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Administrative License Suspension: Does Length of Suspension Matter?

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Abstract

Objective: Administrative license revocation (ALR) laws, which provide that the license of a driver with a blood alcohol concentration at or over the illegal limit is subject to an immediate suspension by the state department of motor vehicles, are an example of a traffic law in which the sanction rapidly follows the offense. The power of ALR laws has been attributed to how swiftly the sanction is applied, but does the length of suspension matter? Our objectives were to (a) determine the relationship of the ALR suspension length to the prevalence of drinking drivers relative to sober drivers in fatal crashes and (b) estimate the extent that the relationship is associated to the general deterrent effect compared to the specific deterrent effect of the law.

Methods: Data comparing the impact of ALR law implementation and ALR law suspension periods were analyzed using structural equation modeling techniques on the ratio of drinking drivers to non-drinking drivers in fatal crashes from the Fatality Analysis Reporting System (FARS).

Results: States with an ALR law with a short suspension period (1–30 days) had a significantly lower drinking driver ratio than states with no ALR law. States with a suspension period of 91–180 days had significantly lower ratios than states with shorter suspension periods, while the three states with suspension lengths of 181 days or longer had significantly lower ratios than states with shorter suspension periods.

Discussion: The implementation of any ALR law was associated with a 13.1% decrease in the drinking/non-drinking driver fatal crash ratio but only a 1.8% decrease in the intoxicated /non-intoxicated fatal crash ratio. The ALR laws and suspension lengths had a significant general deterrent effect, but no specific deterrent effect.

Practical Implications: States might want to keep (or adopt) ALR laws for their general deterrent effects and pursue alternatives for specific deterrent effects. States with short ALR suspension periods should consider lengthening them to 91 days or longer.

Keywords

administrative license revocation (ALR) laws; license suspension length; Fatality Analysis Reporting System (FARS); drinking driver ratio

INTRODUCTION

Laws adopted in the United States to control and reduce alcohol-impaired driving vary considerably by state (National Highway Traffic Safety Administration [NHTSA] 2010). These laws have been adopted over the past 100 years and form the legal structure that enables law enforcement to stop drivers on public roads (with reasonable suspicion) and arrest them for driving while intoxicated (DWI) (with probable cause). In every state, it is illegal per se to drive with a blood alcohol concentration (BAC) of .08 g/dL or greater, and it is illegal per se for drivers younger than 21 years to drive with any alcohol in their systems (BAC .02). Criminal sanctions for a first-offense DWI conviction typically consist of at least a driver's license suspension or revocation period decided by the judge; a fine; some alcohol education or treatment; and either some time in jail, some period under house arrest, or some minimal hours of community service. Between 1982 and 1997, the key modern impaired driving laws were adopted by most of the 50 states and the District of Columbia (Fell & Voas 2006). As a result, there was a substantial decrease in the proportion of traffic fatalities involving alcohol-impaired drivers during that period. However, progress has stalled since 1997 (Dang 2008; Fell, Tippetts, & Voas 2009) (Figure 1).

The opportunities for strengthening current DWI laws are limited. There is scant support for lowering the illegal BAC limit for driving from .08 to .05, as recommended by the National Transportation Safety Board (NTSB 2013), and not many other laws lend themselves to enhancement. Outside of the BAC per se laws, administrative license revocation or suspension (ALR or ALS) laws are perhaps the most powerful measures against alcohol-impaired driving in the U.S. drunk-driving enforcement system. This is because they provide for the immediate suspension of the driver's license upon arrest for DWI—the driver's license is actually taken by the arresting officer in most states. ALR laws allow the state department of motor vehicles (DMV) and/or licensing department to suspend or revoke the license well before the criminal sanctions take effect. This strengthens the .08 BAC per se law by ensuring that a significant penalty occurs in close proximity to DWI apprehension—an important factor in creating deterrence. This licensing control measure also rapidly removes a high-risk driver from the public roadways. Several large national studies have demonstrated that the presence of an ALR law is associated with a reduction in alcohol-related crashes (Klein 1989; Shults et al. 2001; Voas, Tippetts, & Fell 2000; Wagenaar, Zobeck, Hingson, & Williams 1995; Zador, Lund, Field, & Weinberg 1988). What is not known is the extent to which the severity of the penalty—the length of the license suspension—influences the effectiveness of the ALR law. ALR laws offer two possibilities for strengthening deterrence to impaired driving: (a) by extending ALR to the nine states currently without such laws and (b) by increasing the severity of the sanction (length of the license suspension) in the states with such laws. This study is important for the following reasons:

