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An Investigation of the Usefulness, the Acceptability and Impact on Lifestyle of Alcohol Ignition Interlocks in Drink-Driving Offenders

Douglas J. Beirness¹, Andrew Clayton² and Ward Vanlaar³
¹ Beirness & Associates Inc.
² RSN Associates LLP
³ Traffic Injury Research Foundation

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EXECUTIVE SUMMARY

Significant inroads have been made in the past two decades in the fight against drink driving. Many types of countermeasures have been developed and implemented. Despite the dramatic reduction in drink driving and the dramatic change in societal attitudes related to this behaviour, drink driving is still a significant cause of accidents and casualties.

One of the relatively recent countermeasures is the alcohol ignition interlock, a technological solution that prevents engine operation if a sample containing alcohol above a set level is provided by the driver.

This research project reviewed existing interlock programmes and examined the practical issues that arise from setting up and operating a programme that involved the use of this technology by convicted drink drivers. The report describes the technology, the existing interlock programmes and their effectiveness in reducing drink driving, and reports on the results of a longitudinal experimental research study carried out in the UK.

Many types of interlock programme for drink-drive offenders are currently in operation, mostly in North America. They range from discretionary to mandatory and vary as to the mandating authority. Participation rates are low (typically 10%, with the highest rate of 62% for one mandatory programme). Reconviction rates while on the programme are substantially lower, but this beneficial effect disappears once the technology is removed.

Experts advise that future programmes should enrol offenders as soon as the offence is committed and include counselling and rehabilitation in parallel. Tailoring the length of the programme to the individual is also advised, ideally basing this on the performance of that individual on the interlock programme.

The UK demonstration project examined the practicalities of setting up such a programme. It used interviews, focus groups and a longitudinal randomised control design to assess the impact of the interlock on drink-drive offenders and their families.

The UK stakeholders that took part in the interviews and focus groups reported interest in an interlock programme for drink-driving offenders as a programme with potential impact on the drink-driving problem, but also expressed some scepticism about the technology. Family members were particularly favourable to a measure seen as providing reassurance that the offender is not drink driving.

One hundred and eighty-three convicted drink-drive offenders who had attended Drink Drive Rehabilitation (DDR) courses in the two study areas (West Midlands
and Greater Manchester) were recruited for the longitudinal experimental part of the study. They were randomly assigned to either the interlock \((n = 89)\) or the control \((n = 94)\) group.

Service centres capable of installing and maintaining interlocks were identified and trained to provide the technical expertise required for the programme. Research team members were trained to collect data using a large battery of standard and custom-made measurement tools examining travel habits, alcohol consumption and attitudes.

The interlock group agreed to have the device installed in the car they used for a period of 12 months. During this time they were required to report to the interlock service centre at periodic intervals for routine maintenance and calibration of the device, and to download the data captured by the data recorder. At each service appointment, participants were engaged in an interview with a member of the research team. Following the initial interview at the time of interlock installation (i.e. month 0), interviews were scheduled to occur at six set-times during the 12-month interlock period. A final follow-up interview was scheduled to occur six months after the removal of the interlock device. Participants assigned to the control condition did not have an interlock installed but followed an identical schedule of interviews. Family members of the interlock clients were also interviewed at months 0, 7 and 18.

Questionnaire data revealed limited evidence of positive changes in drinking for both interlock and control group participants. This was also reflected in the interview data, in which many participants and family members reported a positive impact on the extent of drinking over the course of the study. Drinking remained an issue for many participants and their families. Although many reported drinking less, the reported consumption at the end of the study remained high relative to that of the general population.

Many participants struggled with their drinking. The interlock assisted them by providing a physical barrier to separate their drinking from their driving. Many attributed changes in their drinking to the interlock but it was not always clear whether the extent of their drinking was reduced or their patterns of drinking changed to accommodate the interlock (some may have ways to continue drinking without having to drive). This is reflected in the number of failed breath tests in the morning.

By itself, the interlock is unlikely to have a profound and lasting effect on well-entrenched drinking behaviours. Many believed the interlock was helping them with their drinking and that it provided a catalyst and the tool to facilitate behaviour changes. In many cases, more was required. Ongoing counselling and rehabilitation would be of tremendous assistance to interlock participants over the course of the interlock programme to help them in their struggle with alcohol.
Technical difficulties with the interlock device were reported on numerous occasions. These ranged from faulty equipment to complaints about the frequent number of re-tests, the inability to provide an adequate breath sample and the long warm-up time. It is possible to adjust the breath pressure and volume specifications required by the interlock to facilitate use by those with specific limitations. The number and timing of re-tests can also be adjusted in the software of the device.

Despite repeated complaints about the lengthy warm-up time and the number of re-tests required, most interlock participants found the device to be an acceptable instrument that had a beneficial impact. It was apparent that being able to drive was important to these individuals; for many, drinking was important as well. The interlock helped prevent the inevitable overlap between the driving and the drinking.

Several interlock participants (and family members) admitted to circumventing the device by having someone else provide a breath sample. The usual requirement to hum and then blow when providing a sample of breath was removed for this field trial. The hum-blow technique requires a good deal of practice to perfect, which effectively prevents an untrained bystander providing a breath sample to start the vehicle. It is recommended that the hum-blow requirement be included as a feature in any future interlock programme to restrict this type of circumvention. Alternatively, ignition interlock devices with photo-ID, which are now becoming available, could be used. This effectively allows a check on whether the breath sample was delivered by the offender (Robertson et al., 2006). An offence of soliciting or providing a breath sample on behalf of the driver to enable an interlock-equipped vehicle to start would reduce circumvention even further.

Interlock participants found the device useful in preventing subsequent drink-drive offences and reported its use as further support for their efforts to change their drinking patterns. However, similar effects were evident among the comparison group, and therefore an objective effect of the interlock cannot be inferred.

In interpreting the findings from this study, it must be recognised that the participants were self-selected volunteers who responded to a mail invitation. All had served a period of disqualification and had completed a DDR course. All were fully re-licensed. Participants were compensated for their time, travel and inconvenience. The installation of the interlock, its maintenance and de-installation were provided free of charge to participants. Hence, the findings may not be representative of those obtained from other drink-drive offenders who participate in interlock programmes under other circumstances, such as those who are mandated to participate and/or must pay for the interlock themselves.

Finally, should a UK programme be pursued, the challenges reported above need to be acknowledged and at least partly overcome. Accurate information from credible sources directed at key stakeholder and potential programme participants will be required to enhance knowledge and provide stakeholder support for the interlock programme.
1 INTRODUCTION

Significant inroads have been made in the past two decades in the fight against drink driving. Many types of countermeasures have been developed and implemented. Despite the dramatic reduction in drink driving and the dramatic change in societal attitudes related to this behaviour, drink driving is still a significant cause of accidents and casualties.

One of the relatively recent countermeasures is the alcohol ignition interlock, a technological solution that prevents engine operation if a sample containing alcohol above a set level is provided.

The current research project examined the practical issues that arise from setting up and operating a programme that involved the use of this technology by convicted drink drivers. This report describes the technology, the existing interlock programmes, their effectiveness in reducing drink driving, and reports on the methodology and results of a longitudinal experimental research study carried out in the UK.

1.1 The technology

1.1.1 Historical background

The development of a vehicle that could not be driven by someone whose ability to do so was impaired by alcohol has intrigued road safety professionals since the 1960s (Voas, 1970). The development of such a system, however, proved to be a considerable challenge. The search began in earnest in 1968 when the US Secretary of Transportation issued a report to Congress acknowledging the potential of an in-vehicle device that could prevent the operation of a vehicle by someone whose ability to do so was impaired by alcohol (US Department of Transportation, 1968). Two different approaches emerged:

- devices that assessed the degree of motor or perceptual impairment of the driver; and
- devices that measured the blood alcohol concentration (BAC) of the individual from breath samples.

Performance-based devices required the driver to perform a perceptual or motor task successfully before the vehicle would start. The rationale for such a system was that a driver who had consumed sufficient alcohol to impair performance on the task(s) was deemed too impaired to drive a motor vehicle. The types of task considered for these performance-based ignition interlock systems typically involved reaction time, tracking, hand-eye coordination, divided attention and/or short-term memory. Laboratory tests found that several of these tasks could discriminate between highly
intoxicated (i.e. BACs \( > 0.18\% \)) and alcohol-free subjects, yet none could successfully discriminate between subjects at mid-range BACs (i.e. BACs between 0.05 and 0.15\%).

