REVISITING THE IMPACT OF IGNITION INTERLOCK DEVICES by Brant Walker

Ignition interlock laws (IILs) are designed to combat drunk driving while still allowing offenders to operate their vehicles. Used as both a punishment and a deterrent, ignition interlock devices are an alternative to unequivocal license suspension for driving under the influence (DUI) offenses. An individual with an ignition interlock device is required to blow into the device to start one's vehicle and periodically required to blow into the device again during usage. Drivers must bear the cost of device installation and upkeep, which averages from about $900 to $1,300 a year. The harshest of penalties require drivers to have a device installed for two years after conviction. These laws have been implemented in all 50 states; however, provisions vary in the requirements for first-time vs. repeat offenders, length of period, and BAC level triggering implementation. After Iowa in 1997, New Mexico was the next state to implement an IIL in 2005. By 2018, 42 states had passed some type of IIL, with 30 states requiring device installation for all offenders.

Research has found evidence that IILs reduce alcohol-related motor vehicle fatalities and DUI recidivism. However, there is no convincing evidence of their impact on DUI arrests, and no research has linked the laws to drunk driving behavior outside of DUI arrests or other enforcement measures.

We study the effect of U.S. state IILs on three sets of outcomes: motor vehicle fatalities, DUI arrests, and self-reported impaired driving. Following previous studies, we classify a state's law as "strong" if it requires drivers to have a device installed for all offenders, and "weak" if it only applies when offenders have a BAC above some threshold (typically 0.08). Our analysis provides evidence that strong IILs reduce DUI arrests by nearly 4%, with a particularly strong effect of over 5% among women. However, we find no evidence that these effects yield any decline in the number of motor vehicle fatalities. Moreover, we surprisingly estimate that strong IILs significantly increase the likelihood that individuals who report drinking also report having driven while impaired, which might be attributable to the laws raising awareness that even moderate drinking can lead to driving impairment.

LITERATURE REVIEW

An early comprehensive review of IILs was done in 2011 compiling many studies concerning the effect on motor vehicle accidents and fatalities, as well as DUI recidivism (Elder et al., 2011). The two reliable studies included on overall accident rates present evidence that the installation of a device increases overall crash rates relative to those having a suspended license, while Kerns (2017) finds no effect on overall motor vehicle accidents. In Elder et al. (2011), all reviewed analyses of recidivism reported that DUI offenders with ignition interlock devices installed are significantly less likely to be arrested for another offense when compared to individuals without devices or who had their license suspended instead. However, most of the findings suggest a lack of a long-term recidivism effect, as the impact on arrest rates disappears after the devices are removed. While these results come from observational data, controlled trials show comparable results (Beck et al., 1999).

Other evidence regarding deterrent effects of ignition interlock devices against motor vehicle accidents is more substantial. Assessments of IILs in Sweden, Nova Scotia, and Ontario provide no consensus effect on collision-related outcomes (Bjerre & Thorsson, 2008; Vanlaar et al., 2017; Wu et al., 2015). However, U.S. studies largely agree that IILs reduce alcohol-related motor vehicle fatalities (Carter et al., 2015; Fell & Lacey, 2011; Kaufman & Wiebe, 2016; McGinty et al., 2017; Teoh et al., 2018; Ullman, 2016)which aim to prevent people convicted of driving under the influence of alcohol from driving while intoxicated. Methods. We used data from the National Highway Traffic Safety Administration for 1999 to 2013. From 2004 to 2013, 18 states made interlocks mandatory for all drunk-driving convictions. We compared alcohol-involved crash deaths between 18 states with and 32 states without universal interlock requirements, accounting for state and year effects, and for clustering within states. Results. Policy impact was apparent 3 years after implementation. The adjusted rate of alcohol-involved crash deaths was 4.7 (95% confidence interval [CI] = 4.0, 5.4. In conclusion, the literature generally agrees that IILs significantly decrease motor vehicle deaths, though accidents more broadly might be unaffected or even increase in comparison to license suspension programs (Elder et al. 2011).

Evidence on DUI arrest rates pales by comparison: the only analysis comes from an economics master's thesis which finds no significant response of DUI arrest rates to IIL implementation (Soper, 2020).

