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Estimating the National and Local Prevalence of Problem Drug Misuse in Scotland

LHCC and SIP Estimates

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Executive Summary

In contrast with other areas of the United Kingdom, and indeed Europe, Scotland has consistent estimates of the prevalence of problem drug use across the 15 National Health Service (NHS) Board, 22 Drug Action Team (DAT) and 32 Council areas. The prevalence estimates were derived from research that was funded by the Scottish Executive and commissioned through the Information and Statistics Division (ISD) of the NHS in Scotland. The research team, which is a collaboration between the Centre for Drug Misuse Research at the University of Glasgow and the Scottish Centre for Infection and Environmental Health, used a methodology known as capture-recapture to provide estimates of the prevalence of opiate and / or benzodiazepine misuse at the Council, DAT and NHS Board area levels, and estimates of the prevalence of drug injecting at the NHS Board area level.

In total it was estimated that there were 55,800 problem drug users in Scotland in 2000; this estimates converts to 2.0% of the population aged between 15 and 54. There were differences in the estimated prevalence of problem drug across the Drug Action Team areas, with the Aberdeen City, Argyll & Clyde, Dundee City and Greater Glasgow Drug Action Team areas experiencing heightened levels of problem drug use.

While the prevalence estimates for 2000 have been of use to the Scottish DATs in their strategic planning, information at a more local level is required to inform the planning and provision of drug services within a DAT area and should be included in any further prevalence estimation exercises. As some Drug Action Teams span several Council areas, the existing Council area estimates can be used by those Drug Action Teams to examine differing levels of prevalence within the area they cover. However Local Health Care Co-operative (LHCC) areas have been identified as a more suitable operational level within a NHS Board that prevalence estimates could be obtained for which would inform the needs of all Scottish DATs. LHCCs are operational units responsible for managing and delivering integrated services across specific areas. The structure of LHCCs allows groups of GPs to develop extended primary care teams which encompass district nurses, health visitors, midwives, community psychiatric nurses and professions allied to medicine within a multi-practice framework. Not every GP in Scotland has become part of an LHCC and in total there are 83 LHCCs in Scotland. These are of varying size and cover diverse populations. Social Inclusion Partnerships (SIPs) are an alternative local area level at which prevalence estimates could be obtained; however only a limited number of areas in Scotland have been classified as SIP areas.

As with the year 2000 problem drug use prevalence estimates, the Scottish Drug Misuse Database is currently summarised only by NHS Board and Council (and thus by DAT) area of residence. Methods for

assigning LHCC area of residence to the data within the Scottish Drug Misuse Database have been considered within this research, along with similar, consistent methods for assigning NHS Board or Council area of residence. There are several steps that are required to enable the provision of prevalence estimates at the LHCC area level. These steps are:-

- Construct LHCC areas in terms of postcode district or postcode sector

- Map the known population (from the Scottish Drug Misuse Database) onto the LHCC areas and other sources of information such as the Police or Criminal Justice Sections of Social Work Departments

- Estimate drug misuse prevalence using these known data

A similar systematic approach is required when providing problem drug use prevalence estimates at the NHS Board or Council area levels.

Constructing LHCC Areas from Postcode Data

Data on problem drug users typically include either the postcode sector or postcode district of residence. There are 950 postcode sectors and 443 postcode districts in Scotland. As previously described, LHCCs were developed as groupings of GPs to which funding and planning functions have been devolved. They do not have strict geographical boundaries as, although GPs may have catchment areas, patients can chose to use GPs whose surgeries are some distance from where they live. In order to base prevalence estimates at the LHCC area level, it is useful to approximate the LHCC areas in terms of postcode sectors or postcode districts. The approach taken within this research uses the Community Health Index (CHI) to examine the postcode sector of residence of the patients of each GP within an LHCC. From the CHI it is possible to define the LHCC area by where the majority of the patients of the GPs of a particular LHCC live. For example, 69% of the population within the TD13.5 postcode sector are patients of a GP within the East Lothian LHCC; therefore the whole of this postcode sector is assigned to that LHCC area. This approach has been taken to assign neighbouring postcode sectors or districts to each LHCC in Scotland and thus define the LHCCs as groups of coterminous postcode districts or sectors.

Constructing NHS Board or Council Areas from Postcode Data

Most postcode sectors (or postcode districts) will lie entirely within one NHS Board or Council area. Some, however, will be split across one or more NHS Board or Council area. In these instances, the NHS Board and Council can be assigned on the basis of the population breakdown of each population sector, split across Council or NHS Board

boundaries. Thus the Council and NHS Board area assigned to that postcode sector will be the one where the largest proportion of the population of the postcode sector resides. For example, the TD13.5 postcode sector is partly in the East Lothian Council area (and thus the Lothian NHS Board area) and partly in the Scottish Borders Council area (and thus the Borders NHS Board area). From the mid-year population estimates, it can be noted that 78% of the population of that postcode sector are within the East Lothian section, therefore it may be appropriate to assign the whole of the postcode sector to the East Lothian Council and the Lothian NHS Board areas. Once the NHS Board or Council area of residence have been assigned to each postcode sector or district, each of the 15 NHS Board, 32 Council or 22 DAT areas can be constructed in terms of either postcode sector or district. This step is also important for constructing the population figures used in rates to compare across areas. There will, however, be some postcode districts or postcode sectors where the socio-economic profile, or information about the known drug using population, suggests that most of the drug using population for that area should live in the smaller area. There is not, as yet, a systematic approach to identifying such postcode sectors, although allocating postcode district area of residence can be informed by the number of known drug users in each of the constituent postcode sectors.