To ensure that all drivers with a BAC over a specified value failed the test (thereby disabling the ignition), the performance criteria had to be set at a level that also eliminated a considerable number of individuals who had not been drinking or who had BACs lower than the threshold. Obviously, such a system would not be acceptable to the public since many individuals who had not been drinking would fail the test and would not be able to start their vehicles. Indeed, none of the performance-based interlock systems was even close to 100\% reliable in discriminating between drivers with zero or low BACs and legally intoxicated drivers. As a result of the high number of false positive rates associated with performance-based interlock systems, this type of device proved unviable.

Meanwhile, the availability of small and relatively low-cost integrated circuits and microprocessors greatly facilitated the development of small, accurate breath-testing devices and began to change the direction of alcohol interlock research. Although a breath alcohol-based interlock device had been considered in the early 1970s, the technology was not sufficiently advanced to make such a device feasible. By the early 1980s, virtually all research on alcohol interlock devices was focused on in-vehicle breath-test devices.

Interlock devices based on breath alcohol measurement proved considerably more reliable than performance-based systems, accurately discriminating between drivers with BACs above and below a specified threshold value virtually 100\% of the time (Frank, 1988). Technological innovations introduced over the years have contributed to the development of a reliable interlock device that prevents drinkers from driving and is difficult to circumvent.

1.1.2 Current alcohol interlock devices

Present alcohol interlock devices are based on the fundamental principle that every time an attempt is made to start the vehicle, the driver is required to blow into a small breath-testing instrument that is wired directly to the vehicle’s ignition system. If the device detects alcohol in excess of the threshold value, which can be set at different values, the vehicle will not start. The typical value in current use is 0.02\% (20 mg alcohol /100 ml blood).

The interlock device (Figure 1.1) consists of a control module, which is mounted under the dash, and a sample head into which the driver provides a breath sample when requested. Following a brief warm-up period, the driver must blow directly into a mouthpiece attached to the sample head. If the driver’s BAC is below a set level (usually set at 0.02\%), the control unit displays a message indicating that the vehicle can be started. If the BAC is over the set level, the control unit enters a short
ignition lock-out period and tells the driver to try again later. The driver is allowed to try again after five minutes. After five minutes, if the BAC is still over the set level, the control unit enters a long ignition lock-out period and the driver must wait 30 minutes before trying again.

Once the vehicle has been successfully started, the control unit will provide a visual and auditory signal indicating that a running re-test is required. The running re-test is programmed to occur on a random interval. The driver has 10 minutes to find a safe location to pull over and provide another breath sample. If this test reveals that the driver’s BAC is over 0.02%, the driver is instructed to park the vehicle and turn off the ignition. Failure to do so results in an auditory alarm being triggered. Failure to provide the re-test within the 10-minute window also triggers the alarm. At no time will the interlock stop the vehicle or turn off the ignition.

1.1.3 Standards for interlock devices

Established standards or guidelines for interlock devices exist in several countries (CENELEC, 2005; Electronics Test Centre 1992; NHTSA 1992; Standards Australia 1993). The National Highway Traffic Safety Administration (NHTSA) is currently in the process of updating the US guidelines and Transport Canada is developing a revised set of standards for Canada. The purpose of these various guidelines or standards is to ensure that interlock devices are reliable and valid, and to provide assurance to both the public and users that they perform as expected and desired. For example, the new generation of interlock devices have incorporated a sensor that is specific to alcohol (i.e. it eliminates positive readings that are false which are due to other organic hydrocarbons) and is capable of preventing ignition 90% of the time when the individual’s actual BAC is 0.01% higher than the threshold BAC.

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1 Transport Canada is also engaged in a project to develop standards for interlock programmes.
Even under extreme conditions (e.g. temperature of \(-40^\circ\text{C}\)), a person with a BAC of 0.06% would almost certainly be prevented from starting the vehicle 98% of the time.

Protection against potential circumvention of the device is also required by the standards. To meet these standards, interlock devices contain such features as temperature and pressure sensors (to guard against filtered or stored samples or samples introduced by mechanical devices), a data logger (to record all attempts to start the vehicle as well as the driver’s BAC), and a running re-test requirement (to guard against bystanders providing a sample as well as extended periods of idling).

These features have helped to create interlock devices that do exactly what they are intended and expected to do, i.e. prevent drivers impaired by alcohol from operating the vehicle in which it is installed.

1.2 Interlock programmes

The initial concept of an alcohol ignition interlock implied the universal application of the technology in every vehicle to prevent all impaired drivers from being able to operate a vehicle. Recent initiatives in both Sweden and the US have rekindled interest in this vision but it is acknowledged that a substantial investment of financial, political and intellectual capital will be necessary to make it a reality. As such, the primary use of interlock programmes remains as a means of short-term incapacitation for those convicted of a drink-driving offence.

When the first viable interlock device was introduced more than two decades ago, the technology was universally hailed as a technology with the potential to have a tremendous impact on the magnitude of the alcohol-crash problem. However, contrary to expectation, when interlock programmes were implemented, the technology was greeted with trepidation and programmes failed to flourish. The devices were considered expensive and relatively easy to circumvent. Media reports of isolated failures of some of the early devices served to create a general perception that interlocks did not work. The shackles of doubt have been difficult to remove. However, the technology has continued to evolve and the shortcomings of the first interlock systems were largely eliminated in subsequent generations of devices. In addition, evaluation studies began to show a promising reduction in repeat offences among offenders who participated in interlock programmes. More states began introducing legislation permitting the use of interlock devices for persons convicted of a drink-driving offence.

At present, nine Canadian jurisdictions and 44 American states have legislation that allows the installation of interlock devices in the vehicles of drink-drive offenders. Despite the large number of jurisdictions in North America with interlock programmes, participation rates remain low. It is estimated that there are currently about 70,000 interlocks in use throughout North America. Although this number is
substantially higher than it was even a few years ago, it pales in comparison with the estimated 1.6 million drivers charged with a drink-driving offence in North America every year.

Other countries (e.g. Sweden and Australia) have also initiated interlock programmes. In March 2002, a consortium of road safety research institutes in Europe completed a feasibility study regarding the implementation of alcohol interlock programmes as part of the EU drink-driving policies (Bax et al., 2001). In September 2003, the European Commission officially approved a field trial which began in the spring of 2004 (Vanlaar and Mathijssen, 2005).

Typically, less than 10% of eligible offenders participate in an interlock programme. The type of interlock programme, the degree of discretion and other drink-drive countermeasures play an important role in determining participation rates. For example, Voas et al. (2002) describe a judicial programme in Hancock County, Indiana, that coerces drink-drive offenders into installing interlocks by giving them a choice between participating in an interlock programme or jail (which is implemented by house arrest). Sixty-two per cent of offenders entered the interlock programme and this partial response resulted in significant countywide reductions in repeat drink-driving offences relative to six nearby comparison counties. In a voluntary programme in Quebec, offenders are offered a reduction in the length of the mandatory period of hard suspension (from twelve months to three) if they participate in the interlock programme for the remaining nine months. Over 20% of offenders choose the interlock programme – higher than the typical 10% but considerably lower than what might be considered an optimal level of uptake necessary to have a substantial impact on the alcohol-crash problem.

### 1.2.1 Types of interlock programmes

Interlock programmes involve more than just a breath-test device installed in a vehicle. They require an integrated set of activities and rules that specify eligibility, duration, monitoring, violations and other programme parameters such as re-test frequency, the use of emergency overrides, the threshold BAC and sanctions for violations. The structure of existing interlock programmes varies considerably.

Beirness and Simpson (2003) classified interlock programmes along two primary dimensions – the programme authority (either judicial or administrative) and the degree of discretion (mandatory or voluntary).

In terms of the programme authority, interlock programmes may be administered either by the courts (interlocks are ordered by a judge as a condition of probation for a drink-driving conviction) or by the agency responsible for driver licensing (interlocks are available as a condition of licence reinstatement).
The responsibilities of the programme authority include determining which offenders are eligible to participate in the interlock programme, monitoring participants, imposing sanctions for non-compliance and/or programme violations, and determining programme completion. In many US programmes, legislation governing interlock programmes places this authority with judges and the courts. Judges determine who should participate in the interlock programme and can require participation as a condition of probation. The advantage of placing the interlock programme in the hands of judges is that the courts have the power to impose alternative or additional sanctions for non-compliance or misconduct. The disadvantages are that many judges do not impose interlock restrictions on offenders – even when mandated to do so – and fail to follow-up with those who fail to comply with the order. In addition, the courts and probation systems are often ill-prepared to deal with the large influx of drink-drive offenders in a programme about which they typically know very little.

