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Assessing the Scale and Impact of Illicit Drug Markets in Scotland

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The views expressed in this report are those of the researcher and do not necessarily represent those of the Scottish Government or Scottish Ministers.

Executive Summary

In this report we provide estimates of the size and value of the illicit drugs market as well as estimates of the economic and social cost of illicit drug use in Scotland for the year 2006. This work provides the first real attempt at both estimating the size of the market and the cost of illicit drug use in Scotland and has done so using only available data sources. Therefore, whilst this study is invaluable in providing an initial evidence base, the work also outlines the limitations of the methods employed as a result of using only available data sources and provides recommendations to aid the development of these methods and estimates in the future.

Prevalence of illicit drug use

Estimates of the number of both problem and recreational drug users using heroin, crack cocaine, methadone, powder cocaine, amphetamines, ecstasy, cannabis and benzodiazepines are needed to inform both the drug markets model and social and economic costs model.

The estimates for the number of problem drug users using all of the above drugs are derived from two data sources, the Drug Outcomes Research In Scotland (DORIS) study and the 2006 national Prevalence Study (Hay et al, 2009). The estimates for the number of recreational drug users using all of the above drugs with the exception of heroin or crack cocaine are derived from two different data sources namely the 2006 Scottish Adolescent Lifestyle and Substance Use Survey (SALSUS) and the 2006 Scottish Crime and Victimisation Survey (SCVS). There are a number of assumptions and limitations associated with these estimates. As a result a sensitivity analysis is used to determine the effect such assumptions have on both the estimated size and value of the illicit drugs market and the total estimated economic and social cost of illicit drug use.

The prevalence of illicit drug use for problem and recreational drug users is estimated for all types of drugs. The estimates relating to problem drug use range from 6,135 problem drug users who use amphetamines to 50,077 problem drug users who use heroin. For recreational drug use our estimates range from 49,113 recreational drug users using benzodiazepines to 321,352 using cannabis.

Size and value of illicit drug market

The size of the illicit drugs market is estimated by combining the average amounts of drugs that problem and recreational drug users use in a year with the estimated prevalence of drug use for each drug type. The estimated size is then combined with price information for each drug type to estimate the total value of the illicit drugs market in Scotland. The DORIS study is utilised once again to examine the average amount and frequency of which each drug is used by problem drug users. There is not such a comprehensive dataset available for recreational drug users and so information on average quantity and frequency was gathered using a variety of sources including the SCVS and the Independent Drugs Monitoring Unit (IDMU).

The Scottish Crime and Drug Enforcement Agency (SCDEA) provided price information for all types of drug with the exception of benzodiazepines. This is combined with the estimated quantity of each drug used to give the estimated value of the drugs market. The total value of the illicit drugs market is estimated at around £1.4bn. Heroin holds the largest share of the market with 39% of the market, with

cannabis holding a 19% share, the second largest. Problem drug users hold the largest percentage share of the total market (63%).

Given that each data source used was created for purposes other than those used for this study, there are a number of assumptions and limitations associated with using the data for this purpose. Once again a sensitivity analysis examines the effect such assumptions have on the total estimates.

Economic and social costs of illicit drug use

Cost consequences are identified using a similar approach to the previous Home Office studies (Godfrey et al, 2002; Gordon et al, 2006). Five cost areas are identified as: health, criminal justice, social care, costs to the economy and wider costs to society. Individual consequences are then identified for each area for both problem and recreational drug use. The total estimates for each area are calculated by combining information on the number of occurrences of each identified cost consequence with the unit price of each consequence.

In order to achieve this data from a large number of sources is employed. DORIS is used extensively to provide data on problem drug users while a larger number of separate data sources are used to provide data on recreational drug users, such as SMR01 for the health consequences.

The total economic and social cost of illicit drug use in Scotland is estimated at just under £3.5bn. Costs associated with problem drug use accounts for 96% of the total cost and this equates to just under £61,000 per problem drug user. Recreational drug use accounts for 4% of the total estimated cost equating to £134 per user.

As with the markets and prevalence estimates described above it is necessary to make a number of assumptions in order to produce estimates of the economic and social costs of illicit drug use in Scotland since we use only available data sources. Once more a sensitivity analysis is carried out to validate the model and determine the effect such assumptions have on the final estimate.

A number of recommendations are made in terms of improvements to the existing data available. Of note is the issue of average quantities used for each drug type. There is a dearth of data on average amounts of drugs consumed by recreational drug users. Although DORIS provides better information for problem drug users, the respondents in DORIS often gave their answer in monetary terms rather than weight. This problem is compounded by the issue of price varying by amount bought or possibly by type of drug user.

Estimating the economic and social costs of illicit drug use in Scotland is impeded by the lack of Scottish crime costs that can be used in conjunction with crimes carried out by problem drug users. Given that the costs of crime contribute largely to the total estimated cost, this is an important issue that would need to be addressed in order to improve on this study.

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1 Introduction

This report describes a study that aims to assess the scale and impact of illicit drug markets in Scotland. There are two key elements to the study. The first is to provide an initial estimate of the size of the illicit drugs market, both in terms of monetary value and the amount of drugs used. The second is to provide an initial estimate of economic and wider social costs of illicit drug use in Scotland. All of these estimates are initial estimates based solely on currently available data sources. The study also makes a number of recommendations on potential improvements to data sources in order to improve the robustness of any future estimates. An Excel file containing the analysis and listing all data sources used for both parts of the study has been made available and should be used in conjunction with this report.

It is clearly important to have information on the size of the illicit drugs market in Scotland and the social and economic costs attributable to Scotland's illicit drug users. Estimates of the size of the market give an indication of the amount of drugs used in Scotland, both in monetary terms and the physical amount used. The wider estimates of the economic and social costs of drug use provide a measure of the total costs to society of drug use by considering the consequences of drug use such as drug-related crime, health service use, drug related deaths and the cost of social care. Both types of estimates are needed, not just at a national level but also at a local level to inform the work of the Scottish Crime and Drug Enforcement Agency (SCDEA), the Alcohol and Drug Partnerships (ADPs) and their partner organisations in health and social care. Such estimates need not only to be accurate and robust, but also based on data sources that can be updated over time to give an indication about trends in costs / market size.

There have been previous attempts to size the UK market for illicit drugs; however such studies primarily focus on England and Wales and only include an extrapolation to the UK level, so it is not possible to disaggregate these estimates to provide estimates for Scotland. In terms of estimating the economic and social costs of illicit drug use, previous Home Office reports (Godfrey et al, 2002; Gordon et al, 2006) have been upfront in their focus solely on England and Wales, without any attempt to include Scotland or Northern Ireland in their analyses.

This study is therefore the first attempt to size the Scottish market for illicit drugs and provide estimates of the economic and social costs of Scotland's drug use. In contrast to previous UK studies, this study aims to bring the two elements (markets and economic / social costs) together in a unified approach. This is sensible, not least because both elements depend heavily on estimates of the number of individuals in Scotland who are using illicit drugs. This study also has a broader remit than the previous Home Office studies in that it tries to encompass a wider range of illicit substances: previous economic and social costs studies have included only Class A drugs while previous sizing the markets studies excluded methadone and benzodiazepines.

We begin by providing a brief review of the more prominent UK studies. A wider review of the international literature was beyond the scope of this study. We therefore focussed on two Home Office funded studies that aimed to estimate the size of the UK market for illicit drugs. The first was by Bramley-Harker (2001) which provided estimates (mainly for England and Wales) for 1998. The second was by Pudney and colleagues (2006) which provided estimates for 2003/04 and similarly had a focus towards England and Wales. There are two main studies estimating the economic and social costs of drug use in England and Wales. The first was carried out by

Godfrey et al (2002) and the second, which provided updated estimates following the approach of Godfrey, is reported in Gordon et al (2006).

The review of these studies is included to put the Scottish work in context, rather than to determine the methodological approach taken within this study. The methods that were used in this study were agreed with the advisory group that was established to oversee the study, and were constrained by the need to base the initial estimates solely on currently available data, as additional data collection was beyond the scope of this study. There was however a desire, so far as possible, that the results for Scotland would be comparable to those previously obtained for England.

2 Previous United Kingdom Studies

In this section we consider previous recent studies carried out in the United Kingdom that aimed to estimate the size of the illicit drugs market or to estimate the social and economic costs of drug use.

We begin by discussing the markets studies.

2.1 Sizing the market for illicit drugs

Bramley-Harker (2001), Sizing the UK market for illicit drugs

In a Home Office funded study, Bramley-Harker attempted to estimate the size of the drugs market in the UK, using data primarily for England and Wales. The study attempted to estimate the size of the market for six drugs; amphetamines, cannabis, cocaine (powder), crack cocaine, ecstasy and heroin. The study is described as an illustration of the methodology rather than the application of a firm tool to assess the size of markets. The report clearly set out the assumptions and used data available for 1998. Although there had been some attempts in the past to estimate the prevalence of problem drug use (such as the use of opiate and / or crack cocaine) by Frischer et al (2004), Bramley-Harker chose instead to derive information on the number of drug users from arrest data. He used the NEW-ADAM study (Bennett, 2000) to estimate levels of drug use by those who had been arrested and combined that information with information on the number of arrests. This programme was a survey of arrestees where interview data was augmented with urine samples to identify drugs in the respondents system.

The NEW-ADAM study at that time only sampled arrestees at four sites; Liverpool, Nottingham, Sunderland and South Norwood (an area of South London near Croydon). Those four sites are unlikely to be representative of England and Wales in terms of levels of drug use (as Liverpool and Nottingham both come in the highest ten out of 149 English Drug Action Team areas for the prevalence of problem drug use; Hay et al, 2006). It is, however, less clear as to whether they would be representative of levels of drug use amongst those arrested for crime, which is the more important issue.

The study used a “demand” rather than a “supply” approach, in that it considered the amounts of drugs used by drug users and built on that information to get a national figure for the amount of drugs used, rather than trying to estimate the amount of drugs entering the UK based on production, trafficking and successful seizures data. Bramley-Harker divided drug users (and hence the market) into three groups; regular users, occasional users and users in prison. He also limited his analyses to amphetamines, cannabis, crack cocaine, ecstasy, heroin and powder cocaine.

Bramley-Harker suggested that surveys are not appropriate for quantifying many patterns of illicit drug use, particularly heroin or crack cocaine use. He noted that the capture-recapture method can be used to estimate the size of heroin using populations, but suggested that it was less useful for estimating drug use prevalence nationally. This was, however, prior to large scale Home Office funded studies that provided local and national estimates of the prevalence of problem drug use for England, derived in part using the capture-recapture method (Hay et al, 2006), and national estimates of the prevalence of problem drug use in Scotland have been available since 2000 (Hay et al, 2001). He also considered multiplier methods, such as the mortality multiplier, for use in estimating prevalence and discussed what they saw as the benefits of the multiple indicator method (Bramley-Harker, 2001, p.6).

The commissioning body (the Home Office and H.M. Customs and Excise) were keen to receive a methodology based on data that are routinely available and updated on an annual basis. That is perhaps why the study focused on the NEW-ADAM data (which they considered would be a continuing data source) rather than more one-off studies such as capture-recapture or multiple indicator method studies.

To derive estimates of the number of drug users from NEW-ADAM, Bramley-Harker followed a process that first involved estimating the number of people in England arrested for all offences. This is then combined with information derived from the NEW-ADAM sample on the proportion of those arrested who were regular drug users.

Next they attempted to estimate the probability that a regular user is arrested within a year. This information can be combined with the total number of people arrested and the proportion of those arrested who were regular drug users to derive estimates of the total number of people using individual drugs. They then estimated the number of regular users who are in the general population (i.e. not in prison), again using information from NEW-ADAM (this time the respondent's prison history).

They used that approach to estimate the number of amphetamines, crack cocaine, heroin and powder cocaine users, but suggested that they prefer to use household survey data for quantifying cannabis and ecstasy use. They therefore limited estimates of cannabis and ecstasy use to 'occasional' use.

The Bramley-Harker study estimated the total value of the UK drug market (inclusive of amphetamine, cannabis, cocaine, crack cocaine, ecstasy and heroin) in 1998 to be £6.6bn. Heroin took the largest share of the market, at £2.3bn, followed by crack cocaine at £1.8bn. The size of the crack cocaine market was much bigger than the powder cocaine market which was just over £350m. In terms of quantities, this would equate to just over 31 tonnes of heroin, around 18 tonnes of crack cocaine and about 4.5 tonnes of cocaine powder. The amount of cannabis in the UK market was estimated to be just over 480 tonnes a year.

In his referee comments, Pudney suggested that Bramley-Harker was erroneously using NEW-ADAM to calculate the probability that a regular drug user is arrested. He suggested that NEW-ADAM could actually only be used to calculate the probability that, once arrested, a regular drug user goes on to be re-arrested. More broadly, he noted that different drugs may lead to different arrest rates, something not accounted for in the Bramley-Harker analyses. This was particularly relevant for comparing crack cocaine use with powder cocaine use, where one could speculate that a heavily addicted crack user may have more chance of arrest than someone only using powder cocaine.

Pudney noted some of the issues related to Bramley-Harker's approach of using a regression model to calculate the rates at which regular users use different drugs. After suggesting that this was flawed, he went on to note that since it is likely that Bramley-Harker under-estimated the number of regular users and then over-estimated their drug consumption, the final estimates may not have been too badly biased. He did, however, suggest that this could be a reason for an apparent disparity between the size of the powder cocaine market and the crack cocaine market.

In his comments, Pudney rejected Bramley-Harker's approach of splitting the drug using population into three groups (regular, occasional and prison users) and suggested that a more appropriate split would be between users who had been

arrested (within the past year) and users that had not. The basis for this suggestion was rooted in the availability of data, in that an offender based survey may be the best route to quantifying drug use amongst arrestees and another survey, such as the British Crime Survey (BCS) would be the best route of quantifying drug use in the non-arrestee population. It should be remembered that arrestees (in this instance) are people arrested for any relevant crime, not just drugs possession or supply offences. He was, however, sceptical of the ability of NEW-ADAM to accurately portray levels of drug use across the total population in England and Wales that have been arrested. He also made a brief comment about the inappropriateness of extrapolating the BCS to provide estimates of the size of the Scottish and Northern Ireland drug markets.

The rest of Pudney's referee comments were concerned with making suggestions for improving the methodology, and indeed when Pudney was later commissioned to provide estimates for 2003/04 he described his report as making such methodological improvements. As previously mentioned, he suggested that it was more appropriate to split the population into arrestees and non-arrestees. He suggested that one primary reason for rejecting the regular / occasional drug use split used by Bramley-Harker was that levels of drug use form a continuum that cannot be easily split into two groups.

In summary, Pudney concluded that while the Bramley-Harker study was a worthy first attempt at estimating the size of the UK drugs market, it should not be regarded as a reliable benchmark. He suggested that the lack of measures of inherent uncertainty in the estimates was a serious failing. Finally, he suggested that established surveys, such as the BCS, should consider redesigning their drug use components to make them more appropriate for estimating levels of drug consumption.

Pudney et al (2006), Estimating the size of the UK illicit drug market

When Pudney and colleagues estimated the size of the UK illicit drug market in 2003/04, they again chose to include only amphetamines, cannabis, crack cocaine, ecstasy, heroin and powder cocaine. They also primarily focused on England and Wales, but suggested that their approach to extrapolating to the UK level was better than Bramley-Harker's, since they took into account the difference in age structure between Scotland and England and Wales. However, they still ignored differences in some of the more fundamental inputs into their estimates, such as arrest rates (which are used to estimate the number of drug users) and consumption rates.

While noting that their estimates were improvements on previous ones partly due to the availability of better data, they also suggested that their estimates were better as they also included drug use by juveniles (aged 10 to 16) and because of the various statistical innovations they employed, such as correcting for non-response and under-reporting in surveys.

As with the previous study, the size of the drug using population was derived from surveys, rather than more sophisticated methods for estimating prevalence which were in the public domain at that time, in particular the work of Frischer et al who used the multiple indicator method alongside Drug Action Team (DAT) area level capture-recapture estimates for Brighton, Greater Manchester (10 DAT areas), Liverpool and areas within Greater London (12 DAT areas) to provide a national estimate for England. This may, however, be because of the perceived need to use data from sources that would be systematically updated every year (as would the surveys Pudney and colleagues settled on).

As suggested in the comments on Bramley-Harker's earlier work, they split the adult population into two groups – those that had been arrested (within the reference year) and those that had not. Arrests were not restricted to obvious drug-related arrests such as possession or supply offences. They used the Offending, Crime and Justice Survey (OCJS) carried out in 2003 to examine drug consumption by non-offending adults and used the Arrestee Survey (AS) carried out in 2003/04 to quantify drug use by arrestees. The AS can be seen as a more comprehensive and updated version of the NEW-ADAM survey used by Bramley-Harker, however the Arrestee Survey takes saliva samples instead of urine samples to corroborate recent drug use. Although still beset by the issue of low response rate (often more to do with gaining access to an arrestee rather than the arrestee refusing to participate) the AS is far more representative and larger, with a sample size of just over 7,500 in 2003/04.

While initially it may appear strange to use an offending survey (OCJS) to look at non-arrestees, it was possible from that data source to isolate respondents who had not been arrested in the last year. Self report of arrest was used to identify those who had been arrested. Respondents could, however, be reporting that they were arrested for minor, non-notifiable offences such as drunk and disorderly. These offences do not appear in official statistics therefore there could be an issue of comparing offending behaviour in OCJS with the published offence statistics. Information about drug use and drug consumption by juveniles came from the Schools Survey (SS) carried out in 2003. Where possible, Pudney and colleagues compared and contrasted the results from these surveys with other surveys (such as the BCS, the Youth Lifestyles Survey (YLS) and the previous NEW-ADAM study). Thus Pudney and colleagues quite rigorously and systematically reviewed all available drug prevalence / drug consumption information and, in all likelihood, used the best available data. They went further and considered and updated these data in light of issues such as the wording of questionnaires, the validity of self reports against biological measures (such as urine or saliva tests) and non-response in surveys. They also considered under-reporting in surveys, but concluded that they could not effectively account for this issue.

After concluding that the responses in the AS were not reliable enough to quantify amounts spent on drugs (or indeed amounts used) Pudney and colleagues also systematically compared the price and consumption data from a wide range of sources, including the National Criminal Intelligence Service (NCIS), the Forensic Science Service (FSS) and the Independent Drug Monitoring Unit (IDMU). The FSS data was particularly useful for examining purity, whereas the IDMU data was used mainly in comparison with more official data, as it is, in part, derived from unrepresentative surveys from night clubs or music festivals. Pudney and colleagues also cast their net wider than the UK, considering Australian data.

Pudney and colleagues did not feel they had relevant information on the number of drug users in England from sources such as Frischer's (Frischer, Heatlie and Hickman, 2004) (for more problematic patterns of drug use such as heroin use) or more directly from the BCS (in terms of cannabis use). They therefore estimated the size of the drug using population by combining the probability of an individual being arrested and the probability that, given arrest, they use drugs (and similarly the probability that, given they had not been arrested, they use drugs). Once these probabilities were combined, they also required information on the number of arrests to extract the number of drug users out of this equation. Obtaining information on the number of arrests appeared to be less than straightforward, eventually involving the authors estimating the size of the England and Wales population that are not living in households (split by age group) in order to obtain what they consider to be more reliable estimates of the number of arrests in England and Wales in 2003/04.

As they did not explicitly estimate the number of drug users within their analyses, instead arriving at it by combining probabilities of arrests, probabilities of drug use if arrested (or if not arrested) and estimated numbers of arrests, they did not present information on the number of people they estimated to be using drugs (hence not allowing the reader to make direct comparisons with Bramley-Harker's prevalence estimates or the other estimates available at that time, such as Frischer's). They only presented the estimates of the size of the markets (in aggregate street quantities, aggregate pure quantities and aggregate expenditure) for both England and Wales and extrapolated to the UK level. They also apportioned the market by the three population groups they have created; juveniles, adult non-arrestees and adult arrestees. In total they estimated the size of the market in England and Wales to be £4.645 billion, with an estimate for the UK of £5.271 billion. Pudney and colleagues quite rightly attempted to examine the statistical variation in these estimates (in a similar manner to which a 95% confidence interval reflects the statistical variation in a point estimate) and presented the error bounds as plus or minus £1.2 billion for the English estimate and £1.3 billion for the UK estimate. They noted that their estimate of £4.6 billion is less than the £5.5 billion estimate of Bramley-Harker and noted that part of the difference could be due to falling drug prices; it could also be due to the methodological differences and differences in the data sources used. They did, however, note that in terms of individual drugs, the value of the powder cocaine market in the 2003/04 report was over 300% larger than in the original report.

2.2 Estimating the economic and social costs of illicit drug use

There have been two studies commissioned by the Home Office to estimate the social and economic costs of illicit drug use in England and Wales. The first, carried out by Christine Godfrey and colleagues (2002), estimated the costs in 2000. The second updated these costs in terms of methodology and the data used in 2003/04 (Gordon et al, 2006). Both studies estimated the cost to society as a result of class A drug use only, while this current study aims to estimate the cost to society as a result of a wide range of illicit drug use including class A drugs as well as drugs such as cannabis. The rationale for the Home Office funded studies also differed slightly to the current study in that their aim was to produce estimates that "represent the baseline against which the effects of any changes in policy could be assessed" (Godfrey et al, 2002, pg 4). Therefore the decision to include costs was based partly on whether the cost would change as a result of changes to government policy. This current study on the other hand aims to provide a comprehensive measure of the costs to society as a result of illicit drug use, whether or not they are likely to be influenced by policy changes.

A study with a similar remit to this current one is the 2002 study that estimated the cost of illicit drug use in Canada as well as the cost of alcohol and tobacco use (Rehm et al, 2006). Although we are focusing on estimating the cost of illicit drugs on society, part of the remit for this current study is to consider extending the model to include alcohol and tobacco. Therefore, while the Canadian study is not as relevant as the Home Office commissioned studies in terms of its geographical and social profile, it is a useful study to examine given its similar remit.

Methods for constructing the cost model

Both Home Office studies estimated the cost to society by considering the consequences of class A drug use by three different drug using populations, in terms of levels of use as well as problems associated with these different levels of use. These groups were labelled young recreational, older regular and problematic drug users. Problematic users were defined as those whose use of drugs was an essential

part of their life and this intense use was impacting negatively on their life. Where this was not the case, then the person was defined as a recreational user; and was defined as a young recreational or older regular user depending on whether the person was under or over 25 years.

This split seems sensible when considering the possible consequences of problematic drug use, which would by definition, be more serious than those experienced by recreational drug users. Thus, by attaching costs to the consequences and combining with prevalence figures for recreational and problematic drug users a more realistic and precise model of the social and economic costs of class A drug use can be constructed. However, while it was appropriate to split the recreational group by age in order to model the impact of specific policies on young recreational drug users, there is not such a need to do so in this current study.

Costs (or consequences) were considered for five different domains: health, work, driving, crime and other social consequences for each of the three drug using populations. They were then categorised into one of six different groups depending on who bore the cost (e.g. the user themselves, families, the public sector etc). Although the five domains seem quite comprehensive, the rationale for using the estimates to model policy changes meant that some costs were not included in the model since they would not be changed by policy changes. Therefore costs such as treatment and law enforcement costs were not included in the model. Other costs, for example drug driving costs, were included in the model but it was not possible to estimate a cost due to the limitations on available data relating to drug driving.

In contrast, the Canadian study in line with the 'International Guidelines for Estimating the Costs of Substance Abuse' (Single et al, 2001) did not split the drug using population when considering what consequences, or costs should be included in their model. The categories of costs included in the Canadian model were similar to Godfrey et al's cost domains, namely: direct health care costs, direct costs of law enforcement attributable to illegal drugs and other substance-attributable matters and indirect costs such as lost productivity. However, their list was more comprehensive and included costs such as inpatient specialised treatment and costs for prevention and research.

Estimating the cost consequences

The authors of both Home Office reports on the social and economic costs of class A drug use used two methods to estimate the costs included in their model. Where possible they used risk probabilities (the probability that a person will experience a certain consequence as a result of their drug use), calculated using sources such as the NTORS study (National Treatment Outcomes Research Study) which gathered a wide variety of information on the health, criminal and social status of problematic drug users. The risk probability was then applied to the prevalence estimates for each of the three drug using populations, thus producing an aggregated estimate of the cost of class A drug use that modelled the different consequences in terms of severity and level experienced by the three different drug using populations.

Where it was not possible to use risk probabilities, particularly pertinent to the young recreational and older regular users, the authors used available data on the current level of consequences. For example, it was not possible to estimate the probability of a drug related death by a young recreational user using available data sources on young people's drug use. Instead the estimate was based on the number of class A

drug related deaths for the year 2000 who were defined as young recreational drug users in this study.

The first Home Office study (Godfrey et al, 2002) estimated the social and economic costs of class A drug use in 2000 to be just under £12bn while the updated study (Gordon et al, 2006) estimated the total cost for 2003/04 to be around £15bn.

3 Prevalence of Illicit Drug Use

3.1 Introduction

In this section we describe the data sources we have used to provide information on the number of people in Scotland using illicit substances. We summarise the data sources, then go on to discuss the assumptions associated with basing our estimates of the size of the market and the economic and social costs on these data sources. We describe this section as the 'prevalence model' in that we have constructed what we regard as the most likely scenario as regards to drug use in Scotland, split by age group, type or types of drugs used and severity of use.