Estimating the Prevalence of Problem Drug Use at the LHCC Level

Capture-recapture methods were then applied to known data, stratified by LHCC area of residence, from the Scottish Drug Misuse Database and other relevant data sources in two NHS Board areas. These two areas contained four DAT / Council areas. These areas were selected due to the availability of relevant data. Estimates were also provided for the two Social Inclusion Partnership (SIP) areas within those areas. It was found that there was marked variation in the estimated prevalence of problem drug use across the LHCC areas in those NHS Board areas. However in some of the smaller, rural LHCCs, it was not possible to obtain valid prevalence estimates using only the capture-recapture method. More generally, it was concluded that valid prevalence estimates could be obtained for most LHCC areas in Scotland and therefore inform the Scottish DATs in their planning and provision of appropriate services.

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1 Introduction

In contrast with other areas of the United Kingdom, and indeed Europe, Scotland now has timely and consistent estimates of the prevalence of problem drug use across the 15 National Health Service (NHS) Board, 22 Drug Action Team (DAT) and 32 Council areas. The prevalence estimates were derived from research that was funded by the Scottish Executive and commissioned through the Information and Statistics Division (ISD) of the NHS in Scotland. The research team, which is a collaboration between the Centre for Drug Misuse Research at the University of Glasgow and the Scottish Centre for Infection and Environmental Health, used a methodology known as capture-recapture to provide estimates of the prevalence of opiate and / or benzodiazepine misuse at the Council, DAT and NHS Board area levels, and estimates of the prevalence of drug injecting at the NHS Board area level.

While the prevalence estimates have been of use to the Scottish DATs in their strategic planning, information at a more local level is required to inform the planning and provision of drug services within a DAT area. In some DAT areas however the previous study had informed this process; for example, both the Argyll & Clyde and the Greater Glasgow DATs not only received estimates of the prevalence of problem drug use within the Council areas of which they are comprised, but the research team provided supplementary estimates detailing the prevalence of problem drug use in partial Council areas that they cover. Local Health Care Co-operative (LHCC) areas are a suitable operational level within a NHS Board that prevalence estimates could be obtained for, whereas Social Inclusion Partnership (SIP) areas are defined areas within certain Councils.

This report details the steps that need to be taken when providing valid information on drug users contacting drug services at the LHCC area level and when obtaining estimates of the prevalence of problem drug use (including the hidden drug use not identified from treatment service) at the LHCC or SIP area level.

Within a more general drive towards an evidence-based strategic response to problem drug use at both the national and local level, it is important to provide DATs with information on the pattern of both 'known' drug use and 'hidden' drug use within the geographical area which they cover. Although local needs assessments may be a better vehicle for balancing information on the nature and extent of drug use with an audit of the available treatment and support services, there is still a place for consistent and comparable estimates of the prevalence of problem drug use at a lower area level than the NHS Board or Council area level. While it is particularly useful for the Scottish Executive to know how drug use is distributed across the 22 DAT areas and 32 Council areas when allocating funding to these bodies, it will be useful for the DATs to know how drug use is distributed within their

area and thus how to target resources efficiently. In addition, the constituent organisations within a DAT, such as Social Work or the Police, would also find estimates of the prevalence of problem drug use within the area which they cover useful in their planning processes.

At the start of the research, the main objective was to provide estimates of the prevalence of problem drug use for each of the LHCC and the larger SIP areas in Scotland. Following close consultation with ISD, an agreed secondary objective was to devise an approach which would satisfy the concerns of the organisations that provide data to the research team and which also would meet the requirements of the Multi-Centre Research Ethics Committee (MREC) which covers Scotland. After devising such an approach and obtaining MREC approval based on that approach, it was then agreed with ISD that collecting data to provide prevalence estimates in all 22 DAT areas of Scotland may place an excessive burden on the data providers. The availability of police data at postcode sector/district level in some DAT areas led to the research focussing on DATs in Aberdeen, Aberdeenshire, Fife and Moray where the data was more complete. By concentrating on these four DAT areas, the research can also demonstrate some of the key issues when providing LHCC area estimates across Scotland, for example these areas reflect wide variation in the levels of known drug misuse and there are particular issues in identifying which LHCC some drug users are resident within in and around the Aberdeen and Dunfermline areas.

The other main objective of the research was to map the known drug using population, in particular that found within the Scottish Drug Misuse Database, onto the LHCCs across Scotland. This could be done using aggregated existing data and has therefore been done for the whole of Scotland.

Before considering the methods that can be used to estimate the prevalence of problem drug use at the local level, we describe the different area levels we refer to in the research.

