Road Safety Research Report 90
A Review of Methodologies Employed in Roadside Surveys of Drinking and Driving

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# TOWARDS AN IMPROVED METHODOLOGY FOR FUTURE UK ROADSIDE SURVEYS

## 3.1 What are the objectives of the roadside survey?

- **3.1.1** Establishing the prevalence of drinking and driving
- **3.1.2** Establishing the trend of drinking and driving.
- **3.1.3** Measuring the impact of alcohol-related policies, campaigns or enforcement practices
- **3.1.4** To gain insights into the characteristics, attitudes and behaviour of drink drivers.

## 3.2 What alternative methods have been used in other roadside surveys of drinking and driving?

## 3.3 Options for modifying the UK methodology

- **3.3.1** Who collects the data?
- **3.3.2** When are the data collected?
- **3.3.3** Where are the data collected?
- **3.3.4** What data are collected?

# RECOMMENDATIONS

## 4.1 General issues

## 4.2 Objectives of the research

## 4.3 Methodological issues

## 4.4 Who should collect the data?

## 4.5 Where should the data be collected?

## 4.6 When should the data be collected?

## 4.7 What data should be collected?

# CONCLUSION

# ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

It is eight years since the last roadside survey of drinking and driving was conducted in the United Kingdom, during which time there have been changes in government policy regarding alcohol (e.g. extended licensing laws), as well as societal and cultural changes which could all influence both the extent of drinking and driving and the characteristics of drinkers who also choose to drive. Consequently, the data on which policy decisions related to this issue are based may be out of date and/or inaccurate.

The Department for Transport is to commission a new roadside survey of drinking and driving in 2008. In preparation for that research, this report reviews the roadside surveys previously conducted in the UK and then considers similar studies conducted in other parts of the world, with the primary objective of identifying examples of best practice which could inform the design of a new UK roadside survey of drinking and driving.

The review has benefited from the involvement of a team of experts who formed a Scientific Steering Committee (SSC) to oversee the report and to offer suggestions for issues to consider, research to be included in the review and improvements that could be made to the report. In addition, experts from around the world were also invited to submit their views and suggest relevant reports on this subject.

Following a review of the UK research conducted to date, and a discussion of the various possible research objectives that a roadside survey might try to address, the report reviews specific studies that offer potential improvements to the methods used previously in the UK. This section of the report is structured around the fundamental aspects of the research methodology that could be changed, namely:

- Who collects the data?
- When are the data collected?
- Where are the data collected and how are the sites selected?
- What data are collected?

To answer these questions, recent examples of best practice from Belgium, the Netherlands, Canada and the USA are discussed in detail.

A draft version of the report was sent to the members of the SSC for comment and review. Subsequently, the SSC met to discuss the report and to develop a list of recommendations for the Department for Transport. These discussions are covered in Section 4, which summarises the views expressed at that meeting and provides a set of recommendations arising out of the meeting. Of the recommendations provided, the key points to consider are as follows:
• The Department for Transport needs to identify what the research is intended to achieve and provide a clear statement of these objectives to prospective contractors.

• The research should be piloted in one region to trial the methodology and to demonstrate the potential benefits to other police regions.

• It is recommended that, rather than a one-off survey or a survey repeated once every five to ten years, the roadside survey should be a rolling survey that, over time, would enable the prevalence of drink driving to be determined, provide valuable data on regional, seasonal and temporal differences, and create a platform for collecting data on other issues.

• The methodology should include methods and statistical procedures to take account of non-response.

• Site and vehicle selection should adopt a scientific approach, such as using a systematic sampling framework to identify survey sites.

• The survey team should be composed of police officers and civilian interviewers to provide the best mix of skills and to help strengthen response rates.

• It is recommended that Department for Transport explore the feasibility of using the new breath-testing devices either as part of a demonstration project or, failing that, to provide supplementary data on the drink-drive problem.
INTRODUCTION

Roadside surveys of drinking and driving typically involve drivers being stopped at random and asked to provide a sample of breath, which is analysed for alcohol content, together with some basic data about the driver. Generally, the aim of these surveys has been to provide an indication of either the prevalence of drinking and driving within a region (be that national or local), or – in the case of repeated surveys – an indication of national trends in drinking and driving. In addition, recent roadside surveys have been seen as opportunities to collect data on other issues, such as establishing seat-belt usage rates to identify the prevalence of drug use in the driving population.

It is eight years since the last roadside survey of drinking and driving was conducted in the UK. Since then a number of changes have taken place in the UK, which may have had an impact on levels of drinking and driving. One factor that is often considered to have an impact on traffic offending generally is the level of enforcement; particularly the number, visibility and prevalence of traffic police. The number of police officers involved in traffic policing in the UK has been on the decline for 40 years. In 1966, designated traffic police made up 15–20% of the constable workforce. By 1998 this figure had fallen to 7% (HMIC, 1998) and a recent report showed that the trend had continued with a further 12% reduction in numbers between 1997/98 and 2001/02 (PA Consulting, 2003).

While the number of police officers involved in policing our roads has declined over the past 40 years, over that time there has also been a significant shift in public opinion with regard to the social acceptability of drinking and driving. The prevailing attitude of 40 years ago (‘one more for the road’) has been replaced by a more socially responsible attitude by the majority of the population. Opinion poll surveys for the Department for Transport Think! Road Safety Campaign support this view: the number of people strongly agreeing with the view that drink driving puts others at risk is up from 54% in 2004 to 80% in 2007.

Against this backdrop of a more responsible attitude towards drinking and driving there have been a number of policy and social changes in recent years that may also have an effect on the incidence of drink-driving. Specifically, the introduction of the Licensing Act 2005 has facilitated ‘round-the-clock’ alcohol consumption, with a possible effect on the times of day and week when drink driving is most likely, while the rise of ‘female-friendly’ bars (e.g. ‘All Bar One’) and the popularity of ‘alcopops’ (with alcohol content heavily masked by fruit flavours) may have contributed to an increase in drinking among younger people and women. In addition, there is evidence that the rise of ‘ladette’ culture, where young women are said to emulate male behaviour, has been mirrored in the driving style and behaviour of young women. Corbett (2007) notes that there was a 6% increase in licensed female drivers between 1998 and 2003, but over the same period there were much
higher rises in the number of women convicted for dangerous driving (+39%), drink and drug driving (+19%), speed-limit convictions (+24%), and insurance and record-keeping convictions (+25%).

With these changes in mind, it could be argued that it is now time to gather fresh data on the extent of the drinking and driving problem. Has the reported change in the acceptability of drink driving been matched by a decline in the prevalence of drinking and driving since 1999, or has the percentage of UK drivers who are over the drink-drive limit\(^1\) remained at around 1% as it did between 1962 and 1999?

1.1 Objectives

It has been proposed that a new roadside survey of drinking and driving be undertaken in 2008. However, a national survey involving thousands of drivers requires major resources, both in terms of funding and police involvement. If a roadside survey is to be commissioned it is essential that every effort is made to ensure that the exercise is fruitful, scientifically rigorous and produces valid, reliable results that deliver meaningful new information, and thus value for money. With this in mind, the Department for Transport has commissioned Clockwork Research to review the methodologies that have been employed in previous roadside surveys of drinking and driving, conducted both in the UK and overseas.

The report addresses the following questions:

1. What methodologies have been used in previous roadside surveys undertaken by the UK? 
2. What can we learn from the approaches taken in previous research? 
3. Are there any limitations with the methods used in the previous work? 
4. How does the approach taken in the UK compare with approaches taken by other countries: for example, in other European countries and in North America? 
5. What evidence exists for the appropriateness and effectiveness of the UK approach and alternatives identified elsewhere? 
6. What lessons can be learned from these alternative approaches? 
7. What improvements could be made to the UK approach? 
8. Based on the evidence from the UK and overseas, what options/recommendations are there for the UK?

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1 The UK legal limit for drink driving at the time of writing is a blood alcohol concentration (BAC) of 80 mg alcohol per 100 ml blood. The equivalent value for breath alcohol concentration (BrAC) is 35 μg alcohol per 100 ml breath.
1.2 Sources

Research published since 1973 is reviewed from literature identified from relevant databases:

- Transport and Economics;
- International Bibliography of Social Science;
- CSA Social Science Database;
- PubMed; and
- Bath Information and Data Services (BIDS).

In addition, contact was made with acknowledged experts in the fields of drink driving, enforcement practices, survey methods and driver behaviour for advice and guidance. Each expert was asked for their comments on the methods adopted in the UK, and suggestions for relevant studies to be included in the review. A sub-group of experts was invited to contribute further to the project by forming a Scientific Steering Committee (SSC), which met to discuss the project and reviewed first drafts of the final report. The experts consulted are listed below, with members of the SSC marked with an asterisk:

- Sergeant Roger Agombar, Department for Transport, UK;
- Professor Richard Allsop,* University College London (UCL), UK;
- Doug Beirness, Beirness and Associates Inc., Canada;
- Andrew Burr, Department for Transport, UK;
- Dr Claire Corbett,* Brunel University, UK;
- Dr Åsa Forsman, VTI (Swedish National Road and Transport Research Institute), Sweden;
- Pat Kilby,* Department for Transport, UK;
- Dr Lily Read, Department for Transport, UK;
- Dr Rob Tunbridge, Independent, UK;
- Ward Vanlaar, Traffic Injury Research Foundation (TIRF), Canada;
- René Mathijssen,* SWOV (Dutch National Road Safety Research Institute), the Netherlands;
- Chief Superintendent Jerry Moore,* Department for Transport, UK;
- Deirdre O’Reilly, Department for Transport, UK; and
- Maria Vegega, National Highway Traffic Safety Administration (NHTSA), USA.
1.3 Structure of the report

This report is structured into five sections. Following this introduction, Section 2 reviews the methodologies adopted for roadside surveys of drinking and driving conducted in the UK between 1962 and 1999. Section 3 reviews innovative methods that have been adopted in other countries and which offer potential improvements to the approaches adopted in the UK. Section 4 then considers ways that the methodology employed in future UK surveys of drinking and driving could be modified in order to improve the quality of the resulting data and includes a list of recommendations for the Department for Transport. Finally, Section 5 provides a conclusion to the research.

1.4 Issues to consider

1.4.1 What do we mean by drinking and driving?

Before embarking on a roadside survey of drinking and driving it is important to set out what the research team mean by ‘drinking and driving’. Typically this will mean those drivers whose breath alcohol concentration (BrAC), as measured by a roadside screening device, is above the drink-drive limit for that jurisdiction. However, results may be presented in terms of the percentage of drivers who test positive for any given level of alcohol.

The way that results from different surveys have been reported varies, depending on the objectives of a particular survey and the BrAC limits in place at the time that the survey was conducted. In addition, while modern screening devices provide a digital reading of a driver’s BrAC, studies conducted prior to 1980, or studies using less advanced breath-testing devices, may have categorised the BrAC into a band (e.g. below 22 μg/100 ml, between 22 μg/100 ml and 35 μg/100 ml, and above 35 μg/100 ml), typically represented by a traffic light system. Hence the individual collecting the data would not have known the exact figure. This can make comparisons between older and more recent studies problematic.

1.4.2 The UK legal position regarding roadside surveys

In most countries the police have powers to conduct random breath tests. This power has enabled police forces in countries such as Australia, Belgium, Finland, Sweden and the Netherlands to conduct large-scale random breath-testing exercises involving road blocks and mass screening. In other countries, including the UK, Germany, Canada and the USA, police technically do not have powers to conduct random breath-testing. However, in practice the police still have the power to stop a motorist at random and then, suspecting that the driver may have been drinking, conduct a breath test. The important difference is that, where random breath testing is permissible, the police can screen all drivers, not just those who give the police officer some cause for suspicion (e.g. smelling of alcohol).
2 ROADSIDE SURVEYS ADMINISTERED IN THE UK 1962–99

Between 1962 and 1999 the Transport Research Laboratory (and its predecessors the Road Research Laboratory and Transport and Road Research Laboratory) was commissioned by the UK Department for Transport to conduct seven roadside surveys of drinking and driving. The methodologies used for these surveys were broadly similar, but with some important differences brought about by changing priorities and the specific objectives of the research.

This section will review the roadside surveys of drinking and driving that have been conducted in the UK, with the emphasis on identifying differences between the methodologies employed. It is not the purpose of this section to review the results of the surveys in any detail, except where results may have been influenced by the methods used.

2.1 The 1962–64 surveys

The earliest roadside surveys of drinking and driving in the UK were conducted by the Road Research Laboratory (RRL)/Transport and Road Research Laboratory (TRRL) between December 1962 and December 1964 (TRRL, 1967). The first survey was a pilot study that took place in Lincolnshire in December 1962, and which was reported to have achieved a 95% response rate. Subsequently, a main study was carried out over four weeks in December 1964 at three sites in the Dorking area of Surrey. The stated purpose of the survey was to study drivers’ drinking habits and to establish a pattern of such. The survey was restricted to drivers of private cars and motorcycles.

In these earliest surveys drivers were stopped by police and asked if they would cooperate in a survey. Those drivers who agreed were guided into a control site off the main road where a trained interviewer administered a questionnaire at the car window and asked them to blow into a plastic bag. These bags were then returned to the RRL where they were analysed for breath alcohol content. In addition to providing a breath sample, drivers were asked how long it was since their last alcoholic drink and their frequency of drinking. Demographic data about the driver was also collected (age, gender, occupation, length of journey, number of passengers). However, neither the driver’s name nor the registration number of the driver’s vehicle were taken.

The original aim was to carry out 1,500 tests, collected between 6 pm and midnight on Thursday, Friday and Saturday. In all, 1,739 drivers gave samples, of whom 16.8% were positive for any alcohol (BAC above 5 mg/100 ml). At the time of the survey there was no national limit for drinking and driving (which was not
introduced until 1967), but 1.9% of the sample gave a reading equivalent to a BAC of between 55 mg and 99 mg per 100 ml of blood.

No further national roadside surveys were conducted in the UK until 1988.

2.2 The 1988 survey

2.2.1 Background

Between 1988 and 1990 two roadside surveys of drinking and driving (and a pilot survey in 1989) were conducted in the UK. The first survey was carried out in Sussex and Warwickshire in the spring of 1988 (Sabey et al., 1998).

