

# A Review of Evidence Related to Drug Driving in the UK: A Report Submitted to the North Review Team

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Department for Transport

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Since this review was completed, the Misuse of Drugs Act 1971 has been amended. As a result, several of the drugs, including mephedrone, referred to in this document as 'legal highs' have now been classified under the Misuse of Drugs Act 1971 and are now banned. Further information is available at: [A change to the Misuse of Drugs Act 1971: Control of mephedrone and other cathinone derivatives | Home Office](#).

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## GLOSSARY

1,4-BD	1,4-butanediol
2CB	2,5-dimethoxy-4-bromophenethylamine
2CI	2,5-dimethoxy-4-iodophenethylamine
A&E	Accident and Emergency
ACMD	Advisory Council on the Misuse of Drugs
ACPO	Association of Chief Police Officers
ANPR	Automatic Number Plate Recognition
BAC	Blood Alcohol Concentration
BaD	Breath and Drugs
BCS	British Crime Survey
BZP	1-benzylpiperazine
CERTIFIED	Conception and Evaluation of Roadside Testing Instruments to Formalise Impairment Evidence in Drivers
CCWA	Chemistry Centre of Western Australia
CNS	Central Nervous System
CP 47,497	Synthetic cannabinoid
DDS	Drug Detection System
DECP	Drug Evaluation and Classification Program
DfT	Department for Transport
DFTDA	Division of Forensic Toxicology and Drug Abuse
DID	Drivers Impaired by Drugs
DIR	Drug Influence Recognition
DRE	Drug Recognition Examiner (or Expert)
DRT	Drug Recognition Test
DRT	Drug Recognition Training
DRUID	DRiving Under the Influence of Drugs, Alcohol and Medicines
DUI	Driving Under the Influence
DUID	Driving Under the Influence of Drugs
DWI	Driving While Intoxicated
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EU	European Union
FIT	Field Impairment Test
FME	Forensic Medical Examiner
FSS	Forensic Science Service
GBL	Gamma-butyrolactone
GHB	Gamma-hydroxybutyrate
HGN	Horizontal Gaze Nystagmus
HOSDB	Home Office Scientific Development Branch
HU-210	Synthetic cannabinoid
IMMORTAL	Impaired Motorists, Methods Of Roadside Testing and Assessment for Licensing
IRIS	Company which provides case management for coroners



JWH-018	Synthetic cannabinoid
JWH-073	Synthetic cannabinoid
LCMS	Liquid chromatography-mass spectrometry
LGC	Formerly Laboratory of the Government Chemist
LOD	Level of Detection
LOQ	Level of Quantification
LSD	Lysergic Acid Diethylamide
LTG	Formerly the London Toxicology Group
mCPP	Meta-Chlorophenylpiperazine
MDMA	3,4-Methylenedioxymethamphetamine or ecstasy
MG DD/F	National Pro Forma Drink/Drugs Impairment Assessment Form
MoJ	Ministry of Justice
NHS	National Health Service
NHTSA	National Highway Traffic Safety Administration
np-SAD	National Programme on Substance Abuse Deaths
NTA	National Treatment Agency for Substance Misuse
OF	Oral Fluid
OFT	Oral Fluid Test
PIT	Preliminary Impairment Test
RAC	Royal Automobile Club
ROFT	Roadside Oral Fluid Test
ROSITA	ROadSIde Testing Assessment
RTA	Road Traffic Accident
SAMHSA	Substance Abuse and Mental Health Services Administration
SCS	Scottish Crime Survey
SDLP	Standard Deviation of Lateral Position
SESR	Scottish Executive Social Research
SFST	Standardised Field Sobriety Tests
TEG	Traffic Enforcement Group
TFMPP	3-Trifluoromethylphenylpiperazine
THC	Delta-9-Tetrahydrocannabinol
THC-COOH	Tetrahydrocannabinol carboxylic acid
TISPOL	European traffic police network
TRB	Transportation Research Board
TRL	Transport Research Laboratory
UK	United Kingdom
USA	United States of America
VMS	Variable Message Sign
WA	Western Australia

# EXECUTIVE SUMMARY

Sir Peter North has been invited to advise Ministers on the merits of specific proposals for changes to the legislative regime for drink and drug driving, reporting by the end of March 2010. In order to assist the North Review team in the work being undertaken, Clockwork Research has been contracted to submit a review drawing together and synthesising evidence on a variety of issues relating to drug driving.

This report has been compiled from a review of a broad range of data sources including:

- a) UK Government research reports;
- b) European Council reports;
- c) Reports from transport authorities in other jurisdictions;
- d) EU research programmes reports;
- e) Papers that have appeared in academic journals; and
- f) Information and reports provided by independent drug expert organisations.

As well as desk-based research, semi-structured interviews were conducted with relevant UK stakeholders, including coroners and their clerks, toxicologists, police officers and a representative from the Home Office Scientific Development Branch. These interviews served to inform our understanding of the current practices involving drug driving cases in the UK.

The report is structured around five chapters, each focusing on one of the questions presented to Clockwork Research. Each chapter adopts a similar structure: following a brief introduction providing background information, the chapter reviews evidence that addresses the question. Evidence gaps are identified, and the chapter concludes with a summary of the key points, together with recommendations where appropriate.

## Summary of results

### *Regarding the prevalence of drug driving in the UK*

- The review has highlighted the value of the British Crime Survey as a robust source of data regarding the current prevalence of drugs in the general population, albeit with some important methodological caveats.
- The evidence regarding the prevalence of drug driving is far less robust. There is a lack of recent UK data on the impact that drug driving has on casualty rates; it

is over 10 years since the last survey exploring the incidence of drugs in road accident fatalities. Consequently, the evidence-base upon which current drugs driving policy is based is out of date.

- The review has identified a number of potential sources of data on the issue, for example those collected by HM Coroners, and the results of drug drive submissions sent to the toxicology laboratories for analysis.
- While data on drug driving do exist, a lack of co-ordination among all stakeholders (e.g. Home Office, MoJ, DfT, HM Coroners, forensic toxicology laboratories) and a lack of resources mean that these data have been collected neither on a routine basis nor in a standardised manner, nor extracted and analysed to determine the true extent and nature of the drug-drive problem.
- Analysis of the various data sources that are available shows a number of common findings:
  - Cannabis remains the most prevalent illicit drug across all surveys and data sources. However, there has been a significant increase since the mid-1990s in the prevalence of cocaine use: in the general population; in drug drive submissions to forensic toxicology laboratories; and among drivers and other road users fatally injured in road traffic accidents.
  - Regional variations are also apparent: in Scotland, benzodiazepines are the most prevalent drug group, with over 80% of drivers suspected of being impaired by drugs testing positive for a benzodiazepine.
  - There appears to have been a considerable increase in polydrug use by drivers since the 1990s. Sixteen per cent of submissions to the FSS and LGC from 2007 to 2009 tested positive for more than one drug, while analysis of Scottish data shows that over 80% of drivers suspected of being impaired by drugs test positive for two or more drugs, and in 25% of cases drivers test positive for four or more drugs.
  - Recent surveys and anecdotal evidence suggest there has been a surge in the use of legal highs. However, to date there is limited evidence of the extent to which those using these drugs are also driving, or what effect the substances have on road safety, either alone or in combination with other illicit drugs and/or alcohol.
  - The data situation in the UK is contrasted with that in Norway, where a database is maintained centrally, containing results from all cases of suspected driving under the influence of alcohol and non-alcohol drugs. Analysis of this database enables Norwegian policy makers and enforcement authorities to make informed decisions on the most appropriate strategies to adopt to tackle the problem and to target resources most effectively.

### *Regarding the status of roadside drug testing devices*

- The Railways and Transport Safety Act 2003 gave British police the power to require a driver suspected of being unfit to drive because of a drug to undertake

a preliminary drug test “*by means of a device of a type approved by the Secretary of State*” (The Railways and Transport Safety Act 2003, section 6c).

- However, to date a type-approval specification for such a device has not been produced. Consequently, while a range of commercial drug screening devices is available, none is suitable for enforcement purposes in the UK.
- Home Office Scientific Development Branch has been working on the development of a roadside screening device based on surface-enhanced Raman spectroscopy (SERS) over the last 10 years, both in house and externally. A SERS based device would be a considerable advance over existing commercially available devices in that it would be capable of identifying any drug.
- Following an expert peer review in 2008, the in-house development by HOSDB of the SERS substrates required for such a device was halted and the emphasis placed on developing external technologies, including those based on SERS. Following two calls for research initiated at the start of 2009, two external research contracts were placed, with the aim of developing prototype devices within the next three years.
- With regard to drug screening devices for use at the roadside, the preferred matrix for analysis is oral fluid, which is easy and convenient to collect, and any drugs detected in this medium are indicative of recent use.
- Early trials of roadside drug screening devices based on oral fluid (ROSITA, ROSITA 2) concluded that none of the devices tested at that time was suitable for use in enforcement at the roadside. However, recent evaluations of drug screening devices have highlighted continued improvements in sensitivity and the general performance of oral fluid drug testing devices, but also that the reliable detection of cannabinoid use and benzodiazepines still remains problematic.
- DRUID (DRiving Under the Influence of Drugs, Alcohol and Medicines), a project funded by the European Commission, includes an analytical evaluation of several on-site oral fluid screeners. The final report is still in production but early results suggest that:
  - Police evaluations of the devices tested were broadly positive;
  - Eight out of the 13 evaluated devices were rated as “promising” and were subsequently included in a scientific evaluation focusing on sensitivity and specificity;
  - Research papers in press have reported on the evaluations of four of these devices. While one device was considered unsuitable, three devices demonstrated excellent sensitivity for amphetamine/MDMA and moderate sensitivity for the detection of cocaine and cannabis. A newer version of one of the devices using ‘new generation’ oral fluid screening tests demonstrated improved sensitivity (93%) for THC.

- A recent evaluation of the zero tolerance approach adopted in parts of Australia is particularly informative. A report on the first 12 months of the new law in Western Australia reveals that during this period 9,716 roadside tests were conducted. Of these, 517 tested positive for one or more proscribed drug (5.3%).
- The results suggest that a ‘zero tolerance’ policy utilising roadside screening devices has distinct advantages over the UK’s impairment-based approach. Specifically, the process is simple, straightforward, quick to administer and unambiguous.
- Drug Impaired Driving (DID) legislation (which is akin to our own impairment-based approach) was introduced in conjunction with the ROFT (Roadside Oral Fluid Testing) procedures. However, DID appears to have been largely ignored as an anti-drug-drive measure, in favour of the ROFT approach: during the study period only five drivers were charged with DID.
- Police officers appeared to be more comfortable with administering the ROFT rather than trying to demonstrate impairment in order to secure a conviction for DID.
- The Australian experience suggests that, were the UK to move to a zero tolerance system, one effect would be that police officers would be less likely to pursue a case for Driving Under the Influence of Drugs (section 4 of the Road Traffic Act 1988).

### *Regarding the potential for setting legal limits for specified drugs for drivers*

- The complex nature of drug pharmacodynamics and pharmacokinetics<sup>1</sup> makes it difficult to establish values that would represent impairment in the general population.
- The main challenges in determining suitable cut-offs include: individual variations, drug tolerance, interactions with other drugs, and the variable effects of the same blood concentrations of drugs depending on whether the concentration is rising or falling.
- One review of the evidence for levels of cannabis related to impairment has suggested a cut-off for THC in whole blood of between 3.5–5 ng/ml, although a population-based study in France suggests that impairment is evident at lower levels (above 1 ng/ml).
- Attempts to develop comparable levels for amphetamines, however, have found greater variation in the association between blood concentrations and tests of

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1 Put simply, pharmacodynamics explores what a drug does to the body, whereas pharmacokinetics explores what the body does to a drug.

impairment and thus recommend that *per se* cut-offs are inappropriate for this drug group.

- Tolerance issues and interactions with other drugs suggest that identifying suitable cut-off values for other drugs may also be inappropriate.
- Within Europe, a variety of drug driving policies has been adopted by the different countries, ranging from zero tolerance *per se* limits (e.g. Sweden) to proof of impairment (e.g. current UK laws), each with subtle variations.
- A zero tolerance approach overcomes the difficulties associated with: a) proving impairment; and b) deciding on scientifically valid cut-offs from conflicting sources of data. However, zero limit *per se* laws also have the potential to penalise drivers who are not impaired and pose no risk to safety.
- Studies of the effectiveness of Sweden's zero tolerance laws have found them to have been unsuccessful in deterring DUID re-offenders.
- Further research into the correlations between blood concentrations of certain drugs and impairment may help to move toward developing suitable cut-offs (like those developed over time for alcohol). However, 'before' and 'after' studies of newly introduced laws to evaluate the performance of these various approaches in practice may be more useful.

### *Regarding the application of the Field Impairment Test (FIT) by UK law enforcement officers*

- The Railways and Transport Safety Act 2003 gave British police officers the power to require "*a person to co-operate with any one or more preliminary tests administered to the person by that constable or another constable*".
- There are currently no readily available data on the number of officers who are trained to administer FIT and how many are actively doing so.
- This lack of data makes it difficult to draw conclusions regarding the effectiveness of FIT as a tool to help a police officer to make a judgement of a driver's impairment.
- However, the DfT Code of Practice for PITs (Preliminary Impairment Tests) requires that each force should keep a record of the number of officers trained to conduct FIT. Hence, it should be possible to collect data on the number of these officers in the UK.
- It is recommended that all forces are approached to provide these data, so that a comprehensive picture can be built of the number of FIT-trained officers within each force.
- In order to ascertain whether PITs are *effective*, it would be necessary to collect data showing the number of FITs conducted, and the outcomes of these tests.

- Another potential source of data on the effectiveness of FIT is the forms that should accompany blood/urine samples submitted for forensic analysis. However, the extent to which these forms are sent with the samples is variable, as is the extent/quality of the information they contain.
- Previous research has established that FITs are a useful screening tool for police officers to use when faced with a driver that they suspect of being impaired by drugs.
- In the absence of a type-approved roadside screening device, the tests are a valuable addition to the evidence gathering process.
- Research that has considered whether impairment tests are effective at detecting impairment due to specific drugs shows good results for cannabis and ketamine, but suggests that FIT is not a sensitive measure for detecting amphetamine, at least in low doses.
- For drugs where no roadside screening test yet exists (e.g. ketamine, synthetic cannabinoids, mephedrone, BZP), a well conducted FIT (incorporating Drug Influence Recognition) could help the officer to identify impairment and pinpoint the broad group of drugs that might account for that impairment, thus helping to direct any subsequent toxicological analysis.
- Currently there is no requirement for officers trained in DRT/FIT to undergo any form of refresher training to keep them current; it is recommended that regular refresher training should be a requirement for all FIT-trained officers and instructor trainers.

### *Regarding the impact of 'legal highs' on road safety/driver impairment*

- 'Legal highs' in this report refers to a group of relatively new drugs that have increased in popularity over the past two years throughout the UK and across Europe, which include **mephedrone**, **GBL**, **BZP** and **synthetic cannabinoids**.
- At present, very few data are available to establish the true prevalence of legal highs in the UK. However, media reports, largely based on anecdotal interviews, suggest use is widespread throughout the country.
- A recent survey on drug use among clubbers revealed that, of 2,200 respondents, 59% had tried a legal high of some kind and 38% had tried some form of legal high 'party pill'.
- Forty-two per cent of respondents reported ever using mephedrone (34% in the last month) and one in four respondents (26%) had ever used BZP. The same survey found that the percentage of the group who had used cannabis, ecstasy and cocaine in the last month was 54%, 48% and 47% respectively.



- Despite their increased prevalence, particularly within certain demographic groups, at present, few if any of these drugs are included in standard screening panels in toxicology laboratories.
- Research has yet to consider the effect of these drugs on driving or road safety generally. From what is known of the chemical structures of the drugs and user reports, the effects of legal highs on road safety may be inferred by reference to research on similar, established drugs.
- The true scope of effects, however, is unknown and so these comparisons should be treated with caution as the legal high effects may be less predictable, more intense or may interact with other drugs and alcohol in different ways.
- Synthetic cannabinoids present particular challenges to forensic laboratories, because by the time their chemical structure has been identified, still more will have been developed, with ever changing brand names and active components, as those producing them change their composition to circumvent the law.
- This problem might yet be addressed by an amendment to the law that has been proposed by the Scottish Government, which would criminalise the act of selling or manufacturing recreational drugs rather than the substance itself, thus removing the incentive to create pharmaceutical combinations outside the latest illegal drug classifications.
- Toxicology laboratories should be encouraged to screen for a broader range of drugs beyond the standard panel of illicit drugs, so as to provide an overall view of drug prevalence in drivers suspected of impairment due to drugs, or in RTA fatalities. Until this is regular practice, the impact of legal highs on road safety will remain unknown.



# 1 INTRODUCTION

As part of the UK Government's efforts to further reduce the number of deaths caused by drink and drug driving, Sir Peter North has been invited to advise Ministers on the merits of specific proposals for changes to the legislative regime for drink and drug driving, reporting by the end of March 2010.

With regard to drug driving, the Review will advise on whether there is a need for new legislation to make it an offence to drive with a named substance in the body. The Review will also set out the likely impacts of any changes in driver behaviour, and the practical steps needed to support the introduction of any new or revised offence.

As part of this work, Clockwork Research has been contracted to submit a review drawing together and synthesising evidence on the following issues:

- a) What literature/data relevant to the UK is there regarding the prevalence of illicit drug use among:
  - the general population;
  - drivers (ideally broken down by type of driver – e.g. car, motorbike etc – and gender and age);
  - road collision-involved drivers; and
  - driver road fatalities?
- b) What literature there is regarding the status, effectiveness and accuracy of drug testing devices for roadside and police station tests (this is likely to include sourcing an early/interim summary of DRUID findings and any other findings since ROSITA 2)?
- c) What is the literature from around the world regarding the potential for setting legal limits for specified drugs for drivers?
- d) What is the literature regarding the application of the Field Impairment Test (FIT) by law enforcement officers (preferably in the UK) in practice?
- e) What is the literature regarding the impact of 'legal highs' on road safety/driver impairment?

## 2 METHODS

Desk-based research was the primary methodology employed to address the five review questions. Although our search was UK-focused, for a number of the questions addressed by this report, the lack of robust recent evidence specific to the UK required the research team to be more creative and to look further afield: first, geographically, by considering the extent of the problem in jurisdictions other than the UK, and secondly, by identifying research that has not appeared in the traditional, peer-reviewed journals, but which nevertheless helps to inform our understanding of the subject.

Our search for resources and supporting literature was extensive, covering the following data sources:

- a) UK Government research reports – e.g. Home Office, Department for Transport, Department of Health, NHS National Treatment Agency for Substance Misuse (NTA), Office for National Statistics, and the Scottish Government;
- b) European Council reports – e.g. European Monitoring Centre for Drugs and Drug Addiction, Pompidou Group;
- c) Reports from transport authorities in other jurisdictions;
- d) EU research programmes reports – e.g. IMMORTAL, CERTIFIED, ROSITA, DRUID;
- e) PubMed (US National Library of Medicine) – using key search terms such as “Drug AND driving”, “[*specific drug name*] and driving”;
- f) Independent drug expert organisations – e.g. Advisory Council on the Misuse of Drugs, DrugScope, the Drug Education Forum;
- g) Karch’s Pathology of Drug Abuse, 4th edition.

As well as desk-based research, semi-structured interviews were conducted with relevant UK stakeholders, including coroners and their clerks, toxicologists, police officers and a representative from the Home Office Scientific Development Branch. These interviews served to inform our understanding of the current practices involving drug driving cases in the UK.

### 2.1 Methodological issues

Research on drugs and driving is problematic because of a range of methodological issues, including population sampling, data collection and the specific research and analysis methods employed. These issues can make comparisons between studies and across countries problematic. Consequently, before addressing the questions, this review will briefly summarise some of the key difficulties.

When interpreting drug driving prevalence statistics, consideration must be taken of the population group sampled. For example, the prevalence of drugs reported in a study of randomly selected drivers is likely to be lower than for a study of drivers tested on suspicion of impairment. Furthermore, in those studies involving road traffic casualties or fatalities, samples might only be requested where: a) drugs are suspected by police or coroners, or b) alcohol has been ruled out. Where these criteria are used, prevalence estimates may be exaggerated. Unfortunately, there are no set criteria used by police forces and coroners across the UK, so regional prevalence estimates may vary based not on actual incidence, but on process. Furthermore, while some RTA studies are toxicology based, others (primarily annual government road statistics) are based on contributory factors reported by police at the scene that are not necessarily confirmed by toxicological analysis.

The timing and location of roadside sampling is also an important factor in interpreting prevalence estimates. Sampling during weekend nights on roads connecting nightlife and residential areas will likely result in higher prevalence estimates than mid-week sampling in a business district.

With regard to prevalence estimates from toxicological analysis, the type of substance tested for may vary. For example, the prevalence of 'cannabis' may include all cases where THC (active compound) and THC-COOH (inactive metabolite) are present, whereas in other studies only the presence of the active THC compound will be included. The specific methods used are not always made explicit in the reports. This raises concerns about interpretation of prevalence estimates, as testing for THC-COOH (or the inactive metabolites of other drugs such as benzoylecgonine, of cocaine) may be overestimating drug driving, because the compounds can appear in road users who ceased using the drug several days prior to testing.

More detailed discussions of the methodological issues surrounding drug driving research can be found in de Gier (1999), EMCDDA (1999) and Klemenjak *et al.*, (2005).

## **3 THE PREVALENCE OF DRUG DRIVING**

### **3.1 Background**

While there has been a considerable amount of research into the prevalence and impact of drink driving in the UK, little research has focused on driving under the influence of drugs other than alcohol. Hence, the first question addressed by this review attempts to identify in the literature the extent to which UK road users are on our roads while under the influence of drugs, with a view to understanding the impact of drugs on road safety.

### **3.2 Structure of the chapter**

This chapter is structured in accordance with the format of the Department for Transport (DfT) research specification question which asked:

What literature/data relevant to the UK is there regarding the prevalence of illicit drug use among:

- a) the general population;
- b) drivers (ideally broken down by type of driver – e.g. car, motorbike, etc. – and gender and age);
- c) road collision-involved drivers; and
- d) driver road fatalities?

The following sections address each of these four questions in turn using the following sources: statistical data provided by the Home Office, the Ministry of Justice (MoJ) and the DfT; data provided by the Forensic Science Service (FSS) and LGC (formerly the Laboratory of the Government Chemist); UK Government research reports; and research that has appeared in academic journals.

### **3.3 What is the prevalence of illicit drug use among the general population?**

In order to capture an accurate picture of the prevalence and profile of drug driving, it is necessary first to have an understanding of the current prevalence and profile of drug use in the greater population. Arguably the most comprehensive and reliable source of data on drug use in the general UK population is the annual British Crime Survey (BCS), administered by the Home Office Research, Development and Statistics Directorate. The BCS has included a self-report module on illicit drug use since 1996; consequently, it provides important data on trends in drug use over time. One of the major benefits of the BCS is that it is a consistent data collection tool that

has been deployed in a consistent manner over a prolonged period. However, as the BCS authors note:

*“the BCS does not cover some small groups, potentially important given that they may have relatively high rates of drug use: notably the homeless, and those living in certain institutions such as prisons or student halls of residence. Nor, in practice, will any household survey necessarily reach those problematic drug users whose lives are so busy or chaotic that they are hardly ever at home or are unable to take part in an interview. . . As a result, the BCS is likely to underestimate the overall use of drugs such as opiates and crack cocaine, and possibly also frequent cocaine powder users”*

Hoare (2009) p. 2

Despite these limitations, the BCS is the most robust and extensive survey of illicit drug use in the UK. The 2008/09 England and Wales BCS (Hoare, 2009) involved 28,604 respondents between the ages of 16 and 59<sup>2</sup> who live in a household. Results suggest that the most prevalent illicit drugs used in the last year were cannabis (7.9% of 16 to 59 years olds reported use in the last year<sup>3</sup>), cocaine (3%, predominantly powder, not crack), ecstasy (1.8%), amyl nitrite (1.4%) and amphetamines (1.2%).

Figure 3.1 plots responses to questions about ‘last year’ drug use since 1996 and shows that, overall, there has been a reduction in illicit drug use (from 11.1% to 10.1%) but a significant increase in the use of Class A drugs (from 2.7% to 3.7%). Much of this increase stems from a long-term increase in ‘last year use’ of cocaine (from 0.6% to 3%), partially offset by a decrease in use of LSD over the same period (from 1.0% to 0.2%). Between 1996 and 2008/9 there has also been a significant increase in the use of tranquillisers.

In contrast, there was a significant decrease in the use of hallucinogens, LSD, amphetamines, anabolic steroids and cannabis. Last year use of stimulants, opiates, crack cocaine, ecstasy, magic mushrooms, heroin, methadone, amyl nitrite and glues were not significantly different between the most recent and the 1996 surveys.

