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Evaluation of a program to motivate impaired driving offenders to install ignition interlocks

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Abstract

Approximately 30,000 alcohol ignition interlocks, which are designed to prevent the operation of a vehicle if the driver has been drinking, are in use in the US and Canada. Ignition interlock programs are also being initiated in Sweden and Australia. The best-controlled studies that are currently available suggest that ignition interlocks are effective in reducing impaired driving recidivism while on the vehicle. However, in the US, the practical effectiveness of these devices is limited because only a small number of offenders are willing to install them in order to drive legally. This paper reports on a study of a court policy that created a strong incentive for impaired driving offenders to install interlocks by making traditional penalties, such as jail or electronically monitored house arrest, the alternative to participation in an interlock program. Comparison of the recidivism rates of offenders subject to this policy with offenders in similar, nearby courts, not using interlocks, indicated that the policy was producing substantial reductions in DUI recidivism. © 2001 Elsevier Science Ltd. All rights reserved.

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1. Introduction

In the US, drivers convicted of driving under the influence (DUI) of alcohol are a significant risk to the public. They have 4.8 times the normal probability of being involved in a fatal crash with a blood alcohol concentration (BAC) of 0.10 or higher (Hedlund and Fell, 1995). License suspension reduces that risk by as much as half (Peck et al., 1985). However, 50–75% of suspended DUI offenders continue to drive to some extent (Nichols and Ross, 1989). In the US, suspended offenders are apparently so successful in avoiding apprehension when driving illegally that half or more do not reinstate their licenses when they become eligible (Voas et al., 1997a). In an effort to reduce illicit driving by DUI offenders, state legislatures are enacting laws that take action against the offenders' vehicles. Impounding the vehicles of individuals driving while suspended reduces recidivism (Voas et al. 1997b; DeYoung

1997), but it is awkward for the state to impound vehicles when the owner is someone other than the offender.

An alternative to impounding an offender's vehicle is to require the installation of an alcohol ignition interlock, which prevents operation of the vehicle when the driver has been drinking. Some 30,000 interlocks are in use in the US and Canada. Most states have not yet adequately evaluated their interlock programs, partly because it has often been difficult to verify that the device was actually installed on the vehicle and for how long. In California, one of the largest users of interlocks, ignition interlocks appear to provide only a small nonsignificant reduction in recidivism (Tashima and Helander, 1999, Table 15(a), p. 40). However, most of the best-controlled research studies (Voas et al., 1999) have found that the interlock substantially decreased recidivism while on the vehicle. Nonetheless, two factors limit the effectiveness of the interlock: (a) relatively few offenders volunteer to install interlocks; and (b) the offender's driving behavior while on the interlock does not carryover to post-interlock driving. Consequently, after the interlock is removed, the recidivism rate is the

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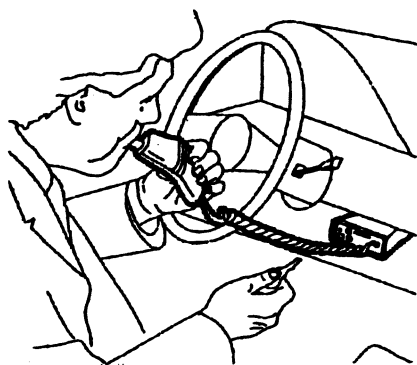


Fig. 1. Picture of interlock.

same for interlock users as for similar offenders who did not install the device (Voas et al., 1999; Coben and Larkin, 1999).