At the time that the 1988 survey was commissioned it should be borne in mind that no one at the TRRL or the Department for Transport had had direct experience of running the previous roadside surveys. Consequently, there was concern as to the public (and political) reaction to the conduct of such surveys. The survey was pre-announced in the press, with background on the need for such studies, but with the reassurance – as in 1964 – that the confidentiality of participants would be safeguarded.

2.2.2 1988 survey methodology

The 1988 survey involved drivers being surveyed between the hours of 10 pm and 3 am on Thursday, Friday and Saturday nights over an eight-week period between April and June 1988. A total of 46 locations, selected by the researchers in conjunction with the police forces involved, were sampled across the two counties, with the survey team focusing on a different location each night.

As with all such studies, particular attention was paid to the safety and security of all concerned. The majority of the surveys were conducted in segregated lay-bys or in car parks. Signage, cones and road marking were designed to ensure traffic management and the confidence of drivers. A mobile lighting system was also employed to further enhance safety. Wherever possible, sites were located so as not to be visible too far ahead to minimise the possibility that drivers would re-route to avoid them.

The survey teams at each location consisted of police officers, a TRRL team leader, TRRL staff and other interviewers with specialist experience. The TRRL team leader was in communication with the police via radio. On the direction of the TRRL team leader, drivers of cars and light vans were randomly stopped by the police and guided to marked stopping bays where an interviewer greeted them, introduced herself (all interviewers happened to be female) and explained that the survey was connected with road safety and that their participation was voluntary and confidential.
Drivers were then encouraged to leave their vehicles and to continue the interview in the comfort of an adjacent Portakabin. However, when this was refused an interview was offered at the car window, where necessary using a shortened questionnaire. In the vast majority of cases, drivers agreed (out of 2,656 drivers who were asked, 51 declined to be interviewed).

In the Portakabin a questionnaire was administered. In addition to demographic information (age, gender, occupation, driving experience and origin/destination of the journey), the questionnaire was designed to establish the driver’s drinking behaviour and alcohol consumption on the day of the survey, together with details of their normal drinking behaviour and attitudes to drinking and driving.

2.2.3 Procedures for collecting alcohol data

Prior to leaving, all subjects were asked to provide a sample of breath. A reliable non-statutory instrument (Lion SD2) was used which gave a digital readout of breath alcohol concentration (BrAC).

Where subjects provided a sample above the legal limit, they were advised of the fact and every effort was made to deter them from driving further until their breath alcohol level was below the legal limit.

Where drivers were only slightly above the limit, they were advised to stay in the survey area until a satisfactory level was obtained on re-test; light refreshments were made available. Alternatively, subject to the driver’s permission, where a passenger could legally drive, they were offered a breath test and, if negative, were encouraged to drive in place of the driver.

Where no suitable replacement driver was present and where the driver’s breath alcohol level was high and unlikely to fall below the limit within an hour, alternative arrangements were offered. In cases where the destination was less than eight miles, TRRL staff (with suitable insurance cover) drove the vehicle to the destination. In one case, where a driver had a longer journey to make, National Breakdown assisted. In other cases the driver walked or got a taxi to their destination.2

Although drivers over the limit were offered an amnesty in this way, had a driver over the limit insisted on continuing their journey a police officer would have been asked to warn them of the consequences. This was essential to guard against any liability for future accident involvement. This course of action did not prove necessary.3

2 In contrast with these earlier studies, research of this kind would now need to receive ethical clearance and it is likely that a more robust management of risks would be required.

3 The current status of legal liability would need to be checked in any future drink-drive survey.
At the completion of the interview and test, each driver was given a letter expressing thanks and outlining the purpose of the survey.

### 2.2.4 Results of the 1988 survey

In the 1988 survey a total of 2,656 drivers were approached, of whom 2,485 (93.8%) agreed to a full interview. A further 120 (4.5%) took part in a shortened version and 51 (1.9%) refused an interview. Of those approached, 71.3% were male and 28.7% were female.

Valid breath samples were obtained from 2,488 drivers (93.7%), with a further 60 (2.3%) being willing but unable to provide an adequate sample. Eighty drivers (3.0%) refused to provide a breath sample.

In terms of recorded BrACs, the overall number of drivers over the limit was 42 (1.7%). However, there were significant differences between the Sussex and Warwickshire results, with 13 drivers (1.0%) and 29 drivers (2.4%) being over the national BAC limit (80 mg/100 ml) in each county respectively.

It is possible that variations between the two counties in terms of existing policies on the application of breath tests played a part in these figures. In Sussex a concentrated drink-driving enforcement campaign had been in operation for over six months prior to being terminated immediately before the start of the surveys in April 1988. In Warwickshire no such initiative was in place.

### 2.3 The 1989–90 surveys

#### 2.3.1 Background

The surveys carried out in Sussex and Warwickshire in 1988 had established the practical viability and public acceptability of roadside testing for drinking and driving. However, while there was enthusiasm for a more substantial programme of surveys to be commissioned, there was concern regarding the high costs associated with the methodology adopted in the 1988 surveys. Consequently, in the summer of 1989 a revised experimental procedure was piloted in Wiltshire (Everest et al., 1990). The main variation to the previous approach was that drivers were surveyed at the car door, immediately upon arrival at the survey site. This allowed maximum attention to be paid to drivers who had been drinking – particularly those who were over the limit – and also reduced the delay to drivers who had not been drinking.

#### 2.3.2 1990 survey methodology

Following the successful 1989 pilot, roadside surveys of drinking and driving were carried out in 10 counties of England and Wales between April and October 1990 (Everest et al., 1991). The locations for the survey were selected randomly among
major roads in the urban and rural areas, with the choice being weighted to yield approximately 60% of sites in urban areas. However, for a proportion of sites selected, a different approach was taken. The distribution of injury accidents over a three-year period which involved a car or light commercial vehicle, and in which at least one driver had provided a positive breath test/failed to provide a sample, was analysed. In these cases, a survey site was sought on a given length of road where there had been two or more such accidents and where offending drivers had been travelling in the same direction. Overall, approximately 16% of the 442 sites surveyed were chosen in this way.

Two teams conducted the work on Thursday, Friday and Saturday nights between 7 pm and 2 am. Ten police force areas took part in the survey: Cumbria, Derbyshire, Durham, Gwent, Kent, Northants, Suffolk, Sussex, West Mercia and Wiltshire. Expansion of the survey area was designed to obtain results that were more representative of the country as a whole and to explore regional differences. The schedule involved 15 nights’ work in each area with, in the great majority of cases, three locations being surveyed on each night.

In contrast to the 1988 survey, some of the fieldwork was carried out by external staff (to TRRL) for the 1990 survey, mainly recruited from security companies, for example Group 4. These staff were trained by TRRL to carry out the various tasks within the teams. Each survey team consisted of a team leader, two experienced TRRL interviewers, two drivers/support staff (Group 4) and a police constable. Each TRRL interviewer worked with a Group 4 employee, collecting breath-test data and conducting roadside interviews.

Drivers of cars and light vans were randomly stopped and guided to the marked stopping bays where an interviewer greeted them. Having introduced him/herself and explained who he or she represented, it was made clear that the survey was connected with road safety, was confidential and voluntary. All subsequent interviewing and testing was conducted with the driver in their car.

Drivers were then asked to take a voluntary breath test using a reliable non-statutory instrument (Lion SD2). This gave a digital readout of breath alcohol concentration (BrAC).

As in the 1989 pilot investigations, this worked well and achieved a high screening rate. Using this method, subjects were selected for a more detailed interview according to a predetermined plan, allowing emphasis to be placed on those whose BAC reading was over half the limit (i.e. above 40 mg/100 ml). It also minimised the inconvenience to non-drinking drivers who, in most cases, were not interviewed at length. The limited information obtained for these drivers at the site was supplemented by two questionnaires. Drivers who were found to have been over half the legal limit \( (n = 426) \) were sent an extended questionnaire asking them for more extensive information on their drinking habits, attitudes, etc., while self-completion
questionnaires were distributed to the remainder of the sample. The response rate to the questionnaires was 60%.

The questionnaire used at the roadside for those drivers who had been drinking was similar to those used in 1988 and the 1989 pilot and was designed to establish the driver’s drinking behaviour and alcohol consumption both on the day of the survey and more generally. As with the previous surveys, additional demographic data were also collected. The procedures for dealing with drivers who were close to, or over, the legal drink-driving limit were similar to those used in the 1988 survey (described in Section 2.2.3).

### 2.3.3 Results of the 1990 survey

During the 1990 survey, 13,694 drivers were approached, of whom 13,476 (98.4%) provided a valid breath test. Of those approached, 74.2% were male and 25.8% female.

In terms of recorded BrACs, the overall number of drivers who were over the UK national BAC limit was 138 (1.02%). 0.16% exceeded twice the legal limit and 426 drivers (3.2%) exceeded half the legal limit. As with previous surveys, unless an alternative, sober driver was available, or a friend could collect the driver, drivers with a BAC content above the legal limit were provided with an alternative means of transport to their destination.\(^4\)

There was some variation between counties in terms of those who exceeded the BAC limit, with a minimum in Cumbria of 0.49% and a maximum in West Mercia of 1.61%. There was also a slight difference between rural and urban sites in the distribution of drivers who were over the limit, with 0.80% and 1.15% being recorded as over the limit respectively.

The 1988 survey, while robust in its design, had been very expensive. With the Department for Transport being committed and enthusiastic to roll out the surveys to a more representative sample of regions, the 1990 roadside surveys saw a fivefold increase in the number of counties involved, and a tenfold increase in the number of survey sites. Clearly, the methodology adopted in the 1988 survey was too costly for it to be repeated on this scale. However, while the 1990 methodology, in its reliance on outside contractors and lower pay grade personnel to administer the surveys, was more cost effective, it could be argued that using relatively inexperienced surveying teams compromised the scientific rigour of the methodology. Moreover, having three separate organisations (the police, TRRL and Group 4 Security) involved in the setting up and administration of the surveys, led to practical difficulties. These

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\(^4\) As noted previously, current concerns regarding what is ethically permissible would necessitate a more stringent approach for drivers who were not over the limit, but whose blood alcohol content could give cause for concern.
concerns and the experience gained from running the 1990 survey would play a major role in the methodological design adopted for the 1998/99 roadside surveys.

2.4 The 1998 and 1999 surveys

2.4.1 Background

The objective of the 1990 survey was to gather data on the prevalence of drinking and driving in the UK. By 1998 there was concern that it had been eight years since the last major roadside survey had taken place, a period during which a range of road safety measures had been implemented which could have impacted upon levels of drink driving. There was also a more pressing issue: a reduction to the UK limit for drink driving was being considered. Consequently, one of the main objectives of the surveys administered in 1998/99 was to monitor any change in alcohol levels of the driving population before and after any change in the drink-drive limit. In order to ensure that the data collected was broadly representative of national levels of drinking and driving, it was proposed that four surveys would need to be carried out in each of the 11 police forces in Great Britain.

The first two of the planned surveys were carried out in October 1998 and April 1999 (Tunbridge et al., 2003). However, the third and fourth surveys were cancelled after it became clear that a change in the drink-drive limit would not take place in the foreseeable future.

Following experience with the surveys in 1989 and 1990, further consideration was given to improving the efficiency of the survey process. These earlier surveys had involved three orders of organisation: a contractor setting up and managing the site; TRRL interviewers conducting the surveys and administering the breath tests; and the police stopping the traffic. While the results had been largely successful, there had been difficulties experienced in recruiting suitably trained staff, while the costs of the survey were still considered to be unacceptably high.

The 1998 and 1999 surveys saw a radical departure from previous methodologies. Instead of using trained interviewers to collect the alcohol data and administer the questionnaires, individual police forces were recruited to manage and administer the whole process. It was hoped that this approach would both improve the efficiency of the survey process and reduce significantly the overall cost of the exercise.

2.4.2 1998–99 survey methodology

Eleven police forces were involved in the 1998 survey and each was requested to carry out 1,000 tests over a period of four weeks (i.e. a target total of 11,000 tests). The forces chosen were Avon and Somerset, Essex, Lincolnshire, Greater Manchester, South Yorkshire, Sussex, Tayside, Thames Valley, Warwickshire, West Mercia and West Midlands. All 11 forces were involved in the first survey (October
1998), but Tayside was excluded from the second survey as there were local elections in Scotland in April 1999.

Following discussions with police representatives, it was decided that the survey period should be restricted to ‘drinking hours’ on weekend nights, i.e. between 10 pm and 2 am on Thursday, Friday and Saturday nights. Drivers were to be breath tested and given a postal questionnaire to complete and return.

The success or failure of the methodology adopted for the 1998 and 1999 surveys was heavily dependent upon the cooperation of the police forces. Consequently, considerable efforts were made to ensure that the survey methodology was understood and applied consistently across all 11 forces, and that the police officers involved in the study understood the reasons for conducting the work and the importance of scientific rigour.

To facilitate this process, representatives of the cooperating police forces and TRL project personnel were invited to a central training meeting in London. The duration and timing of each survey were agreed and the survey documents and pre-calibrated breathalysers (Lion SD 400 Alcometers) were distributed to the participating police forces. For each force a liaison officer was appointed, whose responsibility it was to deal with any enquiries from the force or TRL.

The sites at which the survey was carried out were a matter of discretion for each police force. However, a variety of locations and road types were sought in order to provide a balanced sample of rural and urban sites, with a range of traffic levels. Much of the data on sites is no longer available, but in the 1998 survey data were collected at a total of 130 sites.

2.4.3 Roadside testing procedures

In previous surveys, because the breath test was administered by civilian personnel, it was possible to offer those drivers who were over the limit the chance of an ‘amnesty’ so long as they did not continue to drive. However, in the 1998/99 surveys the testing was carried out by on-duty police officers. Consequently, a new protocol for administering the breath test and questionnaires had to be devised. This new protocol had to allow the police officer to follow normal policing procedures in the event that a driver gave a positive roadside screening test, while also enabling the breath-test reading to be collected, anonymised and returned to TRL for analysis purposes. This process is summarised in Figure 2.1.

To summarise Figure 2.1, once a driver was stopped, if the police officer did not suspect impairment or a screening breath test was negative, the driver was asked to provide a digital roadside breath test for research purposes. In the event that alcohol impairment was suspected, a normal (type-approved) screening breath test was administered. If this test was positive, or the driver refused to provide a breath
sample or was suspected of being impaired, the driver was dealt with under existing police procedures and was not asked to participate in the roadside survey. Any evidential breath alcohol level obtained at the police station was then anonymised and returned by that force’s police liaison officer to TRL for inclusion in the survey of drivers’ alcohol levels.

