EVALUATION OF THE TEXAS 0.08 BAC LAW

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Abstract — Aims: The purpose of the present study was to assess the effects on alcohol-involved traffic crashes and fatalities of the 0.08 blood alcohol concentration (BAC) per se law introduced in the state of Texas in 1999. Method: Data pertaining to alcohol-involved traffic crashes and fatalities were extracted from two datasets: the Fatality Analysis Reporting System (FARS) compiled by the National Highway Traffic Safety Administration (for the period January 1995–September 2002), and the Texas Department of Public Safety (DPS) reports of Alcohol Related Motor Vehicle Traffic Accidents and Casualties (for the period January 1995–December 2000). The data were analysed using time-series methods (ARIMA routines). The effects of the law on all drivers were assessed, along with the effects among gender, racial, and age subgroups and crash location (urban vs rural). Results: Separate time-series analyses were conducted with all alcohol-involved and fatal alcohol-involved crashes from the DPS dataset and fatal alcohol-involved crashes from the FARS dataset as the outcome variables. None of the effects for either the total sample or any of the subgroups analysed was statistically significant (this was true of both the FARS and DPS datasets). Conclusions: While there is a growing body of evidence that indicates that 0.08 BAC laws can be effective in reducing alcohol-involved traffic accidents and fatalities, the present study shows that this was not the case in Texas. Future research should move beyond the simple question of whether or not 0.08 BAC laws ‘work’ and instead explore in more detail the conditions, such as publicity and enforcement, under which the law does or does not contribute to a decline in alcohol-involved accidents and fatalities.

INTRODUCTION

The introduction of 0.08 blood alcohol concentration (BAC) per se laws has long been one of the most contentious and fiercely debated areas of alcohol policy in the United States. In October of 2000, President Clinton signed federal legislation (the 0.08 Blood Alcohol Concentration Bill) requiring states to set 0.08 BAC as the legal limit while driving. States were given until October 1, 2003 to pass 0.08 BAC legislation or lose 2% of their federal highway construction funds. Specifically, failure to pass such a law resulted in a 2% reduction in federal highway appropriations in 2004. Each subsequent year of non-compliance carried an additional 2% reduction in highway funds, culminating in an 8% reduction in funds by 2007. However, any state that adopted the 0.08 BAC threshold by 2007 would receive the highway funds that it had lost between 2004 and 2007. At the time that the federal legislation was passed, 18 states and the District of Columbia had enacted 0.08 BAC legislation.

One of the reasons why the introduction of 0.08 BAC laws has been so contentious and has been resisted by state legislators is that there exists conflicting evidence as to whether or not they are effective. Some studies of individual states or small groups of states indicate that the law is successful in reducing alcohol-related traffic fatalities (Hingson et al., 1996; Dee, 2001; Voas et al., 2002). However, others produced more equivocal findings (Apsler et al., 1999) or results that simply showed little or no meaningful effect (Foss et al., 2001). Reviews of the available evidence have also come to differing conclusions. A report of the US General Accounting Office published in 1999 concluded that: ‘Overall, the evidence does not conclusively establish that 0.08 BAC laws, by themselves, result in reductions in the number and severity of alcohol-related crashes’ (US General Accounting Office, 1999, p. 2). In contrast, a review produced by staff of the Centers for Disease Control (CDC) concluded that: ‘Strong evidence was found for the effectiveness of 0.08 blood alcohol concentration laws’ (Shults et al., 2001, p. 66). One possible reason why studies have produced different results is that their methodologies vary in terms of the types of study designs, outcome measures, and data analyses used. In addition, it is entirely possible that the law is effective in some (and, perhaps, most) states but not in others due to factors such as lack of publicity and/or enforcement or the absence of complementary laws such as administrative license revocation (ALR).