1. Forty-one states currently have an ALR law, so they are in a position to rapidly change the suspension length based on any new information on ALR effectiveness.

2. Nine states have not yet adopted an ALR law despite the evidence for its effectiveness. Improved information on the role of the suspension sanction might encourage passage of the ALR law in these nine states.
3. License suspension is one of the easiest, most efficient, and most inexpensive sanctions for the government to impose on DWI offenders. In the current U.S. economic environment, low-cost measures are the only programs likely to be enacted by state legislatures.
4. The current enthusiasm for the enactment of first-offender alcohol ignition interlock laws is resulting in the shortening of ALR suspension periods to move offenders into an interlock program at an earlier date. This may have an effect on ALR laws, but more research is needed on this issue.
5. This study will inform deterrence theory by separating the general deterrent effect of ALR laws on all drivers from the specific deterrent effect on the DWI offenders who were actually suspended.

Ross (1984) has described the three primary factors in producing deterrence as (1) the probability of detection and apprehension, (2) the severity of the penalty, and (3) the speed with which the penalty follows on the proscribed behavior. ALR laws ensure that a certain penalty (driver's license suspension) will follow rapidly (upon apprehension for DWI). Thus, ALR laws are believed to be particularly effective in producing *general deterrence* among all drivers. The application of the suspension penalty also has a separate *specific deterrent* effect on those DWI offenders who are sanctioned, initially preventing them from driving, or if they drive illicitly, motivating them to drive less and more carefully during the suspension period. After experiencing the license suspension, DWI offenders are then presumably deterred from recidivating. Past studies of ALR laws have not distinguished between its general and specific deterrent effect on crash involvements. Separating these two features of the ALR law will advance the utility of deterrence theory for state traffic safety officials and research theorists.

Classic deterrence theory recommends that sanctions for DWI be swift and severe without being excessively harsh (Gibbs 1975; Ross 1984; Ross & Voas 1990). ALR is an example of that classical deterrence policy because the sanction follows swiftly upon apprehension. Moreover, it increases the certainty of the sanction because it is essentially automatic. It is issued by the DMV, not the courts, which ensures that the sanction will be imposed. The loss of a driver's license is considered a severe penalty for most drivers who depend upon being able to drive. ALR suspension lengths, however, vary greatly by state (see Appendix A). This raises the question of whether the length of the suspension in a given state is severe enough or so severe that it reduces compliance. For example, for first-time DWI offenders, the suspension period is 7 days in Virginia but 1 year in Georgia. It is unclear, yet essential for policy purposes, to understand whether and to what extent the length of the ALR suspension affects the deterrence of an ALR law. The research described herein addresses this issue. Furthermore, it is possible that the length of the ALR suspension will differentially affect the general driving public versus drivers who have been convicted of DWI in the past and have already experienced the sanction. Given the central importance of *the swiftness and certainty* of punishment in general deterrence (Ross 1984), the effect of the

length of suspension on the deterrence of the average driver is not known. For drivers with prior DWI offenses, however, longer suspensions should reduce the exposure of DWI offenders to crashes for a longer period. Conversely, longer suspensions may increase an offender's motivation to drive illicitly. Although there is some evidence that experiencing the license suspension reduces DWI recidivism (Homel 1981; Paulsrude & Klingberg 1975; Peck, Wilson, & Sutton 1994), the most effective length for the ALR suspension is unclear.

