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Design of an Evaluation Plan for Senate Bill 1046

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16. Abstract

In an effort to understand and decrease alcohol-impaired driving as a primary collision factor In California, the research team designed an evaluation plan for California Senate Bill 1046 and its focus on ignition interlock devices as a sentence for Driving Under Influence offense. This plan will evaluate whether Senate Bill 1046 affected the Driving Under the Influence crash frequency and severity, and whether sociodemographic and geographic factors influence its effectiveness. This report lays the foundation for the evaluation that will be conducted in 2024. The research team conducted a meta-analysis of the last 12 years of literature and research on ignition interlock programs inside and outside the United States. Based on the findings of this analysis, the recommended evaluation plan of the law revolves around three research questions that focus on the changes in the frequency/severity of DUI-related crashes in California, the impact of the law on recidivism and on interlock installation rates. To respond to these questions, the research team recommends a list of data that should be collected, such as the number of injuries and deaths resulting from alcohol-related motor vehicle accidents, installation rates of ignition interlocks compared to the prior five-year period, the number of individuals who were required to have an ignition interlock device installed who were convicted of an alcohol-related violation, as well as number of lockouts while an interlock is installed. The research team proposed several statistical approaches for the analysis of this data, such as descriptive statistics, time series analysis, analysis of variance, and logistic regression.

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LIST OF ACRONYMS

AB: Assembly Bill

BAC: Blood Alcohol Concentration

CalSTA: California State Transportation Agency

CHP: California Highway Patrol

CPC: California Penal Code

CVC: California Vehicle Code

DMV: Department of Motor Vehicle

DOJ: Department of Justice

DUI: Driving Under the Influence

IID: Ignition Interlock Device

NHTSA: National Highway Traffic Safety Administration

SB: Senate Bill

Executive Summary

This report presented the design and development of an evaluation plan for Senate Bill 1046 and its mandate of ignition interlock devices as a sentence for DUI offenses.

Overall, the evaluation of the effectiveness of the IID program will explore whether the implementation of an IID program as mandated by SB 1046 in California can affect the frequency of DUI-related accidents and their outcome severity. In addition, the evaluation will hypothesize whether sociodemographic factors, such as age, gender, and geographic location are related to committing DUI offenses or repeating the offence even after being in the program or convicted. This report lays the foundation for this evaluation that will be conducted in 2024 by designing an evaluation plan informed by current literature.

The review of the last 12 years of literature and research in IID program installation and implementation showed that useful sources of data for IID program evaluation include drivers' records and DUI conviction data; survey data from participants in the ignition interlock device program; and DUI-related crash data on the number of injured and fatalities. In addition, analysis of variance, time series analysis, descriptive statistics, chi-square test of independence, linear regression, logistic regression, and semi-structured interviews were among the most commonly applied analytical approaches.

Based on the findings of this research, the recommended evaluation plan of SB1046 revolves around three research questions:

1. Are there significant changes in the frequency or severity of DUI-related crashes in CA that could be possibly attributed to the IID program implementation?

2. What is the impact of the IID program in CA on DUI recidivism?

3. What is the impact of SB 1046 on IID installation rates?

SB 1046 specifies that the evaluation of the new policy should focus on data collected between January 1, 2019, and January 1, 2024, and that a period of similar duration prior to the implementation of the program needs to be selected as a comparison/control group. Therefore, it is suggested that the 2019–2024 data should be compared to the immediately preceding 5-year period, January 1, 2014, and January 1, 2019, inclusive. In addition, attention must be paid in the analysis to the time period between January 1, 2014, and January 1, 2019, since four California counties were part of the pilot program defined by AB 91. It is suggested not to include the data regarding these four counties in the control group.

For the aforementioned period, data should be collected on the number of:

- injuries and deaths resulting from alcohol-related motor vehicle accidents;

- DUI-related crashes;

- IIDs in use compared to the total number of DUI offenders required to install an IID;

- installation rates of IID compared to the prior five-year period;

- individuals convicted more than one time for driving under the influence of alcohol;

- individuals who were required to have a functioning, certified IID installed as a result of the program who killed or injured anyone in an accident while he or she was operating a vehicle under the influence of alcohol;

- individuals who were required to have a functioning, certified IID installed as a result of the program who were convicted of an alcohol-related violation;

- lockouts while an IID is installed, obtained from the IID providers.

Depending on the data and the research question, the authors propose the use of descriptive statistics, time series analysis, analysis of variance, and logistic regression to evaluate the effectiveness of the IID law on DUI-related crash frequency and severity, as well as DUI recidivism.

The proposed evaluation plan will be affected by several limitations, including limited follow-up time for DUI offenders due to the need for a prompt evaluation before the end of the mandate, reduced post-conviction time for DUI offenders convicted in the last 36 months of the mandate, adjudication time lag, reporting errors in data, inaccurate abstracts of conviction, effects of the COVID-19 pandemic on driving behavior and DUI offenses, and inaccuracy of geographic location.

The expected barriers and challenges to the successful implementation of the IID program include financial burden associated with IID and DUI offense, relicensing fees, insurance fees, cost of treatment completion, and poor monitoring of DUI offenders in the IID program. Therefore, the analysis of data should be cautiously conducted considering the limitations and barriers that might affect the results and their interpretation.

1. Introduction

Although there have been trending reductions in impaired driving fatalities in the United States over the past few years, Driving Under the Influence (DUI) arrests and impaired driving fatalities are still a problem. The National Highway Traffic Safety Administration (NHTSA) reported 10,142 alcohol-impaired driving fatalities in 2019, which accounted for 28% of total fatal traffic crashes (Highway Traffic Safety Administration and Department of Transportation 2019; NHTSA n.d.). Each day, about 28 people in the US die in DUI crashes (NHTSA n.d.; Highway Traffic Safety Administration and Department of Transportation 2019; National Highway Traffic Safety Administration 2020). An alcohol-impaired driving fatality is defined as a fatality in a crash involving a driver or motorcycle rider (operator) with a blood alcohol concentration (BAC) of .08 grams per deciliter (g/dL) or greater.

Impaired driving is a serious problem in California. In 2019, about 937 people were killed in alcohol-related crashes. This accounted for 26% of all traffic fatalities in California (decrease of 5.1% with respect to 2018) (Highway Traffic Safety Administration and Department of Transportation 2019; NHTSA n.d.). Alcohol-impaired driving is a primary collision factor in California.

Common sanctions to counteract DUI offenses comprise probation time, jail time, DUI programs, and the installation of Ignition Interlock Devices (IID). The length of the sanctions depends on whether the offender commits a first offense or a repeat offense (second, third, or higher). Alcohol ignition interlocks (IID) are devices installed on vehicles that, by requiring a breath test before the engine can be started, prevent drivers with more than minimal amounts of alcohol in their breath from operating vehicles.

Research has shown that interlock programs reduce the incidence of impaired driving when an interlock device is installed in the vehicle (Nochajski et al. 2020b; Le et al. 2019). In 2010, a study of New Mexico's interlock program (Marques et al. 2010) found that IID programs substantially reduce recidivism while the devices are installed on the offenders' vehicles (both first and multiple offenders). The study also shows that the interlock record produced by DUI offenders is a valuable tool for predicting recidivism once the interlock is removed and that this record clearly identifies subgroups of offenders who are resistant to interventions. In 2019, a study of the Minnesota IID program showed that the recidivism rate of offenders who are given an IID device is half compared to the recidivism rate of offenders who do not install the IID device (Le et al. 2019). The Minnesota study also shows that first-time offenders are about 13% less likely to get arrested again after removal of IID device. Studies in other US States, Sweden, and Canada show similar benefits of IID installation (Fieldler, Brittle, and Stafford 2012; Bauer 2015). However, research also shows that the long-term effects of interlock programs in reducing DUIs are an area of concern (Teoh et al. 2021), as the preventative benefits seem to decrease after the removal of the device. In addition, many existing studies do not include sociodemographic stressors (Smart et al. 2018), randomized control trials (Willis, Lybrand, and Bellamy 2004), or other factors such as co-substance use.

1.1 Previous California legislation on Ignition Interlock devices

Ignition Interlock Devices were introduced in California in the early 1990s. California was the first US state to enact legislation that authorizes judges to requires the installation of IID for DUI offenders (Fulkerson 2003). However, judges did not sentence most repeat DUI offenders to install the IID. Therefore, in 1993, Assembly Bill 2851 introduced the requirement that judges order all repeat DUI offenders to install IIDs. However, the annual reports of the California DUI Management Information System show that a small percentage (less than 20%) of DUI offenders were ordered by the court to install an IID device (Chapman, Oulad Daoud, and Masten 2015).

In 1999, Assembly Bill 762 added new provisions to the existing IID laws. AB 762 required persons convicted of driving while suspended for DUI offenses to install an IID for a period not to exceed three years or until their driving privilege is reinstated. AB 762 also provided incentives for repeat DUI offenders to reinstate early if they install an IID and encourages judges to order first DUI offenders to install an IID in the case of aggravating factors. The evaluation of the effectiveness of these initial IID laws in California gave mixed results and revealed that IID are effective only in specific contexts and among specific groups of offenders.

In 2006, Assembly Bill 979 was implemented to reduce the mandatory suspension/revocation period for DUI offenders if the offender installed an IID. The reduction was substantial, as it reduced suspension/revocation time from a 12 to 30 months range to only 12 months.

In 2009, Senate Bill 1388 transferred regulatory authority of all mandatory IID programs from the state courts to the DMV. This bill also authorized the DMV to require any person convicted of driving while suspended for DUI offenses to install an IID on all vehicles that the driver owns/operates.

In 2010, three separate IID legislations were introduced: SB 598, AB 91, and SB 895. SB 598 allowed second and third DUI offenders convicted of an alcohol-only misdemeanor (CVC 23152) the option of a restricted driver's license after completing a suspension period if they, among other conditions, installed an IID for the remainder of their suspension period. AB 91 established a pilot program in four California counties (Alameda, Los Angeles, Sacramento, and Tulare) that, from July 1, 2010, to January 1, 2016, required all offenders convicted of first-time or repeat DUI offenses (CVC 23152 and 23153) to install an IID on all their vehicles to obtain a restricted, reissued, or reinstated driver's license. The required time period for IID Installation ranged from 5 to 48 months, depending on the number of prior DUI convictions. SB 895 terminated the 1-year Administrative Per Se (APS) license suspension period if the person met the conditions under SB 598, including the installation of an IID.

The evaluation study of AB 91 (Chapman, Oulad Daoud, and Masten 2015) shows that IID installation rates increased to 42.4% during the pilot period in the pilot counties, compared to 2.1% during the pre-pilot period. The installation rates were highest among first-time DUI

offenders. However, the study concluded that the license-based rates of DUI convictions in the pilot counties during the pilot program were not significantly different from the pre-pilot period.

Further evaluation of the AB 91 pilot program (Research and Development Branch 2016) indicated that in the pilot counties there were no differences in DUI recidivism and crash involvement of DUI offenders than those in the non-pilot counties. In addition, this study shows that the IID can be associated with reduced DUI recidivism among specific DUI offenders' groups, but with a substantial increase in subsequent crashes among IID installers with respect to suspended or revoked DUI offenders. The results also show a strong association between an IID-restricted driver's license and reduced DUI recidivism.

In 2017, in an attempt to deter motorists from driving while impaired, and thereby enhancing road safety, Governor Brown signed Senate Bill 1046 (SB:1046 2016) into law. The new law mandates that, from January 1, 2019, to January 1, 2026, all repeat and all injury-involved DUI offenders install an IID for a time period ranging from 12 to 48 months (one to four years), depending on the number of prior DUI convictions. DUI offenders who install an IID are allowed to drive anytime and anywhere if the vehicle is equipped with an IID. The evaluation of SB 1046 is the focus of this report and will be presented in detail in section 1.2.