Throughout the survey the safety of both the police officers and the drivers while the breath testing was taking place was a key consideration. Tests were normally carried out either immediately adjacent to the car or, where practical, with the driver still in the vehicle. Both the normal roadside screening breath-test devices and the non-statutory device used to collect data from those drivers who were not over the limit were handheld and compact, which facilitated ease of use even in relatively busy traffic situations.

Police officers had been supplied with forms on which to complete details of each test conducted. These included: the time and date of test; gender and age of driver;
location; reason for stopping; and weather conditions. In addition, breath alcohol (BrAC) readings were recorded.

Upon completion of each test, the driver was given a separate questionnaire to be completed and returned to TRL in a pre-paid envelope. The questionnaire was accompanied by a covering letter from the Head of Road Safety at the Department for Transport, giving brief information about the survey and thanking them for their help. This approach had previously produced a high rate of response (60%) from the public. In the October 1998 survey, a total of 3,751 completed surveys were returned (equivalent to a response rate of 35% of those drivers stopped). The equivalent figures for the spring 1999 survey were 4,808 completed surveys returned; a response rate of 50%.

The driver questionnaire covered annual mileage, the presence of any passengers and questions that enabled the driver’s socio-economic grouping to be determined. It also included questions that sought the driver’s opinions on being asked to provide a breath sample, the practicalities of the method involved and how they were treated by the police officer. The driver was also asked to provide an opinion on the police being given legal powers to require roadside evidential tests and on drink-driving issues in general.

The use of postal questionnaires in the 1998/99 surveys was quite successful. The response rate for the April 1999 survey was reasonably high, and even the lower response rate achieved in the October 1998 survey could be considered acceptable for this type of research. (Note, no information is available on the percentage of drivers who were asked to provide a breath sample and the percentage who agreed to do so.)

### 2.4.4 Results of the 1998–99 surveys

Tables 2.1 and 2.2 show the results of the surveys conducted in October 1998 and April 1999. Table 2.1 gives the overall proportion of drivers over the limit in the October 1998 survey, according to location. Table 2.1 shows that the overall proportion of drivers over the limit in the autumn 1998 survey was 1.0%.

<table>
<thead>
<tr>
<th>Location</th>
<th>Number</th>
<th>All</th>
<th>% over limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>89</td>
<td>8,776</td>
<td>1.01</td>
</tr>
<tr>
<td>Rural</td>
<td>17</td>
<td>1,893</td>
<td>0.90</td>
</tr>
<tr>
<td>Not known</td>
<td>1</td>
<td>48</td>
<td>2.08</td>
</tr>
<tr>
<td>All</td>
<td>107</td>
<td>10,717</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Table 2.2 gives the overall proportion of drivers over the limit in the April 1999 survey, according to location. Table 2.2 shows that the overall proportion of drivers over the limit in the April 1999 survey was 0.7%.

<table>
<thead>
<tr>
<th>Location</th>
<th>Number</th>
<th>All</th>
<th>% over limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>54</td>
<td>7,494</td>
<td>0.7</td>
</tr>
<tr>
<td>Rural</td>
<td>9</td>
<td>2,040</td>
<td>0.4</td>
</tr>
<tr>
<td>Not known</td>
<td>1</td>
<td>37</td>
<td>2.7</td>
</tr>
<tr>
<td>All</td>
<td>64</td>
<td>9,571</td>
<td>0.7</td>
</tr>
</tbody>
</table>

### 2.4.5 Comparison of breath-test data for the autumn and spring surveys

Comparing the results of Table 2.1 with Table 2.2 shows a significant difference in the percentage of drivers with an illegal alcohol level. When comparing the results of the two surveys it is important to bear in mind that the number of drivers who are over the limit, as a proportion of the total number of drivers surveyed, is extremely small. Consequently, it only takes a relatively small increase in over-the-limit cases to have a significant effect on the percentage of drivers over the limit. For example, in the spring 1999 survey 64 out of 9,571 drivers had a BAC above 80 mg/100 ml, thus producing a figure of 0.7% of the sample being over the limit. Yet if 30 positive cases across the country had been mistakenly excluded from the spring dataset (e.g. because they were going through the legal process), this would be sufficient to cause the difference in the percentages between the two surveys.

Assuming that there had not been a sudden shift in drivers’ attitudes and behaviour between the two surveys, what other reasons could account for such a drop in the proportion of drivers caught driving over the limit? To answer this it is necessary to look in more detail at the two surveys. In autumn 1998 the distribution of sites surveyed was 82% urban and 17.7% rural. In spring 1999 this distribution was 78% and 21%, respectively. This difference was probably due to random variation in testing sites, although weather and seasonal factors may also have played a part: testing in rural locations being more practical in the spring. Regardless of the reasons for the difference, given that previous UK surveys have established that the incidence (or, at least, the rate of detection) of drink driving is higher in urban than rural locations, could it be that the higher proportion of tests administered in urban areas contributed to the overall higher incidence in the autumn survey? Yet, although a higher proportion of rural tests were administered in the spring survey, the percentage of drivers who were over the limit in the autumn survey in both the urban and rural settings was significantly higher. It is possible that this was the effect of repeat testing at the same locations in the spring, with drivers avoiding favourite spots used by the police to catch drink drivers.
However, the most likely explanation for the difference between the results appears to be a level of underreporting of positive cases that occurred in the spring survey. In post-survey debriefings it became clear that in the second survey, in a number of cases where a motorist was suspected of impairment and an evidential breath test at a police station was carried out, the result was not returned to TRL for inclusion in the survey.

Prior to the autumn survey, representatives from all the forces involved in the study were invited to a central training day, at which practices and procedures to be employed during the survey were carefully and thoroughly explained. Similarly, the forms to be used by the police officers collecting data were explained and researchers were on hand to answer any questions. This training day helped to ensure that the forces understood what was expected of them and the importance of following the procedures.

Prior to the second survey it was considered sufficient for the briefing to be conducted at the local level by the police liaison officers for each force who had attended the original central training day. By the time these local briefings were conducted six months had elapsed and it is likely that, while the same protocol was adopted, the quality of some of the briefings may have suffered as a result. It is also possible that in some forces there would have been changes in the personnel involved in the survey, with the result that new officers were brought in to administer the survey who had received minimal briefing about the procedures and practices to be followed.

2.5 What can we learn from the methods of previous UK roadside surveys?

The methodologies adopted for the roadside surveys conducted in the UK between 1964 and 1999 had a number of similarities:

- in all the surveys testing took place on Thursday, Friday and Saturday nights;
- apart from the 1964 survey all subsequent studies covered the time between 10 pm and 2 am on these three nights;\(^5\) and
- in all the surveys police officers were used to stop drivers. This is a legal requirement and a necessity to ensure the protection of the survey teams and the safety of the general public, and to maintain the traffic flow. The presence of police officers also has the benefit that drivers are generally more willing to participate in the survey if they see that it is being conducted in conjunction with the police.

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\(^5\) In 1988 the period covered extended until 3 am, while in 1990 the survey session commenced at 7 pm. However, it is unclear whether data for the period 10 pm to 2 am could be extracted (or is still available) for these earlier surveys.
The principal difference between the various UK surveys is in the personnel employed to administer the breath tests and questionnaires.

At the time that the 1988 survey was commissioned there was some concern as to the public’s reaction to the survey. Consequently, every effort was made to limit the chances of anything going wrong. This approach was undoubtedly successful; the surveys were well received by both the press and public, achieved a high response rate and were largely trouble-free. However, the approach was labour-intensive and consequently very costly.

As a result of the experience gained from the 1988 survey, it was considered that the strict protocol employed in 1988 could be relaxed to some extent while still maintaining the same level of scientific validity. The 1989/90 surveys achieved considerable savings in costs and resources by employing sub-contractors, largely from commercial security companies such as Group 4, to organise and set up the individual survey sites.

However, the involvement of three separate entities in the delivery of the surveys on site produced some problems with coordination between the security company, TRL and police staff. This meant that, on average, these sites took longer to set up and take down than the later two surveys administered solely by the police.

Although this approach delivered considerable saving in costs, there were significant problems in recruiting staff of sufficient quality to administer the surveys.

In the light of this experience, it was considered that further savings and efficiency could be achieved by exclusively employing police officers to collect the necessary data. Traffic police officers were trained by TRL staff in the conduct and administration of the surveys and the process for returning the forms used to collect driver survey data and breath alcohol readings. The police officers then set up, organised and administered the practical aspects of the roadside surveys.

In the autumn survey this method was largely successful. However, the significant difference in over-the-limit cases reported in the spring survey suggests that this second survey suffered as a result of the lack of a follow-up or refresher training day prior to the commencement of the second study. If the same methodology is repeated, whereby police officers collect all data in consecutive surveys occurring within a six to twelve-month period, it should not be assumed that the same officers within each force will be involved in both studies, or that the level of enthusiasm that existed prior to the first survey will be maintained for subsequent surveys. Consequently, it is strongly recommended that representatives from each participating police force attend a central training day prior to each survey.
3 TOWARDS AN IMPROVED METHODOLOGY FOR FUTURE UK ROADSIDE SURVEYS

Before considering the options available for improving the methodology for future UK roadside surveys, it is first necessary to have a clear understanding of the objective of the research. This section first summarises the typical objectives of roadside surveys and then considers to what extent the UK research to date has met these objectives.

3.1 What are the objectives of the roadside survey?

The following list summarises the possible objectives of roadside surveys of drinking and driving:

- To obtain a picture of the prevalence of drinking and driving?
- To assess the trend of drinking and driving?
- To measure the impact of alcohol-related policies (e.g. a change in the drink-drive limit), publicity campaigns or enforcement practices that have been introduced at a local or national level, or to help decide if a policy change is required if drink-driving levels are found to be unacceptably high. A related objective would be to justify a policy change when one is implemented where drink-drive levels have fallen.
- To gain insights into the characteristics, attitudes and behaviour of drink drivers.

The specific objective(s) of the research will determine the research design and data collection requirements. The following sections consider these issues in more detail.

3.1.1 Establishing the prevalence of drinking and driving

It could be argued that, with the exception of those surveys that were scheduled to occur before and after a possible reduction to the drink-drive limit (1998/99), UK surveys have had the primary objective of establishing the prevalence of drinking and driving in the UK. However, in order to obtain a true picture of prevalence, that is representative of the UK as a whole, reflects seasonal changes and takes account of monthly, weekly, daily and even hourly variations, a sophisticated, carefully designed study would be required. Such a study design would involve a systematic sample of survey locations and times, and a random sample of passing drivers to be tested at these locations and times, and would allow for international comparisons.

Two effective ways of obtaining a random sample of passing drivers are that, as soon as an interviewer becomes free, the next vehicle is stopped, or that every nth vehicle is stopped. In practice, however, the latter option may be difficult to achieve because
of variations in traffic volumes (by time of day, by day of week and by location). During rush hours traffic volume may be too high, while at night, or in rural areas, it may be too low.

It is clear from the review of the methods employed in the UK surveys that none have approached the level of scientific rigour required to be able to estimate prevalence. First, UK roadside surveys have been limited to weekend nights, when drink drivers will be over-represented and the sample is likely to be biased towards males and younger drivers. As a consequence, the figures give a picture of drinking and driving when it is believed to be at its worst: at the times of the day and week when it can be expected that drinking and driving will be most likely. Moreover, nothing is known from these surveys about the incidence of drink driving from 2 am on Sunday through to 10 pm on Thursday. Limiting the survey to weekend nights also means that we have no survey information on the extent of the ‘morning after’ problem, whereby drivers are still under the influence of alcohol the following morning. Anecdotal evidence from the UK Drink-Drive Rehabilitation course providers suggests that a significant number of drivers (c.17–20%) are caught at this time of day. The figure in some other countries is higher still: the regular surveys of drinking and driving conducted in Finland since 1978 (Penttilä et al., 1981; Penttilä et al., 2004) have found that the highest rates of drunken driving occurred there in the morning. The 2003 survey, for example, found that 0.44% of drivers stopped on Saturday mornings were over the 0.5% limit, compared with 0.21% on Saturday nights. While the Finnish data may not be representative, it is clear that there would be value in gaining a better understanding of the extent of the problem of morning-after drink driving in the UK.

Second, none of the UK surveys has employed a systematic sampling framework for the selection of survey sites. For the most part, while these have been selected as a result of detailed pre-research by the study team, inevitably the final selection is, to some extent, influenced by the need to consider the safety of the interviewers, police and public, the ease of administering the survey, and the proximity to urban areas and places where drinking and driving is most prevalent (e.g. near pubs and clubs). It is unavoidable that these factors govern survey site selection to a degree.

The most comprehensive of the UK surveys involved sampling at 442 locations in 10 of the 46 counties of England, selected to achieve a good mix of urban and rural settings. Thus, it was intended that the results obtained would be more representative of the country as a whole and would enable regional differences to be explored.

In the 1998/99 surveys, 10 of the 43 police forces in England and Wales took part in the study. The 10 forces selected were intended to be representative of the UK as a whole in terms of the geography, size of conurbations and mix between urban and rural areas that they covered. However, it is inevitable that there would be variations between the forces in their policing practices, in the level of the enforcement of the
law on drinking and driving, and in local initiatives that may have been running in the months prior to the surveys commencing. Consequently, the UK roadside surveys to date cannot be considered to have established the prevalence of drinking and driving, except – with some qualifications – during the times and on the days that testing took place, i.e. during ‘drinking hours’ on weekend nights.

3.1.2 Establishing the trend of drinking and driving

Assessing the trend of drinking and driving over time, while still difficult, is arguably an easier objective to meet. The research locations and times can be selected based on supposedly high levels of drinking and driving, or on the ease of stopping and testing drivers. For such an approach the main requirements are that similar, or at least comparable, research locations and times are selected across the whole time series, and that the same procedures are employed for stopping and testing drivers. It is also preferable that drivers are stopped and tested at random (Mathijssen, 2007, personal communication). Clearly, in this regard it is essential that the police officers involved in the study understand that the purpose of the survey is to collect data on trends or prevalence, rather than simply to detect drink drivers.

Between 1988 and 1999 four surveys took place, but the methods adopted for the various surveys – the locations visited, the personnel employed to collect data and the months when the survey took place – were too varied to enable a trend to be determined. Moreover, it is now eight years since the last survey, so even if the same methods were replicated it would be questionable whether the results of a roadside survey administered in 2008 could be directly compared with previous studies.