Reduced health care costs and productivity losses represent imtportant potential benefits of IILs. While this is outside the scope of our analysis, Bjerre et al., (2007)but with no comparable opportunity to participate in an AIIP. Setting: As an alternative to licence revocation DWI offenders can participate in a voluntary 2-year AIIP permitting the offender to drive under strict regulations entailing regular medical check-ups. The participants are forced to alter their alcohol habits and those who cannot demonstrate sobriety are dismissed from the programme. Participants are liable for all costs themselves. Design: Quasi-experimental, with a non-equivalent control group used for comparison; intent-to-treat design. Based on the number of occasions/days in hospital and on sick leave/disability pension, the health-care costs for public insurance have been calculated. Finding: Average total health-care costs were 25% lower among AIIP participants (1156 individuals found that hospital care, sick leave, and disability pension costs were cumulatively about 25% lower among ignition interlock program participants.

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DATA AND METHODS

This analysis takes advantage of three different sets of data from the U.S. during the years 1999–2018. For alcohol-related motor vehicle fatalities, we use monthly data from the Fatality Analysis Reporting System (FARS). We study the effects of IILs on alcohol-related fatal accidents in each state. As BAC information on drivers is highly incomplete, we use two different methods from the literature to construct counts of accidents that are particularly likely to involve alcohol. One is simply the number of accidents occurring between the hours of 9 pm and 6 am, during which roughly two-thirds of accidents are estimated to involve impaired drivers, relative to about one-quarter during the other hours of the day. A second set of accident counts is based on statistical imputations, predicted from observed accident characteristics, of BAC corresponding to each accident. FARS provides 10 different estimated BAC levels and advises each should be used separately rather than averaged into one value, yielding a total of 11 different alcohol-involved fatal accident counts including the nighttime measure.

Monthly DUI arrest data come from the Uniform Crime Reporting Program (UCR) of the FBI. These data are inconsistent across states, based on the reporting behavior of their component law enforcement agencies. We calculate the percentage of the state population covered by an agency's reporting data each month and estimate a set of models for which the threshold for inclusion in the analysis sample varies from 50% (most lenient) to 90% (most strict). We consider DUI arrests as a proxy for impaired driving but acknowledge several weaknesses of this strategy. Specifically, DUI arrests depend critically on enforcement decisions regarding resources devoted to DUI policing and discretion used by officers involved, and represent only a small fraction of alcohol-impaired driving episodes (around 1%) (Impaired Driving Factsheet, 2020). Therefore, we interpret the results using UCR data specifically as the effect on *DUI arrests*, not drunk driving *behavior*.

To capture the impacts of IILs on impaired driving along with drinking more generally, we use data from the Behavioral Risk Factor Surveillance System (BRFSS), a health-related telephone survey of respondents ages 18 and above conducted by the Centers for Disease Control. Our main outcome variable comes from the question "During the past 30 days, how many times have you driven when you've had perhaps too much to drink?". This question was asked only in 1999 and then in even numbered years starting in 2002, and only to respondents who reported any drinking in the previous 30 days. We also examine alcohol consumption behavior.

In each analysis we control for a variety of demographic measures such as age, gender, race/ethnicity, unemployment, and education, along with other alcohol-related policy variables including the beer tax, BAC 0.08 drunk driving laws, and open container laws. We estimate models that include state and year fixed effects, so that IIL effects are identified from within-state changes rather than cross-sectional differences. The year fixed effects are interacted with U.S. census division indicators, so that comparisons are restricted to geographically proximate states. Nonlinear state-specific time trends are also included to address the possibility that pre-law implementation trends in outcomes vary across states. Standard errors are clustered at the state level to adjust for serial correlation of outcomes within states over time.