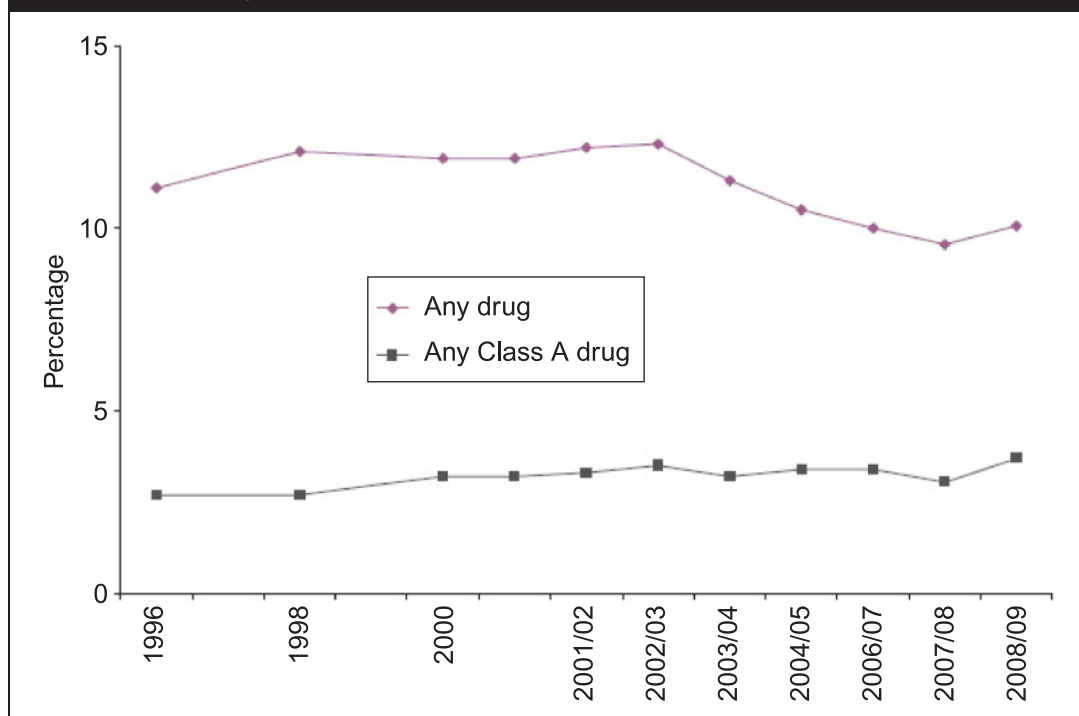
One of the issues with surveys of this type, which present respondents with a list of drugs and ask them to indicate which of these they have taken, is that the list of drugs needs constantly to be updated to reflect ever-changing patterns in drug usage. In 2005/06 the BCS included ketamine for the first time, while methamphetamines

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2 It could be argued that the top end of this range could be extended.

3 Data from ‘last year use’ were chosen (c.f. used in lifetime or last month) as they are the most reliable source of recent drug trends. ‘Used in lifetime’ data do not provide information on recent drug trends, and ‘last month use’ data tend to come from a smaller sample of people and are thus more variable and less reliable.

**Figure 3.1: Proportion of 16 to 59 year olds reporting use of any drug or any Class A drug in the last year, 1996 to 2008/9 (Source: Hoare, 2009)**



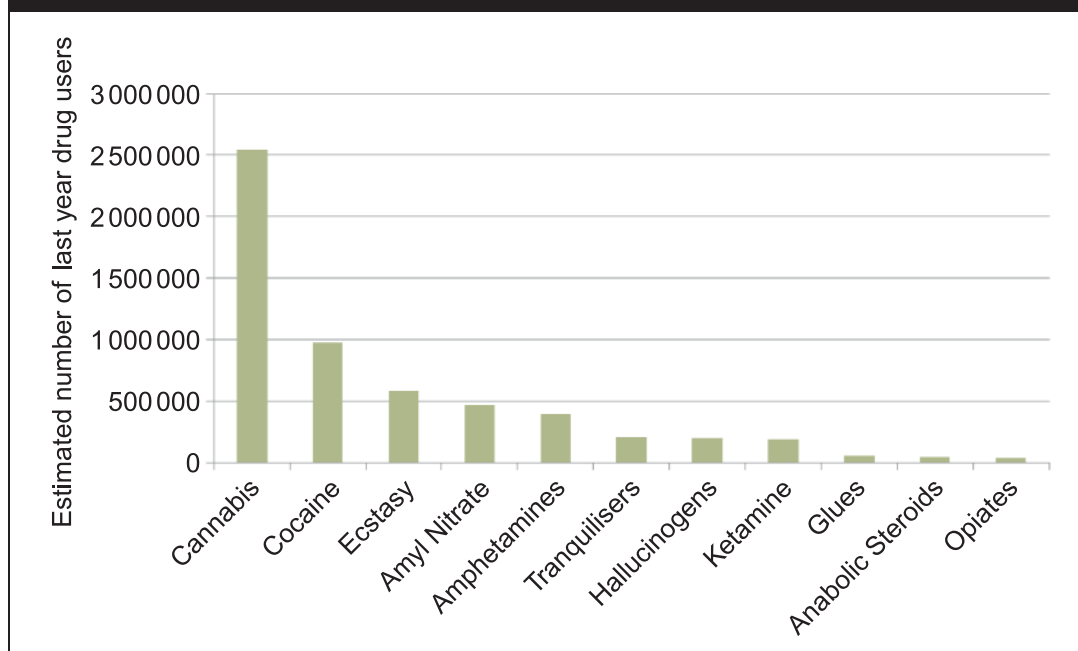
were added to the 2008/09 survey. In 2009 the survey included questions on use of skunk (a generic term for stronger breeds of herbal cannabis), results of which will be reported in next year's annual bulletin. Discussions with the Home Office reveal that questions on 'legal highs' (e.g. BZP, GBL, 'Spice' and khat) have been recently introduced to the BCS. Preliminary data will be available from these questions in July 2010 (next year's annual bulletin). Trend reports on recently added drugs reveals that ketamine use has increased from 2007/08 to 2008/09 (0.4% to 0.6%). Similarly, last year use of cocaine powder, ecstasy, tranquillisers and anabolic steroids increased from the 2007/08 to 2008/09 survey, as have the use of stimulants as a group.

The BCS report includes estimates of the number of people who have used illicit drugs. Based on a population of 32.2 million persons aged 16–59 living in households in England and Wales, the authors estimate that around 3.2 million people have used illicit drugs in the last year. Figure 3.2 shows a breakdown of the estimated number of last year users of each drug or drug group.<sup>4</sup>

The distribution of drug type prevalence indicated by the BCS broadly mirrors patterns of drug use across other European member states, as indicated by statistics from the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA).

<sup>4</sup> Cocaine includes cocaine powder and crack cocaine; hallucinogens includes LSD and magic mushrooms; amphetamines includes methamphetamines; opiates includes methadone and heroin.

**Figure 3.2: Estimates of the number of last year users of different drugs (Source: Hoare, 2009)**



The EMCDDA annual report for 2009 (EMCDDA, 2009a) revealed that cannabis and cocaine were the two most commonly used drug types, followed by amphetamines and ecstasy.

### 3.4 What is the prevalence of illicit drug use among young people?

The BCS provides a record of trends in drug use among 16–24-year-olds since 1996 when the BCS first included a section on illicit drug use. Table 3.1 compares survey results for this demographic group for the years 1996 and 2008/09. The table shows that last year use of any drug by this age group ( $n = 5428$ ) has declined significantly: in 1996, 29.7% of 16–24-year-olds had taken any illicit drug in the previous year; in 2008/09 this figure was 22.6%. Much of this drop can be explained by the decline in use of cannabis. While it is still the most commonly used illicit drug, reported use of cannabis by 16–24-year-olds has dropped from 26% in 1996 to 18.7% in 2008/09. The survey results indicate that use of most illicit drugs appears to have declined since 1996. However, in contrast, use of cocaine (powder), the second most commonly used illicit drug, has increased significantly among this age group: from 1.3% in 1996 to 6.6% in the most recent survey.

The upward trend in cocaine use is of particular concern – in the last year alone there has been a 29% increase in *last year* use of cocaine (from 5.1% in 2007/08). Over the same time period, ketamine use has also increased: from 0.9% to 1.9% (a 111% increase, albeit from a low starting point). A recent survey of 2,200 dance

**Table 3.1: Last year drug use among 16–24-year-olds for 1996 and 2008/9  
(Source: Hoare, 2009)**

	Last year drug use among 16–24 year olds		
	1996 (%)	2008/09 (%)	Percentage change (%)
<b>Used any illicit drug</b>	29.7	22.6	–24
<b>Cannabis</b>	26.0	18.7	–28
<b>Cocaine</b>	1.3	6.6	+408
<b>Opiates</b>	?	<0.05	No change
<b>LSD</b>	4.5	0.8	–82
<b>Amphetamines</b>	11.8	2.6	–78
<b>Amyl nitrite</b>	?	4.4	?
<b>Ecstasy</b>	6.6	4.4	–33

magazine readers showed that 32% of respondents had taken ketamine in the last month (*Mixmag*, 2010).

### 3.5 What is the prevalence of illicit drug use among drivers?

The BCS drug misuse data were collected from 28,604 respondents between the ages of 16 and 59 who live in a household. Although this is likely to result in an underestimate of the total prevalence of drug use in the general population, this sample demographic is likely to more closely match the road-using demographic that is of principal interest. However, the BCS does not ask respondents about their driving habits and so does not provide information on the prevalence of drug driving. Moreover, the survey was administered to drivers and non-drivers, so the results cannot be extrapolated to the driver population. However, a small number of studies have been conducted in the UK in recent years that do throw light on this question.

The methodological issues highlighted previously suggest that the results of epidemiological research and other prevalence studies conducted around the world may be of limited relevance to the UK situation. For this reason, where possible this section focuses on research conducted in the UK.

In terms of research that has attempted to estimate the prevalence of drug driving in the UK, the most relevant recent research has been conducted in Scotland. Since 2000, a number of valuable studies have been conducted in Scotland, including: surveys estimating the prevalence of drug use in the general population of drivers; research that has focused on particular groups of road users; roadside surveys to test drivers for the presence of drugs; as well as qualitative research to better understand the attitudes and behaviour of drivers who admit to driving under the influence of drugs. This section provides a summary of these studies.



A report by Scottish Executive Social Research (SESR: Myant *et al.*, 2006) included an estimate of the prevalence of general drug use and drug driving in Scotland, using a household survey that targeted drivers between the ages of 17 and 39.<sup>5</sup> The survey found a significant reduction in reported drug use in the last 12 months compared to a previous survey in 2000 (Ingram *et al.*, 2000; from 14% in 2000<sup>6</sup> to 9% in 2005). The authors attribute this finding to a reduction in the willingness to report drug use rather than an actual change in behaviour, citing the 2003 Scottish Crime Survey's (SCS)<sup>7</sup> finding that 15% of 17–39-year-olds had taken drugs in the last year. However, the 2008/09 British Crime Survey also reported a reduction in overall drug use, so the finding may not be entirely attributable to under reporting.

The SESR study found that men were more likely to have taken drugs in the last 12 months (12% versus 7%). The SCS (2003) reported the same trends but much higher values, 20% and 11% respectively. There were no significant trends in drug use across age groups, but the survey was not designed to capture and reflect these trends (e.g. the number of respondents in each age group range was not even). The SCS (2003) and the previous survey conducted in 2000 showed a trend for last year drug use in the younger age groups, especially the 20–24-year-old age range.

The types of drugs used were analysed by category (not individually), the most common being cannabis (7% of respondents claimed to have used this drug group in the past year; c.f. 12% in the 2000 survey). 'Stimulants/hallucinogens', 'opiates' and 'suppressants' were reported to have been used by 3% of respondents.

Respondents who reported drug use in their life time were asked further questions as to whether they had ever used drugs and driven within a defined period of time. Again, under-reporting was suspected, but 6% of all respondents (16% of those ever having used drugs) claimed to have ever driven while under the influence of drugs, 3.5% (9% of drug users) in the last year. Even when adjusting for suspected under-reporting (which raised estimates to 11% and 6%, respectively), the authors conclude that there had been little change in the prevalence of drug driving from 2000 to 2005. No significant differences were found between genders (men 4%, women 2%) or across age groups in terms of reported drug driving. This contrasted with the 2000 survey, which showed that the most prevalent age group for drug driving was the 20–24-year-olds, and the incidence of drug driving decreased consistently across older age groups.

Another source of data on the incidence of drug driving comes from the EU project IMMORTAL.<sup>8</sup> As part of this study, oral fluid samples were collected from 1,312

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5 The survey was conducted in 2005. The data include 1,031 interviews, which was a 74% response rate.

6 1,008 drivers between the ages of 17 and 39 completed the 2000 survey.

7  $n = 1,631$  16–39 yo;  $n = 3,168$  16–59 yo.

8 Impaired Motorists, Methods Of Roadside Testing and Assessment for Licensing.

drivers at the roadside in Glasgow (Assum *et al.*, 2005). The original aim of this study was to examine whether drivers using one or more of eight defined drug groups<sup>9</sup> have a higher accident risk than drivers not using these drugs, and to attempt to quantify this risk. It was originally intended that – in common with similar studies conducted as part of the same project in the Netherlands and Norway – a case-control study would be conducted. In those countries, the prevalence of substances found in a sample of non-accident involved drivers (Roadside Sample) was compared with the prevalence among injured drivers (Hospital Sample). However, in Scotland, because of problems in obtaining ethical approval for the hospital study, the roadside samples were to be compared with analyses of fatally-injured cases in Central Glasgow. However, because of the low number of available fatality data ( $n = 22$ ), the comparison was not statistically meaningful.

Of the 1,312 oral fluid samples taken at the roadside, the most common drugs detected were ecstasy (estimated prevalence of drug used in isolation or combination = 4.6%,  $n = 51$ ) and cannabis (3.3%,  $n = 52$ ). The estimated prevalence of 6 drug groups<sup>10</sup> in non-accident involved drivers was 10.8% (Assum *et al.*, 2005). These values only include drugs detected at a concentration above SAMHSA<sup>11</sup> confirmatory test cut-offs for oral fluid.

The aforementioned studies involved surveying drivers from the general population. However, other research has considered specific groups within which the prevalence of drug driving could be expected to be higher. As part of their study to assess the effectiveness of the then recently introduced Field Impairment Tests (FIT), Oliver *et al.* (2006) analysed biological samples from drivers apprehended under suspicion of impaired driving, and 75% of analysed biological samples from this group ( $n = 283$ ) tested positive for drugs.<sup>12,13</sup>

Of these samples 64% ( $n = 182$ ) were from drivers who were judged to be impaired following a roadside FIT and Forensic Medical Examiner (FME) agreement; the remaining samples were supplied voluntarily by drivers. Benzodiazepines were the most commonly detected drug group, followed by opioids such as morphine (heroin) and methadone, which were often found in combination (68% of methadone positive samples ( $n = 17$ ) were also positive for heroin). The combination of opioids and

9 Benzodiazepines, codeine, other opiates, amphetamines, ecstasy, cannabis, cocaine and alcohol.

10 The six drug groups were: cannabis, amphetamine, ecstasy or similar, cocaine, opiates (excluding codeine), and codeine. Benzodiazepines and alcohol were not reported in this section of the report.

11 Substance Abuse and Mental Health Services Administration (USA).

12 NB: this study was not intended to determine the profile and prevalence of drugs, but to determine the efficacy of FIT.

13 Eighty-nine per cent of all forms received were male, and average age of the group was 28 years (range 15–74 years). However, not all individuals in this group contributed to the data presented. No other demographics are available.

benzodiazepines was particularly common, accounting for 59% ( $n = 114$ ) of blood and urine polydrug samples. Polydrug use was found in 56% ( $n = 86$ ) of blood samples. Cannabinoids were the third most frequently detected drug group (33% of blood and urine samples,  $n = 64$ ), although in almost half of cases the active component of cannabis, THC, was not confirmed – suggesting that the individual may not have been suffering the impairing effects at the time the sample was taken.

In cases where a driver was judged not to be impaired at the roadside (i.e. FIT was negative), no blood or urine sample was taken. In these cases drivers were asked to provide an oral fluid sample. Where these samples tested positive for drugs, opioids and cannabis were the most frequently detected.

Earlier research in Scotland has attempted to gauge the prevalence of drug driving, and to explore the attitudes of drug users who drive while under the influence of drugs. Neale *et al.* (2000) used a four-prong approach to capture the prevalence and attitudes of driving drug users. The study involved:

- semi-structured interviews with 61 individuals who had recently attended nightclubs across Scotland;
- self-completion questionnaires completed by 88 attendees of Scottish dance events;
- similar self-completion questionnaires handed out to drivers crossing main toll-bridges around Glasgow (538 returned questionnaires); and
- 10 focus group discussions.

The study aimed to target drivers with a range of drug use risk.<sup>14</sup>

In terms of general drug use, irrespective of driving, the most commonly used drug across all studies was cannabis (84% of clubbers interviewed ( $n = 51$ ); 69% of dancers surveyed ( $n = 61$ ); and 6% of toll-bridge users surveyed ( $n = 34$ ) used cannabis). Ecstasy, cocaine and amphetamines were, in turn, reported as the next most common by clubbers and dancers. However, toll-bridge users reported amphetamine use as second highest, followed by ecstasy and cocaine. Opiates were not reported as used by any respondents, and benzodiazepine use was reported infrequently.

The survey also highlighted an issue confirmed by anecdotal evidence from qualitative research conducted as part of the recent THINK! campaign on drug driving. Users of cannabis reported using the drug during both the weekdays and weekends, whereas drugs such as ecstasy were only used on weekend nights,

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14 All clubbers interviewed used drugs, most surveyed did, toll-bridge surveys were conducted at 'peak drug-driving times' and focus group subjects were selected as 'likely to have a range of views on drug use and driving'.

especially when going to a club. In contrast, cocaine was generally only used at house parties.

When asked whether they had ever drug driven, 85% of clubbers and 62% of dance attendees (holding a driving licence) confirmed that they had, compared with only 10% of toll-bridge respondents. For each respondent group, cannabis was the most commonly used drug when driving, followed by ecstasy. Furthermore, whereas driving while under the influence of cannabis was reported as a frequent occurrence on any day of the week, driving under the influence of ecstasy was reported as an irregular occurrence, e.g. limited to driving home from a club at the weekend.

### 3.5.1 *Other sources*

Concern about drug driving, particularly among young people, has led to a number of surveys being conducted by magazines aimed at young people. *Max Power* magazine, for example, a magazine aimed at young men with an interest in modified cars, conducted a survey in February 2006 in conjunction with the RAC (Royal Automobile Club) Foundation. Of 474 readers who responded, 20% reported driving while under the influence of illegal drugs every day. The most common drug reported was cannabis (59% of those surveyed). Over a third of respondents (37%) claimed to have driven after taking cocaine, and 44% regularly drug drive while carrying passengers. While the results of this survey might be considered less reliable than some of the other studies reported, the figures are consistent with the view that this demographic group is the most likely to drive under the influence of drugs (and possibly is unaware of the potential dangers and penalties of doing so).

In 2009, *Mixmag*, a magazine aimed at clubbers, conducted a large-scale survey of its readers, focusing on drugs. Overseen by Dr Adam Winstock of King's College Institute of Psychiatry, the survey resulted in more than 3,000 responses. Of particular relevance, the survey included a section on drug driving. The main survey results appeared in the February 2010 edition of the magazine but, at the time of writing, results relating to drug driving were still being analysed. The results of this study have the potential to provide some of the most interesting data on the problem of drug driving.

## 3.6 **What is the prevalence of illicit drug use among road collision-involved drivers?**

The research discussed in the preceding sections has considered the prevalence of drug driving as an activity, with little consideration for its consequences. This section focuses on the incidence of drugs in drivers involved in collisions. However, it should be noted that the following data collection issues may lead to the role played by drugs being underestimated by the official statistics:

- Differences in the training, experience and (to a lesser extent) the procedures used by police officers, when attending road traffic collisions, may result in differences among officers in their decisions and perceptions of impairment. For example, a traffic officer trained as a Drug Recognition Examiner (DRE) or trained to administer FIT is likely to be more alert to the signs of drug-related driving than an officer who has not been trained in these methods.
- Given the relative difficulties associated with proving drug-related impairment compared to proving that a driver is impaired by alcohol, as well as the additional costs involved, a driver giving a positive result for alcohol may be more likely to be prosecuted for drink driving, even where there is a suspicion that drugs may also play a part.

According to the *Reported Road Casualties GB: 2008 Annual Report* (DfT, 2009) impairment due to drugs was recorded as a contributory factor by police in 687 (1%) of all reported road accidents in which injury was sustained. In contrast, impairment due to alcohol was cited as a contributory factor in 6,758 (5%) of all accidents. Accidents involving drug impaired pedestrians account for a further 242 accidents (pedestrian impairment due to alcohol was a contributory factor in 2,494 accidents).

### 3.7 What data exist on the number of drivers suspected of being impaired by drugs?

Collation of data supplied by the Forensic Science Service (FSS) and LGC reveals that, in 2008, samples for a total of 3,153 cases involving a) a road traffic accident (RTA), or b) a driver who was considered to be impaired as a result of their performance of the FIT<sup>15</sup>, were submitted for analysis. The distribution of samples received from the 43 forces in England and Wales is shown by Association of Chief Police Officers (ACPO) Region in Figure 3.3.

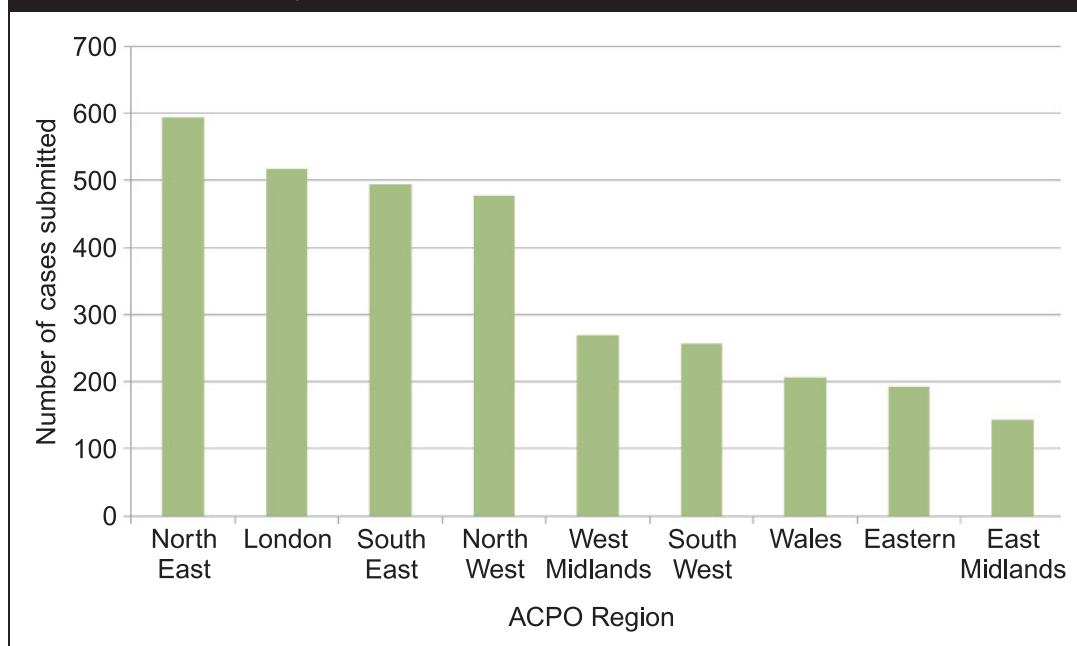
FSS and LGC handle the majority of police drug drive submissions in England and Wales. However, it is possible that some forces also use other laboratories, or that shared contractual arrangements or consortia may be in place, which could affect the figures for individual forces. For these reasons, while the data are believed to provide an accurate record of the overall total of RTA and FIT cases submitted to these two laboratories during 2008, the precise numbers for each region should be treated with a degree of caution.

Although this figure provides some information on the overall incidence of drug driving, the data provide no information on which drugs were involved. Such data are not routinely collected by government statistics, but the Home Office Scientific Development Branch (HOSDB) has obtained toxicology results for 3,423 RTA/FIT

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15 And where the FME agreed that the driver may have a condition resulting from a drug and therefore requested a sample to be taken for toxicological analysis.

**Figure 3.3: Number of RTA/FIT samples submitted to FSS/LGC laboratories by ACPO Region in 2008<sup>16</sup>**



cases submitted to FSS and LGC between February 2007 and February 2009.<sup>17</sup> Of these, 82% ( $n = 2,818$ ) were positive for one or more drugs.<sup>18</sup> Figure 3.4 summarises these toxicological results for samples submitted from 31 police forces from England and Wales.