The effectiveness of ALR laws depends upon several factors in addition to the swiftness and length of the ALR suspension. These include public awareness of DWI laws and their sanctions, the enforcement intensity of impaired driving laws, and many socioeconomic factors (Voas et al. 2000). In our analyses, we have controlled for state mileage, state unemployment rate, state urban-rural mileage mix, state per capita alcohol consumption, state population age distribution, and the presence of key alcohol safety laws and policies. No other prior ALR study has controlled for these specific factors.

METHODS

Administrative License Revocation Laws

We first conducted legal research to determine effective dates of the 41 states and Washington, DC that currently have ALR laws, as well as the suspension length for an alcohol-related offense associated with each law. Nine states—Kentucky, Michigan, Montana, New Jersey, Pennsylvania, Rhode Island, South Carolina, South Dakota, and Tennessee—did not have ALR laws in effect at the time of this study. The legal research was completed using Westlaw and web searches to confirm the existence of ALR laws in each state and DC as of January 1, 2014. Next, Westlaw and HeinOnline were used to review the legislative history of the ALR laws, identify the date these laws went into effect, and track whether the license suspension period changed. For example, it was determined that Utah's ALR law went into effect on August 1, 1983 with a 90-day license suspension. On July 1, 2009, the suspension period for a first-offense DWI was increased to 120 days. All changes in suspension periods were taken into account in our study. Of the states that had an ALR law, the suspension length was divided into four periods: 1 to 30 days (7 states), 31 to 90 days (18 states), 91 to 180 days (14 states), and 181 days or longer (3 states). ALR suspension length was coded separately as a four level variable ranging from 0 = no law/no suspension to 4 = 181 day suspension or longer. Three jurisdictions (Washington, DC, Minnesota, and West Virginia) had an ALR law in effect prior to 1982. The remaining states implemented their laws during the years evaluated in the current study (1982–2012). ALR laws were coded as “0” if the law was absent and “1” if the law was implemented or in effect in any given year (Appendix B).

Minimum Legal Drinking Age 21 (MLDA-21) Laws

Based on our prior research (Fell, Fisher, Voas, Blackman, & Tippetts 2009), we selected three MLDA laws that were hypothesized to have an impact on fatal crash outcome ratios and were relevant to the population examined in the current study. These laws included (1) illegal to possess alcohol if younger than 21 years, (2) illegal to purchase or attempt to purchase alcohol if younger than 21 years, and (3) use alcohol if younger than 21 years and

lose your driver's license if cited. Data for these laws were collected from the Alcohol Policy Information System general protocol "Conducting Legal Research on Activity 6 Policies, General Protocols," the online legal research tools Westlaw and HeinOnline, as well information obtained directly from states to complete the data set. These laws were coded as "0" if the law was absent and "1" if the law was present.

Changes in Blood Alcohol Concentration Laws

As was the case in our previous studies, we used BAC limit laws, which have been empirically shown to impact drinking and driving behaviors (Bernat, Dunsmuir, & Wagenaar 2004; Dee 2001; Hingson, Heeren, & Winter 2000; Klein 1989; Shults et al. 2001; Tippetts, Voas, Fell, & Nichols 2005; Voas et al. 2000; Wagenaar, Maldonado-Molina, Ma, Tobler, & Komro 2007; Wagenaar & Maldonado-Molina 2007). These laws involved (a) lowering the BAC limit for driving from .15 to .10, which was later followed by (b) lowering the BAC limit from .10 to .08. These laws were coded similarly to the MLDA-21 laws.

