



WASHINGTON  
*Traffic Safety*  
COMMISSION

## **Evaluation of the Washington State Ignition Interlock Pilot Program 2009**

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2012 Recidivism Report as Submitted to the Legislature Per RCW  
46.20.745(5)

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April 2014

## Publication and Contact Information

A PDF version of this report is available for download on the Washington Traffic Safety Commission website at:

<http://www-stage.wtsc.wa.gov/wp-content/uploads/downloads/2014/04/IIPP.pdf>

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A special thanks to Phil Salzberg, PhD for conducting and interpreting the Ignition Interlock Pilot Program recidivism and compliance analysis.

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## EXECUTIVE SUMMARY

Washington State first enacted ignition interlock laws in 1987. The laws have been modified several times over the past two decades to expand ignition interlock device (IID) use and increase compliance. In 2009, Washington State created Ignition Interlock Licenses (IIL) and modified the existing ignition interlock laws. The Washington Traffic Safety Commission (WTSC) evaluated the effects of the 2009 law on recidivism and compliance. This report provides an evaluation of drivers who had an IID installed during 2009 under the new laws. Utilizing data provided by ignition interlock vendors and the Department of Licensing (DOL), WTSC evaluated installation compliance, noncompliance behaviors, and recidivism. The evaluation showed:

*Installation compliance has improved.*

- An installation compliance rate of 56 percent, higher than the 33 percent compliance rate reported in an evaluation of the 2004-2006 laws.

*There is a high frequency of driver noncompliant actions after the IID is installed.*

- Among IID drivers, 8.2 percent started their vehicles either never or rarely (0-9 starts per month). An additional 5.1 percent of drivers exhibited minimum vehicle use (10-19 starts per month).
- Overall, 21 percent of interlocked drivers were found to have tampered with the IID at least once. Among drivers who tampered with their IIDs, the average number of tampering attempts was 11.6 times.
- Overall, 73 percent of interlocked drivers experienced one or more start failures; the average number of start failures was 10.8. Ten percent of these drivers had 27 or more start failures. The average blood alcohol concentration (BAC) reading for start failures was 0.09.
- Failures in random retests occurred for 37 percent of all drivers with an average of 1.6 retest failures. The average BAC reading was 0.06 for retest failures.
- Vehicle lockouts occurred among 25 percent of the drivers, with an average of 1.32 lockouts.

*The IID significantly lowered recidivism among second and third-plus DUI offenders.*

- Among first driving under the influence (DUI) offenders, no significant difference in recidivism was found between the IID drivers and non-IID drivers. Differences in age and prior driving history between IID drivers and non-IID drivers did not affect the results.
- Among second DUI offenders, there was a significant difference in recidivism between the IID drivers and non-IID drivers. Second DUI offenders with an IID had a 26 percent lower recidivism rate.
- Among third-plus DUI offenders, there was a significant difference in recidivism between the IID drivers and non-IID drivers. Third-plus DUI offenders with an IID had a 28 percent lower recidivism rate.