In terms of severity of use, we split the population into two broad groups (or compartments). These are problem drug users and recreational drug users. The recreational drug use group only includes individuals aged between 10 and 64. We ignore any drug use by those less than 10 years or older than 64 years. While individuals of such ages may be using drugs, it is assumed that their contribution to the size of the markets or the social and economic costs would be negligible. Following the recommendations of the European Monitoring Centre for Drugs and Drug Addiction, the 2006 Scottish Prevalence Study estimated the prevalence of problem drug use across the 15 to 64 age range therefore for this study problem drug users range from age 15 to age 64 (thus defining all drug use by those under 15 as recreational use).

Clearly by categorising all of Scotland's drug users into two broad groups, we are in danger of ignoring much of the inherent variation amongst individuals' patterns of drug use. What we may have assigned as recreational (i.e. non-problematic) use for one person may indeed cause them more problems than a similar level of drug use amongst someone we have placed in the problem drug user category. We also try not to attach any value judgements to the two categories, although the categories may have labels that, to some readers, appear judgemental. However in order to provide estimates of the size of the drugs market in Scotland or the social and economic costs we need to recognise that some people use drugs in different ways to others and we need to split the population into at least two different groups. We could attempt to give each group a non-descriptive name, such as Group A and Group B, but such an approach could be confusing.

3.2 Case Definitions

By 'problem drug use' we typically mean illicit drug use that would often result in the users requiring social or medical intervention into their lives. That would typically mean drug treatment, however we note that a substantial number of people who we would class as problem drug users are not currently engaging in treatment. Characteristically, drug users in this compartment would not be in employment and may have criminal justice issues and often other social / medical issues such as conditions relating to the injecting of drugs. We do, however, note that some users of drugs that we would naturally associate with problem drug use, such as heroin, may be using the drug in a less problematic way than typified above.

By 'recreational' drug use we mean illicit drug use, particularly the use of drugs such as cannabis, ecstasy and powder cocaine that would not typically be seen as causing major widespread problems to the users or society. Clearly there may be patterns of use, for example, of cannabis or cocaine that are indeed problematic, however, out of necessity we have classed all use of such drugs as recreational.

In terms of this study our definition of problem drug use has been led by the data sources available in Scotland on problem drug use, particularly the 2006 Scottish Prevalence Study. The Prevalence study defined problem drug use as illicit use of opiates and / or benzodiazepines and this study has used the same case definition. Therefore an individual who illicitly uses any opiate and / or benzodiazepine is defined as a problem drug user. Although we would also consider crack cocaine users to be problem drug users it was not possible to estimate the number of such users within the prevalence study. The way in which this issue was dealt with is discussed in a later section in this chapter.

Following on from this, we define illicit drug users as recreational drug users if their drug use does not include opiates or benzodiazepines.

These categories are not perfect, and may quite rightly be criticised as over-simplifications of Scotland's patterns of drug use. We accept this criticism; however we note that it is a necessary step within the wider analyses to estimate the size of the markets and social and economic costs. We do take steps to account for this over-simplification by including a range of consumption estimates within each group rather than just a point estimate of the amount of drugs used by, for example, recreational cannabis users.

3.3 Data Sources

The previous UK studies, based on English data, have based their estimates of the number of drug users on surveys, in particular surveys of those that have been arrested (NEW-ADAM in Bramley-Harker (2001) and the Arrestee Survey in Pudney et al (2006)). Both studies then had to base their estimates on the number of drug users on information such as the probability of arrest, the probability that if they had been arrested they were using drugs and the number of arrests.

In this study, we do not follow the approach of the two previous studies for a number of reasons. The first reason is pragmatic; there is no Scottish survey that directly compares to either the NEW-ADAM or Arrestee Survey carried out in England or Wales. There may have been merit in using data collected through the small number of drug courts or arrest referral schemes in Scotland, but this was not thought appropriate because there are too few schemes and the data from such schemes is not believed to be representative of the whole of Scotland. Instead, we based our estimates on the national estimate of the prevalence of problem drug use and the Scottish Crime and Victimisation Survey (SCVS) and the Scottish Schools Adolescent Lifestyle and Substance Use Survey (SALSUS), which are two major studies commissioned by the Scottish Government to estimate the prevalence of drug use within the general population.

As with Pudney's approach we do attempt to cross-validate the results of these surveys with other available data, however we make no attempt at correcting for under-reporting or non-response. The reason for this is primarily because making such adjustments would have been out with the scope of this study. In addition we are not convinced that there is any significant under-reporting within the SCVS or SALSUS, at least for cannabis, amphetamine, ecstasy or cocaine use. In fact, there is a risk with schools surveys that respondents may exaggerate their drug use. In an attempt to detect this, SALSUS includes a fake drug however it is not clear how they deal with respondents reported to use this fake drug. It is easy to speculate that there could be under-reporting, however, there is no real evidence to back up that assertion. Studies have been done elsewhere that show discrepancies between self-reported drug use and other measures, for example saliva or urine testing (Fendrich

et al, 2004; Harrison and Hughes, 1997), however, without carrying out these comparisons on the specific Scottish studies we are using data from, it would be wrong to conclude that there is actually any under-reporting. This could, of course, result in bias within our estimates, but we would prefer to state that we have made this assumption rather than try to account for such potential bias.

In terms of non-response bias, this could also influence the prevalence estimates from both SALSUS and SCVS. In relation to SALSUS, this would occur if those absent from mainstream schooling (for example those off sick, truanting or in alternatives to mainstream education such as residential schools or secure units, or indeed those in private education) had different patterns of drug use than those captured within the SALSUS sampling. Undoubtedly this could occur, but again without firm evidence as to the effect of such non-response we would prefer to acknowledge it in our assumptions rather than try to account for it. There may also be non-response bias in the SCVS. It is difficult to account for the perhaps significant non-response bias when considering heroin or crack cocaine users who will be in accommodation that is not entirely amenable to the typical household survey (including homeless accommodation, temporary accommodation or prison). We have therefore quantified the use of such drugs from means other than surveys, and have assumed that no problem drug users will be included in the SCVS sample. For the use of other drugs (such as cannabis and cocaine) there may be a degree of non-response bias, but again attempting to account for this would have been outwith the scope of this study.

Our definition of problem drug user is led by the available data, in this case, the national prevalence study (Hay et al, 2009) and DORIS, the Drug Outcomes Research in Scotland study[1]. We have also obtained information from the Scottish Drug Misuse Database[2], but we have found that it was not particularly useful for feeding into the prevalence model for this study for a number of reasons that will be discussed in a later section.

We are using the national prevalence study and DORIS to estimate the use of all the different types of drugs used by problem drug users. So in effect, we are assuming that problem drug users (such as those that use heroin or crack cocaine) would be unlikely to be participating in household surveys such as the Scottish Crime and Victimisation Survey. We have therefore estimated the number of problem drug users using cannabis (and thus the amounts they use) from the national prevalence study and DORIS rather than assuming they use the same amount found Scotland-wide from the SCVS.

3.4 Problem Drug Users

To estimate the number of problem drug users who use different drugs we combine the results from the 2006 national prevalence study with information on the drugs used by problem drug users surveyed in the DORIS study. We first need to derive a total number of problem drug users, and define explicitly what we mean by problem drug use in this setting.

The first step is to derive an estimate of the number of opiate and/or benzodiazepine users in Scotland. The number of opiate and/or benzodiazepine users in 2006 was

[1] http://www.gla.ac.uk/departments/drugmisuse/projects/currentprojects/drugoutcomeresearchinscotlanddorisstudy/

[2] http://www.drugmisuse.isdscotland.org/sdmd/sdmd.htm

estimated to be 55,328 (Hay et al, 2009). For the purposes of this study we will refer to this population of drug users as ***problem drug users or PDUs***.

To estimate the number of problem drug users who are using different drugs two different sources could be used; the Scottish Drug Misuse Database and DORIS. The Scottish Drug Misuse Database contains records of all new clients in treatment in Scotland for any given year and is currently moving towards recording information on all clients in treatment through the new SMR25 form. This form, amongst other things, asks patients about their current illicit drug use allowing up to six different drugs to be recorded along with the amount being used and the frequency of their use. The advantage of using the Scottish Drug Misuse Database is that their data is routinely available, it is up to date and has a large sample size compared to DORIS. Despite this, however, the nature of the database is not set up to record reliable information on secondary drug use as is shown below.

The DORIS study, on the other hand, is a cohort study following an initial sample of 1,030 drug users entering treatment in 2002[3]. The cohort was followed up after 3 time periods; after 8 months, after 16 months and after 33 months. There are a number of advantages and limitations to the DORIS study that must be noted. Firstly, DORIS was set up to sample from a cross section of the problem drug using population in Scotland. It asked respondents in-depth questions on a wide range of areas relating to their life, from their illicit drug using profile to their uptake in health services and criminal history. Given that this study was for research purposes only it is felt that respondents may provide less biased answers than they would when answering questions for the SMR24/25 form when entering treatment. Even though this study only included individuals who had been in treatment at least once (in other words it excluded drug users who had never been in treatment), many of the questions asked in the first DORIS are about life before treatment. Therefore it is felt that using DORIS provides an adequate sample of problem drug users at all stages of their drug using careers.

However, as with any questionnaire that asks about behaviour in the last six or eight months there may be issues with recall. Further, there is a risk that participants may misunderstand certain questions either due to differences in the use of language by the interviewer and participant or due to the questions being too vague. Given the illegal status of drug use, DORIS participants are a covert population and so the sample size is limited at 1,030. It must also be noted that Aberdeen drug users are not well represented in this study due to the largest drug treatment agency not wishing to take part in the study.

Heroin Use

The DORIS study included 1,001 problem drug users, identified as either using any opiates or benzodiazepine illicitly, or receiving substitute treatment for their opiate or benzodiazepine use, or had been identified via prison treatment. Out of the 1,001 problem drug users, 906 reported that they were using heroin. Thus we assume that 90.50% of problem drug users use heroin. If we apply this proportion to the estimated number of problem users (55,328) we estimate that there are 50,077 heroin users in Scotland.

[3] The total DORIS sample size was 1,033, however we excluded three individuals for whom there was not a date of birth recorded.

Crack Cocaine Use

The approach described above needs to be adapted for crack cocaine users as there may be crack cocaine users who are not also opiate users. In this study we include crack cocaine use in our definition of problem drug use, such that, anyone using opiate or crack cocaine would be defined as a problem drug user. We can therefore either assume that there are virtually no individuals using crack cocaine who have not used an opiate, or we can try to estimate, from DORIS, the size of the problem user population that is using crack cocaine without using opiates.

We find from DORIS that there are only three people using crack cocaine but not using opiates. That could, however, be for a number of reasons. In particular, it could be because DORIS was designed to follow individuals from their first treatment episode and in Scotland the vast majority of treatment services are often accused of being opiate-centric. It could also be because the first sweep of DORIS is quite dated, since it was carried out in 2002 when crack cocaine use may not have been so prevalent. Unfortunately the 2006 national prevalence study did not find sufficient information to derive valid crack cocaine prevalence estimates. Although there are probably quite a few reasons why there are extremely low levels of crack cocaine use (without concurrent opiate use) in the DORIS sample, it could actually be possible that there are only a small amount of people in Scotland using crack cocaine who are not also using opiates. This is perhaps confirmed when an extract of the Scottish Drug Misuse Database is examined. Out of more than 9,000 individuals who are identified as using any opiate or crack cocaine, only 46 say they are using crack cocaine but not any opiate.

We therefore assume that the estimate of 55,328 opiate users is also a valid estimate of the number of opiate and / or crack cocaine users (or problem drug users) following the definition employed within this study. We can therefore estimate the number of problem drug users using crack cocaine in the same way as we estimated the number of opiate users using heroin. In total, 284 out of the 1,001 problem drug users stated that they were using crack cocaine. Thus we estimate that there are 15,697 problem drug users who are crack cocaine users.

Other drugs

We estimate the number of problem drug users who use amphetamines, benzodiazepines, cocaine (powder), ecstasy, and methadone (used illicitly) in the same way, by applying the proportions found in the DORIS problem drug using sample to the estimated total number of problem drug users. Table 3.4.1 summarises these estimates. As with all tables in this report, figures such as the number of days or the estimated prevalence of drug users are presented as whole numbers. All other figures are rounded to two decimal places. This can give the appearance of spurious accuracy, and hence should be interpreted with caution.

Table 3.4.1 Estimated number of users (who are categorised as problem drug users, by type of drug) using DORIS (n = 1,001)

Drug	PDUs in DORIS using drug (%)	Estimate
Heroin	90.51	50,077
Crack Cocaine	28.37	15,697
Methadone	32.57	18,019
Benzodiazepines	77.52	42,892
Cannabis	72.83	40,294
Amphetamines	11.09	6,136
Ecstasy	21.78	12,049
Powder Cocaine	26.77	14,813

There are some points worth noting from that table. In terms of powder cocaine, the 14,813 estimate describes only the number of 'problem users' who use cocaine powder. There will be other cocaine users in the recreational category. The same can be said for amphetamines, ecstasy, cannabis and benzodiazepines (although there might be some merit in assuming that benzodiazepine use is only by problem users). As we are assuming that all heroin, illicit methadone and crack cocaine use is done by problem users, the figures in the table provide what, for the moment, are our final estimates of the number of people in Scotland using those drugs. One final point to note is that the majority of problem drug users in DORIS are polydrug users. Therefore the estimates given above for each individual drug cannot be summed.

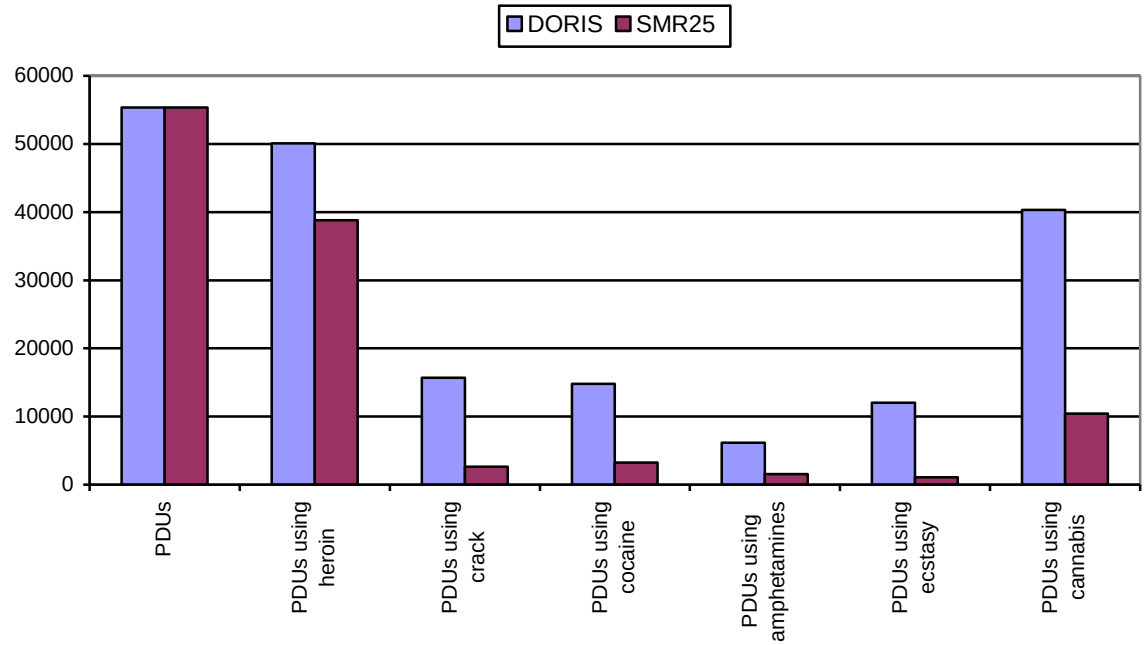
As previously mentioned, information from the Scottish Drug Misuse Database could be used to estimate how many people use crack cocaine but do not use opiates. We can also attempt to use the Scottish Drug Misuse Database data in the same manner as we used the DORIS data to try to estimate the numbers of problem users using different drugs – see table 3.4.2 below.

Table 3.4.2 Estimated number of users (who are categorised as problem drug users, by type of drug) using SMR25 data (n = 9,624).

Drug	PDUs in SMR25 using drug (%)	Estimate
Heroin	70.11	38,794
Crack Cocaine	4.73	2,622
Methadone	7.45	4,122
Benzodiazepines	34.36	19,012
Cannabis	18.85	10,434
Amphetamines	2.78	1,541
Ecstasy	1.96	1,087
Powder Cocaine	5.89	3,260

The two sets of figures are compared graphically in Figure 3.4.1 below:

Figure 3.4.1 Estimated number of users (who are categorised as problem drug users, by type of drug) using DORIS and SMR25 data.



Apart from heroin, there appears to be marked differences between the estimated numbers of problem users using specific drugs when deriving the estimates from the Scottish Drug Misuse Database data. One reason for the difference would be that the Scottish Drug Misuse Database asks about drugs used in the last 30 days whereas DORIS uses 90 days. However we suspect that much of the difference is because DORIS more accurately records secondary drug use than the Scottish Drug Misuse Database, either through more specific questioning about all illicit substances used or because an individual drug user would have less reason for not telling a DORIS interviewer about all aspects of their drug use. This is perhaps more acutely seen when looking at ecstasy, where almost ten times as many opiate users surveyed in DORIS admitted using that drug compared to within SMR25. Because of this, we intend using only the estimates derived from the DORIS data within this study.

3.5 Recreational Drug Use

We can estimate the number of drug users who are not classed as problem drug users from existing surveys.

We can use information from the Scottish Adolescent Lifestyle and Substance Use Survey (SALSUS), which is augmented for the youngest individuals by information from a study on pre-teen drug use (McIntosh et al). For adults we use the Scottish Crime and Victimisation Survey. Although there is a slight overlap between the age groups of the two studies, with 16 year olds in both the SALSUS and SCVS studies, we have used the SCVS to estimate the levels of drug use by 16 year olds, primarily because the 16 year olds in SALSUS are possibly either quite old for their peer group within school (and thus appearing quite young for a 16 year old) or have been held back a year at some point. Therefore they may not be representative of 16 year olds in Scotland.

To reiterate, we assume that all heroin, crack cocaine or methadone use is by problem drug users and thus negligible within the non-problem use group.

We based our estimates of the number of adult recreational users using particular drugs on the Scottish Crime and Victimisation Survey. As previously noted, we do not make any attempt to correct for any possible bias introduced by either non-response or under-reporting. We have assumed that all heroin, crack cocaine and methadone use occurring in this 25 to 64 year old age group to come under the definition of problem drug use. As for other drugs, we simply apply the percentage used in the last year (for each individual age) to the population of Scotland who are that age to estimate the total number of people that age who are using a particular drug.

A similar approach is taken with the data from SALSUS and the preteen study to provide estimates of the number of people aged 10 to 15 using specific drugs. These estimates are used in conjunction with the data for 16 to 24 year olds to provide estimates of the number of younger people in the recreational group. Table 3.5.1 presents our estimates of the number of recreational drug users, obtained by combining the results of the preteen, SALSUS and SCVS studies. As with the problem drug use estimates, the estimates given below cannot be summed due to some individuals using more than one drug.

Table 3.5.1 Estimated number of recreational users (used in last year)

Drug	10 to 24	25 to 64	Total
Cocaine (Powder)	67,187	32,924	100,111
Amphetamines	38,597	25,194	63,791
Ecstasy	57,367	32,499	89,867
Cannabis	191,469	129,883	321,352
Benzodiazepines	29,421	19,692	49,113

We have used these estimates relating to the last year within this analysis, primarily as we are interested in estimating the size of the market over a one year period, and also because questions relating to the frequency of use are framed in terms of the amount of times the drug is used over the past year.

3.6 Summary

We can summarise this information into a single table that presents the estimates of the number of drug user (either problem drug users or non-problem drug users).

Table 3.6.1 Total Number of Users

Drug	Problem	Recreational	Total
Heroin	50,077	-	50,077
Methadone (Illicit)	18,019	-	18,019
Crack cocaine	15,697	-	15,697
Cocaine (Powder)	14,813	100,111	115,541
Amphetamines	6,135	63,791	70,182
Ecstasy	12,049	89,867	102,418
Cannabis	40,294	321,352	363,323
Benzodiazepines	42,892	49,113	93,790

3.7 Discussion

The previous sections have presented the prevalence estimates we intend using to inform both the analyses to estimate the size of the illicit drugs market in Scotland and the estimates of the social and economic costs. There are some assumptions associated with these estimates. One main assumption is that there is a negligible number of people who use crack cocaine but who do not use opiates. This may not be the case, but we have not found any data with which we could attempt to quantify this group of problem drug users.

We have taken the estimates from SALSUS and the SCVS at face value in that we have made no formal correction for potential biases introduced by either under-reporting or non-response. It could, however, be argued that using the national prevalence estimate in conjunction with DORIS would correct (at least in part) for under-reporting and non-response, particularly for heroin, crack cocaine, methadone and powder cocaine. There could be under-reporting in SALSUS and SCVS that is not accounted for. We have, however, taken the decision that it is not within the scope of this study to alter the results of these studies without some hard evidence that the results are affected by such biases (and if they were, then it would be up to the study teams / commissioners to deal with that problem). Thus we have not followed some of what Pudney suggests as methodological improvements, although to be fair, the issue of non-response in arrestee surveys is much greater and is corrected for within the source publication (by Pudney himself).

There is also the issue (perhaps more pertinent) that we could possibly be double counting people if the SCVS did adequately pick up problem users in their sample, particularly in terms of benzodiazepine and cocaine powder use.

We have also ignored an issue that Bramley-Harker explicitly tries to account for, that is differing patterns of drug use within prison. Pudney perhaps tries to account for this by splitting the population into household-based and non-household based groups, but does not explicitly model prison drug use in a separate category. We feel that the nature of DORIS (which includes a prison sample) and our interpretation of our national prevalence estimates, coupled with the typical pattern of heroin users serving relatively short sentences makes our approach robust to not specifically attempting to quantify the size of the market within prison. However, we have no firm evidence to back up that assertion.

4 Size and Value of Illicit Drug Market

4.1 Introduction

In this section we consider information on the amounts of drugs that drug users in Scotland would typically be using and combine this information with the prevalence estimates described in the previous section to provide estimates of the total amount of drugs used in Scotland in 2006. This amount will be considered as the street amount recognising the fact that for some drugs, the actual substance purchased by the end users would not be 100% pure. As we also have pricing data (of street drugs) we can estimate a monetary value for the total amount of drugs used, thus estimating the financial size of the market along with the physical size of it. All details of this analysis along with information on the data sources used can be found in the excel file accompanying this report.

4.2 Method for estimating the size of the illicit drugs market

The method for estimating the size of the illicit drugs market is based on quite a simple premise: combine information on the number of people using drugs with the amount they typically use to estimate the total amount of drugs used in the country. Combining this with information on the average price of drugs then allows a monetary value for the size of the market to be derived. Indeed, the approach is so straightforward you can skip a stage by directly combining information on the amount spent on drugs with the number of drug users to get the monetary value, and then use price estimates to calculate backwards to get the total amount used.

The actual analyses are, however, not so simple. They need to take into account difficulties in obtaining reliable estimates of the numbers of drug users; not just an overall total but numbers split by different types of drug (including those who use more than one type of drug). They also need to recognise that different types of drug user typically use differing amounts of drug and thus spend different amounts on drugs. This is obvious when comparing a 13 year old who has, on a few occasions, smoked a cannabis joint with a heavily addicted heroin user who injects their drugs several times a day. This issue becomes a bit more difficult when we begin to consider the point at which regular use of a substance could be considered problem use.

We therefore combine information on the number of drug users, split into the two groups of recreational users and problem drug users, with estimates of the amount of the drug used within a given year. We obtain the estimated amount of drugs used from a range of different sources, including the DORIS survey. Some sources provide information on the amount of a drug used within an individual drug use episode and this needs to be scaled up to provide information on the amount used per year by combining with information on the frequency of use.

4.3 Problem Drug Users

Heroin

From DORIS, problem drug users who use heroin use on average 64 days out of 90, which would equate to 261 days per year. On the basis of their responses within the DORIS survey, on average they use 0.89 grams per day, giving a total yearly use estimate (per heroin user) of 232 grams. Thus, the estimated 50,077 heroin users would use 11,635,465 grams of heroin (11,635 kg, or 11.46 tonnes). Data from the

Scottish Crime and Drug Enforcement Agency (SCDEA) suggest that heroin costs, on average, £47.35 per gram. Thus, the total cost of Scotland's heroin market is estimated to be £550,939,291 or £11,002 per heroin user.

There were a small number of respondents within DORIS whose average daily drug use amount appeared unfeasible. Those who were reporting unfeasibly large amounts of heroin per day (anything over an eighth of an ounce was assumed to be unfeasible) were removed from the analyses. Those who appeared to report very small amounts of heroin use (low outliers) were retained within the analyses as there was no strong justification for assuming that the responses were wrong.

The reported amounts used within the Scottish Drug Misuse Database were also examined. Again there were responses that were unfeasibly large. Perhaps it is the larger sample in the Scottish Drug Misuse Database or the possibility that those entering the DORIS data could more easily check back with the interviewer if there was any confusion about the amount, but there were proportionately more responses in the Scottish Drug Misuse Database that did not appear to be feasible. That was one reason why we did not use the Scottish Drug Misuse Database to estimate the amount of heroin (or indeed other drugs) used in a typical drug using day by problem drug users. The other reason is that there is a suspicion that problem drug users presenting at services may exaggerate their levels of heroin use in order to obtain a larger methadone prescription.

Other Drugs

The approach taken to estimate the number of days a problem drug user typically uses heroin was also taken for other drugs. Table 4.3.1 presents information from DORIS on the mean number of days per year a problem drug user uses specific drugs. The median and semi-interquartile range is also presented.