Seat Belt Safety Laws

Prior research has demonstrated the impact of primary and secondary seat belt laws on fatal crash ratios (Fell, Fisher, et al. 2009; Voas, Fell, Tippetts, Blackman, & Nichols 2007). Seat belt laws were coded as "0" if there was no law, "1" if there were secondary laws, and "2" if there were secondary laws that were upgraded to primary laws. With secondary seat belt laws, police must stop a driver for another traffic violation (e.g., speeding) before they can cite the driver for not wearing a seat belt. Primary seat belt laws allow police to stop and issue citations to drivers directly for not wearing a seat belt. Upgrading to primary laws has been shown to have much greater effects on drinking driver fatal crashes compared to non-drinking driver fatal crashes (Voas et al. 2007).

Traffic Fatalities

Annual traffic fatality data from 1982 to 2012 for each state were derived from the NHTSA's Fatality Analysis Reporting System (FARS) (NHTSA, 2014). FARS is a continuous census of vehicular crashes that (1) resulted in the death of an individual within 30 days of the crash, (2) occurred on the U.S. public roadways, and (3) had been investigated and reported by police. The involvement of alcohol in the crash is derived from positive BAC tests. When these data are incomplete or missing, the BACs of drivers in the FARS database are imputed from the police assessment of drinking, time of the crash, number of vehicles in the crash, age and gender of the driver, and other factors (Subramanian 2002). The imputation process was validated on cases with a tested BAC but using only the other variables to estimate a BAC and produced very close matches to the measured BACs in those validations.

Any number of variables could potentially impact the rates of crashes involving drinking drivers (e.g., road conditions, geographical considerations, variations in policing policies). Although it would be ideal to measure and control for each of these variables, obtaining accurate operational measures for each variable in each state would not be possible. However, because many of these unknown factors likely also impact crashes not involving

drinking drivers, the use of a “non-drinking driver” control condition should provide an adjustment for the unmeasured factors that potentially affect fatal crashes.

One method of accounting for a control condition is the use of ratios (Tippetts & Voas 2002). The use of ratios would mean that positive cases (i.e., drivers screening positive for alcohol) be in the numerator, and negative cases (e.g., drivers not screening positive for alcohol) be in the denominator. As a result, any change in the positive cases will only change the numerator and, subsequently, allow for a more accurate appraisal of the change. For the purposes of the current study, these outcome measures were computed from FARS data for each year by state in a number of different ways:

1. To measure the impact of the ALR law and suspension length on drinking driver fatal crashes, we used alcohol positive cases (BAC $\geq .01$) as the numerator and alcohol negative cases (BAC = .00) as the denominator.
2. To measure the effect of the ALR law and suspension length on intoxicated drivers in fatal crashes, we used drivers with a BAC $\geq .08$ as the numerator and drivers below a BAC $< .08$ as the denominator.
3. To measure the general deterrent effect of ALR suspension length, we used alcohol positive cases in the numerator and alcohol negative cases as the denominator among drivers with no prior DWI convictions.
4. To measure the specific deterrent effect of the ALR suspension length, we used cases in which alcohol positive drivers with a DWI conviction in the prior three years as the numerator and alcohol negative drivers with a prior DWI conviction in the prior three years were as the denominator.

Driver Age

As was the case with traffic fatalities, driver age was extracted from the FARS data set for each ratio listed above. Driver ages were used as a covariate and were hypothesized to be related to rates of alcohol consumption and FARS ratios.

Alcohol Consumption

Per capita alcohol consumption rates were obtained for individuals aged 15 years and older by year and state from the annual publication of the National Institute on Alcohol Abuse and Alcoholism's Alcohol Epidemiologic Data System. Alcohol consumption rates were only available as general numbers by state and year and not available for partitioning into age groups. In our previous research, we found that laws predicted alcohol consumption which, in turn, predicted FARS ratios (Fell, Fisher, et al. 2009; Fell, Scherer, Thomas, & Voas 2014; Scherer, Fell, Thomas, & Voas 2015; Voas et al. 2007).

Economic Strength and Driving Exposure

Economic strength and driving exposure were estimated by using two measures: state unemployment rates and vehicle miles traveled (VMT). Data on VMT were derived from the Federal Highway Administration, which produces an annual estimate of total VMT by state and year. Unemployment statistics were derived from the Bureau of Labor Statistics, which

publishes monthly employment statistics by state. Both of these indicators have been found to be associated with drinking driver rates in fatal crashes (Tippetts et al. 2005; Voas, Tippetts, & Fell 2003; Voas et al. 2000).