Table 1. Summary of California DUI Legislation Pertaining to IID

Legislation	Year	California legislation on IID
	Early 1990s	Judges are authorized to order IID installation for repeat DUI offenders.
AB 2851	1993	Judges are required to order IID installation for repeat DUI offenders.
AB 762	1999	Persons convicted of driving while suspended for DUI offenses need to install an IID for a period not to exceed three years or until their driving privilege is reinstated. Incentives for repeat DUI offenders to reinstate early are provided if they install an IID. Judges are encouraged to order first DUI offenders to install an IID in case of aggravating factors.
AB 979	2006	Mandatory suspension/revocation period is reduced if the DUI offender installed an IID.
SB 1388	2009	Regulatory authority of all mandatory IID programs transferred from state courts to DMV. DMV is authorized to require any person convicted of driving while suspended for DUI offenses to install an IID on all vehicles that the driver owns/operates.
SB 598	2010	Second and third DUI offenders convicted of alcohol-only misdemeanor (CVC 23152) have the option of a restricted driver's license after completing a suspension period if they, among other conditions, install an IID for the remainder of their suspension period.
AB 91	2010	Pilot program in four California counties is established that, from July 1, 2010 to January 1, 2016 requires all offenders convicted of first-time or repeat DUI offense (CVC 23152 and 23153) to install an IID on all their vehicles to obtain a restricted, reissued or reinstated driver's license.
SB 895	2010	The 1-year Administrative Per Se (APS) license suspension period is terminated if the person meets the conditions under SB 598 including the installation of an IID.
SB 1046	2017	Extends the existing AB 91 pilot program until January 1, 2019. Effective January 1, 2019 until January 1, 2026, allows persons convicted of a first alcohol-related DUI offense and requires persons convicted of a first alcohol-related DUI offense with injury and persons convicted of a repeat alcohol-related DUI offense to install an IID for a specific period of time.

1.2 California Senate Bill 1046

From January 1, 2019, to January 1, 2026, California Senate Bill 1046 mandates that all repeat and all injury-involved DUI offenders install an ignition interlock device (IID) for a time period ranging from 12 to 48 months (one to four years), depending on the number of prior DUI convictions. A list of the main type of violations related to DUIs is provided in Table 2. A summary

of mandatory IID installation periods defined by SB 1046, depending on the type of violation and number of previous citations, is provided in Table 3.

Table 2. List of Violations Related to DUI

Violation	Reason
CVC 23103	Reckless driving
CVC 23140	Underage DUI (BAC>0.05%)
CVC 23152	Driving under the influence of alcohol or drugs (BAC > 0.08%)
CVC 23153	Driving under the influence of alcohol or drugs and then causing physical harm to someone (BAC > 0.08%)
California Penal Code 191.5	Gross Vehicular Manslaughter While Intoxicated
California Penal code 192.5	Vehicular Manslaughter involving vessel
CVC 13353	Refusal to submit a chemical test
CDC 14601.2	Driving while suspended for DUI conviction

Table 3. Summary of Conviction Length per SB 1046 (DMV 2021)

Number of prior DUI convictions within 10 years	Mandatory IID restriction term (non-injury offense - CVC 23152)	Mandatory IID restriction term (injury offense or vehicular manslaughter offense - CVC 23153, CPC 191.5, CPC 192.5)
0	0	1 year
1	1 year	2 years
2	2 years	3 years
3 or more	3 years	3 years
1 or more prior felony convictions	3 years	4 years

DUI offenders who install an IID are allowed to drive anytime and anywhere if the vehicle is equipped with an IID. This program applies to all DUI offenders convicted of a DUI involving alcohol or a combination of alcohol and drugs in the period in which the law is in effect, except for first-time offenders whose violation did not result in injury, offenders who were administratively suspended after their arrest, and offenders approved for an IID exemption. Offenders may immediately comply with the required IID installation without serving any suspension or revocation period.

The law also allows those who receive a suspension to obtain an IID-restricted driving privilege and receive credit toward their required IID restriction period if they are later convicted of a DUI. In addition, courts have the discretion to order a non-injury first DUI offender to install an IID for a period of up to 6 months. If the court does not order IID installation, a non-injury first offender may apply for a driver's license for IID restrictions or restrictions that allow them to drive to, from, and during their employment and to and from a DUI treatment program for 12 months.

Offenders convicted of driving while suspended due to a DUI offense are also ordered IID installation for a period ranging from one to three years based on prior convictions.

1.3 Aim and Organization of the Report

The objective of this project is to design and develop an evaluation plan for SB 1046 and its implementation of ignition interlock devices. The design presented in this report offers a new viewpoint with respect to previous evaluations of similar laws that are focused on an expert scientific approach and data analysis. This evaluation design is based on a thorough review of existing literature on IID laws performed through a comprehensive meta-analysis.

After this initial introduction, which reviews the California legislation pertaining to DUI laws and IID installation, this final report describes the process and results of the comprehensive meta-analysis of the relevant literature related to IID effectiveness (Chapter 2), a summary of current literature, and a description of possible evaluation processes with relative research questions (Chapter 3). Chapter 4 focuses on the recommended design of the evaluation plan, with a description of the selected research questions, as well as details of the required data and proposed statistical approach to assess the effectiveness of the IID program in California.

2. Systematic Literature Review Through Meta-Analysis Approach

In order to address all the significant factors that can potentially contribute to developing a practical and useful program assessment model, a significant review of related literature is required. A meta-analytic approach is applied to examine the comprehensive literature related to the IID effectiveness for the period 2010 to 2022. Literature search sources, search terms, selection and rejection procedures adopted for this systematic literature review, as well as a summary of findings are specified as followed.

2.1 Sample of Studies

A comprehensive literature search was conducted using both Google-based and library databases. Google Scholar was first used to seek references that were examined for relevance to the main scope of the project. To further analyze existing literature, a similar search was conducted on literature in the Science Direct database.

2.2 Search Terms

The primary search term included "ignition interlock program". After the initial listing of articles was obtained, reference lists were checked to determine whether any other related studies could be included. In a concurrent process, subject matter experts from DMV and CalSTA were consulted for reference to reports and documents that had not been identified by the prior, formal search procedure.

Following this initial procedure, the collected literature was examined and potential factors associated with the effective evaluation of the ignition interlock law in various parts of the US and the world were identified.

On the basis of these initial findings, a specific search in the aforementioned databases was conducted using the following terms: *ignition interlock device effectiveness*, *ignition interlock device effectiveness California, effectiveness of ignition interlocks community*, *ignition interlock evaluation of the implementation, ignition interlock device evaluation, state ignition interlock programs, alcohol ignition interlock program*.

The search was divided into different year categories to assure all existing literature was included for inspection. When these elicitation processes no longer yielded new citations, a final listing of articles was compiled. This research yielded more than 15,000 documents available over the years from 2010 to 2022. The chosen literature included journal articles, conference proceedings, reports, and book sections on IID use and effectiveness.

2.3 Inclusion and Exclusion

Each article was evaluated based on its title, abstract, and a quick review of text to decide upon its selection or rejection. The studies and articles were further inspected to ensure they met the four criteria for inclusion in the meta-analysis: (a) the objective of the study or research questions are directly related to measuring the effectiveness of the ignition interlock program, regardless of the study location (either inside or outside of USA); (b) the study includes information on the sources of data used for evaluation; (c) the study includes a number of factors, such as sociodemographic or behavioral or previous recode of DUI, when the data was collected through survey analysis; and (d) the study includes sufficient information on benefits and limitations of the data/analysis/results related to the ignition interlock evaluation.

Any studies discussing the physical or technical aspects of ignition interlock devices or the like were excluded. A majority of papers were repeated in both databases, and a large proportion was not relevant to the overall scope and objectives of this project. All these were excluded. In addition, articles in languages other than English were excluded.

After removing the duplicate articles, and applying this filtration, a total of 276 articles were saved for further investigation.

2.4 Literature Collection and Results

Using the above-mentioned process, a total of 276 articles were saved and closely investigated. Each article was evaluated based on its title, abstract, and a quick review of text to decide upon its selection or rejection. Finally, a total of 96 papers were found as most relevant to the topic and scope of the project, a list of which is provided in Appendix A.

2.4.1 Data

The literature review shows that various researchers have taken advantage of various data sources and methodologies based on specific research questions or hypotheses defined. However, the data can be categorized into three main categories:

1. drivers' records and DUI conviction data;

2. survey data from participants in ignition interlock device program;

3. DUI-related crash data on the number of injured and fatalities.

The first category, drivers' records and DUI conviction data, includes data such as

- Interlock device data

- Driving records of the DUI offenders

- Blood alcohol level data (for DUI offenders)

- Number of previous violations of DUI offenders while in the ignition interlock program

The second category is constituted by data collected from participants in ignition interlock device programs through surveys. The surveys consisted of questions that assess the relationship between special factors with the recidivism of DUI among offenders in the program. The majority of surveys contain sociodemographic factors, behavioral factors, previous DUI offenses, and participants' opinions on the effect of ignition interlock devices on their driving behavior. The surveys were usually completed by the participants in the ignition interlock device program before entering the program and after exiting it.

The third category of the data is usually publicly available or attainable and consists of the record of accidents that occurred as a result of DUI annually, per specific location. The data provide information on the number of DUI-related crashes and their consequences of either injury or fatality.

2.4.2 Statistical Analysis

Identifying proper statistical methods to analyze data is a significant step in yielding useful information and insights about the effectiveness of the ignition interlock program. Therefore, in order to identify the most useful statistical methods for data analysis on the effectiveness of the ignition interlock program law, all statistical approaches were extracted from the final list of 96 papers. The most common analytical approaches are:

- Analysis of variance

- Time series (autoregressive integrated moving average)

- Descriptive statistics

- Linear regression

- Chi-square

- Survival analysis

- Literature review

- Multivariate logistic regression analysis

- Retrospective cohort design

- Semi-structured interviews

- Binary logistic regression

It is worth mentioning that selecting the most proper statistical approach is dominated by the specifications of the available data to investigate the research objectives.

2.4.3 Research Questions and Hypotheses

While different papers used a variety of data and methods, the research questions and hypotheses they addressed were duplicated or repeated among all the relevant papers. Overall, the research on the effectiveness of IID programs seeks to explore whether the implementation of an IID program can affect the rate of DUI-related accidents and their outcome severity. In addition, the research seeks to hypothesize whether specific factors (such as sociodemographic, behavioral, driving patterns, and drinking patterns) are related to becoming a DUI offender or repeating the offence even after being in the program or convicted. The detailed research questions can be summarized as:

- Is there a relationship between IID program design and Implementation and the rate of IID in use in a geographic location?

- Is there a relationship between IID program implementation and frequency of DUI-related accidents over a specific period of time/specific location?

- Is there a relationship between IID program implementation and severity consequences of DUI-related accidents over a specific period of time/specific location?

- Is there a relationship between the IID program and DUI recidivism?

- What specific factors can be attributed to DUI recidivism among first-time offenders?

- What specific factors can be attributed to DUI recidivism among repeated offenders?

Based on the results of the review of the relevant literature provided in this section, several specific approaches can be proposed for evaluating the effectiveness of the IID program in California. A detailed discussion of the possible evaluation plans and research questions based on the 96 papers identified by the meta-analysis is presented in Chapter III.

3. Possible Evaluation Plans and Research Questions

This chapter includes a discussion of various approaches to evaluating the effectiveness of the IID program from different perspectives of research as well as barriers and challenges in implementing IID law and installation. Section 3.1 includes a review of some selected relevant literature. An overview of the various possible approaches is also discussed in sections 3.2 to 3.5. The list of full relevant references identified by the meta-analysis is provided in Appendix A.

3.1 Review of Selected Literature

The analysis of the relevant literature is divided between research conducted outside the USA (section 3.1.1) and domestically (section 3.1.2).

3.1.1 Evaluation of IID Program Effectiveness Outside the United States

According to a report from the European Parliament's Committee on Transport and Tourism (Luis and Moncayo 2014), while the use of IID programs as part of rehabilitation programs targeting certain types of users (e.g., hard-core drink drivers, recidivists, or first-time drink-driving offenders) could be an important contribution to road safety to reduce the number of road victims, IID as a preventative measure in specific categories of commercial vehicles is not recommended due to high costs and few numbers of DUI-related deaths that involve commercial vehicles.

Research conducted in Canada analyzed the effectiveness of IID programs among DUI offenders with voluntary and mandatory IID installation. The research used survival analysis and time-series analysis as well as descriptive statistics and showed that the IID program was associated with a positive impact on reducing the risk of DUI-related convictions while driving, with no difference among either group considering crashes. They also reported significant, yet temporary, reductions in the number of DUI-related crashes in the first and seventh month after the program was implemented with a 13.32% and 9.93% decrease, respectively. In addition, the time-series results suggested a small marginal decrease in the number of accidents. However, no significant effects were observed associated with the implementation of the IID program on the number of those DUI-related accidents with fatal and serious injuries (R. Robertson and Vanlaar 2010; R. D. Robertson and Pashley 2015; "Behavioral Patterns of Interlock Offenders: Phase II" 2013).