The alcohol interlock is a device that requires the vehicle operator to blow into a small handheld alcohol sensor unit attached to the vehicle dashboard (see Fig. 1). The unit uses either a fuel cell or a semi-conductor to sense alcohol in the expired air and if the operator has a BAC higher than a low level (usually 0.025 in the US, 0.04 in Alberta, Canada), the device prevents the vehicle from starting. Early models of this device, initially proposed by Voas (1970), did not have adequate provisions for preventing circumvention and for recording the breath samples and driving of the DUI offender (Collier, 1994). Interlock model specifications issued by the National Highway Traffic Safety Administration (NHTSA), US Department of Transportation, in 1992 (Federal Register (57 [67], 11772–11787)) have motivated manufacturers to produce units that are highly resistant to tampering and circumvention. The ignition interlock must be attached to the vehicle by shrink tape, which will reveal any attempt to remove the unit. It must also record any time the unit is disconnected from the vehicle's power source. In addition, these specifications require interlock units to log all breath tests and driving activity and to retest drivers randomly while the vehicle is underway. This rolling retest procedure prevents the DUI offender from leaving the engine running while in a bar drinking and also frustrates the use of a third party to start the vehicle because another test will be required within a few minutes. These changes have largely ended circumvention problems in the interlock vehicle. Consequently, its use by the courts to control the driving of DUI offenders has spread rapidly. As of September 2000, 38 states have enacted legislation providing for its use. For a fee of about \$60 per month, the device helps the offender stay employed and, also, makes the sanction more acceptable to the courts and the legislators who are concerned about hardship for innocent family members.

2. Problem

Attempts to evaluate interlock programs have been hampered by the small number of offenders participating in programs managed by a few local courts scattered across the country. The assignment of interlock devices based on self-selection and court approval results in nonrandom assignment of this countermeasure. Nevertheless, evaluations of nine interlock programs have provided significant evidence that the interlock reduces recidivism while on the offender's vehicle (Voas et al., 1999; Coben and Larkin, 1999). The generally favorable results from the evaluations of interlock programs have led to Federal legislation encouraging their use. Under the Transportation Equity Act for the 21st Century (TEA-21), states must enact laws providing for the interlock (or impoundment) for second DUI offenders by October, 2000 or lose some construction funds through transfer to highway safety programs.

Among DUI offenders eligible for interlock programs, participation rates have been low — only 3% among second offenders in West Virginia (Tippetts and Voas, 1998), 2% of second offenders in Michigan, 1% of second offenders in Nebraska and 4% of all offenders in Wisconsin (Simpson et al., 1996). The reasons for such low participation rates are not entirely clear. However, it appears that the inconvenience of being unable to drive or the perceived risk of driving while unlicensed is too weak an incentive to motivate greater participation. Several disincentives to participation in an interlock program were noted, such as the annoyance of blowing into the unit repeatedly while driving and a program fee of \$60 per month. Further, increased insurance costs for individuals convicted of DUI can run as high as \$1000. Consequently, many DUI offenders do not even apply for full reinstatement of their licenses when they become eligible. The objective of this study was to determine whether using more severe sanction alternatives to installing an ignition interlock would result in motivating a greater percentage of the offenders to enter an interlock program and result in reduced DUI recidivism.

Interlocks are used under two legal authorities: (a) the state motor vehicle department as a condition of license reinstatement; or (b) the court as a condition of probation. An advantage for motor vehicle departments is that they usually have greater resources for managing the programs. A disadvantage, however, is that the only incentive they have to motivate offenders to accept the interlock is the privilege of driving the interlock vehicle legally. Unfortunately, this is a relatively weak motivator, as is indicated by the low percentage (16.4%) of DUI offenders in California who chose to reinstate their driving privilege even when the interlock was not a requirement for reinstatement (Tashima and Helander, 1999). In contrast, by making

the interlock a condition of probation, courts can (at least in concept) make incarceration the alternative to the interlock. Thus, the courts potentially have greater power to motivate offenders' participation in interlock programs.