Postcode Districts and Postcode Sectors

Postcodes were created to assist in the efficient delivery of post to business and residential addresses across the country. A postcode, such as G31 2LF, can be split into hierarchical levels. The first letter G, signifies the postcode area and there are 16 postcode areas in Scotland. Postcode districts are denoted by the postcode area and the next one or two digits such as G31. There are 443 postcode districts in Scotland. Below that level, there are postcode sectors that are denoted by the postcode district plus the remaining digit after the space, for example G31 2 (sometimes denoted as G31.2). There are 950 postcode sectors in Scotland. Below this level, the last two letters signify the postcode unit. However the full postcode, including the postcode area, would cover such a small population that collating

sensitive information at such a small area level could easily compromise the confidentiality of the residents of that area. Therefore the postcode sector area level is the smallest level at which sensitive data, such as those on drug misuse, are collated. Table 1.1 provides some further information on the size of postcode districts and sectors in Scotland.

Table 1.1 Information on postcode sectors and postcode districts in Scotland

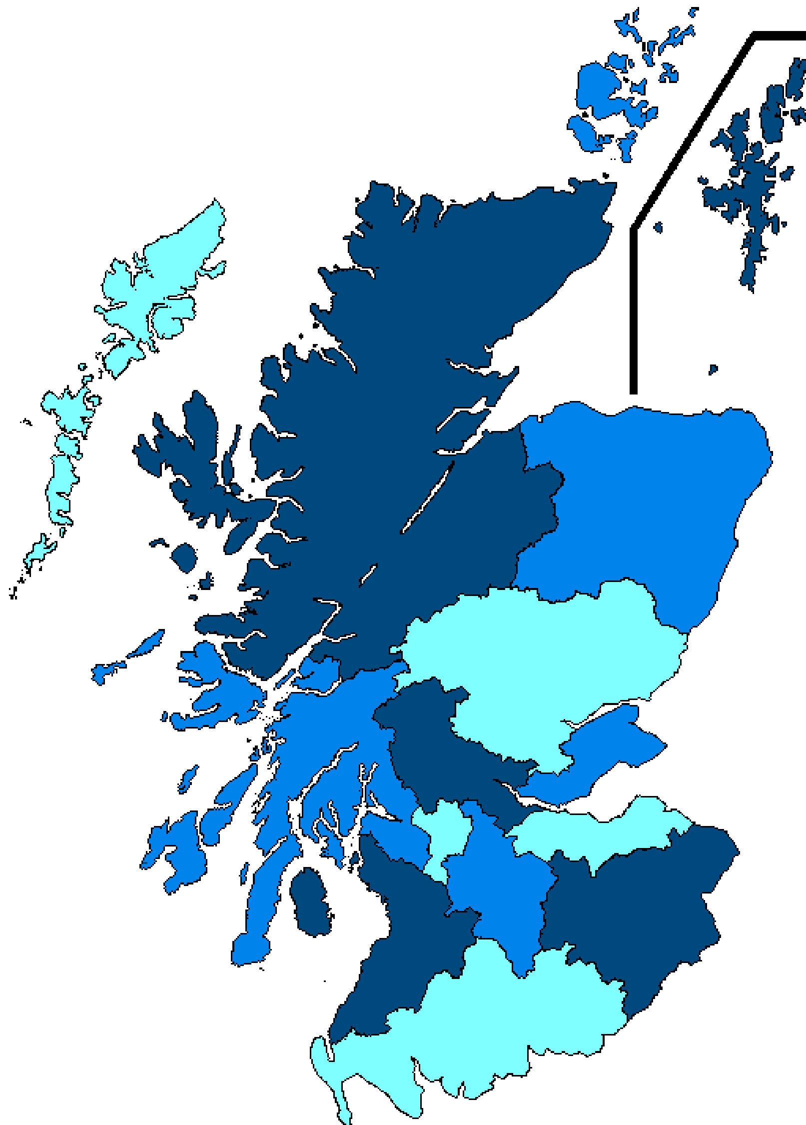
		Population size		
Level	**n**	**mean**	**minimum**	**maximum**
Postcode District	433	11,545	9	53,313
Postcode Sector	950	5,384	9	20,558

In many of the more rural areas of Scotland, there is only one postcode sector in a postcode district, and from Table A1 (Appendix), the smallest postcode sector in Scotland (PH30.4) which covers a population of nine in the west Highlands, is the only postcode sector in the PH30 postcode district. The largest postcode district is ML6 (population 53,313) which covers Airdrie. The largest postcode sector, with a population of 20,558, is the EH54.6 sector that covers part of Livingston.

Health Boards

Following the NHS (Scotland) Act 1972, 15 Health Boards were created in 1974 to provide a single local health care system reporting to the Secretary of State for Scotland (now the Scottish Executive). The Health Boards were constituted from groups of the 53 local government districts that existed before local government reorganisation in 1996. Figure 1.1 shows the boundaries of the Scottish Health Boards.

Figure 1.1 Map showing the boundaries of the Scottish NHS Boards



More recently, the Health Boards have evolved and been renamed NHS Boards. These 15 NHS Boards have the same boundaries as before.