A more recent study conducted in Ontario, Canada showed that when proper incentivizing is added to the IID installation, installation rates are expected to increase. This study found that incentivization of interlock installation by eligible drivers has additional advantages over mandated installation programs, and if incentives are attractive, they can also be used to leverage other positive outcomes beyond increased installation rates (Ma et al. 2016).

A study on tracking drivers involved in DUI-related crashes, with the sentencing of license cancellation and IID installation between 2008 to 2013 in Australia, used data files related to the

convicted drink-driving offence, data files with information on license status changes, ban from driving, license conditions, and driver's demographic. The data for 10 years before the index offence was also required to determine whether it was the first or a repeat offence. The data was divided into groups based on the changes in the IID law and compared using descriptive statistics for measuring the effects of the IID program on DUI-related incidences. The results revealed that the drink-driving measures have both been successful in reducing DUI-related offences and crashes. It further showed that the IID had a positive effect on reducing DUI-related incidences both during the IID program and during the nature intervention period (Watson et al. 2015; Fitzharris et al. 2015).

3.1.2 Evaluation of IID Program Effectiveness in the United States

Regarding the research conducted in the US, several useful approaches, data sources, and results for policy making and informed decision making in IID program evaluation were analyzed. A comprehensive review of the IID program laws in fifty states in the US was conducted by Shulman-Laniel et al. to assess how the laws were changed over time to provide insights for policymakers and researchers in law evaluations (Shulman-Laniel et al. 2017). The results showed that states have faced continuous challenges in a number of policy issues such as for whom IID should be mandated and whether a license should be suspended for DUI prior to reinstating driving privileges with or without an IID. Furthermore, the research proposes some of the additional public health and societal benefits of IID installation beyond drink driving prevention such as enabling DUI offenders to maintain employment, manage family responsibilities, attend treatment sessions, or obtain education or training during the DUI sentence.

In a report from the National Highway Traffic Safety Administration (McKnight et al. 2020) examining the relationship between changes in interlock law and interlock use, the extent of interlock use was compared before and after changes to interlock laws were enacted in Florida and West Virginia. To understand changes in interlock use, archival data from interlock vendors and State agencies were gathered. The data was archived before and after the implementation of each legal change. The analyses were limited by the data available. McKnight et al. discussed that different measures of interlock use can be considered such as:

- Installations—The number of instances in which an interlock was newly installed on a vehicle

- Interlocks-in-Place—The number of interlocks that are currently installed in vehicles at a given time. Other studies used the term "interlocks-in-use"

- Installations as a Proportion of Those Eligible—A measure that accounts for overall changes in DUI rates

- Lack-of-Use—A measure of the extent to which interlock-equipped vehicles were not used frequently or at all, derived from interlock log data on the number of vehicle starts

The results of this analysis identified increases in interlock use in Florida and West Virginia after the implementation of the interlock laws. The number of interlocks-in-place did not show significant changes in interlock use in either state, but this may have been due to a limitation of the data. The findings reveal there was an increase in interlock installations following changes in the DUI laws in each State. This study also found that barriers to interlock use arose when eligibility to enroll in an interlock program is connected to meeting obligations unrelated to DUI charges, such as paying past fines, taxes, or child support.

To review the IID program law in the state of Texas, the strengths and weaknesses of the IID statutes were compared with Colorado, New Mexico, and Washington, and the findings were shared and discussed with four focus groups including prosecutors, members of the judiciary, probation officers, and ignition interlock manufacturers. The goal of this research was to gain qualitative insight into the strengths of Texas' ignition interlock statutes, the weaknesses of Texas' ignition interlock statutes, the application of Texas' ignition interlock statutes, the impacts of newer statutes designed to incentivize IID installation, and recommendations to improve Texas' ignition interlock statutes (Prescott et al. 2018).

In Nochajski et al., a total of 166 IID program participants were asked to complete two surveys from the period of arrest to IID installation and during the period of IID use (Nochajski et al. 2020a). The survey included questions on demographics, driving environments and transportation needs, reported driving activities, and reported drinking activities. The results showed that IID users made some adjustments in their drinking behavior, including how, where, and the amount consumed. The findings suggest that applying specific intervention efforts could extend the benefits of the IID beyond the sanction period. Another study of the relevant literature on the IID program reported that recidivism rates can be reduced by 50 to 90 percent for offenders while the IID is installed (Fell and Scolese 2021).

The interlock offers an opportune time for tailoring targeted interventions to develop habits to separate drinking from driving among this high-risk population. In (Scherer 2020), different types of IID users upon whom targeted interventions could be developed were identified based on an assessment of the IID program participants at IID installation and again six months later. Data was collected on the behavioral and social factors of drivers such as drinking environment, drinking motivation, social support, drug use, and problem drinking behaviors as indicators of high-risk driving behaviors. The aim of this research was to identify different types of IID users and if targeted interventions could be proven useful. Analysis was done using latent class clustering models and multivariate regression analysis to assess the effect of such factors on impaired driving attempts. Another study conducted on 59 males and 42 females who completed questionnaires on demographic information, drinking behavior, driving history, and mental health assessment showed that drivers with elevations in mental health concerns have significantly worse lockout rations compared to others. Therefore, the study suggests that an effective tool in the success of IID law, considering the ratio of IID lockouts while in the program, is providing support for

tailored intervention that aims at improving behavioral adaptation to the device (Scherer et al. 2021).

The effectiveness of the IID program in reducing recidivism was assessed by determining which factors of such programs contribute to their positive impact (Assailly and Cestac 2014) through a survey of IID program participants and a control group of participants for five years. Data was collected from the official driver's license files and included blood alcohol concentration at time of arrest and previous and subsequent violations (alcohol-related or other types). The survey questions were developed using standard models that investigate and explain which elements of the rehabilitation training courses favor behavioral modifications. This study found that the two salient features among the majority of drivers who drink under the influence of alcohol were male proneness to alcohol-related violations and a very high BAC (between 1.5 and 2 g/l).

3.1.3 Barrier and Challenges for IID Installation and Program Implementation

Several studies focus on identifying barriers and challenges in IID installation and program implementation. In order to understand why DUI offenders resist the installation of the IID, semi-structured interviews were conducted with a sample of non-installers (four females and two males). The results showed that reasons for resistance to IID installation include alleviating constraints, predominantly the financial burdens associated with an IID, and institutional mistrust. Additionally, data revealed that participants are managing without the IID by mitigating apprehension such as driving cautiously to avoid detection and utilising alternative transportation (Romosz et al. 2021).

A review of the IID program as a sentencing option for high-risk drink drivers in New Zealand (Waters 2015) revealed that IID installation was significantly related to the reduction in drink driving when compared to other existing sanctions such as license disqualification and fines. However, they reported noticeable barriers attached to the IID program including cost, legal loops, alternative sentences. In addition, they reported that the IID program has been involved in High Court Appeals, further reducing judges' confidence in this option. Moreover, the promise of driving with an installed interlock is undermined by the costs of device installation, device maintenance, insurance, relicensing fees, and the completion of treatment (Ma et al. 2016).

Other literature suggested that the lack of monitoring of the IID program negatively impacts reduction in recidivism (Rauch et al. 2011; Nicholas 2021). Based on a survey of law officers involved in road traffic safety in New Jersey, some of the significant factors that can enhance the success of the IID program administration are better monitoring, increased penalties, and lower costs associated with IID installation and DUI offense (Nicholas 2021).

The review of other literature contained similar research hypotheses, research questions, methodological approaches to data collection, and analysis in various states, as described in the previous sections. These include (Carter et al. 2015; Voas et al. 2016; Blom and Blokdijk 2021; Ullman 2016; Taylor et al. 2017; National Highway Traffic Safety Administration NHTSA 2009;

McGinty et al. 2017; Shiomoto 2015; Wu et al. 2015; Teutsch and Naimi 2018; T. McCartt, A. Leaf, and M. Farmer 2022; Miller et al. 2015; Kerns 2017; Beck, Kelley-Baker, and Voas 2015; Benjamin Chun-Kit Tong 2017).

Based on the review conducted on all the relevant literature in this study, the research team proposed four different approaches that can be taken to assess the various aspects of the IID law in California. Each approach is explained in detail in the following sections.

3.2 Proposed Approach #1

In this first proposed approach, the only variables that are considered for the study are taken from the IID program/law itself. The research hypothesis in this approach is that "the rate of interlock in-use is associated with design, management, and support of the IID programs."

In this approach, a scoring system that analyses the performance of each component of the IID program is created and then the law is scored based on expert opinion. Then, the association/correlation between the scoring of components and the rate of interlock in-use is studied. The main research question for approach 1 is:

- Are the IID program design, management, and support effective with regard to the rate of interlock in-use in CA?

The answer to this question provides insights on:

- Whether the IID program has been effective in increasing or decreasing the interlock in-use rate?

- What components of the IID program have the strongest, moderate, and weak association with IID success?

To successfully conduct the research and address the research questions, data is required on arrests, courts, and IID providers. The dependent/target variable to measure can be the interlock in-use rate. To calculate the rate, the number of IIDs in use were obtained from the state record. This number is then divided by the total number of DUI offenders who are eligible to install the IID. If the total number of DUI offenders who are eligible to install IID is not available, then other public data should be used as denominators to calculate the rate as an alternative solution.

The final calculation should be either of the following based on the availability of the data:

- Interlock in-use rate—Number of IIDs in use/ total number of DUI offenders eligible to install IID

- Interlock in-use rate—Number of IIDs in use/ population data in CA from the U.S. Census Bureau

- Interlock in-use rate—Number of IIDs in use/ DUI fatalities in motor vehicle crashes that involved at least one driver with BAC>= 08 g/dL, obtained from NHTSA's Fatality Analysis Reporting Systems (FARS)

The three main features included in this evaluation approach are program design, program management, and program support, and they allowed the evaluation of the interlock in-use rate as a representation of the effectiveness of the IID program. Each of the three features has several other components explained below, resulting in a total of eight features: requirement, penalties, monitoring, uniformity, coordination, education, resources, and data. Table 4 provides a summary of a possible scoring approach for these features, according to (Casanova-Powel et al. 2015).

Program Design

1. Requirement: Requirements and incentives for IID

    a. Successes: CLOSE LOOPHOLES

        i. Requirements for first offenders

        ii. Requirements for repeat or high BAC offenders

        iii. Requirement as a condition of hardship license

    b. Obstacles

        i. Implementation of interlock without education, courts reluctant to require interlock

        ii. Delays in processing make it difficult to identify good interlock candidates

2. Penalties: Swift, certain, appropriately severe penalty for disobeying IID laws

    a. Obstacles

        i. Many states do not monitor failures/positive alcohol results and therefore cannot penalize interlock violations

Program Management

1. Monitoring: Ensure IID is installed and no tampering or circumvent

    a. Successes

        i. Central data repository to make monitoring easier and more accessible (Florida)

      ii. Alcohol screening and treatment. (New York has a voluntary treatment program for conditional license or reinstatement)

   b. Obstacles

      i. Agencies are rarely alerted if the interlock is not installed

      ii. Lack of vendor oversight causes uncertified vendors to distribute IID

   c. Promising

      i. Proactive field inspections to monitor violations

2. Uniformity: Same interlock programs across the state

   a. Successes

      i. Data repository from above is the same state-wide

      ii. Interagency task forces (Colorado, Oregon, Texas)

3. Coordination: Communication across law enforcement agencies

   a. Obstacles

      i. Lack of training in state databases as employees who are familiar with the technology retire

   b. Promising

      i. Same record system across vendor, DMV, court system, etc

4. Education: Thorough education on IID programs for public and program staff

   a. Successes

      i. Regular training sessions for law enforcement

      ii. Texas Center for Judiciary holds regular education for judges

   b. Obstacles

      i. Education for multiagency staffing is limited

Program Support

1. Resources: Adequate staff and funding for the program

   a. Obstacles

        i. Funding for low-income offender resources is limited; some people cannot afford the fees of having IID

        ii. Funding for IID staffing is limited

  b. Promising

        i. More funding for interlock

2. Data: Accurate, accessible, up-to-date data to monitor the program

  a. Successes

        i. Electronic reporting reports more accurate and timely data

        ii. Required download intervals for data – 30 to 60 days

        iii. Online Interlock System (OIS) (Colorado)

        iv. Choosing only very few state-authorized vendors (Texas, Florida)

  b. Obstacles

        i. Many states do not have a central repository for interlock

        ii. State record systems can be very outdated

        iii. Vendor software more complex than state data

  c. Promising

        i. Updating record systems with accurate data

Table 4. Rating Scores for Performance Keys - 1,3,5 Ratings (Casanova-Powel et al. 2015)