*Several factors related to the IID may affect recidivism rates.*

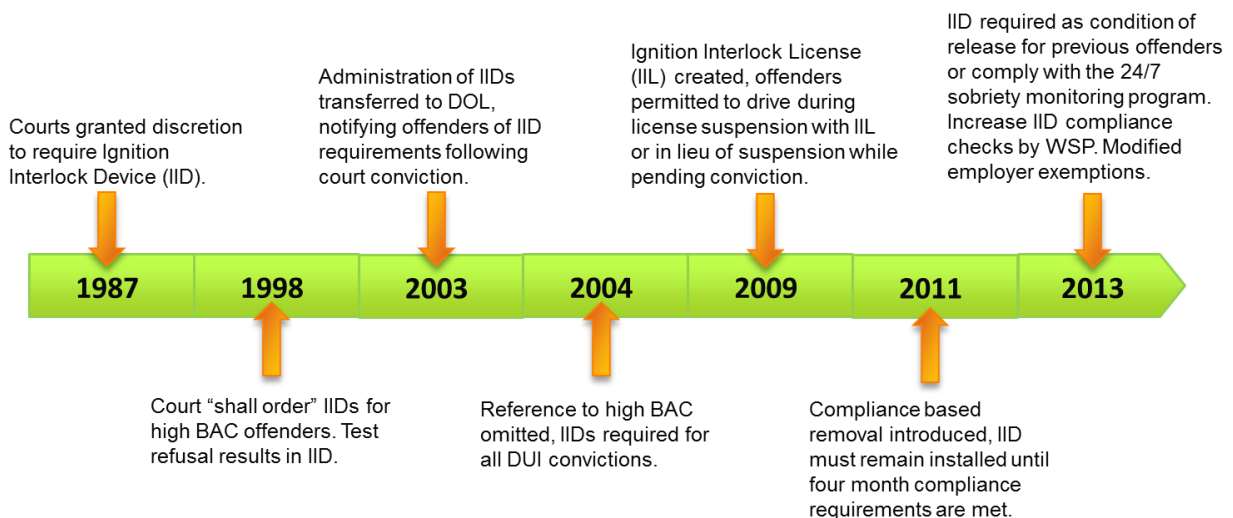
- The lower the number of vehicle start attempts, the higher the likelihood of recidivism.
- The greater the number failed starts, the greater the likelihood of recidivism.
- The higher the average BAC reading at vehicle startup, the greater the likelihood of recidivism.
- Fewer months of IID use lead to a greater likelihood of recidivism.
- The greater the number of IID tampers, the greater the likelihood of recidivism.

These results suggest that drivers most likely to recidivate are those that provide higher BAC samples, those who accumulate numerous failed start attempts, and those with many attempts at device tampering. Furthermore, drivers with few vehicle start attempts and fewer months of IID use had higher recidivism rates. The finding of no recidivism effect among first DUI offenders was unexpected; however, interlocks were installed for a shorter time among first DUI offenders than for second and third-plus DUI offenders. Nearly one-third of first DUI offenders had interlocks removed within four months after installation. This issue has since been addressed with law changes in 2011 requiring compliance-based removal. The 2009 law does appear to have increased the rate of interlock installation. These study findings suggest that many drivers do comply with interlock requirements, while a significant minority were in substantial non-compliance. Appropriate strategies for dealing with these drivers, such as intensive monitoring with the threat of jail time, must be considered.

## INTRODUCTION AND BACKGROUND

An alcohol ignition interlock is a device that prevents a vehicle from starting unless the driver provides a breath sample with a BAC lower than a preset level. In Washington that level is 0.025. IIDs are used to prevent DUI offenders from driving after consuming alcohol, while allowing them to maintain restricted driving privileges for a specific period. All 50 states and the District of Columbia have ignition interlock laws. Washington State first introduced Ignition Interlock laws in 1987. The laws have been modified several times over the past two decades to expand ignition interlock use and increase compliance.

### Timeline of Changes in Washington State Ignition Interlock Laws



In 2009, Washington State created IILs and modified the existing ignition interlock laws ([E2SHB 3254](#)). The 2009 law allowed DUI offenders with administrative license suspensions (or in lieu of administrative suspensions) to apply for an IIL. Offenders receiving an IIL waived their right to a DOL hearing for an administrative suspension. The new law required installation and maintenance of an interlock device in all vehicles operated by offenders (excluding employer-owned vehicles). Offenders must pay all interlock costs including licensing fees, vendor fees for installing, leasing, and removing the device, and fees for a fund set up to assist indigent persons with their interlock costs. The requirement to install an IID can be waived if the offender does not own a car, or if ignition interlocks are not available in the offender's area. If this requirement were to be waived, the offender would then be required to submit to alcohol monitoring for the same length of time that the IID would have been required.