LHCCs

The Government's 1997 White Paper *Designed to Care* brought about changes to the way primary care services are delivered across Scotland. One significant change was the move away from GP fund-holding practices towards LHCCs, which are operational units responsible for managing and delivering integrated services across

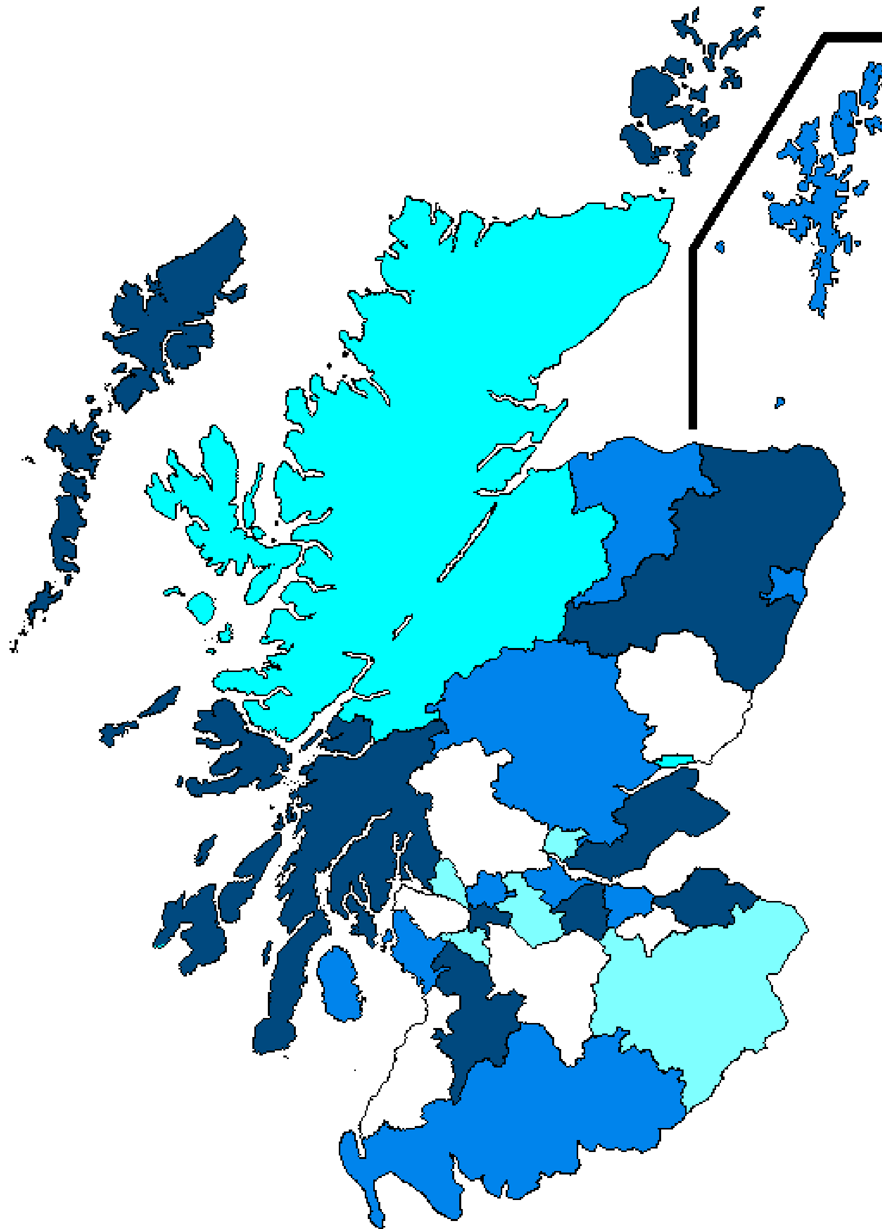
what were intended to be defined areas. The structure of LHCCs allows groups of GPs to develop extended primary care teams which encompass district nurses, health visitors, midwives, community psychiatric nurses and professions allied to medicine within a multi-practice framework. Not every GP in Scotland has become part of an LHCC. In particular, there are no LHCCs in the Western Isles Health Board area. In total there are 83 LHCCs in Scotland.

As they have been created as groupings of GPs, it is not always straightforward to assign a defined geographical area to each LHCC in Scotland. Indeed, within Greater Glasgow, the WestOne and Riverside LHCCs cover similar areas.

Councils

The 1994 Local Government (Scotland) Act led to the abolition of the previous structure of nine regions and 53 districts. Since April 1996, Scotland has been split into 32 Council areas. Some Councils, such as Highland and Dumfries & Galloway, followed the previous region boundaries, whereas some, such as East Lothian and Moray, followed the previous district boundaries. Other Councils were created from groups of the old districts, for example East Ayrshire Council is comprised of the previous Cumnock & Doon Valley and Kilmarnock & Loudon District Councils. The new Dundee City Council was formed from most of the previous Dundee District Council, with some areas being transferred to Angus or Perth & Kinross. In west central Scotland, however, the reorganisation was more complex resulting in some Council areas now being split across NHS Board areas. Figure 1.2 shows the Council boundaries, as they currently stand, for Scotland.

Figure 1.2 Map showing the boundaries of the Scottish Councils



SIPs

'Social Inclusion' and 'Social Exclusion' are terms widely used by politicians and routinely referred to in the media. 'Social Exclusion' can be described as the effect a combination of problems such as low income, high crime, unemployment and bad health can have on the individual and communities. 'Social Inclusion' can therefore refer to any initiatives that focus on issues such as community development, health, housing, etc. These initiatives are not confined to local areas and

include national strategies such as the New Community Schools, New Deal and Social Inclusion Partnerships (SIPs).