Table 4.3.1 Average number of days used in last 90 days by drug type

Drug	Average response (90 days)	Average Number of Days (per year)	Median	25th	75th
Heroin	64	261	77	45	86
Methadone (illicit)	17	69	7	2	20
Crack cocaine	19	77	5	2	26
Cocaine (powder)	14	57	4	1	16
Amphetamines	14	57	4	1	15
Ecstasy	9	37	3	1	12
Cannabis	51	207	60	13	84
Benzodiazepines	39	158	35	10	70

The amount used on a typical drug using day (episode) for drugs other than heroin was also derived from the DORIS sample, as shown in Table 4.3.2, again with the median and semi-interquartile ranges.

Table 4.3.2 Average amount used per drug using day (episode) by drug type

Drug	Average amount used per episode	Units	Median	25th	75th
Heroin	0.89	Grams	0.63	0.42	1.06
Methadone (illicit)	57.94	Millilitres	50.00	30.00	75.00
Crack cocaine	1.64	Grams	1.00	0.50	2.00
Cocaine (powder)	1.13	Grams	1.00	0.50	1.00
Amphetamines	2.84	Grams	1.80	1.00	2.75
Ecstasy	3.50	Tablets	2.00	1.00	4.00
Cannabis	2.22	Grams	1.40	0.70	3.23
Benzodiazepines	0.13	Grams	0.10	0.05	0.15

There are assumptions relating to the average amounts used for a typical day that they use those drugs (i.e. drug using episode). One main issue (which is expanded upon below) is that many DORIS respondents reported their levels of drug use, particularly heroin use, in monetary terms rather than by weight. We therefore had to convert the monetary amount into a weight using a fixed price per gram as suggested by the SCDEA price estimates. Appendix 1 presents a summary of the issues when converting monetary expressions of the quantities used into weights.

This fixed amount per gram, which was calculated by taking the average of all reported prices from all Police Force areas, is likely to be an overestimate in some parts of the country and an underestimate in others. Moreover, the fixed amount relates to 2006 prices and not 2002/03 prices, the prices that drug users would be paying for their drugs when the first round of DORIS interviews were carried out. These issues were more pertinent for heroin use, but there are similar issues for the other drugs. For powder cocaine we would sometimes need to estimate how much cocaine would be in a typical 'line'. We took this value from an internet site[4] where it was suggested that the average 'line' contained between 35 and 100 milligrams of cocaine. We therefore assumed that there was 70 milligrams in a typical 'line'. Similarly we had to estimate how much crack cocaine would be in a typical 'rock'. This was derived directly from the DORIS data which suggested that there was, on average, 0.1 grams per £10 in rocks costing less that £100, 0.2 grams per £10 in rocks costing between £100 and £500 and 0.35 grams per £10 in rocks costing more than £500. Information on the average amount of amphetamines in a 'wrap' was also found on the internet, this time from the Independent Drug Monitoring Unit[5]. It was assumed that there was 1 gram of amphetamine in the average wrap. As ecstasy is reported in this study as per tablet and not per gram, this issue does not arise for that drug. For cannabis it was assumed that there was 0.35 grams of cannabis in a joint. Sufficient data to split the reported amounts of cannabis use into herbal cannabis use (including skunk) or cannabis resin were not available from DORIS, or indeed any other readily available data source. Separate pricing data (and amounts in weight in a joint) were available from the Independent Drug Monitoring Unit website, however, this could not be used without separate information on amounts used. We therefore assume that the 0.35 grams per joint is a suitable estimate for the average amount used, whether it be herbal cannabis, skunk or cannabis resin.

There is, however, a greater issue with estimating the amount of benzodiazepines that a problem drug user uses in a typical day, as we are combining information

[4] http://drugsproject.co.uk/?page_id=10
[5] http://www.idmu.co.uk/amphetuse.htm

about diazepam and temazepam use. We have examined the responses for diazepam use and temazepam use and used the higher amount for both the number of days (in the last 90 days) used and also the amount used per episode. Thus, in effect, we are ignoring any poly drug use (particularly within a specific day) where an individual uses both diazepam and temazepam.

4.4 Recreational Drug Users

In terms of the non-problem use we have had to resort to what Pudney has done and trawl the published and grey literature for average amounts used by non-problem users. One particularly useful source was the Independent Drug Monitoring Unit, a private company that, amongst other things, provides expert witness statements for courts, particularly on what typical amounts of personal daily use would be.

There were difficulties in estimating the number of days per year that an individual, who is not a problem drug user, uses particular drugs. The Scottish Crime and Victimisation Survey does not have enough respondents to examine this issue (apart from for cannabis use as we consider below). We use data from surveys carried out by the Independent Drug Monitoring Unit (https://www.idmu.co.uk). They group their respondents into the following frequency of use in the last year categories:

- Ten times or less
- More than ten times but not monthly
- Monthly but not daily
- Daily

It is difficult to accurately convert the responses from these broad categories into actual quantities used per year, but we have made the following assumptions. If someone responded that they used ten times or less per year, we assumed that they, on average, used 5 times in a year. For those in the second group, we assumed that they used 11 times in a year. The monthly but not daily category is quite wide and we have assumed that this could cover anyone who uses from 12 days per year (i.e. once a month) up to 364 days a year. The average would therefore be 188 days per year. Combining the proportions from IDMU with these assumed averages we get the following:

Table 4.4.1 Estimated average number of days used per year for specific drugs

Drug	Average number of days used per year
Cocaine (Powder)	47
Amphetamines	71
Ecstasy	70
Cannabis	211
Benzodiazepines	41

We also carried out an analysis from the Scottish Crime and Victimisation Survey (for those that suggested that cannabis was the drug they used most). The frequency groupings for that survey appear more useful. However the results from the Scottish Crime and Victimisation Survey suggest that the average cannabis user uses the drug 144 times per year. It may be that the sample in the Scottish Crime and Victimisation Survey under-represents those who use cannabis more frequently (or those that admit using cannabis under-report the amount they use).

In terms of amounts used per typical day by non-problem drug users, there is very little information available. For cannabis use, we used data from the Independent Drug Monitoring Unit which suggested that the average user uses 1 gram of cannabis per day. Again this has to be taken as an average over the different types of cannabis (herbal, skunk and resin). For amphetamines, it was taken to be 1.3 grams per day (Boys et al, 2002). For ecstasy, it was taken from the Independent Drug Monitoring Unit at an average of 2.92 tablets per day. Finally for benzodiazepines, it was taken as 0.07 grams per day, also from the Independent Drug Monitoring Unit website.

Price data

The price data comes primarily from the SCDEA, apart from the price estimates for Benzodiazepines. The SCDEA data contained price information from each Police Force area in Scotland for a range of quantities and types of drug. Even though there are significant geographical variations in price it was not possible to allow for this in the model. It was also not possible to determine the average quantity bought by users of the varying drugs from the available sources that could determine what price supplied by the SCDEA to use. Therefore the price used for each type of drug was calculated by taking the average price of all quantities given by the SCDEA that could be considered for personal use. These thresholds were taken from a consultation paper produced by the Home Office (2006). Although not used in regulation, these threshold levels are the only suggested levels available. In the absence of other information, this was used. As previously mentioned this average price will likely be an underestimate in some Police Force areas and an overestimate in others. A discussion on all of these issues raised above can be found in the discussion section at the end of this chapter.

The price per pill for benzodiazepines was taken to be 50 pence, with 10 milligrams taken to be the amount in the typical pill. This was primarily derived from information on diazepam. Other pricing and amounts used data that could be derived specifically for temazepam but as it is not possible to differentiate between diazepam and temazepam use in other aspects of the study, the 50 pence per 10 milligrams price was used for both drugs. This price does not however appear to contradict the available pricing data for temazepam. There were, however, some fairly major differences between the benzodiazepine pricing data on the Independent Drug Monitoring Unit website and the range of other websites with benzodiazepine pricing information. Where most websites suggest that 50 pence per pill seems appropriate, the Independent Drug Monitoring Unit website seems to suggest that the price would be about 50 pence for 20 pills. This was not seen as credible. Therefore we assumed a price of 50 pence per 10 milligrams, or £50 per gram.

The price data used in this study is presented in Table 4.4.2

Table 4.4.2 Price estimates for specific drugs

Drug	Cost	Units
Heroin	£47.35	grams
Methadone (Illicit)	£0.20	millilitres
Crack cocaine	£91.62	grams
Cocaine (Powder)	£43.86	grams
Amphetamines	£5.55	grams
Ecstasy	£3.38	tablets
Cannabis	£3.10	grams
Benzodiazepines	£50.00	grams

We are assuming that price data for problem drug users is the same as for non-problem drug users. However, as discussed later, this assumption may not be valid if problem drug users are able to source their drugs at a lower price than those who use drugs on a less regular basis.

4.5 Results

The total amount of illicit drugs consumed and the total amount spent on illicit drugs by all recreational and problem drug users in Scotland was estimated for each type of drug using the methods described in previous sections. The results are first summarised for problem drug users in table 4.5.1 below.

Table 4.5.1 Summary of the analyses to estimate the size of the problem drug use drugs market in 2006

Drug	Number of Users	Days per year	Amount per day	Units	Total Amount Used	Units	Cost	Total Cost
Heroin	50,077	261	0.89	grams	11,635,465	grams	£47.35	£550,939,291
Methadone (Illicit)	18,019	69	57.94	millilitres	71,979,075	millilitres	£0.20	£14,395,815
Crack cocaine	15,697	77	1.64	grams	1,983,705	grams	£91.62	£181,747,031
Cocaine (Powder)	14,813	57	1.13	grams	950,644	grams	£43.86	£41,695,236
Amphetamines	6,135	57	2.84	grams	989,306	grams	£5.55	£5,490,648
Ecstasy	12,049	37	3.50	tablets	1,539,318	tablets	£3.38	£5,202,894
Cannabis	40,294	207	2.22	grams	18,487,545	grams	£3.10	£57,311,388
Benzodiazepines	42,892	158	0.13	grams	881,924	grams	£50.00	£44,096,176
Total (PDU)								**£900,878,480**

Given that different units of measurement are applied to different types of illicit drugs, it does not make sense to estimate the total quantity of illicit drugs consumed by PDUs. However it does makes sense to do so when examining the total amount spent and it was in fact estimated that problem drug users in Scotland spent a total of around £900m in 2006. Since we have estimated that there are 55,328 problem drug users in Scotland, this equates to around £16,000 per PDU.

Comparisons between the amounts spent on different types of illicit drugs show that heroin has by far the biggest share of the market with around £550m being spent on it in 2006. This equates to 61% of the problem drug use market as shown in figure 4.5.1 below. Second to that is crack cocaine with PDUs spending around £180m and equating to 20% of the market. The remaining six types of illicit drug together make up the residual 19% of the market.

Figure 4.5.1 Percentage value of the problem drug use market attributed to specific drugs

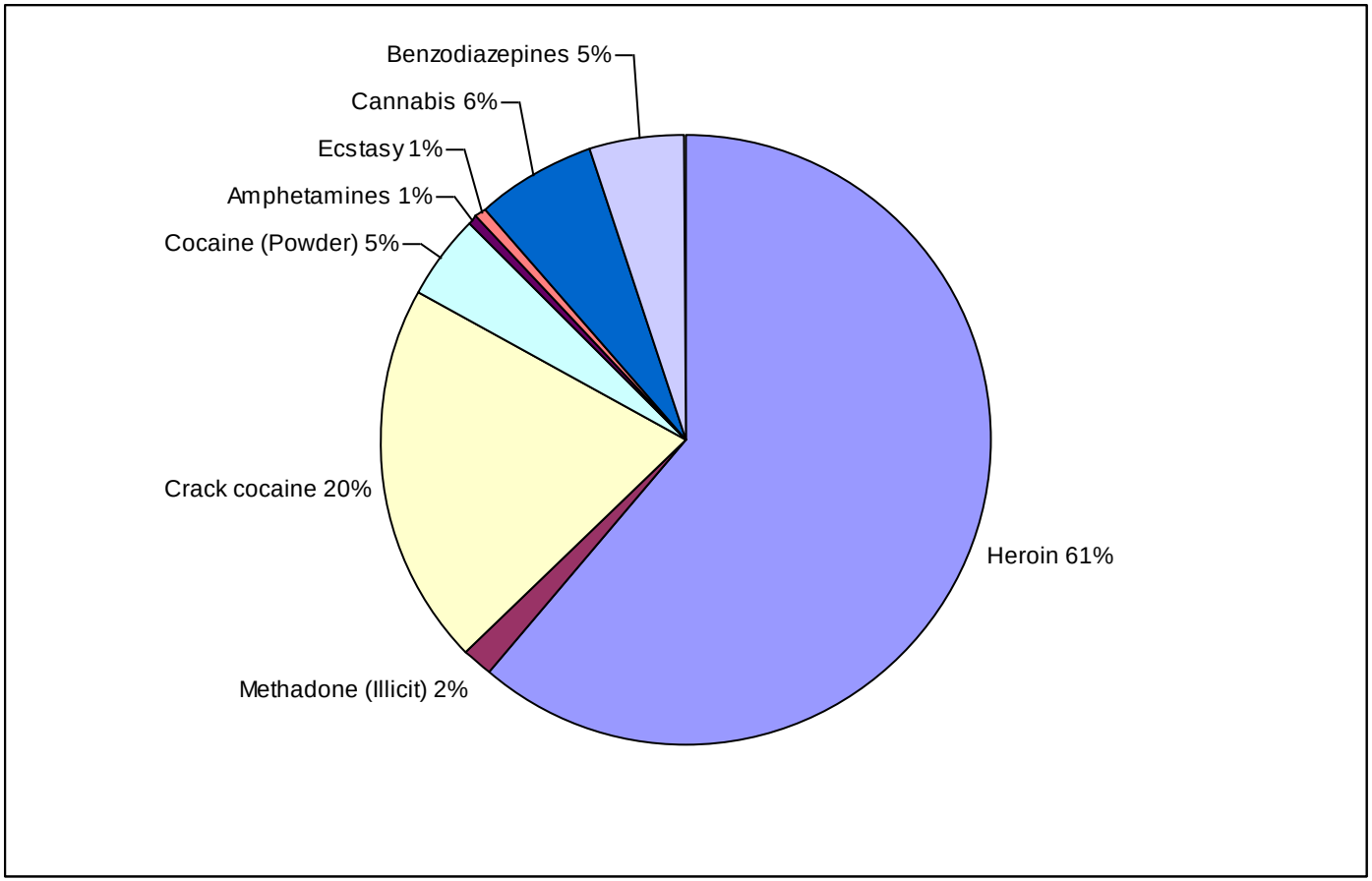
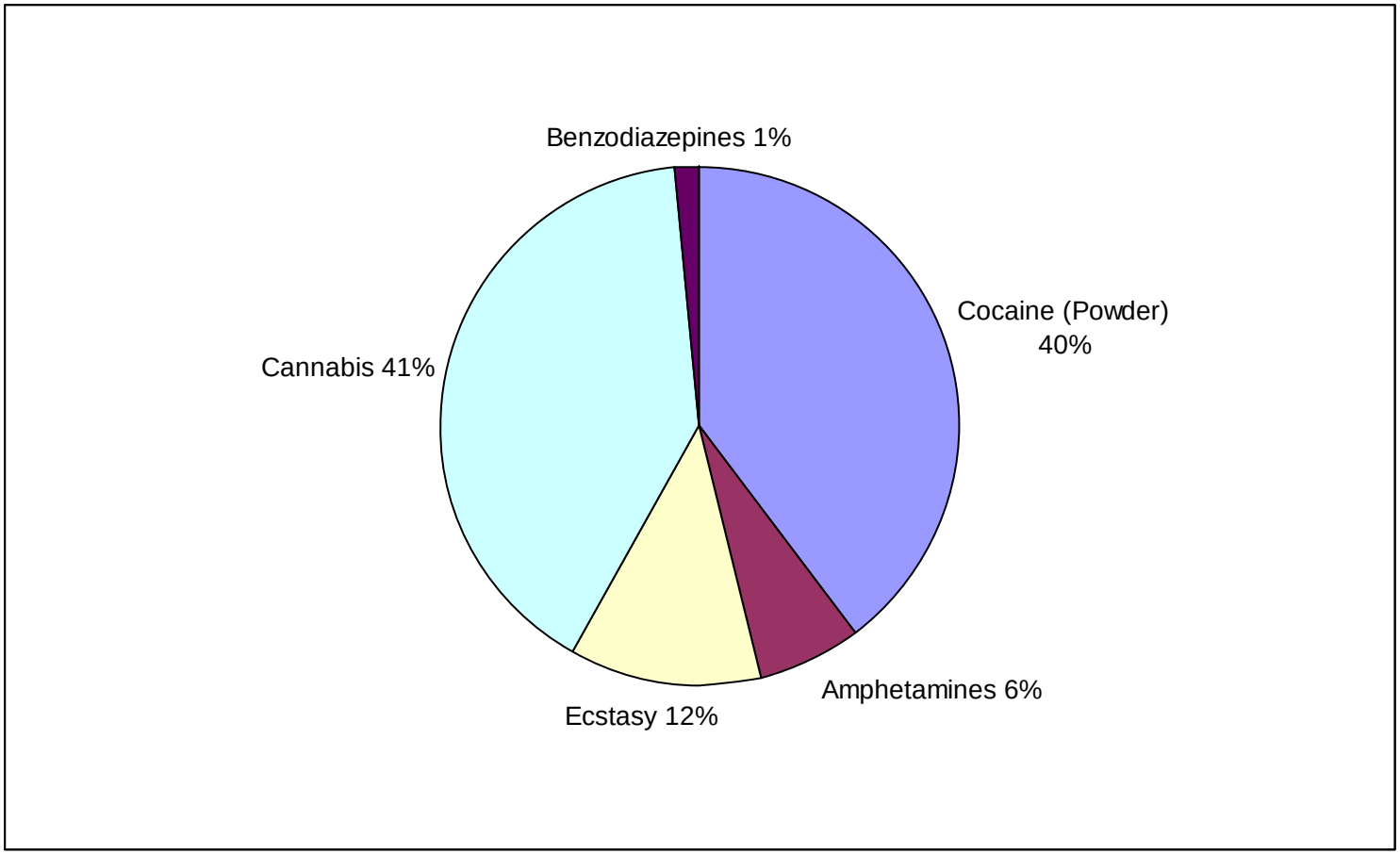


Table 4.5.2 below shows the recreational drug market to be just over half the size of the problem drug market in terms of value where it was estimated that recreational drug users spent around £500m in 2006. Powder cocaine and cannabis have the largest shares in the recreational market in almost equal measure with recreational drug users spending around £210m each in 2006. This equates to around 40% of the recreational drug market as shown in figure 4.5.2.

Table 4.5.2 Summary of the analyses to estimate the size of the recreational drug use drugs market

Drug	Number of Users	Days per year	Amount per day	Units	Total Amount Used	Units	Cost	Total Cost
Cocaine (Powder)	100,111	47	1.00	grams	4,705,217	grams	£43.86	£206,370,818
Amphetamines	63,791	71	1.30	grams	5,887,909	grams	£5.55	£32,677,897
Ecstasy	89,867	70	2.92	tablets	18,368,815	tablets	£3.38	£62,086,594
Cannabis	321,352	211	1.00	grams	67,805,272	grams	£3.10	£210,196,343
Benzodiazepines	49,113	41	0.07	grams	140,954	grams	£50.00	£7,047,716
Total (recreational)								**£518,379,367**

Figure 4.5.2 Percentage value of the recreational drug use market attributed to specific drugs



In combining both the problem and recreational estimates above, it is possible to estimate the total size of the illicit drugs market in Scotland in 2006. Table 4.5.3 below shows that drug users in Scotland spent around £1.4bn on illicit drugs in 2006. Once again heroin holds the largest share of the total drugs market where the estimate of around £550m equates to 39% of the total illicit drugs market (see figure 4.5.3). Cannabis holds a 19% share, the second largest, of the total illicit drugs market with a total of nearly £270m being spent on the drug in 2006. This is followed closely by powder cocaine, which holds a 17% share of the market with an estimate of just under £250m spent on powder cocaine in 2006.

Of the total £1.4bn spent on illicit drugs in Scotland, 63% was by problem drug users and the remaining 37% by recreational drug users. This is shown graphically in figure 4.5.4.

Table 4.5.3 Summary of the analyses to estimate the size of the total drug use drugs market

Drug	Total Amount Used	Units	Cost per Unit	Total Cost
Heroin	11,635,465	grams	£47.35	£550,939,291
Methadone (Illicit)	71,979,075	millilitres	£0.20	£14,395,815
Crack cocaine	1,983,705	grams	£91.62	£181,747,031
Cocaine (Powder)	6,838,553	grams	£43.86	£248,066,053
Amphetamines	19,358,121	grams	£5.55	£38,168,544
Ecstasy	69,344,590	tablets	£3.38	£67,289,488
Cannabis	18,628,499	grams	£3.10	£267,507,731
Benzodiazepines	881,924	grams	£50.00	£51,143,892
Total (PDU & recreational)				**£1,419,257,847**

These figures represent our best estimate of the size of different drugs markets based on the available data and given a range of plausible assumptions. However, as we emphasise in Appendix 2, the results are highly sensitive to the assumptions adopted and the “true” market size could be much higher or lower than suggested here.

Figure 4.5.3 Percentage value of the total drugs market attributed to specific drugs

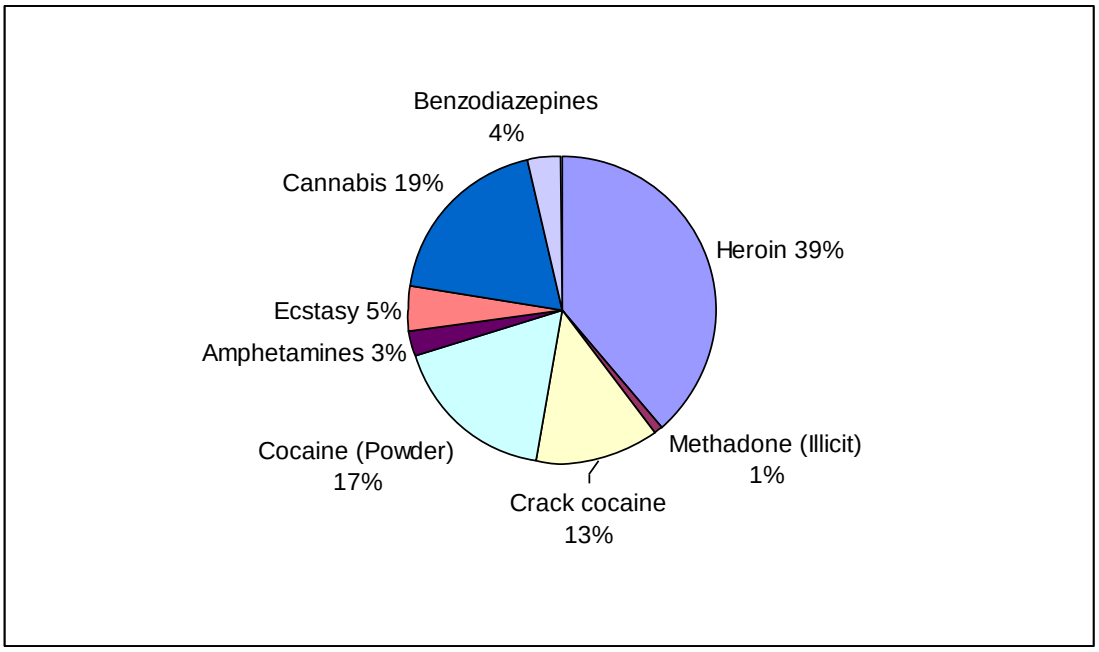
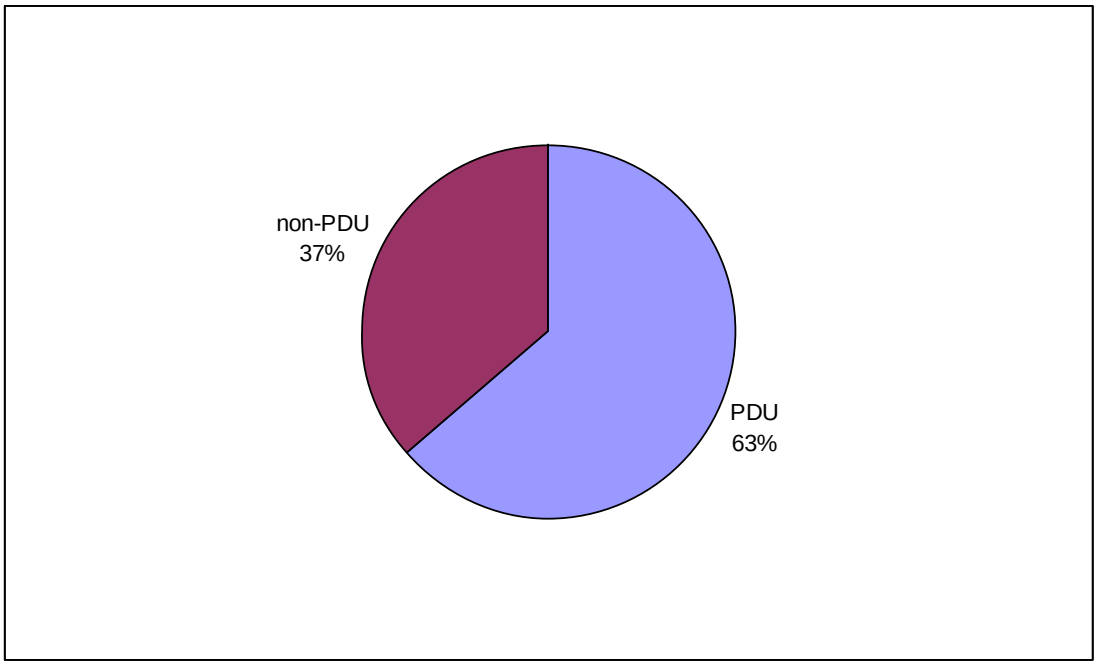


Figure 4.5.4 Percentage value of the total drugs market attributed to problem drug users and recreational drug users



4.6 Data recommendations

The data used to estimate the size of the illicit drug market in Scotland comes from a range of sources, none of which were specifically established in order to size the drugs market. The first step in the process was to divide the drug using population of Scotland into two groups which we have labelled problem drug users and recreational drug users. As previously discussed, labelling the groups as such is not without problems; however it was a necessary step in creating a model with which to estimate the size of the drugs market. This is primarily because the available data used to inform the model often comes from a range of studies. Some studies focus on problem drug users (such as the national prevalence study or the DORIS study) while other studies do not specifically target heroin or crack cocaine users in their sampling (such as the SCVS) and thus may be more suitable to quantifying recreational drug use.