It can be seen from Figure 3.4 that, for those drivers who come to the attention of the police as a result of their impaired driving, the drugs most likely to be detected in blood samples are cannabinoids, cocaine, benzodiazepines and opiates. It is unclear from these data whether the cannabinoids detected were the active parent drug, THC, or one of the inactive metabolites of cannabis (e.g. THC-COOH), which may be detected for some time after the drug's impairing effects have disappeared. It is also unclear from the data what proportion of the opiates and benzodiazepines detected had been prescribed and what proportion were being used illicitly.<sup>19</sup>

<sup>16</sup> Differences in population numbers between ACPO regions should be taken into account when interpreting these figures.

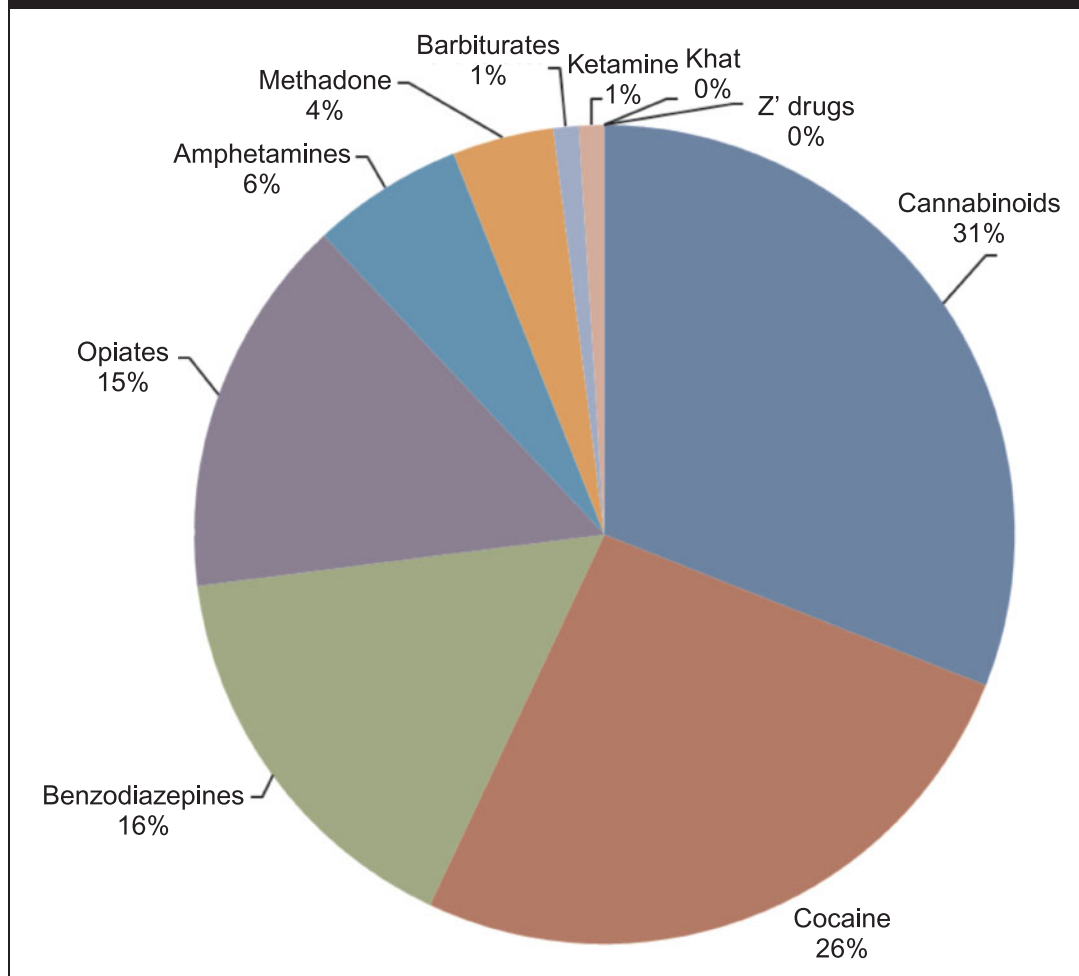
<sup>17</sup> Some forces contributed data over a longer time period than others, which may lead to biases in the data. Thus these data should be interpreted with caution. However, this is currently the most comprehensive dataset available in the UK and is a useful guide to the profile of drug use in FIT/RTA cases in England and Wales.

<sup>18</sup> There are currently no UK standards for positive cut-off values, therefore it is possible that the cut-off values used by different laboratories vary. However, any variation in cut-off values is unlikely to have a significant effect on the proportions shown in Figure 3.4.

<sup>19</sup> A more detailed analysis would identify cases where the drugs detected were above therapeutic levels.



**Figure 3.4: Percentage frequency of different drug groups in RTA/FIT submissions to LGC/FSS, 2007–09 (Source: Lamping, 2009)**

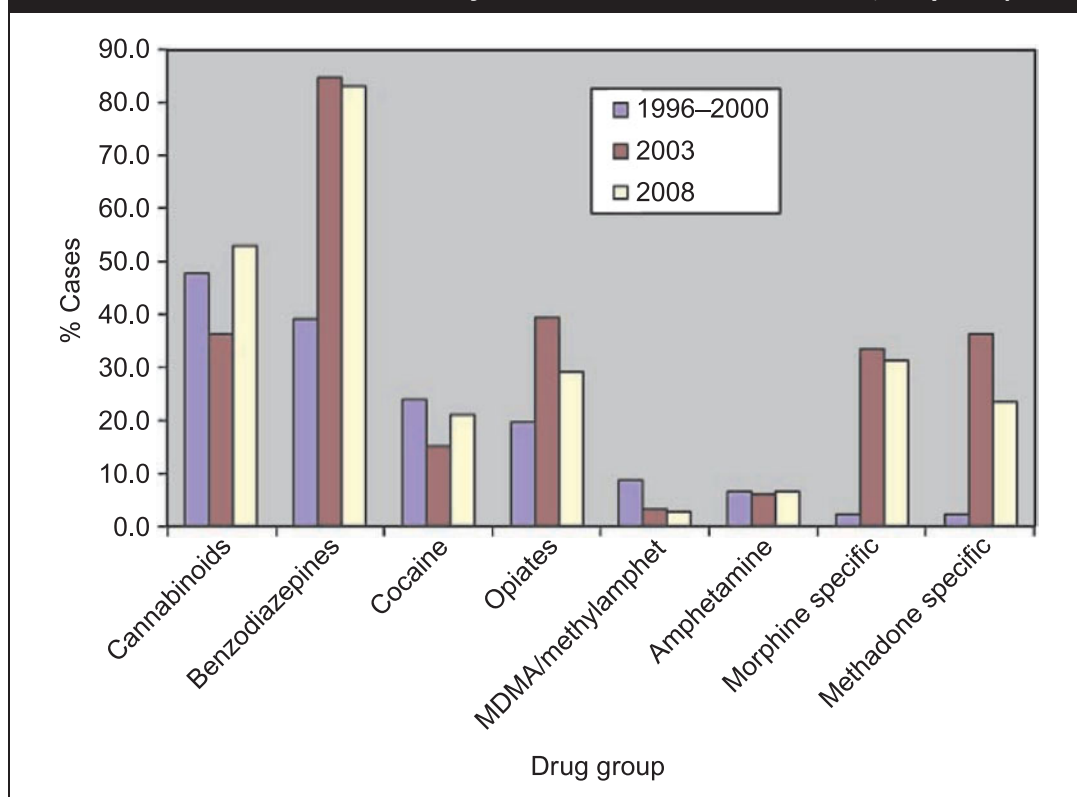


The data also highlighted the prevalence of polydrug use: in 16% of cases the driver tested positive for more than one drug. Although various combinations of drugs were detected, opiates, cocaine and benzodiazepines were most often detected together.

Further evidence regarding the incidence of drugs in drivers suspected of being impaired by drugs (Figure 3.5) comes from a recently published study of Section 4 cases submitted for forensic analysis in Scotland between 1996 and 2008 (Officer, 2009).

As Figure 3.5 shows, across the three time periods studied cannabinoids are consistently prevalent in c.40–50% of cases. Moreover, the incidence of benzodiazepines has increased dramatically since 1996, doubling from around 40% to over 80% in 2008. The most recent figures also show a significant increase in prevalence of opiates and methadone, but little change in the incidence of cocaine, amphetamine, methamphetamine or MDMA.

**Figure 3.5: Comparison of prevalence of different drug groups found in cases between 1996 and 2000, 2003 and 2008 data (Source: Officer (2009) Trends in drug use of Scottish drivers arrested under Section 4 of the Road Traffic Act A 10 year review. Science and Justice, 49: p. 239)**



This study also revealed a significant increase in the number of cases testing positive for multiple drugs. Analysis of the 1996–2000 data showed that 28% of cases tested positive for more than one drug; in 2008 this figure was 83%. Of more concern still is the finding that the number of cases testing positive for four or more drugs has risen from 4% in 1996–2000 to 25% in 2008 (Officer, 2009).

### 3.8 What is the prevalence of illicit drug use among road accident fatalities?

In 2008, impairment due to drugs was listed as a contributory factor in 56 fatal road accidents in the UK. This accounted for 3% of all fatal road accidents that year. A further 14 (1%) fatal accidents were reported as being at least partially due to drug impaired pedestrians (DfT National Statistics, 2009).

Since the late 1980s, three studies have investigated the incidence of drugs in UK road accident fatalities. The first two (Everest *et al.*, (1989) and Tunbridge *et al.*, (2001)) were conducted by the Transport Research Laboratory on behalf of the DfT. These studies involved collating the results of samples analysed on behalf of HM Coroners in England and Wales and Procurators Fiscal in Scotland. In contrast, the most recent study (Elliott *et al.*, 2009) was conducted independently of the DfT,



with little awareness of the previous research conducted by TRL in this area. As a consequence, it is difficult to compare the data presented by Elliott *et al.*, with those produced by the earlier studies. The following sections summarise the results of the Tunbridge *et al.*, (2001) study, with reference to the earlier research where appropriate. There then follows a summary of the study conducted by Elliott *et al.* (2009).

### 3.8.1 *Incidence of drugs and alcohol in road accident fatalities (Tunbridge et al., 2001)*

Tunbridge *et al.* (2001) analysed the results of blood and urine samples taken from road accident fatalities<sup>20</sup> between 1996 and 2000. The study reported a six-fold increase in the incidence of illicit drugs detected in samples taken from victims of fatal road accidents since a previous, similar study in 1989 (Everest *et al.*, 1989), rising from 3% in 1989 to 18% in 2001. Overall, there was a three-fold increase in drug use (medicinal and illicit combined): from 7.4% to 24.1%.

#### 3.8.1.1 Incidence of different drug types in road accident fatalities

Cannabis was by the far the most prevalent drug detected in fatalities: it was detected in 47% of all single drug use casualties and present in 11.9% of all samples analysed ( $n = 141$ ; c.f. 2.6% in 1989).<sup>21</sup> Opiates were the second most prevalent drug group (5.6% of samples), followed by benzodiazepines (4.8%) and amphetamines (4.5%). Trends in polydrug use increased significantly between the two studies, from 5.3% of fatalities testing positive for multiple drugs in 1989, to 26% in 2001. The most common drug combination was amphetamines and cannabis (17% of multiple drug samples).

#### 3.8.1.2 Incidence of drugs in different road user types

Drivers were the largest road user group (45% of fatalities,  $n = 533$ ), 22.9% of whom were found to be drug positive (see Figure 3.6). This figure was lower for riders (20.3%), pedestrians (20.2%) and pedal cyclists (14.7%), but higher for passengers (34.1%). Cannabis was the most common single-use drug for all road user groups except for pedestrians (opiates) and pedal cyclists (no illicit drugs detected). Passenger fatalities had the highest proportion of polydrug use (8.1%).

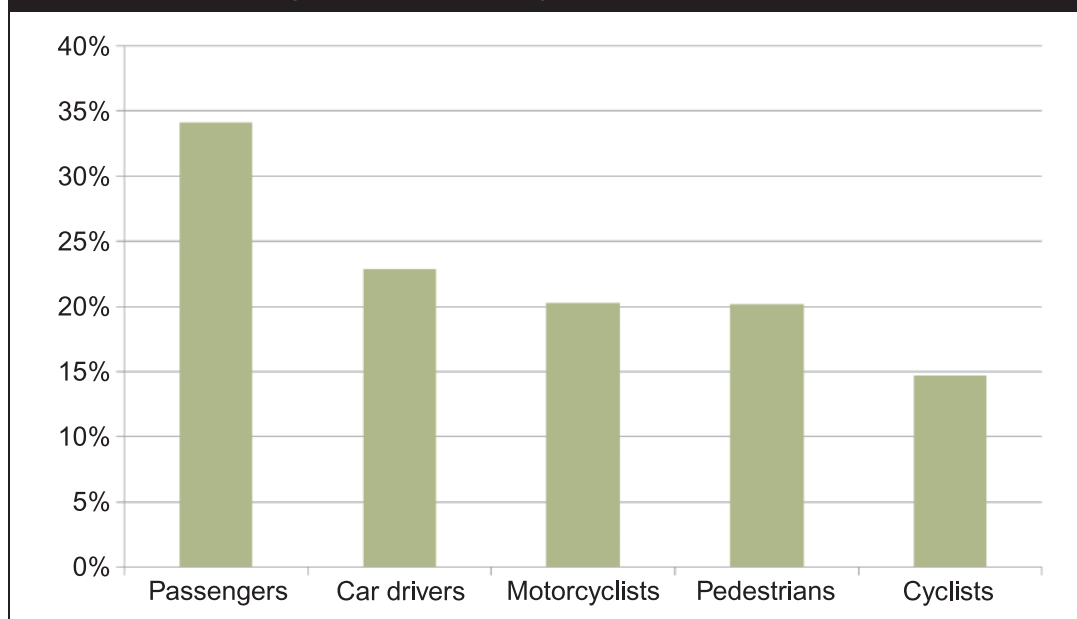
The data reported by Tunbridge *et al.* are now 10 years old and there is a need to collect these data again to determine whether these trends have changed over the last

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20 A road traffic fatality was defined as a victim who died within 12 hours of the road accident.

21 The authors of these studies acknowledge that only cannabis was screened for, not the active compound delta-9 THC. As a result of the length of time that cannabis metabolites remain detectable (particularly in urine), cannabis use cannot be directly linked to accident causation.

**Figure 3.6: Percentage of different road user fatalities testing positive for one or more drugs (Source: Tunbridge *et al.*, 2001)**



decade. For example, although cocaine was not one of the most prevalent drugs detected (2.6% of all samples), cocaine use was seen to increase across the study period from eight cases approximately halfway through the study (January 1998) to 31 cases by the end of the study (June 2000). Given the significant increase in cocaine use since 1996 highlighted by the BCS (Hoare, 2009) and the prevalence of cocaine in drug driving case submissions, it is important to investigate to what extent this increase is reflected in road accident fatalities.

### 3.8.2 Prevalence of drugs and alcohol in road traffic fatalities (Elliott *et al.*, 2009)

The most recent analysis of HM Coroners' data was undertaken by Elliott *et al.* (2009). This involved analysis of blood and urine samples taken from road accident fatalities between 2000 and 2006. These data were used to compare the drug and alcohol profiles of various road users (603 drivers, 193 motor cyclists, 18 pedal cyclists, 104 car passengers, 4 motor cycle passengers and 125 pedestrians). Before discussing the results it is important to emphasise that, in contrast to the two TRL studies mentioned previously, Elliott's study focuses on coroners' submissions and therefore does not represent a random sample of cases as was the case in the TRL research. Consequently it is inevitable that the incidence of drugs and alcohol in these results will be far greater than that seen previously.

Of the 1,047 cases routinely analysed for drugs under the direction of the coroner, 54% ( $n = 562$ ) tested positive for drugs and/or alcohol (42% for alcohol only). However, it should be noted that the definition of drugs used by Elliott *et al.* is much broader than that generally used in research of this kind, as it includes a range of over-the-counter medicines (55 cases, e.g. paracetamol, ibuprofen) and non-

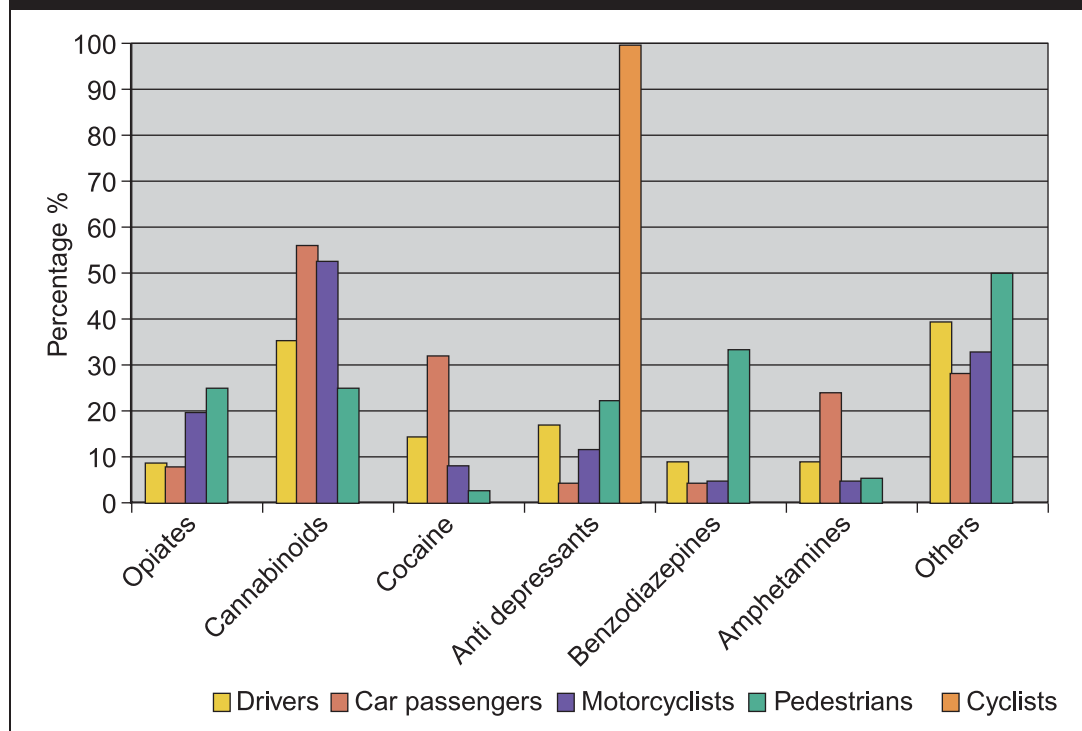
psychoactive prescription drugs (57 cases, e.g. cardiovascular medication, anti-inflammatories).

**Of those fatalities testing positive for drugs and/or alcohol**, 58% of drivers were drug positive (32% drugs only, 26% drugs and alcohol), while 70% were positive for alcohol (42% alcohol only, 26% drugs and alcohol). This equates to one-third (32%,  $n = 192$ ) of all driver samples testing positive for drugs.

While our interest in this research focuses on the drugs detected, it is also important to highlight the high incidence of alcohol in this sample, both alone and in combination with drugs. Of those who tested positive for alcohol, at least 60% of every road user group other than cyclists were above the legal driving limit for alcohol (BAC 80 mg/100 ml). Of particular concern is the finding that 67% of drivers and 80% of pedestrians who tested positive for alcohol were above the legal limit. Motorcyclists were the only group in which ‘alcohol only’ was not the predominant finding; for this group ‘drugs only’ was the most frequent finding (44%), while a further 22%<sup>22</sup> tested positive for both drugs and alcohol.

Cannabinoids (as THC-COOH – the inactive metabolite of cannabis) was the most frequently detected drug group in drivers (excluding the ‘other’ drug group), car passengers and motor cyclists. Indeed, as Figure 3.7 shows, c.35% of drivers, 55%

**Figure 3.7: Percentage frequency of drug types detected in the victim groups** (Source: Elliott, Woolacott and Braithwaite (2009) *The prevalence of drugs and alcohol found in road traffic fatalities: A comparative study of victims. Science and Justice*, 49: p.21)



<sup>22</sup> The paper does not provide exact values for ‘drugs only’ and ‘drugs and alcohol’. These values have been estimated from the graph provided.

of car passengers and over 50% of motorcyclists who tested positive for drugs tested positive for cannabinoids. However, as the analysis focused on THC-COOH, which remains detectable long after last use, this high incidence is not surprising. Similarly, while it is a concern that c.15% of drivers who tested positive for drugs and/or alcohol tested positive for cocaine, our discussions with HOSDB suggest that inactive metabolites of cocaine can also be detected for long durations, although not as long as cannabis metabolites.

Approximately one-third of pedestrians testing positive for drugs were found to have taken benzodiazepines; half had taken 'other' drugs (e.g. OTC, prescription etc.). Two drivers tested positive for both ketamine and BZP (benzylpiperazine, a 'legal high' recently brought under the control of the Misuse of Drugs Act). GHB (gamma-hydroxybutyrate) was detected in one motorcyclist. Of the 24 car passengers who tested positive for drugs, over 30% tested positive for cocaine and over 20% tested positive for amphetamines.

### **3.8.3 *Other sources of data on the prevalence of drugs in road accident fatalities***

As part of a separate project being conducted by Clockwork, discussions have been held with the Coroner's Society and with a coroner's clerk. From these discussions it is apparent that the majority of coroners use a database system called IRIS to record details about the deceased. The IRIS database already includes a pro-forma version of the TRL form used to collect data on alcohol in road accident fatalities (used to create the Alcohol database, maintained by TRL). It would be a relatively simple task to adapt this pro-forma to include a box for recording data on the results of any toxicological analysis for drugs.

## **3.9 Discussion**

### **3.9.1 *Data sources***

This section has reviewed evidence regarding the prevalence of drugs: in the general population; among specific demographic groups; and in the driving population, with a particular focus on road casualties. The review has highlighted the value of the British Crime Survey as a robust source of data regarding the prevalence of drugs in the general population, albeit with some important caveats. These data are collected on an annual basis, using the same methodology, and questions are regularly updated to respond to trends in drug use.

The evidence regarding the prevalence of drug driving is far less robust. The planned addition of questions on this subject to future editions of the BCS will, over time, fill this evidence gap. However, there are few recent UK data on the impact that drug driving has on casualty rates. It is over 10 years since the last survey

exploring the incidence of drugs in road accident fatalities. Consequently, the evidence base upon which current drugs driving policy is based is out of date.

A number of sources of data have been identified that offer the potential to answer questions relating to the impact that drugs have on road casualty statistics. For example, where toxicological analysis has been conducted, the data may be recorded by coroner's clerks in the IRIS database. These data are currently held independently by each coroner's office, with the likelihood that there is wide variation in terms of the way the data are recorded. It is recommended that efforts are made to standardise this data collection and for the results from each coroner to be collated centrally.

However, this does not overcome the problem that coroners do not routinely request toxicological analysis of samples from those killed in road accidents (and hence there is wide variation across the UK in terms of the data that would be available). One of the main reasons coroners do not request toxicological analysis for RTA fatalities for which there are no signs to suggest drug use is the cost of analysis: a basic drug screen for a standard panel of illicit drugs typically costs in the region of £100–200, while confirmatory analysis on one drug could cost a further £200.

In addition to the data collected by coroners, work undertaken by HOSDB has identified that the toxicology laboratories (principally FSS and LGC) have toxicological data on cases where a police force has requested analysis of a sample from a driver suspected of driving while impaired by drugs or involved in an RTA. Again, however, these data are not recorded in a central database. Indeed, it is our understanding that the data are not currently collated by the toxicological laboratories. Instead, the results of each individual case are communicated to the relevant police force, and then retained as part of the case file or on the laboratory's independent information management system, but not entered into a central database.

It is clear that data on drug driving do exist, but the lack of co-ordination among all stakeholders (e.g. Home Office, DfT, HM Coroners, forensic toxicology laboratories) and a lack of resources mean that these data have been collected neither on a routine basis nor in a standardised manner, nor extracted and analysed to determine the extent of the drug drive problem. At the time of writing, researchers from Clockwork Research are engaged in a scoping study to identify sources of drug driving data. This research has involved discussions with many of the aforementioned stakeholders. These discussions have revealed a willingness from all parties to work together and to share data so that the true extent of drug driving, and the impact it has on road safety, can be established.

It is interesting to contrast the lack of available data in the UK with the situation in other countries. In Norway, for example, the Division of Forensic Toxicology and Drug Abuse (DFTDA) at the Norwegian Institute of Public Health analyses all blood

samples from suspects of drug driving in Norway. These data are then held in a database containing results from all cases of suspected driving under the influence of alcohol and non-alcohol drugs. This database provides an invaluable source of information on the prevalence of drug driving in Norway, the drugs of most concern from a road safety perspective, and the consequences of drug driving. Together this information enables Norwegian policy makers and enforcement authorities to make informed decisions on the most appropriate strategies to adopt to tackle the problem and to target resources most effectively.