The formation and implementation of SIPs in Scotland was announced on 8 May 1998 at the Scottish Urban Regeneration Forum's Inaugural Lecture by the then Secretary of State, Donald Dewar. It was said that they would evolve and replace the Priority Partnership Areas designated in 1996. This was followed in March 1999 by the Scottish Social Inclusion Network's strategy document - 'Social Inclusion: Opening the Door to a Better Scotland'. This document outlined five key aspects of social inclusion policy:-

- Excluded young people
- Inclusive communities
- The impact of local anti-poverty action
- Developing an evaluation framework for social inclusion work
- How to promote effective, integrated action at a local level

SIPs can be viewed as a practical application of this social inclusion policy in communities across Scotland.

SIPs themselves are local bodies of representatives from local authorities, health boards, the voluntary sector and community representatives. Their task is to develop strategies and fund local projects to tackle social exclusion. There are currently 48 SIPs operating across Scotland. Thirty-four are area-based initiatives the other 14 are thematic, focussing on subjects such as health and young adults. Some of the area-based SIPs cover quite small areas and therefore may not be suitable levels at which to aggregate data on drug use. The project team has focussed on two area-based SIPs, one in Fife the other in Aberdeen.

2 Methods

In this section we describe the methods used when summarising information on drug misuse at the NHS Board, Council and LHCC area levels. We also provide a brief description of the methods that can then be used to estimate the prevalence of problem drug use at the local level and thus give estimates of the prevalence of problem drug use by NHS Board, Council or LHCC area.

2.1 Mapping Data on Drug Misuse

We start by describing how information on the size of the population of Scotland, stratified by postcode sector, can be used to determine the area of residence of drug users found within the Scottish Drug Misuse Database and thus help provide estimates of the prevalence of problem drug use at the local level. As previously described, we wish to summarise information at the NHS Board, Council and LHCC area levels.

The Scottish Drug Misuse Database collates information on drug users starting contact with a range of treatment and support agencies across Scotland. Drug misuse is largely a covert activity, and confidentiality and anonymity are two pertinent issues when collecting and collating information on an individual's misuse of drugs. Within the Scottish Drug Misuse Database, only a limited set of attributer data is obtained on each individual, for example only the forename initial, surname initial and fourth character of the surname are extracted from the client's name. In place of the client's full address, only the postcode district of residence has traditionally been collected. However, the most recent version of the form used for collecting information for the Scottish Drug Misuse Database (SMR24) now requests postcode sector of residence.

More generally, the quality of data that are collated on drug users in contact with treatment and support agencies in Scotland could be improved. While ISD is striving to improve the quality of the data that are collected for the Scottish Drug Misuse Database, there is a need to take a pragmatic approach and develop methods for working with data of the quality that is currently available. Thus within this research we have developed methods that can be applied to data at the postcode district level, as well as at the postcode sector level. Partly this is to address the issue of the lack of completeness in some of the postcode sector data within some of the returns to the Scottish Drug Misuse Database, but also because there are valid concerns of some organisations about providing postcode sector data to external researchers.

The number of people living in Scotland is an unknown quantity; however the General Register Office for Scotland produces yearly estimates of the population, and population size estimates can be obtained for each and every postcode sector in Scotland. Within this

report, we have used the mid-year estimates for 2000 which present estimates of the population of Scotland by age group, and also by Council area of residence and postcode sector. It is also possible to identify the NHS Board area of residence in those Council areas in west central Scotland that are split across NHS Board boundaries. We focus on two population figures within each postcode sector, the population aged 15 to 54 and the total population.

To be able to apply some of the more common epidemiological approaches to information on drug misuse within LHCC, Council or NHS Board areas, it is useful to assign groups of coterminous postcode sectors, or alternatively groups of coterminous postcode districts to these different areas. Thus, for example, it would be useful to define Moray Council as covering the AB37, AB38, AB55, AB56, IV30, IV31, IV32 and IV36 postcode districts or that the G60.5, G81.1, G81.2, G81.3, G81.4, G81.5 and G81.6 postcode sectors form the Clydebank LHCC. Unfortunately the LHCC, Council or NHS Board boundaries do not always match postcode sector or postcode district boundaries. From the mid-year population estimates we can, however, calculate for each postcode sector or postcode district what percentage of the population of that area lives in different Councils or NHS Board areas and then use that information when assigning a postcode sector or district to a particular Council or NHS Board area.

It should be remembered that, as postcode districts and postcode sectors are much smaller than Council or NHS Board areas, then there will be a minority of postcode districts or postcode sectors that are split across more than one Council or NHS Board area. Thus for most postcode sectors (or indeed postcode districts), 100% of the population will live in a particular Council or NHS Board area and therefore it is clear that the postcode sector should be assigned to that Council or NHS Board area. But for some other postcode sectors, some of the population will live in one Council area whereas the rest will live in one or more others. In those postcode sectors, the Council and NHS Board area assigned to that postcode sector will be the one where the largest proportion of the population of the postcode sector resides. For example, the TD13.5 postcode sector is partly in the East Lothian Council area (and thus the Lothian NHS Board area) and partly in the Scottish Borders Council area (and thus the Borders NHS Board area). From the mid-year population estimates, it can be noted that 78% of the population of that postcode sector are within the East Lothian section, therefore it may be appropriate to assign the whole of the postcode sector to the East Lothian Council and the Lothian NHS Board areas.