The purpose of the present study was to assess the effects on alcohol-involved traffic crashes and fatalities of the 0.08 BAC law introduced in the state of Texas in 1999. Time-series analysis was performed on aggregate level state data for all drivers and for specific subgroups for the period January 1995–September 2002 for fatal crashes and for the period January 1995–December 2000 for all crashes. The problem of confounding of the effects of the 0.08 BAC law by the simultaneous introduction of an ALR law that has beset much of the early research was not a problem in Texas as the state has had an ALR programme (which allows the Department of Public Safety to suspend the licenses of drivers who fail or refuse to take a chemical test for alcohol) since January 1, 1995.

METHODS

The state of Texas introduced a 0.08 BAC law on September 1, 1999. Indeed, it was the only state of those to consider 0.08 BAC legislation in 1999 to actually implement a legal change in the threshold from 0.10 to 0.08. At the time the state ranked among the highest in alcohol-related traffic fatalities (National Highway Traffic Safety Administration, 1999). In 1998, a total of 1573 drivers were killed on its roads in fatal crashes that involved alcohol—about 600 more than the total number in the next highest state (California).
In order to compare our findings in the state of Texas with previous research, we employed a data analysis strategy similar to that used by Foss and co-workers in their study of the effects of the introduction of a 0.08 BAC law in North Carolina in October of 1993 (Foss et al., 2001). Like Foss et al., the present analysis used both FARS data on fatally injured drivers and a proxy outcome measure for alcohol-related accidents from the state police department dataset. The primary analysis used was structural time-series which controlled for the preexisting decline in alcohol-related crashes and seasonal variations to examine the before and after trend in the state.

Datasets and variables

Data pertaining to alcohol-involved traffic crashes and fatalities were extracted from two datasets. The first of these was the Fatality Analysis Reporting System (FARS), compiled by the National Highway Traffic Safety Administration, which is a census of all fatal traffic accidents occurring in the USA (National Highway Traffic Safety Administration, 2001). The FARS dataset is the most widely used in studies of alcohol-related traffic fatalities in the USA and has been employed in a number of other evaluations of changes in state BAC laws (Dee, 2001; Foss et al., 2001; Voas et al., 2002; Tippetts et al., 2005). FARS data were available for the period January 1995–September 2002, inclusive. This allowed assessment of the effects of the law for three years following implementation. The second dataset used was the Texas Department of Public Safety (DPS) Reports of Alcohol Related Motor Vehicle Traffic Accidents and Casualties, which contains data on both non-fatal and fatal accidents (Texas Department of Public Safety Accident Records Bureau, 2001). Datasets produced by state agencies such as the Texas DPS are less frequently used in alcohol-related traffic safety research in the United States (probably due to availability of a national dataset—i.e. FARS), although they have the advantage of containing data on both fatal and non-fatal accidents and including data on driver ethnicity that is absent from the FARS. DPS data were available for the period January 1995–December 2000, inclusive. Thus, we were only able to assess the short-term effects (i.e. 15 months) of the law using this dataset.

A major limitation of the Texas DPS dataset that was used in the analysis is missing BAC data on drivers: this ranged from 63% in 1996 to 68% in 2000. Previous studies that have used state-level datasets to assess the effects of 0.08 BAC and other traffic safety laws have dealt with the problem of missing alcohol data by using a proxy measures of alcohol-involved accidents (e.g. Holder and Wagenaar, 1994; Foss et al., 2001). This procedure was used in the present analysis. Specifically, alcohol involvement was assumed if the accident occurred on a Friday or Saturday night between 7 p.m. and 5 a.m. and involved only one vehicle.

The FARS dataset is also limited by the quality of data in the state source documents from which it is derived, including problems with missing BAC values. In the Texas FARS files used in our analysis, missing BAC data ranged from 64% in 1996 to 78% in 2002. However, one reason why the FARS dataset is so widely used in alcohol-related traffic research is that it incorporates an imputation system that generates BAC values for each driver for whom data are missing. The FARS imputation system was originally developed in the mid-1980s to provide probabilities for three BAC values (Klein, 1986), but was recently upgraded to a system of multiple imputation (National Center for Statistics and Analysis, 2002). The multiple imputation procedure uses recorded variables that are associated with BAC, such as age, sex, time of the accident, day of the accident, and the officer’s suspicion of alcohol involvement, to generate a prediction of what the BAC is likely to have been (Subramanian and Utter, 2003). This multiple imputation procedure was used in the present analysis and alcohol involvement was defined as a driver BAC > 0.