### 3.9.2 *Which drugs are of most concern for road safety?*

While cannabis remains the most prevalent drug across all survey data identified, evidence from the BCS suggests that there has been a significant increase in the prevalence of cocaine usage in the general population, even within the last year. Results from the HOSDB analysis of drug drive submissions to FSS/LGC also indicate that cannabis and cocaine are especially prevalent among those who are arrested on suspicion of driving while impaired by drugs.

With regard to fatalities, there is limited recent data, but the study by Elliott *et al.* (2009) suggests that there has been a considerable increase in the incidence of cocaine in road accident fatalities since the research conducted by Tunbridge *et al.* (2001). Similarly, the proportion of drivers testing positive for cannabinoids (in both Elliott's analysis of coroners' data and the FSS/LGC data) suggests an increase in the number of drivers driving with cannabis in their system since Tunbridge's 2001 paper.<sup>23</sup> These same data sources also highlight an alarming increase in the incidence of polydrug use: a finding supported by recent research on trends in drug driving in Scotland since 1996 (Officer, 2009). This study found a considerable increase in polydrug use, rising from 28% in 1996–2000 to 83% in 2008. Moreover, the study identified a dramatic increase in the proportion of impaired drivers who tested positive for four or more drugs, rising from 4% to 25% across this time period.

While these figures are of concern, it is important to point out that the results from these various studies are not directly comparable: the Tunbridge study included all fatalities, whereas the data analysed by Elliott *et al.* (2009), the FSS/LGC data and Officer (2009) are all biased towards those who were suspected of having drugs in their system.

Finally, the data that are available suggest that there have been significant changes in the patterns of drug use in the past decade, which makes the reliance on historic data ever more problematic. While research suggests that cannabis is still the illicit drug most commonly used in the general population (and most frequently detected in

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23 Although the presence of a drug or its metabolites does not, as mentioned previously, necessarily imply impairment.

drivers), the continuing rise in the use of cocaine, particularly among younger adults, coupled with the move away from ecstasy and drugs such as LSD, is worthy of note. Moreover, the recent surge in interest in 'legal highs' (drugs such as BZP, GBL, synthetic cannabinoids and mephedrone) is also of particular concern.

Although there are currently no data on the prevalence of legal highs among drivers and other road users, or of the effects such use might have on road safety, this is clearly an issue that warrants further research.



## 4 THE STATUS OF ROADSIDE DRUG TESTING DEVICES

### 4.1 Background

Ever since drug driving began to be recognised as a road safety problem, researchers around the world have worked to develop a drug-testing equivalent of the breathalyser – a device that is portable, robust, simple to use, reliable and capable of delivering unambiguous results within a reasonable time.

It has long been recognised that oral fluid (OF) offers considerable advantages over other biological samples as a medium to be analysed for the presence of drugs of abuse, particularly at the roadside. The ready availability of OF, together with the fact that samples can be collected by non-medical personnel without embarrassment, make it an attractive medium for drug screening (Verstraete, 2005). Within the context of drug driving, OF has the additional advantage that the window of detection of drugs in OF reflects the corresponding window in blood (Lillsunde, 2008).

### 4.2 Structure of chapter

This chapter begins with an outline of the current status of drug screening devices in the UK. There then follows a review of results from the most recent evaluations of roadside oral fluid screening devices, including summaries of: a) DRUID, an EU research project which has included an evaluation of eight such devices; and b) a study which has monitored the first 12 months following amendments to the drug driving legislation that were introduced into Western Australia in 2007.

### 4.3 Current status of drug screening devices in the UK

The Railways and Transport Safety Act 2003 gave British police the power to require a driver suspected of being unfit to drive because of drugs to undertake a preliminary drug test. Section 6c of the Act defines a preliminary drug test as:

*“(1) . . . a procedure by which a specimen of sweat or saliva is-*  
*a) obtained; and*  
*(b) used for the purpose of obtaining, by means of a device of a type approved by the Secretary of State, an indication whether the person to whom the test is administered has a drug in his body.”*

Railways and Transport Safety Act 2003, section 6c



The Act refers to “a device of a type approved by the Secretary of State”. However:

*“There is currently no type approval specification for roadside screening devices to detect drugs and so they cannot be used for enforcement purposes. We are therefore working with the Forensic Science Service on a specification for drug-detecting roadside screening devices. It will cover all types of device including the multi-drug device we are developing”*

Source: website of the Home Office Scientific Development Branch,  
accessed 15 February, 2010

The website also states:

*“We are developing a roadside screening device to detect drug drivers. If banned substances are found through use of the device, the motorist will be required to go to a police station and take a blood test.*

*In our device a small amount of oral fluid is placed onto a specially designed chemical slide, which is analysed by exposing the slide to a beam of laser light for a few seconds. It is expected to be able to detect all drugs, including illicit drugs, prescription and over-the-counter medicines.*

*It will be a couple of years before our multi-drug device is available and type-approved for use as the scientific development work behind it is highly complex.”*

Source: website of the Home Office Scientific Development Branch,  
accessed 15 February, 2010

On behalf of the Home Office and the police, HOSDB has been actively promoting research to develop technologies with the required polydrug detection capabilities for use by the police at the roadside. The device described above is based on surface-enhanced Raman spectroscopy (SERS), a technology that offers considerable promise in this area, as it is capable of detecting any drug present in an oral fluid sample (on the basis that each molecule has its own unique spectrum). Following an expert peer review in 2008, the in-house development by HOSDB of the SERS substrates required for such a device was halted and the emphasis placed on developing external technologies, including those based on SERS. Two calls for research, initiated at the start of 2009, resulted in the placement of two contracts, with the aim of developing prototype devices within the next three years. While one of these contracts utilises SERS technology, the other is focused upon an immunoassay technique that offers far greater sensitivity than that currently available in commercial products, within a robust, portable device. A further call is planned in 2010, again with the aim of stimulating research in this area and developing a device that can meet the demanding scientific challenges of this application.

In the meantime, regulatory authorities around the world are using existing technologies with varying degrees of success, and work continues to evaluate the latest crop of commercial devices. Two recent projects are of particular interest: the EU project DRUID, and the review of new legislation pertaining to drug driving introduced in Western Australia in 2007 (Woolley and Baldock, 2009). The remainder of this report focuses on these two projects.

## 4.4 Recent evaluations of roadside drug screening devices

The potential of OF as a medium for roadside drug screening has led to a number of device evaluations being conducted over the past 20 years (e.g. ROSITA – ROadSide Testing Assessment, ROSITA 2). The ROSITA studies concluded that none of the devices tested at that time was suitable for roadside enforcement purposes.

Subsequent studies have shown that roadside drug screening devices demonstrate increasing promise, but continue to struggle with technological issues including poor sensitivity<sup>24</sup> and reliability, as well as practical difficulties such as some suspects being unable to provide sufficient sample volume.<sup>25</sup> However, the last decade has seen considerable improvements in sample collection technologies, the reliability of immunoassays and confirmation methods, and in the understanding of toxicokinetics in oral fluid (Verstraete, 2005).

Recently, published evaluations of drug screening devices (e.g. Walsh *et al.*, 2007; Crouch *et al.*, 2008; Pehrsson *et al.*, 2008; see also the review by Bosker and Huestis, 2009) have highlighted continued improvements in sensitivity and the general performance of OF drug testing devices, but also that the reliable detection of cannabinoids (Walsh *et al.*, 2007) and benzodiazepines (Pehrsson *et al.*, 2008) still remains problematic.

### 4.4.1 DRUID

DRUID (DRiving Under the Influence of Drugs, Alcohol and Medicines) is a project funded by the European Commission within the framework of the EU 6th Framework Programme. DRUID involves partners from 37 organisations based in 18 countries working together to find answers to questions concerning the use of drugs or medicines that affect people's ability to drive safely. No UK organisations are involved in DRUID.

Work package 3 (WP3) of DRUID involves an analytical evaluation of several on-site (e.g. roadside) oral fluid screeners. We contacted the leader of WP3 in an effort

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24 Sensitivity refers to the proportion of true positives correctly identified by the test. Specificity refers to the proportion of true negatives correctly identified by the test.

25 Certain drugs, notably cannabis, cause the user to experience a particularly dry mouth.

to obtain an early draft of the report, but were informed that the report of this evaluation is still being finalised and will not be made public for several months. However, we were provided with a copy of a presentation delivered at the recent TRB (Transportation Research Board) Conference in the USA. From this presentation and other documentation on DRUID we have been able to put together the following summary.

DRUID consists of seven work packages (WP) covering Methodology, Epidemiology, Enforcement, Classification, Rehabilitation, Withdrawal and Dissemination. WP3 focuses on enforcement issues, with the following objectives:

1. Development of a set of user specifications, functional requirements and recommendations for on-site drug screening devices.
2. Development of recommendations for the roadside selection procedure of drivers of drug-related impairment, focused on the reliability of the selection procedure.
3. Development of recommendations for implementing cost-beneficial drug driving enforcement by the police.

The above objectives were addressed by three tasks:

- WP 3.1 Practical evaluation of on-site oral fluid screening devices;
- WP 3.2 Scientific evaluation of a selection of oral fluid screening devices;
- WP 3.3 Cost–benefit analysis.

The following section discusses the first two of these tasks.

#### **4.4.1.1 WP 3.1: Practical evaluation of on-site oral fluid screening devices**

The practical evaluation of roadside screening devices was conducted by the TISPOL Organisation (European traffic police network) in the Netherlands and was based on several indicators, including:

- The proportion of completed tests per device;
- The time needed for sample collection and analysis;
- Officers' positive opinion on ease-of-use in general;
- Officers' positive opinion on ease-of-use at the roadside; and
- Officers' positive opinion on testing hygiene.

Note that the practical evaluation by the police did not include sensitivity and specificity.

The main result of this task was that eight out of the 13 evaluated devices have been qualified as ‘promising’. Those devices considered to be promising showed the following outcomes:

- The proportion of completed tests per device varied from 80 to 98%;
- The time needed for sample collection and analysis varied from 3 to 14 minutes;
- Officers’ positive opinion on ease-of-use in general varied from 75 to 100%;
- Officers’ positive opinion on ease-of-use at the roadside varied from 44 to 100%; and
- Officers’ positive opinion on testing hygiene varied from 60 to 100%.

#### **Police user requirements and specifications**

Based on experiences during training sessions and testing of the devices, user requirements and specifications have been formulated regarding:

- **Training** of police officers in charge of detecting drug-impaired drivers;
- Operational **testing** of drivers at the roadside or at the police station; and
- **Documentation** of test procedures and devices.

Based on discussions during two plenary meetings of the police teams involved with the practical evaluation of on-site drug screening devices, an outline of drug driving legislation from a practical police perspective has been formulated. At the time of writing no further information on this aspect of the study was available.

#### **4.4.1.2 WP 3.2 Scientific evaluation of a selection of oral fluid screening devices**

This task involved a selection of devices based on the experiences of Rosita 2 and DRUID Task 3.1, and the availability and willingness of manufacturers to participate in the study. As a consequence, the following devices were selected for evaluation:

- Drugwipe<sup>®</sup> 5+ (Securetec);
- Oralab<sup>®</sup> 6 (Varian);
- ORATECT III<sup>®</sup> (Branan Medical);
- OrAlert<sup>®</sup> (Transmetron);
- DRUG Test 5000<sup>®</sup> (Drager);
- RapidSTAT<sup>®</sup> (Mavand GMBh);
- BIOSENS (Biosensor Applications<sup>®</sup>); and
- Cozart DDS<sup>®</sup>.

The evaluation was conducted by the Danish Transport Research Institute and involved stopping and testing two groups of subjects from moving traffic:

- Suspected drivers; and
- A non-suspected driver for each selected suspected driver.

Subjects were asked to provide oral fluid samples which were then tested with one<sup>26</sup> of the drug screen devices, using the following target cut-off limits:

- Amphetamine 25 ng/ml;
- Methamphetamine 25 ng/ml;
- Opiates 20 ng/ml;
- Cannabis (THC) 1 ng/ml;
- Cocaine 10 ng/ml; and
- Benzodiazepines 1–5 ng/ml.

As a result of the low number of drug positive subjects at the roadside, additional subjects were recruited from two other sources:

- Customers of a ‘coffee-shop’; and
- Patients of rehabilitation centres for drug addicts.

This resulted in the assessment of the performance of the devices being mainly focused on their ability to detect THC. Preliminary results suggest that there were large differences both *among* the devices and *within* devices tested under different conditions (roadside/addiction centre/coffee-shop). The final report will include: full analytical results for all devices, analytical results of the checklist for clinical signs of impairment, and an assessment of the distinction between positive and negative test results.

Although the final report is not yet available, results of some of the evaluations have begun to appear in academic journals. Wille *et al.* (2009) have recently reported on a study that assessed the reliability of the Mavand RapidSTAT<sup>®</sup>, the Securetec Drugwipe-5+<sup>®</sup>, and the Dräger DrugTest 5000<sup>®</sup>. The authors conclude that the devices all demonstrated excellent sensitivity (between 92 and 100%) for amphetamine/MDMA; and moderate sensitivity (67–75%) for the detection of cocaine. The devices detected about 70% of all cannabis users in a roadside setting. However, a newer version of the DrugTest 5000<sup>®</sup> test cassette demonstrated a sensitivity of 93%, indicating an increased detection of Delta(9)-THC using ‘new generation’ oral fluid screening tests with lowered cut-offs.

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26 From the brief information we have obtained it is unclear how many devices tested each sample.

In contrast to these promising results, Goessaert *et al.* (2010) evaluated the Varian Oralab 6<sup>®</sup> test and concluded that, while the specificity of the device was generally good, sensitivity was low for cocaine and THC. As a result, they conclude that the device is not sensitive enough to be applied during roadside police controls.

## 4.5 Evaluation of new drug drive legislation introduced into Western Australia in 2007

In 2004, Victoria in Australia became the first jurisdiction in the world to introduce roadside driver drug testing, which enabled police to test drivers for the presence of cannabis (THC) and methamphetamine. No legal limits were set for either drug; any detected presence of either was declared illegal (i.e. zero tolerance). The Victoria model has since been replicated in a number of jurisdictions around the world and was adopted by Western Australia (WA) in October 2007. The new laws required the Western Australian State Government to undertake a review of the amended legislation after 12 months of operation.

A comprehensive analysis of the legislation after 12 months was reported by Woolley and Baldock (2009) and is summarised in the following section.

The Western Australian Road Traffic Act 1974 was amended in 2007 to allow for two new offences:

- a) driving with the presence of a proscribed illicit drug in oral fluid or blood; and
- b) driving while impaired by a drug.

The proscribed drugs were methamphetamine, methylenedioxymethamphetamine (MDMA or ecstasy) and delta-9-tetrahydrocannabinol (THC). The Road Traffic Amendment (Drugs) Act 2007 gave police officers the power to stop drivers randomly and request a sample of oral fluid (or blood) to test for the presence of these drugs.

An important difference between the Victoria model and the situation in the UK is that there is no need to establish impairment: the presence of any of these drugs in oral fluid is taken to be indicative of recent use, which is sufficient for a charge to be laid.

The Western Australian roadside oral fluid testing (ROFT) process is as follows:

1. First, the driver is administered an alcohol breath test. If this shows a level above the legal limit, then the driver is detained and processed as for a drink driving charge.

2. If the breath test is negative, the driver is required to provide a small oral fluid sample for screening with a Securetec Drugwipe II device, which returns a result in approximately six minutes.
3. If the result is negative, the driver is not detained any further. However, if the result is positive, the driver is taken to a Breath and Drug (BaD) Bus to provide an evidentiary oral fluid sample, which is screened using the Cozart Drug Detection System (DDS).
4. In the event that this screening test produces a negative result, the driver is detained no further. However, if the sample is positive for at least one of the proscribed drugs, it is sent to the Chemistry Centre of Western Australia (CCWA) for laboratory analysis using liquid chromatography/mass spectrometry. Part of the sample is given to the driver to obtain an independent laboratory analysis if they wish, and the driver is advised not to drive for 24 hours.
5. If the laboratory analysis shows at least one of the proscribed drugs in the oral fluid sample, the driver is charged with driving with the presence of a proscribed illicit drug in saliva or blood and summonsed to appear in court.
6. The penalties are the same as those for the lowest drink driving offence (driving with a BAC between 0.05 and 0.06 g/100 ml). Penalties also apply if drivers refuse to undertake a drug test when required to do so by a police officer.

More details of the procedures used and the equipment used in WA can be found at Appendices 1 and 2 respectively.

During the period studied (15 October 2007 to 27 November 2008) 9,716 roadside tests were conducted with the Securetec Drugwipe II. Of these, 517 tested positive for one or more proscribed drug (5.3%). Twelve drivers were unable to provide sufficient oral fluid, while a further 12 refused to provide a sample. This latter group were charged with failing to comply with the requirement to provide an oral fluid or blood sample for testing or analysis.

The 517 samples that tested positive with the Drugwipe II were tested in a secondary screening test using the Cozart DDS. Table 4.1 shows that approximately

<b>Table 4.1: Results of Cozart Drug Detection System secondary screening tests</b>		
<b>Cozart test outcome</b>	<b>Number</b>	<b>Per cent</b>
Methamphetamine positive*	342	66.2
THC positive	30	5.8
Positive for both	35	6.8
Negative	109	21.1
Unknown	1	0.2
<b>Total</b>	<b>517</b>	<b>100</b>
* Refers to positive results for a screen that detects the presence of methamphetamine or MDMA.		



1 in 5 of the 517 secondary screening results performed with the Cozart DDS contradicted the result of the initial screening using the Drugwipe II.

The 517 samples tested with both devices were next sent to the CCWA for laboratory analysis. This analysis produced the results in Table 4.2.

<b>Table 4.2: Results of CCWA evidentiary tests</b>		
<b>CCWA analysis outcome</b>	<b>Number</b>	<b>Per cent</b>
Positive methamphetamine only	219	49.5
Positive MDMA only	15	2.9
Positive THC only	45	8.7
Positive methamphetamine + MDMA	35	6.8
Positive methamphetamine + THC	117	22.7
Positive MDMA + THC	6	1.2
Positive for all three	20	3.9
Negative	57	11.1
Total completed	515	100
Pending	2	
<b>Total</b>	<b>517</b>	
NB: Table 4.2 includes a positive methamphetamine only case for which the Cozart test result was unknown.		

As a result of their evaluation, the authors conclude that:

*“The Cozart DDS failed to detect a proportion of the methamphetamine-based drugs and a significant proportion of the THC positive samples. In nearly 30 percent of Cozart screens, at least one drug type that was present was not detected. The sensitivity of the apparatus for detecting THC was only 34 percent (it was 91 percent for the methamphetamine-based drugs). Furthermore, use of the Cozart DDS as a screening instrument resulted in the elimination of over 10 percent of possible prosecutions for the offence of driving with a prescribed drug in oral fluid<sup>27</sup>. . . . On the basis of these results, there is a very clear problem with the use of the Cozart DDS as a screening instrument.”*

Woolley and Baldock, 2009, p.38

However, the authors also note that discussions with the CCWA revealed that a problem with the cotton tip of the Cozart DDS collection device might account for this poor performance. A new collection kit has been provided by Cozart, which – at the time that the report was produced – had yet to be evaluated.

27 According to the WA legislation, only drivers whose samples were positive on the Cozart test were eligible for prosecution if the laboratory analysis detected the presence of proscribed drugs. For drivers whose oral fluid samples were positive for drugs according to the laboratory analysis but whose samples were negative according to the Cozart test, no offence was recorded.



The legislation introduced in October 2007 also included new procedures for the identification and apprehension of drivers impaired by drugs (DID). These new procedures involve the police officer observing driver behaviour likely to indicate drug impaired driving, followed by a Field Impairment Test (FIT). If the driver's performance of FIT suggests impairment, the officer can collect blood and urine samples for toxicological analysis (confirmation by a medical examiner is not required). However, during the first 12 months of the new legislation, only five drivers had been charged with the offence of driving while impaired by drugs in WA.

## 4.6 Discussion

This section has considered current developments with regard to roadside drug screening devices and their application in real-world enforcement. In the UK, there appears to have been little progress since the police were first given powers to require a driver suspected of being impaired by a drug to submit to a screening test, back in 2003. Of most concern is that, even years after the Railways and Transport Safety Act 2003 was introduced, a type-approval specification for roadside screening devices to detect drugs has still not been produced. Consequently, none of the commercially available devices that are currently being used by enforcement agencies elsewhere can be used for enforcement purposes in the UK. While it is acknowledged that these devices have had their limitations, it is disappointing that there has been no forward movement on this issue since 2003.

However, while a type-approval specification is still awaited, HOSDB reports that – on behalf of the Home Office and the police – it has been actively promoting research to develop technologies with the required polydrug detection capabilities for use by the police at the roadside. Commercial manufacturers have been made aware of the police operational requirements through consultation on the draft type-approval specification and through discussion with the police, DfT and Home Office. However, there are still problems with the sensitivity, specificity, operational and storage temperature ranges and environmental robustness of many of these devices (HOSDB, personal communication).

In the meantime, other jurisdictions in Europe and Australia are already using the devices that are currently available. The EU project DRUID, for which a final report will shortly be available, has been testing a number of such devices. Although full results are not yet available, the early indications are that, while some issues remain (e.g. the ability to reliably detect the active metabolite of cannabis at low enough concentrations), there have been considerable improvements in the sensitivity and specificity of roadside oral fluid screening devices since the last wide scale evaluation was conducted (ROSITA 1/2).

The WA experience, and that in Australia generally, is particularly informative, and suggests that a 'zero tolerance' policy utilising roadside screening devices has

distinct advantages over the UK's impairment-based approach. Specifically, the process is simple, straightforward, quick to administer, and unambiguous. It is also interesting to note that the DID powers, introduced in conjunction with the ROFT procedures, have been largely ignored as an anti-drug-drive measure, in favour of the ROFT approach. It is apparent that enforcement officers were more comfortable with administering the ROFT rather than trying to demonstrate impairment in order to secure a conviction for DID. It is also evident that they were content to proceed with a charge attracting much lower sanctions, in the interests of a rapid and practical solution, and one which requires considerably less administrative work.

Clearly, one of the factors determining the effectiveness of such legislation is the severity of the accompanying sanctions. The report recommended that penalties for testing positive to a drug through ROFT should perhaps be increased. In addition, studies investigating recidivism may help to demonstrate the effectiveness of the laws in changing driver behaviour.

The UK currently has in place a system akin to the DID approach, which requires that impairment is demonstrated before a blood or urine sample can be taken for analysis. The Australian experience suggests that, were the UK to move to a zero tolerance system, one effect would be that the police would be less likely to pursue a case for Driving Under the Influence of Drugs (DUID; section 4 of the Road Traffic Act 1988).

## 5 THE POTENTIAL FOR SETTING LEGAL LIMITS FOR SPECIFIED DRUGS FOR DRIVERS

### 5.1 Background

The Road Traffic Act 1988, section 4(1) makes it an offence to drive or attempt to drive a mechanically propelled vehicle on a road or public place when unfit through drink or drugs. In order to secure a section 4 conviction, it is necessary to demonstrate impairment and for this condition to be confirmed by a Forensic Medical Examiner (FME). This ‘impairment-based’ approach has been criticised for a variety of reasons, particularly the time delays between an officer’s initial observations and the driver being examined by an FME, which can cause differences of opinion.

Jurisdictions elsewhere have tackled these and associated problems by removing the need to demonstrate impairment and simply establishing either a zero tolerance approach or a two-tiered approach combining elements of each, with different sanctions depending on the offence. Another approach that has received attention is to establish legal (*per se*<sup>28</sup>) limits for specific drugs, akin to the drink-drive limit that exists for alcohol. This chapter reviews these different approaches.

### 5.2 Structure of the chapter

The chapter is divided into the following sections. First, research studies that have attempted to establish legal limits for different drugs are summarised and the evidence that these studies have produced is evaluated. There next follows a summary of the challenges associated with this approach that have been identified by previous research. Finally the chapter summarises the different legal approaches that have been adopted in other European countries and considers how successful each strategy has been.

Over the past 20 years, a number of reviews of the literature have addressed the relationship between biological (e.g. blood, urine, saliva, sweat) drug concentrations and psychomotor and cognitive skill impairment. The European projects ROSITA (1999) and IMMORTAL (2002) have synthesised experimental data on these topics and have highlighted the impairment that has been shown to be associated with several drug groups (cannabis, opiates, cocaine, amphetamines and hallucinogens). However, these reviews have failed to come to a conclusion regarding the dose response (or more usefully the ‘blood concentration response’) effect of each drug

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28 *Per se* (Latin) meaning by or of itself, or intrinsically. With regard to drink drive legislation, a *per se* law defines legal limits for blood/urine alcohol concentrations above which it is illegal to drive. This is *of itself* an offence: there is no need to demonstrate impairment or (within reason) any other facts.

group. In other words, there is no consistent opinion on the quantity of a particular drug that could be expected to produce a particular level of impairment. This is principally due to three factors:

- a) The variation in methodologies employed in different studies makes direct comparisons difficult;
- b) The wide variation between subjects in terms of their response to a specific dose of a drug limits the conclusions that can be drawn from individual studies; and
- c) Not all studies have employed tests that have direct relevance to driving-related impairment (e.g. flicker fusion tests).