Key	5-rating	Example	3-rating	Example	1-rating	Example
Requirement	Strong law or incentives to install	All offender law, significant reduction of hard suspension period	Moderately strong law with moderate incentives to install	High BAC and repeat offender law with small reduction of hard suspension period	Weak or no law	Repeat-offender law only, exceptions in mandatory programs that let offenders drive without interlocks for certain purposes, no incentives to install
Penalties	Strong, swift and appropriate penalties	Jail time, home monitoring if refuse to install	Moderate penalties	Extension of IID installation period for failure to install, license suspension until term is completed	No penalties	No license suspension, no extension of IID installation period
Monitoring	Careful monitoring to assure IID are installed	Random checks by DMV, probation, treatment center or other interlock involved agency to ensure installation	Average monitoring of offenders	Letter of notification sent to offender from monitoring agency if failed to install	No agency monitoring of offender	Only vendor reports, no other monitoring of offenders
Uniformity	Uniform and consistent operations statewide	All agencies report data regularly in same format, on same time frame	Moderately consistent operations statewide	Most agencies are consistent with operations throughout State	No uniformity or consistency statewide	County or municipalities govern interlock operations individually, no consistency across the State
Coordination	Close coordination, communication across all agencies	Regular task force meetings with representatives from all interlock involved	Moderate coordination, communication across all agencies	Occasional meetings or discussions between interlock involved	No communication between interlock involved	No meetings or discussions between interlock involved agencies

Key	5-rating	Example	3-rating	Example	1-rating	Example
		agencies		agencies, may not include all agencies involved	agencies	
Education	Regular training or education for all interlock involved agency staff and management	Regular meetings between interlock program managers, law enforcement, vendors, DMV, and court staff	Intermittent training or education for all interlock involved agency staff and management	May hold some training or education sessions for one or more agencies yearly or quarterly	No education or training of interlock involved agency staff and management	No meetings between any interlock agency staff
Resources	Adequate staff and funding resources	Designated interlock program manager and interlock staff	Average staff and funding resources	Interlock staff has other duties in addition to interlock responsibilities	Few or no staff or funding resources	No designated interlock program manager or staff- duties are completed by regular staff when time permits
Data	Excellent data records	Available from all agencies to monitor offenders, report violators and evaluate program effectiveness	Average data records	Available from some agencies to monitor offenders, report violators and evaluate program effectiveness	Poor data records	Data unavailable to monitor offenders, report violators and evaluate program effectiveness

A new rubric is designed based on Table 4 to facilitate the scoring of SB 1046 and is presented below.

Rubric used for scoring IID program features:

Requirements: _____/20

How strong is the incentive or requirement to install IID?

Score	Criteria
18–20	Requirements or strong incentives to install, this includes first offenders.
11–17	Strong incentives to install, small discrepancies are observed.
5–10	Moderately strong requirements or incentives to install. Includes only select groups of offenders.
2–4	Weak law for installation. Minimal incentive or requirement.
1	No IID laws, requirements, or incentives.

Comments:

Monitoring: _____/10

How effective is the monitoring of IID installations?

Score	Criteria
9–10	Careful and thorough monitoring process to ensure IID installation.
6–8	Careful and thorough monitoring process with exclusions or loopholes
3–5	Moderate, incomplete monitoring process
2	Very weak monitoring process
1	No monitoring process

Comments:

Penalties: _____/10

How effective are the penalties for IID violations?

Score	Criteria
9–10	Immediate, reasonably strong repercussions for violations.
6–8	Reasonably strong repercussions with delayed enforcement, OR weak repercussions with immediate enforcement.
3–5	Moderate repercussions and delayed enforcement.
2	Weak repercussions with delayed enforcement.
1	No repercussions for IID violations.

Comments:

Coordination: _____/10

How effective is coordination across agencies across the state?

Score	Criteria
9–10	Close coordination between all agencies across the state.
6–8	Close coordination between most agencies across the state.
3–5	Moderate coordination between most agencies across the state.
2	Weak coordination between some agencies across the state.
1	No coordination between agencies across the state.

Comments:

Uniformity: _____/10

How uniform is the IID program across the state?

Score	Criteria
9–10	Consistent operations and resources across the state.
6–8	Consistent operations and resources across the majority of the state.
3–5	Moderately consistent operations across the majority of the state.
2	Moderately consistent operations across parts of the state.
1	Weak uniformity throughout the state.

Comments:

Education: _____/10

How educated are staff and offenders throughout the state?

Score	Criteria
9–10	Regular and relevant education of offenders and staff alike across the state.
6–8	Intermittent and relevant training of offenders and staff across the state.
3–5	Intermittent and relevant training of offenders and staff across parts of the state.
2	Inconsistent education of offenders and IID staff throughout the state.
1	No education on IID in staff.

Comments:

Data: _____/5

How thorough and accessible are the IID data records?

Score	Criteria
5	Excellent data records available to all agencies across the state.
4	Sufficient data records available to most agencies across the state.
3	Average data records available to some agencies across the state.
2	Poor data records available to some agencies across the state.
1	Very poor data records/ No data records.

Comments:

Resources: _____/5

How adequate are the resources (staff and funding) in order to properly operate an interlock program?

Score	Criteria
5	Adequate staff and funding available to the entire state.
4	Adequate staff and funding available to parts of the state.
3	Average staff and funding available to parts of the state.
2	Poor staff and funding available to the entire state.
1	No staff and funding allocated to IID programs.

Comments:

Total Score = _____/80

3.3. Proposed Approach #2

This second approach addresses the effectiveness of the IID program using only publicly available data such as fatalities that included DUI drivers/incidents.

By creating time-series graphs of the changes in the number of accidents in which DUI drivers were included over a number of years (before and after the changes in the IID program), the trend in the data can be used to draft some potential conclusions.

Two research questions are associated with the second approach: (1) "Are there significant changes in the frequency of DUI-related crashes in CA that could be possibly attributed to the IID program implementation?" (2) "Have the patterns in the severity of injury resulting from DUI-related crashes changed if we compare injuries in years before and after implementation of IID program in CA?"

The answer to the first question provides insights on:

- The trends in DUI-related crashes in CA annually

- How the trend patterns are considering the time period before the IID program implementation vs post-implementation period

The public data source that can be used to answer the research questions is publicly available data on Fatality Analysis Reporting System (FARS).

To answer the second research question, the trends in DUI-related crashes can be investigated to ascertain driver age groups and injury severity. The purpose is to provide more information on whether the IID program has affected the severity of DUI-related crashes. Using the drinking driver age groups versus injury severity categories (percent of fatalities, non-incapacitating injury, minor injury, total fatalities, and injuries) a table of data can be constructed.

3.4. Proposed Approach #3

In this third approach, specific data from DUI offenders will be extracted from criminal records. This data can be used together with the number of lockouts during the time the offender (whether first-time or repeat) has been in the IID program.

The research question(s) would be as follows:

(1) What is the impact of the IID program in CA on DUI recidivism?

(2) Which factors affect DUI recidivism in both first-time and repeat offenders?

The answer to these questions provides insights on:

- The trends in DUI recidivism while in the IID program

- The relationship between demographic factors, criminal history, and criminal characteristics of the offenders and the successful or poor performance while being in the IID program

The data should be available from the criminal records of the DUI offenders for both first-time and repeat offenders.

The specific data would be:

- Demographic characteristics: gender; age; driver type

- Type of conviction: criminal sanction (fine, community service, other sanction, license suspension)

- Criminal career characteristics: age of onset; number of previous traffic offences; case density (traffic, DUI, all offences)

The number of lockouts can be divided into two categories as the target variable in the study.

- Category 1: Successful- having 0 or 1 lockout

- Category 2: Poor- having 2 or more lockouts

3.5. Proposed Approach #4

In this fourth approach, a designed survey is required. All DUI-related offenders are asked to complete a survey on the sociodemographic factors, drinking frequency, social context of drinking, stress level in jobs/family/other situations, specific previous problems such as anxiety, etc., and feelings about the IID program mandate.

The survey should be completed twice: once at the beginning of the DII program mandate and once at the end. Only answers from the same participants should be used for the final analyses.

The research question(s) associated with this fourth approach are (1) "What is the impact of the IID program in CA on DUI recidivism?", (2) "What specific factors affect DUI recidivism in DUI drivers?"

The answer to these questions provides insights on:

- The trends in DUI recidivism while in the IID program

- The relationship between sociodemographic factors, drinking frequency, social context of drinking, stress level in jobs/family/other situations, specific previous problems such as anxiety, etc., and feelings about IID program mandate and the successful or poor performance while in the IID program

The data should be available from the criminal records of the DUI offenders for both first-time and repeat offenders.

The specific data would include:

- Sociodemographic characteristics: gender; age; driver type; and perhaps income and ethnicity

- Drinking frequency: stopped drinking (yes/no); still drink but in smaller amount (yes/no); how many drinks per week; how many drinks daily when they were drinking

- Drinking social context: how often drinking for various reasons in social contexts such as "blowing off steam", "reliving fatigue or tension", "socializing with friends", etc.

- Sources of high stress: job, family-related problems, others

- History of previous mental-related problems: anxiety, depression, etc.

- Feelings (positive or negative) about the IID program mandate: "it gave me independence", "it restricts my freedom", etc.

The number of lockouts can be divided into two categories as the target variable in the study.

- Category 1: Successful- having 0 or 1 lockout

- Category 2: Poor- having 2 or more lockouts

Based on the four possible evaluation approaches presented in this chapter, a final evaluation plan is designed and described in Chapter IV to fulfill the specific needs of CalSTA.

4. Research Design for Recommended Evaluation Plan

This chapter presents the design of the proposed evaluation plan for the effectiveness of Senate Bill 1046 based on the bill requirements, literature review and meta-analysis, as well as discussion with CalSTA.

The first element that needs to be defined is the time period over which data will be collected and analyzed. SB 1046 specifies that the evaluation of the new policy should focus on data collected between January 1, 2019, and January 1, 2024, inclusive. In addition, the bill mandates a period of similar duration prior to the implementation of the program to be selected for comparison. The selected prior period is suggested to be January 1, 2014, and January 1, 2019, inclusive. The rationale for this selection is presented in Section 4.1.

The recommended evaluation plan of SB1046 revolves around three research questions:

Research question 1

Are there significant changes in the frequency or severity of DUI-related crashes in CA that could be possibly attributed to the IID program implementation?

Research question 2

What is the impact of the IID program in CA on DUI recidivism?

Research question 3

What is the impact of SB 1046 on IID installation rates?

The details regarding each research question, the necessary data and the proposed statistical approaches are presented in the following sections. It is recommended that the analysis be limited to non-commercial drivers, as the requirements of SB 1046 on commercial drivers are different from non-commercial drivers. In addition, commercial licenses represent a very small percentage of the overall license population.

The analysis of each research question will also be broken out by demographic factors and geographic regions, as outlined in section 4.6. Some limitations of the proposed approach are described in section 4.7.

4.1 Summary of possible statistical approaches

In this section, the statistical approaches identified through the meta-analysis (Chapter 2) are described in order to provide the reader with additional information.