Data analyses

The focus of the data analysis was on crashes and fatalities prior to the implementation of the law (January 1995–August 1999) vs those following its implementation (September 1999–September 2002 for the FARS dataset, and September 1999–December 2000 for the DPS dataset). Since the outcome variables for these analyses were the monthly proportions of accidents involving alcohol, a logit transformation was used to normalize the variables so that standard time-series methods could be used. All models were estimated using the ARIMA routines available in the Stata statistical package (StataCorp, 2005) using lags that were specific to each model. The portmanteau statistic was used to test for residual autocorrelation (Chatfield, 2004). In the models, the variable ‘level’ is an indicator variable defined as ‘0’ prior to September 1999 and ‘1’ after the law went into effect. The variable ‘trend’ is an interaction term computed as the product of time and level. All models were adjusted for the natural logarithm of the total number of crashes and the number of weekend nights each month.

To date, 0.08 BAC laws have been assessed in terms of their effect on reducing alcohol-involved traffic fatalities in the total driving population of the state in which the law was introduced. In cases where no overall effect has been found, there has been little attempt to identify possible differential subgroup effects. This is a curious omission, as rates of alcohol-involved traffic crashes vary by demographic characteristics of drivers such as age and gender (Abdel-Aty and Abdelwahab, 2000). In addition, it is possible that the introduction of a law has differential subgroup effects, as was recently reported for highway speed limits (Dee and Sela, 2003). In light of this, we conducted age, race, and gender subgroup analyses. In addition, available evidence showed that while there had been a decline in the overall proportion of alcohol-related traffic fatalities in Texas prior to the introduction of the 0.08 BAC law those in rural areas increased by 2.4% between 1997 and 1998 (Texas Department of Public Safety, 1999). We therefore also examined the effects of the law in urban vs rural counties.

RESULTS

FARS analysis

Since the FARS dataset contains a more extensive post-law time-series (36 months) than the DPS dataset (15 months) it provides a more stringent test of the effect of the change in
BAC level on alcohol-related crashes in Texas. Using the
FARS data, Fig. 1 shows the percent of fatal crashes that
involved alcohol for each month from January 1995 through
September 2002. There appears to be no noticeable decline
in the trend following introduction of the 0.08 BAC law, espe-
cially if one focuses on the 3-year period immediately prior
to the law and compares this to the 3 years following its
implementation.

To formally assess whether any change could be detected
in the FARS data that coincided with the 0.08 BAC law,
we examined the pre-law vs post-law proportion of alcohol-
involved crashes using a series of ARIMA models. The results
of these analyses are presented in Table 1. Following the pro-
cedure used by Foss and co-workers (2001), the presence of
two types of effects were examined—first, a stepped or abrupt
shift at the point that the law was implemented, and second a
change in trend or slope beginning at the time that the law
was implemented. In addition, we examined the effect among
the total sample as well as gender and age subgroups, and rural
and urban settings. The parameter estimates for both the level
and trend are shown in Column 4, followed by the standard
error of the coefficient, the statistical significance of the esti-
mate, and the upper and lower boundaries of the 95% confi-
dence interval (CI). The final two columns of the table
present the results of the test of whether residual autocorrela-
tion was accounted for in the model (Chatfield, 2004).

The non-significant $\chi^2$ analyses reported for the white noise
test indicate that the model was successful in removing resid-
ual autocorrelation. As for the assessment of the effects of the
introduction of the 0.08 BAC law it can be seen that none of
the parameter estimates even approached statistical signifi-
cance. This was true of both the estimates of change in trend

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**Fig. 1.** Proportion of fatal accidents involving alcohol using the FARS imputed BAC (Texas, January 1995–September 2002).