In terms of problem drug use, the prevalence information was derived by combining the national prevalence study (which estimated the number of opiate and / or benzodiazepine users in Scotland in 2006) and the DORIS study which asked a specific sample of drug users who were entering treatment (possibly for the first time) about the drugs they had been using in the previous 90 days. It is possible that the DORIS survey did not accurately reflect the true levels of drug use by Scotland's problem drug users, either because the sample was not representative of all problem drug users or, since the survey was carried out in 2002, is outdated. There may be bias in the results of DORIS as respondents may have not recalled their drug use accurately, either on purpose or simply because they had forgotten. Without carrying out individual prevalence studies for each of the drugs considered within the problem drug use definition it seems likely that deriving the number of problem drug users who use, for example, illicit methadone will need to be done by combining national prevalence estimates with either a representative survey of problem drug users or information from the Scottish Drug Misuse Database. It is clearly a recommendation of this study that any future estimates of the size of the drugs market in Scotland need to be informed by the results of future national prevalence studies. Studies have, so far, been carried out on a three-yearly basis (2000, 2003 and 2006) and if there is to a 2009 study then planning for it should be carried out as soon as possible. Clearly if a future prevalence estimation study takes a different approach to estimating prevalence then there will be issues about the comparability of the prevalence estimates and therefore the comparability of any resultant estimates of the size of the drugs market. Given the disparity in the responses (between the DORIS survey and the Scottish Drug Misuse Database) of problem drug users about their use of drugs other than heroin, there should be further studies done to look into this issue.

Both of the sources of information about the prevalence of recreational drug use (the SCVS and SALSUS) are part of ongoing series of studies that should continue to examine levels of drug use in the general population. All general population surveys are open to criticism about their ability to quantify a covert and illegal activity such as drug use; however we feel it is beyond the scope of this project to make recommendations about these series of studies, other than that they should continue to provide high quality information on the levels of use of drugs in the general population.

One issue that did arise (and which is discussed in Appendix 1) is how to accurately gauge the amounts of drug used from surveys such as DORIS. This was particularly pertinent in the case of heroin use, where many respondents quantified the amount they use in 'tenner bags'. Certain assumptions were needed in converting these

responses into weights and the validity of the assumptions could be questionable and subject to variation over time and area of the country. For example a tenner bag in Glasgow could weigh more, or less, than a tenner bag in Aberdeen and it could perhaps be assumed that if the street price of heroin increased over time, then the amount in a tenner bag would decrease. A second issue that arose when examining the amounts of drugs the respondents in DORIS used was what to do with reported levels of daily drug use that appeared unfeasibly large. We have simply removed such unfeasibly large amounts from our analyses, something that may have skewed the results. A similar issue occurred within the Scottish Drug Misuse Database data; a data source we did not use to provide information on an average amount of drugs a problem drug user uses per day but does collate such information. Further work may be worthwhile in comparing the information from the Scottish Drug Misuse Database with other sources of information on the average daily amounts of drug use by problem drug users to see if this database can inform future studies.

The biggest issue with the data used to inform the models used to size the drugs market was about the amounts of drugs used by recreational drug users. The source of much of this information was from the Independent Drug Monitoring Unit which describes itself as a drug prices research company that conducts large scale drug user surveys throughout the UK and on the internet. We based the average amount of cannabis a user uses per day on information from that source. It is stated that the mean amount of cannabis used per day is 1 gram, however it is difficult to judge how appropriate it is to use that figure, given that a paper by Boys et al (2002) suggests the mean amount used per day is 1.58 grams. Further work is needed to refine the estimated amounts used per day, particularly by recreational drug users.

Finally we have needed to use the same prices of drugs, regardless of whether the person purchasing and consuming the drug is a problem drug user or a recreational drug user. It could perhaps be argued that different types of drug users are able to buy drugs at different prices. The price data we have used has come from the SCDEA and did not differentiate between the prices paid by problem drug users and those paid by recreational users. There may be merit in examining the price data from other sources, and the surveys carried out by the Independent Drug Monitoring Unit may be useful, particularly if they can be used to examine prices in Scotland.

5 Economic and Social Costs of Illicit Drug Use

5.1 Introduction

The aim of this final part of the study is to estimate the economic and social costs of illicit drug use in Scotland for the year 2006. Further it aims to evaluate the existing readily available data sources both in terms of suitability for use in such an economic model and in terms of identifying gaps where it was not possible to produce a cost estimate as a result of non existent or unsuitable data. As with the analysis detailed in chapter four of this report, the analysis used in this chapter along with information on the data sources used can be found in the excel file accompanying this report.

This part of the study is a cost of illness study since it aims to show the cost to society of illicit drug use. Essentially it examines what the saving to society would be if an "illness", in our case illicit drug use, had not existed. There are two approaches that can be taken:

- Compare the cost to society in areas that are affected by illicit drug use for the current situation in Scotland (i.e. one that has had illicit drug users for many years) with one that has never had illicit drug use

- Compare the cost to society in areas that are affected by illicit drug use for the current situation in Scotland to one where all illicit drug use ended today

Essentially the first approach uses prevalence data to produce an estimate of the social and economic costs borne in the year under review as a result of past and present illicit drug use. The second approach uses incidence data for a given year to estimate the present and future economic and social costs as a result of illicit drug use that given year. Ideally the prevalence and incidence approaches would not be mixed in one analysis. However, the available data does not allow one approach to be used throughout. Therefore a mixture of these approaches was used to estimate the social and economic costs of illicit drug use.

There are three main inputs needed to estimate the social and economic costs of illicit drug use in Scotland. The first input is the set of prevalence estimates that informs the model of how many recreational and problem drug users there are. The second input is the estimated number of occurrences of each individual consequence included in the model for both recreational and problem drug users. The final input is the unit cost to be attached to each consequence. We will begin by looking at the different inputs and will discuss what methods and data sources were used to estimate each of them.

5.2 Methods for estimating the cost consequences of illicit drug use

Following Godfrey et al's approach (2002), we first considered the consequences of illicit drug use by who bears the cost. Three separate areas of impact have been identified; the public sector, the economy and finally society such as drug users themselves or their victims of crime. Under these different groups the costs borne by each were identified and split by what type of drug user, recreational and / or problem, initiated the cost. Appendix 4 details the consequences included in the model. The methods used for estimating the number of occurrences for each

individual consequence identified in the model was led by the available data. Where possible, a bottom up approach was taken so that costs can be attributed to individual drug users. This involved calculating risk probabilities for the two different drug using populations, recreational and problem, for each consequence and applying them to the prevalence estimates for both groups of drug user. If this was not possible then the current level of occurrences for the consequence was used. However for some consequences, for example drug treatment costs, this was not possible and a top down cost had to be used instead.

5.3 Primary data sources used in the costs model

As discussed above, the three main inputs to the model are:

- prevalence estimates for the number of problem and recreational drug users
- the estimated number of occurrences of each individual consequence by type of drug user
- the unit cost to be attached to each consequence

Since the data sources used to estimate the prevalence of recreational and problem users have already been described in chapter 3, this section will focus on the data sources used to estimate the number of occurrences for each individual consequence and the attached costs. In fact, given that there are so many cost components to this model there are numerous sources that have been used to provide the cost information. These individual data sources are referenced throughout this chapter at the point in which they are used in the model.

Also discussed above was the way in which one can estimate the number of occurrences of each individual consequence: either risk probabilities can be estimated and combined with prevalence information or the actual recorded occurrences can be used on their own. The primary data source that was used to estimate risk probabilities was the Drug Outcome Research in Scotland (DORIS) study. A description of the DORIS study along with a discussion on the study's advantages and limitations were given in section 3.4 and this was borne in mind when using the DORIS data in estimating the cost of illicit drug use.

The DORIS questionnaires covered participant's drug using behaviour and treatment history as well as information about their health, criminal history and social circumstances. Given that the majority of DORIS participants would be classed as a problem drug user (PDU) following our current definition of a PDU, these participants could be extracted out and their responses examined to produce risk probabilities or average number of occurrences per PDU for a number of the consequences identified in our model. These include the average number of times a PDU would visit a GP or A&E in a year, and the probability that a PDU would commit an acquisitive crime such as burglary.

One major advantage of using DORIS is the use of three consecutive DORIS sweeps, the first, second and third, in order to aggregate the PDU population further by treatment status. Since the criteria for DORIS1 was that participants are just entering treatment but that many of the questions relate to behaviour in the six or eight months prior to the interview it seems reasonable to assume that the health and criminal behaviours reported by DORIS1 participants are most representative of PDUs not in treatment. By extracting out participants from DORIS2 who state that they are still in contact with their index treatment agency, it seems reasonable to

assume that these participants are most representative of PDUs who have been in treatment for less than a year. Similarly by extracting those participants who state they are still in contact with their index agency in DORIS3 are assumed to be most representative of PDUs in treatment for more than a year. Of course, given the fluidity of the treatment system where PDUs can change treatment agencies or drop out of treatment and then take it up again months (or years) later, it is acknowledged that such rigid definitions will not fit all problem drug users. However, it is considered the best approach to take that will allow us to model the possibly very different degrees of uptake in health services or levels of criminal behaviour by PDUs who are in varying stages of treatment.

One further point to note is that the DORIS samples include people who were in prison at the time of interview. It is obvious that those in prison have restrictions imposed on them that will mean their risk probabilities will be very different from those living in the community. For example, someone who is in prison will not be as likely to visit a GP as someone in the community, and it will be impossible for them to commit a crime such as burglary given they are incarcerated. It makes sense then to remove the prisoners from the sample.

There is, however, no equivalent in-depth study that focuses on recreational drug use where it would be possible to produce reliable risk probabilities. Therefore, all of the consequences relating to recreational drug use are based on currently reported levels of, for example, drug poisonings among recreational users.

As with the cost data, there are a plethora of sources that have been used to provide data on the number of occurrences of each consequence in the model. For the sake of clarity, these sources are discussed in the appropriate section below.

We begin by looking at direct health care costs associated with illicit drug use, followed by the costs to the criminal justice system, social care, the economy, and the wider costs to society.

5.4 Health care costs

For some of the health consequences listed in appendix 4 that relate to problem drug use it was possible to calculate risk probabilities using DORIS. These areas were: visits to accident and emergency; stays in hospital involving at least one overnight stay, visits to a GP and outpatient / community treatment appointments. For the remainder of health consequences associated with problem drug use (e.g. blood borne viruses), a number of sources that record the number of occurrences were used. These are detailed in the relevant sub-section below.

For all of the health consequences listed in appendix 4 that relate to recreational drug use it was not possible to calculate risk probabilities (see section 5.2 above for discussion). Therefore, health consequences associated with recreational drug use were estimated using the recorded number of each health consequence associated with illicit drug use in 2006. In particular figures from the Scottish Morbidity Record, SMR01 have been used.

The SMR01 database contains all records of patients who are admitted as an inpatient or seen as a day case and are receiving care in the general/acute specialities in an NHS hospital in Scotland. Excluded from this are patients receiving speciality psychiatric (which is recorded in SMR04) or maternity care, or are long stay

geriatric patients. For each case six diagnoses are recorded with the main diagnosis being recorded first.

The extract used for this study contained records from the financial year 2006/07 that related to cases where there was mention of illicit drug use in one of the six diagnoses. Specifically, records were included if one of the six diagnoses included any of the following:

- Mental and behavioural disorders due to use of opioids, cannabinoids, sedatives or hypnotics, cocaine, other stimulants including caffeine, hallucinogens or due to multiple drug use and use of other psychoactive substances
- Poisoning by narcotics or hallucinogens
- Finding of opiate, cocaine or hallucinogens in blood

Each case from the extract was then categorised as either problem or recreational according to the diagnoses given: all six diagnoses were examined and, following this study's definition of problem drug use, cases that had a diagnosis mentioning use of any opiate was defined as problem. Further to this, it was assumed that a case which did not explicitly mention use of opiates but did mention multiple drug use was likely to be a problem drug user. The remaining cases were defined as recreational. Out of 5,805 cases 5,094 related to problem drug use and the remaining 711 cases related to recreational drug use.

There are, however, a number of issues relating to the way in which diagnoses are recorded. Although SMR01 records patients who attended A&E and were then admitted to a ward it does not record those who were only seen in A&E. The form that does record these patients is currently not well supported and ISD in fact does not include it in its published statistics. Therefore SMR01 is the only dataset suitable to use. However, it must be noted that by using SMR01 the cohort of patients attending A&E but not being admitted is not included. In addition, it is suspected that there is a widespread risk of the scenario where a patient presents to hospital with a condition related to his drug use but the person treating him/her is either unaware of this or does not record it. There is no way of estimating the extent of either problem. Nonetheless it is clear that both problems will result in the estimated cost of hospital treatment being an underestimate.

The DORIS questionnaire, however, asks respondents if they have attended A&E or stayed overnight in hospital in the last 6 or 8 months. Although this question is not limited to conditions relating to drug use only, an examination of the reasons given for staying overnight in hospital indicated that the majority of stays were related to their drug use. Therefore this figure should be similar, if a little higher, to the number of cases identified as conditions requiring treatment that was related to problem drug use in both the SMR01 and the SMR04 extract. However, there was a significant difference with 6,641 problem cases recorded in SMR01 and SMR04, and 19,305 cases estimated from DORIS. As a result it was felt that where possible the DORIS sample should be used to estimate the health consequences for problem drug users. Unfortunately it is not possible to do the same for recreational drug users. However it seems sensible then to examine all diagnoses rather than only the main diagnosis in order to include as many recreational cases as possible.

Drug related deaths

All types of drug user, but primarily problem drug users, are at risk of death as a result of toxicity, overdose or because of risky behaviour associated with their drug

use. For each death the health service will incur costs for treatment and ambulances. Other groups will also incur a cost as a result of death such as the individual's family and also the economy will suffer from lost output. However these costs are discussed in later sections.

Available sources in Scotland do not allow us to estimate the risk probability for either group of drug user. However, the General Register Office for Scotland (GROS) report the annual number of drug related deaths following the new baseline definition[6]. This includes those whose underlying cause of death was mental and behavioural disorders due to a number of psychoactive substances. However, this definition is not all encompassing as it does not include deaths from risky behaviours associated with illicit drug use such as deaths from AIDS where the risk factor was believed to be sharing needles or deaths from road traffic accidents where the driver was under the influence of an illicit drug. Therefore in the broadest sense of the term 'drug related deaths', the figure used here is likely to be an underestimate. Nonetheless this is the best available and most widely accepted source at present therefore making it the most appropriate to use in this study.

In 2006 there were 421 drug related deaths reported by the GROS. In order to split the number of deaths by the type of drug user the GROS' statistics on the cause of deaths from poisoning was examined. Although not all drug related deaths occur as a result of poisoning, it is the best available source to give an indication of the number of recreational deaths since it lists all substances involved. Other statistics relating specifically to "drug related deaths" from the GROS report only the number of deaths where individual substances were involved and thus prevent deaths from a number of drugs to be summed. A death was defined as recreational if one of the substances involved included amphetamine, ecstasy or cannabis but not opiates or benzodiazepines. There were three deaths where the only substance recorded was cocaine. While a death from powder cocaine would be classed as recreational, a death from crack cocaine would be classed as problem. However it is impossible to differentiate between crack and powder cocaine when testing. For the purposes of this study, and given the small number, these deaths were assumed to be from powder cocaine and so recreational.

Twenty two recreational deaths were identified and then subtracted from the 421 reported drug related deaths in Scotland in 2006. Thus we estimate there were 399 deaths from problem drug use.

Table 5.4.1 below details the estimated number of deaths and the attached costs. The unit health service cost of a death used was the Department of Transport's reported health service cost of a death in 2005 (2007) and uprated to 2006 values.

Table 5.4.1 Summary of drug related death costs by type of drug user

	Number of deaths	Cost
Recreational	22	£19,324
Problem	399	£350,464
Total	***421***	***£369,788***

[6] See: http://www.gro-scotland.gov.uk/statistics/publications-and-data/occpapers/01ddeaths.html for more details

Drug poisonings

Those cases of drug poisoning that did not result in death are costed here. It was not possible to calculate the probability of poisoning by an illicit drug for recreational or problem drug users from the available data in Scotland. Given the problem of under-recording associated with using SMR01 data, DORIS has been used to estimate the number of inpatient stays by problem drug users but it is not possible to estimate the number which relate to drug poisonings. A total cost for inpatient episodes by problem drug users is given later and here only the cost for recreational drug use is shown.

The extract from the SMR01 dataset for 2006/07 was used to identify the records that contained a main diagnosis indicating drug poisoning by cocaine, cannabis, LSD, magic mushrooms or other synthetic narcotic. There were 225 cases of drug poisonings and a total of 251 bed days associated with these cases. It was not possible to determine how many of these cases required an ambulance or who attended A&E. Therefore, in the absence of better information, it was assumed that all cases required an ambulance and attended A&E.

The total cost of a poisoning was calculated using £222 as the unit cost of an ambulance, £82 as the unit cost of an A&E visit and £439 as the cost of a bed day (ISD Scotland, 2007). The cost of an acute bed day was calculated from the total net cost per inpatient case for all acute specialities (£2,460) and divided by average length of stay (5.6 days) (ISD Scotland, 2007).

This yielded a total cost of £178,589 for poisonings among recreational drug users.

Drug poisonings and mental health problems related to illicit drug use

Given that it is possible to record up to six diagnoses for any patient in SMR01, there were cases where patients have been diagnosed with both a drug poisoning and mental health problems related to their recreational drug use. There were 13 such cases and a total of five bed days. Using the same unit costs above gives a cost of £6,147 for drug poisonings and mental health problems related to illicit drug use.

Mental health problems related to illicit drug use

Previous research and literature has shown that both recreational and problem drug users have experienced psychiatric problems brought on by their drug use (EMCDDA, 2005; Volkow, 2001). In Scotland those who received care in general / acute specialties are recorded in SMR01 while those who received care in mental health specialities are recorded in SMR04. Both were used to identify cases of mental illness due to recreational drug use.

The extract of 2006/07 data from the SMR01 dataset relating to recreational cases was first examined. All diagnoses were inspected showing 728 cases of mental and behavioural disorders due to cannabinoids, cocaine, hallucinogens, other stimulants or a combination of these drugs and a total of 899 associated inpatient bed days. Once again, there is no information given on the number of cases attending A&E or requiring an ambulance. It was assumed that all cases went through A&E but that none required an ambulance. Although this is unlikely to be a true reflection, there is no available information that can be used to inform this part of the model. However, the effect that this input has on the total social and economic costs will be studied in a sensitivity analysis (see appendix 3).

The cost of an acute bed day was used along with the cost of A&E per episode for a proportion of the cases[7] giving a total cost of £450,178.

Similarly an extract of 2006/07 data from the SMR04 dataset was used to identify cases where there was a diagnosis containing ICD10 codes that indicated recreational drug use with the following psychiatric problems:

- Acute intoxication
- Psychotic disorder
- Amnesic syndrome
- Residual and late-onset psychotic disorder

There were 129 recreational cases identified resulting in a total of 2,745 bed days. It was assumed that there were no admissions to a psychiatric hospital that required use of an ambulance. The total cost of stays in a psychiatric hospital for a drug related condition was therefore calculated using £259, the Scottish Health Service cost of a psychiatric bed day giving a total cost of £710,955.

As before a total cost for inpatient episodes by problem drug users is given later but again it was not possible to identify those cases relating to psychiatric problems due to problem drug use.

Other inpatient and day cases attributable to drug use

It is expected that there may be other conditions resulting in admission to hospital such as accidents due to being intoxicated or heart problems from cocaine use. For those assumed to be recreational cases in the SMR01 extract, all diagnoses were inspected. There were 11 cases with conditions that are known to be linked to illicit drug use that also had a further diagnosis of illicit drug use resulting in six inpatient bed days. A proportion of these were assumed to have gone through A&E and / or required an ambulance[8]. The cost of such cases was then added to the cost of the six inpatient bed days yielding a total cost of £4,914.

Uptake of health services by problem drug users

As already discussed using the DORIS sample to estimate drug related hospital costs is preferred over the SMR01 subset. The DORIS questionnaire asks respondents how many times they have accessed a variety of health services over the last six or eight months. This includes asking the number of times they have visited A&E, the number of days they have stayed overnight as an inpatient, the number of outpatient or community treatment appointments (not including treatment for drug addiction) they have attended and the number of times they have visited their GP. Given the negative impact that problematic drug use has on the individual's health it is expected that PDUs will place an additional burden on all of these health services and their costs should be included in the model.

[7] The proportion used was the proportion of inpatient cases that were emergency admissions (ISD, 2007)

[8] The proportion of cases that required an ambulance and A&E was estimated by looking at conditions related to drug use and judging whether that condition would have required an ambulance and/or A&E

It is expected that males and females may have different probabilities for attending health services. Further, PDUs who are in different stages of drug treatment may also have different probabilities of attending health services given the expected increase in stability for those remaining in treatment. It makes sense then, to split the problem drug using population by gender and by treatment status when calculating the rate of PDU visits to A&E, their GP etc in a year.

For the purpose of this study which is to estimate the *additional* cost of drug use, it is important that the use of health services for conditions unrelated to a PDU's drug use are not costed. With this in mind the average rate of visits to A&E, to the GP etc for all males and females in Scotland should be subtracted from the rates found in DORIS to give rates that can be attributed to drug use only. However it was only possible to do this for GP visits and inpatient stays since only the average number of inpatient bed days[9] and the average number of GP visits[10] for males and females in Scotland are available. Therefore, in the absence of data on the number of A&E visits and outpatient appointments for the general population, it was assumed that *all* visits to A&E and *all* outpatient appointments by PDUs are related to their drug use. This assumption is validated when examining the reasons given for attending A&E and community treatment or outpatients in the DORIS survey since the overwhelming majority can be directly attributed to drug use. (See appendix 5 for details of the calculations)

The annual rate of visits to A&E for each problem drug user was:

- 1.1 visits per male user not in treatment
- 0.8 visits per female user not in treatment

- 0.6 visits per male user in treatment for less than a year
- 0.5 visits per female user in treatment for less than a year

- 0.6 visits per male user in treatment for over a year
- 0.4 visits per female user in treatment for over a year

These rates were applied to the estimated number of male/female problem drug users not in treatment, in treatment less than a year and in treatment more than a year to give the estimated total number of visits to A&E per year. The total cost of visits to A&E was calculated by multiplying the number of A&E visits by £82, the cost of an A&E visit (ISD, 2007) and adding £222, the cost of an ambulance (ISD Scotland, 2007) for a proportion of these attendances[11]. Table 5.4.2 below shows the total cost:

Table 5.4.2 Summary of A&E costs

	Number visits / year	Cost
Problem drug users	46,034	£9,804,388

[9] Number of bed days occupied by emergency continuous inpatient stays, ISD Scotland (2007)
[10] Rate of GP consultations per 1,000 population, ISD Scotland (2007)
[11] The proportion of cases that required an ambulance was estimated by looking at conditions related to drug use and judging whether that condition would have required an ambulance

Inpatient bed days by problem drug users

The same approach was used to estimate the number of inpatient bed days as was taken to estimate the number of visits to A&E. Thus by subtracting the average number of bed days by all males and females in Scotland from the number calculated for male and female problem drug users, the number of bed days due to drug use is found. This gave estimated annual rates of:

- 4.6 bed days per male user not in treatment
- 7.2 bed days per female user not in treatment

- 1.7 bed days per male user in treatment for less than a year
- 2.4 bed days per female user in treatment for less than a year

- 1.2 bed days per male user in treatment for over a year
- 0.9 bed days per female user in treatment for over a year

Again the total number of inpatient bed days was calculated using the rates then multiplied by £439, the cost of an inpatient bed day[12] to give the total costs shown in table 5.4.3:

Table 5.4.3 Summary of inpatient costs by type of problem drug user

	Number bed days/year	Cost
Problem drug users	210,103	£92,235,081

Outpatient & community treatment appointments

Once again the same approach was used as above to estimate the cost of outpatient and community treatment appointments for drug related conditions. Like the A&E cost, there was no figure available on the average number of appointments for males and females in Scotland. Therefore it was assumed that all appointments attended by PDUs were related to their drug use. The estimated rates were:

- 1.1 appointments per male user not in treatment
- 3.2 appointments per female user not in treatment

- 1.5 appointments per male user in treatment for less than a year
- 2.7 appointments per female user in treatment for less than a year

- 1.1 appointments per male user in treatment for over a year
- 2.5 appointments per female user in treatment for over a year

The rate of appointments per problem drug user was applied to the population of PDUs in Scotland and multiplied by the unit cost of an outpatient appointment which was £100[13]. The total costs are given in table 5.4.4 below:

[12] Cost of an acute bed day was calculated from the total net cost per inpatient case for all acute specialities: £2,460 and divided by average length of stay (5.6 days)
[13] http://www.isdscotland.org/isd/360.html

Table 5.4.4 Summary of outpatient / community treatment costs by type of problem drug user

	Number appts/year	Cost
Problem drug users	96,202	£9,620,250

GP visits

Once again using the same approach as above produced the following estimated rates:

- 1.9 visits per male user not in treatment
- 1.4 visits per female user not in treatment

- 1.3 visits per male user in treatment for less than a year
- 1.5 visits per female user in treatment for less than a year

- 0.0 visits per male user in treatment for over a year
- 1.1 visits per female user in treatment for over a year

These rates were applied to the estimated number of male/female problem drug users not in treatment, in treatment less than a year and in treatment more than a year to give the estimated total number of visits per year. There is no up to date cost of a GP consultation based on Scottish data so the cost of a GP consultation is based on English data (Curtis, 2007). The cost given is from 2005/06 and so was uprated to 2006 values to give a cost of £31 per GP consultation. The total number of visits to a GP was combined with this cost and the total cost is given in table 5.4.5 below:

Table 5.4.5 Summary of GP costs by type of problem drug user

	Number visits/year	Cost
Problem drug users	75,532	£2,369,413

Special needs in pregnancy

There is much evidence to suggest that mothers who are problem drug users are in need of more care than mothers who are not problem drug users (Johnson, 2003). The latest figures on the number of maternities where the mother had a diagnosis of drug misuse are from 2005.