### 5.3 What evidence is there for setting legal limits for specified drugs for drivers? (i.e. non-zero *per se* laws)

The following sections summarise research investigating the potential correlations between concentrations of particular drugs in blood and impairment of driving-related skills. The number of studies focusing on each drug group varies but, understandably, considering its prevalence as a recreational drug around the world, the majority of research has focused on cannabis.

#### 5.3.1 Cannabis

Perhaps the most comprehensive attempt to establish a legal (driving) limit for a particular substance is Grotenhermen *et al.*'s (2007) review of cannabis. Conducted by a team of experts from around the world, the review considered the epidemiological and experimental evidence for *per se* driving limits for cannabis. The team found that existing epidemiological studies were plagued by low sample numbers and often lacked statistical power to provide a scientifically robust guide to *per se* limits. The authors did find, however, that meta-analyses of experimental studies involving cannabis and alcohol provided empirical evidence for initial *per se* limits, in preference to a zero tolerance approach. The authors concluded that 7–10 ng/ml of THC in serum (3.5–5 ng/ml in whole blood) is a reasonable limit. This limit correlates with a BAC of 0.05% in terms of measures of impairment. This laboratory-based limit was suggested while acknowledging the need for a review of real-life driving impairment once adequate epidemiological data are available.

One such study comes from France (Laumon *et al.*, 2005), which involved analysis of 10,748 drivers, with known drug and alcohol concentrations, who were involved in fatal crashes in France from October 2001 to September 2003. Out of this group 6,766 drivers were considered to have been responsible for the accident in which they were involved. This group was compared with 3,006 drivers from the same sample who were not deemed responsible for the collision. This enabled the team to consider whether those who were positive for drugs or alcohol were more likely to have been responsible for the collision, and – for those who tested positive for

cannabis – to calculate what level of cannabis was associated with a significant increase in risk. The study demonstrated a significant dose effect, whereby higher levels of cannabis were associated with an increased risk of being involved in an at-fault accident. Importantly, the study suggested that, even at cannabis concentrations of 1 ng/ml, there was evidence of increased risk (an average odds ratio of 2.18 for Delta 9 THC levels between 0 and 1 ng/ml; at levels above 5 ng/ml the average odds ratio increased to 4.72).

Grotenhermen *et al.* (2007) also highlight the synergistic effects of cannabis in combination with alcohol and suggest that a *per se* limit would need to consider such interactions. They propose that, in the presence of alcohol over 0.03%, a lower THC limit could perhaps be set. This approach was recommended in Germany in 2005 such that the limit for THC without alcohol would be 5 ng/ml and with alcohol would be 3.5 ng/ml (EMCDDA, 2007). In France, where a zero tolerance approach to cannabis applies, a higher penalty is given for drivers caught with drugs in combination with alcohol.

### 5.3.2 Cocaine

While research on cannabis has provided some firm figures for suitable cut-off levels, which are supported by a large body of robust evidence, the same cannot be said for cocaine: to date it has not been possible to identify a suitable cut-off limit for this drug. There are a number of reasons for this. First, in contrast with cannabis, the physiological and psychological effects of cocaine and its metabolites have not been found to be associated with plasma concentrations (Karch, 2009). For example, the same blood concentration of cocaine can have greatly different effects depending on whether concentration levels are rising or falling (Karch, 2009). Moreover, as with many other drugs, regular cocaine use can lead to tolerance such that concentrations which lead to impairment in a naïve user may not elicit signs of impairment in a chronic user (Karch, 2009). These variations in metabolism among individuals further complicate the pursuit of defined cut-off limits associated with driving impairment.

Furthermore, the interactions between cocaine (and its metabolites) and other drugs can also make the development of *per se* limits difficult. A review of the interactions between cocaine and alcohol (Pennings *et al.*, 2002) reported several studies that had found alcohol to increase the plasma levels of cocaine and, importantly, that cocaine actually *attenuated* the negative effects of alcohol on cognitive and motor performance. The authors warn, however, that “the combination [of alcohol and cocaine] provides no definitive protection from the impairing effects of alcohol” (Pennings *et al.*, 2002, p. 778).

Another issue to be considered in setting relevant cut-off levels for cocaine is that, while detection of cocaine in saliva is indicative of very recent use and concentrations correlate well with concentrations in plasma, low concentrations of

cocaine may be found in regular users, even if they have abstained for up to several days (Karch, 2009). This is an important finding to consider, both when assessing the validity of ROFT devices and in interpreting the results of drug prevalence studies.

### 5.3.3 *Amphetamines, methamphetamines*

A similar situation exists with regard to amphetamines and methamphetamines. Karch (2009) highlights several studies which have found that, like cocaine, low doses of (meth)amphetamines can actually improve performance on psychomotor tests. High doses, however, can impair driving performance. Jones (2007) explored the relationship between a physician's judgement of impairment (based on questions, observations and psychomotor and cognitive tests) and blood amphetamine concentrations ( $n = 70$ ). Statistical analysis found no relationship between the degree of drug influence, as determined by clinical tests of impairment, and blood amphetamine concentrations. Reasons for this lack of association suggested by the author include variations in user tolerance to the drug and impairment resulting from come-down effects during low levels of the drug. Jones (2007) concludes that this lack of association renders concentration-based *per se* laws for amphetamines inappropriate in practice.

A Norwegian study (Gustavsen *et al.*, 2004), of 878 motorists positive for amphetamines/methamphetamines only, found a positive correlation between blood amphetamine concentrations and impairment, but only between the blood concentration range of 0.27–0.53 mg/l. Furthermore, although 73% of subjects were judged to be impaired using clinical tests, the mean concentration of amphetamine did not differ from those judged not to be impaired (0.53 mg/l, impaired; 0.50 mg/l, not impaired) (Gustavsen, 2006; cited by Jones, 2007). Although the authors conclude that there was a relationship between clinical tests of impairment and blood amphetamine concentrations, this finding was not true for concentrations in the range found by Jones (2007; mean – 1.0 mg/l, median – 0.9 mg/l) and Jones *et al.* (2008; mean – 1.0 mg/l, median – 0.8 mg/l) in Swedish motorists.

In conclusion, the variation in results regarding the relationship between amphetamine levels and impairment suggests that there is currently insufficient robust evidence to establish a cut-off limit for amphetamines/metamphetamines.

### 5.3.4 *MDMA (ecstasy)*

As might be expected, given the similarities between MDMA and amphetamines/methamphetamines, there is very little evidence regarding what might be considered an appropriate level for a cut-off limit for this drug. Karch (2009) reports that the concentration ranges of blood MDMA in drivers suspected of DUI (or DWI) are so great that they are not suitable for interpretation (50–600 ng/ml). However, these



cases almost all involved polydrug use, which would have further complicated any interpretation of concentration-dependent behaviour.

As with other drugs, the interaction effects with alcohol also need to be considered. Kuypers *et al.* (2006) found that, while MDMA counteracted the subjective impairment of alcohol, objective measures of psychomotor skills were still impaired. Hence, combining MDMA with alcohol may cause the driver to be overconfident in their ability to drive.

### 5.3.5 Opiates and methadone

One of the primary challenges in determining suitable cut-offs for opiates, as for many drugs, is the phenomenon of tolerance. Discussions with toxicologists reveal that the blood concentrations of opiates that are typically seen in addicts would be sufficient to kill a first-time user. Even within those whose use of opiates is for therapeutic reasons, blood concentrations in patients who have developed tolerance would lead to overdose in individuals who have not developed tolerance levels. Similarly, correlations between impairment or pain relief and blood concentrations are difficult to determine given individual variation (Karch, 2009).

Regarding methadone, the metabolism and clearance rates for methadone can also be altered by the presence of other drugs such as alcohol and cocaine, again highlighting the issue of polydrug use and the challenge of developing relevant cut-offs in these situations (Karch, 2009).

## 5.4 Challenges identified

### 5.4.1 Come-down effects

Reviews of the effects of drugs on driver impairment (e.g. ROSITA, 1999; IMMORTAL, 2002) also highlight the impact of come-down symptoms on driver performance and thus road safety. In the case of amphetamines and other stimulants, for example, exhaustion and apathy after the acute effects of the drug have worn off also have the potential to affect driver performance adversely (Jones, 2007; Jones *et al.*, 2008). At this point the drug blood concentration levels of the driver might be lower than a particular cut-off limit, but the impairment being experienced by the individual could be as severe as when these levels were above the limit.

This issue of a particular drug having different effects depending on whether the individual is on the up-phase or down-phase is particularly important when trying to establish cut-off levels. In the case of amphetamines, for example, low levels of the drug during the up-phase (at time point 1) might be associated with improved performance or no effect. With increasing blood concentrations (at time point 2) there would then typically be a decline in performance. However, later (at time point 3), while blood concentrations may have declined to levels similar to those observed

at time point 1, actual performance may be impaired to levels associated with higher blood concentrations – not as a direct result of intoxication caused by the drug, but resulting from come-down or ‘hangover’ effects.

#### **5.4.2 *Low doses of stimulants can improve some psychomotor skills***

With regard to stimulant drugs such as amphetamines and cocaine, several studies have found no change or moderate improvements on psychomotor testing tasks (Karch, 2009; Pennings *et al.*, 2002; Ramaekers *et al.*, 2006). Generally, however, studies that show improvement in specific driving tasks (e.g. standard deviation of lane position) also report impairment in other measures (e.g. car-following performance) and therefore conclude that overall driving ability cannot be said to be improved (Ramaekers *et al.*, 2006).

Nevertheless, the potential legal challenges that might ensue were a driver to be prosecuted for having a level of a drug that research has demonstrated has no effect, or even improves aspects of driver performance, certainly need to be considered.

#### **5.4.3 *Polydrug use***

The additive or synergistic effects observed when alcohol is consumed in combination with psychoactive drugs, or other polydrug use, increase the complexity of setting *per se* limits. The specific interactions between these drugs, as highlighted in the various sections above, may serve to promote or to inhibit the effects of a certain drug in isolation, rendering correlations between drug blood concentrations and impairment open to interpretation.

##### **5.4.3.1 *Prevalence of polydrug use***

Tunbridge *et al.* (2001) found that, of all road fatality cases in which at least one drug was detected, multiple drugs were detected in 26% ( $n = 75$ ). In another study of UK road fatalities, Elliott *et al.* (2009) found that 26% ( $n = 87$ ) of drivers testing positive to either drugs and/or alcohol were found to have taken both. Oliver *et al.* (2006) reported that 63% of drug positive DUID cases were positive for multiple drugs. The most common drugs found in combination were benzodiazepines and opioids (90% of polydrug cases).

#### **5.4.4 *Medicinal psychoactive drugs***

A number of prescription and over-the-counter medicines have the potential to impair driving (e.g. antidepressants, benzodiazepines, opioids, sedating antihistamines). Across Europe there are several different legislative approaches to driving under the influence of such substances. While some countries (e.g. Estonia, Poland, Slovenia) penalise the trace of any substance, whether medicinal or illicit, other countries (e.g. Austria, France, Portugal) have exempted certain psychoactive



medicines from drug driving laws, instead covering any potential impairment due to broader ‘dangerous driving’ laws. A two-tiered system is employed in several EU countries (e.g. Belgium, Czech Republic, Finland, Germany, Latvia, Luxembourg, Slovakia) whereby there is a zero tolerance stance to illicit drugs, but traces of medicinal drugs must be accompanied by proof of impairment. Some countries have a lower penalty for impairment due to medicines compared to illicit drugs; drivers may also avoid charges if a prescription is presented and impairment is not proven (EMCDDA, 2009b; EMCDDA, 2007).

## 5.5 What works in practice?

Drug driving legislation and enforcement approaches vary greatly throughout the world, and even across Europe. However, very few studies have evaluated the effectiveness of any ‘new’ legislation (i.e. comparing the incidence of drug driving before and after a change in legislation). Given the many issues associated with the impairment-based approach employed in the UK, it is tempting to assume that a zero tolerance approach will deliver a simpler procedure with significant improvements.

However, papers from the National Board of Forensic Medicine in Sweden have highlighted some important limitations of *per se* approaches (both zero and non-zero) to drug driving (Jones *et al.*, 2008; Holmgren *et al.*, 2008). Holmgren *et al.* (2008) investigated the re-arrest rate of drug impaired drivers. Nearly 37,000 (36,799) cases were analysed over a four-year period (2001–04). Sixty-eight per cent of illicit drug drivers were re-arrested, compared with 14% of drunk drivers and 17% of medicinal drug drivers. The authors report that this finding supports findings from similar studies in Norway. Mean (and median) amphetamine concentrations increased with the number of re-arrests, from 0.77 mg/l (0.5 mg/l) in first time offenders to 1.22 mg/l (1.0 mg/l) in recidivists (>12 arrests). From these findings, the authors conclude that the introduction of zero tolerance laws has not deterred people from DUID. The authors suggest that more consideration should be given to the underlying cause of drug misuse in order to tackle the problem. However, Jones (2007), as discussed above, argues that *per se* non-zero cut-offs for amphetamines are not appropriate either.

These papers have focused on amphetamines as the predominant drug of abuse in Sweden. The effect of zero tolerance laws on the recidivism of other drug drivers (e.g. cannabis) is yet to be established. In terms of alcohol, an American study of the effectiveness of BAC zero tolerance laws for drivers aged under 21 (Grant, 2007) found that zero tolerance laws neither reduced the number of RTA fatalities in this demographic, nor significantly changed the profile of BAC in those involved. They argue that this is because zero tolerance laws have little effect on driver behaviour.

The reviews of the effectiveness of Sweden's zero tolerance policy do point out that the number of samples sent for analysis rose at least 10-fold since its introduction in 1999. This increase is likely due to a combination of:

- a) increased police enthusiasm and confidence in achieving a successful prosecution (Holmgren *et al.*, 2008; Jones, 2007); and
- b) the provision of specialist training for police officers in drug recognition (Holmgren *et al.*, 2008; Jones, 2008).

Jones *et al.* (2008) conclude that zero tolerance laws have simplified the process in achieving a successful DUID conviction. Under the previous requirements (proof of impairment), few police forces were likely to pursue a DUID charge unless there had been an actual RTA (Jones, 2007). According to Jones *et al.* (2008), zero tolerance laws are “a more pragmatic way to enforce DUID legislation compared with effect-based or impairment laws, and they send a clear and concise message to users of illicit drugs who might decide to drive a motor vehicle and risk having a crash.” (Jones *et al.*, 2008, p. 207).

The high incidence of re-arrests witnessed in Norway suggests that, in some cases, known offenders might have been targeted by officers.<sup>29</sup> Our investigations revealed anecdotal evidence of traffic police parking near the homes of known amphetamine addicts, then stopping and arresting them as soon as they set off in their vehicles, confident that they would test positive for amphetamines.

## 5.6 What are other countries doing?

Within Europe, a variety of drug driving policies have been adopted by the different countries, ranging from zero tolerance *per se* limits (e.g. Sweden) to proof of impairment (e.g. current UK laws), each with subtle variations.

Several countries (e.g. France, Sweden) have opted for a zero tolerance approach. This approach overcomes the difficulties associated with: a) proving impairment; and b) deciding on scientifically valid cut-offs from conflicting sources of data. However, while zero limit *per se* laws bypass the need to investigate correlations between impairment and body fluid concentrations, they also have the potential to penalise drivers who are not impaired and pose no risk to safety. In other countries (e.g. UK, Spain, Italy) the offence is related to impairment, not presence of the drug alone. This has the advantage that only those jeopardising road safety are penalised, but of course it requires impairment to be proved. A number of countries, including Belgium and Germany, have adopted a two-tier system, whereby drivers who are found to have any trace of an illicit substance are charged with a lower-level sanction, while drivers who are demonstrated to be impaired receive more severe

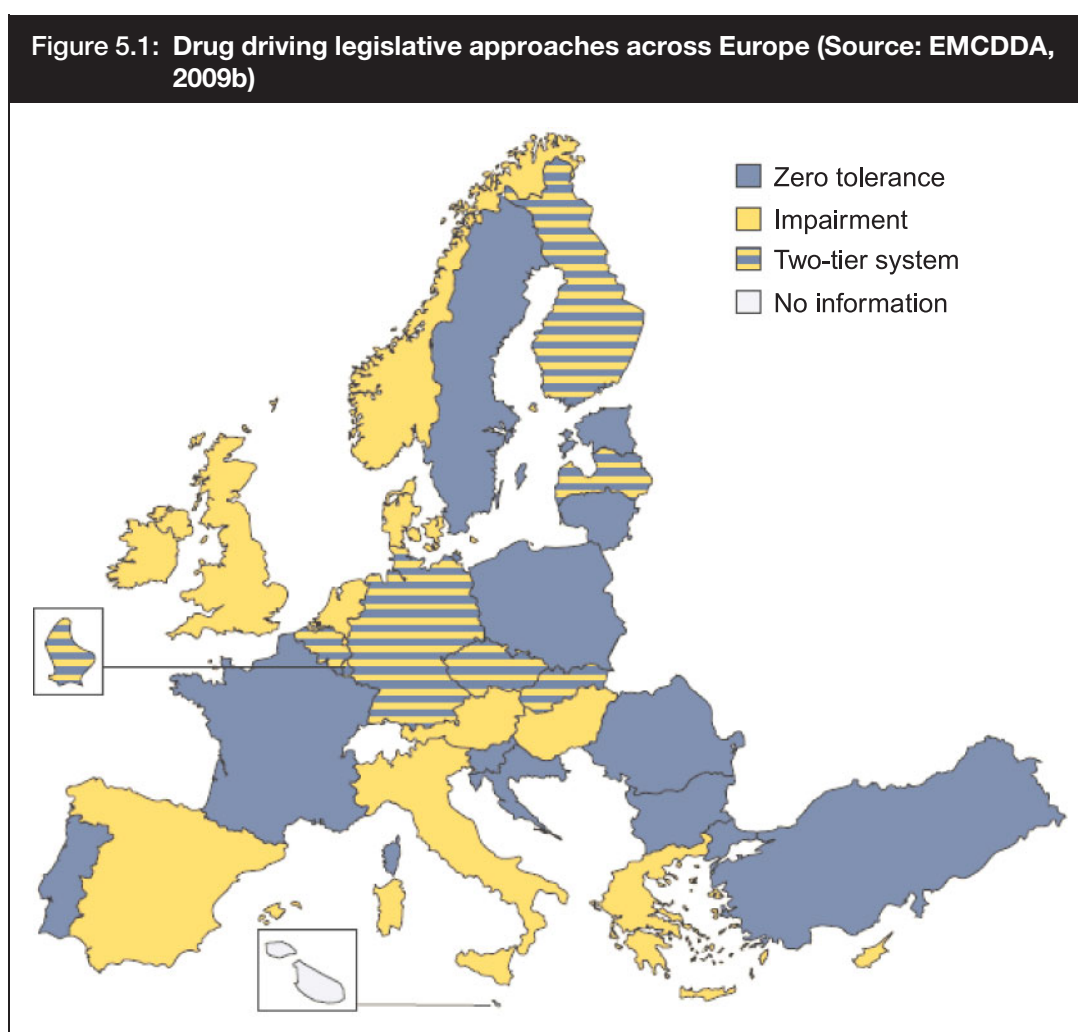
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29 This may also explain re-arrest rates as high as 23 times in Holmgren *et al.* (2008), although this is not mentioned by the authors.

penalties. In other countries (e.g. France, Austria and Portugal), potentially impairing medicines such as benzodiazepines are not covered by the drug driving law, but may be covered by a general offence such as dangerous driving (EMCDDA, 2007; EMCDDA, 2009b).

Cyprus has taken a different approach to tackling the problem, by prosecuting drivers not on a driving offence, but rather for consumption of illegal drugs. The UK (and Belgium), however, have specifically prohibited this approach (EMCDDA, 2007; EMCDDA, 2009b).

Figure 5.1, taken from an EMCDDA briefing (EMCDDA, 2009b), shows the different legislative approaches taken by countries in Europe.



A summary of the legislative approaches to DUID adopted in each country in Europe is shown in Appendix 3.

## 5.7 Discussion

Before *per se* laws are considered, there are a number of factors that need to be addressed. First, if a zero tolerance approach is adopted, a base cut-off will still be required, i.e. a baseline level that minimises the possibility that a positive test is not a false positive. Some jurisdictions have set this base level at the level of detection (LOD), or level of quantification (LOQ).

In Germany, the zero limit for cannabis was initially set at the LOD. However, in January 2005, Germany's Federal Constitutional Court ruled that, because advances in drug testing technology now made it possible to detect miniscule traces of drugs, it was necessary to reinterpret what constitutes drug driving. They suggested a level of 1 ng/ml would be a reasonable cut-off point, which would have brought Germany's level into line with that of France. This followed a ruling by the Federal Constitutional Court that overturned the conviction of a man who had been found with less than 0.5 nanograms of THC per millilitre of blood in his system. The Court ruled that tiny traces of THC in the driver's bloodstream were not sufficient to convict him of driving while intoxicated, which would have led to his driver's licence being revoked (Source: <http://stopthedrugwar.org/chronicle/371/germany.shtml>). However, following a meta-analysis of available data, a recommendation was made to set the limit value for the THC concentration in blood at 3.5–5 ng/ml (lower if combined with alcohol) (EMCDDA, 2007).

Consideration must also be given to the compounds that are screened for – such as the active compound of cannabis (THC) or the inactive metabolites (THC-COOH). If only the active compound is screened for, it will reduce the risk of false positives, especially with regard to long-lasting, inactive cannabis metabolites.

Regulatory authorities need to consider their objectives in setting drug driving laws: Is the objective to target general drug use or to target those drivers who are impaired by drugs? Take alcohol, for example: it is not an offence to drink alcohol and drive, but it is an offence to drive while *impaired* by alcohol. The argument that the same drug concentration can have varying levels of psychoactive effects depending on the individual (tolerance, gender, body size and composition etc) is also true of alcohol, and yet *per se* non-zero limits have been established, following comprehensive research over several years, in an attempt to balance public safety with civil rights.

### 5.7.1 Key points

The complex nature of drug pharmacodynamics and pharmacokinetics makes it difficult to establish values that would represent impairment in the general population. The main challenges in determining suitable cut-offs include: individual variations, drug tolerance, interactions with other drugs, and the variable effects of the same blood concentrations of drugs depending on whether the concentration is rising or falling.

A robust review of the evidence for levels of cannabis related to impairment has suggested cut-offs that appear promising. Attempts to develop comparable levels for amphetamines, however, have found greater variation in the association between blood concentrations and tests of impairment and recommend that *per se* cut-offs are inappropriate for this drug group.

Studies of the effectiveness of zero tolerance laws have found them to have been unsuccessful in deterring DUID re-offenders. The number of DUID cases and successful prosecutions, however, has increased dramatically since the introduction of zero tolerance laws in Sweden over 10 years ago. Given the debate on what level of a drug constitutes impairment, supporters of impairment-based laws argue that zero tolerance laws have the potential to penalise unimpaired drivers and are not focused on improving road safety, but rather on drug misuse in general.

### 5.7.2 *Evidence gaps and recommendations*

Further research into the correlations between blood concentrations in certain drugs and impairment may help to move toward developing suitable cut-offs (like those developed over time for alcohol). However, ‘before’ and ‘after’ studies of newly introduced laws that evaluate the performance of these various approaches in practice may be of more value.

## 6 THE APPLICATION OF THE FIELD IMPAIRMENT TEST (FIT) BY UK LAW ENFORCEMENT OFFICERS

### 6.1 Background

The origins of the Field Impairment Test (FIT) used in the UK lie in the Drug Recognition Expert (DRE) programme originated by the Los Angeles Police Department in the 1970s. Subsequently, through collaboration with the National Highway Traffic Safety Administration (NHTSA), the Drug Evaluation and Classification Program (DECP) was developed and rolled out across the USA from 1987 onwards.

The potential of DECP as a screening tool to identify, at the roadside, drug use and impairment due to drugs attracted the interest of police forces worldwide and led to adaptations of the DEC programme being implemented in many countries. In the UK, officers from Strathclyde Police in Scotland attended the programme and as a result developed the FIT. FIT consists of a battery of five tests of psychomotor ability and divided attention that are based on the Standardised Field Sobriety Tests (SFST)<sup>30</sup> that form part of the DECP. The five tests that make up FIT are: pupillary comparison, Romberg test (balance and judgement of 30 seconds), the walk-and-turn test, one-leg-stand test and finger-to-nose test.