Data Analysis

Data comparing different ALR license suspension periods were examined using logistic regression modelling by which the outcome was a binary value where “1” represented the suspension time frame of interest (i.e., 1–30, 31–90, 91–180, or 180+) and “0” represented a time period less than the suspension period of interest. Data comparing the impact of ALR law implementation and ALR law suspension periods were analyzed using structural equation modeling (SEM) techniques with Analysis of Moment Structures (AMOS v21), an SPSS package (IBM SPSS Inc., Chicago, IL). SEM is a statistical technique frequently used to estimate causal relationships based on qualitative assumptions represented in a path diagram. SEM allows for confirmatory and exploratory modeling of both observed variables and latent variables derived from combinations of other observed variables (Jöreskog 1966, 1967, 1969). The use of SEM has gained notable popularity among researchers both for its utility in exploring relationships beyond what is possible with simple ANOVAs (analyses of variance) or multiple regression analyses and for its applicability to a variety of functions. SEM was deemed appropriate for use in the current analysis to more accurately account for simultaneous effects of ALR laws and other variables on multiple outcomes (i.e., FARS ratios and alcohol consumption) and because alcohol consumption was modeled as an intermediate variable as well as both a predictor of FARS ratios and an outcome measure of MLDA-21 laws.

Hypothesized Model

The model we used is illustrated in the path diagram in Figure 2 and is composed of (1) ALR laws (either implementation dates or suspension periods), (2) employment rates, (3) driving exposure (i.e., VMT), (4) per capita alcohol consumption, and (5) FARS ratios.

The model assumes that ALR laws predict both alcohol consumption and FARS ratios. Employment rates are hypothesized to effect VMT and alcohol consumption. VMT and alcohol consumption are intermediate variables being both outcomes of employment rates and ALR laws and predictors of FARS ratios. The model controls for age of drivers.

RESULTS

In the current research, we conducted a series of similar structural equation models. Though the structural pathways of the model remained constant (Figure 2), the ALR variable and the FARS variable changed depending on the research question. The ALR variable was examined both in terms of the implementation of the law and the length of the suspension for violating the law. Similarly, depending on the research question, the FARS ratios were examined as BAC positive over BAC negative (i.e., drinking/non-drinking) and BAC $\geq .08$ over BAC $< .08$ (i.e., intoxicated drivers/non-intoxicated drivers). This resulted in four distinct structural models. Additionally, we examined the general and specific deterrent

effect, which resulted in a total of six similar yet distinct structural models. Table 1 shows the fit statistics for all six models examined in the current research.

Ideally, fit statistics for a structural model would yield a non-significant χ^2 statistic, a comparative fit index (CFI) and normed-fit index (NFI) above 0.95, and a root mean square error of approximation between 0.05 and 0.10 (Barrett 2007; Hu & Bentler 1999; MacCallum, Browne, & Sugawara 1996). Given these standards of fit, the models in the current study demonstrate relatively low levels of fit to the data. However, fit statistics are considered guidelines, and models should be accepted if they meet or exceed previous models in the field (Bollen 1989). The models presented in the current research meet or exceed fit statistics presented for similar models in the past (Fell, Fisher, et al. 2009; Fell et al. 2014) and therefore should be accepted.

ALR Law Implementation

Table 2 presents estimates representing the direct relationships between predictor variables and each outcome for two structural models using ALR law implementation as the primary predictor variable of interest. The two models differ in how their FARS variable is categorized. The first model compares drivers with a positive BAC (BAC = .01) over drivers with no measured BAC (BAC = .00), while the second model compares intoxicated drivers (BAC = .08) in fatal crashes to drivers who did not meet the criteria for legal intoxication (BAC < .08).