Although there is information on the number of drug using mothers, there is no information on the additional cost borne by the health service for each of them. However, one part of this cost that could be included is the expenditure by a specialised service aimed at helping pregnant mothers with social problems including drug use known as SNIPS (Special Needs in Pregnancy Service). They reported spending £141, 651 in the Corporate Action Plans that were submitted by each drug action team to the Scottish Government.

Newborn health problems as a result of the mother's drug use

It is known that babies born to dependent mothers are at risk of serious health complications, such as being very underweight, premature and dependent

themselves. ISD Scotland (2006) reported that there were 300 neonatal discharges which included a diagnosis of drug misuse in 2005. Although the latest figure on this is from 2005, it is assumed that the number in 2006 will not have changed significantly from 2005 so using this figure is a good enough proxy. The 300 cases were split into the three groups of problem drug user by calculating the proportion of pregnant women in DORIS 1, 2 and 3 who reported not changing or increasing their drug use during their pregnancy.

The Scottish Health Service Costs for 2006/07[14] give a cost of £7,021 per case for a stay in the special care baby unit and the number of cases with the associated cost is given in table 5.4.6 below:

Table 5.4.6 Summary of newborn health costs by type of problem drug user

	Number	Cost
Problem drug users	300	£2,106,300

HIV / AIDS

Injecting drug users are at risk of contracting a number of blood borne viruses including HIV. For the purpose of estimating the cost of HIV or AIDS treatment the cohort of injecting drug users has been split into four separate groups depending on what stage the virus is at. They are: new HIV cases; existing HIV cases where the injecting drug user is asymptomatic; existing HIV cases where the injecting drug user is symptomatic and cases where HIV has developed into AIDS. This is necessary since, depending on what stage the virus is at, there will be different treatments used and therefore different costs attached.

Figures of new and existing cases of injecting drug users who have HIV and whose HIV has developed into AIDS are published annually by ISD Scotland (2007). Amongst the injecting drug using population there were:

- 25 new cases of HIV in 2006
- 598 existing cases of HIV in 2006
- 4 new cases of AIDS in 2006
- 439 AIDS cases registered between 1985 and 2006

However, there are currently no reports on the numbers of HIV patients who are asymptomatic or symptomatic. Further, the figures reported for AIDS cases do not give an indication of how many are receiving treatment in 2006. The Public Health Laboratory Service reported the proportion of known cases that were asymptomatic and symptomatic in 2001 (cited by Godfrey et al, 2002). Of all known cases of HIV 25.9% were asymptomatic, 48.8% were symptomatic, 28% had AIDS and 1.8% had died (cited by Godfrey et al, 2002). Since the figures used for this study only include live cases, these percentages were scaled so that the percentage of those asymptomatic, symptomatic or have developed AIDS sum to 100%. Thus, 25.2% of known cases were asymptomatic, 47.5% were symptomatic and 27.3% had AIDS.

[14] http://www.isdscotland.org/isd/360.html

Godfrey et al (2002) reported expenditure estimates under combination therapy per person per year. These were up rated to 2006 values giving:

- New HIV cases £218,296
- Asymptomatic £15,773
- Symptomatic £16,764
- AIDS £28,660

Table 5.4.7 below shows the total cost at each stage of the disease:

Table 5.4.7 Summary of costs for HIV and AIDS treatment

	Number	Cost
New HIV cases amongst injecting drug users	25	£5,457,401
Existing HIV cases where the injecting drug user is asymptomatic	151	£2,378,717
Existing HIV cases where the injecting drug user is symptomatic	284	£4,763,596
Cases where HIV has developed into AIDS	163	£4,672,710
Total	***623***	***£17,272,423***

Hepatitis B & C

Injecting drug users are also at risk of contracting hepatitis B and / or C. It must be noted that ISD only reports the number of new hepatitis B cases which in 2006 was 13. Using this figure with £5,519, the annual cost of treating hepatitis B, taken from Godfrey et al (2002) would mean that the total estimated cost of £71,746 for hepatitis B treatment is much less than it should be since it isn't including any of the existing injecting drug users with hepatitis B.

A different approach was taken to estimate the cost of hepatitis C among past or current injecting drug users due to the availability of more detailed information on the numbers of patients at the different stages of the disease. The 'Hepatitis C Action Plan for Scotland' (Scottish Government, 2008a) reported figures on those who had received antiviral treatment in 2006 as well as figures on who had attended a treatment centre, who had developed cirrhosis and who had developed liver failure in 2006. Although the number of patients who had received antiviral treatment and whose route of infection was injecting was reported, those who had attended treatment, developed cirrhosis or liver failure and whose route of infection was injecting was not. It was reported that 90% of hepatitis C patients acquired the disease through injecting, however it is also known that the chaotic lives that many injecting drug users lead means that only a proportion of those with hepatitis C will engage with services. An indication of this is shown in the uptake of treatment: even though 90% of hepatitis C patients were or are injecting drug users, it is known that only 50% of those who received antiviral treatment were past or current injecting drug users. It was assumed that there would be a similar proportion attending treatment centres as those who received treatment (i.e. it was assumed 50% of those attending treatment centres were injecting drug users). However given the severity of liver failure and cirrhosis, it was assumed that 90% of those who had developed liver failure or cirrhosis were injecting drug users. Therefore:

- 225 injecting drug users with hepatitis C received antiviral treatment
- 2,000 injecting drug users with hepatitis C attended treatment centres
- 225 injecting drug users with hepatitis C developed cirrhosis
- 99 injecting drug users with hepatitis C developed liver failure

The report, 'Health benefits of antiviral therapy for mild chronic hepatitis C: randomised controlled trial and economic evaluation' (Wright et al, 2006) details the mean annual unit costs of different stages of hepatitis C. The annual costs used from this report were:

- Antiviral treatment: £7,141
- Management of cirrhosis: £1,138
- Monitoring for mild Hepatitis C (used as a unit cost for all patients attending a treatment centre): £138

A similar report, 'The cost-effectiveness of testing for hepatitis C in former injecting drug users' (Castelnuovo, 2006) gave the cost of waiting for a liver transplant as £9,123.

The total cost of hepatitis C among former and current injecting drug users is given in table 5.4.8 below:

Table 5.4.8 The cost of hepatitis C among former and current injecting drug users

	Number	Cost
Uptake antiviral treatment	225	£1,606,725
Attending treatment centres	2,000	£276,000
Developed cirrhosis	225	£256,050
Developed liver failure	99	£903,161
Total	***2,549***	***£3,041,936***

Substitute prescribing

Methadone is the most commonly prescribed substitute drug for treating opiate dependency in Scotland (ISD Scotland, 2007). It is therefore important to include the cost of prescribing methadone in 2006 in our model. ISD (2007) reported there were 489,447 prescriptions for methadone in 2006/07 and the total cost of dispensing this was £12,683,660.

Although methadone is not the only substitute drug that is used to treat opioid dependency, there is no source of data available that reports the number of prescriptions for other drugs. One of the reasons for this is that, unlike methadone, drugs like diazepam or dihydrocodeine are also prescribed for reasons other than to treat an opiate dependency. Therefore it was not possible to estimate the cost of other substitute prescribing.

Other health costs allocated on a top down basis

For a number of health areas associated with illicit drug use, it was not possible to estimate a cost using a 'bottom-up' approach either because it was not possible to estimate the number of PDUs who would be incurring a cost in that health area or because it was not possible to find a unit cost for that health area. For example, although it was possible to estimate the number of problem users in treatment, it was not possible to estimate the total annual cost of drug treatment using this figure since there is not currently information available on the unit cost of drug treatment in Scotland.

For a number of these health areas, an estimate of the total cost can be found from the Corporate Action Plans[15]. These include drug treatment, dual diagnosis services, toxicology costs, dental costs, harm reduction services and health promotion / prevention costs. It is difficult to assess the completeness or accuracy of these Corporate Action Plans and there may be costs missing from them. However it is currently the best available information. Other health costs not included in the corporate action plans have been taken from a report that detailed Scottish Government spending on tackling drug and alcohol misuse (Health and Sport Committee, 2007). Although this report details the Scottish Government allocation of money to different groups, this is not necessarily an indication of the actual amount spent by these groups. Therefore the amounts given here are assumed to be the minimum amount spent in 2006/07. The total top down cost was apportioned to the recreational and problem drug using groups by examining what proportion of the existing health costs were incurred by the two groups and applying the same proportion. All costs split by type of drug user are listed in table 5.4.9 below.

Table 5.4.9 Health costs allocated on a top down basis by type of drug user

Description	Source	Recreational £	Problem £
Drug treatment	CAPs	£209,123	£22,827,123
Dual Diagnosis services	CAPs	£8,236	£899,036
Toxicology	CAPs	£1,570	£171,398
Dental costs	CAPs	£20	£2,206
Harm reduction services	CAPs	£11,469	£1,251,963
Health promotion / prevention	CAPs	£1,257	£137,180
Support for ADATs (drug specific)	CAPs	£13,617	£1,486,383
Support for Scottish Association of Alcohol and Drug Action Teams (drug specific)	CAPs	£930	£101,570
Communications budget for ADATs (drug specific)	CAPs	£590	£64,410
Scottish Government Justice Analytical Services Division	Health & Sport Committee	£4,049	£441,951
Chief Scientists Office	Health & Sport Committee	£1,235	£134,765
Health Education Board for Scotland	Health & Sport Committee	£11,938	£1,303,062
Hidden Harm	Health & Sport Committee	£2,723	£297,277

Total health costs

Healthcare costs for both drug using groups were summed to give a total health care cost. For recreational drug users this cost includes:

- the health care cost of all recreational drug related deaths
- the cost of all recreational drug poisonings
- the cost of all recreational mental and behavioural disorders that involved a stay in an acute / general hospital associated with a number of ‘recreational’ drugs including cannabis

[15] http://www.drugmisuse.isdscotland.org/dat/cap/0607.htm

- the cost of all stays in a psychiatric hospital as a result of their recreational drug use
- the cost of other drug related conditions recorded in SMR01
- the health costs allocated on a top down basis to the recreational drug using group

For problem drug users this cost includes:

- the health care cost of all drug related deaths where the person was a problem drug user
- the cost of neonatal care needed as a result of the mother's drug use
- the cost of treatment for HIV, AIDS, hepatitis B and hepatitis C for those infected as a result of injecting
- the cost of GP consultations, visits to A&E, outpatient appointments and overnight stays in hospital as a result of their drug use
- the cost of methadone prescribing
- the health costs allocated on a top down basis to the problem drug using group

Table 5.4.10 Total cost to health service (incl top down costs) by type of drug user

	Total health cost
Recreational drug users	£1,636,865
Problem drug users	£178,815,635
All drug users	£180,452,500

Health care costs per problem user

All total health care costs where it was possible to aggregate by treatment status were aggregated into costs for those who were not in treatment, those in treatment less than a year and those in treatment more than a year. Each of the three total costs were then divided by the estimated number of problem drug users in treatment, in treatment less than a year and in treatment more than a year to give a cost per problem drug user. The only costs where it was not possible to aggregate by treatment status were those associated with treatment of blood borne viruses and the costs allocated on a top down basis. These costs are not included in the health costs given below.

Table 5.4.11 Average cost to the health service for problem drug use by treatment status

	Health cost
% not in treatment	£3,005
% in treatment <1yr	£1,536
% in treatment >1yr	£1,173

Perhaps not surprisingly, it can be seen from the table above that the problem drug users who were not in treatment cost more in health care than those in treatment. In fact the cost per PDU is more than doubled when comparing those not in treatment with those in treatment for more than a year.

5.5 Criminal Justice costs

Given the illegal status of the drugs we are costing, the one obvious cost incurred by the criminal justice system would be the criminal justice costs of drug offences. Literature also shows that problem drug users can become involved in other criminal activity, particularly acquisitive crime, as a result of their drug use (Allen, 2005; Seddon, 2000). The DORIS surveys ask participants about a range of crimes they may have committed in the past three months and how often they have committed them (See appendix 6 for question). Assuming that DORIS participants are representative of problem drug users with respect to their criminal behaviour, the three sweeps of DORIS can be inspected and used to calculate the incidence of crime among problem drug users. A number of these crimes were included in our model, namely:

- Drug offences
- Theft from a person
- Theft from a house
- Shoplifting
- Theft from a vehicle
- Theft of a vehicle
- Handled stolen goods
- Fraud / forgery
- Assault
- Criminal damage
- Drug driving
- Soliciting
- Breach of the peace

It should be noted that since there is currently no available evidence of recreational drug users carrying out crime as a result of their drug use, we have assumed that there is no criminal justice cost associated with recreational drug users for such crimes. Further it must also be noted that all crimes committed by problem drug users were assumed to be related to their drug use.

Calculating the incidence of crime

Assuming that each PDU in DORIS will follow a similar pattern of criminal activity in subsequent months, the total number of times a PDU from DORIS has carried out a particular crime in a year can be calculated by multiplying the number of times they have committed a crime in the past three months by four. Using the population of DORIS it is possible to calculate a rate of the number of times a particular crime is committed per PDU.

Given that males and females may have different offending patterns from one another it seems sensible to split the DORIS sample by gender to give a rate per male PDU and a rate per female PDU. The rates per male and female PDU have been summarised in table 5.5.1 and table 5.5.2 respectively. These rates can then be multiplied by the estimated number of male and female PDUs in Scotland and summed together to give a more accurate total number of crimes committed in Scotland by PDUs.

Table 5.5.1 Rate of crime committed in last year per male PDU

	Not in treatment	in treatment <1yr	in treatment >1yr
Shoplifting	54.91	13.60	2.88
Theft from a house	3.12	0.32	0.14
Theft from a person	4.08	0.58	0.35
Fraud / forgery	5.20	8.22	1.05
Theft from a vehicle	6.73	2.73	0.50
Theft of a vehicle	2.62	1.52	0.07
Handling stolen goods	33.13	18.13	8.00
Assault	2.61	0.99	0.49
Criminal damage	1.30	0.35	0.28

Table 5.5.2 Rate of crime committed in last year per female PDU

	Not in treatment	in treatment <1yr	in treatment >1yr
Shoplifting	61.08	23.30	16.76
Theft from a house	2.24	0.05	0.00
Theft from a person	4.26	0.22	0.00
Fraud / forgery	9.29	2.76	0.10
Theft from a vehicle	0.11	0.27	0.19
Theft of a vehicle	0.06	0.00	0.00
Handled stolen goods	32.34	5.32	3.52
Assault	0.89	0.70	0.10
Criminal damage	0.43	0.00	0.00

Attaching costs to crimes committed by PDUs

The Home Office has produced two reports (Dubourg and Hamed, 2005; Brand and Price, 2000) that, between them, allow a cost of crime to be attached to the incidence of crime estimates described above. Although not Scottish costs, these are the best costs available for the purposes of this study and so have been used where possible.

The criminal justice costs reported in both studies include police costs, prosecution costs, court costs, legal aid costs, prison / probation costs and criminal injuries compensation. All of the cost components are weighted by the probability that each type of crime is first reported to the police and then by the probability that the crime is recorded, investigated, goes to court etc. Given this, it is appropriate to use estimates of crimes committed rather than crimes recorded when using these unit costs. Thus these costs are appropriate to use with the estimates constructed from DORIS which are based on crimes committed.

There is, however, one notable difference in the methodology used in both reports that impacts significantly on the criminal justice costs. The most recent study (Dubourg and Hamed, 2005) includes the future costs of dealing with crimes committed today while the study carried out by Brand and Price (2000) provides a criminal justice cost that is more a snapshot of the cost of a crime for a year. So, for example the criminal justice costs associated with a person who stole from a house in 2006 and who was sentenced to three years in prison would include a cost for the three years in prison if using Dubourg and Hamed's estimates but only include a prison cost of at most one year if using the Brand and Price's estimates. It makes sense to use the most up-to-date costs. However, for commercial crimes where a

cost using this preferred method is not available, the original cost from Brand and Price (2000) will be used.

Given that the DORIS questionnaire uses different terminology than has been used in the Home Office reports, there are some crimes in DORIS that don't map directly onto the crimes reported by the Home Office. The most problematic surrounds the issue of theft. While DORIS defines two different types of theft, 'theft from a person' and 'theft from a house', there are three different types of theft reported in the Home Office studies that would cover the two from DORIS, 'theft – not vehicle', 'burglary in a dwelling' and 'robbery'. The term 'robbery' would cover any theft, both from a person and from a house, which involved the use or threat of force to a person immediately before or at the time of a theft. The term 'burglary in a dwelling' would cover those thefts from a house that did not involve a threat of violence and the 'theft – not vehicle' would cover thefts from a person that again did not involve the threat or use of violence. From DORIS, however, it is not possible to determine what proportion of the thefts from a person and thefts from a house involved the use or threat of violence. In the absence of this data, it was assumed that the majority of thefts from a person and from a house would not involve a threat of violence. Although this may not be an accurate reflection of reality and could result in under-estimating the total costs, it is the preferred approach rather than excluding this crime from the model. Therefore the Home Office unit cost for 'theft – not vehicle' was used with the number of thefts from a person and the unit cost for 'burglary in a dwelling' was used with the number of thefts from a house.

There was also not a cost given for 'handling stolen goods'. Again rather than not including this crime in the model it was assumed that the resultant criminal justice costs would be similar to the criminal justice costs associated with shoplifting. For both reports it was necessary to uprate the unit costs to 2006-07 prices using the GDP deflator.

Table 5.5.3 below shows costs calculated by combining the criminal justice cost of each crime reported in the Home Office's report by the number of times each crime was estimated to have been committed.

Table 5.5.3 Total criminal justice cost of crimes committed in last year by all PDUs

	Total cost
Shoplifting	£50,611,921
Theft from a house	£119,730,371
Theft from a person	£46,706,360
Fraud / forgery	£189,726,490
Theft from a vehicle	£9,870,978
Theft of a vehicle	£15,755,814
Handling stolen goods	£31,289,460
Assault	£22,867,021
Criminal damage	£5,327,543
Total	**£491,885,958**

Drug offences, drug driving, soliciting and breach of the peace

The two Home Office reports on the cost of crime do not report a cost for drug possession / possession with intent to supply, soliciting, drug driving and breach of the peace offences. For such crimes the criminal justice cost used in this study

consists only of a general cost that includes cost of an arrest (Field, 1997; H.M. Treasury, 2000; Home Office, 1999). Unlike those described above the cost will not be tailored to that specific offence with respect to the probability of arrest.

Drug offences

DORIS 1, 2 and 3 were used to calculate the percentage of problem drug users in the three different treatment states who had been arrested for possession or possession with intent to supply in the last 6 or 8 months. Applying these representative percentages to the estimated number of problem drug users in Scotland who are not in treatment, in treatment less than a year and in treatment more than a year gives an estimate of problem drug users arrested in Scotland. To estimate the number of recreational drug users who had been arrested for possession / possession with intent to supply in 2006, the estimated number of problem drug user arrests was taken away from the recorded number of possession / possession with intent to supply offences. The estimated number of arrests for a drug related offence is given in table 5.5.4 below along with the associated criminal justice costs.

Table 5.5.4 Total estimated cost for drug offences by type of drug user

	Arrests	Cost
Recreational	37,940	£73,228,538
Problem	3,833	£7,397,111
Total	***41,773***	***80,625,649***

The percentage of problem drug users in the three different treatment states who reported having been arrested in the last 6 or 8 months for drug driving, soliciting or breach of the peace was found again using DORIS 1, 2 and 3. These were applied to the three populations and the estimated total number of arrests with the associated criminal justice costs is detailed in table 5.5.5.

Table 5.5.5 Total estimated cost of arrest for problem drug users

	Arrests	Cost
Drug driving	621	£1,198,339
Soliciting	256	£493,452
Breach of the peace	3,764	£7,265,132
Total	***4,641***	***8,956,923***

Other crime costs allocated on a top down basis

As with the health costs, there are some criminal justice costs that could not be estimated using a bottom-up approach. Two of the three top down costs are national agencies involved in enforcement and/or intelligence on illicit drug use where it is not possible to estimate a unit cost. The third top down cost is for criminal justice social work departments where it was not possible estimate what proportion of their time was spent dealing with cases relating to illicit drug use. Therefore although criminal justice social work departments reported their annual expenditure in 2006/07 being around £101m[16], it was not known what proportion of this expenditure relates to problem and recreational drug users. However, the corporate action plans provided by each drug action team area provide the drug related expenditure by the criminal

[16] Scottish Local Government finance statistics 2006-07

justice area and we have assumed that the cost incurred by social work criminal justice teams in Scotland will be included in this.

Once again, the total top down cost was allocated to the recreational and problem drug using groups using the proportion of the existing crime costs that were incurred by the two groups. These costs are given in table 5.5.6 below:

Table 5.5.6 Criminal justice costs allocated on a top down basis by type of drug user

Description	Source	Recreational £	Problem £
Scottish Crime and Drugs Enforcement Agency	Health & Sport Committee	£2,925,018	£20,300,982
National Criminal Intelligence Service	Health & Sport Committee	£691,899	£4,802,101
Criminal Justice Social Work Department	CAPs	£28,877	£200,423

Total criminal justice costs

All crime costs for both drug using groups were summed to give a total criminal justice cost. For recreational drug users this cost includes:

- the criminal justice costs for all drug offences involving recreational drug users
- the criminal justice costs allocated on a top down basis to the recreational drug using group

For problem drug users this cost includes:

- the criminal justice costs for all drug offences involving problem drug users
- the criminal justice costs for acquisitive crimes as well as assault, fraud and criminal damage that were committed by problem drug users (see appendix 6 for a full list)
- the cost of all arrests for problem drug users who were caught driving under the influence of drugs, soliciting or arrested for breach of the peace
- the criminal justice costs allocated on a top down basis to the problem drug using group

Table 5.5.7 Total criminal justice cost by type of drug user

	Total criminal justice cost
Recreational drug users	£76,874,333
Problem drug users	£533,543,497
All drug users	***£610,417,830***

Criminal justice cost of crime per drug using group

As expected problem drug users who are not in treatment reported committing the most crime out of all three groups and therefore contribute most to the total criminal justice costs. Excluding top-down costs, the average cost incurred by the criminal justice system for each problem drug user in the three treatment groups is detailed in table 5.5.8.

Table 5.5.8 Average criminal justice cost per problem drug user by treatment status

	Total crime cost
Problem drug users not in treatment	£12,713
Problem drug users in treatment <1yr	£6,524
Problem drug users in treatment >1yr	£1,536

5.6 Social Care costs

Children & Families

It is known that children of problem drug users often require intervention from social work. The total cost of intervention from social work should include the cost of time spent by the children and families' team on cases where parental drug use is cause for concern. For the purposes of this study, it is assumed that recreational drug use will not on its own result in intervention from children and families social work.

Forrester and Harwin (2006) examined all files going for long-term allocation in four London boroughs over on average 1 year. They reported that 11% of all families referred involved concern around heroin misuse. Assuming a similar pattern in Scotland the 11% was applied to the total annual expenditure of children & families social work teams[17] which in 2006 was £638,775,000. Since the annual expenditure reported by children & families social work teams includes money spent on looked after and accommodated children, there is no need to estimate this separately.

This yielded an estimate of £70,265,250.

Children's Panel

The Scottish Children's Reporter Administration (SCRA) reports annually the number of referrals to the children's hearing system on the grounds of "misused drugs or alcohol" and the number for "lack of parental care". The SCRA (2007) reported that in 2006 there were:

- 56,199 referrals in total to the children's hearing system
- 1,609 referrals on the grounds of "misused drugs or alcohol"
- 19,086 referrals for lack of parental care

There is no evidence to suggest what proportion of the reported referrals on the grounds of "misused drugs or alcohol" was due to drugs only. For the purpose of this study it was assumed to be 80%, giving an estimate of 1,287 referrals on the grounds of misusing drugs only. This equates to 2% of the total number of referrals to the children's hearing system.

The total annual expenditure by the Children's Panel was calculated by summing the local government contribution[18] and the expenditure of the Children's Panel itself (SCRA, 2007), reported to be £2,669,000 and £22,637,000 respectively. Since 2% of

[17] Scottish Local Government finance statistics 2006-07: Annual expenditure by Children & Families

[18] Scottish Local Government finance statistics 2006-07: Annual expenditure on Children's Panel

the total referrals were related to young people's (assumed to be) recreational drug use it is assumed that 2% of the annual expenditure is related to recreational drug use. This gives an estimate of £579,617.