- Descriptive statistics: descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries of the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data

- Literature review: a systematic review is aimed at collecting and summarizing all empirical evidence that fits pre-specified eligibility criteria for answering a research question

- Linear regression: linear regression is the fundamental regression algorithm that estimates/predicts the output coordinate from the input. In the simplest form, it can be used to find the relationship between one input and one output variable to provide a correlational analysis of how the output variable is affected by changes in the input values

- Analysis of variance (ANOVA): ANOVA is used to test for differences among several population means. It allows for multiple comparisons while holding the probability of a type I error (rejection of a true null hypothesis) at a preselected level. ANOVA works by comparing variance estimates: one due to chance factors alone and one due to chance plus treatment (if there is a treatment effect). ANOVA can also be used to study two or more treatment variables simultaneously

- Time-series (autoregressive integrated moving average): an autoregressive integrated moving average, or ARIMA, is a statistical analysis model that uses time-series data to either better understand the data set or to predict future trends. A statistical model is autoregressive if it predicts future values based on past values

- Chi-square test of independence: the chi-square test of contingency is based on the differences between the observed values and those that would be expected if the variables were independent. If these differences are small, there is little dependence between the variables; large differences indicate a dependence. It is used when both variables are categorical/text

- Survival analysis: survival analysis is the analysis of time-to-event data. Such data describe the length of time from a time origin to an endpoint of interest. For example, individuals might be followed from birth to the onset of some disease, or the survival time after the diagnosis of some disease might be studied. Survival analysis methods are usually used to analyze data collected prospectively in time, such as data from a prospective cohort study or data collected for a clinical trial

- Logistic regression analysis: logistic regression is a statistical test used to predict a single binary variable using one or more other variables. It also is used to determine the numerical relationship between such a set of variables. The output variable should be binary. The changes in the probability of either output can be determined

- Retrospective cohort design: retrospective cohort studies examine health outcomes over a span of time and are applied in epidemiologic studies

- Semi-structured interviews: a semi-structured interview is a data collection method that relies on asking questions within a predetermined thematic framework. In research, semi-structured interviews are often qualitative in nature. They are generally used as exploratory tools in marketing, social science, survey methodology, and other research fields

4.2 Rationale for Time Period Selection for Control Group

SB 1046 specifies that the evaluation of the new policy should focus on data collected between January 1, 2019, and January 1, 2024, and that a period of similar duration prior to the implementation of the program needs to be selected as a comparison/control group. The selected prior period is suggested to be the immediate 5-year period, January 1, 2014, and January 1, 2019, inclusive. This period of time has been selected due to its similar length and close proximity in time with respect to the time period over which SB 1046 is in effect.

In addition, attention must be paid in the analysis to the time period January 1, 2014, and January 1, 2019, since four California counties were part of the pilot program defined by AB 91. It is suggested not to include the data regarding these four counties in the control group.

4.3 Research Question 1: Effect on DUI Crashes

The first research question proposed for the final evaluation plan focuses on the effect of SB 1046 on the number of crashes in California related to DUI offenses. This research question seeks to analyze the changes in both the frequency and severity of DUI-related crashes in California that could be attributed to the implementation of SB 1046.

Research question 1: "Are there significant changes in the frequency or severity of DUI-related crashes in CA that could be possibly attributed to the IID program implementation?"

4.3.1 Datasets & Rationale

Two main data sets will be used to respond to this question:

- Number of injuries and deaths resulting from alcohol-related motor vehicle crashes between January 1, 2019, and January 1, 2024, inclusive, and during periods of similar duration prior to the implementation of the program

- Number of DUI-related crashes between January 1, 2019, and January 1, 2024, inclusive, and during periods of similar duration prior to the implementation of the program

These sets of data are in line with the requirements from SB 1046, CVC §23575.5(b)(3). The data collected between January 1, 2019, and January 1, 2024, will be compared with the prior 5-year period defined in section 4.2.

The number of DUI-related crashes and the number of injuries and deaths resulting from alcohol-related accidents can be obtained from the California Highway Patrol (CHP). Based on this data, the percentage of DUI crashes, the percentage of DUI crash injuries, and the percentage of DUI crash fatalities will be computed on a yearly basis based on the total number of crashes, injuries, and fatalities in the same year.

The data should be aggregated by geographic location, as described in section 4.6.

This analysis will determine whether the percentage of alcohol-involved crashes, injuries and fatalities declined or not due to the implementation of SB 1046 and whether age, sex, and geographic location play a role on this effect.

4.3.2 Proposed Statistical Approach

Three different statistical approaches are recommended to analyze the data related to research question 1:

- **Yearly descriptive statistics** by visualizing the overall annual trends in DUI-related accident numbers and outcomes (number of injuries and number of fatalities)

- **Analysis of Variance** to measure the effect of each of the mentioned factors on the average number of DUI-related crashes; it can also be used to identify the effect of sociodemographic factors and geographical location (or any other ones) on the average number of DUI-related crashes in presence and absence of the IID law

- **Logistic regression** to measure how the probability of injury/fatality has changed as an effect of various factors while the IID law was implemented between January 2019 and January 2024. This method clarifies whether the change in severity in DUI accidents can be attributed to the IID law

Three controlling variables could be included in the statistical model that compared the control time period to the period in which SB 1046 is in effect. These variables adjust for the effects of confounding economic factors as well as the effects of the Covid-19 pandemic on DUI convictions, such as:

- Monthly California unemployment rate, which can be obtained from the Bureau of Labor Statistics

- US average monthly retail price per gallon of gasoline, which can be obtained from the US Energy Information Administration

- Number of miles driven on a monthly basis (which can be obtained through Caltrans)

The proposed statistical methods will provide useful insights for research question 1 as long as adequate sample size is available. In the event of having samples bigger than some thousand data points, other advanced methods such as decision tree models can be developed for measuring how the probability of injury/fatality has changed as an effect of various factors while the IID law was implemented between January 2019 and January 2024.

4.4 Research Question 2: Effect on DUI Recidivism

The second research question will investigate the effect of SB 1046 on DUI recidivism in California.

Research question 2: "What is the impact of the IID program in CA on DUI recidivism?"

4.4.1 Datasets & Rationale

The following data sets will be used to evaluate the effectiveness of DUI in decreasing recidivism.

- Number of individuals convicted more than one time for driving under the influence of alcohol between January 1, 2019, and January 1, 2024, inclusive, and periods of similar duration prior to the implementation of the program. CVC §23575.5(b)(4)

- Number of individuals who were required to have a functioning, certified IID installed as a result of the program who killed or injured anyone in an accident while he or she was operating a vehicle under the influence of alcohol. CVC §23575.5(b)(1)

- Number of individuals who were required to have a functioning, certified IID installed as a result of the program who were convicted of an alcohol-related violation of Section 23103, as specified in Section 23103.5, or Section 23140, 23152, or 23153, or Section 191.5, or subdivision (a) of Section 192.5 of the Penal Code during the term in which the person was required to have the ignition interlock device installed. CVC §23575.5(b)(2)

- Number of lockouts while an IID is installed, obtained from the IID providers

These sets of data are in line with the requirements of CVC §23575.5(b). The number of individuals who were convicted of one or more than one DUI will be obtained from abstracts of conviction, which are reported to DMV by all California courts. The number of individuals who were required to have a functioning certified IID installed as a result of SB 1046 will be obtained from DMV records.

Three DUI offender levels should be defined for all convictions, and all DUI offenders will be grouped according to such levels: "first DUI offenders", "second DUI offenders", and "third-or-more DUI offenders". The conviction data should also be aggregated by sociodemographic factors and geographic location, as described in section 4.6.

In order to assess behavior changes, this data should be differentiated based on whether these violations occurred during the mandatory IID installation period or after. In addition, these violations should be characterized in the context of days to first subsequent DUI conviction, the days to first subsequent DUI incident and the days to first subsequent crash.

The number of lockouts while an IID is installed will provide information about offenders that are at high risk of recidivism, as the analysis of literature presented in Chapters II and III suggests.

4.4.2 Proposed Statistical Approach

The effect of the IID law on recidivism can be studied with the use of an ad-hoc survey used to collect direct input from offenders. Discussion suggested that this is not a viable option: a new survey would need to be designed and implemented at the time of this study (2022), but the law has been in effect for more than two years. Therefore, it would not be possible to collect survey results for both the control time period and the first two years of the mandate, making the data analysis not effective and not trustworthy.

In the absence of a survey data collection method, one approach is to look at the number/frequency of the DUI-related crashes for those who were in the IID program vs those who were not, or the time period that the IID law was implemented. That way, we could do correlation analysis/scatter plots/box plots to see if they are correlated. The following statistical approaches are suggested for the analysis of the second research question:

- **Analysis of Variance**: a one-way ANOVA can be applied for the comparison of the average number of DUI-related crashes between two groups. Group 1 includes the number of DUI-related crashes/arrests/incidents for those offenders in the IID program. Group 2 includes the same for those who were not in the program. The comparison statistically provides evidence of whether the averages of the DUI-related incidences were different due to belonging to either group. Consequently, box plots can be drawn showing the change in average, minimum, maximum and median values between the two groups.

- Alternatively, the same statistical analysis can be done for comparing the number of DUI-related incidences for Group 1: those DUI-related before the implementation of the IID law vs Group 2: those after the implementation. This will show if the **average** number of DUI-related incidents has changed over a specific period of time as a result of implementing the IID law. The trend in such changes, however, can be depicted using time-series analysis;

- **Correlation analysis** can be used by creating a scatter diagram for the total number of DUI-related incidences for each year (or quarter/season/month, any other desired time interval), in the presence and absence of the IID law. The scatter diagram provides a linear illustration of how the frequencies have changed over time. In case of visible differences in the patterns, it could be, very cautiously, concluded that there would be a correlation between the change in the number of DUI-related crashes and the IID law implementation.

Monthly license-based rates of convictions per 100,000 drivers aged 16 or older can be calculated based on the total counts of licensed drivers in each county, as obtained from the DMV's State Age and Sex report. This data is provided on a biannual basis (January and July) and can be linearly interpolated to obtain a monthly count of licensed drivers.

4.5 Research question 3: effect on IID use

In addition to the research questions above, the evaluation should include a discussion on how SB 1046 changed the rate of IID usage and installation in California, as identified by the third research question.

Research question 3: "What is the impact of SB 1046 on IID installation rates?"

4.5.1 Datasets & Rationale

The following data sets will be used to evaluate the effectiveness of IID in decreasing recidivism.

- Number of IIDs in use compared to the total number of DUI offenders required to install an IID

- Installation rates of IID compared to the prior five-year period

The number of DUI offenders who installed an IID can be obtained, per their violation month, from DMV records based on the offenders who submitted an IID installation form during the 3 years post-conviction follow-up period. The total number of DUI offenders required to install an IID can be obtained from abstracts of conviction submitted to the DMV by the courts.

The installation rate is designated as the percentage of DUI offenders who installed at least one IID at some point during the 3 years after the DUI conviction date (post-conviction period).

The data should be aggregated by DUI offender levels, type of conviction, demographic factors and geographic location, as described in section 4.6.

4.5.2 Proposed Statistical Approach

Three different statistical approaches are recommended to analyze the data related to research question 3:

- **Time-series analyses and yearly descriptive statistics** can be used to depict the trend in changes in IID installation rate as well as the trend in changes in the number of IIDs in use compared to the total number of DUI offenders required to install an IID

- **Analysis of Variance**: One-way ANOVA can be applied for the comparison of the average installation rates of IID between two groups. Group 1 includes the Installation rates of IID before 2019. Group 2 includes the Installation rates of IID for the five-year period of 2019–2024. The comparison statistically provides evidence of whether the average ratio of IID installation rates was different due to belonging to either group. Consequently, box plots can be drawn showing the change in average, minimum, maximum, and median values between the two groups

4.6 Information about Demographic and Geographic Areas

The statistical analyses proposed to answer the three research questions will be separated by demographic and geographic factors to understand the effect of SB 1046 on different groups of the population. Fundamentally, the DMV records and retains only information that is relevant to (a) establishing a person's identity, and (b) taking actions related to the driving privilege.

4.6.1 Demographic Factors

In terms of demographic data, for each driver's license, the DMV retains information about age (date of birth) and gender (male, female, non-binary). Based on previous DMV annual reports, eight age groups and three sex groups can be defined, as described in Table 5.

The DMV does not retain information regarding an individual's race and/or ethnicity or socioeconomic status, and as such, it is not possible to differentiate the statistical analysis based on these factors. There is also no information retained by the DMV that could be used as a proxy to determine the ethnicity/race of the individual. Some data regarding ethnicity could be obtained through the data collected by treatment programs in which DUI offenders participate. Another possible source of data regarding the ethnicity of DUI offenders could be obtained from the California judicial system.