So far, most courts have used interlocks as a response to an offender's petition for hardship licensing. In this mode, the incentive for using the interlock is essentially the same as that of the motor vehicle departments: it simply allows the offender to drive the interlock vehicle legally. In the future, US states that assign management of the federally required TEA-21 interlock program to the courts will presumably require that judges mandate the installation of the ignition interlock as a condition of probation, such as is currently done with treatment or community service programs to which DUI offenders are currently sentenced. Consequently, participation in an interlock program will be reinforced by the threat of jail. This should increase the level of offender participation, but it is too early to tell whether this will be the case. However, one court in Hancock County, Indiana has been requiring installation of the interlock using the threat of jail or electronically monitored house arrest as the alternative to compliance for several years. This provided an opportunity for a pilot study of the overall efficacy of a court policy that attempts to obtain a high level of participation in an interlock program by increasing the penalties for noncompliance. Because the Hancock County Court increased its penalties for noncompliance with the interlock program, it appeared most appropriate to measure the recidivism rates for all offenders, on and not on the interlock, from that court with the recidivism rates of offenders from six similar courts that did not use the interlock sanction. Thus, this study did not provide a test of the effectiveness of the interlock per se. However, the study did provide an overall evaluation of a program designed to motivate most offenders to install interlocks.

3. Methods

In 1992, the Hancock County Court adopted the policy of making the ignition interlock a standard portion of most DUI sentences involving multiple offenders. On July 1, 1997, based on the perceived success of that policy, the court extended the policy to first offenders. To evaluate the efficacy of these policies, we compared the overall DUI recidivism rate in Hancock County with the overall recidivism rate in six other suburban counties surrounding Indianapolis (see Fig. 2).

Marion County, which encompasses the city of Indianapolis, was not included in the comparison group because it is an urban rather than suburban area and



Fig. 2. Comparison counties in Indiana.

Hamilton County was excluded because it had a smaller, less-intensive interlock program. That left six counties (Boone, Hendricks, Johnson, Madison, Morgan and Shelby) that did not have ignition interlock programs to serve as a comparison group for Hancock County. Table 1 provides the number of licensed drivers and the arrest and crash rates in Hancock County and the six comparison counties. As can be seen, Hancock County falls in the mid-range of arrest and crash rates of the six comparison counties.

The experimental design for the study is shown in Fig. 3. As noted, the Hancock Court's policy of threatening to apply more severe penalties to motivate offenders to participate in an interlock program was implemented in two stages: for multiple offenders on January 1, 1992 and for first offenders on July 1, 1997. For each type of DUI offender, it is possible to define a pre- and a post-policy period. If the interlock policy is efficacious, then the DUI recidivism rate in the post-interlock period should be lower than in the pre-policy period. The design in Fig. 3 contrasts the pre-policy period with the post-policy period in Hancock County with identical periods in the six comparison counties. This design has two main effects: the differences between Hancock and the comparison counties (the 'county' effect) and the differences between the pre- and post-periods (the 'time' effect). The impact of the interlock policy change is measured by the interaction between these two main effects. The 'county' main effect will account for differences between the court in Hancock County and the courts in the other six counties in the general severity of sanctioning (if such differences exist) and the differences in the underlying drinking-and-driving rates and DUI arrest rates be-

Table 1

Licensed drivers, crashes, and enforcement indexes for Hancock County and the six comparison counties

County (1995)	Licensed drivers ^a	A/R crashes	DWI/1000 lic. drivers	Alcohol-related crashes/1000 lic. drivers	DWI and alcohol-related crashes
Hancock	36 505	67	10.8	1.84	5.5
Boone	30 275	55	6.57	1.82	3.6
Hendricks	58 390	75	10.31	1.28	8.0
Johnson	69 917	134	8.27	1.92	4.3
Madison	91 324	297	7.96	3.25	2.4
Morgan	41 798	99	16.68	2.37	7.0
Shelby	28 756	65	10.57	2.26	4.7

^a 1994 figures used. Source: Alcohol Crash Facts, Governor's Council on Impaired and Dangerous Driving, Indiana, 1995.

tween counties. The 'time' main effect will account for time trends that are not related to the policy change, such as variations in employment level. In addition to these main effects, age and gender that are available on the drivers' records were used as covariates to reduce the impact of these factors on the result.