In the 1998/99 UK surveys, the police were allowed to select the research sites at their own discretion. While this enabled police forces to use their local knowledge to identify ‘suitable’ locations, it would have made it difficult to guarantee that the locations selected in subsequent surveys would be comparable. Furthermore, it should be noted that what might be considered a suitable location from a policing and safety perspective may not be suitable from a research perspective. Consequently, the UK surveys of drinking and driving to date cannot be considered to provide us with sufficient information on the trend of drinking and driving within the UK.

3.1.3 Measuring the impact of alcohol-related policies, campaigns or enforcement practices

The stated objective of the 1998/99 surveys was to monitor the effects of a change to the legal limit for drinking and driving. The original design allowed for four surveys to take place: two before and two after the limit was lowered. In the event, no reduction in the limit occurred and so the third and fourth surveys were cancelled.
If the final two surveys had taken place (regardless of a change to the limit) these latter surveys would have largely replicated the methodology adopted in autumn 1998 and spring 1999. The same forces would have been involved, using identical procedures to collect data in the same or comparable locations one year on from the previous surveys. Consequently, while the research would no longer have met the original objective, the results of the four surveys together could have been considered as a series of data which would have met a different objective; namely to establish the trend of drinking and driving on weekend evenings in the UK (albeit over a short time period). As such, and with the benefit of hindsight, the decision to cancel the third and fourth surveys could be considered a missed opportunity.

### 3.1.4 To gain insights into the characteristics, attitudes and behaviour of drink drivers

It is questionable whether the information obtained from questionnaires administered at the roadside warrant the extra time and cost required. Clearly the most important piece of information to be obtained is the breath alcohol reading. Recognition of this, together with the view that little useful data are obtained from roadside questionnaires, has led some jurisdictions (e.g. the Netherlands) to dispense with questionnaires. As an alternative approach, the 1998/99 UK surveys used postal questionnaires to elicit further information, on the basis that drivers would be more willing to answer additional questions in privacy and at a more convenient time. The postal questionnaire used in autumn 1998 asked drivers about their general drinking behaviour, the circumstances surrounding the particular day on which they were stopped, and their attitudes towards drink-drive policy and enforcement practices. Of most interest were the responses to the questions on policy:

‘At present, the blood alcohol limit for driving is 80 milligrams of alcohol in 100 millilitres of blood (80 mg/100 ml). Would you be in favour of this being reduced to 50 mg/100 ml?’

This question was only asked in the autumn 1998 survey as there were local elections in the spring of 1999. Three-quarters of drivers who responded were in favour of a lower limit.

‘At present, to prosecute a drink driver after a roadside test, a second breath test is needed at the police station. If this could be done on the basis of an accurate roadside test, would you be in favour?’

A very similar proportion of drivers were in favour of allowing evidential roadside testing in each survey; around 75%.

It could be argued that the postal questionnaires provided little useful information on the characteristics of drink drivers (which may be better obtained from other
sources, such as drivers who take part in a drink-driver rehabilitation course). Moreover, questionnaires and surveys can only provide useful information if the size and selectivity of the non-response group are taken into account. It is evident that the characteristics of the non-response group were not considered in previous surveys conducted in the UK, an issue which future surveys will need to address. If so, the use of postal questionnaires could be a cost-effective way to elicit potentially valuable information from a sample of drivers (albeit self-selected from among those given questionnaires), regarding attitudes towards current policy and potential changes to those policies.

### 3.2 What alternative methods have been used in other roadside surveys of drinking and driving?

The literature search and discussions with experts in the field of drinking and driving revealed over 30 roadside surveys that had been conducted since 1970. Most of these surveys adopted similar methodologies to those employed in the UK between 1988 and 1999. While there may have been minor variations in procedures or in the way that results have been reported, in common with the UK approach, the majority of these surveys have involved police officers randomly stopping drivers on weekend nights and directing them to a lay-by or car park where trained interviewers collect breath-test data and administer questionnaires. Consequently, there would be little to be gained from reviewing in detail the methodologies of each of these surveys. Appendix 1 provides a summary table (Table A1.1) covering the majority of these surveys. For each study considered, the following information is provided (where available):

- country;
- year;
- stated objective;
- sample size;
- region;
- number of locations sampled;
- days of week and hours when data were collected;
- months or seasons when the survey ran;
- details of data collection methods (e.g. who collected the data); and

- percentage of the sample who tested positive for:
  - any alcohol (in practice, typically above 5 mg/100 ml BAC);
  - alcohol above 50 mg/100 ml BAC; and
  - alcohol above 80 mg/100 ml BAC.
Table A1.1 is not intended as an exhaustive list of all roadside surveys of drinking and driving. For example, in the USA between 1972 and 1976 a number of relatively small surveys (samples of c.1,000 or less) were conducted in individual states (e.g. Fairfax, Virginia, 1972; Iowa, 1972; Hennepin County, Minneapolis, 1973; Utah, 1972, 1973, 1974; Los Angeles, 1975). However, these studies were designed to measure the effectiveness of the various countermeasures introduced as part of local Alcohol Safety Action Projects (ASAPs) and generally involved small samples. Moreover, it would be inappropriate to generalise their findings to other jurisdictions.

3.3 Options for modifying the UK methodology

Section 3.1 emphasised that the research design adopted for a roadside survey will be largely influenced by the specific objectives of the research (why is the data being collected?). The other parts of the survey process that could be modified can be summarised by the following questions:

- Who collects the data?
- When are the data collected?
- Where are the data collected and how are sites selected?
- What data are collected?

This section focuses on roadside surveys that have adopted an alternative approach in one or more of the above areas. Four roadside surveys are reviewed, each one being an example of an alternative methodology that could be adopted for a future UK survey. In this way, each of the surveys is treated as a case study for the particular modification.

3.3.1 Who collects the data?

The UK roadside surveys have employed three different models for collecting data:

1. Police stop drivers and interviewers collect the data (1964, 1988).
2. Police stop drivers and the data are collected by a pairing of research staff and security firm personnel (1990).

Each of these approaches has its merits: option 1 ensured that the data collection process adhered to high scientific standards; while options 2 and 3 reduced significantly the costs of the survey.

It is a legal requirement that police officers conduct the initial stopping of drivers, so their involvement in the survey is a necessity. The issue is then whether there is any
need for others to be involved in the survey process. The 1998 and 1999 UK roadside surveys took a ‘police-only’ approach, with mixed results. As was noted in Section 2.4.4, the spring 1999 survey suffered probably because of the lack of a national refresher briefing day for the police officers involved. Clearly this is an issue that could be readily addressed in future surveys.

One also needs to consider whether trained interviewers or police officers are better able to collect the necessary data to the scientific standards required. Trained interviewers should be relied upon to follow a set procedure without deviation: their role is clearly defined and limited simply to collecting that data. Where data are collected solely by police officers, their role is not so clearly defined. While they will be acting as researchers, collecting data as necessary, should a driver test positive, their role becomes that of enforcement officer – they will then be required to deal with the driver according to normal police procedures.

These issues have been addressed in research conducted in the Dutch province of Zeeland, which coincides with a police region. The Zeeland police region consists of three police districts. Shortly after the turn of the Millennium, a Regional Traffic Police Team was established in Zeeland, which conducts weekly drink-driving enforcement activities at different locations and times throughout the province, normally selecting the sites and times for testing themselves. However, once a month the team conducts a roadside survey session according to a research design developed by researchers, which dictates in which police district and at which locations drivers will be tested. The survey is confined to Saturday nights between 9 pm and 4 am. Each quarter of the year one survey session is conducted in each of the three police districts, allowing three-monthly updates of the drink-driving trend in Zeeland. The Zeeland roadside survey results in an annual sample of approximately 4,500 randomly tested drivers. The police use handheld screening devices with an integrated data logger which records the date and time of the test and the test result, and these details are downloaded as a Microsoft Excel spreadsheet.

This approach has the significant advantage that most of the procedures are part of normal police practice. Consequently, the additional costs for administering each roadside survey are minimal, largely confined to the costs of having the data analysed and reported by an independent external researcher, at a cost in the region of €5,000.

It has been estimated that, if the Zeeland procedure was extended to all 25 police regions in the Netherlands, it would be possible to obtain an annual sample of at least 100,000 drivers. Perhaps it would be possible to employ a similar methodology in the UK, particularly if the objective is to establish a time series of roadside surveys (Mathijssen, 2007, personal communication).
While the UK does not have regional teams dedicated to traffic enforcement, the impending introduction of new screening devices into the UK, which can be used to collect demographic data, offer the possibility of adopting a similar approach in the UK. One option would be to fund individual forces to undertake more drink-drive enforcement and for a part of the enforcement process to be set up along similar lines to the Zeeland approach, i.e. according to a research design developed by researchers.

While economical, the ‘police-only’ approach is not without problems. For example:

- drivers, particularly those who have drunk alcohol, are less likely to agree to provide a breath sample when they are asked by a police officer to volunteer;
- where a police officer takes the breath sample, if a driver is over the limit he or she will have to be dealt with by the police officer under normal police procedures, even where the test was voluntary;\(^6\)
- there is a possibility that police officers collecting data may be called away to deal with other priorities, particularly on weekend nights in urban locations;\(^7\)
- the nature of police shift patterns mean that at certain times of the 24-hour period it may be difficult to find police officers to collect data; and
- given their training and experience, unless properly trained to understand the importance of collecting data from a representative sample, police officers stopping drivers may be tempted to select participants according to observable characteristics that suggest they may be drink drivers, rather than at random.

The alternative would be for the breath test to be administered by a civilian. In this case the test results would not be admissible as evidence in a court of law (and so if a driver tested positive a police officer would have to administer a second test). This was the approach adopted in the UK in the 1988 and 1990 surveys: drivers were offered an amnesty should they test positive, and where they did so alternative arrangements were made for their onward journey. A similar approach has been used in surveys in Canada. Clearly the cost implications of such an arrangement need to be balanced against the likely increase in participation resulting from data being collected by civilian interviewers.

There are also issues of risk management to be considered: what if a driver who tests positive insists on driving? Where the test has been administered by a civilian

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\(^6\) This is not a problem in the Netherlands, where the survey teams generally consist of 10 to 12 police officers. Six officers focus on testing, while the remaining four to six take care of the transport of suspects and the subsequent legal procedures.

\(^7\) This issue can be addressed by establishing clear arrangements within the police force (as is the case in the Netherlands). Sometimes officers will still be called away but in most cases this will only be for a short time and there will still be sufficient officers to continue the survey.
and has not been witnessed by a police officer, the police are powerless to intervene until the driver attempts to leave the test site. It is also questionable whether today an ethics committee would give approval for a study that allows drivers to continue with their journey if they test positive for alcohol above a certain level.

### 3.3.2 When are the data collected?

UK surveys have restricted the days and times of day when data are collected to Thursday, Friday and Saturday nights, between 10 pm and 2/3 am. From a cost-reduction perspective it makes good sense to limit the amount of time that survey teams are out on the road. However, as was noted in Section 3.1.1, by focusing solely on these nights the resulting data cannot be used as an indicator of the prevalence of drinking and driving at other times of the week.

Restricting the survey to times of the week when drinking and driving is most likely is one of the most effective ways to reduce the overall costs of the survey. Indeed, of the 30+ surveys identified in this review, only three surveys (Kenya 1996; Belgium 2003; Sweden 2007) surveyed drivers across every day of the week, and only the Belgian survey covered all hours of the day, and on a nationwide basis.

The national roadside survey that took place in Belgium in 2003 (Vanlaar, 2005) was the third national survey to take place in that country in the space of five years. The 2003 survey built upon the methodology used in the previous studies, is based on sound statistical principles and can be considered an example of best practice in this area. The national roadside surveys in Belgium are organised by the Belgian Road Safety Institute (IBSR), with the objective of identifying trends in drinking and driving. To enable this, the aim is to repeat the roadside surveys every two years. In 1998 and 2000 data were collected on Saturday and Sunday nights between 10 pm and 4 am. All the data were collected by either state or municipal police. While the locations at which the police officers were stationed were not randomly selected, efforts were made to achieve a representative sample of passing drivers by stopping as many drivers as possible and testing them all.

As a result of the experience gained in the 1998 and 2000 surveys, the IBSR refined the methodology further for the next survey, which took place in October and November 2003. A pilot project successfully tested the methodology, as a result of which almost all Belgian police forces agreed to participate in the full study.

In terms of strengthening the methodology, first, the process by which road sites were selected was improved to try to ensure that they were reasonably representative: this process is described in the next section. Second, to ensure that a comprehensive picture of the prevalence of drinking and driving was obtained, the data were collected on all days and across all hours of the week. Once a representative selection of road sites had been identified, each site was randomly linked to one of four possible time periods:
- weekdays – Monday, Tuesday, Wednesday, Thursday and Friday from 8 am to 10 pm;
- week nights – Monday, Tuesday, Wednesday, Thursday and Friday from 10 pm to 08 am;
- weekend days – Saturday and Sunday from 8 am to 10 pm; and
- weekend nights – Saturday and Sunday from 10 pm to 8 am.

At these sites and times during October and November in 2003 car drivers were stopped at random by police officers and asked to provide a sample of breath. As with the previous surveys, a representative sample of drivers was obtained by stopping as many drivers as possible and testing them all, without distinguishing between drivers on the basis of observed behaviour. In addition to providing a breath sample, drivers were also asked to complete a short questionnaire. Of the 12,824 drivers who provided a breath sample, 3.3% had a BrAC of at least 22 μg/100 ml, and most of these drivers (2.26%) had a BrAC of at least 35 μg/100 ml. From a methodological perspective, however, the more important issue is whether the enhanced research design provided sufficient additional understanding about the drinking and driving problem in Belgium to warrant the additional time and cost involved in administering the survey.

Focusing on the extended coverage provided by the Belgium 2003 survey, it is evident that this approach enabled a more comprehensive picture to be built up of the patterns of drinking and driving across the full week. Table 3.1 summarises the findings in terms of the time periods described above.