Under the 2009 law, when DOL received notification that a functioning interlock device was no longer installed for a specific offender, DOL was required to notify that person that the IIL would be canceled in 15 days. This license cancellation would automatically take effect unless the offender provided proof to

DOL that a functioning device had been re-installed. If the IIL was cancelled, a new IIL could be obtained upon presentation of proof that an IID had been re-installed. In addition, DOL was required to revoke the IIL if the offender were to be convicted of operating a motor vehicle in violation of IID restrictions, or if convicted of any offense that would warrant suspension of a regular driver license.

A provision in the legislation required the DOL, Washington State Patrol (WSP), and the WTSC to establish a pilot program for monitoring the compliance of interlock-mandated drivers and interlock device vendors. The Legislature also specifically asked WTSC to track recidivism and to evaluate the compliance of drivers required to install IIDs and identify ways to track compliance.

This report provides an evaluation of drivers who had an IID installed during 2009 under the new laws. A [report](#) conducted by the Insurance Institute for Highway Safety (McCartt, Leaf, Farmer, & Eichelberger, 2013) evaluated the effects on recidivism of Washington's earlier ignition interlock laws (1999-2006). For the 2009 law, WTSC, in collaboration with DOL and WSP, evaluated the following outcomes:

- Compliance with IID installation requirements (percentage of drivers required to have an IID who actually have confirmed installation).
- Noncompliance incidence of IID tampering.
- Noncompliance incidence of IID testing failures and BAC levels.
- Noncompliance through circumvention of installed IIDs by avoiding or limiting driving of the IID vehicle (possible driving of non-IID vehicles).
- Alcohol-related violation recidivism rates of drivers who had an IID installed in 2009. The follow-up period for recidivism was two years post-IID installation or post-2009 DUI conviction for the compare group without IIDs.

In 2011, the ignition interlock laws were further modified to introduce a compliance-based requirement for removal of the IID. Under the modification, in order for an offender to have an IID removed, the certified interlock vendor must verify to DOL that, in the previous four months, the offender did not attempt to start the vehicle with a BAC of 0.04 or higher, fail to take or pass a test, or fail to appear at the vendor for scheduled IID service. IIDs must now remain installed on the offender's vehicle until the vendor verifies that the offender has satisfied the four month compliance requirement.

For purposes of this evaluation, offenders with interlocks installed in 2009 were followed for at least two years post-IID installation. Compliance was measured for one year and recidivism was measured for two years post-IID installation. Some offenders included in this evaluation still had IIDs installed at the conclusion of the follow-up period.

## EVALUATION METHODS

This evaluation focuses on the effects of Washington's ignition interlock law as revised in 2009. The study sample is limited to drivers who had an IID installed during 2009. Two primary data sources were used for this study. Interlock vendors provided event information collected through software installed on IIDs, and DOL provided driver record data on driver violations, department actions taken, and other relevant IID-related events. More information about these data sources is available in Appendix A.

Six ignition interlock companies were doing business in Washington during the period when this study was conducted. Five of them provided relatively complete data. The sixth company used a different business model, employing installers who operated independently, and did not use a central database. Only two out of the eight independent installers for this company provided data. Installation logs and event logs were provided separately. After linking the two files, 11,202 complete records were available for event analysis. The 1,755 install records that did not link to events were maintained for installation compliance and recidivism analysis. IID vendor data was obtained through the end of 2010 to measure compliance for at least one year post-installation. These data were used to measure:

- Compliance with IID installation requirements.
- Noncompliance incidence of IID tampering.
- Noncompliance incidence of IID testing failures and BAC levels.
- Noncompliance through circumvention of installed IIDs.

DOL provided data from their driver record database. The 2009 DOL file was used to match installations to vendor event data for compliance follow-up. After linking the vendor file and the DOL file, 11,746 records were available for analysis. Drivers who were required to install an IID but did not were identified in these records and used as the comparison group for recidivism analysis, a total of 30,164 records. The DOL's 2010 and 2011 files were used to complement the compliance measures listed above. The DOL 2012 file was used to analyze recidivism among the IID group compared to the non-IID group of drivers. The 2012 DOL data were used to measure:

- Alcohol-related violation recidivism rates of drivers who had an IID installed in 2009 compared to drivers who did not install the required IID.