As previously described, LHCCs were developed as groupings of GPs to which funding and planning functions have been devolved. They do not have strict geographical boundaries as, although GPs may have catchment areas, patients can chose to use GPs whose surgeries are some distance from where they live. In order to base prevalence

estimates at the LHCC area level, it is necessary to approximate the LHCC areas to groups of coterminous postcode sectors or postcode districts. Two approaches can be taken to this; one which uses the Community Health Index (CHI) to examine the addresses of patients of the GPs within an LHCC and thus define the LHCC area by where these patients live and the other is for the NHS Boards of Scotland to define the LHCCs in their area in terms of postcode districts or sectors. Within this research, the approach based on the CHI has been taken for the whole of Scotland. In a similar manner to assigning Council area and NHS Board area of residence, we would assign the LHCC area on the basis of that which the largest proportion of the postcode sectors cover. In addition, within the Greater Glasgow NHS Board area we were able to contrast the two approaches as the NHS Board had produced a map of the LHCCs in its areas in terms of postcode sectors.

This approach may not be appropriate for many areas of epidemiology, but it may be more appropriate for estimating the prevalence of drug misuse. This is in part due to the nature of data collated on drug use in Scotland, but also because the results of this type of estimation will be prevalence rates. Thus any biases introduced by approximating LHCC areas to coterminous postcode district / sector areas will be minimised as both the numerator and denominator in the prevalence rate (i.e. the number of drug users and the total population aged 15 to 54) will correspond to the same area.

2.2 Multiplier Methods

Many traditional methods of estimating the prevalence of problem drug use apply multipliers to readily available indicator data; for example, if it can be assumed that 2% of problem drug users die each year from drug-related deaths, then the number of drug-related deaths can be multiplied by 50 to provide an estimate of the prevalence of problem drug use. Other common indicators include the number of drug users in treatment or the level of drug-related crime, particularly crimes of possession. Clearly, a key component of the multiplier / indicator approach is the derivation of the multiplier. This is often only practical by concentrating on particular groups – for example looking at drug-related mortality within a cohort of drug users attending treatment services. Other multipliers can be derived from particular geographical areas. If, for example, the prevalence of problem drug use within a given town or city was well documented, and information on the number of drug users in contact with services can be readily obtained, then it would be possible to derive a treatment multiplier for that area. Unfortunately, multipliers may only be applicable to either the group or the specific area from which they were derived. A cohort of drug users in contact with services may experience different mortality than those not in contact. A treatment multiplier derived from one town might not be appropriate for another town, or indeed for a rural area where access to treatment services may be limited. What in effect multiplier

methods assume is that it is safe to extrapolate information from specific groups or areas to a wider area.

The multivariate indicator method (MIM) is an extension to the traditional multiplier method that can serve to improve the validity of the estimates. The method links the prevalence of problem drug use to a combination of typically five indicators and again extrapolates from areas where the prevalence of problem drug use is known onto areas where prevalence is unknown. The areas where existing prevalence estimates are available are known as anchor points and would typically be NHS Board areas or Council areas. While including more than one indicator in the prevalence estimation method can reduce, for example, the effect of any differences in the level of treatment provision, it still remains a valid criticism that the MIM approach will not adequately reflect local differences in the relationship between drug misuse prevalence and indicator data at the Council or NHS Board area level.

2.3 Capture-recapture Methods

The capture-recapture method recognises that only a proportion of drug users in a given area can be identified from data sources such as drug treatment services or the Police. The method employs several data sources from which it is possible to estimate the proportion of drug users that are identifiable from a source, such as treatment, and thus provide an estimate of the size of the hidden drug using population. For the best application of the method, data from three or more agencies are required and sufficient information is required to be able to identify which drug users are in two or three sources. A statistical model can then be applied to that type of data to give an estimate of the number of drug users not found in any of the sources. This estimate, along with the information on the known population, gives the total drug using population in an area.

There are several features of the capture-recapture method that should be noted when considering applying the method at a small geographical level such as the LHCC area level. When examining these features it is useful to simplify the methodology by ignoring some of the other important issues (such as derivation of confidence intervals, model selection). These issues are, however, addressed in previous reports.

It is useful to consider the simpler two-sample capture-recapture method that employs treatment data and Police data. In the two-sample example, the Police data source can be seen as providing a 'treatment' multiplier that would suggest, for example, that 40% of drug users are in treatment. Thus, in this example, information from the Police data source would estimate that the probability (or chance) that a drug user is in treatment is 0.4. Clearly, whether or not an individual drug user is or is not in treatment is not simply by chance. There will be a raft of social, behavioural, medical and criminal justice factors that influence

whether or not an individual is in treatment (such as experience of overdose, distrust of services or having friends in treatment). It may, indeed, be quite difficult to attribute these factors to individuals. But, as in other aspects of statistical analysis, this complex issue is simplified into a statistical framework, in this case a probability. Once the probability of being in treatment has been established, the prevalence of drug use can be easily obtained by combining that probability with the numbers in treatment.