For all Canadian and for several US interlock programmes, responsibility rests with the driver licensing agency. These departments enforce the rules for obtaining and maintaining a driver’s licence and are set up to deal with large numbers of drivers and all types of licensing situations. With appropriate legislation and regulations, they can apply further licensing sanctions as required, but usually lack the same authority as the courts to impose the serious penalties for non-compliance.

Interlock programmes also differ in the level of discretion involved on the part of the offender and/or the programme authority. For example, some programmes require judges to order interlock programme participation for certain drink-drive offenders (e.g. repeat offenders); other programmes require participation as a condition of licence reinstatement. These are ostensibly non-discretionary programmes in which drink-drive offenders are required to participate. Other programmes allow a greater degree of discretion on the part of either the programme authority or the offender. For example, some programmes allow the judge to determine whether or not the offender should participate; others allow the offender to decide. In discretionary programmes, there is often an incentive for the offender to participate, such as a reduction in the period of licence suspension and a disincentive to drive while disqualified, such as vehicle impoundment.

The degree of discretion involved in getting offenders into interlock programmes is complicated by the fact that even when interlock programme participation is mandated by law, some judges will not order an offender to participate. For example, in a sample of California drink-drive offenders, DeYoung (2002) reported that just 10% of eligible offenders were ordered by the courts to install an interlock and only 22% of those complied, yielding a net participation rate of about 2.2%.

The classification of interlock programmes along the dimensions of programme authority and degree of discretion fails to cover all possible types of programmes. In fact, several programmes currently provide mixed approaches, including a judicial
option to order programme participation while allowing offenders the opportunity to elect the programme voluntarily. Others mandate interlock programme participation for repeat offenders and make it voluntary for first-time offenders. As interlock programmes mature, they need to evolve to meet the changing needs. In this context, as the benefits of interlock programmes become increasingly evident, there is a growing trend for interlock programmes to become increasingly less discretionary in an attempt to maximise participation rates.

1.2.2 Effectiveness of interlock programmes

Several studies have evaluated the impact of interlock programmes. Comprehensive reviews of the evaluation studies agree that interlock programmes have a beneficial impact on recidivism on those who participate (Beirness and Marques, 2004; Coben and Larkin, 1999; Willis et al., 2004). These reviews also agree that the beneficial effect dissipates once the interlock device is removed from the vehicle.

Table 1.1 summarises the results of the evaluation studies of interlock programmes. The impact of interlock programmes is evident by the large differences in repeat offence rates between interlock programme participants and non-participants. While the device is installed in the vehicle, the repeat offence rate among interlock programme participants is 37% to 90% lower than among a comparison group that does not have the device installed. The existing studies also clearly indicate that the reduction in recidivism among interlock participants is limited to the period of interlock installation. There is little, if any, residual effect in preventing impaired driving after the device is removed.

Importantly, these studies have examined a wide variety of interlock programmes. Despite the differences among interlock programmes and study designs, the predominant pattern of results indicates that interlocks effectively reduce the incidence of repeat impaired driving offences while installed in the vehicle. This demonstrates the overall robustness of the impact.

The fact that most studies show that re-arrest rates increase following removal of the interlock does not reflect on the efficacy of interlock programmes, nor should it be used to discount or discredit the beneficial effects of interlock programmes. First, it should be noted that, even though the recidivism rate among interlock participants following the removal of the interlock device matches that of drink-drive offenders who did not participate in the programme, the significant effect evident during the interlock period is not lost. For example, the three-year cumulative re-offence rate (minimum two years after interlock programme completion) for first-time offenders in the Alberta interlock programme was 15.3 offences per 1,000 drivers, compared with 43.8 for suspended drivers and 131.2 for drivers ineligible for the interlock programme (Voas, 2000). The five-year cumulative re-offence rate for repeat offenders who participated in the interlock programme is about half that of non-participants.
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Authors/year</th>
<th>Characteristics of population</th>
<th>Findings: recidivism with interlock</th>
<th>Findings: recidivism after interlock</th>
<th>Comparison group</th>
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<tbody>
<tr>
<td>California</td>
<td>EMT Group (1990)</td>
<td>First and multiple</td>
<td>Interlock 3.9%</td>
<td>Non-interlocks 5.9%</td>
<td>Suspended</td>
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<td>Cincinnati, Ohio</td>
<td>Morse and Elliot (1992)</td>
<td>First offenders over 0.20% BAC plus multiple offenders</td>
<td>Interlock 2.9%</td>
<td>Non-interlocks 8.4%</td>
<td>Suspended</td>
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<td>Oregon</td>
<td>Jones (1993)</td>
<td>Multiple offenders</td>
<td>Interlock 5%</td>
<td>Non-interlocks 8%</td>
<td>Restricted</td>
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<td>North Carolina</td>
<td>Popkin et al. (1993)</td>
<td>Second offenders</td>
<td>Interlock 2.7%</td>
<td>Restricted 7.1%</td>
<td>Restricted licence and suspended</td>
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<td>Alberta</td>
<td>Weinrath (1997)</td>
<td>Multiple offenders</td>
<td>Interlock 10%</td>
<td>Non-interlocks 25%</td>
<td>Suspended</td>
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<td>West Virginia</td>
<td>Tippetts and Voas (1997)</td>
<td>First and second offenders</td>
<td>Interlock 1.6%</td>
<td>Non-interlocks 6.4%</td>
<td>Licensed and suspended</td>
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<td>Maryland (random assignment)</td>
<td>Beck et al. (1999)</td>
<td>Second offenders</td>
<td>Interlock 2.4%</td>
<td>Non-interlocks 6.7%</td>
<td>Licensed</td>
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<tr>
<td>Alberta</td>
<td>Voas et al. (1999)</td>
<td>First and second offenders</td>
<td>(12 months) Interlock 0.1%</td>
<td>Suspended 2.23%</td>
<td>Suspended and ineligible</td>
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<td></td>
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<td>(24 months) Interlock 0.85%</td>
<td>Suspended 8.08%</td>
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<td>Ineligible 18.72%</td>
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<tr>
<td>Quebec</td>
<td>Vezina (2002)</td>
<td>First and repeat offenders</td>
<td>First (12 months) Interlock &lt; 0.5%</td>
<td>Suspended 2%</td>
<td>Suspended</td>
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<td></td>
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<td>Second (24 months) Interlock &lt; 2%</td>
<td>Suspended 6%</td>
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<td>24 months Interlock 4% Suspended 5%</td>
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<td>36 months Interlock 4% Suspended 7%</td>
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(continued)
A criticism of existing evaluation studies concerns low participation rates and the problem of recruitment or selection into interlock programmes. In general, only a small portion of eligible driving while intoxicated (DWI) offenders (generally less than 20%) choose to participate in an interlock programme relative to those who remain fully suspended (Voas et al., 1999). This suggests that interlock programme participants might differ on one or more critical dimensions from those who elect to remain suspended (e.g. desire or need to drive, financial resources, etc.), factors that might affect re-offence rates.

Accordingly, whether participants volunteer for the interlock programme or participate as a result of a judge’s order, the process of selecting interlock participants may result in a bias that favours those with a lower likelihood of recidivism. Hence, it is important to consider that the lower rates of recidivism among interlock participants observed in evaluation studies may not be attributable to the programme but rather to differences in the characteristics of those who do, and those who do not, participate in interlock programmes.

A factor that argues against the possibility that self-selection bias accounts for the observed effect of interlock programmes is the similar reoccurrence rates among programme participants and non-participants after the interlock is removed. Even though the interlock and control groups may differ on a number of dimensions, they would appear to be comparable on the most critical dimension, i.e. the likelihood of recidivism.

The self-selection problem is overcome in evaluation studies through the use of a random assignment protocol. Only one study has been able to assign participants to an interlock programme randomly (Beck et al., 1999). By assigning offenders from a common pool to either an interlock programme or control condition, this design ensured comparability of the groups. The results and recidivism rates from this more
tightly controlled design were similar to the findings of studies in which participants were self-selected, or ordered by a justice to install an interlock device. This suggests that the differences in recidivism are attributable to the interlock programme and are not just a consequence of differences in the characteristics of participants.