In addition to evaluating recidivism, these data permitted analysis of correlations between recidivism and other offender behaviors recorded in the vendor event logs. The following factors were considered for predictors of recidivism:

- Vehicle start attempts per month.
- Number of failed start attempts.
- High BAC results at vehicle start attempt.
- Number of months the IID was installed.
- Number of IID tampering events.



It should be noted that the comparison group was not a true control group because of selection bias. That is, drivers in the intervention group chose to have interlocks installed either to obtain interlock licenses or to comply with court ordered sanctions. Drivers in the comparison group chose not have interlocks installed and, thus, likely differed from intervention drivers on other factors in addition to the IID installation (i.e. driving with a suspended license).

For evaluating recidivism, every driver's follow-up period began on the date of IID installation, typically about mid-2009, and ended two years later. The tracking period for the comparison group was also two years, beginning on the date of each driver's 2009 DUI conviction. The follow-up tracking period was exactly two years for each driver in the study. Alcohol-related violations included DUI convictions, convictions on charges reduced from DUI, and DUI arrests resulting in administrative actions.

## EVALUATION RESULTS AND OUTCOMES

### Driver Compliance with IID Installation

DOL Action Codes for 2009 indicate that installation of interlocks were required in 23,117 cases. Vendors reported IID installations for 12,957 drivers during 2009. These numbers indicate an installation compliance rate of 56 percent. This rate is substantially higher than the roughly 33 percent compliance rate for first-time Washington DUI offenders reported for the years 2004 through 2006 (IIHS, 2013). DOL department action codes showed 14,890 “proof of install” reports for 2009 which suggests an even higher compliance rate; however, some of these action codes were for 2008 installations, which could not be distinguished from 2009 installations.

Virtually all interlock installations were in vehicles registered to Washington-resident drivers (99.2 percent). Reasons for device-installation were also reported by vendors, although this information was missing in 35 percent of cases. Of the 8,385 cases for which a reason for installation was reported:

- 19 percent were for court mandated installs.
- 8 percent were for deferred prosecutions.
- 43 percent were to obtain an interlock license.
- 30 percent of the cases were coded as “other” reasons. These “other” reason codes were not clearly defined, but likely represent non-driving related violation reasons such as referrals from treatment providers.

Interlock devices were installed for periods ranging from one month to 24 months; the average length of installation was 12.5 months. The length of the installation was defined as the number of months between the install date and the vendor-reported removal date or months between the install date and January 1, 2011, if the device had not been removed by the end of the data reporting period.

### Driver Noncompliant Actions after IID Installation

#### *Minimizing Use of IID Vehicles*

Use of interlocked vehicles was operationally defined by the total number of vehicle start attempts (successes plus failures) for each driver, divided by the number of months the interlock was installed. Starts and failures were summed across all service intervals reported for each driver. This yielded the average number of start attempts per month for each driver.

Nine hundred and fifteen drivers (8.2 percent) started their vehicles either never or rarely; i.e., they attempted between zero and nine starts per month. An additional 573 (5.1 percent) drivers exhibited minimum vehicle use, starting their vehicles only between 10 and 19 times per month. The average number of starts per month for interlocked drivers as a whole was 98.3. Voas, et al. (2000) examined the issue of drivers circumventing the IID requirement by avoiding the use of their interlocked vehicles.

Their study found that drivers who had their vehicles interlocked but also had access to other non-interlocked vehicles made fewer trips in their interlocked vehicles than did drivers who only had access to an interlocked vehicle.

*IID Device Tampering*

Vendors reported the number of tampering events on the event log files. Examples of tampering included using a mechanical air blower to provide a bogus breath sample, having another person blow into the IID, or physically tampering with wiring or the IID itself. Overall, 2,350 (21 percent) of the 11,202 interlocked drivers were found to have tampered with the IID at least once. Among the 2,350 drivers who tampered with their IIDs, the average number of tampering attempts was 11.6 times. These findings indicate that a significant minority of drivers, about one in five, repeatedly tampered or tried to circumvent the IID. Tampering may become more rare as newer devices presently in use employ cameras to record whether offenders themselves provided the breath sample.