Table 5. Socio-demographic Factors in Terms of Age and Sex

Factors	Groups
Age (8 groups)	Under 18 18–20 21–30 31–40 41–50 51–60 61–70 71 and over
Sex (3 groups)	Female Male Non-binary

4.6.2 Geographic Factors

In terms of geographic information, the DMV retains information regarding individuals' addresses; however, due to privacy and security concerns, geographic information shared for research purposes is generally limited to zip codes. This information could be used to differentiate between geographic zones (i.e., county, metropolitan vs nonmetropolitan). However, geographic differentiation based on zip code information retained by the DMV has several limitations, as several reports noted that DUI offenders often fail to update their current address with the DMV which might give rise to inflation in the error of estimation. Keeping this in mind, it is proposed that the following geographic factors should be considered:

- 58 California counties

- Metropolitan vs nonmetropolitan classification scheme. The 2013 Rural-Urban Continuum Codes as defined by the US. Department of Agriculture can be used to distinguish metropolitan counties by the population size of their metro area, and nonmetropolitan counties by the degree of urbanization and adjacency to a metro area. This classification scheme defines nine categories, as listed in Table 6: three metro and six nonmetro categories, according to the table below. In California, 64% of the counties are classified as metropolitan areas, and 36% as nonmetropolitan areas (Table 7)

Table 6. Definition of Zip Code Designation Based on Population Size Per USDA (Cromartie 2020)

Code	Designation	Description
1	Metropolitan	Counties in metro areas of 1 million population or more
2	Metropolitan	Counties in metro areas of 250,000 to 1 million population
3	Metropolitan	Counties in metro areas of fewer than 250,000 population
4	Nonmetropolitan	Urban population of 20,000 or more, adjacent to a metro area
5	Nonmetropolitan	Urban population of 20,000 or more, not adjacent to a metro area
6	Nonmetropolitan	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Nonmetropolitan	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Nonmetropolitan	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Nonmetropolitan	Completely rural or less than 2,500 urban population, not adjacent to a metro area

Table 7. Classification of California Counties Based on USDA Codes

Code	# of CA counties	% of CA counties
1	16	28%
2	13	22%
3	8	14%
4	5	9%
5	1	2%
6	6	10%
7	5	9%
8	4	7%
9	0	0%

The sociodemographic and geographic factors suggested for the evaluation of SB 1046 are summarized in Table 8.

Table 8. Summary of Socio-Demographic and Geographic Factors

Factors	
Age (8 groups)	Under 18 18–20 21–30 31–40 41–50 51–60 61–70 71 and over
Sex (3 groups)	Female Male Non-binary
Geographic area - A	58 California counties
Geographic area - B	Metropolitan Nonmetropolitan

4.7 Limitations of the Proposed Approach

The proposed evaluation program will be affected by several limitations, as listed below (Oulad Daoud Sladjana 2021).

- Limited follow-up time for DUI offenders due to the need for a prompt evaluation;

- Reduced post-conviction time for DUI offenders convicted in the last 36 months of the designated time period;

- Adjudication time lag: Time between arrest and conviction, as well as time lag for courts to report to DMV. Generally, it takes between four to six months for the adjudication process (from DUI arrest to update of the offender's driving record);

- Reporting errors: arrest data are reported to the DOJ, Criminal Justice Statistics Center, by individual law enforcement agencies throughout the state. As such, these data are subject to reporting errors such as incorrect names, birthdates, or arrest dates. Nonreporting of arrest data due to error or omission can also occur. In addition, when data is entered into the DOJ's system, only the highest-order offense is included. Therefore, in cases where a DUI arrest is made in conjunction with, for example, an auto theft arrest, that DUI arrest will not be included in the database. This results in a slight but systematic underreporting of the annual number of DUI arrests. In addition, alcohol- and drug-involved crash data are reported to the CHP by local law enforcement agencies and district offices of the CHP.

As such, these data are subject to reporting and non-reporting errors similar to those occurring in both DUI arrest and conviction data. While most local law enforcement agencies will investigate and file reports on crashes involving injury or death, the investigation and reporting of property damage-only crashes vary widely by local jurisdiction. Data are entered onto CHP's Statewide Integrated Traffic Records System (SWITRS) and published in their annual report;

- Inaccurate abstracts of conviction: abstracts of conviction for DUIs are reported to the DMV by courts throughout the state. Conviction data are subject to change since abstracts of conviction can be amended, corrected, or dismissed after the initial abstract of conviction is reported to the DMV. Also, reporting, and non-reporting errors can occur as with DUI arrest data;

- Effects of COVID pandemic: preliminary reports show that drivers showed riskier behavior during the COVID pandemic years (2020–2022) and that DUI offenses have increased despite the lockdowns and the reduction in the total number of driven miles per day/month;

- Inaccuracy of Geographic location: several reports show that DUI offenders often do not update their current address with the DMV. Therefore, inaccuracies will be present when separating the data by geographic location based on zip codes (Rogers 2012; Gebers and Hanely 1989).

5. Summary & Conclusions

This report presented the design and development of an evaluation plan for Senate Bill 1046 and its mandate of ignition interlock devices as a sentence for DUI offenses.

Overall, the evaluation of the effectiveness of the IID program will explore whether the implementation of an IID program as mandated by SB 1046 in California can affect the frequency of DUI-related accidents and their outcome severity. In addition, the evaluation will hypothesize whether sociodemographic factors, drinking environment, drinking behavior, and driving patterns are related to committing DUI offenses or repeating the offense even after being in the program or convicted. This report lays the foundation for this evaluation that will be conducted in 2024 by designing an evaluation plan informed by current literature.

The review of the last 12 years of literature and research in IID program installation and implementation showed that useful sources of data for IID program evaluation include drivers' records and DUI conviction data; survey data from participants in ignition interlock device programs; and DUI-related crash data on the number of injured and fatalities. In addition, analysis of variance, time-series analysis, descriptive statistics, chi-square tests of independence, linear regression, logistic regression, and semi-structured interviews were among the most commonly applied analytical approaches.

Based on the findings of this research, the recommended evaluation plan of SB1046 revolves around three research questions:

1. Are there significant changes in the frequency or severity of DUI-related crashes in CA that could be possibly attributed to the IID program implementation?

2. What is the impact of the IID program in CA on DUI recidivism?

3. What is the impact of SB 1046 on IID installation rates?

SB 1046 specifies that the evaluation of the new policy should focus on data collected between January 1, 2019, and January 1, 2024, and that a period of similar duration prior to the implementation of the program needs to be selected as a comparison/control group. Therefore, it is suggested that the 2019–2024 data should be compared to the prior immediate 5-year period, January 1, 2014, and January 1, 2019, inclusive. In addition, attention must be paid in the analysis to the time period from January 1, 2014, to January 1, 2019, since four California counties were part of the pilot program defined by AB 91. It is suggested not to include the data regarding these four counties in the control group.

For the aforementioned period, data should be collected on the number of:

- Injuries and deaths resulting from alcohol-related motor vehicle accidents

- DUI-related crashes

- IIDs in use compared to the total number of DUI offenders required to install an IID

- Installation rates of IID compared to the prior five-year period

- Individuals convicted more than one time for driving under the influence of alcohol

- Individuals who were required to have a functioning, certified IID installed as a result of the program who killed or injured anyone in an accident while he or she was operating a vehicle under the influence of alcohol

- Individuals who were required to have a functioning, certified IID installed as a result of the program who were convicted of an alcohol-related violation

- Lockouts while an IID is installed, obtained from the IID providers

Depending on the data and the research question, the authors propose the use of descriptive statistics, time-series analysis, analysis of variance, and logistic regression to evaluate the effectiveness of the IID law on the frequency and severity of DUI-related crashes, as well as DUI recidivism.

The proposed evaluation plan will be affected by several limitations, including limited follow-up time for DUI offenders due to the need for a prompt evaluation, reduced post-conviction time for DUI offenders convicted in the last 36 months of the mandate, adjudication time lag, reporting errors in data, inaccurate abstracts of conviction, effects of the COVID pandemic on driving behavior and DUI offenses, and inaccuracy of geographic location.

The expected barriers and challenges in the successful implementation of the IID program include the financial burden associated with IID and DUI offenses, relicensing fees, insurance fees, cost of treatment completion, and poor monitoring of DUI offenders in the IID program. Therefore, the analysis of data should be cautiously conducted considering the limitations and barriers that might have an effect on the results and their interpretation.

Appendix A

A list of all the papers selected as relevant in the meta-analysis is presented in the following pages.

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2010	Knapp, K; Utecht, B	Application of a rural safety policy improvement index framework	University of Minnesota Center for Transportation Studies					https://conservancy.umn.edu/bitstream/handle/11299/97675/cts%2010-07.pdf?sequence=1
2010	Rahim, H A; Hassan, S.D S;	Breathalyzer enabled ignition switch system	6th International Colloquium on Signal Processing & its Application, IEEE					https://ieeexplore-ieee-org.libaccess.sjlibrary.org/document/5545238
2010	Marques, P; Tippetts, S; Allen, J; Javors, M; Alling, C; Yegles, M; Pragst, F; Wurst, F;	Estimating driver risk using alcohol biomarkers, interlock blood alcohol concentration tests and psychometric assessments: initial descriptives	Addiction	105	2	226-239	Wiley Online Library	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc2825139/
2010	Marques, P R; Voas, R B; Roth, R; Tippetts, A S;	Evaluation of the New Mexico ignition interlock program.	United States. National Highway Traffic Safety Administration.					
2010	Lahausse, J; Fildes, B;	Harm's way	Intertraffic World		11	4-7		

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2010	Ursino, Brian A;	Ignition interlocks	The Police Chief	77		24-27		
2010	Marques, P R; Voas, R B;	Key features for ignition interlock programs	Department of Transportation, DOT HS 811 262					https://rosap.ntl.bts.gov/view/dot/ 60975
2010	Voas, R B;	Monitoring drinking: alternative to license suspension to control impaired drivers?	Transportation Research Record	2182	1		SAGE Publicatio ns, Los Angeles, CA	
2010	Sakairi, M; Suzuki, D; Nishimura, A; Ichige, Y; Kiguchi, M	Simultaneous detection of breath and alcohol using breath-alcohol sensor for prevention of drunk driving	IEICE Electronics Express	7	6	467-472		https://www.jstage.jst.go.jp/article /elex/7/6/7_6_467/_pdf
2010	Robertson, R D; Holmes, E; Vanlaar, W GM;	The implementation of alcohol interlocks for first offenders: a case study	Traffic Injury Research Foundation					https://tirf.ca/wp-content/uploads/2017/02/cc_2010 _report_web.pdf
2010	Robertson, R D; Holmes, E; Vanlaar, W GM;	The implementation of alcohol interlocks for offenders: a roadmap	Traffic Injury Research Foundation					https://tirf.ca/wp-content/uploads/2017/02/cc_2010 _roadmap_2.pdf

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2010	Vanlaar, W; Robertson, R; Schaap, D; Vissers, J;	Understanding behavioral patterns of interlocked offenders to inform the efficient and effective implementation of interlock programs: how offenders on an interlock learn to comply						https://www.semanticscholar.org/paper/understanding-behavioural-patterns-of-interlocked-vanlaar-robertson/904f14024d37b4713336066c6888df6c4e72e2d3
2011	Robertson, R D; Holmes, E; Vanlaar, W;	Alcohol interlocks: harmonizing policies and practices.	Proceedings of the 11th International Alcohol Interlock Symposium					https://tirf.ca/wp-content/uploads/2016/08/11th_annual_interlock_symposium_5.pdf
2011	Freed, M;	Blow zero before you go.	Proctor	31	5	16-17		
2011	Marques, P; Hansson, T; Isaksson, A; Walther, L; Jones, J; Lewis, D; Jones, M;	Detection of phosphatidylethanol (peth) in the blood of drivers in an alcohol ignition interlock program	Traffic Injury Prevention	12	2	136-141	Taylor & Francis	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3077108/
2011	Elder, R W; Voas, R; Beirness, DDoug; S, Ruth A; Sleet, D A; Nichols, J L; Compton, R;	Effectiveness of ignition interlocks for preventing alcohol-impaired driving and alcohol-related crashes: a community guide systematic review	American Journal of Preventive Medicine	40	3	362-376	Elsevier	