Again it is not known exactly how many of the referrals for lack of parental care are due to illicit drug use. However, a study that looked at the circumstances surrounding children in Edinburgh who were made subject to a child protection order was carried out by the Scottish Children's Reporter Administration (SCRA, 2008). They reported that 78% of all cases involved children living with a parent or parents whose substance misuse had been noted as a significant risk and a contributing factor in the child protection order being made. It seems reasonable to assume that 78% of the referrals to the children's panel for parental care involved illicit drug use. This gives an estimate of 14,887 referrals that relate to parental (assumed to be) problem drug use which is 26% of the total number of referrals to the children's hearing system. Applying this proportion to the total annual expenditure gives an estimate of £6,703,544 incurred by the children's panel that related to problem drug use.

Substance misuse services

The Scottish Local Government finance statistics 2006-07 reports the annual expenditure by substance misuse services in Scotland as £42,348,000. However it is not possible to determine what proportion of this can be attributed to services for drug and not alcohol use. The Scottish Government report, "The cost of alcohol use and misuse 2006-07" (2008b) assumed that 25% of these services' costs could be attributed to alcohol use. It was assumed then, that 75% of substance misuse services were specifically drug services. Applying this percentage to the total annual expenditure by substance misuse services[19] gives the total expenditure on drug misuse services as £31,761,000

Other social care costs allocated on a top down basis

There are four additional costs that have been included in the model as social care costs. As before these top down costs have been split using the same proportion of social care costs that were found to be attributable to recreational and problem drug users using a bottom-up approach.

Table 5.6.1 Social care costs allocated on a top down basis by type of drug user

Description	Source	Recreational £	Problem £
Scottish Drugs Forum	Health & Sport Committee	£2,476	£464,524
Scottish Training on Drugs & Alcohol (STRADA)	Health & Sport Committee	£4,120	£772,880
Scottish Centre for Health Working Lives	Health & Sport Committee	£4,507	£845,493
Grants to charities	Health & Sport Committee	£3,367	£631,633

[19] Scottish Local Government finance statistics 2006-07: Annual expenditure by substance misuse services

Total social care costs

All social care costs for both drug using groups were summed to give a total social care cost. For recreational drug users this cost includes:

- Children's Panel costs associated with young people's recreational drug use
- The social care costs allocated on a top down basis to the recreational drug using group

For problem drug users this cost includes:

- The expenditure of children and families social work that is attributable to cases involving problem drug using parents
- Children's Panel costs associated with parental problem drug users
- The total expenditure of substance misuse services for clients with problem drug use
- The social care costs allocated on a top down basis to the problem drug using group

Table 5.6.2 Total social care cost by type of drug user

	Total social care cost
Recreational drug users	£594,087
Problem drug users	£111,444,323
All drug users	***£112,038,410***

5.7 Costs to the economy

It is expected that the economy will incur costs as a result of workers being absent from work as a result of their drug use. Since the majority of problem drug users are unemployed, this cost will be largely initiated by recreational drug users.

Unemployed problem drug users will also initiate a cost to the economy. Using the scenario that there has never been illicit drug use in Scotland for comparison, many of those individuals who are unemployed problem drug users would, in this scenario be in employment. Therefore the economy is incurring a cost for the lost productivity as a result of this unemployment. It is also incurring a cost of lost output for drug related deaths since they would otherwise be working.

Absences from work

There is a dearth of information on the proportion of absences that are due to illicit drug use. The best available information comes from the Chartered Institute of Personnel and Development (CIPD) who carry out an annual absence management survey in which they ask manual and non-manual workers if drink or drug related conditions were a leading cause of short-term absence. Although the percentage of specifically drug related absences can be extracted, the problem with this question is that it does not give an indication of how many absences are drink or drug related. Therefore applying the average annual cost of absence per employee to the number of employees citing drugs as a leading cause of short term absence will be an over estimate since it assumes that every absence in the last year was caused at least in part by drugs. Nonetheless this is the best available information at present.

In order to estimate the number of workers in Scotland who cited drink or drug related conditions as a leading cause of absence, the number of manual and non-manual workers in Scotland must be known. The number of manual workers in Scotland in 2006 was estimated at 758,400 by summing the number of workers in elementary occupations, process, plant & machine operatives and skilled trade occupations from the "Annual Population Survey in Scotland: A Compendium of Labour Market Statistics 2006" (Scottish Government, 2007a). The number of non-manual workers in Scotland in 2006 was estimated at 1,606,600 by summing the number of workers in the remaining occupational groups.

The "Absence management: Annual survey report 2007" by the CIPD (2007) reported that on average 4% of manual workers and 2% of non-manual workers cited drugs or alcohol as a reason for their short term absence. This equates to 31,094 manual workers and 30,525 non-manual workers in Scotland. The Canadian cost study (Rehm et al, 2006) found that 41% of drug or alcohol absences were due to drugs only. Thus it was assumed that 12,749 manual workers and 12,515 non-manual workers were absent from work as a result of their drug use. The average employment rate from the three DORIS samples was 11%. Thus 11% of the absences were assumed to be due to problem drug use and the remainder recreational.

Finally the cost was calculated by multiplying the number of absences by the average sector cost of employee absence per year calculated from the CIPD report (2007) as £677. The total cost of absences is summarised in table 5.7.1 below:

Table 5.7.1 Total cost of absences due to illicit drug use by type of drug user

	Number workers citing drugs as reason for absence	Total cost of absences
Recreational	22,398	£15,152,290
Problem	2,866	£1,938,886

Lost productivity

It is known that there are high levels of unemployment among the problem drug using population. This may be the case for a number of reasons including the chaotic nature of many PDUs lives that makes it hard to find or remain in employment and an increase in illness as a result of their drug use making them unfit to work.

If there had never been illicit drug use, it is assumed that problem drug users would otherwise be no different to the rest of the population in terms of the percentage who are economically active and inactive and the percentage of those economically active who are unemployed. The DORIS survey asks respondents if they have had any paid legal work in the last six months. It is assumed that the percentage of DORIS participants who report having had no paid legal work in the last six months is a good indication of the level of unemployment among problem drug users. The "Labour Market Statistics" (National Statistics, 2007) can then be used to give an indication of those in the problem drug using population who would be economically inactive or would be unemployed regardless of their drug use and therefore would not be costed in this model. See appendix 7 for a detailed example of the breakdown of the calculations for those not in treatment.

Using the DORIS surveys and the percentages given in the "Labour Market Statistics" (2007), it was estimated that there are 26,145 male problem drug users and 10,704 female problem drug users who would be in employment if there had never been illicit drug use. The "Annual Survey of Hours and Earnings" (National Statistics, 2006) reports the median gross annual earnings for men in Scotland was £23,433 and for women was £14,603.

Thus it was estimated that £768,961,443 of productivity was lost in 2006 as a result of unemployment among problem drug users.

Lost output

Illicit drug users who died prematurely and were in employment in 2006 will produce a cost equivalent to their lost output. The estimated number of drug related deaths by type of drug user that was given in section 5.4 is used again and as with the lost productivity estimate above, the lost output estimate was constructed by calculating an estimate for males and females separately.

In order to split the drug related deaths by gender the proportions of male and female problem and recreational drug users were used. The DORIS samples were used to estimate the proportion of male and female PDUs who were not in treatment, in treatment less than a year and in treatment for more than a year. Both SALSUS and the SCVS were used and an average taken to estimate the proportion of male and female recreational drug users. These are given in table 5.7.2 below:

Table 5.7.2 Estimated proportion of male and female illicit drug users

	% male	% female
Recreational	56.26	43.74
Not in treatment	67.65	32.35
In treatment < 1yr	63.05	36.95
In treatment > 1yr	57.58	42.42

Using the proportions given above in combination with the number of drug related deaths and the male and female employment rate gives the estimated number of male and female illicit drug users who were in employment when they died. For recreational drug users the employment rate was assumed to be the same as the Scottish employment rate in 2006 (National Statistics, 2007) which was 78% for males and 72% for females. For problem drug users the employment rate was estimated using the percentage of respondents in the three DORIS samples who said they had had paid legal employment in the last six months. Thus it was estimated that:

- 14% of males and 10% of females not in treatment were in employment
- 12% of males and 8% of females in treatment less than a year were in employment
- 13% of males and 12% of females in treatment over a year were in employment

Summing the estimated number of employed males and females who died and combining with the Department for Transport's estimated cost for lost output that has been uprated to 2006 values (2007) yields a total estimate for lost output. This is summarised in table 5.7.3:

Table 5.7.3 Cost of lost output due to premature death by type of drug user

	Employed male deaths	Employed female deaths	Lost output cost
Recreational	10	7	£8,393,438
Problem	36	13	£24,476,473
Total	***45***	***20***	***£32,869,912***

Table 5.7.4 Total cost to the economy by type of drug user

	Total cost to the economy
Recreational	£23,545,729
Problem	£795,376,802
Total	***£818,922,530***

5.8 Wider costs to society

There are a number of individuals who incur a cost as a result of illicit drug use. Many of the costs to individuals are not tangible costs that the individual has had to pay out but are intangible costs such as the cost of pain and suffering by those who are a victim of crime perpetrated by a problem drug user, or the emotional pain experienced by the family of a drug user who has died as a result of their drug use.

Value of lives lost as a result of drug related deaths

The cost of lost output resulting from drug related deaths has already been estimated and discussed above. However, the emotional and physical pain endured by both the drug user and the family needs to be estimated. The Department for Transport (2007) defines the value of a life as "human costs, based on WTP (willingness to pay) values, which represent pain, grief and suffering to the casualty, relatives and friends, and, for fatal casualties, the intrinsic loss of enjoyment of life over and above the consumption of goods and services."

The 2005 value of a life (Department for Transport, 2007) was uprated to 2006/07 values to give an estimated value of a life of £962,077. This was applied to the estimates of drug related deaths for each drug using group given in the health section of this report and the results are summarised in table 5.8.1 below:

Table 5.8.1 Social cost of drug related deaths by type of drug user

	Number	Human cost of death
Recreational	22	£21,165,696
Problem	399	£383,868,754
Total	***421***	***£405,034,450***

Victim costs, consequence of crime costs and anticipation of crime costs

As discussed above, there are costs borne by the victims of crimes perpetrated by problem drug users as a result of their drug use. As mentioned in section 5.5, it was assumed that levels of crime related to recreational drug use were negligible except from drug offences, which is assumed to be a "victimless" crime.

The estimates of the number of times a crime is committed per male and female problem drug user in the crime section of this report are used again here (see tables 5.5.1 & 5.5.2) and are multiplied with the anticipation of crime cost and separately with the victim or consequence of crime cost reported in the Home Office studies on cost of crime (Dubourg and Hamed, 2005; Brand and Price, 2000).

Table 5.8.2 Total anticipation of crime costs for crimes committed in the last year by PDUs

	Anticipation of crime cost
Shoplifting	£75,917,881
Theft from a house	£41,910,895
Theft from a person	£5,120,631
Fraud / forgery	£0
Theft from a vehicle	£32,771,648
Theft of a vehicle	£72,524,251
Handled stolen goods	£0
Assault	£0
Criminal damage	£2,071,822
Total	***£230,317,128***

Table 5.8.3 Total victim / consequence of crime costs for crimes committed in the last year by PDUs

	Victim/consequence of crime cost
Shoplifting	£126,529,802
Theft from a house	£182,386,106
Theft from a person	£46,706,360
Fraud / forgery	£189,726,490
Theft from a vehicle	£126,743,362
Theft of a vehicle	£239,266,687
Handled stolen goods	£78,223,651
Assault	£106,354,068
Criminal damage	£29,259,203
Total	***£1,125,195,728***

Table 5.8.4 Anticipation, victim and consequence costs of crime costs per PDU by treatment status

	Cost per PDU
Problem drug users not in treatment	£35,069
Problem drug users in treatment <1yr	£15,025
Problem drug users in treatment >1yr	£3,072

Table 5.8.5 Total wider social costs by type of drug user

	Total wider social costs
Recreational	£21,165,696
Problem	£1,739,381,610
Total	***£1,760,547,306***

5.9 Total economic and social costs

Adding together all of these costs, our results suggest that the total economic and social costs attributable to illicit drug users in Scotland was around £3.5bn in 2006. As with the market size estimates, the "true" figure could of course be much higher or much lower than suggested by our calculations. This issue is investigated in more detail in Appendix 3.

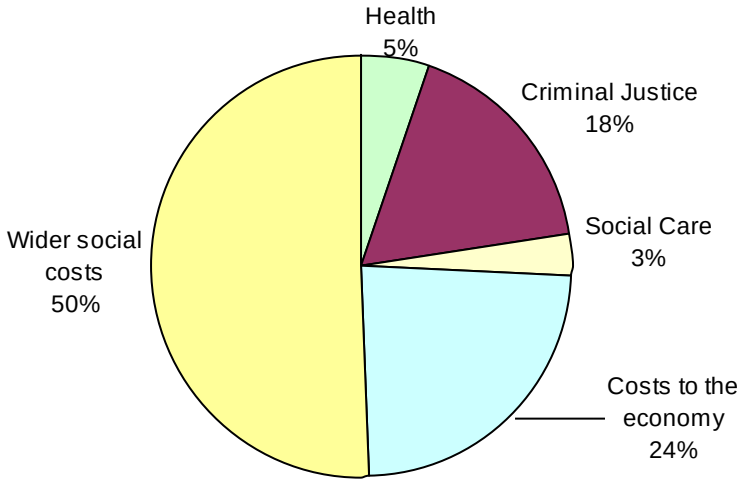
It is also useful to know not just the overall total, but also the split by area affected and by type of drug user. These splits are summarised in table 5.9.1:

Table 5.9.1 Total economic & social costs for costs including all top down costs

	Recreational	Problem	Total
Health	£1,636,865	£178,815,635	£180,452,500
Criminal Justice	£76,874,333	£533,543,497	£610,417,830
Social care	£594,087	£111,444,323	£112,038,410
Costs to the economy	£23,545,729	£795,376,802	£818,922,530
Wider costs to society	£21,165,696	£1,739,381,610	£1,760,547,306
Total	**£123,816,710**	**£3,358,561,868**	**£3,482,378,578**

Figure 5.91 below shows graphically the proportion of the total social and economic costs that have been borne by the different areas:

Figure 5.9.1 Breakdown of total economic & social costs by type of cost



With a cost of over £1.7 billion, the wider costs to society account for half of the total economic and social costs in Scotland in 2006. Over £1.1 billion of this cost is due solely to the cost incurred by victims of crime. Part of these costs will include tangible costs such as the cost of health treatment as a result of an assault or the cost of valuables that have been stolen for example. However, the two most significant inputs used to estimate the victim costs are intangible costs where there is an attempt to put a monetary value on the pain and suffering caused.

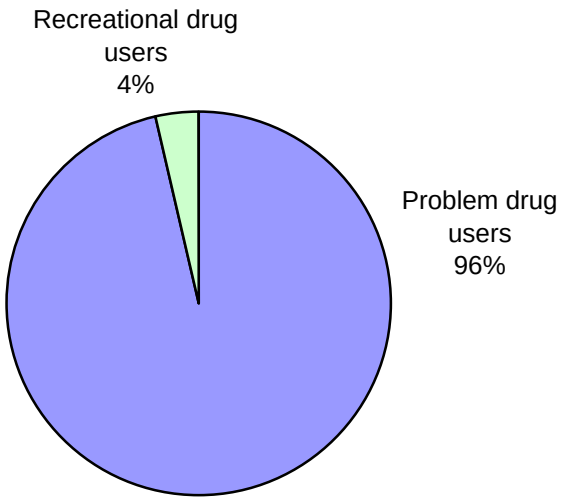
It may be surprising that health only contributes 5% of the total economic and social costs. This might however be in part due to the expected underestimate of the total cost of drug treatment in Scotland given by the alcohol and drug action teams.

The total economic and social costs have also been split by type of drug user with problem drug users instigating significantly more economic and social costs than recreational drug users. It is estimated that:

- The total economic and social cost per recreational drug user is £134
- The total economic and social cost per problem drug user is £60,703

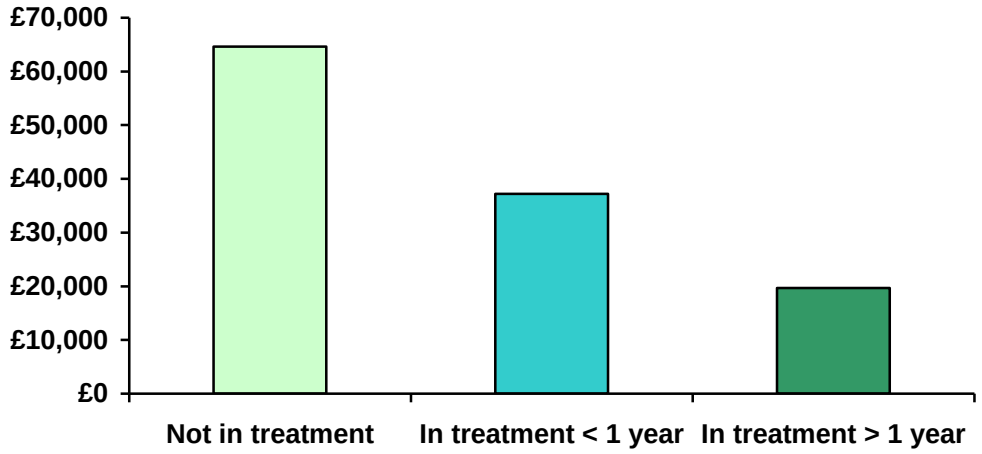
Figure 5.9.2 below shows that 96% of the total economic and social costs relate to problem drug use while only 4% relates to recreational drug use:

Figure 5.9.2 Breakdown of total social & economic costs by type of drug users



Focusing on the problem drug using population it is possible to estimate the breakdown of social and economic cost per problem drug user not in treatment, in treatment less than a year and in treatment more than a year. These costs do not include the top down costs since it was not possible to split these costs by treatment status. Figure 5.9.3 shows that those who have not been in treatment instigate the greatest cost while those in treatment instigate the least cost.

Figure 5.9.3 Social and economic costs, per drug user, due to problem drug use by treatment status



In terms of how much the Government spent or will spend reacting to the effects of illicit drug use in 2006, it is estimated that:

- For every problem drug user in Scotland the Government will pay on average £14,889
- For every recreational drug user in Scotland the Government will pay on average £85

In terms of how much is borne in economic costs primarily incurred by industry through lost productivity, lost output as a result of premature deaths and absence due to drug use, it is estimated that:

- For every problem drug use in Scotland, the economy will pay on average £14,376
- For every recreational drug user in Scotland, the economy will pay on average £25

In terms of social costs incurred as a result of drug use, namely the cost to victims of crime, the cost of pain and suffering for the individuals themselves and their families caused by drug related deaths it is estimated that:

- For every problem drug use in Scotland, individuals will pay on average £31,438
- For every recreational drug user in Scotland, individuals will pay on average £23

5.10 Discussion & recommendations

Validation of the model and sensitivity analysis

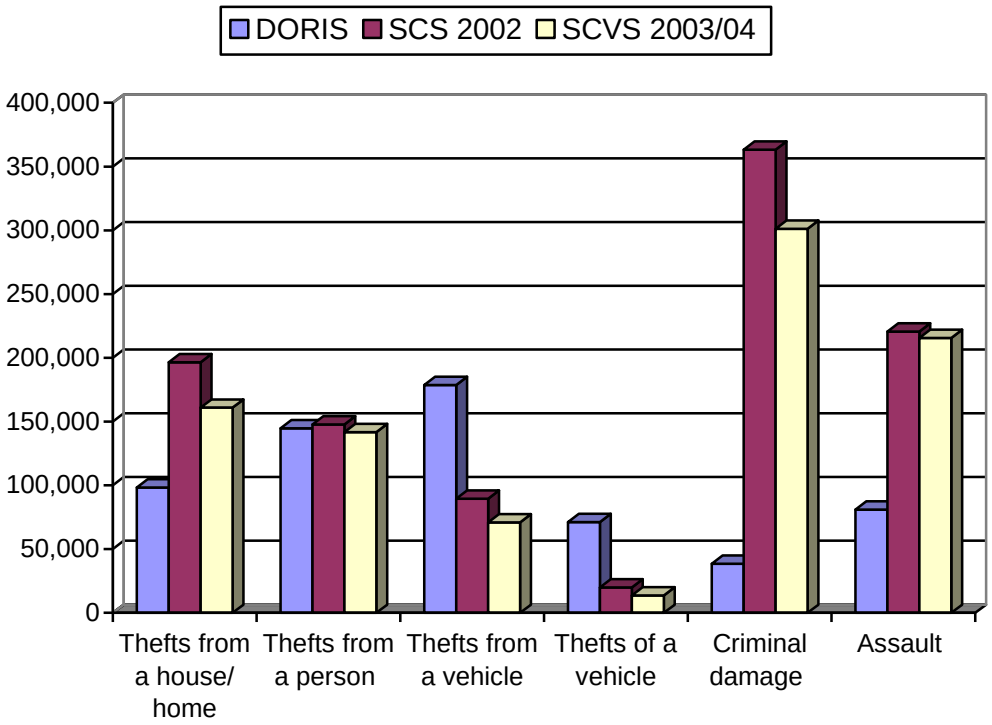
In this section we discuss the attempts made to validate parts of the model where there was a significant degree of uncertainty or where the inputs are thought to have a significant influence on the total costs.

The aim of this part of the study was to use existing data sources to estimate the total social and economic cost of illicit drug use in Scotland. Where the required data was not readily available, the decision was taken that it was better to make an assumption than to exclude that cost from the model. When this happened, the assumption, or guesstimate was stated clearly. In order to test the robustness of the model to these assumptions, a sensitivity analysis was carried out to examine the correlation between the inputs that were based on assumptions or guesstimates and the total cost. Where the inputs based on assumptions are found to be highly correlated to the total costs, then it would be necessary to conclude that the model is not robust to the assumption made and a recommendation would be given to produce the required data. Details of this sensitivity analysis can be found in appendix 3.

Given that such a large proportion of the total social and economic costs in Scotland are based on DORIS participant's self reporting of crime committed, it also seems appropriate to compare the figures reported by DORIS participants with some other data sources in order to test their credibility. Although there is no similar study that examines the level of crime committed by problem drug users in Scotland, the Scottish Crime and Victimisation Survey (SCVS) and its predecessor, the Scottish Crime Survey (SCS) reports the estimated total number of crimes committed in Scotland by surveying the general population of Scotland about their experience of crime perpetrated against them, allowing some checks to be made against non-commercial crime. There are a number of differences between DORIS and the crime surveys that makes direct comparison impossible. Firstly, DORIS allows the number of crimes committed specifically by problem drug users to be estimated while the crimes reported through the crime surveys could be committed by anyone. Secondly, the terminology relating to the different types of crime do not match completely. For example the DORIS questionnaire asks participants about 'theft from a person' while the SCS or SCVS asks participants about 'theft from a person', 'other personal theft and 'robbery'. So there has to be some assumptions based on how DORIS participants in particular interpret the meaning of 'theft from a person', in other words do they include what the SCVS terms as 'other personal theft' and 'robbery'? In this case it was assumed that the DORIS participants may well have included all types of personal theft and so all three categories from the SCVS were combined. Similarly both 'housebreaking' and 'other household theft' were combined to compare with DORIS' 'theft from a house'. Thirdly, the crime surveys and DORIS are estimating levels of crime based on the reporting of two very different groups of people, the victims and the perpetrators respectively. There may be different biases present in both surveys.

However, all three problems are contributing in the same way in that they would inflate the estimates based on the SCS or SCVS. Therefore, it is expected that the estimates reported in the SCS and SCVS would be higher than those estimated from DORIS participants. The results from the SCS based on crimes committed in 2002 and the SCVS in 2003/04 (Scottish Government, 2007b) were used to compare with DORIS since they straddle the time period in which DORIS 1, 2 and 3 were carried out. Figure 5.10.1 below shows the estimated levels of different types of crime by source.

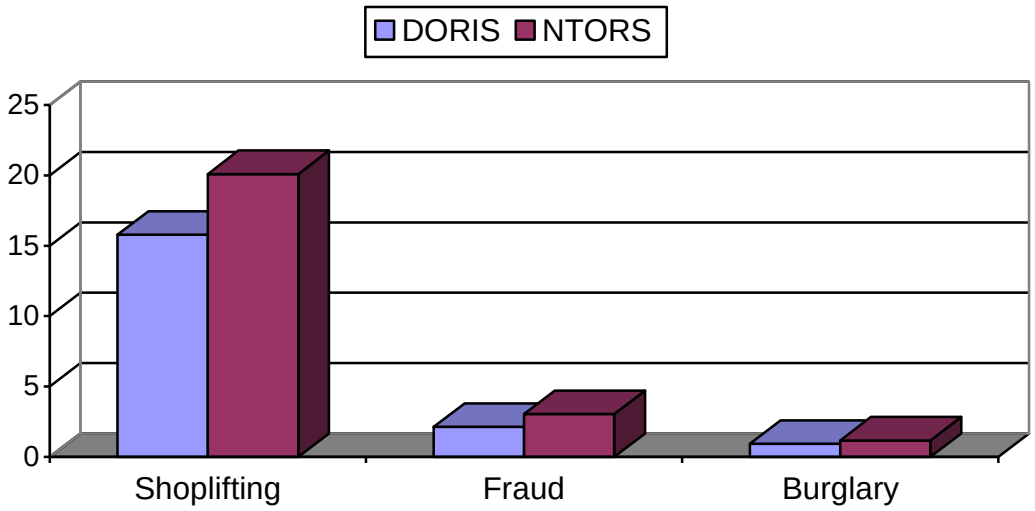
Figure 5.10.1 Estimated levels of crime



For three of the six crimes displayed above, namely 'theft from a house', 'criminal damage' and 'assault', the SCS and SCVS both provide some credibility to the DORIS figures since their levels are much higher than those estimated from DORIS. However, the estimated level of 'thefts from a person' derived from DORIS is only slightly less than the level derived from the SCS 2002 and in fact slightly higher than the level derived from the SCVS 2003/04. Estimates of the number of thefts from and of a vehicle are considerably higher when using DORIS than they are when using the SCS 2002 or the SCVS 2003/03. These differences could be due to the problems discussed above, i.e. differing definitions or differing populations.