*Positive BAC during Start or Retest*

Data on vehicle start failures, retest failures, and BAC readings were recorded by vendors at each recalibration/service interval. If multiple BACs for a driver were recorded on the vendor’s data file, only the highest BAC reading was reported to the WTSC. Thus, the data reported are based on the highest BAC reading per driver across all service intervals.

<b>START FAILURES</b>	
Percent of Drivers with Start Failures	73%
Average Number of Start Failures	10.8
Average BAC of Drivers with Start Failures	0.09
<b>RETEST FAILURES</b>	
Percent of Drivers with Retest Failures	37%
Average Number of Retest Failures	1.6
Average BAC of Drivers with Retest Failures	0.06
<b>VEHICLE LOCK DOWNS</b>	
Percent of Drivers with Vehicle Lock Down	25%
Average Number of Lock Downs	1.3

*Table 1: Summary of start and retest failures, some resulting in vehicle lock down.*

Overall, 73 percent of interlocked drivers experienced one or more failures in starting their vehicles, and the average number of failures among this 73 percent was 10.8. However, the median number of start failures was 2.5, indicating that half of interlocked drivers had fewer than 2.5 failures. On the other hand, 10 percent of these drivers had 27 or more start failures. This pattern indicates that most drivers experienced relatively few start failures and may have learned from the experience, while a significant minority had large numbers of failures. The highest number of failures was 341 for a single driver. The average BAC reading for start failures was 0.09, with a range of 0.025 to 0.49.

Failures in random retests occurred for 37 percent of all drivers. An average of 1.6 retest failures occurred among those who failed. The average BAC reading was 0.06 for retest failures. When a driver

fails a retest, the engine will stop and another retest will be required. If the second retest is failed, the driver will be “locked out” and the vehicle will not start again until it is brought in for vendor service. Lockouts occurred among 25 percent of the drivers, with an average of 1.32 lockouts.

The average BAC level in driver ‘start fails’ was 0.07, indicating that half of these drivers were below the .08 legal limit when they tried (and failed) to start their vehicles. However, 10 percent of interlocked drivers blew BACs of 0.17 or higher, while an additional 5 percent would be considered “hard-core” drinking drivers based on their BACs of 0.20 or higher. Overall, a failed start attempt means the IID is working, preventing a drinking driver from operating their vehicle. However the minority of drivers that repeatedly try to operate their vehicles after drinking supports the observation that the IID is effective while installed, but may have little effect on long-term behavior change.

## Recidivism Rates

Driver recidivism was measured in terms of the number of post-installation (IID drivers) or post-conviction (non-IID drivers) alcohol-related violations occurring during the two-year tracking period. Alcohol violations included DUI convictions, administrative per-se actions, and convictions on reduced charges. Overall, the incidence of alcohol violations ranged from zero to five per driver.

Ninety percent of all drivers in the study incurred no alcohol violations, while 10 percent had one or more. The recidivism data presented below represent mean numbers of re-offenses per driver in each study group and comparison group. For example, the mean of .072 for first offender IID drivers represents 0.072 violations per driver, or 7.2 violations per 100 drivers.

Number or Prior DUI	Comparison Groups	Average Re-offenses	Significance
First Offenders	IID Drivers	0.072	Not Significant p=0.363
	Non-IID Drivers	0.076	
Second Offenders	IID Drivers	0.068	Significant p=0.000
	Non-IID Drivers	0.092	
Third-plus Offenders	IID Drivers	0.086	Significant p=0.000
	Non-IID Drivers	0.119	

*Table 2: Significance of Recidivism Differences between IID Drivers and the Control Group*

- Among first DUI offenders, no significant difference in recidivism was found between the IID drivers and non-IID drivers. Differences in age and prior driving history between IID drivers and non-IID drivers did not affect this outcome.
- Among second DUI offenders, there was a significant difference in recidivism between the IID drivers and non-IID drivers. Second offenders with an IID had a 26 percent lower recidivism rate.
- Among third or more DUI offenders, there was a significant difference in recidivism between the IID drivers and non-IID drivers. Third-plus offenders with an IID had a 28 percent lower rate.