During June and July 1999, a pilot of the tests was conducted by the TRL (Tunbridge *et al.*, 2000). In this pilot study, police officers from six forces, who received training in how to recognise the signs of drug use (Drug Recognition Training – DRT) and FIT, applied this training in their day-to-day policing over the two-month period. The results showed that the combination of DRT/FIT offered considerable promise as a means of identifying drug use and drug-related impairment at the roadside. A follow-up one-year pilot study of FIT carried out in Scotland led to nationwide implementation of the test.

Up until 2003, drivers had to be requested to participate in FIT. However, the Railways and Transport Safety Act 2003 gave British police officers the power to require “a person to co-operate with any one or more preliminary tests administered to the person by that constable or another constable” (Railways and Transport Safety Act, 2003). The term ‘preliminary test’ covers preliminary breath tests, preliminary impairment tests and preliminary drug tests.

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30 The SFST was originally designed to detect alcohol intoxication and usually consists of the walk-and-turn test, the one-leg-stand test and Horizontal Gaze Nystagmus (HGN) – a test particularly sensitive to alcohol impairment.

## 6.2 Structure of this chapter

The remainder of this chapter is divided into three sections. The first section considers the current status of FIT in the UK and assesses what data are available that would enable a proper evaluation of the practical application of FIT by police officers in the UK. This section also discusses procedural and implementation issues that have been raised regarding FIT – in particular, the problems caused by the delay between FIT being administered and a police surgeon/FME attending to examine the suspect.

The second section considers research that has assessed the effectiveness of FIT as a roadside test of impairment, as administered by traffic enforcement officers. While a number of evaluation studies of SFST have been conducted (principally in the USA and Canada), much of this research has focused on the power of SFST to identify alcohol-related impairment. In addition, differences among jurisdictions in terms of the police procedures employed when administering the FIT or SFST mean that such research is of limited relevance to the UK. Consequently, this section focuses on UK-specific research that has considered the use of FIT in practice.

It is also informative to consider the extent to which FIT and SFST are capable of detecting impairment related to specific drug groups. While there is limited research in this area, a small number of studies have explored the issue. Consequently, the third section reviews these studies and considers which aspects of the FIT are most useful in this regard.

## 6.3 Current status of FIT in the UK

According to the Railways and Transport Safety Act 2003, a Preliminary Impairment Test is a procedure whereby the constable administering the test:

- a) observes the person to whom the test is administered in his performance of tasks specified by the constable, and
- b) makes such other observations of the person's physical state as the constable thinks expedient.

(Railways and Transport Safety Act, 2003, section 6b)

A Preliminary Impairment Test may be a test of any type provided that it meets the requirements and objectives of the Act and is administered in accordance with a Code of Practice issued by the Secretary of State for Transport for the purpose. The DfT Code of Practice for Preliminary Impairment Tests (2004) refers specifically to the use of pupillary examinations and Field Impairment Tests together as a Preliminary Impairment Test (PIT). To avoid confusion, the remainder of this report will use the term FIT, rather than PIT, to describe the battery of tests conducted to assess whether a driver is unfit to drive because of drugs.



In August 2000 the ACPO (Road Policing) Committee made DRT available for all forces. Subsequently, the National Drug Drive Instructor training for FIT and Drug Influence Recognition (DIR) was developed on behalf of ACPO and the DfT. Appendix 4 provides a summary of the topics covered by the National Drug Drive Training (Field Impairment Testing and Drug Influence Recognition programme).

In order to gain an understanding of the effectiveness of FIT as a Preliminary Impairment Test (PIT), it would be necessary to have answers to the following questions:

1. How many police officers in each police force and across the UK have been trained to conduct FIT?
2. Of these FIT-trained officers, how many have actually conducted FIT, and how many are actively using FIT?
3. How many FITs are conducted each year by each police force, and thus, how many FITs are conducted annually across the UK?
4. What is the breakdown of results of FIT?
  - a) How many drivers undertaking FIT are subsequently arrested on suspicion of being impaired by drugs?
  - b) How many drivers initially suspected of being impaired by drugs are released without charge following completion of FIT?
  - c) What proportion of drivers suspected of being impaired by drugs as a result of their performance of FIT (and other observations) and whom the FME considers may have a condition caused by alcohol or a drug, are subsequently found not to have any drugs in their system?
  - d) What proportion of drivers suspected of being impaired by drugs as a result of their performance of FIT (and other observations) are subsequently considered by the FME not to have a condition caused by alcohol or a drug, resulting in them being released without charge?

During the course of our investigations we approached the Home Office, DfT, ACPO and the Ministry of Justice for information that would help answer these questions. These discussions have identified the following sources of data.

### **6.3.1 *Number of officers trained as instructor trainers***

DfT records show that since June 2005, approximately 200 police officers have been approved as instructor trainers (i.e. approved to train other officers in FIT). However, these certificates do not expire and the instructor trainers do not have to undergo any refresher training. Consequently, there is no information available on how many of these instructor trainers are active, or how many officers each instructor trainer has trained.



### 6.3.2 Number of FITs conducted

While annual data are not collected, ACPO statistics on the Christmas 2009 drink drive campaign (ACPO, 2010) show that, between 1 December 2009 and 1 January 2010, the 43 police forces in England and Wales administered 223,423 breath tests. This was a 22% increase on the number administered during the Christmas 2008 campaign. Over 7,600 (4%) of these tests were positive, failed or refused, resulting in the arrest of the driver. In contrast, during the same campaign (Christmas 2009), a total of just 489 FITs were conducted (up from 481 in 2008) of which 18% ( $n = 87$ ) resulted in a section 4 arrest. These data are clearly not representative of normal policing activities throughout the whole of the year. However, it is informative to see how few FITs were conducted, and how many of these resulted in arrest, compared with the number of breath tests administered and the small proportion found to be positive.

### 6.3.3 Drug driving offences and outcomes

The Ministry of Justice releases annual statistics on the number of proceedings and convictions for driving-related offences in Magistrates' courts (MoJ, 2008). Table 6.1 summarises drug and drink driving related offences for 2007 and 2008. The

**Table 6.1: Proceedings from magistrates' courts by offence type and outcome, England and Wales (Source: [collated from] MoJ, 2008)**

Driving offence type		2007	2008	Change (%)
<b>Drink<sup>1</sup></b>	Proceedings	81,578	73,223	-10
	Findings of guilt	76,693	69,493	-9
	% found guilty	94.0	94.9	+1
<b>Drugs<sup>2</sup></b>	Proceedings	646	253	-61
	Findings of guilt	412	168	-59
	% found guilty	63.8	66.4	+4
<b>Drink or drugs<sup>3</sup></b>	Proceedings	1,939	2,599	+34
	Findings of guilt	1014	1426	+41
	% found guilty	52.3	54.9	+5
<b>Failing to provide a specimen<sup>4</sup></b>	Proceedings	12,873	10,981	-15
	Findings of guilt	10,438	9,134	-12
	% found guilty	81.1	83.2	+3

1. Drink driving offences include: Unfit to drive through drink (impairment), Driving with alcohol in the blood above the prescribed limit, In charge of stolen vehicle while unfit through drink (impairment), In charge of motor vehicle with alcohol in the blood above the prescribed limit.
2. Drug driving offences include: Unfit to drive through drugs (impairment), In charge of stolen vehicle while unfit through drugs (impairment).
3. Drink or drugs offences include: Causing death by careless driving under influence of drink or drugs, Unfit to drive through drink or drugs (impairment), In charge of motor vehicle while unfit through drink or drugs (impairment).
4. Failing to provide a specimen offences include: Driving and failing to provide specimen for analysis (breath, blood or urine), In charge of motor vehicle and failing to provide specimen for analysis (breath, blood or urine), Failing to provide specimen for initial breath test, Failing to allow specimens of blood to be subjected to laboratory test.

table highlights the change in the number of proceedings and proportion of cases resulting in a conviction across the two years. There were significantly fewer drugs-related proceedings compared with drink-related offences, and the number of drug-related offence proceedings fell substantially in 2008. Furthermore, drink-related offences were more likely to have resulted in a guilty charge compared with drug-related offences.

## 6.4 Issues surrounding the implementation of FIT in the UK

A recent paper (Officer, 2009) offers some insights into reasons why so few FITs are conducted, even during a campaign focusing on driver impairment. Officer (2009) compared drug drive cases submitted for analysis to the Scottish Police Services Authority in three time periods (1996–2000, 2003 and 2008). Although the focus of the report was the differences in drug driving prevalence across the 12 years of the study, the author comments that, following the original introduction of FIT in Scotland, there was an increase in the number of section 4 cases being submitted for analysis, but *“the number of FIT tests being carried out has dropped and arrests have tailed off. Discussions with the Police revealed that many Police Officers lack the confidence to carry out the tests and a lack of regular training may be partly to blame.”* (Officer, 2009 p.238)

These comments were echoed by those we spoke to during our investigations. According to one Head of Roads Policing, in his force there are so few drug driving cases that even those who are trained to conduct FIT rarely have occasion to do so and thus lose confidence in conducting FIT adequately.<sup>31</sup> He added that this lack of confidence extends through to all the procedures that follow, such as filling out paperwork and requesting samples.

Despite the lack of data held centrally, it is evident that some data should be available at each individual force. The Road Traffic Act 1988, as amended by the Railways and Transport Safety Act 2003, required the Secretary of State for Transport to issue a Code of Practice, in respect of Preliminary Impairment Tests. Section 3.4 of the Code of Practice (DfT, 2004) states:

*“Chief Officers will keep a record of officers trained and the date of Approval and should issue to each officer a certificate of approval.”*

Hence, each individual force should at the very least keep a record of officers who have been trained to conduct FIT/PITs. Unfortunately, there is no requirement to provide this information to any external authority, and so none of the authorities contacted were able to provide a figure for the number of officers trained to conduct

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31 Analysis of the submissions to FSS/LGC for 2008 revealed that this force had at least 70 cases of drug driving in that year.

FIT. Nevertheless, it should be possible to establish the total number of UK police officers trained to administer FIT, by making contact with each Chief Officer and asking them to provide this information. It might also be possible, through the same routes, to ascertain how many of these officers are currently active.

There is also no requirement for police forces to keep a record of the number of FITs administered by each individual FIT-trained officer, or by the force as a whole, and so again none of the authorities contacted was able to provide this information. Consequently, it may be more difficult to establish how many officers are actively using FIT, how many have done so in the last 12 months, how many FITs they have administered, and what the results were.

Clearly this lack of data is a major impediment to gaining an understanding of the effectiveness of the FIT in practice. However, discussions with the FSS have revealed other potential sources of information. First, in the event that a FIT is administered after a driver has passed a breath test, the fact that the FIT was administered should be recorded on the form used for recording details of the breath test. However, these data are not collated either at the local or national level. Second, where a FIT has been conducted and a sample has been sent for forensic analysis, this sample should be accompanied by a copy of the MG DD/F form completed by the police officer administering the FIT. This form would be a very valuable source of data, as it would enable the driver's performance on each element of FIT to be compared with the results of the toxicological analysis. It would also include cases where a driver was considered impaired by a drug as a result of his/her performance of FIT, but who subsequently tested negative for drugs.

Our discussions with the FSS and LGC revealed that the extent to which this procedure (i.e. MG DD/F form sent with sample) is adhered to varies considerably. Moreover, at present, these data are not collated in a database – the results are sent to the force concerned and the data (including the MG DD/F form, if available) are kept in the file pertaining to the case. Consequently, it would be necessary to go through each file manually to collect the data. With c.3,000 drug drive cases being submitted (to FSS and the LGC combined) for analysis each year, this would clearly be a time consuming and potentially costly task. However, the data provided by such an exercise would have the potential to inform not only our understanding of the effectiveness of FIT, but also the prevalence of drug driving and the types of drugs being used by drivers. For these reasons the benefits might justify the costs.

Of course, while these data would be very valuable, they provide no information on cases where the arresting officer's judgement of the driver's performance of FIT did not concur with the FME's assessment and, as a result, the driver was released. This difference in opinion has been attributed to the time delay between the officer administering the tests at the roadside and an FME attending to examine the driver. As a result of such delays, a driver who was considered to be impaired at the

roadside may be considered not to have a drug-related condition by an FME examining him or her some time later.

It is interesting to compare the different solutions that have been proposed to address this problem. In an interview that appeared in *Policing Review* in August 2009, ACPO Lead for Roads Policing, Chief Constable Giannasi, commented:

*“...there will always be a need to prove impairment. While the scientists seek a technological solution, we are in discussions with government to seek changes in legislation to make the existing process more effective. So we are asking for the law to be changed to remove the medical practitioner from the evidential chain because that builds in delay.”*

Police Federation Roads Policing Review, Volume 4, August 2009, p.3

In his evidence to a Scottish Parliament hearing on drug driving (2001), Chief Inspector Paul Fleming, one of the two Strathclyde police officers who introduced Field Impairment Testing into Scotland in the late 1990s, also highlighted the problem caused by delays between the initial assessment and the police surgeon's examination:

*“A lot of the time individuals are not found to be impaired by the police surgeon,<sup>32</sup> but they quite evidently were impaired at the roadside.”*

Official Report of the **Scottish Parliament Justice 2 Committee**,  
28 March 2001, Drugs and Driving (Column 85)

However, rather than remove the police surgeon from the process, Chief Inspector Fleming argued that the police surgeon is an integral part of the system:

*“When I was in America, I found that the police surgeon had been excluded from the process. Specially trained police officers known as drug recognition experts conduct a medical examination as well as the tests that have been described. We do not suggest that the police surgeon should be removed from the process, because if the impairment is not drug-induced—if it is due to illness or injury, for example—we are looking for the police surgeon to identify its cause.”*

Official Report of the **Scottish Parliament Justice 2 Committee**.  
28 March 2001, Drugs and Driving (Column 85)

It is clear that the delays caused by waiting for a police surgeon to attend the police station may result in the individual no longer displaying a condition caused by a drug. However, as Chief Inspector Fleming pointed out, there are other reasons for

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32 Of course, the role of the police surgeon is not to give a view as to whether the individual is *impaired*, but to certify that a condition that may be due to alcohol or drugs is present.

having the police surgeon attend, not least of all to ensure the health and safety of the individual in custody.

A related problem, specific to drugs with a short half-life, was highlighted by Officer (2009):

*“It is widely recognised that the half-life for GHB in blood is extremely short at 0.3–1 h and it is suspected that the delay in processing the suspect and obtaining the relevant blood or urine sample may be sufficient for any GHB present to reduce to a concentration below our limit of detection.”*

Officer (2009) reports that one suggestion that has been proposed to address this issue is for a blood sample to be obtained by a nurse prior to the police surgeon’s arrival. However, this would require a change to the current administrative procedures/legislation. as currently a blood/urine sample can only be required where:

- a) the suspect is in hospital; or
- b) a screening test has been taken and this shows a positive result; or
- c) the FME confirms that the individual has a condition that may be due to a drug.

This proposed approach mirrors the system currently in operation in Victoria, Australia, whereby if a police officer witnesses poor driving (or an accident) and suspects that the driver is impaired, he/she may stop the driver and perform a FIT, then (without requiring confirmation of impairment from a medical practitioner) request that a technician takes blood, which is then sent for confirmatory analysis.

An alternative solution would be to remove the need to prove impairment, and to follow the zero tolerance approach taken by a number of other countries in Europe. This option is discussed in more detail elsewhere in this report.

## **6.5 The effectiveness of FIT as a roadside test of impairment – UK research**

In the absence of current data on the practical implementation of FIT, it is informative to revisit the evaluation of FIT conducted between 2001 and 2003 by the University of Glasgow (Oliver *et al.*, 2006). In addition to monitoring the effectiveness of FIT, the project aimed to quantify police officers’ ability to identify impaired drivers and to validate the use of FIT in the UK. This was achieved by requesting biological samples from all drivers who were asked to take FIT, regardless of whether they were considered impaired following their performance of FIT and/or were considered by an FME to have a condition that may be due to a drug. These samples were then analysed for the presence of drugs. Oliver *et al.* used

the presence of a drug to assess the efficacy of FIT in identifying impairment.<sup>33</sup> As such, the study provides valuable data that directly address some of the questions listed at the start of this chapter (specifically, questions 4a–d).

From a total of 977 cases where FIT was administered and a completed form received, 40% of drivers ( $n = 386$ ) were judged to be impaired at the roadside; 60% ( $n = 591$ ) were judged not to be impaired. In 77% of cases where the driver was judged to be impaired as a result of their performance of FIT, the FME confirmed that the driver's condition might be due to a drug. Toxicological analysis was completed for 194 cases where the police officer's opinion agreed with that of the FME and, for these, 94% ( $n = 182$ ) were drug positive.

While these figures appear to offer strong support for the value of FIT as a procedure for identifying impairment at the roadside, concerns were expressed regarding the negative predictive value of FIT: of those judged not to be impaired by the police officer, only 29% were found to be drug-free. Of course, these cases are not necessarily false negatives: the police officer was assessing the condition of the driver at the roadside, not whether the driver had drugs in their system. It is quite possible that the driver did not display impairment at the time of examination, despite drugs remaining detectable in the driver's sample.

Figure 6.1, reproduced from the original report by Oliver *et al.* (2006), shows the breakdown of biological samples taken for analysis. In summary, of the 337 samples analysed,<sup>34</sup> 64% of drug-positive cases were identified as impaired at the roadside. Seventy-four per cent of all drug-negative cases were judged not to be impaired at the roadside.

The report concludes that FIT is an effective screening tool but that “further development and testing of FIT would be advantageous to improve the specificity and negative predictive value of the overall battery of tests” (Oliver *et al.* 2006, p.30). Two elements of the test (the ‘walk-and-turn’ and ‘one-leg-stand’ tests) were singled out as demonstrating high levels of accuracy (>80%) in terms of identifying impairment. In contrast, the authors concluded that the pupillary examination in its current form displayed poor accuracy, adding little to the overall predictive value of FIT. Finally, the authors comment that the high incidence of drug positive cases judged to be unimpaired by the officer conducting FIT might suggest a training issue.

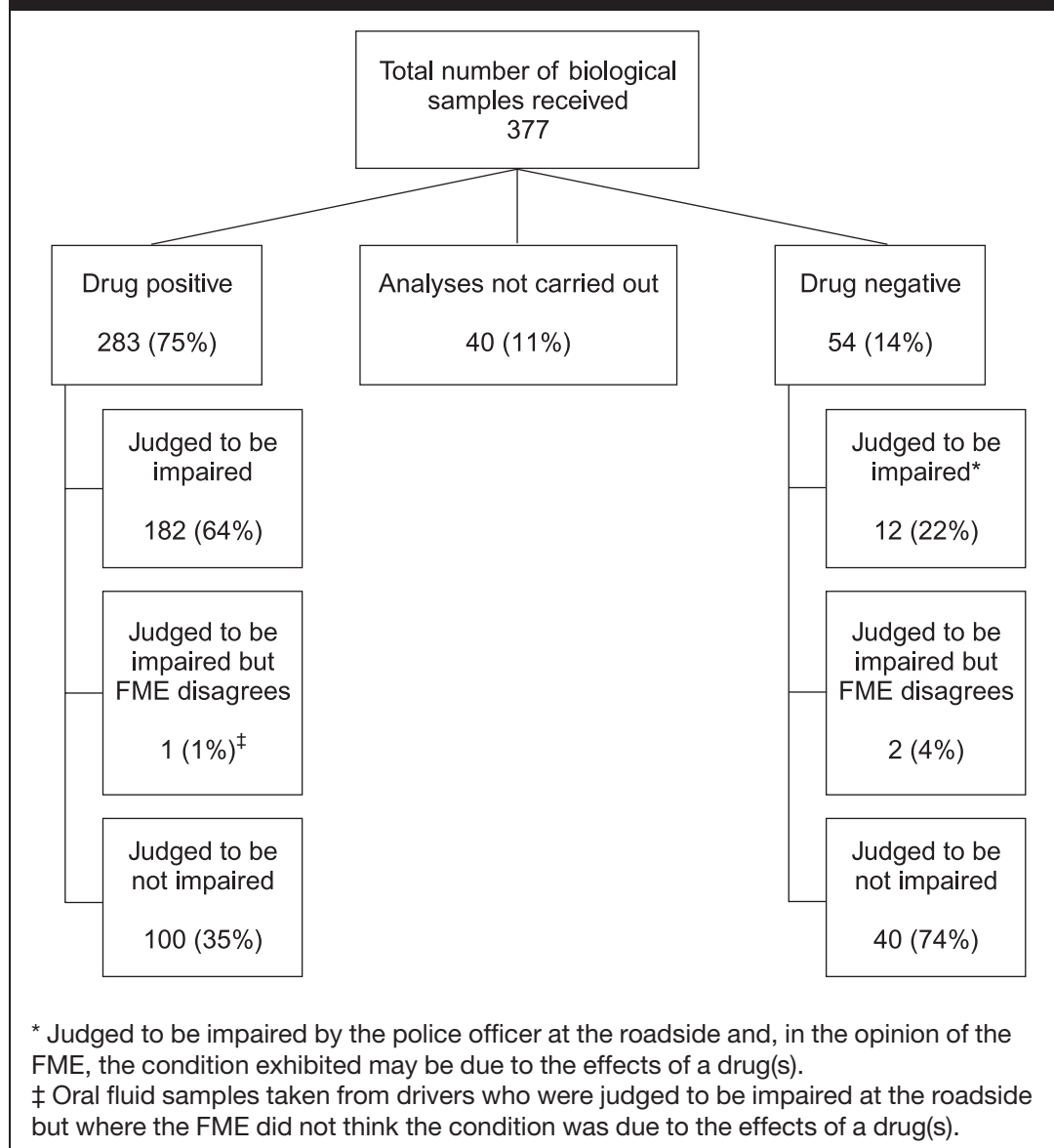
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33 Presence of a drug does not mean that the driver was impaired, *per se*, but higher levels of a drug would suggest impairment.

34 This figure consists of 194 cases where the FME's opinion that the driver's condition might be due to a drug agreed with the police officer's opinion of impairment, plus 140 cases where the driver was not considered to be impaired at the roadside, plus three cases in which the FME disagreed with the roadside judgement



**Figure 6.1: Breakdown of biological samples received for analyses (Source: Oliver *et al.*, 2006)**



## 6.6 The effectiveness of FIT as a means of detecting impairment due to specific drugs

A small number of studies conducted around the world have considered the ability of FIT (or more typically, the Standardised Field Sobriety Test (SFST) from which the UK FIT was derived) to detect impairment resulting from use of specific drugs. These studies have identified elements of the SFST that are most effective in detecting impairment and also highlight issues related to the ability of SFST/FIT to detect impairment in drivers who may be impaired by specific substances. As these issues may inform our understanding of the performance of FIT in practice, the results of these studies are summarised below.

### 6.6.1 Cannabis

Papafotiou *et al.* (2005) have investigated the sensitivity of SFSTs to detect impairment resulting from marijuana intoxication. The study involved 40 participants consuming cigarettes containing either 0% THC (placebo); 1.74% THC (low dose) or 2.93% THC (high dose). They then performed the SFST 5 minutes (Time 1), 55 minutes (Time 2) and 105 minutes (Time 3) after smoking. Results showed a positive relationship between THC dose and the number of participants whose performance on the SFSTs resulted in them being classified as impaired.

One of the key points arising from this study was that the predictive value of the SFST was improved by adding a count of 'Head Movements or Jerks' to the HGN test. (Neither of these is included in the UK FIT.)

### 6.6.2 Cannabis with and without alcohol

As part of a driving simulator study looking at the effects on driving performance of consuming cannabis alone and in combination with alcohol, Papafotiou *et al.* (2007) administered the SFST battery to measure impairment and to predict driving performance (sample size = 80; 39 females, 41 males). Papafotiou *et al.* concluded that the SFSTs were effective in predicting driving performance and the impairment resulting from consumption of cannabis and alcohol. Of the battery of tests administered, more errors were observed during the One Leg Stand test the higher the dose of THC administered. The authors concluded that the SFSTs are reliable tests of impairment, producing accurate and replicable scores on the SFSTs. As with the Papafotiou *et al.* (2005) study, the battery of tests included the HGN test, which the authors concluded was improved when 'Head Movements/Jerks' were scored.

### 6.6.3 Amphetamines

The potential of SFSTs to detect impairment resulting from amphetamine use has been explored by Silber *et al.* (2005) in a study involving 20 healthy volunteers, each given low levels of amphetamine and subsequently tested on a battery of SFSTs. The battery of tests consisted of the HGN test, the Walk and Turn test, and the One Leg Stand test. Performance on the SFSTs was not impaired when participants were tested 120 minutes and 170 minutes post drug administration. The presence of dexamphetamine was identified in 5% of cases, d-methamphetamine in 5%, and d,l-methamphetamine in 0% of cases. The authors conclude that, under these conditions, this battery of SFSTs is not a sensitive measure for detecting low levels of amphetamine (at least 2 hours post-consumption). In a separate paper, Papafotiou *et al.* (2007), summarising the results of a series of studies conducted by the same team, reported that, in many cases, performance on the SFSTs was better under the influence of amphetamines compared with no drug (placebo). However, it is important to note that the SFSTs were administered between 2 and 3 hours after



drug administration; it is possible that the sensitivity of the SFSTs would have been improved had they been conducted sooner after the drugs were administered.