This probability (of being in treatment) may not be equal across all drug users in Scotland. In addition to the person-based factors described above (such as mistrust of services) there will be other types of factors that can be attributed to groups of individuals. Gender may be an issue (the traditional view being that women are less likely to be in treatment than men). Age is another issue, with older drug users probably more likely to be in treatment than younger drug users. Other similar factors may be type of drugs used, route of administration or ethnicity. Perhaps more importantly, the probability of being in treatment may depend on the drug user's area of residence. The availability and nature of service provision (and to a lesser extent the effects of area-based social exclusion factors such as lack of transport, lack of childcare, poor housing etc) will influence the probability that an individual drug user is in treatment.

Thus, when using the capture-recapture method to estimate the prevalence of drug misuse in Scotland, it is necessary to stratify by area of residence, particularly by NHS Board or Council area of residence, as it is at those levels that many of the decisions about treatment provision are made. This requirement also provides for estimates at the NHS Board or Council level. There is also a justification to stratify at a lower level where treatment provision is not uniform across a Council area (i.e. in at least one Council area in Scotland, service provision is focussed towards particular parts of the Council area. Thus it can be useful to stratify at a smaller geographical level (such as the LHCC area level). The additional effects of area-based social exclusion factors can also be more easily accounted for within an LHCC area level analysis. There will, however, be a point at which further area-based stratification becomes inappropriate, both in terms of providing too small an amount of data to analyse and also in terms of it being unlikely that service provision would vary significantly between areas. To use Fife as an example, it may be likely that the probability that an individual drug user in the more rural North East Fife LHCC is in contact with services would differ to that of a drug user in the more urban Dunfermline LHCC area, but it is less likely that this probability differs between the KY15 and the KY16 postcode districts within North East Fife. Moreover, there may be even less difference in this probability between the KY16.8 and KY16.9 postcode sectors (although differences in this probability between postcode sectors within the same postcode district are likely to exist in some areas of Scotland). It should, however, be remembered that it is the probability

of a drug user being in treatment that is being considered here, not the number of drug users or the percentage of the population that uses drugs.

2.4 Comparison of Methods

To compare the capture-recapture method and the MIM approach, the prevalence estimates at the Council area level derived in 2000 using the capture-recapture method were compared to estimates derived from the MIM approach. Although there are 32 Council areas in Scotland, this comparative analysis is restricted to the 29 mainland Council areas. This was because the capture-recapture method was adapted to provide estimates in two of the Island Council areas.

The capture-recapture estimates were obtained using data from the Scottish Drug Misuse Database and the eight Police forces in Scotland and also information from Social Enquiry Reports completed on offenders by Social Work Departments. Further information about the Council area analysis is available within previous reports.

The MIM approach requires readily available prevalence estimates for at least two anchor point areas. This comparative analysis benefits from the luxury of having 29 possible anchor points; therefore it is possible to examine differences when using any number of anchor points. Within this analysis, we have opted for using eight anchor points and thus we are extrapolating the information from eight Council areas to the remaining 21 Council areas of Scotland. Clearly the prevalence estimates derived from the MIM approach would depend on what particular eight Council areas are selected as anchor points. Therefore we have randomly selected 100 different combinations of eight anchor points and carried out the MIM analysis 100 times, each time with a different set of anchor points.

The indicators we used within the MIM analysis are as follows:-

- Clients in treatment (Scottish Drug Misuse Database 2000)
- General acute admissions for drug misuse (ISD 2000)
- Drug-related offences (Scottish Executive)
- Crimes against property (Scottish Executive)
- Income support (Income Support Statistics Quarterly Enquiry)

These indicators were selected, as they are readily available at the Council area level in Scotland.

There are several results from both the capture-recapture method and the MIM approach that can be compared. For example, we can compare the estimated total number of drug users in mainland Scotland, or we can compare the estimates in each of the 29 Council areas. It should also be recognised that as we are undertaking 100 different MIM analyses, we would need to summarise the 100 different

estimates into either the mean or median estimate, or provide a measure of the spread of the 100 estimates.