As we can see, the two models perform similarly in how they predict alcohol consumption. That is, both models demonstrate about a 3.4% decrease in per capita alcohol consumption after the implementation of the BAC .10 illegal limit laws and about a 5% decrease with the implementation of the BAC .08 illegal limit laws. Further, in both models the implementation of the MLDA-21 possession law, purchase law, and use/lose law demonstrates similar decreases in per capita alcohol consumption (i.e., 12.5%, 4.3%, and 3.6% respectively). Finally, for both models, higher unemployment rates decrease alcohol consumption by just over 1%. Interestingly, in both models ALR law implementation is associated with an almost 6% increase in alcohol consumption.

The two models differ, however, when examining the FARS ratios for each model. The impact of all laws are notably less for the intoxicated/non-intoxicated driver model compared to the drinking/non-drinking driver model. Of note, for both models ALR law implementation is associated with a decrease in FARS ratios, but in the alcohol positive/negative model, there is a 13.3% decrease associated with ALR law implementation. In the intoxicated/non-intoxicated driver model, that benefit is reduced to only a 1.8% decrease in FARS ratios. Also of interest, an increase of one unit of per capita alcohol consumption accounts for a 36.1% increase in FARS ratios when examining drinking/non-drinking drivers but only a 6.5% increase among intoxicated/non-intoxicated drivers in fatal crashes.

ALR Suspension Length

Table 3 presents the estimates of coefficients representing direct relationships between predictor variables and outcome measures. As before, Table 3 provides data on two models which differ based on how the FARS variable is categorized (i.e., drinking/non-drinking and

intoxicated/non-intoxicated). Unlike Table 2, however, Table 3 uses ALR suspension length as its predictor variable. Variables predicting alcohol consumption demonstrated similar patterns for both models presented in Table 3. That is, both models demonstrate about a 5% decrease in per capita alcohol consumption after the implementation of the BAC .10 illegal limit laws, and about a 4% decrease with the implementation of the BAC .08 illegal limit laws. Further, in both models the implementation of the MLDA-21 possession law, purchase law, and use/lose law demonstrates similar decreases in per capita alcohol consumption (i.e., 12.2%, 4.3% and 3.6% respectively). However, an increase in the ALR suspension length is associated with almost a 1% increase in alcohol consumption rates.

When we examine the FARS ratio outcomes, we again see a notable decrease in accounted variance for both models across the board, with the exception of the MLDA-21 purchase law, which is not significant when examining drinking/non-drinking drivers but accounts for a 1% decrease among intoxicated drivers in fatal crashes. ALR suspension length predicts over a 4% decrease in the model measuring drinking/non-drinking drivers but less than a 1% decrease in the model measuring the ratio of intoxicated drivers in fatal crashes.

Using logistic regression analysis, we also sought to establish if there is a significant difference in the impact of ALR laws on FARS ratios based on the length of the suspension periods. Table 4 demonstrates that states with an ALR law with a short suspension period (i.e., 1–30 days) are significantly better than states with no law ($\beta = -.184, p < .001$). However, states with a suspension length of 31 to 90 days are not significantly better than states with a suspension length of 1 to 30 days ($\beta = -.177, p = .177$). States with a suspension length of 91 to 180 days are significantly better than states with shorter suspension periods ($\beta = -.149, p < .001$), while the three states with suspension lengths of 181 days or longer fair significantly better than states with shorter suspension periods ($\beta = -.070, p = .013$).

General and Specific Deterrent Effect

One of the objectives of the current research was to examine how ALR law suspension length might have a general deterrent and/or a specific deterrent effect on FARS ratios. Table 5 presents estimates for both the *general deterrent* effect of ALR suspension length and the *specific deterrent* effect of the law. However, when we examine FARS ratios, we note a strong general deterrent effect, in which ALR suspension length has a 4.4% decrease in FARS ratios of drivers without prior DWIs.