In summary, differing types of evidence have consistently shown a strong beneficial impact of interlock programmes, at least while the device is installed. Once the device is removed, the recidivism rates among interlock participants generally do not differ from those of DWI offenders who do not use the interlock. If there remains an expectation and desire for this beneficial effect of interlock programmes to persist after the device is removed, then every effort must be made to change the individual’s behaviour – particularly the frequency and extent of alcohol consumption – during the period that the offender is under the control of the interlock programme. Failing to change the behaviour, we must find ways to limit their unmonitored driving.

Research is continuing to evaluate various interlock programmes. Willis et al. (2004) emphasised the need to conduct further random controlled trials to eliminate the potential confound of selection bias and provide further evidence to strengthen the evidence of a beneficial impact of interlock programmes. In addition, it will be necessary to demonstrate that interlock programmes have an impact beyond reduced recidivism and can effect reductions in alcohol-involved crashes. This will require more widespread participation in interlock programmes by a wide range of drink-drive offenders.

1.2.3 The future of interlock programmes

Interlock programmes continue to evolve. Many jurisdictions that initially introduced a voluntary or discretionary programme have made participation mandatory, particularly for repeat offenders. Higher participation rates as a result of non-discretionary programmes will most likely enhance the beneficial impact of interlock programmes. However, without further enhancements, interlock programmes will remain a form of temporary incapacitation for the period of time that the device is installed in the offender’s vehicle. Interlock programmes can be improved to reduce the re-offence rate after removal of the device.

First and foremost, the perceived objective of interlock programmes must change from one of simple punishment and incapacitation to one that incorporates rehabilitation. In the absence of a change in drinking behaviour, many drink-drive offenders will return to their previous pattern of drink driving within a short period of time after the interlock is removed. Simply participating in an interlock programme can not be expected to change drinking patterns. However, the period of interlock programme participation provides the opportunity to engage the offender in an educational and therapeutic process that can have a beneficial impact on
patterns of alcohol consumption. Alternatively, the interlock can be viewed as an adjunct to treatment, to ensure that relapses do not result in a subsequent drink-drive offence.

Marques et al. (2000) reported results from such a therapeutic intervention in a two-city comparison in which interlock offenders in Calgary, Alberta, received an adjunctive intervention during each monthly visit to the interlock service centre. The comparison group was comprised of offenders in Edmonton who did not receive the intervention. The intervention was a composite of motivational enhancement, pragmatic counselling and anticipatory planning for life after the interlock (Marques et al., 1998). Among those in the intervention site, a 50% reduction in recidivism rates of first offenders relative to the first offenders in the comparison group was found during the first 12 months after the interlock was removed; no comparable effect was documented for multiple offenders. The findings suggest that behaviour can be affected at least temporarily to forestall the return to impaired driving after the interlock period.

A more systematic and fully specified intervention protocol that involved a motivational enhancement intervention for interlock offenders was developed and introduced in Texas. In this case, the sentencing judges require the offender to install the interlock and to attend the Support for Interlock Planning programme (Timken and Marques 2003). The intervention combines 12 hours of services delivered in both group and individual session formats. The group component of this study involves the first time interlock offenders being brought together for group sessions. Intermediate indicators from pre-post-survey instruments show significant changes in drinking level and drinking consequences following the intervention. Anecdotal reports suggest that this pragmatic model of reconsidering the costs and benefits of drinking and driving appeals to the offenders.

It has often been suggested that the impact of interlock programmes could be enhanced by simply extending the duration of the interlock programme. Alternatively, rather than subject all offenders to a longer period of interlock installation, the term could be extended for those interlock participants who are at highest risk of a repeat offence. The ideal criterion for removal would be when participants can demonstrate that they no longer need the interlock to control their drink-driving behaviour. Objective standards could be developed based on the data from the interlock recorder.

Recent evidence has shown that interlock participants at highest risk of a repeat drink-drive offence after the device is removed can be identified by the rate of elevated interlock tests during the first several months of interlock use. This was first documented in Alberta from the data of 2,200 offenders who provided 5.5 million BAC tests (Marques et al., 2001) and subsequently confirmed in Quebec with 7,200 offenders based on 18.8 million breath tests (Marques et al., 2003a). The rate of interlock BAC tests above 0.02% (20 mg/dL) of all tests taken strongly predicts the
likelihood of a repeat drink-drive offence. Positive BAC tests were a better predictor than other known factors related to recidivism, such as prior offences, moving violations, driving while suspended charges, as well as demographic and questionnaire-based information.

Further analyses of both the Alberta and Quebec data confirmed that the occurrence of elevated tests during the morning hours adds substantially to a predictive model for future drink-drive offences. While the overall highest number of BAC tests taken occurs in late afternoon around 5 pm, the highest number of tests with BAC $\geq 0.02\%$ occurred between 7 am and 8 am on Monday through to Friday mornings. Elevated BACs at this time are indicative of drinking the previous night and are unobtrusive indicators of a pattern of heavy drinking. Knowing which offenders logged two or more elevated BAC test results during the morning hours strengthened the predictive model by another 45% after accounting for all other factors (Marques et al., 2003b, 2003c), including prior DWI status.

1.3 Current state of the art

Tremendous time and effort were invested in the development of interlock technology to the point where a number of reliable devices with adequate anti-circumvention features are commercially available. They utilise state-of-the-art electronics to ensure that drivers with a BAC above the specified threshold value will be unable to start the vehicle, while at the same time allowing legitimate use of the vehicle by non-drinking drivers. Evaluation studies clearly demonstrate beneficial effects associated with interlock programmes. Yet, significant challenges remain for interlock programmes.

Despite the growing body of evidence supporting the use of interlock programmes as an effective drink-drive countermeasure, there is a somewhat paradoxical hesitation to implement and/or expand interlock programmes. To some extent, the reluctance to embrace interlock programmes reflects a legacy of past failures. In the course of the evolution of interlocks, many lessons were learned through field trials. The media was quick to pick up on the failures and limitations of early interlock devices. Some of these stories have become almost legendary. Some media reports highlighted the relative ease with which drivers could circumvent the early interlock devices, creating the widespread impression that ‘interlocks do not work’. Although government guidelines have specified, and interlock manufacturers have introduced, numerous features into the current generation of devices to significantly reduce the possibility of circumvention (e.g. temperature and pressure sensors, event recording and running re-tests), the legacy of past failures lives on and serves as the basis of a belief system that is difficult to change.
2 OVERVIEW OF THE RESEARCH STUDY

The present project is a demonstration project investigating the practical issues that would arise from the set up and operation of an interlock programme in the UK. The objectives of the project were as follows:

1. To examine the practicalities of installing and maintaining the interlock technology within a group of drink-driving offenders.

2. To highlight any operational issues derived from this and recommend ways to avoid or overcome these issues.

3. To evaluate the impact of having interlocks fitted to the drink-driver’s car, in terms of the driver’s attitudes towards drink driving and other unsafe driving behaviours, the changes to the user’s driving style and general lifestyle, and the associated changes this brings to the driver’s family.

4. To investigate the acceptability of the interlock technology to the driver and their family, and to monitor car usage and any attempts to tamper with the technology.

5. To examine changes in the above variables throughout the duration of the study.

The design of the project involved a longitudinal comparison of a group of drink-drive offenders who participated in an ignition interlock programme with a comparable group of drink-drive offenders who did not participate in the programme. Interlock programme participants were monitored for the 12-month duration of the interlock programme and follow-up occurred six months after the conclusion of their participation. Control group participants were monitored over a comparable period of time.

The three-part study examined the practicalities and social aspects of participation in an alcohol ignition interlock programme, and the impact on the lifestyle of users and other household members as a result of having an interlock installed in the family vehicle.

Phase I consisted of a series of interviews and focus groups with drink-drive offenders, their families, local officials (e.g. the police, crown prosecutors and magistrates) and other interested parties to determine their thoughts, perceptions, beliefs and expectations of an alcohol ignition interlock programme. In addition, the background work to set up an interlock programme in two cities was carried out.