The finding of no recidivism effect among first offenders was unexpected. The published research on ignition interlocks, both nationally and internationally, has consistently shown positive recidivism results (Willis, Lybrand, Bellamy, 2004; Elder, et al., 2007). An earlier evaluation of Washington's 2004 ignition interlock laws (McCartt, Leaf, Farmer, & Eichelberger, 2013) found similar positive results. Typically, recidivism for interlocked drivers is significantly lower than for comparison group drivers during the time the IID is installed. Once the devices are removed, however, recidivism for the previously-interlocked drivers reverts to the same level as for the comparison group.

A possible explanation for the current findings is that interlocks were installed for a shorter time among first offenders than for second and third-plus offenders. The average number of months until the IID was removed (or the data reporting period ended) were 10.4, 13.3, and 13.8 months for the first, second, and third-plus offender groups, respectively. However, a large number of first offenders (28 percent) had interlocks removed within four months after installation. These drivers may have had devices installed during their three-month administrative suspensions and subsequently had DUI charges dismissed or were convicted on reduced charges, thus bypassing the IID requirement for those convicted of DUI. In contrast, very few second or third-plus offenders had their IIDs removed early.

### *Predictors of Recidivism*

Additional analyses were conducted to examine whether any non-compliance behaviors could predict recidivism. Multiple regression analysis was conducted using eight interlock variables as predictors of alcohol re-offenses. Five variables were significant predictors; however, it should be noted that none of these factors yielded particularly strong predictive relationships. The three non-significant variables were prior DUI offenses, high BAC Reading on retests, and number of vehicle lockouts.

The following variables predicted recidivism:

- Vehicle start attempts per month yielded a negative predictive relationship ( $p=.008$ ). The lower the number of start attempts, the higher the likelihood of recidivism.
- The number of failed start attempts yielded a positive predictive relationship ( $p=.051$ ). The greater the number failed starts, the greater the likelihood of recidivism.
- High BAC readings on startup showed a positive predictive relationship ( $p=.002$ ). The higher the BAC, the greater the likelihood of recidivism.
- Months the IID was in use yielded a negative predictive relationship ( $p=.003$ ). Fewer months of IID use lead to a greater likelihood of recidivism.
- The number of IID tampers produced a positive predictive relationship ( $p=.010$ ). The greater the number of tampers, the greater the likelihood of recidivism.

These results indicate that drivers most likely to recidivate are those who blow higher BACs, those who accumulate numerous failed start attempts, and those with many attempts at device tampering. Furthermore, drivers with fewer vehicle start attempts and fewer months of IID use had higher recidivism rates.

## EFFECTIVENESS OF IGNITION INTERLOCK LAWS

Ignition interlocks have been in use to prevent alcohol-impaired driving for more than two decades, becoming increasingly sophisticated during that time. Numerous studies have shown that interlock programs reduce recidivism during the time the devices are installed, and show promising effects for reducing alcohol-involved crashes. According to the National Highway Traffic Safety Administration (2012) IIDs must be part of a comprehensive impaired driving program that includes legislation, enforcement, treatment for alcohol misuse, offender monitoring, and data reporting for evaluation. Ignition interlocks have been identified as a proven strategy for reducing DUI recidivism (NHTSA, 2013). A review of 15 studies of interlock effectiveness revealed DUI recidivism rates that were 75 percent lower than for offenders who did not have interlocks installed, with similar findings for both first-time and repeat offenders.

The National Cooperative for Highway Research Program (2006), sponsored by the Federal Highway Administration, has identified requiring ignition interlocks as a condition for license reinstatement as a strategy proven to be effective. More recently, several technological improvements have made circumventing the installed ignition interlock more difficult. Ignition interlocks are a less intrusive approach than impounding vehicles and have been shown more effective than license suspension or revocations.

