New Zealand, Spain, Switzerland, and the United Kingdom each have a BAC limit of 0.08. Finland, Iceland, Japan, Norway, and the Netherlands have adopted a BAC limit of 0.05 [8].

In early 1994, as more states were considering the adoption of 0.08 BAC, NHTSA decided to conduct a preliminary assessment of the changes in alcohol-related crashes in the states that had passed laws lowering the BAC limit to 0.08. At that time, a total of five states had their 0.08 BAC legislation in effect for at least two years. Table 2 lists these states along with the effective date of the legislation which set the BAC limit at 0.08.

TABLE 2
States with 0.08 BAC Legislation for At Least Two Years

STATE	EFFECTIVE DATE
California	January 1, 1990
Maine	August 4, 1988
Oregon	October 15, 1983
Utah	August 1, 1983
Vermont	July 1, 1991

It was felt that these states had legislation lowering the BAC limit in place for a time period long enough to determine if possible changes had occurred in crash-related measures. The purpose of this study is to describe the findings of a **preliminary assessment** of the impact of 0.08 BAC legislation on reducing driver involvement in alcohol-related fatal crashes in these five states. The goal of the study was to determine if changes had occurred coincident with the effective date of the 0.08 BAC laws so as to provide information for other states considering similar legislation. A more in-depth study has recently begun that will investigate the effect of 0.08 BAC legislation, and consider other programs, legislation and outside factors that may affect the findings reported herein. The results documented in this preliminary assessment focus only on the presence of 0.08 BAC legislation.

DATA

Data from NHTSA's Fatal Accident Reporting System (FARS) were used to analyze the level of driver involvement in alcohol-related fatal crashes comparing time periods before vs. after the 0.08 BAC legislation became effective in each state. FARS began in 1975 and contains a census of the most severe traffic crashes, i.e., those resulting in a fatality. A crash is included in FARS when it involves a motor vehicle traveling on a trafficway open to the public and results in the death of an occupant of a vehicle or a nonmotorist within thirty (30) days of the crash.

FARS data for each of the five states used in this study were extracted from the file using equal periods of time to represent crashes occurring before and after the 0.08 BAC law became effective. The before and after time periods used in the analysis for each state are shown in Table 3. The particular time periods shown were chosen based on several considerations. These considerations were: (1) using the latest available year of FARS data at the time of the analysis (1992); (2) using at least two years of FARS data before vs. after,

where possible; (3) the earliest available year of FARS data for which it was possible to make reliable estimates of alcohol involvement (1982) and (4) the effective date of the legislation. In addition, the before and after time periods were chosen to represent similar crash patterns, i.e., compare summer months "before" 0.08 BAC legislation to summer months "after" 0.08 BAC legislation became effective; and **did not account for other legislation aimed at reducing the impact of drinking and driving.** For example, the study of the California experience with 0.08 BAC found a significant reduction in alcohol-related traffic fatalities, but the authors of that study felt it was not possible to separate the effect from that of the implementation of administrative license revocation, which followed six months after 0.08; both changes were noted in California's public information campaign preceding implementation. Thus, conclusions regarding the effect of 0.08 BAC laws in this report could be confounded with effects of other legislation occurring at or near the time of 0.08 BAC implementation, like the California experience. As stated earlier, a follow-up report, analyzing these data in greater detail and accounting for the presence of other legislation is currently underway in NHTSA.

TABLE 3
"Before" vs. "After" Time Periods Used in Analysis

STATE	"BEFORE" .08 BAC	"AFTER" .08 BAC
California	1/88 - 12/89	1/90 - 12/91
Maine	8/86 - 7/88	8/88 - 7/90
Oregon	1/82 - 9/83	1/84 - 9/85
Utah	1/82 - 7/83	1/84 - 7/85
Vermont	7/89 - 12/90	7/91 - 12/92

Six different measures of driver involvement in alcohol-related fatal crashes were examined for changes in the level of crashes when the "before" time periods were compared to the "after" time periods in each state. As no measure of driver involvement in alcohol-related fatal crashes can be considered "perfect," it was decided to use several that are well known in the traffic safety literature. Each of these measures has been examined in the literature and is considered indicative of the occurrence of drinking and driving. For each of the six measures that follow, all drivers of age 21 and older who were involved in fatal crashes in FARS were included:

(1) any alcohol (BAC $\geq$ .01) [9];

(2) intoxicated (BAC $\geq$ .10) [9];
(3) police-reported driver [PRD] alcohol involvement;
(4) single-vehicle nighttime [SVN] driver involvement;
(5) single-vehicle nighttime male [SVNM] driver involvement; and
(6) estimated alcohol involvement [PRD, positive BAC result, alcohol violations].

The data extracted from FARS for the purposes of this study were limited to drivers of age 21 and older. Each state that has passed legislation to set the BAC limit at 0.08 has done so for drivers over the age of 21. [As of 1988, all of the fifty states and the District of Columbia had legislation in place which set the minimum legal drinking age at 21.] Thus, any change in the level of driver involvement in fatal crashes in states with 0.08 BAC would be expected for drivers age 21 and older, as these are the drivers that would be impacted most by the 0.08 BAC legislation. This does not preclude the possibility that drivers under 21 years of age, who cannot legally purchase alcohol, could be affected by 0.08 BAC laws.