Phase II involved the development and implementation of a demonstration ignition interlock programme in which a group of drink-drive offenders installed and used an alcohol ignition interlock device for a period of up to 12 months. A comparison group of drink-drive offenders who did not participate in the interlock programme were identified and monitored over the same period of time. Both groups attended
periodic interviews and completed a series of questionnaires both during and after the interlock period to assess the social, behavioural and lifestyle impact of participation in an ignition interlock programme. The assignment to groups was random.

Phase III involved follow-up interviews with programme participants and their immediate families to assess the overall impact and value of the programme.

A summary of the methodology and findings from each of the three phases of the project is included below. The findings of the three phases combined with the evidence reviewed in the introduction to this report lead to the overall study conclusions reported in Section 6.
3 PHASE I: PRELIMINARY ASSESSMENT

The purpose of Phase I of the study was:

• to conduct interviews with key stakeholders to garner a preliminary assessment of the general perception of, and response to, interlock programmes;
• to conduct focus groups with convicted drink drivers and family members to assess their reactions to the conviction and the possibility of using an interlock;
• to select and set-up interlock service facilities;
• to develop the operational specifications for a demonstration interlock programme;
• to determine the procedure for recruiting participants; and
• to determine the procedures for data collection.

3.1 Results

3.1.1 Interviews with key stakeholders

Interviews were conducted with several individuals and groups with an interest in drink-driving issues, including the Parliamentary Advisory Council for Transport Safety (PACTS), the Automobile Association Motoring Trust, the Magistrates’ Association Road Traffic Committee, the South West Senior Traffic Officers Committee (police), individual officers from West Midlands Police and Greater Manchester Police, and the British Beer and Pub Association. The overall intent was to assess the level of knowledge about ignition interlock programmes and to obtain their thoughts, opinions, beliefs and expectations of such programmes.

The major issues raised by participants at all the meetings surrounded circumvention of the device, tampering and cost. The same questions were raised by virtually all participants, for example, ‘Can’t someone else simply blow into it?’, ‘How easily can it be disconnected?’, ‘How much does it cost?’ and ‘Who pays for it?’.

Circumvention of the device remains a key concern. However, most were unaware of the numerous features built into the device to discourage and prevent circumvention.

There was an assumption that the interlock breath alcohol threshold would be set at the legal limit so that users would be prevented from repeating the offence but would not be prevented from more modest levels of consumption. Most were pleasantly surprised to learn that the threshold value (20 mg/dL blood) was
considerably lower than the legal limit for driving – effectively preventing driving after more than a single drink.

Many were of the opinion that the target group for a mandatory interlock programme should be high risk offenders. This includes those disqualified twice within 10 years for any drink-drive offence, those disqualified for having a proportion of alcohol in the body two and a half, or more, times the legal limit, and those disqualified for failing without reasonable cause to provide a specimen for analysis.

Participants were not necessarily opposed to interlocks being applied to first-time offenders but thought it could perhaps be restricted to those with high BACs. The idea that interlocks should be made available on a voluntary basis to parents to help ensure that their teenage children did not drink and drive was raised on several occasions. Enthusiasm for this idea diminished when participants learned that all users of the vehicle would have to use the interlock once it was installed in the vehicle.

Some thought an interlock programme could be offered to certain offenders as a means to reduce the length of their licence disqualification, much as is the case with the current Drink Drive Rehabilitation (DDR) scheme.

### 3.1.2 Focus groups with convicted drink drivers

Four focus groups with drink drivers and four family in-depth interviews were conducted. All participants were recruited using local DDR course providers. The sessions were designed primarily to assess drink-drive offenders’:

- knowledge of ignition interlock programmes; and
- thoughts, opinions, beliefs and expectations of such programmes.

It also examined family members’:

- views on the impact the conviction and penalties had had on them; and
- their views on, and support for the installation of the interlock device since they, too, would have to use the interlock if they were to drive the vehicle in which it was installed.

In addition, the sessions were used to gather feedback regarding some of the materials to be used in the study for recruitment, data collection and the retention of participants.

The majority of drink-drive offenders interviewed were men but women were well represented in most groups. The age ranged from early 20s to early 70s. Most
acknowledged that they had been drink driving for many years, often without knowing they were over the limit.

The discussions began with participants’ description of the circumstances and events surrounding their most recent arrest for drink driving. Some admitted driving while knowing that they were over the limit; many did not believe that they were at significant risk.

The disqualification from driving was by far the most difficult element of the penalty to cope with and manage. Respondents reported loss of:

- jobs;
- earning opportunity;
- status; and
- the trust of those most important to them (typically a partner or family member).

This had caused most respondents a great deal of difficulty. Anything that might reduce the ban period would be welcomed by most respondents. A significant proportion stated that they would have been prepared to pay thousands of pounds to avoid a ban, such was the importance of having a car and driving. Reduction in the period of disqualification was a major factor in encouraging offenders to register for the DDR courses.

The impact of the conviction had varying effects across the sample. For most, the ban was the most significant burden. Other specific impacts included:

- loss of employment;
- being denied promotions;
- the inconvenience to themselves and others;
- loss of income;
- loss of status/respect;
- the stigma of being labelled a drink driver and a criminal; and
- loss of trust.

To a large extent the thoughts, views and opinions expressed in the family interviews reflected those in the focus group sessions. The hardship associated with the disqualification was a prominent concern. Family members, particularly the spouse, were put in the position of having to act as chauffeur.

The social embarrassment and stigma placed families in a very stressful situation. Respondents reported difficulties in relationships with their wives (confirmed by the
wives as well) as a result of the drink-drive conviction. Others reported struggling with the task of explaining to their children why they could not drive any more. It was apparent that the impact on family dynamics could be profound and long lasting.

Family members were acutely aware of the financial impact of the conviction. The fine, rehabilitation course, additional transportation expenses and increased insurance were all an unexpected – and unwelcome – drain on the household budget. The social stigma cast a shadow over the entire family. The only thing worse than being labelled a drink driver was being known as the family member of one.

Loss of trust was also a prominent issue. This, too, created difficulties in the family dynamic. This loss of trust is expected to continue after the period of disqualification is over.

It was apparent from the discussions that very few respondents had any knowledge of alcohol interlock programmes. However, the majority were strongly in favour of such a device. Across the sample there were three general levels of response:

- **Strong supporters/advocates.** These respondents argued that the interlock should be fitted as ‘standard’ in all new cars. This, they argue, would ensure that all drivers kept within the law for drink driving, and would save lives and serious injuries much in the same way as antilock braking systems (ABS) and airbags do. These respondents were in the minority, albeit vocally so.

- **Supporters.** By far the largest group, these respondents saw the device as highly beneficial through a shorter period of disqualification, by being able to check if one is under the limit, and in helping to re-earn the trust that has been lost.

- **The cynical.** Cynicism about the device was expressed by a significant minority about the ability to circumvent the device or simply use another vehicle.

The interlock itself generated a great deal of interest, with many questions asked about its cost, operation, installation and maintenance. Some respondents, particularly the more guilt ridden, expressed interest in having it as a permanent fixture in their car and all were willing to accept it for a period if it meant their ban would be shorter.

Participants also provided extremely valuable feedback on the draft recruitment letters, some of the questionnaires to be used, and the incentive they would expect in order to participate in a study of this nature (where the usual reduction in the disqualification period did not apply).
3.1.3 **Selection and set up of interlock service facilities**

The two basic requirements for the service centre to be used in the study were:

- the availability of auto-electric/auto-electronic expertise that would enable installation and servicing of the interlock device; and
- the availability of suitable on-site space in which project participants could be interviewed in some degree of privacy during the installation, removal or servicing of the interlock device.

The geographical location of the service centre also needed to allow for a sufficient number of offenders residing within an accessible area.

In the initial stages of the project, it had been thought that one service centre in Bristol would be sufficient. As the investigation proceeded, it became clear that additional sites, servicing larger catchment areas, would be required. Eventually, two adequate service centres were located – one in Smethwick in the West Midlands, the other in Pendlebury in Greater Manchester. The service centre in Bristol (Yate) was not used in the study.

3.1.4 **Development of the research interlock programme**

The interlock device to be used in the research was the Guardian Interlock WR2 (see Figure 1.1). This device meets or exceeds the performance and reliability criteria specified in the standards required by the National Highway Traffic Safety Administration and the Alberta Research Council. These standards not only specify the tolerance thresholds for the measurement of alcohol but also outline criteria for protection against tampering and circumvention. The device has also proven to be a reliable performer in numerous interlock programmes throughout North America, Sweden and Australia over the past 15 years.