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2011	Rauch, E J; Ahlin, E M; Zador, P L; Howard, J M; Duncan, G D;	Effects of administrative ignition interlock license restrictions on drivers with multiple alcohol offenses	Journal of Experimental Criminology	7	2	127-148	Springer	
2011	Hajizamani, M; Shrubsall, S C; Viegas, J M;	Evaluation of in-vehicle alcohol intake control devices using agent-based modeling (abm)	Multimodal Approach To Sustained Transportation System Development: Information, Technology, Implementation			1555-1561		https://ebookcentral.proquest.com/lib/sjsu/reader.action?docid=3115661
2011	Hill, J D;	Identifying costs and funding alternatives for equipping operating while intoxicated (OWI) offenders with ignition interlock devices (IID)	Wisconsin Department of Transportation					https://books.google.com/books?hl=en&lr=&id=pe_rya_yetwc&oi=fnd&pg=pa1&dq=identifying+costs+and+funding+alternatives+for+equipping+operating+while+intoxicated+(owi)+offenders+with+ignition+interlock+devices+(iids)&ots=xywstthni5&sig=stdgtrugbyrezesz_43lcgaxhqk#v=onepage&q=identifying%20costs%20and%20funding%20alternatives%20for%20equipping%20operating%20while%20intoxicated%20(owi)%20offenders%20

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
								with%20ignition%20interlock%20 devices%20(iids)&f=false
2011	Lenneman, J K; Backs, R W; Cassavaugh, N; Bos, A; Vanbergen, N	Improving driver safety with behavioral countermeasures.	Michigan. Dept. Of Transportation.					https://www.michigan.gov/docum ents/mdot/mdot_research_report_ rc1561_372531_7.pdf
2011	Medeiros-Ward, N; Strayer, D L;	On the costs of in-vehicle assessment of alcohol consumption	Proceedings Of The Human Factors And Ergonomics Society	55	1	1760-1764	SAGE Publicatio ns Sage CA: Los Angeles, CA	http://citeseerx.ist.psu.edu/viewdo c/download?doi=10.1.1.861.6658 &rep=rep1&type=pdf

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
			Annual Meeting					
2011	Elder, R W;	Overview of effectiveness of ignition interlocks: reflections from the perspective of theories of punishment	Countermeasures To Address Impaired Driving Offenders			32		https://onlinepubs.trb.org/onlinepubs/circulars/ec174.pdf#page=38
2011	Gross, N; Mcgehee, D; Peek-Asa, C; Nambisan, S;	Review of breath alcohol ignition interlock devices	Iowa Department of Transportation					https://www.pacificariptide.com/files/baiid_final__report-2011.pdf
2011	Zador, P. L; Ahlin, E. M; Rauch, W. J; Howard, J. M; Duncan, G D;	The effects of closer monitoring on driver compliance with interlock restrictions	Accident Analysis & Prevention	43	6	1960-1967	Elsevier	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3153731/
2011	Voas, R B; Dupont, R L; Talpins, S K; Shea, C L;	Towards a national model for managing impaired driving offenders	Addiction	106	7	1221-1227	Wiley Online Library	https://onlinelibrary-wiley-com.libaccess.sjlibrary.org/doi/full/10.1111/j.1360-0443.2010.03339.x

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2012	Šucha, M;	Alcohol ignition interlock ("alcolock") as an effective tool to prevent drink driving	Adiktologie	12	2	152-157		http://199757.w57.wedos.ws/wp-content/uploads/2018/09/2012_2_sucha_alcolock.pdf
2012	Terranova, V A;	Evaluation of the ignition interlock bond condition's impact on recidivism	Dissertation, Texas State University-San Marcos					https://digital.library.txstate.edu/bitstream/handle/10877/4252/terranova-thesis.pdf?sequence=2
2012	Rogers, P N;	Identifying barriers to driving privilege reinstatement among California dui offenders	California Department Of Motor Vehicles					https://www.dmv.ca.gov/portal/uploads/2020/04/s3-237.pdf
2012	Robertson, R D; Holmes, E; Vanlaar, W;	Integrating systems: creating a continuum of care.	Proceedings Of The 12th International Alcohol Interlock Symposium					
2012	Liang, K; Sun, L;	Research on intelligence prevention system of drink-driving	2012 IEEE International Conference On Cyber Technology In Automation, Control, And Intelligent Systems (CYBER)					
2012	Grill, K; Nihlén Fahlquist, J;	Responsibility, paternalism and alcohol interlocks	Public Health Ethics	5	2	116-127		https://doi.org/10.1093/phe/phs015

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2012	Chamberlain, E; Solomon, R M;	The challenges of implementing interlock best practices in a federal state: the Canadian experience	Injury Prevention	18	5	347-352	BMJ Publishing Group Ltd	
2013	Voas, R B; Tippetts, A S; Grosz, M;	Administrative reinstatement interlock programs: Florida, a 10-year study	Alcoholism: Clinical And Experimental Research	37	7	1243-1251	Wiley Online Library	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3675180/
2013	Bailey, TJ; Lindsay, VL; Royals, J;	Alcohol ignition interlock schemes: best practice review	Journal Of Public Health	89	11	1696-1700		https://cdn-s3-nrspp-2020.s3.ap-southeast-1.amazonaws.com/wp-content/uploads/sites/4/2017/03/07081245/casr119.pdf
2013	Cestac, J;	Alcohol interlocks, recidivism prevention and self evaluation of alcohol problems	International Conference On Alcohol, Drugs And Traffic Safety (T2013), 20th, 2013, Brisbane, Queensland, Australia					https://pdf.sciencedirectassets.com/273143/1-s2.0-s1162908814x00034/1-s2.0-s116290881400022x/main.pdf?x-amz-security-token=iqojb3jpz2lux2vjefcacxvzlwvhc3qtmsjhmeucihe6qsyp5n0mvoe8m6r13i6xyncz%2f%2buxvxorfhbmgo%2b%2baieaujy3zx95iycfqurztkrekt0lgskn8f6qe%2f

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2013	Foward, S;	An interview study with convicted drink drivers	20th International Conference On Alcohol, Drugs And Traffic Safety (T2013), Brisbane, Queensland, Australia					https://drive.google.com/file/d/11t5vmhgvm9btqfjehmtquhhzbnsn9db5/view
2013	Vanlaar, W; Mckiernan, A; Robertson, R;	Behavioral patterns of interlocked offenders: phase II	Traffic Injury Research Foundation					
2013	Bailey, T; Lindsay, V; Royals, J;	Best practice in alcohol ignition interlock schemes	Australasian College Of Road Safety Conference, Adelaide					https://hekyll.services.adelaide.edu.au/dspace/bitstream/2440/82808/1/hdl_82808.pdf
2013	Goodwin, A H; Kirley, B; Sandt, L; Hall, W; Thomas, L; O'Brien, N P; Summerlin, D;	Countermeasures That Work: A Highway Safety Countermeasure Guide For State Highway Safety Offices, 7th Edition	United States. Department Of Transportation. DOT HS 811 727					
2013	Keeble, L;	Design intervention	Vision Zero International					http://viewer.zmags.com/publication/783832a6#/783832a6/62
2013	Mccartt, A; Eichelberger, A; Leaf, W;	Effects of all-offender alcohol ignition interlock laws on recidivism and alcohol-related crashes	International Conference On Alcohol, Drugs And Traffic Safety (T2013), 20th, 2013, Brisbane, Queensland, Australia					

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2013	Löytty, M;	Evaluation of the interlock program for dui offenders in Finland	International Conference On Alcohol, Drugs And Traffic Safety (T2013), 20th, 2013, Brisbane, Queensland, Australia					https://drive.google.com/file/d/1ndm-zi7oiatlembnz_trll3fkdncxc4t/view
2013	Voas, R; Kelley-Baker, T; Taylor, E;	Five levels of interlock program monitoring	Australasian Road Safety Research Policing Education Conference, 2013, Brisbane, Queensland, Australia					https://acrs.org.au/files/arsrpe/paper%20167%20-%20voas%20monitoring%20-%20alcohol%20ignition%20interlocks.pdf
2013	Marques, P R; Tippetts, A S; Yegles, M;	Hair ethylglucuronide and blood phosphatidylethanol detection of 4 dui driver risk factors	International Conference On Alcohol, Drugs And Traffic Safety (T2013), 20th, 2013, Brisbane, Queensland, Australia					https://drive.google.com/file/d/1vrueocfboj2pahcuhswxslv4mbd75icq/view
2013	Chamberlain, E; Solomon, R; Murie, A;	Increasing alcohol interlock participation rates in canada: best practices and effects of insurance	Proceedings From 20th International Conference On Alcohol, Drugs And Traffic Safety. Brisbane, Australia					http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1090.7809&rep=rep1&type=pdf
2013	Robertson, R; Harrod, S; Holmes, E; (Editors)	Proceedings Of The Association Of Ignition Interlock Program Administrators (AIIPA) 1st Annual Conference	AIIPA 1st Annual Conference Proceedings, Oklahoma City, Oklahoma					https://drive.google.com/file/d/1-d427xhsw1sqkcqbdiodxrv3s99o9eiw/view

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2013	Voas, R B; Tippetts, A S; Grosz, M;	Recidivism following interlock: any evidence of change?	International Conference On Alcohol, Drugs And Traffic Safety (T2013), 20th, 2013, Brisbane, Queensland, Australia					
2013	Blais, E; Sergerie, D; Maurice, P;	The effect of ignition interlock programs on drinking-and-driving: a systematic review	23rd Canadian Multidisciplinary Conference					https://www.researchgate.net/profile/etienne-blais/publication/280625582_the_effect_of_ignition_interlock_programs_on_drinking-and-driving_a_systematic_review/links/55bfc78608aec0e5f4476915/the-effect-of-ignition-interlock-programs-on-drinking-and-driving-a-systematic-review.pdf

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2013	Klipp, S;	Towards a national alcohol interlock field trial in Germany, achievements and challenges	Schriftenreihe Fahreignung					https://d1wqtxts1xzle7.cloudfront. net/39921160/towards_a_national _alcohol_interlock_fie20151112- 10954-16nmfu9-with-cover-page- v2.pdf?expires=1650444757&sign ature=sfoxwxxi5~63jssp5wlambb~ bglbu5ahwbqdf3xmbumlb0uqinor 1resauggwhzcnws6aywbv20mny2~ dph1lfb3tkulredxoou82l9cwst5kaz fon2atjegjuskkcznifk0uhgzyjnwmz hvoqiwluj4bnzx~4a5nzfrd- ~icj5vx5fkeex7zej5r0zldqkktasokhf n5kzcv57kpak9e7woair8hzb2dxo1 pnppuvklpz24gdefoz3rynk0svdjvd 7zvm7nsawtwjxzw6twwj1xuishi2q ot2djjyh9iwkxclu~u~rwpz897vhic w9izkzlqrmtlpckghzqzhfqsq__&k ey-pair-id=apkajlohf5ggslrbv4za

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2013	Mccartt, Anne T; Leaf, William A; Farmer, Charles M; Eichelberger, Angela H;	Washington state's alcohol ignition interlock law: effects on recidivism among first-time dui offenders	Traffic Injury Prevention	14	3	215-229	Taylor & Francis	https://www.researchgate.net/profile/william-leaf-2/publication/235739005_washington_state%27s_alcohol_ignition_interlock_law_effects_on_recidivism_among_first-time_dui_offenders/links/00b495368ed8e321db000000/washington-states-alcohol-ignition-interlock-law-effects-on-recidivism-among-first-time-dui-offenders.pdf
2014	Assailly, J-P; Cestac, Julien;	Alcohol interlocks and prevention of drunk-driving recidivism	European Review Of Applied Psychology	64	3	141-149	Elsevier	https://reader.elsevier.com/reader/sd/pii/s116290881400022x?token=ed6de73aeaa506422074d1212395c35977bd8c61c00b3329e28c7d37ee5b5dc3276b3f7cebc205d83ef02c7884c6ba6d&originregion=us-east-1&origincreation=20220420014035
2014	Vanlaar, W; Mckiernan, A; Robertson, R;	Behavioural patterns of interlocked offenders	Twenty-Fourth Canadian Multidisciplinary Road Safety Conference					

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2014	Kahn, Christopher A;	Commentary: locked out or locked up: are ignition interlocks the answer?	Annals Of Emergency Medicine	63	4	475-476	Elsevier	https://www.annemergmed.com/article/s0196-0644(14)00117-6/fulltext
2014	Mayer, Robin;	Ignition interlocks–what you need to know: a toolkit for policymakers, highway safety professionals, and advocates	National Highway Traffic Safety Administration, DOT HS 811 883;					https://rosap.ntl.bts.gov/view/dot/60807
2014	Vanlaar, Ward; Hing, Marisela Mainegra; Robertson, Robyn;	Nova scotia alcohol ignition interlock program: outcome evaluation: technical report	Traffic Injury Research Foundation					https://tirf.ca/wp-content/uploads/2017/01/novascotiainterlock-outcomeevaluation-techreport-26-1.pdf
2014	Martino, A; Sitran, A; Rosa, C;	Technical development and deployment of alcohol interlocks in road safety policy	Report to the directorate-general for internal policies policy department b: structural and cohesion policies					https://www.europarl.europa.eu/regdata/etudes/etudes/join/2014/513993/ipol-tran_et(2014)513993_en.pdf