RESULTS

We begin with DUI arrests. Over nine models for which the threshold percentage of population covered for inclusion, as described above, ranges from 50% to 90% (i.e. lenient to strict) in increments of 5 percentage points, the average effect of a strong ILL is to reduce DUI arrests by 3.8%, with an average p-value of 0.066. Interestingly, the effect of strong IILs on females is larger, with an average decrease of 5.2% and p-value of 0.021, despite females making up only around 1 in 5 DUI arrests; the average effect for males is 3.4% with a p-value of 0.096. Additionally, the effect of strong laws appears to have been more prevalent in the first half of our data period, particularly among males. The estimated decline in DUI arrests overall, and among males, is about 8% over 1999–2008, but becomes insignificant afterwards, and the difference in the early-period and later-period effects is statistically significant. Therefore, strong IILs may have reduced DUI arrests when first passed, but offenders might eventually have found ways to circumvent the devices.

Next, building especially from Ullman (2016), we examine alcohol-related fatal motor vehicle accidents. We find that the effect on DUI arrests does not translate to any reduction in motor vehicle fatalities. While in basic two-way fixed effects regressions strong laws are associated with lower rates of alcohol-related fatal accidents, the result disappears upon adding state time trends and restricting comparisons to states in the same census division. Moreover, no significant results are apparent even in the relatively early sample period studied by Ullman (2016) corresponding to the stronger DUI arrest effects documented above. Given the prevalence of prior evidence that IILs significantly reduced motor vehicle fatalities, this result bears further scrutiny. However, it is quite possible that these earlier findings merely reflected a violation of the parallel trends assumption, in that states most likely to implement strong laws were the ones in which alcohol-related fatalities were already falling prior to law adoption.

The DUI arrest results do not necessarily imply that IILs reduce drunk driving, given the limitations outlined previously. For this, we turn to the BRFSS data. We estimate a counterintuitive statistically significant *increase* of 12–13% in the likelihood of an individual driving while impaired in response to the adoption of strong IILs. These same laws were not estimated to impact the likelihood of alcohol consumption, implying that they increase impaired driving conditional on the decision to drink. A prospective explanation, though one that is merely speculative, is that strong laws increase awareness of a simple fact: driving after moderate drinking represents impaired driving, regardless of the legality of the driver's BAC level. This is possible if those subject to strong laws circumvent them by driving an alternative vehicle or having a partner or friend drive; these actions are necessary even after moderate drinking by the respondent that would not have resulted in device implementation in other states.

Despite having no impact on the outcomes mentioned above, weak IILs are linked to a marginally significant increase in the number of days people drink (3.2%) and binge drink (1.1%), perhaps by drinkers who would otherwise be driving but have had to make prior arrangements to be driven by others. While all these results suggest the necessity for further research, it should be noted that they are robust to a wide variety of specification permutations, and are accompanied by tests suggesting that they do not spuriously reflect states with more impaired drivers being especially likely to enact strong ILLs.

CONCLUSIONS

We estimate a small but statistically significant decline in DUI arrests as a result of the passage of strong IILs, particularly for females. However, this result may reflect large effects immediately after early-adopting states implemented the laws that have since disappeared. Moreover, any effect on DUI arrests does not appear to manifest in lower alcohol-involved fatal accident rates, as we are unable to replicate or extend the fatal accident results from the previous literature. A weak DUI effect could reasonably equate to a lack of impact on fatal accidents if the arrests eliminated by IILs are inherently concentrated among drivers compliant with the laws, who may be less likely to cause fatal accidents regardless. Finally, we find a small but statistically significant increase in drunk driving prevalence as a result of strong IILs. However, this impact on self-reported drunk driving may simple be a result stemming from increased awareness of intoxication at the time of operating a vehicle. Weak IILs may slightly increase drinking frequency, but otherwise have no effect on the outcomes we studied.

States passed IILs as a relatively inexpensive way to reduce drunk driving amongst their residents. Offenders bear the cost of the device and reap the benefits of having less disruption in their lives. However, there are significant difficulties with the implementation of IILs, with two prevalent problems. Firstly, earlier devices were relatively easy to tamper with, allowing drunk drivers to circumvent their machines and stay on the road. Secondly, IILs only require devices to be installed in vehicles registered under the offender's name, meaning drivers could simply use the vehicle of someone else in the household. These results suggest policy makers must continue to rigorously study the impacts of IILs, in order to determine next steps in the continuing fight against drunk driving and the damages it causes

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