Data for analysis of recidivism rates before and after the policy change were obtained from the Indiana Department of Motor Vehicles, covering the years from January 1, 1987 through December 31, 1999. These data included the age, gender and full driving records of all individuals with a DUI offense or a suspension for refusing a breath test. These records contained the date of the offense, the date of conviction and identified the court that heard the case.

Although the objective of this study was to determine the efficacy of requiring all DUI offenders to install interlocks, it was not possible to ensure that all those coming before the court would enter the interlock program. Some offenders did not own vehicles and others were from out of state. Still others failed to report to the interlock provider, so bench warrants were issued to force them to return to court, where they received other penalties. To determine what portion of the DUI cases were successfully placed in the interlock program, 60 successive cases that came before the court in January and February, 1998 were drawn from the Hancock County Court files. These were traced through the provider's records to determine whether they had installed interlocks.

4. Results

4.1. First DUI offenders

For this analysis, we used 21,325 of the 21,871 valid cases from the state's driver record file. The 1327 invalid cases for the counties studied were those missing citation-issue and court-disposition dates, so it could not be determined when each driver was issued the

citation or was convicted of DUI. The 546 unused valid cases were excluded from the analysis mainly because they were missing age and gender information. The valid cases of first offenders were those that did not have second arrest dates before their first disposition date. Although data were available through the end of 1999, the cutoff date for this analysis was October 14, 1999, which is when the numbers for both first and multiple DUI offenders began to drop significantly. This drop appeared to be attributable to the lag in the recording process. Any case having a disposition date after October 14, 1999 was not analyzed. The response variable was the elapsed time from disposition date to the date of the second DUI. The Cox regression procedure was used in the survival analysis. This procedure permits the inclusion of covariates to reduce the impact of extraneous factors. Gender and age were included as covariates. Age data for this analysis were grouped as follows: younger than 21, 21–25; 26–35; 36–45; 46–55 and 56 and older. Because we suspected that the incidence of recidivism was lowest in the oldest group, we chose this group as the reference group. Table 2 presents the results of the Cox regression analysis for first DUI offenders.

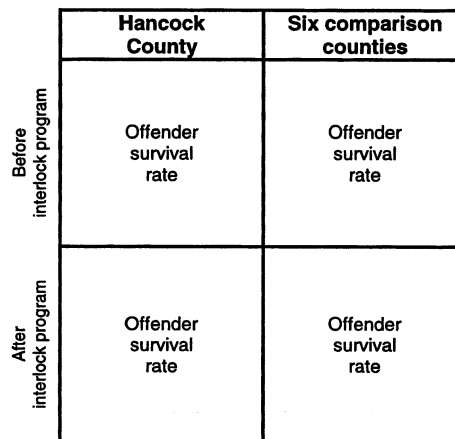


Fig. 3. Efficacy study research design.

Table 2
Model estimates for first offenders

Parameter	Estimate (B)	P-value	Exp (B)
Time: Pre-Post	-0.2582	0.0005	0.7725
County: Hancock versus others	-0.1135	0.0044	0.8927
Interaction: county/time	-0.5090	0.0411	0.6011
Gender	-0.2910	0.0000	0.7475
<i>Age group:</i>			
<21	1.1347	0.0000	3.1102
21–25	0.8723	0.0000	2.3925
26–35	0.8497	0.0000	2.3390
36–45	0.7078	0.0000	2.0295
46–55	0.4655	0.0000	1.5928

Pre-post: 0 = before July 1, 1997; 1 = on or after July 1, 1997. County: 0 = the six comparison counties. 1 = Hancock county. Gender: 0 = Male, 1 = Female. Age: 56 and older age group is reference group.