We see similar results for the alcohol consumption outcome as we have in previous tables. The general deterrent model also demonstrates about a 31% decrease in per capital alcohol consumption after the implementation of the BAC .10 illegal limit law and about a 5% decrease with the implementation of the BAC .08 illegal limit laws. Further, the implementation of the MLDA-21 possession law (2.5%) and use/lose law (6.3%) demonstrates decreases in per capita alcohol consumption. The implementation of the MLDA-21 purchase law, however, has no significant impact on alcohol consumption among this group.

When we examine how ALR law suspension length serves as a specific deterrent, we find no significant differences in ALR suspension length, BAC .10 and .08, or MLDA-21 purchase law implementation. We find only mild effects for the MLDA-21 possession law (−0.3%), use/lose law (−0.3%), and secondary and primary seat belt safety laws (−0.1%).

DISCUSSION

Our analyses indicate that ALR laws are still effective and that the ALR suspension length does matter. The implementation of any ALR law (with any suspension length) is associated with a 13.1% decrease in the drinking/non-drinking driver FARS ratio but only a 1.8% decrease in the intoxicated/non-intoxicated FARS ratio. So the ALR law affects drinking drivers (BAC .01) substantially but not intoxicated drivers (BAC .08). The risk of a fatal crash increases at each increase in BAC level (Voas, Torres, Romano, & Lacey 2012), so it appears that ALR laws send a message to not drink and drive (BAC = .01-.07) or you will lose your license, but this message does not reach drivers who get intoxicated and then drive (BAC .08). Perhaps moderate drinkers fear the loss of their license more so than binge drinkers.

With regard to ALR suspension length, even a short suspension period of 1 to 30 days has a significant effect ($p < .001$) compared to having no ALR law. However, suspension periods of 31 to 90 days are no better than periods of 1 to 30 days. States with ALR suspension periods of 91 to 180 days are significantly better ($p < .001$) than states with suspension periods of 1 to 90 days, as are the three states with suspension periods greater than 180 days compared to states with lower suspension lengths of 1 to 180 days ($p = .013$).

Practical Applications

The ALR laws and the suspension lengths only had general deterrent effects and not specific deterrent effects according to our study methods. This suggests that states might want to keep (or adopt) ALR laws for the general deterrent effects and pursue alternatives—such as alcohol ignition interlock laws for all convicted offenders—for specific deterrent effects (Beck, Rauch, Baker, & Williams 1999; Marques, Tippetts, Voas, & Beirness 2001; McCartt, Leaf, Farmer, & Eichelberger 2013; Raub, Lucke, & Wark 2003). States with short ALR suspension periods (90 days or less) might want to consider lengthening them to 91 days or longer.

Limitations and Future Directions

The use of FARS ratios in the current research meant that drivers screening positive for alcohol (the numerator) was a function of drivers not screening positive for alcohol (the denominator). This allowed for a more accurate appraisal of changes in FARS ratios over other methods. However, this approach also means that single vehicle crashes – though in the minority – would only impact the numerator and not the denominator resulting in a slightly different effect on the ratio over multiple vehicle crashes in which multiple drivers were involved. Though the use of ratios was appropriate for the research questions posited in the current paper, future research may consider incorporating driver responsibility into their

outcome measure or else controlling for the rates of single to multiple vehicle crashes to account for this variation.

Future research examining fatal crash ratios may also include a detailed consideration of whether the crashes occurred in rural or urban settings. As the outcome is death associated with the crash, access to near-by trauma centers (as may be more likely in urban settings than rural settings) may reduce fatalities associated with crashes and thereby influence the outcome as a whole. Though this was beyond the scope of the current study, this may be an area of further scientific inquiry.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Proportion of all drivers involved in fatal crashes estimated to have been legally intoxicated (BAC ≥ .08), 1982–2013, United States (NHTSA, 2015).

Figure 2.

Hypothesized structural model pathways.

¹Refers to law implementation or license suspension period depending on research question.

Table 1.