**Table 1.** Time-series (ARIMA) models of FARS data for fatal accidents

<table>
<thead>
<tr>
<th>Source</th>
<th>Coefficient</th>
<th>SE</th>
<th>p-value</th>
<th>95% CI</th>
<th>$\chi^2$</th>
<th>P-value</th>
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<td>0.601</td>
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<td>0.00</td>
<td>0.601</td>
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<td>0.00</td>
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<tr>
<td></td>
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<td>0.836</td>
<td>–3.19</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level</td>
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<td>–0.01</td>
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<td>0.00</td>
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<td>0.01</td>
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<tr>
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<td></td>
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</tr>
<tr>
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<td>0.395</td>
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<td>0.00</td>
<td>0.369</td>
<td>–0.01</td>
<td>0.00</td>
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</table>

*Texas, January 1995–September 2002 (level = shift in level; trend = change in slope).
Fig. 2. Proportion of (a) fatal accidents and (b) total accidents involving alcohol using the DPS surrogate variable (Texas, January 1995–December 2000).
and change in level, and for the total sample and the various subgroups.

**DPS analysis**

We also conducted separate time-series analyses of both fatal alcohol-involved crashes and all alcohol-involved crashes (i.e., fatal and non-fatal) using the DPS dataset. These analyses are based on the DPS proxy measure of a single vehicle accident occurring on Friday or Saturday between 7 p.m. and 5 a.m. Since these time-series included just 15 post-law data points they provide a less rigorous test of the influence of the law than the FARS analysis and can only be used to estimate its immediate effects. The timelines for each type of alcohol-related accident are presented in Fig. 2. With the exception of the first six months of the all accidents timeline, the trends for each were fairly stable throughout the period and appear unchanged after the introduction of the 0.08 BAC law. Also, comparison of Figs 1 and 2a shows that there was basic agreement between the two measures of fatal accidents.

The results of the ARIMA analyses of the DPS fatal alcohol-related accidents and total alcohol-related accidents are presented in Tables 2 and 3, respectively. Since the DPS dataset includes information on race, we were able to include this in the subgroup analyses for two categories (White and Black). As with the FARS analysis, none of the white noise tests was statistically significant. In addition, the results for the assessment of the effects of the change in BAC law were essentially the same as those for the FARS dataset. With the exception of the estimate for all accidents among the 25–64-year-old subgroup, none of the effects approached statistical significance (and even this finding should be interpreted with caution given the number of comparisons reported).

**DISCUSSION**

Before discussing these findings and their policy implications in more detail, it is important to reiterate the limitations of the data available to conduct these analyses. Specifically, there was a large amount of missing BAC data in both the DPS and FARS datasets. In light of this, a surrogate for alcohol-involved crashes had to be created for the former and a system of multiple imputations used with the latter. While the new FARS imputation system is very sophisticated, and it was encouraging that our independent proxy measure showed a similar pattern to this over time, there is obviously some uncertainty introduced into the analyses by the fact that the ‘true’ BAC data were unavailable for so many of the drivers. In light of this, the findings presented should be interpreted with caution. Having stated this, these limitations are not unique to our study, and virtually all the previous research in this area makes use of the FARS dataset (Dee, 2001; Voas et al., 2002; Tippetts et al., 2005) and, in some cases, complements this with proxy measures from state public safety departments (Foss et al., 2001).

As noted in our introduction, the evidence pertaining to the effectiveness of 0.08 BAC laws has been somewhat mixed. The findings reported herein are consistent with those of Foss et al. (2001) who found no noticeable effects in their evaluation of the 1993 North Carolina law. However, they are at odds with studies conducted in other jurisdictions (Hingson et al., 1996; Dee, 2001; Voas et al., 2002), and with the conclusions of a recent CDC review which stated that there was ‘strong evidence’ for the effectiveness of 0.08 BAC laws (Shults et al., 2001). Similarly, a recent meta-analysis of BAC laws in 18 states and the District of Columbia concluded that the overall effect of the law was a 14.8% reduction in the rate of alcohol-involved fatal accidents (Tippetts et al., 2005). Why, then, the discrepancy between the Texas results and most of the other evaluations?