The second column in Table 2 contains the parameter estimates and the last column gives the exponents of the parameter estimates. These exponents provide an estimate of the relative risk related to each of the main effects: time, county, age and gender. Thus, a first offender in the post-period is roughly 0.77 times as likely to recidivate as a first offender in the pre-period, all other things remaining the same. Similarly, the relative risk parameter estimate for county means that a first offender in Hancock County is roughly 0.89 times as likely to recidivate as a first offender in the group of six surrounding counties. However, because there is interaction between time and county, the estimate of which is -0.509 , there is a further 40% reduction in the likelihood of recidivism if the offender is from Hancock County and is in the post-period. Furthermore, a female first offender is ≈ 0.75 times as likely to recidivate as a male first offender with the same covariate values. For the age categories, the parameter estimates shown are relative to the age 56 and older group.

4.2. Multiple DUI offenders

In our analysis of multiple offenders, we used 9356 of the 9470 valid cases available from state records. As with the first-offender analysis, the remaining cases were excluded mainly because of missing covariate values. The variables used for this analysis are almost the same as those used for the first-offender analysis, the only difference being the date used to separate the pre- and post-periods, which was January 1, 1992 rather than July 1, 1997. Table 3 presents all the important parameter estimates and associated *P*-values.

For multiple offenders, the county effect is not statis-

tically significant given that the associated *P*-value is > 0.69 ; however, the pre- and post-time effect is highly significant ($P < 0.0001$). The interaction between county and time, which is the true measure of the interlock policy, is also significant ($P < 0.03$). Gender, however, was found to be only marginally significant ($P > 0.06$) but was retained in the model to obtain more precise estimates of the other model parameters, especially the county-by-time interaction. These parameter estimates indicate that (a) a multiple offender in the post-period is $\approx 46\%$ as likely as a multiple offender in the pre-period to recidivate again, everything else being equal; (b) if a multiple offender is convicted in Hancock County in the post-period, the risk of recidivism is further reduced by $\approx 22\%$; and (c) the risk of recidivism is significantly higher for multiple offenders younger than aged 21 than for all the other age groups. As suspected, the lowest risk group is offenders aged 56 and older (see Table 3).

Analysis of the 60 cases drawn from the court record system, which were followed through the interlock provider's records, indicated that 42 of the 60 (70%) offenders were sentenced to the interlock program. However, five of those failed to report to the program provider or failed to comply with the interlock program requirements and were given other sanctions, leaving 37 (62%) who actually entered the interlock program. Of the 18 offenders not sentenced to the interlock, three were convicted of driving while impaired by drugs and, therefore, were deemed unsuitable for the alcohol interlock program. One other offender was not sentenced to the interlock program because he was under an extradition order from another state and another was an out-of-state resident. This left 13 offenders who either did not own vehicles or could not be pressured into the interlock program.

Table 3
Model estimates for multiple offenders

Parameter	Estimate (B)	P-value	Exp (B)
Time: Pre-Post	-0.7830	0.0000	0.4570
County: Hancock versus others	-0.0270	0.6975	0.9733
Interaction: county/time	-0.2425	0.0298	0.7846
Gender	-0.1105	0.0612	0.8954
<i>Age group:</i>			
<21	0.7906	0.0000	2.2048
21–25	0.4085	0.0006	1.5045
26–35	0.4641	0.0000	1.5905
36–45	0.4232	0.0003	1.5268
46–55	0.2208	0.0894	1.2471

Pre-post: 0 = before January 1, 1992. 1 = on or after January 1, 1992. County: 0 = the six comparison counties; 1 = Hancock county. Gender: 0 = male, 1 = female. Age: 56 and older group is reference group.