An independent evaluation of requirements introduced in Washington's 2004 ignition interlock law (requiring all DUI offenders to have ignition interlocks) found an 11 percent reduction in two-year DUI recidivism rates among first-time simple DUI offenders, down to 9.1 percent (McCartt, et al., 2013). Based on these data, the researchers estimated a 0.06 percentage point decrease in recidivism rates for each percentage point increase in the proportion of first simple DUI offenders with ignition interlocks. If ignition interlocks had been installed in 100 percent of first-time DUI offender's vehicles and reductions in recidivism followed the linear relationship described above, the recidivism rate would have fallen from 9.1 percent to 3.2 percent. The 2004 law change was also associated with an 8.3 percent reduction in single-vehicle late-night crash risk.

During the McCartt study, only drivers who had been convicted of DUI were subject to IID restrictions on their driver's license after their suspension period. A first offender restriction was for one year. After the 2009 law change, the IIL was available instead of suspension. First time DUI offenders may only have a three month suspension. They may also serve their administrative license suspension concurrently with their post-conviction suspension. Drivers may also be ultimately convicted of a lesser charge, also shortening the IID installation period. These differences may partly explain the differences in recidivism among first time offenders observed between the two study evaluations.

Research suggests that once interlocks are removed, the preventive effects dissipate. A 2004 review of ignition interlock research concluded that interlock programs are effective while the device is installed, supported by controlled trials representing a general trend among both first-time and repeat DUI

offenders towards lower recidivism rates. However, none of the reviewed research provided any evidence for the effectiveness of the programs continuing once the device is removed (Willis, Lybrand, & Bellamy, 2004). An updated systematic review of literature pertaining to the effectiveness of ignition interlocks was conducted in 2007 (Elder, et al.). Installation of ignition interlocks was consistently found to lead to reductions in recidivism rates. Consistent with earlier studies, the removal of interlocks resulted in recidivism rates similar to those in comparison groups. There is limited research suggesting that while the interlock is installed, alcohol-related crashes decrease. These findings suggest that in order to achieve the maximum benefit from ignition interlock programs, installation compliance and compliance while the interlock is installed should be a major program focus.

## SUMMARY

These study findings suggest that many drivers did comply with interlock requirements, while a significant minority were in substantial non-compliance. Between 8 percent and 14 percent of drivers minimized use of their interlocked vehicles. About 20 percent made numerous attempts to tamper with or circumvent the IID. About 10 percent had large numbers of start failures and BACs of 0.16 or higher, and about 5 percent could be considered “hard core” alcohol-dependent drivers, with BAC results of .20 or higher.

The majority of drivers did submit positive BACs samples when starting their vehicles, but the median number start failures (2.5) suggests that at least half of the drivers may have modified their behavior after just a few positive BACs. One can speculate that these drivers learned from their BAC test failures and made appropriate behavioral changes. However, a substantial segment of the interlock group seems not to have changed their behavior and thus continued to experience multiple start failures and high BAC test results. Given that a significant minority of interlocked drivers seems to be persistent in not complying with IID requirements, appropriate strategies for dealing with these drivers might include intensive alcohol monitoring and alcohol abuse treatment, stricter legislative requirements for removal of the interlock device, and an increased use of in-home alcohol monitoring.

The findings of this study suggest that a major goal of ESSHB 3245, to provide an incentive to install and use IIDs, was only partially realized. The law does appear to have increased the rate of interlock installation, to 56 percent from 33 percent in earlier years. However, significant impacts on recidivism were observed only for repeat offenders. The length of interlock restriction for first DUI convictions is one year. The bigger challenge is the fact that many first time arrestees received a license suspension, and were possibly not convicted of DUI. The Legislature may wish to consider extending the length of the interlock requirement for first DUI convictions, in addition to recent legislation imposing an IID requirement for those convicted of reduced charges.