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2014	Waters, Gerald;	The New Zealand alcohol interlock program: a review of the first year as a sentencing option for high risk drink drivers	Research Driving Impaired In New Zealand (Online). Available At: Http://Www. Aa. Co. Nz/Assets/About/Research-Foundation/Impairment/NZ-Alcohol-Interlock-Program-Report. Pdf					https://www.researchgate.net/profile/gerald-waters/publication/306284612_the_new_zealand_alcohol_interlock_program_a_review_of_the_first_year_as_a_sentencing_option_for_high_risk_drink_drivers/links/57b6820b08aede8a665bc1c9/the-new-zealand-alcohol-interlock-program-a-review-of-the-first-year-as-a-sentencing-option-for-high-risk-drink-drivers.pdf
2014	Fleming, S	Traffic safety: alcohol ignition interlocks are effective while installed; less is known about how to increase installation rates	Report To The Chairman, Committee On Commerce, Science, And Transportation, U.S. Senate GAO-14-559					https://www.gao.gov/products/gao-14-559
2015	Watkins, K E; Kilmer, B; Osilla, K C; Graf, M;	Driving under the influence of alcohol: could California do more to prevent it	Santa Monica, CA: RAND Corporation.					https://www.rand.org/content/dam/rand/pubs/perspectives/pe100/pe162/rand_pe162.pdf
2015	Beck, Kenneth H; Kelley-Baker, Tara; Voas, Robert B;	Dui offenders' experience with an ignition interlock program: comparing those who have and have not	Traffic Injury Prevention	16	4	329-335	Taylor & Francis	

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		adapted from their primary drinking location						
2015	Miller, Peter G; Curtis, Ashlee; Sønderlund, Anders; Day, Andrew; Droste, Nic;	Effectiveness of interventions for convicted dui offenders in reducing recidivism: a systematic review of the peer-reviewed scientific literature	The American Journal Of Drug And Alcohol Abuse	41	1	16-29	Taylor & Francis	https://www.tandfonline.com/doi/pdf/10.3109/00952990.2014.966199
2015	Wu, Q; Chen, T; Byrne, P A; Larsen, J; Elzohairy, Y;	General deterrence of drinking and driving: an evaluation of the effectiveness of three Ontario countermeasures	International Journal Of Engineering Management And Economics	5	3-4	209-223	Inderscience Publishers (IEL)	https://www.inderscienceonline.com/doi/abs/10.1504/ijeme.2015.072554
2015	Chapman, E; Oulad D, S; Masten, S. V.	General deterrent evaluation of the ignition interlock pilot program in California	California Department Of Motor Vehicles, CAL-DMV-RSS-14-247					https://www.dmv.ca.gov/portal/uploads/2020/04/s5-247-1.pdf
2015	Carter, P M; Flannagan, C A; Bingham, C R; Cunningham, R M; Rupp, J D;	Modeling the injury prevention impact of mandatory alcohol ignition interlock installation in all new US vehicles	American Journal Of Public Health	105	5	1028-35		https://dx.doi.org/10.2105%2fajph.2014.302445

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2015	Fitzharris, M; Liu, S; Peiris, S; Devlin, A; Young, K; Lenne, M; Bowman, D; Gatof, J;	Options to extend coverage of alcohol interlock programs	Austroads, AP-R495-15					https://researchmgt.monash.edu/ws/portalfiles/portal/64125261/33451212_oa.pdf
2015	Watson, A; Imberger, K; Cavallo, A; Healy, D; Freeman, J; Filtness, A; Wilson, H; Catchpole, J;	The impact of safety measures on the re-offence and crash rates of drink-driving offenders in Victoria	Proceedings Of The 2015 Australasian Road Safety Conference (ARSC2015)			1-10	Australasian College Of Road Safety (ACRS)	https://eprints.qut.edu.au/89999/3/89999.pdf
2016	Powell, T D Casanova; V, W G; Robertson, R D;	Annual ignition interlock survey: United States	Traffic Injury Research Foundation					https://trid.trb.org/view/1469352
2016	Terranova, V A;	Assessing the effects of the ignition-interlock device on recidivism	Dissertation, Texas State University					https://digital.library.txstate.edu/bitstream/handle/10877/6842/terranova-dissertation-2016.pdf?isallowed=y&sequence=1

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2016	Kaufman, E J; Wiebe, D J;	Impact of state ignition interlock laws on alcohol-involved crash deaths in the United States	American Journal Of Public Health	106	5	865-871	American Public Health Association	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc4985097/
2016	Ullman, D F;	Locked and not loaded: first time offenders and state ignition interlock programs	International Review Of Law And Economics	45		1-13	Elsevier	https://reader.elsevier.com/reader/sd/pii/s0144818815000599?token=c082e5fce506599738e988362d00637d49da1fe8f631a78e39a2d821ec60b81423c551650645e6d9df09f2d17f62bc3b&originregion=us-east-1&origincreation=20220420013240
2016	Ma, T; Byrne, P A; Bhatti, J A; Elzohairy, Y;	Program design for incentivizing ignition interlock installation for alcohol-impaired drivers: the Ontario approach	Accident Analysis & Prevention	95		27-32	Elsevier	https://reader.elsevier.com/reader/sd/pii/s000145751630207x?token=a171d082fff77310ca51fa0ab3c21e51c210bde4cb93b88fddacf06a6eb07705f2cbe4e3f41491c651ae1bbc16e33f56&originregion=us-east-1&origincreation=20220420011756

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2016	Perry, Amanda E;	Sentencing and deterrence	What Works In Crime Prevention And Rehabilitation			169-191	Springer	https://link-springer-com.libaccess.sjlibrary.org/chapter/10.1007/978-1-4939-3477-5_6
2017	Nieuwkamp, R; Martensen, H; Meesmann, U;	Alcohol interlock	European Road Safety Decision Support System					file:///c:/users/012744017.sjsuad/downloads/alcohol_interlock_08062017.pdf
2017	Vanlaar, W G; Hing, Marisela M; Robertson, R D;	An evaluation of nova scotia's alcohol ignition interlock program	Accident Analysis & Prevention	100		44-52	Elsevier	https://reader.elsevier.com/reader/sd/pii/s0001457516304559?token=982c1d1be3f88280223fa1fe44936 7dbf1327fcad3dfd2144008dbe5a 2c4f1e4bba5a329bc155e92943b69 21055d8f6b&originregion=us-east-1&origincreation=2022042001164 2
2017	Kerns, T;	Effectiveness of an ignition interlock device in reducing alcohol-impaired driving recidivism and alcohol-impaired motor vehicle crashes in Maryland	Dissertation, University Of Maryland, Baltimore					https://archive.hshsl.umaryland.edu/handle/10713/6751

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2017	Springer, J Fred; Phillips, Joël L;	Evaluation of the California ignition interlock pilot program: a policy experiment	Applied Policy Research			356-376	Routledge	https://csu-sjsu.primo.exlibrisgroup.com/discovery/fulldisplay?docid=alma991013664417702919&context=l&vid=01cals_sjo:01cals_sjo&lang=en&search_scope=myinst_and_ci&adaptor=local%20search%20engine&tab=everything&query=any,contains,applied%20policy%20research&offset=0
2017	Mcginty, E E; Tung, G; Shulman-Laniel, J; Hardy, R; Rutkow, L; Frattaroli, S; Vernick, J S;	Ignition interlock laws: effects on fatal motor vehicle crashes, 1982–2013	American Journal Of Preventive Medicine	52	4	417-423	Elsevier	https://interlockciim.org/wp-content/uploads/2018/09/ajpm-interlocks.pdf
2017	Taylor, E; Voas, R; Marques, P; Mcknight, S; Atkins, R;	Interlock data utilization	National Highway Safety Administration, DOT HS 812 445					https://rosap.ntl.bts.gov/view/dot/34986

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2017	Kelley-Baker, T; Taylor, E; Berning, A; Yao, J; Lauer, E; Watson, D. E.;	The feasibility of voluntary ignition interlocks as a prevention strategy for young drivers	Washington, DC: National Highway Traffic Safety Administration, DOT HS 812 425					https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/812425-the-feasibility-of-ignition-interlocks-as-a-prevention-strategies-for-young-drivers.pdf
2018	Mccartt, A T	Effects of Washington State's alcohol ignition interlock laws on dui recidivism: an update	Traffic Injury Prevention	19	7	665-674	Exlibris Rapidill (Kemp Library)	
2018	Prescott, J; Trueblood, A; Pant, A; Walden, T;	State of Texas ignition interlock laws: a policy evaluation	Texas Association Of Counties					
2018	Bailey, S; Soole, D; Cattermole-Terzic, V; Osmond, S;	Toward a performance-based approach to the Queensland alcohol ignition interlock program: the impact of performance record on risk of recidivism	Washington DC, United States					
2019	Le, T Q; Powell, T C; Lucas, J M; Scopatz, R;	Evaluation of Minnesota's ignition interlock program	Transportation Research Board 98th Annual Meeting, Washington DC, United States					https://trid.trb.org/view/1573324

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2019	Clark, B; Thompson, L; Wong, C; Newstead, S;	Evaluation of the act alcohol interlock program	MUARC, Melbourne Vic Australia					https://research.monash.edu/en/publications/evaluation-of-the-act-alcohol-interlock-program
2019	Prescott, J;	State of Texas ignition interlock laws	22nd International Council On Alcohol, Drugs And Traffic Safety Conference			177		https://vpp-seidl.de/ueber-uns/t2019/content_117567/icadts_t2019_conferenceproceedings.pdf#page=178
2020	Mcknight, A. S., And Tippetts, A. S.	Alcohol ignition interlock uses rates following changes in interlock legislation	National Highway Safety Administration					
2020	Kathleen E. Soper	All-offender ignition interlock laws & dui arrest rates	Dissertation, City Of University Of New York (CUNY)					https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1624&context=hc_sas_etds
2020	Nochajski, Thomas H	The impact of interlock installation on driving behavior and drinking behavior related to driving	Traffic Injury Prevention	21	7	419-424	Exlibris Rapidill (Main Library)	

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2020	Mcknight, A. S., And Tippetts, A. S.	Ignition interlock use rates following changes in interlock legislation	National Highway Safety Administration					
2021	Scherer, M; Beck, K; Taylor, E P; Romosz, A; Voas, R; Romano, E;	A latent class analysis of dui offender motivation and awareness as predictors of performance while on alcohol ignition interlocks	Journal Of Substance Use	26	3	250-255	Taylor & Francis	
2021	Scherer, M;	A latent class analysis of dui offender motivation and awareness as predictors of performance while on alcohol ignition interlocks	Journal Of Substance Abuse	26	3	250-255	Exlibris Rapidill (Main Library)	
2021	Blom, M; Blokdijk, D;	Long-term effectiveness of the alcohol ignition interlock program: a retrospective cohort study in the Netherlands	Accident Analysis & Prevention	151		105888		
2021	Nicholas F. Schock	New jersey field service individuals' perspective of the ignition interlock device's impact on traffic safety	Dissertation, Wilmington University (Delaware)					

Year	Author	Title	Publication	Vol.	N.	Pages	Publisher	URL (accessed March 2022)
2021	Teoh, E; Fell, J; Scherer, M; Wolfe, D;	State alcohol ignition interlock laws and fatal crashes	Traffic Injury Prevention	22	8	589-592		
2021	Fell, J C	The effectiveness of alcohol monitoring as a treatment for driving-while-intoxicated offenders: a literature review and synthesis	Traffic Injury Prevention	22	S1	S1-S7		
2021	Romosz, A; Scherer, M; Voas, R; Romano, E; Nochajski, T H; Taylor, E P; Brogdale M R; Manning, A R;	Understanding non-installers of the ignition interlock device: a qualitative analysis	Australasian Professional Society On Alcohol And Other Drugs	40		1083-1091	Drug And Alcohol Review	

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