<table>
<thead>
<tr>
<th>Time period</th>
<th>Percentage of drivers above legal limit (22 μg/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>2.16</td>
</tr>
<tr>
<td>Week night</td>
<td>0.88</td>
</tr>
<tr>
<td>Weekend day</td>
<td>3.17</td>
</tr>
<tr>
<td>Weekend night</td>
<td>7.76</td>
</tr>
</tbody>
</table>

The results suggest that the problem of drinking and driving is significantly worse on weekend nights, which supports the approach taken elsewhere whereby data collection activities have focused on Friday and Saturday nights. However, more surprising is the finding that there is a significant drinking and driving problem during the day time, both at the weekends and on weekdays. Some researchers maintain that the Belgian figures for weekdays seem at odds with data from other jurisdictions, although there is some support for this finding from previous
research.\textsuperscript{8} If, as in most surveys, data collection had been restricted to weekend nights, the extent of drinking and driving during the daytime would have been overlooked, with possible consequences for any countermeasures identified.

### 3.3.3 Where are the data collected?

While the initial selection of sites for roadside surveys is usually made by researchers, typically there is some reliance on local police knowledge to identify a final selection of suitable survey sites. Understandably, the selection of these sites will be heavily influenced by issues of safety both to the interviewing team and to the general public. There may also be practical issues, such as having a site off the public highway large enough to accommodate the cars of drivers being tested, a team of interviewers and other vehicles (e.g. where an amnesty is provided for drivers deemed unfit to drive, taxis may need to be available to provide onward transport). As a consequence, the extent to which the locations selected as survey sites can be considered representative is questionable.

An example of a survey designed with a random sampling approach comes from Canada (Beirness and Foss, 2006) where roadside surveys have been organised in British Columbia on a regular basis since 1974. Since 1993 there have been five surveys. For these surveys, potential sites within each of the participating cities were identified by creating a grid on a map of each city and numbering each section. Intersections and roadway segments were then selected at random from within the grid sections. However, while this aspect of the selection process was random, when it came to identifying locations that would be used in the study a number of other practical issues came into play, which made the selection of sites non-random. First, the site had to be a parking lot or open area off the main roadway, with a separate entrance and exit. Second, the approach to the survey site had to be free of obstructions, curves in the roadway or major intersections. Third, the site had to be free of other traffic during survey hours. Next, permission to use the site had to be obtained from the owners which, the authors acknowledge, is much more difficult to obtain where the site is owned by a large corporation. Finally, sites selected for one survey were then used again in subsequent surveys.

In the USA, national roadside surveys were conducted in 1973, 1986 and 1996, and a national survey is in progress at the time of writing. Each of these surveys has employed a multi-stage sampling procedure designed to be representative of the 48 contiguous states. The initial sample is derived from the National Automotive Sampling System/Crashworthiness Data System (NHTSA, 1995). The Crashworthiness Data System (CDS) collects detailed information on an annual sample of approximately 5,000 traffic crashes involving at least one vehicle that is

\textsuperscript{8} A survey of drinking drivers administered in pubs (Corbett et al., 1991), for example, estimated that a higher proportion of lunchtime drinkers would have been over the limit on driving away than would have been the case during the evenings.
towed from the crash scene in 24 primary sampling units (PSUs) across the nation (NHTSA, 2007). The selection process then consists of the following procedures:

1. Selecting PSUs made up of cities, large counties or groups of counties from within four regions of the US and three levels of population density. The PSUs selected were those employed in the CDS. This enabled the sample to be weighted by crash frequency rather than population (thus producing a smaller sampling variance). In addition, the use of the CDS list of police jurisdictions provided easier access to police departments who were already working with the National Highway Traffic Safety Administration (NHTSA).

2. Selecting a sample of police jurisdictions (PJs) within each of the selected PSUs invited to participate in the survey. Departments were selected from those chosen for the CDS using simple random sampling.

3. Selecting survey sites within the geographical area of the selected PJs. This is achieved by placing a grid over a map of the area and randomly selecting 1 square mile cells within which the survey sites will be located. The site supervisor and police officer were instructed to find a ‘safe and effective’ site within the selected square, providing enough viewing distance of the roadway to permit an officer to signal oncoming vehicles to stop.

While complex, these sampling procedures ensure that the probability of selecting a PSU and a PJ survey location and driver is known at each stage in the sample design:

‘Knowing these probabilities allowed the computation of the probability that each individual driver would be interviewed in the survey. This was done by multiplying the sampling probabilities at each of the four stages to obtain the final overall probability of being sampled. The weight given to each case in the final totals (sampling weight) was then computed as the inverse of the sampling probability – that is, data from drivers who were unlikely to be interviewed based on the sampling procedure used were given more weight than data from drivers who were more likely to be interviewed. This ensured that the basic requirement of the sampling theory – that is, every driver has an equal chance of being interviewed – was met by adjusting for the biases inherent in the selection of locations within the sampling frame.’ (NHTSA, 2007; p. 11)

An alternative approach aimed at achieving similar objectives has been used in the aforementioned Belgium roadside survey. A random sample of potential road sites in each of the participating regions was first selected using a Geographical Information System (GIS). Subsequently, local police officers in each region reviewed the list of sites and decided whether a particular site should be replaced for reasons of efficiency or security (Vanlaar, 2005).
The initial identification of a random sample of potential locations from which a final list was selected may help to minimise some of the biases that would otherwise arise, but it should be noted that the second stage of this selection process introduces the same methodological weaknesses previously identified. It could therefore be argued that a sound systematic site selection would raise less bias than selecting sites using a combination of random selection and discretion.

The Belgian methodology was further enhanced by adopting more robust statistical procedures in the design of the survey. For example, the traffic flow at each site was counted, which was then used to calculate weights for each site, with the formula \((\frac{N}{n})(\frac{M}{m})\), where:

\[
N = \text{the total number of cars per site}; \\
(n = \text{the number of sampled cars per site}; \\
M = \text{the total number of sites per region}; \text{ and} \\
m = \text{the total number of sites sampled in the region}.
\]

The relevant resulting weight was then attached to each observed alcohol level in estimating the prevalence of drink driving. The values of \(N\), \(n\), \(M\) and \(m\) could also be used to calculate the influence of traffic flow on the probability of drink driving.

The attention given to statistical issues in the Belgian methodology made it possible to calculate correct standard errors, 95% confidence intervals and \(p\) values. In addition, the enhanced methodology enabled the researchers to evaluate the statistical significance of the differences between the percentages of drivers who were over the legal limit during the various time periods (Vanlaar, 2005).

It is questionable whether it is actually possible to achieve a truly random selection of sites (e.g. the second stage of the sampling in Belgium involved police officers selecting suitable sites from the list of sites selected at random), and hence whether this should be an aim in designing a roadside survey. Indeed, there is a prevalent view among researchers in this field that rather than trying to achieve a random sample, which for a host of reasons may not be practically possible, it is better to produce a systematic sample of research sites. In the framework of the EU DRUID (DRiving Under the Influence of Drugs) research project, large-scale roadside surveys of drink and drug driving are to be conducted in 12 European countries. It is informative to note that all 12 countries have unanimously agreed to select a systematic sample of research sites rather than a random sample.

These issues notwithstanding, it is fair to say that a UK survey would benefit from being designed with the same degree of attention to sound statistical principles as the Belgium surveys.
3.3.4 What data are collected?

While the overall costs of a roadside survey could be reduced by having police officers collect all the data, or by limiting the days and times on which the data are collected to known peak times for drinking and driving, inevitably a roadside survey is a very costly exercise. Moreover, unless a series of repeat surveys are to be administered at regular intervals, a roadside survey is likely to be a rare event. Consequently, there is an argument for making the most of the opportunity by collecting other data at the same time as collecting breath-test data. This is the approach being taken in the most recent roadside survey of drinking and driving conducted in the USA. A full roadside survey is currently in progress, however, the methodology being used in the full study has been piloted and reported (NHTSA, 2007), from which the following details are taken.

Following a feasibility study, in which the procedure to collect survey data and biological samples at the roadside was developed and refined, a pilot study was conducted in six states. The pilot developed and tested the methodology that is currently being used in a full-scale national roadside survey.

The methodology being employed in this study is similar to that used elsewhere but involves relatively large survey teams (up to 10 data collectors, one to two police officers and a phlebotomist to take blood samples). The police officer positions his vehicle at the side of the road with lights flashing, in front of the testing site. As and when a data collector becomes free, the police officer flags down the next driver from the flow of traffic and, having briefly explained the purpose of the study, directs the driver to a bay within the survey site (e.g. a car park).

On approaching the vehicle, the data collector observes and records basic demographic data (the gender and ethnicity of the driver, the number of passengers, use of seat belt) so that these data are recorded for all drivers stopped, including those who refuse to participate. Having introduced him/herself and explained that the study is voluntary and anonymous, the data collector then invites the driver to answer a range of questions on topics such as the details of the trip they are making, their annual mileage, their drinking, and drinking and driving. If they refuse the interview, they are requested to provide a breath sample before leaving the bay. Drivers are then offered incentives to provide an oral fluid sample ($10); a blood sample ($50) and to complete an Alcohol Use Disorder (AUD) screening questionnaire ($5).

An important advancement of the NHTSA study is the use of technology to assist with the data collection process. First, all observation data, questionnaire responses and AUD screening data are stored on a Sony Clie J2 Personal Digital Assistant (PDA). Second, the result of the breath test is not displayed on the screening device (Intoxilyzer 400PA) but, rather, is stored within the device to be merged with other data about the respondent and downloaded to computer for analysis at a later date.
In this way no one at the survey site knows the alcohol reading for the participant, ensuring that all the data remain anonymous and confidential. In the pilot study the only deviation from this procedure was where a respondent appeared impaired. In such cases a supervisor administered a standard breath test, which displayed the result. If the reading was above the equivalent of 50 mg/100 ml BAC, alternative transport arrangements were made: for example, asking a sober passenger to drive, arranging for the driver to be collected by a friend, arranging a taxi or, rarely, one of the researchers drove the respondent home in the respondent’s car while another followed in a rental car.

Finally, where the respondent agrees, a sample of oral fluid is collected using a saliva sample collection device. The driver places the paddle end of the device under their tongue until a defined volume of oral fluid has saturated the device. The device is then placed into the storage tube containing a preservative buffer solution, is sealed and placed in the pack of data collected from that respondent.

The NHTSA pilot study is notable on several levels:

- The data collection teams are much larger than have generally been involved in European roadside surveys. Typically, an NHTSA team consisted of eight to ten individuals, but in some cases the team consisted of as many as 13 individuals.

- As might be expected, the proportion of drivers who agreed to provide oral fluid and blood samples was significantly lower than those who provided alcohol samples. Of those approached, approximately 79% provided a breath sample, 67% provided a saliva sample and 42% provided blood.

- Owing to the comprehensive nature of the survey procedure, the time required to collect data from each respondent was considerably longer than other surveys: to collect the survey data and a breath test took, on average, five to seven minutes. Adding the oral fluid test increased the data collection time to 10–12 minutes; adding the blood test increased this to 20–25 minutes. It is interesting to compare these times with data collection times in other roadside surveys. Generally, such information is not readily available; however, the report of the German roadside survey (Krüger et al., 1995) which ran from 1992–94 considered the time taken for the police to collect data to be a significant factor in response rates. The researchers categorised data collection times as short (less than one minute), medium (up to two minutes) and long (over two minutes), and concluded that the longer the police spent with drivers the lower response rates were.

- The survey site and the procedures may have appeared quite intimidating to some potential respondents: each site consisted of a large team, and the collection of saliva and blood samples may have deterred some drivers from participating.
• Probably as a consequence of both the time required for data collection and the intimidating nature of the setting and procedures, response rates were significantly lower than the previous national roadside surveys conducted in the USA. In 1996, 95.7% of those who entered survey locations provided a breath sample: in the 2005 pilot study this figure was only 79.4%. The lower response rate (and the possibility that this might have been caused by the data collection procedures) is an issue that needs to be considered when weighing up the costs and benefits of using the roadside survey as an opportunity to collect more data. A response rate of barely 80% is of limited value where the drivers of most interest form only 1–2% of the population.

• The authors of the report also highlight the possibility that the general public may simply be more wary of responding to surveys of this nature than they were 10 years ago – some potential respondents asked if they were going to be tested for their DNA.

• The methodology employed in the pilot study is currently being used in a national roadside survey, which aims to collect data from 6,000 drivers across the USA. Assuming that the same data are collected, the incentives are set at the same level and similar response rates for each part of the data collection are achieved, the cost of the survey is likely to be very high: based on the figures provided, the incentives alone would cost in the region of $182,000.

Similar roadside surveys are currently being conducted in a number of European countries (not including the UK) as part of the EU research project DRUID. One of the objectives of the project is to establish the prevalence of drug driving in participating countries. This information will be collected by means of roadside surveys in 13 European countries where randomly stopped drivers are checked for drug consumption. These countries are Denmark, Belgium, the Netherlands, Sweden, Finland, Italy, Hungary, Lithuania, Poland, Spain, Czech Republic, Norway and Portugal. In the Netherlands, for example, approximately 5,000 randomly selected drivers will be requested to volunteer for an interview and a blood sample. All drivers are breath tested by the police and those subjects who refuse to provide a blood sample are requested to provide a saliva sample. As of January 2008 more than 2,000 drivers had been invited to participate. All of these gave a breath sample, 99% agreed to be interviewed, approximately 70% provided a blood sample and an additional 25% provided a saliva sample. Less than 5% refused to provide any body fluid sample.
4 RECOMMENDATIONS

As a result of the review of the UK roadside surveys and reports of surveys conducted in other countries, a draft report was produced and sent to members of the Scientific Steering Committee (SSC) for review. Subsequently, the SSC met to discuss the report and to produce a set of recommendations for future UK surveys.

Each member of the SSC was first invited to comment on the draft report and then a more general discussion ensued, with the objective of coming to a consensus on the recommendations for a future UK roadside survey of drinking and driving. In keeping with the structure of this report, the SSC’s discussions centred on the areas with potential for improvement highlighted in Section 3:

• who collects the data?
• when and where are the data collected?
• what data are collected?

This section summarises the comments of the SSC and provides recommendations under each theme.

4.1 General issues

While there is a need to keep costs to a manageable level, the roadside survey is a rare opportunity. If it is worth doing at all, it is worth providing a budget sufficient to enable the collection of data on the extent and nature of drink driving, and which allows for comparison both with international studies and with previous roadside surveys conducted in the UK.

A pilot study will be essential to identify, at an early stage, any potential problems with the methodology. In addition, a pilot study undertaken in a small region would enable the likely cost of a larger study to be estimated. In the Netherlands, the results of a pilot study were used successfully to demonstrate to other police forces the benefits of conducting a roadside survey, and as a way to gain their support and participation in the full study.