The following settings for this machine were agreed after discussions with Department for Transport officials:

- the level of alcohol at which the interlock system is activated was set at the equivalent of 20 mg alcohol/100 ml blood;
- an emergency override switch was provided;
- participants had a 10-minute grace period in which to find a suitable location to pull off the road and provide a breath sample for the random running re-test;
- in the event of a failed running re-test, participants were asked to call a freephone interlock support number (available around the clock) to discuss the

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2 At the time that this research was undertaken, neither the CENELEC (European Committee for Electrotechnical Standardization) nor the British Standards were in force.
situation and determine whether an early recall to the service centre was appropriate; and

• if the scheduled Service Due Date is passed, then permanent lockout would occur five days later.

It should be noted that the usual requirement to use the hum and blow technique to provide the breath sample for the interlock was disabled for this project, with only a breath sample required. The hum and blow technique requires considerable practice and effectively prevents untrained bystanders from providing a breath sample to start the car.

The participants and their family members who were likely to use the car fitted with an interlock were trained in its use and were made aware of the settings listed above.

3.1.5 Recruitment of participants

The initial recruitment strategy was to use the Driver and Vehicle Licensing Agency (DVLA) database to identify repeat drink-drive offenders (with the offences committed within 10 years of each other) who were within six weeks of being able to reapply for their driving licence following disqualification. A search of the DVLA database for this information was conducted to provide numbers of possible initial contacts in an area of 30 miles from the two interlock service facilities at Yate and Smethwick.

The DVLA were provided with the appropriate number of sealed stamped envelopes at the beginning of each calendar month. The address labels that resulted from the database searches would be attached and mailed directly by staff at the DVLA, thus ensuring the anonymity of potential participants. The first tranche was mailed out in August 2004.

The recruitment letter provided three response options to those willing to volunteer to the study:

• an e-mail address direct to the research team;
• a reply slip to the research team (using freepost); and
• a freephone number staffed 12 hours per day (Monday to Friday).

The objective of the call centre staff was to obtain the agreement of the caller to an interviewer visiting them to explain the project in more detail, answer any further questions and formalise their participation to the study.

The recruitment of participants through the DVLA proved unsuccessful and an alternative approach was used thereafter. A list of offenders who had attended a DDR course provided by one large organisation operating in the two study areas was
used for recruitment purposes. The use of names and addresses from this provider was possible because they were held on a computerised database of course participants who had previously agreed in writing to allow their name and address to be used for research purposes.

3.1.6 Data collection

The offenders who volunteered for the study were required to attend several interviews and complete a variety of questionnaires over an 18-month period. The list of instruments used, and the frequency with which they were administered, differed according to group membership (control or interlock group). The family members of those participating were also asked to complete a few instruments.

For the interlock group, the following instruments were selected for administration at various stages of the programme:3

- Alcohol Use Disorders Identification Test (AUDIT)* – interview format.
- Bi-monthly interview – interview format.
- Family Transport Issues – interview.
- Expectations about Interlocks – self-completion.
- Drinking diary* – self-completion.
- Driver Behaviour Scale* – self-completion.
- Social Motivation Scale* – self-completion.
- Demographics – interview format.
- Thoughts About Drinking* – self-completion.
- Technology Acceptance Questionnaire – self-completion.
- Personal Style 1* – self-completion.
- Personal Style 2* – self-completion.
- Research Institute on Addictions Self-Inventory (RIASI)* – self-completion.
- Driving Style.*

In addition, volunteers assigned to this group were required to attend their interlock service facility after the initial 30 days and every two months thereafter. At each

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3 Questionnaires marked with an asterisk are standard instruments; others were specifically designed or substantially modified for the study.
visit to the service centre, the following data were downloaded from the interlock data recorder:

- number of miles driven since the last service;
- number of attempts to circumvent the system;
- number of vehicle starts;
- total number of breath tests;
- number of passed breath tests (i.e. BAC < 20 mg/100 ml);
- number of failed breath tests (i.e. BAC > 20 mg/100 ml);
- number of failed breath tests with high BAC (i.e. > 40 mg/100 ml);
- missed re-tests;
- failed re-tests;
- start violations (i.e. vehicle starts without a breath test); and
- use of the emergency override.

For the comparison group, the following instruments were selected for administration at various stages of the programme:

- AUDIT – interview format.
- Bi-monthly interview – interview format.
- Family Transport Issues – interview format.
- Drinking diary – self-completion.
- Driver Behaviour Scale – self-completion.
- Social Motivation Scale – self-completion.
- Demographics – interview format.
- Thoughts about Drinking – self-completion.
- Personal Style 1 – self-completion.
- Personal Style 2 – self-completion.
- RIASI – self-completion.
- Driving Style.

For family members, the following instruments were selected:

- AUDIT – interview format.
- Bi-monthly interview – interview format.
• Drinking diary – self-completion.
• Social Motivation Scale – self-completion.
• Expectations about Interlocks – self-completion (interlock group only).

Further details about each of the instruments selected are contained in the detailed report on Phase II of the project.
4 PHASE II: DEMONSTRATION INTERLOCK PROGRAMME

4.1 Purpose

The primary purpose of this phase of the project was to provide a group of 100 drink-drive offenders with the experience of participating in an alcohol ignition interlock programme. A group of 100 drink drivers who did not have an interlock installed were used as a comparison group. This required the development and implementation of a demonstration ignition interlock programme in the selected communities. The specific objectives were:

- to examine the practicalities of installing and maintaining the interlock technology within a group of drink-drive offenders;
- to highlight any operational issues derived from this and recommend ways to avoid or overcome these issues;
- to evaluate the impact of having interlocks fitted to the drink-driver’s car, in terms of the driver’s attitudes towards drink driving and other unsafe driving behaviours, the changes to the user’s driving style and general lifestyle, and the associated changes this brings to the driver’s family;
- to investigate the acceptability of the interlock technology to the driver and their family, and to monitor car usage and any attempts to tamper with the technology; and
- to examine changes in the above variables throughout the duration of the study.

4.2 Method

A longitudinal, experimental study design was used. A sample of 183 convicted drink drivers who were eligible to apply to have their driver’s licence reinstated were randomly assigned to either the interlock \( n = 89 \) or to the control \( n = 94 \) group. The interlock group agreed to have the device installed for a period of 12 months. During this time they were required to report to the interlock service centre at periodic intervals for routine maintenance and calibration of the device and to download the data captured by the data recorder. At each service appointment, participants were engaged in an interview with a member of the project team. Following the initial interview at the time of interlock installation (i.e. month 0), interviews were scheduled to occur at predetermined intervals throughout the 12-month interlock period (corresponding to months 1, 3, 5, 7, 9 and 12). A final follow-up interview was scheduled to occur at month 18, six months after the removal of the interlock device. Participants assigned to the control condition did
not have an interlock installed but followed an identical schedule of interviews. Family members of interlock clients were also interviewed at months 0, 7 and 18.

### 4.2.1 Recruitment

Respondents were recruited from those who attended a Drink Drive Rehabilitation (DDR) course in the two areas included in the study. The response rate was low. From almost 1,800 letters mailed out, about 300 responses (17%) were received. Of these, just over half eventually enrolled on the programme.

### 4.2.2 Interlock service centres

Service centre technicians were trained in the installation of interlock devices by personnel from the interlock provider. Other service centre personnel and project staff were trained in the use of the interlock software system at the same time by a representative of the interlock provider. The computer software was used to upload/download information between the interlock device and the secure website that kept a log of all the data recorded by the device. Project staff were also trained to use the interlock device and to train participants to use it.

### 4.2.3 Data collected

Participants attended an interview and completed various questionnaires each time they brought their vehicle in to the service centre to have it calibrated and serviced. Comparison group participants followed a similar schedule of interviews and questionnaires. These questionnaires (described in detail in the Phase II report, internal document) examined demographic characteristics, drinking patterns and problems, driving behaviour, family transportation issues, expectations about interlocks, acceptance of technology, social desirability, and impulsiveness. In addition, at each visit there was a brief interview with a member of the project staff to discuss problems or difficulties (if any) with the interlock, life changes and the impact of the interlock on lifestyle.