#### 6.6.4 Ketamine

In Hong Kong, a popular drug of abuse is ketamine, which the authorities have recognised as having a potential impact on road safety. However, none of the roadside testing devices available for screening of illicit drugs is capable of detecting ketamine. Consequently, Cheng *et al.* (2007) conducted a study to assess the ability of FIT to detect impairment resulting from ketamine use. The research consisted of inviting volunteers ( $n = 62$ ) exiting from discos to participate in a battery of field impairment tests including: measurement of vital signs (body temperature, blood pressure and pulse rate); eye examinations (checking pupil size, lack of convergence (LOC) and HGN); and four divided attention tasks, all of which are used in the UK FIT test (Romberg, One Leg Stand, Finger to Nose and Walk and Turn tests).

In addition, all participants were requested to provide oral fluid and urine samples. The oral fluid samples of 39 of the volunteers tested positive for ketamine: 21 for ketamine only and 18 for ketamine plus one or more other drugs, including methamphetamine, MDMA, benzodiazepines and THC. Fifteen of the ketamine-only users (71%) were identified by FIT, with a 90% detection rate in those who had salivary concentrations above 300 ng/ml. Analysis showed that the most effective elements of FIT in terms of identifying impairment due to ketamine were the LOC, HGN and poor performance on the Walk and Turn and One Leg Stand.

### 6.7 Discussion

#### 6.7.1 Evidence gaps

There is currently a lack of data regarding the extent to which FITs are used by UK police officers. Indeed, no data are available on the number of officers who are trained to administer FIT and who are actively doing so. In the absence of these data, it is difficult to draw any conclusions regarding the effectiveness of FIT at helping the officer to make a judgement of a driver's impairment. However, according to the Code of Practice for PITs, each force should keep a record of the number of officers trained to conduct FIT and so it should be possible to collect data on the number of these officers in the UK. In the first instance, it is recommended that all forces are approached to provide these data, so that a comprehensive picture can be built of the number of FIT-trained officers within each force.

In order to ascertain whether PITs are *effective*, it would be necessary to collect data on a regular basis, similar to that presented in the ACPO Christmas drink drive statistics, showing the number of FITs conducted, and what proportion of these resulted in a section 4 arrest.

Another potential source of data is the forms that are sent along with blood/urine samples submitted for forensic analysis. A copy of the form completed by the police officer at the roadside when administering the PIT (MG DD/F) should be sent with the sample and other documentation. While it is unlikely that all the data contained on the MG DD/F are stored electronically, details of the PIT should be held on the case file compiled by the laboratory and so these could feasibly be analysed and the data collated.

### 6.7.2 *Previous research*

Previous research has established that FITs are a useful screening tool for police officers to use when faced with a driver that they suspect of being impaired due to drugs. The tests enable the officer to interact with the driver at close quarters, as a result of which they are able to observe the driver's manner and demeanour, their speech and appearance. Together with the officer's prior observations of the individual's driving (and other behaviour), the tests provide additional evidence that helps the officer to make a decision as to whether the driver may be impaired by drugs. While it is clear that certain aspects of the FIT procedures could be improved, in the absence of a type-approved roadside screening device, the tests are a valuable addition to the evidence gathering process. As Chief Inspector Fleming commented in 2001:

*"Roadside testing is a way of better articulating the evidence to the court, so that the court can make up its mind based on all the circumstances. It is a way of enhancing the procedure, not changing it."*

Official Report of the **Scottish Parliament Justice 2 Committee**  
28 March 2001, Drugs and Driving (Column 85)

### 6.7.3 *Potential of FIT to detect impairment due to specific drugs*

Research has also considered whether the FIT (or more typically the US version – the SFST) is effective at detecting impairment due to specific drugs. This research suggests that FIT is not a sensitive measure for detecting amphetamine, at least in low doses. However, positive results were found for cannabis (alone and in combination with alcohol) and also for ketamine. These findings highlight an important benefit of FIT that should not be overlooked: the dynamic nature of drug culture means that, until a screening device is available that is capable of detecting all drugs, drug screening devices are likely to be at least one step behind current trends. This is evident in the case of drugs such as ketamine, for which (to the best of our knowledge) there is no roadside screening device available. Similarly, no roadside screening test yet exists for drugs formally known as legal highs (e.g. synthetic cannabinoids, mephedrone, BZP). In these cases, a well conducted FIT could help the officer to identify impairment and pinpoint the broad group of drugs that might account for that impairment, thus helping to direct any subsequent toxicological analysis.

#### 6.7.4 *Recent developments*

The recent appearance of legal highs and the ability of underground chemists to develop a seemingly endless stream of new compounds highlights the potential value of FIT, particularly when used in combination with DRT. As yet, notwithstanding the fact that roadside drug screening tests are not approved for use in the UK, such devices are incapable of detecting drugs other than the most common drugs of abuse. The combination of DRT/FIT applied at the roadside, however, gives the officer the ability to detect drug-related impairment and provides an indication of the broad class of drugs that might account for the impairment. Drug Influence Recognition training already covers these broad classes, and it would be relatively straightforward to add references to the various legal highs in the relevant sections.

Currently there is no requirement for officers trained in DRT/FIT to undergo any form of refresher training to keep them current. However, the rapid and widespread appearance of drugs such as mephedrone, BZP and other drugs formally referred to as legal highs has highlighted the importance of keeping these officers abreast of latest trends and developments. It is therefore recommended that regular refresher training should be a requirement for all FIT-trained officers and instructor trainers.

## 7 THE IMPACT OF ‘LEGAL HIGHS’ ON ROAD SAFETY/DRIVER IMPAIRMENT

### 7.1 Background – what are ‘legal highs’?

The use of the term ‘legal highs’ in this report refers to a group of relatively new drugs that have increased in popularity over the past two years throughout the UK and across Europe. This chapter will focus on the following ‘legal highs’:

- **Mephedrone** – a stimulant from the cathinone family;
- **GBL** – a depressant that converts to GHB in the body;
- **BZP** – a stimulant from the piperazine family;
- **Synthetic cannabinoids** – chemicals sprayed onto herbal smoking mixtures (e.g. ‘Spice’) with effects similar to cannabis.

On 23 December 2009, following advice from the ACMD, the Home Office declared many of these new drugs (e.g. GBL, BZP, synthetic cannabinoids) *illegal* under the Misuse of Drugs Act 1971 because of the threat they pose to individual health and to society. However, mephedrone was not included in this latest legislation and is thus currently the only truly ‘legal’ high of this group. Mephedrone and its relative compounds are currently under investigation by the ACMD, who will shortly advise the Home Office of any necessary changes to the current control of this drug.<sup>35</sup>

### 7.2 Structure of the chapter

This chapter addresses what is currently known about legal highs and considers their potential impact on road safety. First, what little information there is on the likely prevalence of these drugs in the general population is summarised. The chapter then considers what is known about the effects of the different legal high drugs and provides an informed assessment of how these effects may impact on road safety. The primary sources used to address this question include: reports from the ACMD, EMCDDA, Home Office, DrugScope, LTG (formerly the London Toxicology Group), Lifeline, journal articles and media reports, together with the results of discussions with toxicologists and others working in the field.

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35 Update: Following the completion of the parliamentary process mephedrone and other cathinone derivatives became illegal as Class B drugs under the Misuse of Drugs Act 1971, with effect from 16 April 2010.

### 7.3 What is known about the prevalence of legal highs?

At present, very few data are available to establish the prevalence of legal highs in the UK. According to media reports, which are largely based on anecdotal interviews, use is widespread throughout the country. In the case of mephedrone, reports of use range from school children as young as 12<sup>36</sup> to a 49-year-old woman in Scotland who died having taken the drug.<sup>37</sup> This age range was also echoed by mephedrone users in Middlesbrough who were interviewed as part of a focus group study on the drug. The consensus from the group, which had an age range of 18 to over 50, was that “everyone is doing it” (Newcombe, 2009, p. 7).

Recently the National Addiction Centre conducted a survey on drug use through clubbing magazine *Mixmag* (*Mixmag*, 2010). This survey is the first controlled study, to our knowledge, to include questions on the use of legal highs. Of 2,200 readers who completed the survey, 59% had tried a legal high of some kind and 38% had tried some form of legal high party pill. The survey’s definition of legal highs extended to include all substances currently not listed in the Misuse of Drugs Act 1971. Interestingly, the most popular legal high was nitrous oxide (59%), which is not, to our knowledge, currently under review for reclassification. Use of mephedrone was reported by 42% of respondents (11% had used a similar drug, methylone). One in four respondents (26%) had used BZP, 13% had used synthetic cannabinoids such as Spice, while only 6% had tried GBL. Salvia (*Salvia divinorum*, a psychoactive plant that can produce dissociative effects) appeared to be a more popular alternative to Spice, with 29% of readers having used it.

Table 7.1 summarises the percentage of respondents who reported trying legal drugs: a) ever, and b) in the last month. These percentages are displayed in

Table 7.1: Frequency of drug use ever and in the last month, focusing on legal highs <sup>38</sup> (Source: <i>Mixmag</i> , February 2010)		
Drug	Used ever (%)	Used in last month (%)
Cannabis	93	54
Ecstasy	91	48
Cocaine	87	47
Mephedrone	42	34
Methylone	11	8
Poppers	69	15
Salvia	29	3
Spice/Magic	13	2
2CB	18	4
2CI	11	1
GBL	6	2

36 <http://www.tes.co.uk/article.aspx?storycode=6033909> (accessed 14 December 2009)

37 <http://www.heraldsotland.com/news/health/doctors-call-for-ban-on-legal-high-after-woman-dies-1.1002660> (accessed 14 December 2009)

38 BZP was not listed in the graph from which these data were sourced.

comparison with results for the three most commonly used illicit drugs: cannabis, ecstasy and cocaine. The list includes legal substances that are not formally referred to under the popular definition of ‘legal highs’, such as poppers (alkyl nitrites), salvia, steroids, 2CB and 2CI. As mentioned previously, these drugs will not be covered in this chapter.

When compared to both legal highs and traditional illicit drugs, mephedrone was the eleventh most common drug in terms of lifetime use, and the fourth most popular drug used in the last month (34%). A further 15% of respondents said they took the drug at least weekly.

The respondent demographic to this survey was obviously predisposed to the dance scene and drug culture, therefore these figures are not representative of the general population. However, they do highlight the rapid increase in popularity of these drugs, especially mephedrone.

### 7.3.1 *Why the rapid increase in prevalence?*

There are concerns that the recent media coverage of legal highs (especially mephedrone, as it is yet to be controlled) has inadvertently increased the awareness of the availability of these drugs and thus increased consumer interest and demand. For example, headlines such as:

*“Mephedrone menace: The deadly drug that’s cheap, as easy to order as pizza. . . and totally legal”*<sup>39</sup>

*“Sales of legal drugs that mimic cocaine skyrocket”*<sup>40</sup>

*“Clubbers are ‘turning to new legal high mephedrone’”*<sup>41</sup> and

*“Is Meow Meow the new Ecstasy?”*<sup>42</sup>

are, to an extent, self-fulfilling prophecies, each advertising how easy it is to obtain the drug and that it is legal. It is no wonder that, one month after effectively providing free marketing for the drug, an article then reports a ‘skyrocket’ in sales.

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39 <http://www.dailymail.co.uk/news/article-1231538/Mephedrone-menace-The-deadly-drug-thats-cheap-easy-order-pizza-totally-legal.html> Published 12 December 2009; accessed 14 December 2009

40 <http://www.irishexaminer.com/ireland/sales-of-legal-drugs-that-mimic-cocaine-skyrocket-109428.html> Published 11 January 2010; accessed 12 January 2010

41 [http://news.bbc.co.uk/newsbeat/hi/health/newsid\\_10000000/newsid\\_10004300/10004366.stm](http://news.bbc.co.uk/newsbeat/hi/health/newsid_10000000/newsid_10004300/10004366.stm) Published 13 January 2010; accessed 14 January 2010

42 [http://www.timesonline.co.uk/tol/life\\_and\\_style/health/expert\\_advice/article6989754.ece](http://www.timesonline.co.uk/tol/life_and_style/health/expert_advice/article6989754.ece) Published 18 January 2010; accessed 19 January 2010

In support of this, most respondents from the focus group on mephedrone said they had become aware of the drug through coverage in the mass media (Newcombe, 2009).

A similar media effect was observed in Germany in 2008. A television news story that ‘warned’ of a drug that provided the high of marijuana but couldn’t be detected in standard drug tests resulted in an exponential spread of synthetic cannabinoids use (‘Spice’) throughout the country (Piggee, 2009).

## **7.4 What is known about the effects of ‘legal highs’ and their impact on road safety?**

Compared with established illicit drugs such as MDMA (ecstasy), cannabis and cocaine, very little is currently known about the effects of these drugs, as they are relatively new to the market and production is not regulated. However, preliminary research has recently been conducted by the EMCDDA and ACMD in order to inform the Home Office as to what health risks they pose. The results of this early research are summarised below, highlighting the psychoactive and physiological effects of each drug.

To date, to the best of our knowledge, there has been no research to directly assess the impact of these drugs on driving ability and road safety. However, from the current understanding of their effects – which in many cases are similar to known drugs such as MDMA and cannabis – we have extrapolated the limited findings to make educated predictions as to what risks they might pose.

### **7.4.1 Mephedrone (4-methylmethcathinone, M-CAT, methylone, methadrone)**

#### **7.4.1.1 Pharmacological description and effects**

Mephedrone is part of the cathinone family, a group of stimulants based on the pharmacologically active compound extracted from khat (or qat) leaves (although mephedrone itself is synthetic). Cathinone and methcathinone are already controlled under the Misuse of Drugs Act 1971. The majority of information currently available on mephedrone is sourced from either drug information sites (DrugScope, Lifeline, Talk to FRANK), media reports or drug user forums, as neither the ACMD nor EMCDDA have yet issued official reports on this substance.

User reports claim the effects of mephedrone to be similar to ecstasy (MDMA) and other stimulants such as amphetamines and cocaine (Newcombe, 2009). Typically, effects such as euphoria, alertness, talkativeness and empathogenic feelings are reported (Home Office, 2009c; DrugScope, 2009; Newcombe, 2009). Negative side-effects include anxiety, paranoia, tachycardia and fits (Home Office, 2009c). There have also been several reports and observations of blurred vision, hot flushes,



involuntary clenching of muscles, nausea, vomiting, and a blue tinge to the skin, particularly in the extremities and joints (DrugScope, 2009). Medical specialists have voiced concerns over psychological dependence and compulsivity that may lead to excessive use (*Irish Examiner*, 2009; Home Office, 2009c).

#### **7.4.1.2 Impact on road safety**

As a result of its stimulant properties similar to amphetamines, and euphoric, empathogenic effects similar to ecstasy, the effects of the drug on driver performance are likely to be similar to effects caused by cocaine, amphetamines or methamphetamines. According to Maes *et al.* (1999), the negative effects of cocaine and amphetamines on driving ability may include increased risk-taking, loss of concentration and psychological impairment (hallucinations, altered reality). Visual impairment, which has the potential to affect driving ability, has also been reported: “it makes your eyes go fuzzy, it seems like tunnel vision”; “your eyes keep jumping from side to side” (Newcombe, 2009, p. 8).

### **7.4.2 Synthetic cannabinoids**

#### **7.4.2.1 Pharmacological description and effects**

Synthetic cannabinoids encompass a large group of synthetic cannabinoid receptor agonists, which mimic the psychoactivity of tetrahydrocannabinol (THC), the active compound in cannabis. However, these synthetic compounds have been found to be more potent than THC and thus are generally used in smaller doses. Synthetic cannabinoids are typically sprayed on a herbal mix (cannabis and tobacco-free) and sold as incense (e.g. Spice), but with the intention of smoking to experience cannabis-like effects (EMCDDA, 2009c; EMCDDA, 2009e; ACMD, 2009a).

In terms of the potential health effects, very little is known about the effects of these various synthetic compounds on humans. For example, the rate and products of metabolism and any related toxicity are yet to be studied (Auwärter, 2009). The ACMD has warned that assuming the effects are similar to cannabis may underestimate their danger. Furthermore, there are estimated to be hundreds of variations of compounds available, all of which may be used in varying combinations and different strengths from one batch of a particular commercial product to the next (Auwärter, 2009).

In extreme cases, there have been reports in Germany of users admitted to A&E with psychosis-like panic attacks and cardio-circulatory problems (Piggee, 2009). The ACMD has warned of the risk of overdose because of the potency of the synthetic compounds and the inconsistency in batch contents. According to the ACMD, if a full receptor agonist is developed, it may be life threatening (THC is only a partial agonist) (ACMD, 2009a).



#### 7.4.2.2 Impact on road safety

The general psychoactive effects of synthetic cannabinoids are thought to be similar to cannabis but more potent and with potentially worse side effects. Thus, studies on the effect of cannabis on driving are likely to address the minimum risk to road safety. The effects of cannabis on driving ability have been studied extensively and have consistently demonstrated that cannabis impairs psychomotor and cognitive performance in a dose-related manner. Specifically, cannabis affects highly automated skills such as tracking (Sexton *et al.*, 2000) and may have some effect on perception, vigilance and co-ordination (Maes *et al.*, 2009). However, drivers under the influence of marijuana retain insight into their performance and make attempts to compensate when possible by reducing task difficulty, for example by slowing down, not overtaking or by focusing their attention where a response is required (Robbe and O' Hanlon, 1993; Smiley *et al.*, 1999). It is not clear to what extent synthetic cannabinoids might exhibit a similar effect on driving performance and driver insight.

It also has to be borne in mind that the products containing synthetic cannabinoids are likely to be consumed in conjunction with alcohol. Research has consistently demonstrated that the effects of cannabis are significantly more impairing when combined with even moderate doses of alcohol significantly below the legal drink driving limit (e.g. Sexton *et al.*, 2002). Hence, while synthetic cannabinoids alone might be expected to have some impairing effect on driver performance, when consumed in conjunction with alcohol these effects are likely to be magnified.

#### 7.4.3 *Gamma-butyrolactone (GBL) and 1,4-butanediol (1,4-BD)*

##### 7.4.3.1 Pharmacological description and effects

Both GBL and 1,4-BD are precursor compounds that are converted to gamma-hydroxybutyrate (GHB, aka 'liquid ecstasy') in the body after ingestion. GHB has been controlled under the Misuse of Drugs Act 1971 as a Class C drug since 2003 because of its potential health risks, including unconsciousness, fatal intoxication and dependence in regular users (Home Office, 2009b).

The prevalence of GHB and GBL in the general population appears to be low compared with other illicit drugs and is more commonly associated with specific demographics such as the gay community (Home Office, 2009b; EMCDDA, 2008b). Despite this low prevalence, the health costs are high. The *Journal of the Royal Society of Medicine* recently reported (December 2009) the first fatality solely attributed to GBL toxicity.<sup>43</sup> Previously, the death of a 21-year-old woman in Brighton in April 2009 was also linked to the use of GBL but in combination with alcohol.

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43 <http://news.uk.msn.com/uk/articles.aspx?cp-documentid=151487359> (accessed 19 January 2009)

The effects of GHB/GBL range dramatically depending on the individual and the dosage because of a steep dose–response curve (Carter *et al.*, 2006; EMCDDA, 2008c). At low doses, effects can be similar to alcohol (e.g. relaxation, disinhibition). However, small increases in dose can then lead to serious effects, such as impaired consciousness and coma. When combined with alcohol or other psychoactive substances, the intensity of these toxic effects may further increase (EMCDDA, 2008b).

Users report feelings of euphoria, wellbeing and some stimulant-like effects. These effects generally occur 15 minutes after ingestion and can last approximately 3–4 hours. The most frequently reported negative effects described in surveys and online forums are nausea and vomiting, stomach pain and sudden collapse or slipping rapidly into deep, unrousable sleep. Other negative effects can include aggressive behaviour, ataxia, somnolence, bradycardia, hypothermia, random clonic movements, hallucinations, amnesia, respiratory depression and apnoea (EMCDDA, 2008b).

#### 7.4.3.2 Impact on road safety

Case study reports of drivers under the influence of GHB highlight the risk of impairment caused by GBL. One case study (Couper and Logan, 2004) provides an account of a driver arrested seven times over the course of eight months for DUID. In six of the seven cases, GHB was the only drug detected (blood concentration range 44 to 184 mg/l). Prior to arrest, the individual demonstrated obvious signs of driving impairment, including collisions, ignoring traffic signs and lane deviations. The driver's clinical symptoms were sometimes so poor that SFSTs could not be performed. Often, shortly after arrest, the subject would pass out into an unrousable sleep. It is this hypersomnolence and risk of sudden sleep onset that makes driving after taking GHB or its analogues extremely dangerous. In the UK, Elliott *et al.* (2009) reported a blood sample from a road fatality that tested positive to GHB (167 mg/l in ante-mortem serum). Furthermore, the National Addiction Centre Survey (Mixmag, 2009) found that 12% of respondents who had used GBL by itself have passed out; 14% had passed out having taken GBL in combination with alcohol.

#### 7.4.4 1-benzylpiperazine (BZP) and a selected group of substituted piperazines (mCPP, TFMPP)

##### 7.4.4.1 Pharmacological description and effects

BZP is a synthetic central nervous system (CNS) stimulant producing similar physiological effects to amphetamines and methamphetamines such as MDMA (ecstasy) (e.g. euphoria, wakefulness, increased vigilance) but is generally less potent (~10% of d-amphetamine) (ACMD, 2008; LTG, 2009a EMCDDA, 2008a; EMCDDA, 2009d; Karch, 2009). The EMCDDA recommended that BZP be

controlled through measures “appropriate to the relatively low risks of the substance” (EMDDA, 2008a, p. 1).

Although human studies of the use of BZP are limited, there have been user reports and hospital observations of side effects ranging from vomiting, stomach pains, nausea, headaches, anxiety, insomnia, mood swings and confusion (EMCDDA, 2008a) to increased blood pressure, palpitations, poor appetite, irritability and tremors (Home Office, 2009a; Karch, 2009) and hallucinations, paranoia and dystonia (LTG, 2009a). Some symptoms have been known to last up to 24 hours. A small number of cases have led to *grand mal* seizures. BZP has been detected in post-mortems but only in the presence of other substances, so its contribution to these deaths is unknown (EMCDDA, 2008a).

#### 7.4.4.2 Impact on road safety

A study by Thompson *et al.* (in press) found that 300 mg/74 mg BZP/TFMPP actually improved driving performance (as measured by standard deviation of lateral position (SDLP)). However, this study was prematurely cancelled following several severe adverse reactions to the drugs in nearly half the participants in the BZP groups (41%,  $n = 7$ ). Symptoms ranged from anxiety and hallucinations to vomiting and migraine. BZP has recently been detected in RTA fatalities in the UK (Elliott *et al.*, 2009; np-SAD database, personal communication), although the influence of the drug in these accidents is unknown. The stimulant and hallucinogenic properties of BZP make it liable to impair performance to a degree similar to that observed following cocaine and MDMA use: increased risk-taking, reduced concentration and distorted perception (Maes *et al.*, 1999).

## 7.5 Discussion

### 7.5.1 Problems with detection/enforcement

Many, if not all of these drugs are currently not included in standard screening panels in toxicology laboratories. This is due to one or more of the following reasons:

- a) there is no reference sample available;
- b) the available reference sample is too costly for laboratories to purchase;
- c) by the time a reference sample is developed it may be redundant due to those producing the drug changing the chemical composition; and/or
- d) there is little demand for the reference sample as clients (coroners, police) may not recognise the need to screen for such drugs.

Thus, a driver suspected of impairment due to drugs may have a blood or urine sample taken that returns negative results because the drug they have consumed is

not detected by the screening test. This problem of detection creates a problem of enforcement, as proving driver impairment due to these drugs is, at best, costly and, at worst, impossible. Some drugs are easier to detect than others, but the likelihood of ‘underground’ chemists constantly inventing new drugs means the toxicologists will always be playing catch-up in trying to develop standards and references for analysis.

However, using a combination of analysis techniques, Elliott *et al.* (2009) have been able to detect both GHB and BZP in blood samples. Elliott explained that this approach was necessary to capture the broad array of drugs currently available, both medicinal and illicit. Elliott argues that many toxicology laboratories only offer standard panels of the known drug groups in which their clients are interested. Typically, the client may be unaware of the increased prevalence of these new drugs, and so does not request the laboratory to test for them. Consequently, the laboratories do not offer panels other than those testing for a standard list of illicit drugs, because there is no demand for tests for less common drugs.