Recommendation 1: The research should be piloted in one police region to trial the methodology and to demonstrate the potential benefits to other police regions.

4.2 Objectives of the research

The objectives of the research will clearly have a major influence on the survey methodology design and the data collection procedures selected. The Department
for Transport needs to specify clearly the objectives of the research – what questions is the survey intended to answer? The research specification sent to potential contractors needs to include a precise statement of the objectives of the research.

**Recommendation 2: The Department for Transport needs to identify what the research is intended to achieve and provide a clear statement of these objectives to prospective contractors.**

There was a preference expressed for collecting data that would enable prevalence rates to be estimated, as opposed to trend data which would be more expensive and would require the survey to be repeated on a regular basis. There was strong support for the roadside survey to be administered on a ‘rolling basis’, as is the case in the Netherlands, rather than being a one-off activity repeated once every c.5–10 years. A rolling survey would involve the same team collecting data in different police regions across the country (to obtain data on regional variations), throughout the year (to obtain data on seasonal variations), and at different times of the day and week (to obtain data on temporal variations). With careful and efficient planning, this approach has the potential to provide a representative sample of data that would inform our understanding of the prevalence of drink driving across the nation and across the year. A prevalence survey conducted in this way would also allow for international comparisons.

The cost-effectiveness of this approach could be enhanced by using the roadside survey as an opportunity to collect additional data on other road safety issues. For example, in one wave of the survey, data on mobile phone use could be collected, while another wave might collect data on seat-belt wearing rates.

A rolling survey could have the additional benefit that enforcement activity will be perceived by the local public to have increased. However, while this may bring about benefits in terms of drink drivers modifying their behaviour temporarily, it might have the unwelcome effect of affecting the accuracy of data and results. The potential for a similar effect needs to be considered with regard to advance publicity of the survey.

**Recommendation 3: It is recommended that the roadside survey should be a rolling survey that, over time, would enable the prevalence of drink driving to be determined, provide valuable data on regional, seasonal and temporal differences, and create a platform for collecting data on other issues.**

### 4.3 Methodological issues

The research team will need to identify the level and frequency of survey activity that will be required in order to achieve a sample that is sufficient to demonstrate, with statistical significance, those differences between the results of the different
waves of the survey that it would be desirable to detect when, or indeed if, they exist. It is important that every effort is made to ensure a high response rate. In this regard the Department for Transport needs to balance the desire to gather additional valuable data on a group who can be difficult to survey against the possibility that response rates may be reduced if respondents are overloaded with questions.

The SSC felt that the survey would benefit from the provision of a comprehensive training programme for the interviewers and police officers involved in the research. In light of previous UK experience, it was agreed that the training should be repeated before each new wave of the survey (assuming these are separated in time) even if successive waves are being repeated by the same team. The training should provide a thorough explanation of the objectives of the study, the methods, equipment and survey tools to be used, and how to manage any risks associated with the research. The training could also cover the presence of mouth alcohol and how this can affect BrAC readings.

In contrast with previous roadside surveys conducted in the UK and elsewhere, those surveys conducted recently in Belgium and the USA have given greater consideration to the issue of ‘non-response’, i.e. those who choose not to participate in the survey. Just as it is important to understand the characteristics of respondents, it is equally important to try to capture data on those who refuse to participate in order to establish whether the sample of people who are providing data are representative of the wider population. This issue is especially important in research such as this, where the number of positive cases (i.e. those who provide a breath alcohol reading above the drink-drive limit) is a very small proportion (c.1–2%) of those who provide a breath sample. Consequently, the research design and methodology adopted will need to take steps to try to ensure a high response rate and to include methods that take account of non-response. The recent National Highway Traffic Safety Administration (NHTSA) research includes a simple method for collecting data on non-respondents (see Section 3.3.4).

There was considerable interest in the methodology adopted in Belgium. In particular, it was agreed that a UK roadside survey would benefit from being designed with the same attention to statistical principles. It was noted that the Netherlands and the UK use slightly different conversion factors to other countries when converting BrAC to BAC values. In the UK and the Netherlands a conversion figure of 2,300 is used, whereas in the rest of Europe the figure used is 2,100. However, this is only relevant where BAC distributions are being compared between countries, and in order to avoid confusion it is recommended that BrAC values only are used.

Recommendation 4: It is recommended that all survey team personnel, both civilian and police, are thoroughly briefed and trained in the use of the various survey materials and equipment. Where there is a time lag of more than three months between successive waves of the survey, this training should be repeated.
before the next wave commences. This is essential to ensure the smooth and efficient running of the survey.

Recommendation 5: The methodology should be designed with attention to statistical principles and best practice. To maintain consistency with other surveys currently being conducted as part of the EU DRUID (DRiving Under the Influence of Drugs) project, it is further recommended that a systematic step-wise selection of research areas and sites is adopted, together with similar day- and time-classes to the ones used by the EU countries involved in the DRUID roadside surveys.

Recommendation 6: The methodology should include methods to collect basic data on the demographic characteristics of non-respondents and statistical procedures to take account of non-response.

4.4 Who should collect the data?

Legally, the only person who can stop a driver on the public highway is a police officer (or, on motorways, an officer of the Highways Agency). Consequently, police officers must be involved in a roadside survey. The question then remains as to whether police officers should be involved in administering all aspects of the survey (as was the case in 1998/99), or whether a team involving trained researchers and police officers would be preferable.

UK police representatives were supportive of a roadside survey and felt that data and analysis on this issue were badly needed. However, the view was expressed that, while the police service will obviously support the survey, unless the work is offered to individual police officers as overtime they may be less willing to participate.

The SSC discussed the tasks that the police could be involved in, beyond the essential tasks of traffic management and ensuring the safety of all concerned. The Department for Transport Traffic Management (TM) Division employs police officers to administer origin-destination surveys, which are set up by a Service Level Agreement (SLA). Under this process, police forces are paid to undertake a particular piece of work and guarantee levels of service as required. The SLA is set up by an exchange of letters, and rates are agreed for a number of hours per day for x number of days. A similar process could be used to fund the involvement of police officers in a roadside survey of drinking and driving.

If police officers are used to collect breath-test data, they will be required to deal with any positive cases according to normal police procedures. Offering drivers who are over the drink-drive limit an amnesty, as was the case in previous surveys, would not be an option. As a consequence, the police officer administering the breath test would be taken out of the data collection role until the driver is dealt with (which, in practical terms, would mean the police officer would be tied up with follow-up.
procedures for the remainder of that data collection period). The resulting data would not be available to the research team until any resulting legal action has been concluded. In the 1998/99 survey this was overcome by positive BrAC readings being anonymised and made available to the Department for Transport Police Liaison Officer who passed them on to the research team. However, it was clear that this process was not followed in all such instances.

The SSC felt that, despite the cost savings, if police officers were responsible for all data collection, a number of difficulties might arise. Specifically, individual officers could be called away by other policing priorities or staff shortages. In addition, previous experience suggested that there are wide differences between police forces in terms of their policy on drinking and driving, the level of priority given to this issue and how the policy is administered. For these reasons the group agreed that the role of the police should be restricted to traffic enforcement, maintaining the flow of traffic, ensuring public safety (and that of the researchers) and dealing with cases where a driver provides a sample above the drink-drive limit.

The SSC also considered the use of trained interviewers to collect the breath-test data, the approach taken in the 1989 UK roadside survey. In order to reassure drivers of the confidentiality and anonymity of the test, it was recommended that the test result should not be displayed on the device screen but, instead, should be stored for download and analysis at a later date. Drivers who have consumed some alcohol may be more likely to participate if the test is administered by a civilian and thus a more accurate picture of the true extent of drink driving may be obtained. This approach is not without problems, however. In 1989, drivers who tested positive were offered an amnesty and a lift home. The difficulty arises when a driver who is obviously intoxicated decides to drive rather than accepting the lift home. In the 1989 study a quiet word from an attending police officer was sufficient to convince all intoxicated motorists encountered that they would be better advised to accept the offer of a lift. However, it is questionable whether such an approach would be sufficiently robust in terms of risk management to receive ethical clearance today. There is also the issue of how to deal with a driver whose BrAC is below the legal limit but who the interviewer suspects is too intoxicated to drive. While this situation was dealt with successfully in 1989, it is unlikely that a research design that could allow an intoxicated (albeit ‘legal’) driver to proceed would receive ethical clearance.

In order to deal with these difficulties, a combination of police and civilian interviewers might be most appropriate. As police officers are necessary to stop drivers in the first instance, this interaction with the driver could be used as an opportunity to screen out those drivers who are obviously intoxicated. (In practice

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9 The 1998/99 UK surveys addressed this issue by only employing police officers on rest days, although such a practice may lead to elevated fatigue levels of the participating officers.
this is probably what has happened in previous surveys, albeit informally, but it would be sensible to state this explicitly as part of the methodology.) These drivers would then be dealt with by standard police procedures and their breath alcohol level and other relevant details fed in anonymised form into the survey dataset. The drivers whom the police officer does not suspect of being unfit to drive would then be passed through to a civilian interviewer to be dealt with.

Notwithstanding the group’s concerns regarding the exclusive use of police officers to collect data, the SSC was enthusiastic about the research conducted in Zeeland and recommended exploring the feasibility of establishing a UK demonstration project along similar lines. With a demonstration project in mind, the SSC discussed how best to encourage the involvement and support of the police. The Zeeland experience was discussed, and the following were noted as examples of good practice:

- Police participation in Dutch roadside surveys has been encouraged by agreeing to provide participating forces with a report on the drink-driving situation specific to their area, as identified from the research.
- Police support was enhanced by establishing strong links with each force and by having good communication and cooperation between the research team and the police liaison officers.
- The efficiency of the survey team was significantly improved by the establishment of a dedicated Police Transport team, with whom the researchers liaised on a regular basis.
- The police are given a briefing before each research data collection period commences. This briefing explains the objectives of the survey and emphasises that the data are to be used for research purposes only and so must be collected using research methods, rather than in accordance with standard policing procedures (e.g. random sampling as opposed to targeting likely drink drivers).

The police representatives of the SSC mentioned that the impending introduction of new breath-testing equipment presents an opportunity to pilot some of the methods that have been used in the Netherlands. The Department for Transport Road User Safety (RUS) Division has provided a Road Safety Grant to fund the purchase of sufficient new breath-screening devices by police forces in England and Wales for one device to be available in every vehicle likely to be assigned to road traffic collisions. These new devices include software that will collect a battery of information of use to RUS, including the reason for the test, the BrAC result, the age and gender of the subject, and the time and date. While some of this information is already provided by police forces to the Home Office, it relies upon officers completing a slip of paper every time a negative test is conducted. Crucially, the present return does not include the BrAC reading or the reason for the test, the very information which will help the Department for Transport determine the propensity
for drivers who have alcohol in their body, but are below the legal limit of 80 mg/100 ml, to be involved in collisions.\textsuperscript{10}

The data collected on these new devices using normal police procedures would not be suitable for research purposes (e.g. the data would not be obtained from a randomly-selected sample). However, if a demonstration project adopting the Zeeland approach was established, it could be possible for the devices to be used exclusively for research purposes for a short duration each year. For example, if the year was divided into 13 four-weekly periods, for one of these periods the devices could be used to collect research data in accordance with a research design. Taking the idea a step further, if the 13 four-weekly periods could be evenly distributed to 13 forces, then each month of the year the research would move to a different region, thus creating the basic structure for a rolling survey. Care would be required to ensure that this approach did not inadvertently introduce bias into the data collection process (e.g. always sampling the same region in a particular month), but this could be readily avoided through the use of a random number generator to make choices relating to time- or space-related aspects of the rolling survey.\textsuperscript{11}

Recommendation 7: The survey team should be composed of police officers and civilian interviewers in order to provide the best mix of skills and to help strengthen response rates.

Recommendation 8: A rolling survey should be commissioned, first as a demonstration project in one police region and then in a representative sample of police force areas.

Recommendation 9: It is recommended that the Department for Transport explore the feasibility of using the new breath-testing devices either as part of a demonstration project or, failing that, to provide supplementary data on the drink-drive problem.

4.5 Where should the data be collected?

The SSC discussed the issue of survey site selection at some length and it was agreed that any future UK roadside survey should endeavour to use a scientific site-selection method. Two approaches for site selection were identified (random sample of sites versus systematic sample) and their relative merits were discussed. While from a research perspective it would be preferable to identify a truly random sample of sites, in reality this is just not possible. Ultimately, the final selection of sites has to be made by the local police force, whose decision will be based on safety and practical issues, such as road layout, proximity to junctions, ease of access and exit,

\textsuperscript{10} Thanks to Sergeant Roger Agombar for providing the detail regarding the new breath screeners.

\textsuperscript{11} Thanks to Ward Vanlaar for his comments on this issue.
from the site, likelihood of traffic problems etc. Consequently, it is not possible to obtain a truly random sample and therefore the group agreed that it would be preferable to select the broad locations of the sites using a systematic stratified random sampling framework followed by final site selection subject to the various practical constraints, rather than attempting to produce a random sample.

GIS-based mapping systems now offer the potential to quickly produce a systematic sampling framework based on a grid system (e.g. 2 km squares), within which a sample of potential sites can be identified; an approach that has been adopted in Belgium. A similar approach could be adopted in the UK as a means to identify a first level of potential survey sites. Depending on the data available on the GIS database, it could also be possible to stratify the sample of locations by applying layers containing various levels and types of data. For example, if data on bars and restaurants were available, this information could be used to ensure that the potential sites included an appropriate balance between ‘drinking locations’ and ‘non-drinking locations’. Similarly, if data on speed limits for each road were available, this could be used to ensure that a mix of different road types were included in the location’s dataset.

The NHTSA study was commended for employing a multi-level (stratified) sampling framework, which enables the probability that each individual driver would be interviewed in the survey to be calculated. From this calculation a weighting can be applied to each case in the sample, such that those drivers who were less likely to be interviewed are given a higher weight.

There was also some discussion of the possibility that sites that are selected and sampled repeatedly over successive waves of a survey might become known to locals, who would then avoid these areas, particularly when they have been drinking. In previous studies this issue has been addressed by the study team visiting a number of sites during a sampling session; in the Netherlands, for example, six sites are visited in a random order during each session, thus minimising the chances that drivers can predict which areas to avoid.