## APPENDIX A: DATA SOURCES

### Vendor Interlock Data

Six interlock-device companies were doing business in Washington during the period when this study was conducted. Five of them provided relatively complete data. The sixth company used a different business model, used no central database, and employed installers who operated independently. Only two out of the eight installers for this company provided data. Vendor data was sent to the WTSC quarterly in two Excel files, an Install file and an Event Log file. Vendor data were reported for the period from January 2009 through December 2010.

The Install File included the dates of IID installations done during 2009. If an interlock device was removed from a vehicle by a vendor, that removal date was also entered; all removal dates were reported through the end of 2010. Reasons for removal were not provided. Additional data elements included driver identification information (license number, full name, date of birth, and ZIP code of residence), the installer's county, and the reason for installation (mandated by court, to get an interlock license, deferred prosecution, voluntary, other). The Install file consisted of a single record for each driver, unless the driver had two or more installations done (e.g., for replacement of a defective device, for dissatisfied customers who switched vendors and had new IIDs installed, or for drivers who owned multiple vehicles and had an interlock installed on each one). Duplicate records were deleted (N=234), and only one installation per driver was retained. The final Install File contained a total of 12,957 records.

Drivers were required to have their interlock device serviced and re-calibrated every 60 days. Software installed on the interlock devices recorded all significant events, including startup successes and failures, random re-test successes and failures, BAC readings, and attempts to tamper with or circumvent the interlock device. These data elements were included in Event Log files provided to the WTSC, along with driver identification information, service date information, total number of start-up events since the last service, and whether the device was functioning correctly. Event data were uploaded to the vendor's central database when IIDs were serviced. Each record in the event log file consisted of data from a single service or re-calibration of the interlock device, so multiple and variable numbers of service records appeared for each driver included in the study. Event data were reported for two years, 2009 and 2010. Ultimately, all Event Log records for each driver were summarized, condensed, and then merged together to create a single data record for each driver.

The final step in processing vendor data was to match the Install record with the summarized Event record for each driver and then merge them together in a single record so that the resulting file consisted of merged Install-Event log records. However, 1,755 Install records did not match with Event Log records; the majority of these unmatched records came from one company that experienced software and database problems during the study period. The matching and merged Install-Event log data file included 11,202 complete records. The 1,755 unmatched install records were retained for later recidivism analyses.

## **DOL Driver Record Data**

DOL has regularly provided the WTSC with a copy of its driver record database annually in July. These data files include selected data elements from the master DOL database, and reflect information on the database as of the date the WTSC files are created. Data elements from the July 2011 file were used for the analysis of driver compliance, and the 2012 file provided source data for the recidivism analyses.

The DOL data were matched to and then merged with the Install-Event Log file to create the data file used for the recidivism analyses. This DOL-Interlock file provided source data for the “intervention” group for the evaluation analyses. A comparison group of DUI offenders convicted in 2009 but who did not obtain interlocks was identified from the DOL file.

It should be noted that this comparison group was not a true “control group” because of selection bias. That is, drivers in the intervention group chose to have interlocks installed either to obtain interlock licenses or to comply with court ordered sanctions. Drivers in the comparison group chose not have interlocks installed, and thus, most likely differed from intervention drivers on other risk factors in addition to the IID installation (i.e. driving with a suspended license).

The merged DOL-Interlock file allowed for tracking of DUI re-offenses and therefore an analysis of driver recidivism. In addition, this data file permitted an analysis of correlations between recidivism and other offender behaviors recorded in the Event Log file. Alcohol-related violations subsequent to the IID install date were tallied to measure recidivism. Alcohol re-offenses for the comparison group were tallied for all subject-drivers subsequent to their 2009 DUI conviction dates. The July 2012 DOL file provided between 2.5 to 3.5 years of follow-up driving data, so the follow-up tracking period was exactly two years for each driver in the study. Every driver’s follow-up period began on the date of IID installation, typically about mid-2009, and ended 24 months later. The tracking period for the comparison group was also two years, beginning on the date of each driver’s 2009 DUI conviction. Alcohol re-offenses included DUI convictions, convictions on reduced charges, and DUI arrests resulting in administrative actions in cases where no conviction was reported to DOL.

## APPENDIX B: REFERENCES

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