A key feature of the interlock device is the ability to record a series of events associated with its use. These data include the date, time of day, vehicle starts, trip duration, breath alcohol readings, re-tests, missed re-tests, use of the override, etc. These data provide an invaluable record of the use of the interlock and drinking behaviour. In particular, the breath-test results offer a unique diary of alcohol use in relation to driving. Each time the interlock device was brought in for regular maintenance, these data were downloaded to a database for subsequent analysis. In addition, key events on the record were flagged and printed along with the 10 preceding and 10 subsequent interlock events. This list was provided to interviewers to review with clients. Clients were asked about the circumstances surrounding significant events on the record – particularly breath-test results that prevented the participant from operating the vehicle. This allowed interviewers the opportunity to
get a more complete and comprehensive picture of the events surrounding the occurrence.

4.2.4 Data analysis

The overall objective of the data analysis was to determine the extent to which the experience of having an ignition interlock installed in one’s vehicle for an extended period of time (i.e. up to 12 months) had an impact on the attitudes, behaviours and overall lifestyle of users and their immediate family members. The vast amount of quantitative and qualitative data collected from participants over the course of the study was searched for evidence of (positive) lifestyle changes that could be attributed to the use of the interlock. In addition, reactions to, and experiences with, the interlock were key areas for detailed examination of the data.

4.3 Results

4.3.1 Demographics of the sample

Participants reflected the typical demographic characteristics of drink-driving offender populations (e.g. Wanberg et al., 2005). The overwhelming majority of participants in both the interlock and control groups were men. All age groups were represented, with most participants being between the ages of 25 and 44. Just under half (41%) of all participants were single, with an almost equal proportion living in a relationship with a partner, i.e. either married (23%) or common law (16%).

Almost half (48%) of participants indicated that they were employed part-time and only 12% said they worked full-time; another 16% were self-employed. One in 10 were unemployed and 7% were retired. Despite the fact that almost half of the participants worked only part-time, 75% reported that they were the chief income earner in the household.

Among those who reported having at least one drink in the previous week, the quantities of alcohol consumed ranged from 2 to 200 units of alcohol, with a mean of 32 units per week. Seventy-nine per cent of male participants and 55% of female participants exceeded the sensible drinking guidelines.

Three-quarters of all participants had AUDIT (Alcohol Use Disorders Identification Test) scores in excess of 8 – any score above this threshold is considered to represent hazardous or harmful drinking. The average AUDIT score was 12.2.

On the basis of self-report, 82% of all participants were first-time offenders, 11% had been convicted of a prior offence within the previous 10 years and 6% had a prior conviction more than 10 years ago.
There were few differences between interlock and control group participants, indicating that the random assignment procedure was successful in creating interlock and comparison groups that were demographically similar with comparable drinking patterns.

4.3.2 Attrition

Of the original 89 interlock participants, 39 (43%) failed to complete the full 12 months. This includes three who completed the initial interviews but never returned for installation. Overall, 64% of withdrawals from the study occurred within the first three months of having the interlock installed. The main reasons given for early withdrawal were ‘technical problems’ with the device, the annoyance associated with having to provide a breath test at every start and the frequent re-tests. For some, the interlock simply interfered too much with their lifestyle, i.e. their ability to drink and drive. One participant disconnected the device and was subsequently arrested for a drink-driving offence.

Of the 94 participants in the comparison group, 11 (12%) withdrew before the end of 12 months. In contrast to the interlock group, all but one of the 11 withdrew following month 5. Two were reconvicted of a drink-drive offence; two others died during the course of the study. The others withdrew for personal reasons.

4.3.3 Changes over time

It was expected that any positive change in participants over the course of the study was most likely to occur among those in the interlock group. This change may be evident in terms of their attitudes towards interlocks, their driving behaviour, their acceptance of technology, and the extent and pattern of their alcohol use.

To test this hypothesis, several regression analyses were run, using change scores between a particular variable measured at the start of the project and in month 12. Demographic variables including gender, age, marital status, employment, occupation, ethnicity and recidivism status were also entered in these models as control variables in order to estimate the influence of group membership.

Few personal variables showed any significant difference in the extent of change between the interlock and comparison groups over the course of the 12 months. In terms of driving behaviour, controls were found to have a 70% greater chance to have improved their self-reported driving behaviour compared with interlock clients. However, the difference was not significant ($p = 0.25$). Change in the number of days in the past month on which the respondent had a drink differed between the interlock and comparison groups. Controls were more likely to report fewer days on which they had a drink after month 12 compared with month 1.
4.3.4 **Interlock recorder data**

Data from the logger contained in the interlock was a valuable source of information on potential drink-driving behaviour. Key events included:

- stationary fail – breath sample with BAC > 20 mg/100 ml when starting the vehicle;
- start violation – starting the vehicle without providing a breath sample (e.g. hot wiring the vehicle);
- missed re-test – failure to provide a breath sample within 10 minutes of a re-test request; and
- failed re-test – breath sample with BAC > 20 mg/100 ml.

Over 90% of the recorded key events were stationary fails. Most participants (66%) had fewer than three stationary fails per month. A quarter had an average of three to ten stationary fails per month. The highest was 47 (approximately 1.5 stationary fails per day).

There were 328 recorded BACs over 80 mg/100 ml corresponding to 172 potential trips. (Not every high BAC was a potential trip because participants often tested themselves repeatedly after failing the first attempt.) Typically, these events occurred during the early months of the project, during the morning (9 am to 1 pm) and on weekends.

4.3.5 **Circumvention of the interlock**

Attempts to circumvent the interlock were not uncommon. Several participants reported having had someone else provide a breath sample so they could start the car. Some did so only on a single occasion for a specific reason; others did so frequently.

It should be noted that the usual requirement to provide the alcohol breath sample using the hum and blow technique was disabled for this project, with only a simple breath sample being required. As the hum and blow technique requires considerable practice, it is an effective means of preventing untrained bystanders from providing a breath sample.

Other potential circumventions were less frequently observed. Push starting the vehicle was noted on two occasions, ostensibly to get the car to the service centre. Use of the emergency override, which is intended for use in genuine emergencies only, was recorded on several occasions. Sometimes the ‘emergency’ was simply ‘needing to use the car’.
4.3.6 Experiences with the interlock

Interviews with interlock participants at each service interval provided a wealth of information about individual reactions to, and experience with, the interlock. The most commonly reported issues can be divided into six categories:

- the ‘morning after’ effect;
- warm-up time;
- embarrassment;
- rolling re-tests;
- invalid samples; and
- other technical problems.

These six categories are defined as follows:

1. **The ‘morning after’ effect** – this refers to a failed breath test the morning after a night of drinking. Many participants simply did not understand the length of time required to eliminate all the alcohol from the body. Alternatively, they may not have realised how high a BAC they had attained the night before. In any event, many participants were surprised at being unable to start the vehicle the morning after. The frequency with which the ‘morning after’ effect was mentioned by participants speaks volumes about the quantity of alcohol consumed by these individuals. The data leave little question about the extent to which drinking continues to be a significant issue in the overall rehabilitation of drink-driving offenders. In the absence of the interlock, most would not recognise the apparent magnitude of their BAC after drinking and the extent to which a night of drinking can impact on activities the following day. For many of the interlock group, it was a wake-up call and prompted some responsible strategies for solving the problem.

2. **Warm-up time** – participants were advised to remove the sample head from the vehicle and store it in the house or other warm place to minimise the length of the warm-up time. Nevertheless, about a quarter of the interlock group commented on the warm-up time. The delay was estimated at 5–10 minutes; a critical amount of time for many people first thing in the morning.

3. **Embarrassment** – a few participants commented on the embarrassment caused by having to wait in a public place (e.g. a petrol station or work car park) for the device to warm up or to simply provide a valid sample.

4. **Rolling re-tests** – one of the anti-circumvention features built into the interlock device is the requirement for repeated random breath tests (rolling re-tests) after the vehicle has been started. About 15% of participants commented on the rolling re-tests. The main issues were the frequency of these re-tests and the ability to provide a sample safely in traffic. Although the manual clearly states
that drivers should pull over and stop before providing a re-test, several participants admitted providing a re-test while driving.

5. **Invalid samples** – the problem of providing an invalid sample is likely to be greatest immediately after installation as participants become familiar with the device. However, about 10% of participants voiced complaints about difficulties providing a valid sample. Some had difficulty providing the required volume and/or pressure of breath.

6. **Other technical problems** – a variety of other technical problems were reported. In many of these cases, either the entire unit or the sample head was reported to be faulty. To minimise inconvenience, the quickest and easiest solution was to replace the part.