In addition to calls for a more scientific site-selection procedure to be introduced, some members of the group felt that the vehicle selection procedures could be more scientific. In many studies, as soon as an interviewer becomes free, the next approaching vehicle in the queue of traffic is stopped and asked to participate in the survey. It was argued that this approach is acceptable as long as the process is systematic, for example every $n$th vehicle in the line of traffic is stopped. On this issue, it is also worth noting that, in rural locations where traffic density is very low, in order to make the exercise worthwhile it may be necessary for $n$ to be low. However, the same principle applies: as long as the process is systematic, then this should be, which if done correctly provides an effectively random sample.
Recommendation 10: Site and vehicle selection should adopt a scientific approach, such as using a systematic sampling framework to identify survey sites.

4.6 When should the data be collected?

Previous roadside surveys conducted in the UK have been limited to Thursday, Friday and Saturday nights. The SSC were strongly supportive of extending any future surveys to cover other times and days of the week, so that a more complete picture of the extent and nature of drinking and driving might be obtained. In particular, it would be useful to have more data on the extent of the morning after problem.

At the same time it is clear that extending the survey to cover all days of the week and all hours of the day, while desirable, would not be cost effective. Rather than limiting the survey to the same periods as previous UK surveys, or trying to cover other times of the week in a single survey, the group felt that a rolling survey approach might better enable data to be gathered on other days of the week and at other times of the day.

Recommendation 11: It is recommended that a rolling survey approach is used to collect data at different times of the day and on different days of the week.

4.7 What data should be collected?

It was generally agreed that, while a roadside survey presents an opportunity to collect a range of data on drivers who had been drinking, it is important to remember that the most fundamental piece of information that must be collected is the driver’s breath alcohol reading. From a policy perspective, more data on attitudes and beliefs relating to alcohol and driving would be beneficial and it is acknowledged that drink drivers can be a difficult group to recruit for research. Better understanding of the problem – the kinds of people who drink and drive, and where and when – should help us tackle the problem more effectively. However, it is debatable whether a roadside survey is the best method for collecting this data – other sources of data and drink drivers (such as the Drink Drive Rehabilitation Scheme) might be more appropriate and more cost effective.

The group also considered the possibility of screening for drugs at the same time as screening for alcohol, as in the NHTSA study. The point was made that there is very little current UK data on the extent or nature of the drug-drive problem and so additional data would be welcome. However, adding a drug-screening element to the roadside survey introduces additional complexity into the methodology as well as a significant increase in costs and personnel required. The NHTSA experience also suggests that response rates may have been affected: some respondents may have
been intimidated by the size of the survey team, while others may have been deterred by the length of the survey.

The potential benefits of collecting more data, be it attitudinal data related to alcohol or drug-screening data, need to be weighed against the potential impact this additional data collection may have on response rates. On balance, the dual requirements of ensuring a good response rate and keeping costs to a reasonable level suggest that the next UK roadside survey should focus on alcohol rather than including drug screening. Nevertheless, if a rolling survey were to be commissioned, then it would be possible to cover these issues on a smaller scale, which might be more manageable and would certainly be less expensive. For example, one wave of the survey could include drug screening while another might include more detailed attitudinal questionnaires.

**Recommendation 12:** It is important not to lose sight of the fact that the most important piece of datum to be collected is the driver’s breath alcohol reading.

**Recommendation 13:** Use the rolling survey methodology to collect data on a range of other issues. This method could also serve as a pilot for more complex data collection, such as screening for drugs.
5 CONCLUSION

This review has considered research on roadside surveys of drinking and driving from around the world. In addition, discussions have been conducted with experts in the field of alcohol and roadside surveys. Together, these sources have provided a wealth of information on the form that a new roadside survey might take, what data could be collected, where and when they could be collected, and by whom.

It is clear that, while there are a number of options available to the Department for Transport, the final direction that the research takes will be heavily influenced by the specific objectives of the research. The SSC was strongly supportive of a demonstration project involving one police force as a means to trial some of the examples of best practice identified from research in other countries.

There was also enthusiastic support for the roadside survey to be structured as a rolling survey, to enable the cost-effective collection of data at different times of the day, week and year, as well as across different regions. This approach could also form the basis for collecting data on other road safety matters, such as mobile phone use and rates of seat-belt wearing, as well as more complex issues such as the prevalence of drug driving.
6 ACKNOWLEDGEMENTS

The author would like to thank the following individuals whose assistance, guidance and expert advice were willingly provided and very gratefully received:

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- Professor Richard Allsop, University College London (UCL), UK;
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- Dr Claire Corbett, Brunel University, UK;
- Dr Åsa Forsman, VTI (Swedish National Road and Transport Research Institute), Sweden;
- Maureen Keigan, Transport Research Laboratory (TRL), UK;
- Pat Kilby, Department for Transport, Transport Statistics Division, UK;
- René Mathijssen, SWOV (Dutch National Road Safety Research Institute), the Netherlands;
- Chief Superintendent Jerry Moore, Department for Transport, Road User Safety Division, UK;
- Deirdre O’Reilly, Department for Transport, Road User Safety Division, UK;
- Dr Lily Read, Department for Transport, Road User Safety Division, UK;
- Dr Rob Tunbridge, Independent, UK;
- Ward Vanlaar, Traffic Injury Research Foundation (TIRF), Canada; and
- Maria Vegega, National Highway Traffic Safety Administration (NHTSA), USA.
7 REFERENCES

The references apply to the main part of the report and to Appendix 1.


Transport and Road Research Laboratory (TRRL) (1967) *Alcohol and Road Accidents*. Leaflet No. LF57, Crowthorne: TRRL.


APPENDIX 1

Summary of roadside surveys of drinking and driving
Table A1.1: Summary table of Roadside Surveys of Drinking and Driving conducted around the world

<table>
<thead>
<tr>
<th>Country</th>
<th>Year(s)</th>
<th>Stated Objective</th>
<th>Sample size</th>
<th>Where</th>
<th>Site details (number, selection methods where known)</th>
<th>Days of week</th>
<th>Survey times</th>
<th>Months/seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>1964</td>
<td>To study drivers’ drinking habits and to establish a pattern of such</td>
<td>1739</td>
<td>Surrey</td>
<td>3 sites selected at the discretion of individual forces</td>
<td>MTW T</td>
<td>1800–0000</td>
<td>December</td>
</tr>
<tr>
<td>England</td>
<td>1988</td>
<td>To determine the distribution of alcohol in a random sample of drivers</td>
<td>2656</td>
<td>Sussex and Warwickshire</td>
<td>46 sites selected at the discretion of individual forces</td>
<td>MTW T SS</td>
<td>2200–0300</td>
<td>April/May/June</td>
</tr>
<tr>
<td>England and Wales</td>
<td>1990</td>
<td>To determine the distribution of alcohol in a random sample of drivers</td>
<td>13454</td>
<td>10 Counties in England and Wales</td>
<td>442 selected randomly among major roads in the urban and rural areas*</td>
<td>MTW SS</td>
<td>1900–0200</td>
<td>April to October</td>
</tr>
<tr>
<td>England and Scotland</td>
<td>1998</td>
<td>As above, plus to monitor any change in alcohol levels of the driving population before and after any change in the drink-drive limit</td>
<td>10717</td>
<td>11 police forces (10 in England, 1 in Scotland)</td>
<td>130 sites selected at the discretion of individual forces</td>
<td>MTW SS</td>
<td>2200–0200</td>
<td>October</td>
</tr>
<tr>
<td>England</td>
<td>1999</td>
<td>As above, plus to monitor any change in alcohol levels of the driving population before and after any change in the drink-drive limit</td>
<td>9571</td>
<td>10 police forces in England</td>
<td>Similar methods to the 1998 survey understood to have been employed</td>
<td>MTW SS</td>
<td>2200–0200</td>
<td>April</td>
</tr>
<tr>
<td>Canada</td>
<td>1974</td>
<td>To assess the extent and nature of driving after drinking in Canada</td>
<td>Over 9700</td>
<td>All Canadian provinces</td>
<td>585 randomly selected sites</td>
<td>MTW SS</td>
<td>2200–0300</td>
<td>12 week period</td>
</tr>
<tr>
<td>Canada</td>
<td>1981</td>
<td>To estimate the prevalence of drinking and driving</td>
<td>6318 (Quebec) 3216 (Sask.)</td>
<td>Quebec and Saskatchewan</td>
<td>138 (Quebec) 76 (Sask.)</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1986/88</td>
<td>To estimate the prevalence of drinking and driving</td>
<td>6104 (Q.) 4077 (B.) 3804 (M.)</td>
<td>Quebec, Saskatchewan, Manitoba</td>
<td>160 (Q.) 96 (B.) 96 (M.)</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1993</td>
<td>To estimate the prevalence of drinking and driving</td>
<td>5011</td>
<td>Saskatchewan and Nova Scotia</td>
<td>96</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1995</td>
<td>To obtain an objective assessment of the incidence of alcohol use among nighttime drivers prior to, and following a strategic initiative on impaired driving in the area</td>
<td>3416</td>
<td>Vancouver and Saanich, British Columbia</td>
<td>32</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td>Spring and autumn</td>
</tr>
<tr>
<td>Canada</td>
<td>1998</td>
<td>To determine the nature and extent of change in nighttime drinking and driving</td>
<td>5341</td>
<td>Vancouver, Saanich, Kamloops</td>
<td>48</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td>Spring and autumn</td>
</tr>
<tr>
<td>Canada</td>
<td>2003</td>
<td>To determine the nature and extent of change in nighttime drinking and driving</td>
<td>2314</td>
<td>Abbotsford, Saanich and Vancouver, British Columbia</td>
<td>48</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td>Spring</td>
</tr>
<tr>
<td>Canada</td>
<td>2006</td>
<td>To determine the nature and extent of change in nighttime drinking and driving</td>
<td>2627</td>
<td>Abbotsford, Saanich and Vancouver, British Columbia</td>
<td>48</td>
<td>MTW SS</td>
<td>2100–0300</td>
<td>Spring</td>
</tr>
<tr>
<td>Is random breath testing permissible in this jurisdiction?</td>
<td>Personnel and methods</td>
<td>Positive for any alcohol (above 5 mg/100 ml BAC unless otherwise stated)</td>
<td>% between 50 and 80 mg/100 ml unless otherwise stated</td>
<td>%&gt;80 mg/100 ml unless otherwise stated</td>
<td>Notes</td>
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<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>16.70%</td>
<td>1.9% (between 55 and 99 mg)</td>
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</tr>
<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>12.5% (BrAC above 3 µg/100 ml)</td>
<td>2.1% (between 18 and 35 µg/100 ml BrAC)**</td>
<td>1.0% (above 35 µg/100 ml BrAC)</td>
<td></td>
<td>“For a proportion of sites selected a different approach was taken. The distribution of injury accidents over a three-year period which involved a car or light commercial vehicle, and in which at least one driver had provided a positive breath test/failed to provide a sample was analysed. In these cases, a survey site was sought on a given length of road where there had been two or more such accidents and where offending drivers had been traveling in the same direction. Overall approximately 16% of the 442 sites surveyed were chosen in this way. **No figures available for number of drivers above 22 mg/100 ml BrAC).”</td>
<td></td>
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</tr>
<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>10.11% (BrAC above 5 µg/100 ml)</td>
<td>1.85%</td>
<td>1.00%</td>
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<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>10.06% (BrAC above 5 µg/100 ms)</td>
<td>1.76%</td>
<td>0.70%</td>
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<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>11.4% (between 21 and 80 mg/100 ml BAC)</td>
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</tr>
<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>13.8% (between 21 and 80 mg/100 ml BAC)</td>
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</tr>
<tr>
<td>No Have only conducted breath testing in theatre, with police used to stop traffic</td>
<td>12.6% (between 21 and 80 mg/100 ml BAC)</td>
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<tr>
<td>No The surveys conducted in Canada have generally adopted a similar methodology. The surveys were conducted by survey crews (two per city) consisting of approximately eight personnel: a supervisor, a crew chief, four interviewers, a traffic controller, and one police officer to direct traffic off the road into the survey site. Crews surveyed four locations on each night, spending 90 minutes at each location. This methodology has largely been replicated across all the surveys conducted in Canada since 1972, enabling comparisons between surveys to be made. Where possible, the same locations have been used.</td>
<td>8.7% (between 21 and 80 mg/100 ml BAC)</td>
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<tr>
<td>No The surveys conducted in Canada have generally adopted a similar methodology. The surveys were conducted by survey crews (two per city) consisting of approximately eight personnel: a supervisor, a crew chief, four interviewers, a traffic controller, and one police officer to direct traffic off the road into the survey site. Crews surveyed four locations on each night, spending 90 minutes at each location. This methodology has largely been replicated across all the surveys conducted in Canada since 1972, enabling comparisons between surveys to be made. Where possible, the same locations have been used.</td>
<td>17.80%</td>
<td>4.9% (% above 50 mg/100 ml BAC)</td>
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<tr>
<td>No The surveys conducted in Canada have generally adopted a similar methodology. The surveys were conducted by survey crews (two per city) consisting of approximately eight personnel: a supervisor, a crew chief, four interviewers, a traffic controller, and one police officer to direct traffic off the road into the survey site. Crews surveyed four locations on each night, spending 90 minutes at each location. This methodology has largely been replicated across all the surveys conducted in Canada since 1972, enabling comparisons between surveys to be made. Where possible, the same locations have been used.</td>
<td>13.80%</td>
<td>3.5% (% above 50 mg/100 ml BAC)</td>
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</tr>
<tr>
<td>No The surveys conducted in Canada have generally adopted a similar methodology. The surveys were conducted by survey crews (two per city) consisting of approximately eight personnel: a supervisor, a crew chief, four interviewers, a traffic controller, and one police officer to direct traffic off the road into the survey site. Crews surveyed four locations on each night, spending 90 minutes at each location. This methodology has largely been replicated across all the surveys conducted in Canada since 1972, enabling comparisons between surveys to be made. Where possible, the same locations have been used.</td>
<td>12.60%</td>
<td>1.70%</td>
<td>2.20%</td>
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</tr>
<tr>
<td>No The surveys conducted in Canada have generally adopted a similar methodology. The surveys were conducted by survey crews (two per city) consisting of approximately eight personnel: a supervisor, a crew chief, four interviewers, a traffic controller, and one police officer to direct traffic off the road into the survey site. Crews surveyed four locations on each night, spending 90 minutes at each location. This methodology has largely been replicated across all the surveys conducted in Canada since 1972, enabling comparisons between surveys to be made. Where possible, the same locations have been used.</td>
<td>11.40%</td>
<td>4.8% (% above 50 mg/100 ml BAC)</td>
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</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Country</th>
<th>Year(s)</th>
<th>Stated Objective</th>
<th>Sample size</th>
<th>Where</th>
<th>Site details (number, selection methods where known)</th>
<th>Days of week</th>
<th>Survey times</th>
<th>Months/seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1999</td>
<td>To obtain a systematic sample of breath tests from drivers</td>
<td>8616</td>
<td>Perth, WA</td>
<td>36 Sites selected using systematic sampling plan.</td>
<td>2200–0200 or 2300–0300*</td>
<td></td>
<td>Sep/Oct</td>
</tr>
<tr>
<td>Germany</td>
<td>1992–1994</td>
<td>1. To obtain a detailed picture of drink and drug driving in Germany; 2. To examine the effects of raising the legal limit from 0% to 0.8% which took place in former East Germany in 1993; 3. To obtain the information necessary to estimate the alcohol-related accident risk in combination with an accident study,</td>
<td>9041</td>
<td>Two adjacent states in Germany (Unterfranken in former West Germany, and Thueringen in former East Germany)</td>
<td>Sites selected using a random sampling plan and in cooperation with the local police</td>
<td>2000–0400</td>
<td></td>
<td>Oct–Dec 1992; April–June 1993; April–June 1994</td>
</tr>
<tr>
<td>Belgium</td>
<td>2000*</td>
<td>To estimate the proportion of drink drivers in Belgium and their profile</td>
<td>10112</td>
<td>National</td>
<td>&quot;A non-random choice of control sites&quot;</td>
<td>24 hours</td>
<td></td>
<td>Sept/Oct/Nov</td>
</tr>
<tr>
<td>Belgium</td>
<td>2003</td>
<td>To estimate the proportion of drink drivers in Belgium and their profile</td>
<td>12891</td>
<td>National</td>
<td>Sites randomly selected using a Geographical Information System (Arcview). Police then decided whether or not a road site had to be replaced for reasons of efficiency or security</td>
<td></td>
<td></td>
<td>Oct/Nov</td>
</tr>
<tr>
<td>Sweden</td>
<td>1976–1979</td>
<td>To assess the incidence of drink driving in northern Sweden</td>
<td>10515</td>
<td>Northern Sweden</td>
<td>Randomly selected urban and rural main road sections</td>
<td>No details available</td>
<td></td>
<td>January 1976 to May 1979</td>
</tr>
<tr>
<td>Sweden</td>
<td>2007</td>
<td>To test the prevalence of drink driving* in 3 counties of Sweden; and to test the methodology.</td>
<td>22937</td>
<td>Södermanland, Örebro and Östergötland</td>
<td>Randomly selected urban and rural main road sections</td>
<td>0700–2300</td>
<td></td>
<td>June 2006–May 2007</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1999/2000</td>
<td>Pre-test of the effect of newly formed Regional Traffic Police Teams on the BAC distribution of Dutch motorists</td>
<td>29379</td>
<td>National: 25 Dutch police regions (10 experimental + 15 control)</td>
<td>Research locations were stratified based on population and geography of the 12 provinces involved. Most sites were main roads in built-up areas with a speed limit of 50 km/h.</td>
<td>2200–0400</td>
<td></td>
<td>Sept 1999–March 2000</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1970–2006</td>
<td>To assess the BAC distribution of motorists and to evaluate the effect of countermeasures</td>
<td>25000–30000</td>
<td>National</td>
<td>As above</td>
<td>2200–0400</td>
<td></td>
<td>Sept–March</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2004–06</td>
<td>As above</td>
<td>approx. 4500</td>
<td>Zeeland</td>
<td>Systematic sample of research locations based on population and geography of the province.</td>
<td>2100–0400</td>
<td></td>
<td>Jan–Dec 2004, 2005 and 2006</td>
</tr>
<tr>
<td>Is random breath testing permissible in this jurisdiction?</td>
<td>Personnel and methods</td>
<td>Positive for any alcohol (above 5 mg/100 ml BAC unless otherwise stated)</td>
<td>% between 50 and 80 mg/100 ml unless otherwise stated</td>
<td>%&gt;80 mg/100 ml unless otherwise stated</td>
<td>Notes</td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>Random breath tests administered by police officers operating out of a ‘booze bus’ stationed at two sites per night (1.5 hrs per site and 1 hour to travel and set up between sites).</td>
<td>14.90%</td>
<td>1.92% (% above 50 mg/100 ml BAC)</td>
<td>0.91%</td>
<td>*Start and end times alternated between these two alternatives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Car drivers stopped at random by police officers, then directed to drive to the test site for interview, saliva sample (1992 and 1993) and a breath alcohol test, all administered by researchers.</td>
<td>14.6% (Unterfranken); 11.4% (Thueringen)</td>
<td>1.9% (Unterfranken); 1.3% (Thueringen)</td>
<td>1.7% (Unterfranken); 1.5% (Thueringen)</td>
<td>1. 12213 saliva samples were collected in the 1992/1993 surveys. 2. Although data was collected for the whole week, to enable comparability with other surveys results are shown for Friday, Saturday and Sunday nights.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Car drivers randomly stopped and asked by the police to perform an alcohol breath test. Basic demographic data also collected by the police.</td>
<td>90.4% had BrAC less than 0.22 mg/l</td>
<td>1.7% had BrAC between 22 mg and 35 mg/l</td>
<td>6.6% had BrAC of 35 mg/l or more</td>
<td>*This was the second roadside survey conducted in Belgium, an earlier study was carried out in 1998. The methodology adopted in 2000 improved upon that employed in 1998.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Car drivers randomly stopped and asked by the police to perform an alcohol breath test. Random sample achieved by stopping as many drivers as possible and by testing them all, with no distinction based on observable criteria. More detailed questionnaire administered by police.</td>
<td>96.19% had BrAC less than 0.22 mg/l&quot;**</td>
<td>1.04% had BrAC between 22mg and 35mg/l</td>
<td>2.25% had BrAC of 35 mg/l or more. However, during weekend nights this figure rises to 7.76%</td>
<td>**The legal limit for drink driving in Belgium is BrAC 22 mg/l</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Data collected by police conducting random breath tests at roadside check points in Northern Sweden.</td>
<td>Only 13 drivers (0.12% had a BAC level exceeding 0.05%)</td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>Data collected by police conducting breath tests of drivers of passenger cars and light trucks on randomly selected road sections.</td>
<td></td>
<td></td>
<td></td>
<td>&quot;Estimated prevalence of drink driving in the examined population is 0.24%&quot; Here, the prevalence of drink driving means the proportion of the total number of vehicle kilometres that are conducted by drink drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Car drivers randomly stopped and requested by the police to perform an alcohol breath test. Random sample achieved by stopping as many drivers as possible and by testing them all, with no distinction based on observable criteria.</td>
<td>9.5% above 20 mg/100 ml</td>
<td>2.3%</td>
<td>2.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>As above</td>
<td>2004: 7.8% 2005: 7.2% 2006: 7.4% above 20 mg/100 ml</td>
<td>2004: 1.8% 2005: 1.4% 2006: 1.5%</td>
<td>2004: 1.6% 2005: 1.4% 2006: 1.4%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>As above. Data collected by the Regional Traffic Police Team (RTPT) using a handheld screening device combined with a data logger.</td>
<td>2004: 7.5% 2005: 5.3% 2006: 4.2% above 20 mg/100 ml</td>
<td>2004: 1.7% 2005: 1.3% 2006: 0.9%</td>
<td>2004: 0.9% 2005: 0.8% 2006: 0.8%</td>
<td>The RTPT conduct weekly drink driving enforcement activities at different locations and times throughout the province. Normally they select these themselves, but once a month the sites are selected by SWOV researchers according to strict guidelines regarding the sites and times that drivers are tested.</td>
<td></td>
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</tr>
</tbody>
</table>