## **7.5.2 Current status of detectability/reference samples**

### **7.5.2.1 Mephedrone**

Members of LTG have mapped out most derivatives of the cathinone and methcathinone families. Some of these cathinones are already showing up in assays for amphetamines and methamphetamines because of their similar structure. The laboratory at St George’s Hospital has a reference sample for mephedrone that has already led to detection of the drug in samples. However, this is not a pure reference sample, as it is derived from an amnesty sample.

### **7.5.2.2 Synthetic cannabinoids**

A leading forensic toxicologist in the UK expressed concerns that the forensic science industry would be unable to cope with the already vast numbers of synthetic compounds and the speed at which new compounds are being developed. He felt that, of all the ‘legal highs’, synthetic cannabinoids are the most difficult to detect and will be the most difficult to keep up with.

Members of LTG have produced monographs of the most common compounds found in commercial products: JWH-073, JWH-018, HU-210 and CP 47,497. However, these represent only four of hundreds of synthetic compounds that come in a variety of structures and thus do not necessarily cross-react with antibodies used in traditional assays. Furthermore, not all structures have been added to UV spectra libraries for identification and, because of their higher potency, may produce effects in such low concentrations that they would require extremely sensitive assays in order to be detected (EMCDDA, 2009c). Currently, seven groups have been identified and some forensic laboratories are able to detect the more common

compounds in blood samples (e.g. JWH-018, CP 47,497). However, detection in urine samples (which would potentially reveal a longer time period since last use) is still in development (EMCDDA, 2009c).

#### 7.5.2.3 BZP

BZP was detected in two cases in Elliott *et al.*'s (2009) study of road traffic fatalities by employing a broad initial screening described above. Karch (2009) states that mCPP (a piperazine) cannot be detected by standard immunoscreening assays, but only through full scan GC/MS.

#### 7.5.2.4 GBL/GHB

The EMCDDA report that GHB is difficult to detect because of its rapid metabolism and excretion. It is detectable in blood for approximately 6–8 hours and in urine for 10–12 hours. In addition, low levels of GHB occur naturally in the body and it is also produced during post-mortem decomposition (EMCDDA, 2002; Karch, 2009). However, in the case of GBL ingestion, some may be stored in muscle, slowing the conversion to GHB and thus prolonging both the effects of the drug and its window of detectability post-ingestion (EMCDDA, 2002).

A particular problem with the detection of GBL is that, to the best of our knowledge, GBL use cannot be distinguished from GHB use, as GBL is rapidly converted to GHB once ingested. The time delay between ingestion, arrest and sampling would ordinarily be sufficient for full conversion and therefore no detection of GBL itself. Determining whether GBL was used would rely on user admission or witness reports.

### 7.5.3 Evidence gaps

Given the relative recency of abuse of these legal highs, it is unsurprising that research has yet to establish the true prevalence or effects of these substances. For those substances recently controlled under the Misuse of Drugs Act 1971 (BZP, GBL, synthetic cannabinoids) some research has been undertaken to establish the potential harms. However, even for these compounds, robust pharmacokinetic (i.e. metabolism) and pharmacodynamic (i.e. physical and psychological effects) studies in humans are still rare, especially when compared with established illicit drugs such as cocaine, amphetamines and cannabis.

It is also understandable that research has yet to consider the effect of these drugs on driving or road safety generally. From what is known of the chemical structures of the drugs and user reports, the effects of legal highs on road safety may be inferred by reference to research on similar, established drugs. The true scope of effects, however, is unknown, and so these comparisons should be treated with caution, as the legal high effects may be less predictable, more intense or may interact with

other drugs and alcohol in different ways. Moreover, the increased prevalence of polydrug use demonstrated by Officer (2009) suggests that these drugs may be being used in combination with illicit drugs, other legal highs and/or alcohol, with unpredictable consequences.

Legal highs, particularly the synthetic cannabinoids, present unique challenges both to enforcement authorities and to forensic laboratories. Already, since the ban on BZP, GBL and products containing synthetic cannabinoids, a wide variety of replacements (e.g. 'Space', 'Beanz' and 'Mojo' ) have come onto the legal high market, all claiming to be legal. As yet, active ingredients and effects of these new products are unknown but, inevitably, by the time their chemical structure has been identified, still more will have been developed, with ever changing brand names and active components, as those producing them change their composition to circumvent the law.

The problem of forensics trying to keep pace with underground chemists might yet be addressed by an amendment to the law that has been proposed by the Scottish Government. The proposed amendment would criminalise the act of selling or manufacturing recreational drugs rather than the substance itself (*The Times*, 2010), thus removing the incentive to create pharmaceutical combinations outside the latest illegal drug classifications.

While the challenges presented by legal highs are considerable, continued research into these compounds is still necessary. An accurate overview of the current prevalence of these drugs in the general population is, at the very least, an important step in determining which drugs should be the focus of further research. Surveys such as that produced by *Mixmag* help to keep track of current drug usage trends in specific demographic groups, while the results of the 2009/10 BCS will, for the first time, provide information on the prevalence of these drugs in the general population.

As for the prevalence and impact of these drugs on road users, where reference samples are available, coroners, police and toxicology laboratories should be encouraged to consider screening for a broader range of drugs beyond the standard panel of illicit drugs, so as to provide an overall view of drug prevalence in drivers suspected of impairment due to drugs, or in RTA fatalities. So long as forensic laboratories do not test samples for these substances, their true impact on road safety will remain unknown.



## 8 CONCLUSIONS

This report has attempted to answer a range of questions relating to drug driving in the UK: its prevalence, its effects on road safety, and possible enforcement strategies that might impact on the problem. The report has highlighted that very few official data have been collected on this issue in the last decade, but has also identified a number of potential sources of data on the issue, for example those collected by HM Coroners, and the results of drug drive submissions sent to the toxicology labs for analysis.

Analysis of available data shows that cannabis, cocaine and benzodiazepines remain the drugs of most concern, given the frequency with which they are detected in drivers arrested for impaired driving or injured as a result of a traffic collision.

While the Railways and Transport Safety Act 2003 gave British police the power to require a driver suspected of being unfit to drive because of a drug to undertake a preliminary drug test, to date a type-approval specification for such a device has not been produced. Consequently, while a range of commercial drug screening devices is available, none is suitable for enforcement purposes in the UK.

A major EU research project (DRUID) is currently evaluating a variety of commercial roadside drug screening devices. A final report is in production, but early results suggest that a number of the issues previously identified with such devices are close to being resolved, such that several of the devices may be considered suitable for roadside enforcement purposes. However, concerns remain regarding the reliable and consistent detection of certain drugs, particularly cannabis.

While a review of research has suggested a cut-off value for THC in whole blood of between 3.5 and 5 ng/ml, the complex nature of drug pharmacodynamics and pharmacokinetics, combined with issues including individual variations, drug tolerance and interactions with other drugs, makes it difficult to establish values for other drugs that would represent impairment in the general population.

The Railways and Transport Safety Act 2003 also gave British police officers the power to require “a person to co-operate with any one or more preliminary tests administered to the person by that constable or another constable”. There are currently no readily available data on the number of officers who are trained to administer FIT and how many are actively doing so. This lack of data makes it difficult to draw conclusions regarding the effectiveness of FIT as a tool to help a police officer to make a judgement of a driver’s impairment. However, it is apparent that each force should keep a record of the FIT-trained officers; it is recommended that all forces are approached to provide these data, so that a comprehensive picture can be built of the number of FIT-trained officers within each force.



Previous research has established that FITs are a useful screening tool for police officers to use when faced with a driver that they suspect of being impaired by drugs. In the absence of a type-approved roadside screening device, the tests are a valuable addition to the evidence gathering process. However, there is currently no requirement for officers trained in DRT/FIT to undergo any form of refresher training to keep them current; it is recommended that regular refresher training should be a requirement for all FIT-trained officers and instructor trainers.

In contrast with the impairment-based approach taken in countries including the UK, Spain, Norway and the Netherlands, a number of other European countries have adopted either zero tolerance or two-tiered approaches. The zero tolerance approach overcomes the difficulties associated with: a) proving impairment, and b) (to some extent) deciding on scientifically valid cut-offs from conflicting sources of data. However, zero limit *per se* laws also have the potential to penalise drivers who are not impaired and pose no risk to safety.

A recent evaluation of the zero tolerance approach adopted in parts of Australia, which utilises roadside screening devices, suggests that it could have a number of advantages over our own impairment-based approach. Specifically, the process is simple, straightforward, quick to administer, unambiguous, and police officers appeared to be more comfortable administering roadside screening tests than trying to demonstrate a driver's impairment in order to secure a conviction for DID. However, studies of the effectiveness of Sweden's zero tolerance laws have found them to have been unsuccessful in deterring DUID re-offenders.

Finally, the report highlights the recent increased prevalence of drugs defined as 'legal highs' and recommends that toxicology laboratories be encouraged to screen for a broader range of drugs beyond the standard panel of illicit drugs, so as to provide an overall view of drug prevalence in drivers suspected of impairment due to drugs, or in RTA fatalities. Until this is regular practice, the impact of legal highs on road safety will remain unknown.

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## APPENDIX 1:

### Process and chain of evidence considerations (WA)\*

The following outlines the Roadside Oral Fluid Testing (ROFT) procedure. It should be noted that apart from alcohol and drug testing, checks are also made for vehicle compliance, registration and driver licences. Sometimes an Automatic Number Plate Recognition camera is used to complement these checks during daytime operations.

A breath alcohol screening test is administered to every motorist that is stopped. Oral fluid drug testing takes considerably more time than a breath test and therefore not all motorists are requested to submit to a drug test. For such tests, the site must contain areas where motorists can safely park their vehicles and accompany the officer to the preliminary drug testing area (usually a table with chairs in front of the bus).

#### *Preliminary Oral Fluid Test (OFT)*

- a) Motorist is stopped and a breath test performed
- b) If negative, the motorist's vehicle is parked by the police officer and the motorist is requested to undergo a preliminary OFT
- c) The preliminary OFT is administered in the open at a table in front of the bus; screening devices are stored in an esky (cool box)
- d) The testing officer wears latex gloves and checks the tamperproof seal and expiry date prior to using the screening device
- e) Following swabbing, the device is laid flat on a level table for six minutes which is timed with a dedicated stopwatch
- f) If positive, the motorist is required to undergo a secondary test inside the bus
- g) Preliminary screening kits are disposed into a bio-hazard bag along with the latex gloves

The officer accompanies the motorist at all times during the test. Swabbing is encouraged from both the top of the tongue and the sides of the mouth to ensure an adequate sample.

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\*Source: Woolley and Baldock, 2009, pp. 12–13

## *Secondary OFT*

- h) The motorist is taken into the bus and interviewed
- i) The officer, a supervisor and the motorist then proceed to the secondary drug testing station
- j) The supervisor uses a swab to obtain a saliva sample which is then split into several test tubes and mixed with a buffer solution
- k) The supervisor tests one of the samples on the Cozart tester
- l) If positive, another sample is placed in a tamper-proof biohazard bag, sealed, labelled with a bar code sticker, paperwork is also barcoded and attached, and the sample is finally placed in a secure fridge on the bus; another sample is given to the motorist for independent testing should they desire
- m) Upon return to base, the samples are conveyed in an esky to a secure temperature-controlled storage room and paperwork checked and completed. The samples are then conveyed to a second more secure room.

## *CCWA Analysis*

- n) The samples are then transported by hand to the CCWA (Usually the next day)
- o) The CCWA completes a “P69” conveyance form and checks that all barcodes match and that the paperwork is in order

The following are taken into account to maintain the integrity of drug testing operations:

- All drug testing kits are pre-packed in-house by TEG (Traffic Enforcement Group) and stored in a temperature controlled room
- 5 percent of new drug testing kits are batch tested and only released for use once advised by the CCWA
- All drug testing kits are transported in an esky and placed in a refrigerated container on the bus – temperature sensitive stickers on the storage boxes alert the users if the kits have strayed outside their recommended storage temperature of 15 to 25°C
- Paperwork that accompanies the evidentiary saliva sample includes a copy of the Cozart printout, a Form “5” and a Form “P158D”.
- Evidentiary Samples are placed in secure storage on the bus and back at the police base
- Evidentiary samples are hand delivered and are transported in an esky and accompanied at all times

- Tamperproof bags are used to seal the samples
- The samples and all paperwork are bar-coded
- The bus is always powered so that temperature and refrigeration can be maintained; there is also an onboard generator which takes over when mains power is not available
- During the Cozart test, both the supervisor and the motorist wear latex gloves to prevent the possibility of contamination.
- Samples in regional areas are sometimes securely packed in foam containers and sent in by air courier.

## **APPENDIX 2:**

### **Equipment used on the Breath and Drugs (BaD) Testing buses (WA)**

The current equipment used for drug testing includes:

- Securetec Drugwipe II preliminary oral fluid tester;
- Cozart DDS secondary oral fluid tester;
- The CCWA testing equipment (a LCMS mass spectrometer).

The environment on the BaD bus is temperature controlled via an air conditioner and testing kits are stored in temperature controlled fridges. Evidential samples are stored in secure fridges, and simple equipment such as test tube holders and flat tables is utilised as part of the drug testing procedure. The bus has a permanent power supply either via a mains connection (when available) or via the onboard generator. Onboard access to advanced communications networks (such as “Next G”) exists for linking with licensing and criminal databases in both regional and metropolitan areas. A video camera has been installed to record testing operations.

The bus contains five main sections:

- A seating area used for interviewing motorists when they have tested positive on the alcohol or drug screening tests;
- A radio communications and computer terminal station;
- A station for evidentiary Breath Alcohol Testing;
- A station for secondary oral fluid drug testing;
- An area where the registered nurse may obtain blood samples.

TEG also has an Automatic Number Plate Recognition (ANPR) camera that can be used to check for unregistered vehicles and associated unlicensed drivers and arrest warrants. This tends to be used during daytime operations only.

ROFT operations require a requisite amount of traffic control on site and a 4WD is used to tow an electronic Variable Message Sign (VMS) and carry other static warning signs and traffic cones.

## **APPENDIX 3:**

### **Summary of the legislative approaches to DUID adopted in European countries\***

The following table was supplied by the EMCDDA. To the best of their knowledge, the table is an accurate picture of the situation across Europe (EMCDDA, personal communication).

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\*Source: EMCDDA website: <http://eldd.emcdda.europa.eu/html.cfm/index19034EN.html> accessed 28 April 2010)



Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
<b>Belgium</b>	Criminal	At random	Any	Impairment	1 month – 5 years	€1,000–10,000	No	Loi du 16 mars 1999 modifiant la loi relative à la police de la circulation routière Arrêté royal du 4 juin 1999 relatif au prélèvement sanguin
			7 named substances	Zero				
<b>Bulgaria</b>	Criminal	On basis of suspicion	Any	Zero	Up to 3 years, but not less than the period of imprisonment	No	Up to 2 years	Penal code, art. 343b (3)
<b>Czech Republic</b>	Criminal	At random	Any	Impairment	1–10 years (general range for all criminal offences)	CZK 2,000–5,000,000 (€70–179,000) (general range for all criminal offences)	Up to 1 year; 6 months – 3 years if previously sentenced, accident etc.	Penal Code (140/1961), s. 201
	Non-criminal		Any	Zero	6 months to 1 year	CZK 10,000–20,000 (€357–714)	No	Law on Misdemeanours (200/1990), s. 22
				Impairment	1–2 years	CZK 25,000–50,000 (€893–1786)	No	Law on Misdemeanours (200/1990), s. 22
<b>Denmark</b>	Criminal	At random	Any, except if in accordance with medical prescription	Impairment, above defined limits	6 months – 10 years or for life	No fixed fine range	Up to 1 year	Road Traffic Act (LBK 1079 of 14 November 2005), ss.54, 55, 117d, 125, 126, 128. Act 524 of 6 June 2007, BEK 655 of 19 June 2007

(continued)

Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
Germany	Criminal	On basis of suspicion	Any	Impairment	1–3 months or withdrawal	General range for all criminal offences: according to the income of the offender	s.315c (if endangering property or others): up to 5 years s.316: up to 1 year	Criminal Code (StGB) ss.315c, 316,
	Non-criminal	On basis of suspicion	7 named substances	(Zero but Fed. Constitutional Court 2004:) Impairment	1–3 months	Up to €3000	No	Road Traffic Code (StVG) s.24a(2)
Estonia	Non-criminal	At random	Any	Zero	Up to 1 year	Up to €1150	Administrative arrest in police detention house up to 30 days instead of fine	Traffic Act (adopted 14 Dec 2000, entered into force 1 Feb 2001; later amendments include §20 <sup>1</sup> ): §20, §20 <sup>1</sup>  Penal Code (adopted 6 June 2001, entered into force 1 Sep 2002; later amendments include §50): §50
	Criminal if recent recidivist (including from alcohol intoxication)				Up to 3 years	30–500 daily rates (average daily income)	Up to 3 years	Traffic Act (see above); Penal Code (see above): §50, §424
Greece	Criminal	On basis of suspicion	Any	Impairment	3–6 months	From €167	2 months	Law 2696/99, s.42, completed by Law 2963/2001(art.43) and Ministerial Accord 43500/5691/2002
(continued)								

Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
Spain	Criminal	At random	Any	Impairment	1–4 years		3–6 months	Penal Code art.379
	Non-criminal		Any	Impairment	1–3 months	€301–600	No	Law 17/2005 of 19 July, Arts 5–6
France	Criminal	On basis of suspicion	Substances or plants classed as narcotics	Zero	Up to 3 years	€4500 €9,000 if the driver is also under the influence of alcohol	2 years 3 years if the driver is also under the influence of alcohol	Law 2003–87 of 3 Feb, law 99–505,(Art.L. 235–1 and L. 235–2 of code de la route) decree 2001–751 of 27 Aug (Art. R-235–1 and following of code de la route)
Ireland	Criminal	On basis of suspicion	Any	Impairment	Minimum 1 year	Up to €2,500	Up to 6 months	Road Traffic Acts 1961 – 2002
Italy	Criminal	On basis of suspicion	Any	Impairment	15 days – 3 months. In case of more offences in the same year, the period goes from 1 up to 6 months.	€ 258 – 1,032	Up to 1 month	Law 285/1992 updated to may 2006 (New Highway Code), Art. 186 and 187
Cyprus	Criminal	At random. Testing also possible on reasonable suspicion	Any	Impairment	Not specified. Up to court's discretion	No fixed fine range	Up to 1 year	Motor vehicle and Road Traffic Law of 1972, s.9. Usually prosecution under the Narcotics Law of 1977, since use and possession is a criminal offence under that law anyway. No need to prove that the ability to drive safely was affected under the Narcotics Law.

(continued)

Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
Latvia	Non-criminal		Any/medicinal	Any drug – zero Medicinal product – impairment	2 years	Any drug – LVL500 Medicinal product – LVL 30–200	Administrative arrest shall be imposed for a period from 10 up to 15 days	Administrative Violations Code, 149.15
	Criminal (for recidivists within 1 year)		Any	Zero	Up to 5 years	fine not exceeding fifty times the minimum monthly wage	Up to 2 years	Criminal Code s.262
Lithuania	Non-criminal (criminal if causing injury or death)	On basis of suspicion	Any	Zero	1–3 years	€290–870	Administrative arrest from 10 to 30 days instead of fine with confiscation of vehicle from 2 up to 3 years	Administrative Law Offences Code of the Republic of Lithuania Art. 126
Luxembourg	Criminal	On basis of suspicion. At random only if ordered by the Public Prosecutor	All controlled substances	Impairment, legally defined as above certain saliva concentrations	1 month – life	€250–5,000	8 days – 3 years	Loi modifiant la loi du 14 février 1955 concernant la réglementation de la circulation sur toutes les voies publiques, Art. 12 Loi 18 septembre 2007
Hungary	Criminal	At random for alcohol	Any	Impairment	1–10 years or life	No determinate fine	Up to 1 year without aggravating circumstances	Criminal Code Art.188
(continued)								

Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
<b>Netherlands</b>	Criminal	On basis of suspicion	Any	Impairment	Up to 5 years	€6,700  If accident causing bodily injury – up to € 16,750  If fatality – € 16,750, or €67,000 if reckless	Up to 3 months  If accident causing bodily injury – 2 year and 3 months, or 4.5 years if reckless  If fatality – 4.5 years, or 9 years if reckless	Road Traffic Law 1994, Art. 8
<b>Austria</b>	Non-criminal	Assumption (less specific than suspicion)	“Suchtgift”; generally drugs under UN61 and Schedules I+2 of UN71	Impairment	At least 4 weeks	€581–3,633	No	Road Traffic Act, Arts 5, 99
<b>Poland</b>	Criminal	On basis of suspicion	Any	Zero	From 1 to 10 years	Up to 360 day fines	Up to 2 years	Criminal Code, Art. 178a
<b>Slovenia</b>	Non-criminal	At random	Any	Zero	At least 10 penal points * 18 penal points mean withdrawal of driving licence and re-test	From €500	No	Road Safety Law 83/2004 (Arts 131–133)

(continued)

Country	Status of offence	Police may stop to test:	Substances specified	Tolerance (zero/impairment)	Licence suspension period	Fine range	Prison	Legal basis
Slovakia	Non-criminal	At random	Any	Zero	Up to 1 year	€200–1,000, or up to €3,500 (legal person)	No	Act 372/1990 Coll. on Administrative Offences S.22(1)(f)
	Criminal (if recidivist or public transport)		Any	Impairment	1–10 years (general ban on activity)	€160 – 331,930 (general fine)	Up to 1 year (recidivist) Up to 5 years (public transport)	Criminal Code S. 289  Act 8/2009 Coll. on Road Traffic S. 4(2)(b,c) (obligations of driver); S. 69 (1)(d)(testing); S. 70(1)(c) (licence suspension)
Sweden	Criminal	On basis of suspicion	Any, but no liability if in accordance with medical prescription	Zero	1 month – 3 years	Day fines	Up to 2 years	Act on Punishment for some Traffic Crimes (1951:649), s.4
Finland	Criminal	At random	Any	Impairment	Up to 5 years	Up to 120 day fines	Up to 2 years	Penal Code Ch.23, s.3, 4, 8
	Criminal		Narcotic substance other than medicinal product which a person has a right to use	Zero		At least 60 day fines if seriously intoxicated	Up to 6 months	
United Kingdom	Criminal	On basis of suspicion	Any	Impairment	Minimum 1 year (unlimited maximum)	Up to £5000	Up to 6 months, or up to 14 years if fatality	Road Traffic Act s.4
Croatia	Non-criminal	At random	Any	Zero	Up to 6 months	5,000–15,000 KN (€680–2039)	Up to 2 months	Law on the Safety in Road Traffic 67/2008, Art. 199.
Norway	Criminal	On basis of suspicion	Any	Impairment	Minimum 1 year	1.5 x gross monthly income. Rarely under NOK 10,000	Up to 1 year	Road Traffic Act of 18 June 1965 No.4, ss 21–22, 31, 33

## APPENDIX 4:

### Field Impairment Testing and Drug Influence Recognition Practitioners Course\*

**Field Impairment Testing and Drug Influence Recognition Practitioners Course**  
(2 Days minimum)

Aim: To provide students with the skills and knowledge to administer the Field Impairment Tests and understand the influence of drugs on a person.

#### *Course Content:*

- Legal & Procedural Aspects
- Review of current legislation
- Offences
- Preliminary Impairment Testing and the Code of Practice
- Visual detection of the impaired driver
- The Investigative Procedure
- Case Preparation and Evidential Issues
- Case Law
- Station Procedures
- Role of the Forensic Physician
- Field Impairment Testing
- Pupillary Examination
- Introduction to psychophysical testing
- Romberg Test
- Walk & Turn Test
- One Leg Stand Test
- Finger to Nose Test
- Drug Influence Recognition
- Drug Categories

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\*Source: [www.blueknightlearning.com](http://www.blueknightlearning.com) (accessed 17 February 2010)



- Indicators of drug influence –
  - Cannabis
  - Opiates
  - Stimulants
  - Depressants
  - Hallucinogens
  - Inhalants
  - Dissociative Anaesthetics
  - Poly Drug Use

### *Field Impairment Testing and Drug Influence Recognition Instructors Course (5 Days)*

Aim: To provide student instructors with the skills and knowledge to successfully deliver the Field Impairment Testing and Drug Influence Recognition practitioners course, and to enable student practitioners to become proficient in the use of FIT & DIR.

#### *Course Content:*

Module 1 – Understanding the aims and objectives of the training

Module 2 – Relevant legislation and practices

Module 3 – Field Impairment Testing

Module 4 – Human Physiology and the role of the forensic physician

Module 5 – Compare and contrast the UK system with that of the USA

Module 6 – Interpreting the signs and symptoms of drug influence

Module 7 – Written Examination × 2