As the study progressed and participants gained experience with the interlock, there appeared to be greater acceptance of the device and a growing recognition of how it could be of value to them. Many indicated that it made them at least think seriously about their drinking, if not help change their drinking patterns outright. Several participants credited the interlock with helping them avoid drink driving and/or reduce their drinking.

The major benefit of the interlock was seen as the impossibility of committing another drink-drive offence. The device was a safety valve that prevented them from making a bad decision after drinking. Changed drinking habits was also seen as a benefit by many.

Most of the reported drawbacks of interlocks related to technical issues, such as the perceived long warm-up time, invalid samples and the frequency of re-tests. For some, the major drawback was not being able to drive after a few pints.

### 4.3.7 Reflections of spouses

Of the 20 interlock participants who were married or living with a partner, interviews were conducted with 19 of them at the end of the interlock period (i.e. month 12). The main benefit mentioned by 17 respondents was that it gave them peace of mind, a feeling of security knowing that their spouse could not drive after drinking. Most respondents also reported that the interlock had changed their partner’s drinking behaviour. Obviously, drinking was an issue in many families and the interlock was a means to help address the issue in a positive manner.
5 PHASE III: FOLLOW-UP

The purpose of this final phase of the project was to assess the reactions of volunteers in both groups either six months after the interlock was removed (for the interlock group) or 18 months after the initial interview (for the control group). This interval gave participants a chance to reflect on the experience and what, if any, impact it had on their life – in particular, their drinking and drink-driving behaviour. In addition, the follow-up period allowed them time to adjust to life without the interlock and to provide a more balanced perspective on it.

5.1 Results

Follow-up interviews were conducted with 50 interlock participants and 83 participants in the control group. Selected questionnaires (e.g. Alcohol Use Disorders Identification Test (AUDIT), Drinking Diary, Readiness to Change, Research Institute on Addictions Self-Inventory (RIASI)) were completed again at this time.

Overall, there was a decrease of about 10% in the number of participants who scored above the threshold of 8 on the AUDIT over the 18-month period of the study. There was no difference on this measure between those in the interlock and control conditions. About half of all participants had lower scores on the AUDIT at month 18 than at month 0. This suggests an overall decrease in the level of problem drinking over the course of the study for both interlock and control group participants.

In total, 54% of interlock participants reported consuming less alcohol at month 18 than at the beginning of the study, compared with 40% of control participants. The difference between the two groups, however, was not statistically significant.

In terms of Prochaska and DiClemente’s (1986) stages of change model, about a quarter of all participants moved up one stage towards making positive changes in their drinking behaviour over the course of the study. Although a greater percentage of interlock participants (30%) compared with control participants (19%) moved up a stage, this difference was not statistically significant.

In summary, based on the self-report questionnaires, many participants appeared to reduce the extent of their drinking over the course of the study. Although these positive changes appeared to be larger among the interlock groups, they did not differ significantly between interlock and control groups.

The interviews with participants and family members revealed interesting insights into the effect of the interlock. Almost three-quarters of interlock participants claimed that the interlock had helped them change their drinking patterns and...
prevented them from drink driving. About half of the participants indicated that they had been trying to cut down on their drinking and the interlock was of assistance to them. Many claimed the change in drinking was a lasting one. Of those who indicated that the interlock had no effect on their drinking, most denied that they drank a great deal in the first place. A few participants admitted to drinking more since the interlock was removed and all but one claimed the change was a result of personal circumstances not related to the interlock.

Many interlock participants admitted having considered withdrawing from the study at some point. The primary reasons were the low BAC threshold of the interlock, the frequency of re-tests, the long warm-up time and other technical issues with the device. Nevertheless, they persisted with the programme.

Despite the various and numerous complaints expressed by interlock participants about the interlock throughout the study, in the end all rated the programme as being worthwhile. No one rated it negatively. The service centres were rated highly for the quality of service provided.

Family members were generally positive about the interlock experience and the impact that it had on their loved ones. Many reported a positive change in drinking behaviour and the peace of mind provided by having the interlock installed. A few expressed concern upon removal of the interlock because the control was no longer there preventing drink driving. Only one family member indicated that their spouse had increased his drinking following removal of the device.
6 CONCLUSIONS

The UK stakeholders that took part in the study reported interest in an interlock programme for drink-driving offenders as a programme with potential impact on the drink-driving problem. The extent of their present knowledge of interlocks is limited. Scepticism surrounding the technology was also expressed.

Developing and implementing an interlock programme presents a number of challenges. However, the lessons learned could facilitate the successful implementation of a national interlock programme.

In interpreting the findings from this study, it must be recognised that the participants were self-selected volunteers who responded to a mail invitation. All had served a period of disqualification and had completed a Drink Driver Rehabilitation (DDR) course. All were fully re-licensed. The participants were compensated for their time, travel and inconvenience. The installation of the interlock, its maintenance and de-installation were provided free of charge to participants. Hence, the findings may not be representative of those obtained from other drink-drive offenders who participate in interlock programmes under other circumstances such as those who are mandated to participate and/or must pay for the interlock themselves.

Questionnaire data revealed limited evidence of positive changes in drinking for both interlock and control group participants. This was corroborated to some extent in the interviews, in which many participants and family members reported a positive impact on the extent of drinking over the course of the study. However, it was also apparent that drinking remained an issue for many participants and their families. Although many reported reduced drinking, the extent of reported consumption at the end of the study remained high relative to that of the general population. Without further change in the extent of consumption, many programme participants remain at risk of further alcohol problems, including subsequent drink-drive offences.

Many participants had completed the DDR programme prior to entering the study. Although this programme was rated highly by the participants and gave them a solid base for understanding alcohol and its effects, many continued to struggle with their drinking. The interlock was of assistance in that it provided a physical barrier to separate their drinking from their driving. Many attributed changes in their drinking to the interlock but it was not always clear that the extent of drinking changed very much as the patterns or circumstances of drinking changed to accommodate the interlock. That is, they found ways to continue drinking without having to drive. Some may have discontinued having a pint on the way home from work but continued to experience heavy drinking episodes when they did not have to drive. To some extent, this is reflected in the number of failed breath tests in the morning.
Although there are obvious immediate benefits of some of these changes in terms of reduced driving after drinking, there is no guarantee that these changes will persist.

It must be recognised that, by itself, the interlock is unlikely to have a profound and lasting effect on well-entrenched drinking behaviours. Many believed the interlock was helping them with their drinking and that it provided a catalyst and the tool to facilitate behaviour changes. In many cases, more was required. Ongoing counselling and rehabilitation would be of tremendous assistance to interlock participants over the course of the interlock programme to help them in their struggle with alcohol.

Technical difficulties with the interlock device were reported on numerous occasions. These ranged from faulty equipment to complaints about the frequent number of re-tests, the inability to provide an adequate breath sample and the long warm-up time. It is possible to adjust the breath pressure and volume specifications required by the interlock to facilitate use by those with specific limitations. The number and timing of re-tests can also be adjusted in the software of the device.

Despite repeated complaints about the lengthy warm-up time and the number of re-tests required, most interlock participants found the device to be an acceptable instrument that had a beneficial impact. It was apparent that being able to drive was important to these individuals; for many, drinking was important as well. The interlock helped prevent the inevitable overlap between the driving and drinking.

Several interlock participants (and family members) admitted to circumventing the device by having someone else provide a breath sample. The usual requirement to hum and then blow was removed for this field trial. The hum-blow technique required a good deal of practice to perfect, which effectively prevents an untrained bystander providing a breath sample to start the vehicle. It is recommended that the hum-blow requirement be included as a feature in a future interlock programme to restrict this type of circumvention. Alternatively, ignition interlock devices with photo-ID, which are now becoming available, could be used. This effectively allows a check on whether the breath sample was delivered by the offender (Robertson et al., 2006). An offence of soliciting or providing a breath sample on behalf of the driver to enable an interlock-equipped vehicle to start would reduce circumvention even further.

To a large extent, interlock participants found it useful in preventing subsequent drink-drive offences. Many also reported that it helped them in their desire to change their drinking patterns. However, similar effects were evident among the comparison group.

Should a UK programme be pursued, the challenges reported above need to be acknowledged and at least partly overcome. Accurate information from credible sources directed at key stakeholder and potential programme participants will be required to enhance the knowledge of, and provide stakeholder support for, the interlock programme.
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