(continued)
Table A1.1: (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>Year(s)</th>
<th>Stated Objective</th>
<th>Sample size</th>
<th>Where</th>
<th>Site details (number, selection methods where known)</th>
<th>Days of week</th>
<th>Survey times</th>
<th>Months/seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>1973</td>
<td>To obtain estimates of the extent of driving at various BACS on Fri/Sat nights between 2200–0300</td>
<td>3698</td>
<td>34 locations scientifically chosen to represent all but the most sparsely populated parts of the contiguous United States</td>
<td>185 sites</td>
<td>2200–0000 and 0100–0300</td>
<td>October—December 1973</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>1986</td>
<td>To obtain estimates of the extent of driving at various BACS on Fri/Sat nights between 2200 and 0300</td>
<td>3043</td>
<td>As 1973</td>
<td>182 sites</td>
<td>2200–0000 and 0100–0300</td>
<td>April–June</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>1996</td>
<td>To track progress in efforts to reduce alcohol-impaired driving</td>
<td>6298</td>
<td>Sites in 18 states chosen to represent the 48 contiguous United States</td>
<td>24 Primary Sampling Units (PSUs) in 18 states identified using a multi-stage sampling process. 12 survey sites used in each PSU.</td>
<td>2200–0000 and 0100–0300</td>
<td>Sep/Nov</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>2005</td>
<td>To pilot a new methodology for collecting drink and drug drive data</td>
<td>c.600</td>
<td>6 states across the USA</td>
<td>24 PSUs identified using a multi-stage sampling process</td>
<td>2200–0000 and 0100–0300</td>
<td>Aug–Oct 2005</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>c.1996*</td>
<td>To obtain drivers’ BAC data to be used as a reference in formulating drink driving policy in Kenya, as well as testing the feasibility of random breath testing as a strategy.</td>
<td>433</td>
<td>Eldoret, Western Kenya</td>
<td>8</td>
<td>1900–0000</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Annual surveys have been conducted in Uusimaa since 1978</td>
<td>To observe the role of alcohol in periodically arranged annual roadside surveys in Finland. Also, to estimate the effects of a possible reduction to the BAC limit from 0.05 to 0.02%</td>
<td>Over 30000 annually between 1996 and 2003</td>
<td>Uusimaa, Southern Finland</td>
<td>Each survey consists of 4–5 road blocks lasting 30–40 minutes each.</td>
<td>No details available at the time of writing</td>
<td>All surveys took place on 3 Tuesdays and 3 Saturdays during spring and autumn</td>
<td></td>
</tr>
<tr>
<td>S Africa</td>
<td>1982</td>
<td>To determine the blood alcohol content of the road-using public</td>
<td>3196</td>
<td>National</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. Studies have also been conducted in Papua New Guinea, Bangalore India, South Africa, Denmark and various US states, but limited information is available.
2. A number of roadside surveys of drugs and driving have been conducted which have also asked about or tested for alcohol use (e.g. as part of the EU projects IMMORTAL and DRUID, which is running at the time of writing).
Is random breath testing permissible in this jurisdiction?

<table>
<thead>
<tr>
<th>Personnel and methods</th>
<th>Positive for any alcohol (above 5 mg/100 ml BAC unless otherwise stated)</th>
<th>% between 50 and 80 mg/100 ml unless otherwise stated</th>
<th>%&gt;80 mg/100 ml unless otherwise stated</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>One or more local police officers flagged down selected drivers from the passing traffic stream. The driver was interviewed by an interviewer, who - upon completion - signalled the police officer to send the very next passing vehicle to be interviewed and give a breath sample.</td>
<td>36%</td>
<td>8.5% between 50 and 99 mg/100 ml</td>
<td>4.9% above 100 mg/100 ml (Wolfe, 1974)</td>
</tr>
<tr>
<td>No</td>
<td>As above</td>
<td>26%</td>
<td>5% between 50 and 99 mg/100 ml</td>
<td>3% above 100 mg/100 ml (Lund and Wolfe, 1991)</td>
</tr>
<tr>
<td>No</td>
<td>Over 6000 noncommercial four-wheel vehicle operators interviewed and breathalysed between 6 September and 9 November 1996.</td>
<td>17%</td>
<td>5% between 50 and 99 mg/100 ml</td>
<td>2% above 100 mg/100 ml (Voas et al., 1998)</td>
</tr>
<tr>
<td>No</td>
<td>Vehicles stopped by a police officer. Survey teams - comprising up to 10 interviewers, supervisor and a phlebotomist - conduct breath test and survey, and collect saliva and blood samples.</td>
<td>15%</td>
<td>4% between 50 and 99 mg/100 ml</td>
<td>2% above 100 mg/100 ml (NHTSA, 2007)</td>
</tr>
<tr>
<td>No</td>
<td>As above</td>
<td>Survey in progress</td>
<td>Survey in progress</td>
<td>Survey in progress</td>
</tr>
<tr>
<td>?</td>
<td>Vehicles stopped by a team of four police officers. Data collected by four specially-trained medical students. One pair of interviewers and a police officer sampled drivers travelling in one direction, while a second team, stationed on the other side of the road, selected vehicles from traffic in the opposite direction. The next vehicle was stopped whenever the interviewers were free.</td>
<td>20% (BAC &gt; 4 mg/100 ml)</td>
<td>8.30%</td>
<td>4% ^Precise dates of the survey are not available. However, the paper reporting results was published in 1986, hence the year that the survey took place is probably 1994 or 1995.</td>
</tr>
<tr>
<td>Yes</td>
<td>Each survey team consists of one chief inspector, 8–14 police officers, one physician and a few assistants. (BAC&lt;50 mg/100 ml) 1996–2000: 0.41% 2001: 0.55% 2002: 0.78% 2003: 1.01% (BAC&gt;50 mg/100 ml) 1996–2000: 0.23% 2001: 0.20% 2002: 0.27% 2003: 0.20%</td>
<td>No data</td>
<td>The regular surveys conducted in Finland since 1978 have revealed some interesting results regarding rates of drivers who are over the limit (0.05%) at different times of day. For the period 1996 - 2003, the rate of drunken drivers detected on Saturday mornings ranges from 0.25% in 2002 to 0.44% in 2003. In contrast, the equivalent figures for Saturday nights range from 0.18% in 2001 to 0.29% in 2002.</td>
<td></td>
</tr>
<tr>
<td>?</td>
<td></td>
<td>5.30%</td>
<td></td>
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</tbody>
</table>