While the FARS data include the results of blood alcohol tests of drivers involved in fatal crashes, test results are not reported for every driver, for a number of economic, practical, or technical reasons. For the U.S. overall, BAC test results are reported for 75 percent of the fatally injured drivers and are reported for a smaller percentage, often less than 25 percent, of the surviving drivers. To determine the level of alcohol involvement for all drivers in FARS, Klein [9] refined a method based on discriminant analysis to estimate unknown BAC values using the known BAC data. This methodology estimates unknown BACs using a statistical model based on known BAC. Measures (1) and (2) listed above were developed using this methodology. The remaining measures were extracted from FARS, using information from police reporting (measure 3), the circumstances of the crash (measure 4), and other available driver information (measures 5 and 6).

ANALYTICAL METHOD

FARS data for the six measures were examined for the time periods shown in Table 3 for each of the five 0.08 BAC states and the rest of the nation (in each comparison, omitting all five 0.08 states). Using each of the six measures, the proportion of alcohol involvement that was experienced "before" the 0.08 law was compared to the proportion of alcohol involvement that was experienced "after" the 0.08 law, by calculating the percentage change. In other words, if:

$$\text{Alcohol}_{Bi}/\text{Total}_{Bi} = p_{Bi} \quad \text{and}$$

$$\text{Alcohol}_{Ai}/\text{Total}_{Ai} = p_{Ai} ;$$

where i = 1, 2, 3, 4, 5, or 6 for each of the six measures and B is Before 0.08 and A is After 0.08, then the percentage change for measure i is calculated as:

$$\text{Percentage Change}_i = [(p_{Ai} - p_{Bi}) / p_{Bi}] \times 100.$$

A decrease in the level of driver involvement in alcohol-related fatal crashes would yield a negative value for the percentage change, comparing the before 0.08 BAC period to

the after 0.08 BAC period. An increase would yield a positive value for the percentage change.

Calculating the percentage change to compare the differences between p_{Bi} and p_{Ai} for each of the six measures in each of the five states yielded thirty comparisons of the level of driver involvement in alcohol-related fatal crashes before vs. after the 0.08 BAC legislation. A difference in two proportions may be found to be statistically significant using the methods shown in Fleiss [10]. The test statistic employed for the difference in proportions is distributed as χ^2. For this study, the percentage change was considered statistically significant at the $\alpha = 0.10$ level.* Using this as a criterion, Table 4 summarizes the findings of significant decreases by state and measure. Nine of the thirty comparisons of the measures were found to be statistically significant reductions. None of the comparisons using the same measures for the rest of the nation were found to be statistically significant reductions.

TABLE 4

Summary of Significant Decreases in Driver Involvement in Alcohol Related Crashes After 0.08 BAC Legislation

State	Measure	Percentage Decrease
California	Alcohol > .10	- 4 %
Oregon	Any Alcohol	- 9 %
	Alcohol > .10	-11 %
	PRD Alcohol Involvement	-13 %
	Estimated Alcohol Involvement	-11 %
Utah	PRD Alcohol Involvement	-30 %
Vermont	Any Alcohol	-36 %
	Alcohol > .10	-31 %
	Estimated Alcohol Involvement	-40 %

*This is equivalent to a one-tailed t-test at the $\alpha = 0.05$ level of significance.

As indicated in Table 4, significant decreases in the level of driver involvement in alcohol-related fatal crashes were found most often for Oregon (4 of the six measures). No significant decreases were found for any of the measures for Maine. Nine of the thirty measures examined were statistically significant decreases, ranging from a 4 percent decrease in the level of driver involvement in alcohol related fatal crashes at 0.10 BAC to a 40 percent decrease in the level of driver involvement in fatal crashes estimated to be alcohol involved (measure 6).

The remaining 21 measures were not statistically significant at the 0.10 level. Of these, the majority, 16 measures, showed decreases in the level of driver involvement in alcohol-related fatal crashes. Five of the 21 measures that were not statistically significant showed increases in the level of driver involvement in alcohol-related fatal crashes.

SUMMARY

Comparisons between measures of driver involvement in alcohol-related fatal crashes for the five states with 0.08 BAC legislation suggest that significant decreases occurred following implementation of the legislation. While some of the measures employed failed to exhibit statistically significant declines, significant decreases were found for nine of the thirty measures of driver involvement in alcohol-related fatal crashes in four of the five states with 0.08 BAC studied in this preliminary analysis. For Oregon and Vermont, significant reductions were noted for several measures of driver alcohol involvement, while for California and Utah, each exhibited one measure achieving a significant reduction. However, as these findings are preliminary, further analysis is warranted. The current analysis does not account for other potentially important factors, e.g., other alcohol legislation, that could influence the impact of the 0.08 BAC legislation. Additional and more in-depth analytical work is underway to further understand and determine if significant changes in the level of alcohol involvement in crashes have occurred with the passage of 0.08 BAC legislation.

In closing, this preliminary assessment appears to indicate that the implementation of 0.08 BAC laws and other associated activities (such as public information campaigns drawing attention to the change) are associated with reductions in fatal crash driver alcohol involvement.

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