5. Discussion

Past evaluations of interlock programs have compared offenders with ignition interlocks installed on their vehicles with similar offenders without interlocks installed on their vehicles. Such studies can be classified as ‘effectiveness’ studies because they demonstrate that the device itself works when on the vehicle. This evaluation of the Hancock Court interlock policy takes the next step in testing the utility of the interlock by determining its ‘efficacy’ as a component of the overall court sanctioning program for first and multiple DUI offenders. This study presents a particularly challenging test of the efficacy of the interlock because the recidivism rates of all DUI offenders sentenced by the court are included in the analysis. This is appropriate in an efficacy study because the practical value of a remedial procedure depends not only on its effectiveness with those offenders who participate, but also on the proportion of all offenders that can be motivated to enroll in the program. Further, for offenders who did install ignition interlocks, this study included the post-interlock period after the device had been removed from the vehicle, a period during which prior studies have demonstrated the interlock has little or no effect on recidivism (Voas et al., 1999). Despite the inclusion in the analysis of offenders without interlocks and interlock participants during the post-interlock period, the Hancock Court’s policy appeared to produce substantial reductions in recidivism among both first and multiple offenders.

This study also demonstrated the difficulty in motivating all DUI offenders to install interlocks. Because of issues, such as lack of a vehicle, out-of-state residence, or evidence of drug-impaired driving, not all the offenders were sentenced to the ignition interlock program. Further, the court was not successful in pressuring all of those offenders eligible for the interlock program into installing such a device. Thus, the special alternative sanctioning program implemented in Hancock County was only successful in pressuring 62% of the DUI offenders into the interlock program. This was significantly higher than the 10% or lower participation generally achieved by other courts or the state motor vehicle departments in the US.

Despite the inability to get 38% of the offenders into the interlock program, the overall sanctioning process was successful in reducing recidivism relative to surrounding jurisdictions. Ross and Gonzales (1987) found that 75% of DUI offenders drove while suspended. The Hancock County Court program only succeeded in getting 62% of the offenders to install ignition interlocks. One way to avoid being sentenced to the interlock program was for the offender to demonstrate that he or she did not own a vehicle; therefore, it is possible that many of those not in the program were not driving

because they did not have access to a vehicle. The threat of having to install an ignition interlock may have motivated some DUI offenders to sell their vehicles. Although these offenders may have had some access to vehicles of friends or family members, that access may have been reduced compared to owning their own vehicle and resulted in lower driving exposure to additional DUI arrests.

This study has several limitations. It assumes that the six no-interlock courts provide an appropriate comparison for the Hancock County Court. It also assumes that no unmeasured factors that changed over time differentially influenced Hancock offenders. If, for example, the intensity of the enforcement of DUI laws in Hancock County decreased over time while enforcement in the comparison counties remained constant, then this might account for the significant interaction between time and county in the analyses. Further, this study compared the Hancock ‘mandatory’ policy with courts in which the interlock was not used in any form. This policy should also be compared with courts that use the interlock as a discretionary feature of their sanctioning process for offenders who willingly install the interlock to drive legally. Finally, it is likely that when a court applies pressure on offenders to enter an interlock program, even those offenders who avoid participation may be affected. As noted, one way to avoid participation, for example, is not to own a vehicle. Not owning a vehicle may limit the amount of driving and, thus, exposure to a repeat DUI offense. Alternatively, those who refused the interlock may have received electronically monitored house arrest for periods of sufficient length to significantly reduce their driving exposure.

6. Summary

In the US and Canada, alcohol ignition interlocks, which prevent the operation of a vehicle if the driver has been drinking, have been shown to be associated with reduced DUI recidivism while on the vehicle. However, the small number of DUI offenders who willingly install the interlock to drive legally limits the effectiveness of these devices. This research evaluated a court policy in one US county that created a strong incentive for DUI offenders to install interlocks by making traditional penalties, such as jail or house arrest, the alternative to participation in an interlock program. Despite the threat of jail, the court succeeded in getting only 62% of the offenders into the interlock program. Nevertheless, comparison of the recidivism rates of all offenders subject to this policy, whether or not they entered the interlock program, with offenders in similar, nearby courts not using interlocks, indicated that the policy produced substantial reductions in DUI recidivism.

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