The usual approach to addressing such a question is through examination of differences in study design or identification of sources of measurement error and bias. As noted above, there are certainly limitations present in the current analysis, but the primary one (namely missing data and the use of proxy measures and imputations) applies equally to the other research in this area that has reported positive effects. This returns us, therefore, to the idea raised in the introduction that it is entirely possible that the law is effective in most jurisdictions in which it is introduced but not in all of them. And, indeed,
this is what the results of the meta-analysis of Tippetts et al. (2005) indicate. For while they found an overall positive impact, analysis of individual jurisdictions showed that the effect was not statistically significant in 17 of the 16 in which reductions were observed. Moreover, Texas was one of just three states in which the analysis indicated possible increases in alcohol-involved fatal crashes, although these effects were not statistically significant.

Thus, rather than debating whether or not the law is effective, a more useful policy question is why its impact is so limited in some jurisdictions, such as Texas. Recent political and legal developments also make this a more relevant and timely question since the introduction of incentives tied to federal highway construction funds resulted in all 50 states passing 0.08 BAC laws by mid-2005 (Mothers Against Drunk Driving, 2005). The presence of complementary laws such as ALR along with the extent to which the law is publicized and enforced are considered the main factors influencing its effectiveness (US General Accounting Office, 1999; Foss et al., 2001). If other laws are already in place, then the capacity of the 0.08 BAC law to bring about additional reductions may be limited, especially if the law is not well publicized or not consistently enforced. As noted earlier the Texas ALR law was in place five years before the 0.08 BAC law.

As for enforcement and publicity, we unfortunately have no systematic data available on the extent to which the change in the Texas BAC law was publicized or enforced in the years following implementation. Thus, we can only speculate on the influence of these factors on our findings. Tippetts et al. (2005) in their meta-analysis of 0.08 BAC laws report that they had no beneficial effects in states that did not use sobriety checkpoints to enforce and publicize them. Only 4 of the 19 jurisdictions that had introduced a 0.08 BAC law at the time that they conducted their analysis did not implement at least some level of checkpoints. Texas was one of these jurisdictions.

The DUI campaigns conducted in the state of Texas tend to focus on specific holiday weekends (e.g. July 4 and Independence Day) and involve a combination of radio and television public service announcements and increased enforcement (Taylor, 2001; Texas Department of Transportation, 2003). However, in the absence of highly visible and sustained enforcement such as checkpoints, these targeted efforts may simply be insufficient to raise awareness of the likelihood of detection and punishment should one drink and drive. Also, perhaps because enforcement is only stepped-up for brief periods of time, the likelihood of arrest appears to have been no greater after implementation of the law than before. The adult arrest rate for driving under the influence (DUI) in Texas rose from 572 per 100,000 population in 1998 to 637 in 1999, the year that the law was implemented (Criminal Justice Policy Council, 2002, p. 3). It remained at about this level in 2000, but fell back to 588 per 100,000 in 2001. Of course it is possible that people heeded the new law and refrained from drinking and driving. However, had there been intense post-law enforcement one would expect this to have resulted in a noticeable increase in the DUI arrest rate in 2000 and 2001, especially as the threshold for DUI had been lowered.

Future research should move beyond the simple question of whether or not 0.08 BAC laws ‘work’ and instead explore in more detail the conditions under which the law does or does not contribute to a decline in alcohol-involved accidents and fatalities. As just noted, one way to do this is through examining the contextual factors under which the law operates (e.g. enforcement and publicity). Another is to look for possible differential effects of the law among subgroups of the total driving population of a jurisdiction. To this end we examined possible age, gender, race, and location subgroup effects in the present analysis but found none.

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