Structural model fit statistics

Model	χ^2	CFI ¹	NFI ²	RMSEA ³
Low BAC - ALR implementation	3177.737***	.535	.532	.169
High BAC - ALR implementation	3224.659***	.605	.602	.170
Low BAC - ALR suspension length	2875.646***	.558	.555	.160
High BAC - ALR suspension length	2920.394***	.628	.624	.162
General deterrent model	3161.167***	.544	.541	.168
Specific deterrent model	2756.257***	.536	.533	.157

¹Comparative fit index²Normed-fit index³Root mean square error of approximation***
 $p < .001$

Table 2.

Effect of ALR suspension length on drinking to non-drinking FARS ratios and beer consumption.

	BAC .01/BAC = .00		BAC .08/BAC < .08	
	Alcohol consumption	FARS ratio	Alcohol consumption	FARS ratio
ALR law	.058 ***	-.133 ***	.059 ***	-.018 ***
BAC .08 illegal limit	-.054 ***	-.032	-.052 ***	-.009 *
BAC .10 illegal limit	-.034 *	-.274 ***	-.034 *	-.057 ***
Possession law	-.125 ***	-.125 ***	-.124 ***	-.056 ***
Purchase law	-.043 **	-.043 **	-.044 **	.011
Use/lose law	-.036 **	-.036 **	-.035 *	-.021 ***
Seat belt laws	--	-.029 *	--	-.005 *
Alcohol consumption	--	.361 ***	--	.065 *
Unemployment rate	-.011 ***	--	-.012 ***	--
VMT	--	-.002 ***	--	.001 ***

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$

Table 3.

Effect of ALR suspension length on drinking to non-drinking FARS ratios and beer consumption.

	BAC .01/BAC = .00		BAC .08/BAC < .08	
	Alcohol consumption	FARS ratio	Alcohol consumption	FARS ratio
ALR suspension length	.009 *	-.041 ***	.009 *	-.007 ***
BAC .08 illegal limit	-.042 ***	-.055 **	-.039 ***	-.011 **
BAC .10 illegal limit	-.052 **	-.304 ***	-.052 **	-.060 ***
Possession law	-.122 ***	-.255 ***	-.122 ***	-.059 ***
Purchase law	-.043 **	-.002	-.044 **	-.011 *
Use/lose law	-.036 **	-.061 *	-.035 **	-.023 ***
Seat belt laws	--	-.025 *	--	-.004
Alcohol consumption	--	.340 ***	--	.064 ***
Unemployment rate	-.011 ***	--	-.013 ***	--
VMT	--	-.002 ***	--	-.001 ***

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$

Table 4.

Impact of ALR suspension length on alcohol to non-alcohol related fatal crashes.

ALR Suspension length ^I	β	<i>p</i> -value
No ALR law vs. 1–30 days	–.184	<.001
1–30 days vs. 31–90 days	–.177	.177
1–90 days vs. 91–180 days	–.149	<.001
1–180 days vs. 181+ days	–.070	.013

^I All models controlled for driver age, VMT, unemployment rates, per capita beer consumption, and interlock law types.

Table 5.

General and specific deterrent effects of ALR suspension length.

	General deterrent		Specific deterrent	
	Alcohol consumption	FARS ratio	Alcohol consumption	FARS ratio
ALR suspension length	.009 *	-.044 ***	.009 *	-.002
BAC .08 illegal limit	-.042 ***	-.054 **	-.042 ***	-.001
BAC .10 illegal limit	-.052 **	-.309 ***	-.052 **	-.002
Possession law	-.122 ***	-.258 ***	-.123 ***	-.003 *
Purchase law	-.043 **	-.004	-.043 **	-.003
Use/lose law	-.036 **	-.063 *	-.036 **	-.003 *
Seat belt laws	--	-.025 *	--	-.001 *
Alcohol consumption	--	.299 ***	--	.000
Unemployment rate	-.011 ***	--	-.011 ***	--
VMT	--	-.002 ***	--	.000

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$