Although not based on Scottish data, the figures published from the National Treatment Outcome Research Study (NTORS) (Stewart et al, 2006) allow crime rates from DORIS PDUs to be compared with PDUs from NTORS. However, only shoplifting, fraud and burglary are examined in both studies. The rate per PDU for each of these crimes is shown in figure 5.10.2 below. It can be seen that the figures from DORIS seem more in line with the NTORS figures. In fact, the rates per PDU in DORIS for shoplifting, fraud and burglary are less than the rates found from NTORS.

Figure 5.10.2 Comparison of rates per PDU by source



Comparison with the estimated social and economic costs of Class A drug use in England and Wales

Chapter two of this report discussed both Home Office funded studies that estimated the social and economic costs of Class A drug use in 2000 and 2003/04 for England and Wales (Godfrey et al, 2002; Gordon et al, 2006). It makes sense then, to examine how the Scottish cost estimates compare.

A direct comparison of the average cost to society per problem drug user from the most recent Home Office study and the Scottish study shows that English and Welsh problem drug users cost around three quarters of the cost of Scottish problem drug users (£60,703 compared to £44,231 (Gordon et al, 2006)). However, to do such a comparison would be erroneous for a number of reasons. Firstly, the estimate for England and Wales are based on costs for the year 2003/04 while the Scottish estimates are for 2006. Secondly, the two studies have differing rationales with the Home Office study's primary aim being to model the impact of policy changes on the cost estimates while this current study's aim was to carry out a more straightforward but comprehensive cost of illness analysis. Because of this, costs that would not change as a result of policy change such as treatment costs were not included in the England and Wales model but were in the Scottish model. Owing also to the increase in the availability of data, it was possible to include costs in this study that were not available at the time of the Home Office studies such as costs incurred by industry through drug related absences.

There are three groups of costs that were not included in the Home Office study but contributed significantly to this study's estimated cost per PDU. They are listed in table 5.10.2 below:

Table 5.10.1 Cost per PDU for costs not included in previous Home Office study

Area of cost	Cost per PDU
Lost earnings and drug related absences from work	£13,933
Criminal justice, anticipation and victim of crime costs for crimes not included in the Home Office study[20]	£14,121
Top down costs	£1,264
Total	***£29,318***

Extending the costs model to include alcohol and tobacco

One of the subsidiary aims of this study was to consider the scope to extend the estimates to cover alcohol and tobacco. For alcohol, the five areas of health, criminal justice, social care, economic and wider social costs will also incur a cost as a result of alcohol use / misuse. Examining each cost area individually, many of the costs relating to recreational drug use could be estimated for alcohol use / misuse. For example SMR01 could be examined for all cases that include a diagnosis of a 'mental and behavioural disorder due to alcohol use' and costs attached. Similarly a cost for alcohol related deaths could also be estimated using the health service cost of a death given above along with published statistics on alcohol related deaths.

Even though alcohol, unlike illicit drug use is not an illegal act there are crimes that are often linked to alcohol use / misuse. Some crimes relating to alcohol use would perhaps be easier to include than others. For example, it may be easier to find available information on the number of all those arrested for driving under the influence of alcohol or for being drunken and disorderly than the number of arrests for domestic violence where alcohol was an influential factor. However, as with the illicit drug costs sometimes the associated criminal justice cost for these types of crime is not available in order to be able to estimate a cost.

All of the social care costs estimated for illicit drug use could also be estimated for alcohol use (see appendix 4 for details). The same sources could be used but isolating alcohol use rather than illicit drug use. Again all three of the costs termed as economic costs could be estimated for alcohol use. Where the lost productivity of problem drug user was estimated, the alcohol study would estimate the reduced productivity as a result of alcohol use.

Finally the wider social costs would include the social cost of an alcohol related death. As with crime costs for drug driving it may not be possible to estimate victim costs or anticipation of crime costs associated with crashes occurring as a result of drunk driving. For those other crimes related to alcohol use that would incur a victim cost such as domestic violence crimes it is expected that estimates for the number of occurrences will not be available meaning there will not be a victim or anticipation of crime category.

A model for the social and economic costs for tobacco costs would include three of the five cost areas discussed above for alcohol use / misuse, namely health costs, economic costs and wider social costs. The biggest driving force throughout the model will be the health impact of smoking. The health cost area would include deaths caused by smoking (e.g. lung cancer) as well as the cost of treating these and

[20] Crimes not included in Home Office study are: Theft from a vehicle, theft of a vehicle, handling stolen goods, assaults, criminal damage, drug driving, soliciting and breach of the peace

other tobacco related health conditions. The economic costs would again include the costs to the economy as a result of deaths cause by smoking among the working population as well as absenteeism or lost productivity as a result of illnesses developed from smoking. Finally the wider social costs would include the social cost of a death as a result of smoking tobacco. An interesting difference between this model and the models created for illicit drug use and alcohol would be the inclusion of people who are not themselves smokers but who have health conditions as a result of passive smoking.

Recommendations

The final aim of this study was to identify gaps in the available information that hindered the estimation on social and economic costs. It must be borne in mind, however, that the majority of the data sources used were not created for the purposes they have been used here. Although it was necessary to make note of possible limitations with certain data sources, we must be realistic and pragmatic in our recommendations. There are some key parts of the model, however, that would benefit from further work.

The criminal justice costs and the wider social costs were two of the highest cost categories in the model. However, both relied on English costs since they are presently the best available costs that allow crimes committed to be costed rather than reported crimes. However, due to regional differences in legal systems, in policing (e.g. in Scotland there needs to be two police officers present in order to make an arrest while in England a single police officer can make an arrest), in cost of living and possibly in the probabilities of reporting certain crimes, it is expected that costs in Scotland will differ to those estimated in England. Therefore this model would benefit from Scottish criminal justice, anticipation of crime and victim of crime costs.

A key input to this model should be the cost of drug treatment in Scotland. However, there is not a unit cost, or costs available for Scotland that would allow the estimated number of PDUs in particular to be combined with the cost(s) to estimate the total cost of treatment for illicit drug use. As a result the reported top down costs from the Corporate Action Plans had to be used even though these were not consistent across the country.

Finally, given the extensive use of DORIS throughout the model it is clear that such an in-depth longitudinal survey is extremely useful in providing social and economic cost estimates for problem drug use. However, it must be remembered that the first sweep of DORIS, carried out in 2002 and even the most recent sweep of DORIS carried out in 2004/05 are perhaps now outdated in regards to the patterns of crime among PDUs for example.

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Appendix 1 Monetary expressions of amounts used

There is an issue with the DORIS data on amounts used per typical episode, in that many respondents would respond with a monetary amount, rather than a weight, for example, saying they use 2 'tenner bags' of heroin per day (i.e. £20 per day). Out of the 865 respondents who gave a valid response for the amount of heroin they used per day, 591 (68%) gave a response in monetary value rather than weight. Those who answered in monetary terms did appear to differ (in their drug consumption) than those who answered with a weight.

To examine this issue, we assumed that the average price per gram was £47.35 then converted monetary values in weights and vice versa. The following table compares the average weights and prices for those that gave a response in monetary value and those that gave a weight as a response.

Table 1 Price and weight estimates, by mode of response to amount question

	Gave answers as weight	Gave answers as monetary value	Average
Average number of days used (90 days)	71 days	61 days	64 days
Average weight per day	1.17 grams	0.76 grams	0.89 grams
Average price per day	£55.54	£36.05	£42.22

In a typical 90 day period, those that gave their answers as a monetary value would have used 46.69 grams (at a cost of £2,211). Those that gave their answers as a weight would have used 82.76 grams (at a cost of £3,919). When averaging over both types of responses, an individual would have used 57.29 grams (at a cost of £2,713). All differences are statistically significant.

It is unclear why those who gave monetary responses differed from those that gave weight responses. There does not appear to be an obvious reason why those who gave monetary answers use less in a typical 90 day period. In terms of the weight / price issue, the difference could be due to a number of reasons, including the fluctuating price of heroin, particularly since the time at which the DORIS interviews were carried out. It could be due to regional differences across Scotland (e.g. if areas where drug users typically talk about amounts of drugs as tenner bags are those areas where heroin differs in price from the national average).

Relationship between frequency of use and amount used per day

There may also be an issue if frequent drug users use more drugs per episode. The average number of days a heroin user uses heroin (from DORIS) was 64 days. The average amount used per day was 0.89 grams. Combining these two estimates suggests that the average heroin user uses 57.29 grams in a 90 day period (or 232 grams a year). However, we can combine the response to the 'number of days used in last 90 days' with the 'amount used per day' responses for all 865 respondents who gave valid responses to the questions about the amounts used per day. If we do that at the individual level (and not the aggregate / average level above) then the amount used by the average user rises to 258 grams per year (11% more than the amount estimated by combining averages). This is because those that use more frequently use more per day.

It is unclear as to whether this issue should be accounted for in the estimates of the size of the market. As yet, we have only examined this issue for heroin use, however it does appear likely that this issue would arise for other drug users, for example people using crack cocaine daily may use more, per day, than those who only use occasionally.

Appendix 2 Markets Model Sensitivity Analyses

Introduction

In this appendix we describe the sensitivity analyses that were carried out relating to the sizing the drugs markets part of the study. The main objective of that part of the study was to provide estimates of the size of the illicit drugs market in Scotland, both in terms of quantity and cost. Estimates have been derived by combining information from various sources, all of which are based on estimates. For example the size of the cannabis market is derived from estimates such as the estimated number of people in Scotland who use cannabis (from the SCVS and SALSUS), the estimated frequency of cannabis use (also from those surveys) and the estimated amount a cannabis user uses per day (from more anecdotal data).

There are two issues that need to be considered. One is that the estimates are often derived from samples, and as such there will be some amount of statistical error attached to an estimate, typically the standard error of the mean for the average values we have used as inputs to the markets model. This statistical error can then be used to derive a confidence interval, giving some kind of indication of how reliable the estimate is. The other issue is that by only using point estimates, we are ignoring the variability within the population; some heroin users use more heroin per day than others.

Some of the data sources attach a measure the uncertainty to their estimates, for example SALSUS provides confidence intervals for a number of their estimates. The SCVS does not provide confidence intervals for all of the figures in the report, but it is possible to calculate them using standard statistical techniques for deriving standard errors from samples. Therefore it is possible to provide error bounds for the estimated number of people who use particular drugs in Scotland. The national prevalence study, from which we derive the number of heroin users, also provides confidence intervals.

For surveys and the national prevalence study, the statistical exercise of providing standard errors or confidence intervals somewhat ignores the fact that the estimates are based on assumptions that either cannot be tested or are difficult to examine. For example, the surveys assume that the respondents are telling the truth about their drug use. The surveys also assume that their sampling is perfectly representative, and in particular does not under-sample from individuals who are likely to use drugs. There are many statistical assumptions attached to the capture-recapture method that the national prevalence estimate is based on, and these are described elsewhere. We could also derive error bounds for estimates, such as the estimated frequency of heroin use from DORIS, but those error bounds would ignore the issue that the DORIS sample may not be representative of all Scotland's users of heroin (for example the DORIS sample may over-represent drug injectors who may use more heroin per day than drug users who inhale the drug). Thus although standard errors / confidence intervals can be derived, other sources of error are essentially ignored.

For sources, such as the estimated amount of cannabis used by a recreational drug user in a day, there is as much uncertainty in what the possible range attached to an estimate would be as there is over the point estimate. As an example, if we assume that an average recreational cannabis users uses 1 gram of cannabis per day, we could suggest that the range of cannabis used per day is between 0.5 grams and 1.5

grams, but that range is almost as much of a guess as the estimated average amount in that, just as there is no strong evidence that the average user users 1 gram per day, there is no strong evidence that the range of amounts of daily use goes from 0.5 grams to 1.5 grams.

There is also the issue that, instead of assuming a point estimate, with or without a range, there may be an underlying distribution for each estimate. As an example, if it is taken that an average recreational user of cannabis uses 1 gram per day, and the range typically goes from 0.5 grams to 1.5 grams, then perhaps more cannabis users use around a gram per day, therefore the shape of the distribution would be more like a normal distribution (with most people using around the mean value) than a uniform distribution (with people being equally likely to use anything between 0.5 and 1.5 grams). We could spend a lot of time creating what we feel to be realistic distributions but, as with the estimated point value and estimated range, the estimate distribution is, essentially, little more than a guess.

There are several reasons for undertaking sensitivity analyses. The main reasons we have done this in this study are to

- Examine which input estimates have the most effect on the total estimate
- Speculate at some level of error bounds for the total estimates
- Look at how specific estimates affect the total estimate

In these sensitivity analyses we focus on the first two issues. We begin by looking at which input variables have the most effect on the total size of the drugs market in Scotland. We then go on to speculate about the level of error that should be attached to the total estimate.

Methods

The approach we have taken for the markets analysis is to use various distributions for the different inputs into model used to estimate the size of the illicit drugs market. There are two approaches we take to assigning these distributions. They are:

- Assume a uniform distribution, ranging from 0.5 times the point estimate to 1.5 times the point estimate
- Use a normal distribution to approximate the distribution from the source dataset (where available)

When we assume that all of the inputs or estimates range from 0.5 times the point estimate to 1.5 times the point estimate then we have to truncated these where necessary (i.e. the number of days someone use heroin in a 90 day period cannot be more than 90).

Assuming wide ranges (from 0.5 to 1.5 times the point estimate) is helpful for examining how the different input estimates (such as the amount of cannabis used by a recreational user per day) affects the total size of the market. However, there is a potential drawback that the distributions that are truncated (such as the number of days within a 90 day period that a heroin user uses heroin) have less of a range and then, possibly, are restricted in the effect they can have on the total estimate. While this may affect the sensitivity analysis, it perhaps reflects the real situation where some distributions (such as the number of days someone use a certain drug) is truncated at the maximum number of possible days the person can use the drug (e.g. nobody can use heroin more than 365 days per year). Truncating the distributions in

such a way, and still using a uniform distribution, would have the effect of lowering the distribution for the total costs (and thus lowering each of the error bounds).

Using a distribution, such as a normal distribution to approximate the underlying error of the mean in the source datasets provides much tighter error bounds. These error bounds could be considered too narrow, particularly since they ignore any error associated with possible methodological issues (i.e. under-representation or under-reporting in the SCVS).

We can set up the sensitivity analyses by simulating 1,000 values to approximate for each of the distributions used to describe the input variables. As suggested above, we can take three different approaches to creating these distributions. Assigning uniform distributions with the range 0.5 to 1.5 times the point estimate is relatively straightforward. This has been done for all input variables, truncated where necessary. For the approximate distributions of the source datasets, we can do this for the data from the National Prevalence Study and DORIS as we have access to those datasets. In terms of the National Prevalence Study, 1,000 simulated values of the total number of problem drug users was created as part of that study. Those simulated values do not have a standard error attached to them. For the input variables derived from DORIS, we can re-analyse the source data and derive the standard error of the mean for each of the variables used. We can approximate the distribution of the number of recreational drug users who use cocaine, cannabis etc. by treating the number of drug users (e.g. 100,111 users of cocaine) as the product of a simple percentage of the people who use cocaine multiplied by the total population. This ignores the fact that the total number is derived from two different surveys (SCVS and SALSUS) and the sampling frames of each study. Thus a proportion can be obtained, and the standard error of the mean of proportion can be estimated using standard statistical methods. A sample size needs to be assumed. Despite SALSUS having a much larger sample size than SCVS, we went with the SCVS sample size, however we ignored the design effects of both samples. Once the standard error of the mean of the proportion was obtained, this could be scaled up to the population level once again.

It was not possible to approximate a distribution for the more anecdotal data, such as those data derived from the IDMU studies or the price data from SCDEA.

Data

The broad uniform distributions and the distributions approximating to the error found in the source datasets are listed for the variables derived from original data are listed in Table 1 (for variables relating to problem drug use) and Table 2 (for variables relating to recreational drug use). Table 3 presents the broad and best guess distributions for remaining variables.

Table 1 Low and high values of inputs, and standard errors, used in the sensitivity analyses

Description	Point estimate	Low	High	Standard Error
Number of problem drug users	55,328	27,664	82,992	-
% problem drug users that use heroin	0.94	0.47	1	0.008
% problem drug users that use illicit methadone	0.34	0.17	0.51	0.016
% problem drug users that use crack cocaine	0.3	0.15	0.44	0.016
% problem drug users that use cocaine	0.28	0.14	0.42	0.015
% problem drug users that use amphetamine	0.12	0.06	0.17	0.011
% problem drug users that use ecstasy	0.23	0.11	0.34	0.014
% problem drug users that use cannabis	0.76	0.38	1	0.015
% problem drug users that use benzodiazepines	0.81	0.4	1	0.014
Days problem drug users use heroin (out of 90)	64	32	90	0.93
Days problem drug users use illicit methadone (out of 90)	17	9	26	1.28
Days problem drug users use crack cocaine (out of 90)	19	10	29	1.48
Days problem drug users use cocaine (out of 90)	14	7	21	1.29
Days problem drug users use amphetamines (out of 90)	14	7	21	1.99
Days problem drug users use ecstasy (out of 90)	9	5	14	0.86
Days problem drug users use cannabis (out of 90)	51	26	77	1.24
Days problem drug users use benzodiazepines (out of 90)	39	20	59	1.14
Amount of heroin used per day (problem drug users)	0.89	0.44	1.32	0.024
Amount of illicit methadone used per day (problem drug users)	57.94	28.97	86.91	2.22
Amount of crack cocaine used per day (problem drug users)	1.64	0.82	2.46	0.19
Amount of cocaine used per day (problem drug users)	1.13	0.56	1.68	0.08
Amount of amphetamines used per day (problem drug users)	2.84	1.31	3.92	0.36
Amount of ecstasy used per day (problem drug users)	3.50	1.75	5.25	0.2
Amount of cannabis used per day (problem drug users)	2.22	1.03	3.09	0.1
Amount of benzodiazepines used per day (problem drug users)	0.13	0.07	0.2	0.01

Table 2 Low and high values of inputs, and standard errors, used in the sensitivity analyses

Description	Point estimate	Low	High	Standard Error
Number of recreational cocaine users	100,111	50,056	150,167	10,730
Number of recreational amphetamine users	63,791	31,896	95,687	8,608
Number of recreational ecstasy users	89,867	44,934	134,801	10,180
Number of recreational cannabis users	321,352	160,676	482,028	18,629
Number of recreational benzodiazepine users	49,113	24,557	73,670	7,568
Days problem drug users use heroin (out of 90)	64	32	90	0.93

Table 3 Low and high values of inputs used in the sensitivity analyses

Description	Point estimate	Low	High
Days per year recreational users use cocaine	47	24	71
Days per year recreational users use amphetamines	71	36	107
Days per year recreational users use ecstasy	70	35	105
Days per year recreational users use cannabis	211	106	317
Days per year recreational users use benzodiazepines	41	21	62
Amount of cocaine used per day (recreational users)	1	0.5	1.5
Amount of amphetamines used per day (recreational users)	1.3	0.65	1.95
Amount of ecstasy used per day (recreational users)	2.92	1.46	4.38
Amount of cannabis used per day (recreational users)	1	0.5	1.5
Amount of benzodiazepines used per day (recreational users)	0.07	0.04	0.11
Cost of heroin, per gram	47.35	24.33	72.98
Cost of illicit methadone, per millilitre	0.2	0.1	0.3
Cost of crack cocaine, per gram	91.62	45.81	137.43
Cost of cocaine, per gram	43.86	20.65	61.94
Cost of amphetamines, per gram	5.55	2.54	7.62
Cost of ecstasy, per tablet	3.38	1.69	5.07
Cost of cannabis, per gram	3.10	1.47	4.4
Cost of benzodiazepines, per gram	50	25	75

Results

When the 1,000 simulated values for each of the inputs are combined to provide a total estimate of the size of the drugs market, the total estimate can be correlated against each of the input values to find out which one is the most highly correlated. This can be done in various ways, including using rank correlations (where each value of the input variables are ranked and the ranked total estimate is correlated against these ranks). Partial correlations can also be calculated, in which each of the other variables is held constant to examine the particular correlation between any single input and the total estimated size of the drugs market. The approach we took was, however, simply to correlate all input variables with the total size of the drugs market. This more simple approach was taken for ease of analysis in identifying which inputs were most correlated with the total market size, and thus influenced the estimate the most. We also took the simplest approach to simulating the random values in that we took simple random samples. The sensitivity analyses may have had more power if a more sophisticated approach to simulating values was taken, such as Latin Hypercube sampling.

The broad ranges were used to examine the relationship between the input variables and the total cost of the illicit drugs market in Scotland. Table 4 lists the most correlated input variables, in order of decreasing importance.

Table 4 Input variables most correlated with the total size of the drugs market

Number of problem drug users
Cost of heroin
Estimated number of days used cocaine (recreational users)
Cost of cocaine
Estimated number of days used cannabis (recreational users)
Amount of cocaine used per day (recreational users)
Cost of crack cocaine
Cost of cannabis
Amount of cannabis used per day (recreational users)

Thus the number of problem drug users is the input variable that has the most effect on the total size of the drugs market in Scotland. The cost of heroin comes second. It is interesting to note that the estimated number of days cocaine users use cocaine within a year (essentially the frequency of cocaine use) is third. This is one of the variables that we have, perhaps, the least information on. The cost of cocaine comes next followed by the frequency of recreational cannabis use, the amount of cocaine a typical recreational user uses per day (again something we have very little solid information on) and then cost of crack cocaine and the cost of cannabis.

To give some idea of the error surrounding the total estimates, we can use the simulated distributions, in this instance the simulated distributions derived to approximate the error in the source datasets (where available) and the broad uniform distributions for the remainder.

Table 5 gives the lower 2.5 and upper 97.5 percentiles (which would correspond to the lower and upper bounds of a 95% confidence interval, along with the 25th and 75th percentiles (the inter-quartile range) and the median

Table 5 Summary of the simulated distribution of the total cost of problem drug use, recreational drug use and the combined total

Percentile	Problem	Recreational	Total
2.5	623,511,911	242,831,093	993,178,798
25	791,741,888	386,569,612	1,252,166,245
50	931,136,944	473,082,283	1,425,284,672
75	1,077,004,348	584,535,368	1,580,263,924
97.5	1,230,931,157	826,639,979	1,912,102,300

From Table 5, the inter-quartile range of the total estimated size of the drugs market in Scotland is approximately £1,250 million to £1,580 million.

We can also explore some of the main assumptions used when creating the markets model. For example we can derive the total cost of the illicit drugs market in Scotland using the Scottish Drug Misuse Database data to calculate what proportion of problem drug users use heroin, crack cocaine, cannabis etc. We can also examine what would happen to the total cost of the drugs markets if we were to take the number of recreational drug users from the SCVS respondents who said they used drugs in the last month, rather than the last year.

Table 6 compares the total size of the problem drug use market and the total combined drugs market in Scotland when using the Scottish Drug Misuse Database data instead of the DORIS data for apportioning the problem drug use group into heroin users, crack cocaine users etc.

Table 6 Comparison of the size of the drugs market using Scottish Drug Misuse Database data and DORIS data.

	Using SDMD		Using DORIS	
	Problem	Combined	Problem	Combined
Heroin	420,856,897	420,856,897	550,935,871	550,935,871
Methadone (Illicit)	3,293,182	3,293,182	14,395,815	14,395,815
Crack cocaine	30,357,834	30,357,834	181,747,031	181,747,031
Cocaine (Powder)	9,092,486	215,463,304	41,695,236	248,066,053
Amphetamines	1,267,403	33,945,299	5,490,648	38,168,544
Ecstasy	469,361	62,555,955	5,202,894	67,289,488
Cannabis	13,781,620	223,977,964	57,311,388	267,507,731
Benzodiazepines	19,545,920	26,593,636	44,096,176	51,143,892
	498,664,703	**1,017,044,070**	**900,875,059**	**1,419,254,426**

Thus from Table 6, we can see that there is quite a substantial difference when using the DORIS data to derive estimates of the numbers of problem drug users who use heroin, crack cocaine, cannabis etc. The size of the drugs market attributed to problem drug use rises from £499 million to £901 million, a rise of 81% over the £499 million estimate. Focussing on the heroin market alone, the rise is 31%, while there is more than a threefold rise in the costs associated with illicit methadone, crack cocaine, cocaine and cannabis. It could be that the DORIS sample substantially over estimates the amount of secondary drug use by problem drug users. While it could be argued that the DORIS sample may be biased towards people who use, for example, more heroin as they are primarily drawn from treatment sources, there is less of an argument that their use of other drugs is much higher than heroin users who are not in treatment.

Table 7 Comparison of the size of the drugs market using SCVS 'last year' and 'last month' estimates

	Last Month		Last Year	
	Recreational	**Combined**	**Recreational**	**Combined**
Heroin	-	550,935,871	-	550,935,871
Methadone (Illicit)	-	14,395,815	-	14,395,815
Crack cocaine	-	181,747,031	-	181,747,031
Cocaine (Powder)	97,400,034	139,095,269	206,370,818	248,066,053
Amphetamines	13,517,649	19,008,297	32,677,897	38,168,544
Ecstasy	29,499,544	34,702,438	62,086,594	67,289,488
Cannabis	128,230,418	185,541,806	210,196,343	267,507,731
Benzodiazepines	2,459,016	46,555,192	7,047,716	51,143,892
	271,106,660	**1,171,981,719**	**518,379,367**	**1,419,254,426**

Thus although the total size of the drugs market decreases from £1,419 million to £1,172 million when only those who stated they used drugs in the last month are taken to be recreational drug users, the decrease in the size of the drugs market attributed to recreational drug use decreases from £518 million to £271 million.

There are of course a range of other sensitivity analyses similar to those summarised in Table 6 and Table 7 that can be done, looking at the impact the model assumptions have on the total size of the illicit drugs market. Such analyses highlight the fact that the final estimates should be treated with caution, as it is clear that the results are highly dependent on the assumptions and data sources used.

Appendix 3 Economic and Social Cost Model Sensitivity Analyses

There are two parts to this sensitivity analysis. The first determined the most influential inputs to the costs model. The second tested the robustness of the model to the inputs that were guesstimates or assumptions. Given the reported estimated total social and economic cost in the main body of this report is just that, a point estimate, the final part attempts to give an indication of the possible range for the total social and economic cost.

All parts were carried out by first creating distributions around the point estimates that have been used as inputs in the costs model. The approach we have taken for this analysis is to use the distribution of the number of problem drug users (as that is readily available) and assume that all of the other inputs range from 0.5 times the point estimate to 1.5 times the point estimate. We have truncated these where necessary (e.g. the percentage of male problem drug users cannot exceed 100). Assuming wide ranges (from 0.5 to 1.5 times the point estimate) is helpful for examining how the different input estimates (such as the percentage of PDUs in treatment) affects the total social and economic costs. Please note however, that inputs of recorded occurrences and unit costs taken from published statistics were assumed to have a constant distribution since these are not treated as estimates. These inputs are not included in the sensitivity analyses.

We begin by examining which input estimates are most highly correlated to the total cost estimate. We do that by simulating 10,000 values for each of the inputs. The 10,000 values for the problem drug use estimate come directly from the national prevalence study, which used similar simulated values in deriving confidence intervals. For all other input values, the 10,000 values were randomly sampled from a uniform distribution, going from 0.5 times the point estimate to 1.5 times the point estimate (truncated where required). The 95% confidence interval for the national prevalence estimate is 54,451 to 57,234, with the point estimate of 55,328. Table 1 summarises the rest of the input estimates with their point estimate and the low and high values of the uniform distribution the simulated values are drawn from. Given the complexity of the model it was necessary to split the model into the five areas of health, criminal justice, social care, economic and wider social costs and examine the inputs within these areas with the total cost for that area.

Table 1 Low and high values of inputs into the sensitivity analyses

Description	Area of cost	Point estimate	Low	High
% Male Problem Drug Users	Health/ criminal Justice/ economic	0.70	0.35	1.00
% PDUs in treatment	Health/ criminal Justice/ economic/ wider social	0.41	0.20	0.61
% Males not in treatment	Health/ criminal Justice/ economic	0.68	0.34	1.00
% Males in treatment < 1 year	Health/ criminal Justice/ economic	0.63	0.32	0.95
% Males in treatment > 1 year	Health/ criminal Justice/ economic	0.58	0.29	0.86
% Deaths from Recreational drugs	Economic	0.05	0.03	0.08
% Deaths of those not in treatment	Economic	0.86	0.43	1.00
% Death in treatment < 1 year	Economic	0.14	0.07	0.21
% Poisonings requiring Ambulance	Health	1.00	0.50	1.00
% Poisonings admitted to A&E	Health	1.00	0.50	1.00

% Mental disorders requiring Ambulance	Health	0.00	0.00	0.50
% Psychiatric disorders admitted to A&E	Health	0.00	0.00	0.50
% Other cases requiring Ambulance	Health	0.59	0.30	0.89
% Other cases admitted to A&E	Health	0.93	0.47	1.00
% Diagnosed with AIDS	Health	0.28	0.14	0.42
% Asymptomatic of HIV	Health	0.26	0.13	0.39
% Symptomatic of HIV	Health	0.49	0.24	0.73
% Injecting associated Infection	Health	0.90	0.45	1.00
% IDUs receiving antiviral treatment	Health	0.50	0.25	0.75
No of GP visits per male PDU not in treatment	Health	1.88	0.94	2.82
No of GP visits per female PDU not in treatment	Health	1.35	0.68	2.03
No of A&E visits per male PDU not in treatment	Health	1.12	0.56	1.68
No of A&E visits per female PDU not in treatment	Health	0.80	0.40	1.20
No of Outpatient visits per male PDU not in treatment	Health	1.14	0.57	1.71
No of Outpatient visits per female PDU not in treatment	Health	3.23	1.61	4.84
No of days spent as inpatient per male PDU not in treatment	Health	4.57	2.29	6.86
No of days spent as inpatient per female PDU not in treatment	Health	7.17	3.59	10.76
No of GP visits per male PDU in treatment < 1 year	Health	1.30	0.65	1.94
No of GP visits per female PDU in treatment < 1 year	Health	1.48	0.74	2.22
No of A&E visits per male PDU in treatment < 1 year	Health	0.63	0.32	0.95
No of A&E visits per female PDU in treatment < 1 year	Health	0.48	0.24	0.72
No of Outpatient visits per male PDU in treatment < 1 year	Health	1.51	0.76	2.27
No of Outpatient visits per female PDU in treatment < 1 year	Health	2.66	1.33	3.98
No of days spent as inpatient per male PDU in treatment < 1 year	Health	1.72	0.86	2.59
No of days spent as inpatient per female PDU in treatment <1 year	Health	2.45	1.22	3.67
No of GP visits per male PDU in treatment > 1 year	Health	0.02	0.01	0.03
No of GP visits per female PDU in treatment > 1 year	Health	1.08	0.54	1.62
No of A&E visits per male PDU in treatment > 1 year	Health	0.58	0.29	0.87
No of A&E visits per female PDU in treatment > 1 year	Health	0.36	0.18	0.54
No of Outpatient visits per male PDU in treatment > 1 year	Health	1.13	0.57	1.70
No of Outpatient visits per female PDU in treatment > 1 year	Health	2.54	1.27	3.80
No of days spent as inpatient per male PDU in treatment > 1 year	Health	1.23	0.61	1.84
No of days spent as inpatient per female PDU in treatment > 1 year	Health	0.85	0.43	1.28
% Males arrested for Breach of Peace not in treatment	Criminal Justice	0.05	0.03	0.08

% Females arrested for Breach of Peace not in treatment	Criminal Justice	0.02	0.01	0.02
% Males arrested for Driving Under Influence not in treatment	Criminal Justice	0.01	0.01	0.02
% Females arrested for Driving Under Influence not in treatment	Criminal Justice	0.00	0.00	0.00
% Males arrested for Soliciting not in treatment	Criminal Justice	0.00	0.00	0.00
% Females arrested for Soliciting not in treatment	Criminal Justice	0.02	0.01	0.03
% Males arrested for Breach of Peace in treatment < 1 year	Criminal Justice	0.15	0.08	0.23
% Females arrested for Breach of Peace in treatment < 1 year	Criminal Justice	0.07	0.03	0.10
% Males arrested for Driving under Influence in treatment < 1 year	Criminal Justice	0.02	0.01	0.04
% Females arrested for Driving under Influence in treatment < 1 year	Criminal Justice	0.00	0.00	0.00
% Males arrested for Soliciting in treatment < 1 year	Criminal Justice	0.00	0.00	0.00
% Females arrested for Soliciting in treatment < 1 year	Criminal Justice	0.01	0.01	0.02
% Males arrested for Breach of Peace in treatment > 1 year	Criminal Justice	0.09	0.04	0.13
% Females arrested for Breach of Peace in treatment > 1 year	Criminal Justice	0.10	0.05	0.14
% Males arrested for Driving under Influence in treatment > 1 year	Criminal Justice	0.02	0.01	0.03
% Females arrested for Driving under Influence in treatment > 1 year	Criminal Justice	0.00	0.00	0.00
% Males arrested for Soliciting in treatment > 1 year	Criminal Justice	0.00	0.00	0.00
% Females arrested for Soliciting in treatment > 1 year	Criminal Justice	0.00	0.00	0.00
No of thefts from person per male PDU not in treatment	Criminal Justice/ Wider social	4.08	2.04	6.12
No of thefts from person per female PDU not in treatment	Criminal Justice/ Wider social	4.26	2.13	6.39
No of thefts from a house per male PDU not in treatment	Criminal Justice/ Wider social	3.12	1.56	4.68
No of thefts from a house per female PDU not in treatment	Criminal Justice/ Wider social	2.24	1.12	3.35
No of thefts from a shop per male PDU not in treatment	Criminal Justice/ Wider social	54.91	27.45	82.36
No of thefts from a shop per female PDU not in treatment	Criminal Justice/ Wider social	61.08	30.54	91.61
No of thefts from a vehicle per male PDU not in treatment	Criminal Justice/ Wider social	6.73	3.37	10.10
No of thefts from a vehicle per female PDU not in treatment	Criminal Justice/ Wider social	0.11	0.05	0.16
No of vehicle thefts per male PDU not in treatment	Criminal Justice/ Wider social	2.62	1.31	3.92
No of vehicle thefts per female PDU not in treatment	Criminal Justice/ Wider social	0.06	0.03	0.10
No of times handling stolen goods per male PDU not in treatment	Criminal Justice/ Wider social	33.13	16.56	49.69
No of time handling stolen goods per female PDU not in treatment	Criminal Justice/ Wider social	32.34	16.17	48.52

No of times Fraud/Forgery per male PDU not in treatment	Criminal Justice/ Wider social	5.20	2.60	7.80
No of times Fraud/ Forgery per female PDU not in treatment	Criminal Justice/ Wider social	9.29	4.65	13.94
No of assaults per male PDU not in treatment	Criminal Justice/ Wider social	2.61	1.30	3.91
No of assaults per female PDU not in treatment	Criminal Justice/ Wider social	0.89	0.44	1.33
No of Criminal Damage incidents per male PDU not in treatment	Criminal Justice/ Wider social	1.30	0.65	1.95
No of Criminal Damage incidents per female PDU not in treatment	Criminal Justice/ Wider social	0.43	0.22	0.65
No of thefts from a person per male PDU in treatment < 1 year	Criminal Justice/ Wider social	0.58	0.29	0.86
No of thefts from person per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.22	0.11	0.32
No of thefts from a house per male PDU in treatment < 1 year	Criminal Justice/ Wider social	0.32	0.16	0.48
No of thefts from a house per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.05	0.03	0.08
No of thefts from a shop per male PDU in treatment < 1 year	Criminal Justice/ Wider social	13.60	6.80	20.40
No of thefts from a shop per female PDU in treatment < 1 year	Criminal Justice/ Wider social	23.30	11.65	34.95
No of thefts from a vehicle per male PDU in treatment < 1 year	Criminal Justice/ Wider social	2.73	1.37	4.10
No of thefts from a vehicle per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.27	0.14	0.41
No of vehicle thefts per male PDU in treatment < 1 year	Criminal Justice/ Wider social	1.52	0.76	2.29
No of vehicle thefts per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
No of times handling stolen goods per male PDU in treatment < 1 year	Criminal Justice/ Wider social	18.13	9.06	27.19
No of times handling stolen goods per female PDU in treatment < 1 year	Criminal Justice/ Wider social	5.32	2.66	7.97
No of times Fraud/Forgery per male PDU in treatment < 1 year	Criminal Justice/ Wider social	8.22	4.11	12.34
No of times Fraud/Forgery per female PDU in treatment < 1 year	Criminal Justice/ Wider social	2.76	1.38	4.14
No of assaults per male PDU in treatment < 1 year	Criminal Justice/ Wider social	0.99	0.50	1.49
No of assaults per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.70	0.35	1.05
No of criminal damage incidents per male PDU in treatment < 1 year	Criminal Justice/ Wider social	0.35	0.18	0.53
No of criminal damage incidents per female PDU in treatment < 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
No of thefts from a person per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.35	0.18	0.53
No of thefts from a person per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
No of thefts from a house per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.14	0.07	0.21
No of thefts from a house per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
No of thefts from a shop per male PDU in treatment > 1 year	Criminal Justice/ Wider social	2.88	1.44	4.32
No of thefts from a shop per female PDU	Criminal Justice/	16.76	8.38	25.14

in treatment > 1 year	Wider social			
No of thefts from a vehicle per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.50	0.25	0.75
No of thefts from a vehicle per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.19	0.10	0.29
No of vehicle thefts per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.07	0.04	0.11
No of vehicle thefts per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
No of times handling stolen goods per male PDU in treatment > 1 year	Criminal Justice/ Wider social	8.00	4.00	12.00
No of times handling stolen goods per female PDU in treatment > 1 year	Criminal Justice/ Wider social	3.52	1.76	5.29
No of times Fraud/Forgery per male PDU in treatment > 1 year	Criminal Justice/ Wider social	1.05	0.53	1.58
No of times in Fraud/Forgery per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.10	0.05	0.14
No of assaults per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.49	0.25	0.74
No of assaults per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.10	0.05	0.14
No of criminal damage incidents per male PDU in treatment > 1 year	Criminal Justice/ Wider social	0.28	0.14	0.42
No of criminal damage incidents per female PDU in treatment > 1 year	Criminal Justice/ Wider social	0.00	0.00	0.00
% Families solely affected by drug misuse from new Social Work cases	Social care	0.11	0.06	0.17
% Assumed SW referrals for drug misuse	Social	0.80	0.40	1.00
% Child Protection Orders for Parental substance use	Social	0.78	0.39	1.00
% Services for Adults with illicit drug use	Social	0.75	0.38	1.00
Manual workers who cited drugs or alcohol as a reason for their short term absence	Economic	0.04	0.02	0.06
Non-manual workers who cited drugs or alcohol as a reason for their short term absence	Economic	0.02	0.01	0.03
% Absences due to drugs only	Economic	0.41	0.21	0.62
% Unemployed male PDUs not in treatment	Economic	0.86	0.43	1.00
% Unemployed female PDUs not in treatment	Economic	0.90	0.45	1.00
% Unemployed male PDUs in treatment < 1yr	Economic	0.88	0.44	1.00
% Unemployed female PDUs in treatment < 1yr	Economic	0.92	0.46	1.00
% Unemployed male PDUs in treatment > 1yr	Economic	0.87	0.44	1.00
% Unemployed female PDUs in treatment > 1yr	Economic	0.88	0.44	1.00

When the 1,000 simulated values for each of the inputs are combined to provide a total estimate of the size of the drugs market, the total estimate can be correlated against each of the input values to find out which one is the most highly correlated. This can be done in various ways, including using rank correlations (where each value of the input variables are ranked and the ranked total estimate is correlated against these ranks). Partial correlations can also be calculated, in which each of the other variables is held constant to examine the particular correlation between any

single input and the total estimated size of the drugs market. The approach we took was to first identify inputs that are significantly correlated by correlating all input variables for each area with the total estimated cost for that area. Once identified, partial correlations were calculated for these significant inputs while holding all other inputs constant to determine the true extent of the correlation between each input and the estimated cost.

Tables 2, 3, 4, 5 and 6 list the most correlated input variables, in order of decreasing importance for each area. The strongest correlation was the correlation between the percentage of PDUs in treatment and the total criminal justice costs. This was a negative correlation indicating that as the percentage of PDUs in treatment increased, the total estimated criminal justice cost decreased.

Table 2 Five input variables most correlated with the estimated total health cost

Cost group	Input	Correlation
Health	No of days spent as inpatient per male PDU not in treatment	0.86
Health	% PDUs in treatment	-0.85
Health	No of days spent as inpatient per female PDU not in treatment	0.78
Health	% of PDUs who are male	-0.74
Health	No of days spent as inpatient per male PDU in treatment < 1yr	0.24

Table 3 Five input variables most correlated with the estimated total criminal justice cost

Cost group	Input	Correlation
Criminal Justice	% PDUs in treatment	-0.95
Criminal Justice	No of thefts from a house per male PDU not in treatment	0.79
Criminal Justice	No of fraud/forgeries per male PDU not in treatment	0.75
Criminal Justice	No of fraud/forgeries per female PDU not in treatment	0.71
Criminal Justice	No of fraud/forgeries per male PDU in treatment < 1yr	0.51

Table 4 Five input variables most correlated with the estimated total social care cost

Cost group	Input	Correlation
Social care	% families solely affected by drug misuse from new Social Work cases	1.00
Social care	% Child Protection Orders for Parental substance use	1.00
Social care	% Services for Adults with illicit drug use	1.00

Table 5 Five input variables most correlated with the estimated total economic cost

Cost group	Input	Correlation
Economic	% of PDUs who are male	0.87
Economic	% male PDUs not in treatment who are unemployed	0.87
Economic	% male PDUs in treatment > 1yr who are unemployed	0.56
Economic	% male PDUs in treatment < 1yr who are unemployed	0.54
Economic	% female PDUs not in treatment who are unemployed	0.37

Table 6 Five input variables most correlated with the estimated total wider social cost

Cost group	Input	Correlation
Wider costs	% PDUs in treatment	0.64
Wider costs	No of vehicle thefts per male PDU not in treatment	0.37
Wider costs	No of house thefts per male PDU not in treatment	0.25
Wider costs	No of thefts from a vehicle per male PDU not in treatment	0.21
Wider costs	No of shop thefts per male PDU not in treatment	0.19

The second part of the sensitivity analyses tested the robustness of the model to the inputs based on assumptions or guesstimates. These variables were:

- % of poisonings that required an ambulance
- % of poisonings that were treated in A&E
- % of mental and behavioural disorders that required an ambulance
- % of cases seen in a psychiatric hospital that were first treated in A&E
- % of other conditions related to recreational drug use that required an ambulance
- % of other conditions related to recreational drug use that were treated in A&E
- % of referrals to the children's panel on the grounds of "misused drugs or alcohol" were due to drugs only
- % of referrals to the children's panel for parental parental illicit drug use
- % of substance misuse services that are specifically drug services

Bivariate correlations between these inputs and the total social and economic cost were calculated and summarised in table 3 below:

Table 3 Correlation between inputs based on assumptions and the total social and economic cost of illicit drug use in Scotland

Input	Correlation statistic	Significance statistic
% of poisonings that required an ambulance	0.00	0.69
% of poisonings that were treated in A&E	0.00	0.78
% of mental and behavioural disorders that required an ambulance	-0.01	0.30
% of cases seen in a psychiatric hospital that were first treated in A&E	0.01	0.54
% of other conditions related to recreational drug use that required an ambulance	0.00	0.70
% of other conditions related to recreational drug use that were treated in A&E	0.00	0.95
% of referrals to the children's panel on the grounds of "misused drugs or alcohol" were due to drugs only	0.02	0.08
% of referrals to the children's panel for parental illicit drug use	0.02	0.08
% of substance misuse services that are specifically drug services	**0.04**	**0.00**

The table above shows that the only input that is significantly correlated to the estimated total social and economic cost is the percentage of substance misuse services that are specifically drug services. However, the correlation statistics for this input is small (0.04). Therefore, varying this percentage will have a small impact on the total estimated social and economic cost.

The final part aimed to provide a range for the total social and economic costs. This was calculated by taking the 2.5^{th} percentile and the 97.5^{th} percentile of the distribution produced by combining all of the distributions created around the point estimates that have been used as inputs in the costs model. This gave a total social and economic cost of illicit drug use in Scotland that ranged from £2.7bn to £4.1 bn. However, it must be remembered that all of the distributions (with the exception of the one created for the estimated number of PDUs) were created by assuming that the inputs ranged from 0.5 times the point estimate to 1.5 times the point estimate. The values 0.5 and 1.5 were arbitrary due to the lack of available information.

Appendix 4 Typology of costs

Costs incurred by the public sector

Area of cost	Consequence / cost	Type of drug user
Health	Drug related deaths (health cost)	Problem & recreational
	Mental health problems as a result of drug use	Problem & recreational
	Admission to hospital for acute illnesses related to drug use (e.g. overdose, injury when intoxicated)	Problem & recreational
	Outpatient treatment for acute illness related to drug use	Problem
	GP consultations	Problem
	Acquired blood borne viruses as a result of injecting	Problem
	Specialist needs in pregnancy & neonatal care	Problem
	Drug treatment	Problem & recreational
	Substitute prescribing	Problem
Criminal Justice	CJ costs for drug offences	Problem & recreational
	CJ costs for crimes associated with drug use	Problem
	CJ costs for drug driving offences	Problem
Social care	Children & families social work where cases are due to drug use	Problem
	Children's panel where cases are due to child's or parent's drug use	Problem & recreational
	Criminal justice social work where cases are due to drug use	Problem
	Substance misuse teams	Problem

Costs incurred by the economy

Area of cost	Consequence / cost	Type of drug user
n/a	Lost productivity due to drug use	Problem
n/a	Absenteeism due to drug use	Problem & recreational
n/a	Lost output as a result of drug related deaths	Problem & recreational

Wider social costs

Area of cost	Consequence / cost	Type of drug user
n/a	Cost to drug user for a drug related death	Problem & recreational
n/a	Victims of crime related to drug use (e.g. burglary)	Problem
n/a	Cost spent in anticipation of crime related to drug use	Problem

Appendix 5 Calculating the rate of uptake of health services related to problem drug use

A&E visits

Rate per PDU

	Males	Females	Source
General population	?	?	There is no available data source
PDUs not in treatment	1.12	0.80	DORIS1
PDUs in treatment < 1yr	0.63	0.48	DORIS2
PDUs in treatment > 1yr	0.58	0.36	DORIS3

Since there is no available information on the rate of A&E visits by the general population there is no adjustment needed for the rates from DORIS.

Inpatient stays

Rate per 1,000 15-64 population

	Males	Females	Source
General population	327	292	Number of bed days occupied by emergency continuous inpatient stays, ISD Scotland (2007)
PDUs not in treatment	2,450	3,733	DORIS1
PDUs in treatment < 1yr	1,367	1,827	DORIS2
PDUs in treatment > 1yr	1,035	762	DORIS3

The rates for the general population were then subtracted from the rates for PDUs and divided by 1,000 to give a rate per PDU.

Outpatient appointments

Rate per PDU

	Males	Females	Source
General population	?	?	There is no available data source
PDUs not in treatment	1.14	3.23	DORIS1
PDUs in treatment < 1yr	1.51	2.66	DORIS2
PDUs in treatment > 1yr	1.13	2.54	DORIS3

Since there is no available information on the rate of outpatient appointments by the general population there is no adjustment needed for the rates from DORIS.

GP visits

Rate per 1,000 15-64 population

	Males	Females	Source
General population	1,926	3,381	Rate of GP consultations per 1,000 population, ISD Scotland (2007)
PDUs not in treatment	3,806	4,731	DORIS1
PDUs in treatment < 1yr	3,223	4,860	DORIS2
PDUs in treatment > 1yr	1,947	4,464	DORIS3

The rates for the general population were then subtracted from the rates for PDUs and divided by 1,000 to give a rate per PDU.

Appendix 6 Extract from DORIS questionnaire

Q. Which of the following crimes have you committed in the past 3 months?

a) Drug possession
b) Selling/ supplying drugs
c) Theft from a person
d) Theft from a house/ home
e) Theft from a shop or commercial property
f) Theft from a vehicle
g) Theft of a vehicle
h) Other theft [specify]
i) Handling stolen goods
j) Fraud/ forgery/ deception
k) Assault
l) Criminal damage
m) Soliciting
n) Driving under the influence of illegal drugs
o) Breach of the peace

Appendix 7 Calculating the value of productivity for PDUs who are unemployed

Not in treatment

Number of male PDUs not in treatment in Scotland: 23,025
Number of female PDUs not in treatment in Scotland: 9,829

Number of economically active male PDUs in Scotland = 23,025 * 0.831[21] = 19,128*
Number of economically active female PDUs in Scotland = 9,829 * 0.760[22] = 7,465*

From the Labour Force Survey (LFS):
No of economically active male PDUs who would be unemployed = 19,128 * 0.058[23] = 1,114*
No of economically active female PDUs who would be unemployed = 7,465 * 0.048[24] = 356*

From DORIS:
No of economically active male PDUs who would be unemployed = 19,269*0.864[25] = 16,536*
No of economically active female PDUs who would be unemployed = 7,800*0.898[26] = 6,706*

Thus allowing for those PDUs who would remain unemployed if there was no drug use gives

16,536 – 1,114 = 15,421 unemployed male PDUs in Scotland
6,706 – 356 = 6,350 unemployed female PDUs in Scotland

Using the Male and female median gross annual earnings in Scotland taken from ASHE yields estimates of:

- £361,368,299 of lost productivity as a result of unemployment among male PDUs not in treatment
- £92,726,980 of lost productivity as a result of unemployment among female PDUs not in treatment

** Please note that calculated figures here may be slightly different to due to rounding of rates*

[21] Table 1 in Labour market statistics. February 2007: Scotland: 83.1% of working age males in Scotland are economically active
[22] As above: 76.0% of working age females in Scotland are economically active
[23] As above: 5.8% of males in Scotland are unemployed
[24] As above: 4.7% of females in Scotland are unemployed
[25] DORIS: 86.4% of male PDUs not in treatment are unemployed
[26] DORIS: 89.8% of female PDUs not in treatment are unemployed

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