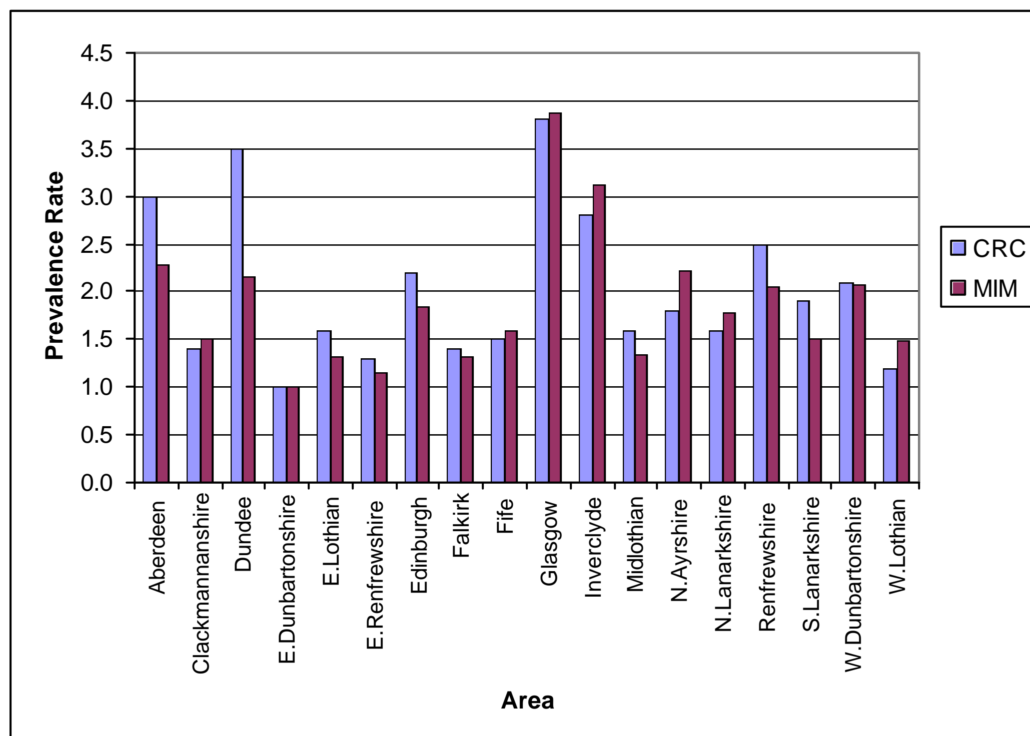
In these analyses, we calculate the median estimates across all 100 derived estimates and present tables and graphs which compare the median of the MIM estimates against the capture-recapture estimates. As an indication of the spread of the different MIM estimates, we can produce histograms that summarise the 100 estimates in each Council area. To avoid repetition within this report, we present only these histograms for the four Council areas in which we examine prevalence estimation at the LHCC area level elsewhere in this report. These four areas are Aberdeen, Aberdeenshire, Fife and Moray. Table 2.1 details a comparison of the capture-recapture estimates for mainland Scotland with the corresponding median MIM values.

Table 2.1 Comparison of Capture-Recapture (CRC) estimates and MIM estimates

		MIM Estimate				
					Percentiles	
Council Area	**CRC estimate**	**Median**	**Minimum**	**Maximum**	**10%**	**90%**
Aberdeen	3,645	2,818	1,244	4,643	2,326	3,573
Aberdeenshire	1,372	1,318	665	1,916	1,036	1,534
Angus	702	693	438	941	597	780
Argyll & Bute	460	619	456	806	551	693
Clackmannanshire	362	399	307	493	345	442
Dumfries & Galloway	1,179	1,072	841	1,336	931	1,184
Dundee City	2,700	1,646	792	2,829	1,371	2,046
East Ayrshire	1,171	1,465	659	2,397	1,211	1,847
East Dunbartonshire	605	629	305	919	491	732
East Lothian	779	647	466	846	572	722
East Renfrewshire	641	570	344	788	485	646
Edinburgh, City of	5,872	4,985	2,963	7,280	4,270	5,957
Falkirk	1,163	1,056	764	1,378	935	1,178
Fife	2,867	3,064	2,193	3,995	2,625	3,483
Glasgow City	13,788	13,760	2,508	27,483	10,552	20,052
Highland	1,029	1,387	938	1,844	1,230	1,523
Inverclyde	1,280	1,433	391	2,685	1,114	1,971
Midlothian	729	623	461	810	553	697
Moray	398	487	265	694	399	562
North Ayrshire	1,384	1,668	774	2,698	1,383	2,085
North Lanarkshire	2,898	3,300	2,045	4,713	2,837	3,905
Perth & Kinross	902	878	597	1,165	778	962
Renfrewshire	2,441	2,004	1,029	3,116	1,682	2,459
Scottish Borders	585	808	637	1,000	697	890
South Ayrshire	503	1,035	667	1,442	891	1,221
South Lanarkshire	3,220	2,607	1,998	3,237	2,243	2,902
Stirling	683	611	424	805	539	675
West Dunbartonshire	1,123	1,087	552	1,697	910	1,336
West Lothian	1,116	1,368	1,075	1,691	1,180	1,509
Scotland	**55,597**	**54,037**	**26,798**	**85,647**	**44,731**	**67,565**

Examining the table we see that the median of the 100 MIM estimates derived from randomly selected anchor points is close to the capture-recapture estimate for most Council areas, but the maximum and minimum values show huge variation. This variation is reduced when examining the 10% and 90% percentiles of the 100 estimates, but still warrants concern about the chances of an individual MIM estimate markedly under- or over-estimating the prevalence of problem drug use within a Council or DAT area.

Figure 2.1 Comparison of Capture-Recapture and MIM prevalence rates by Council area (non-rural Councils)



Figures 2.1 and 2.2 give a comparison of the capture-recapture and MIM prevalence rates for rural and non-rural Council areas. It is clear from the graph that the MIM estimates are slightly larger for rural Council areas than urban ones when compared with the corresponding capture-recapture estimates.

Figure 2.2 Comparison of Capture-Recapture and MIM prevalence rates by Council area (rural Councils)

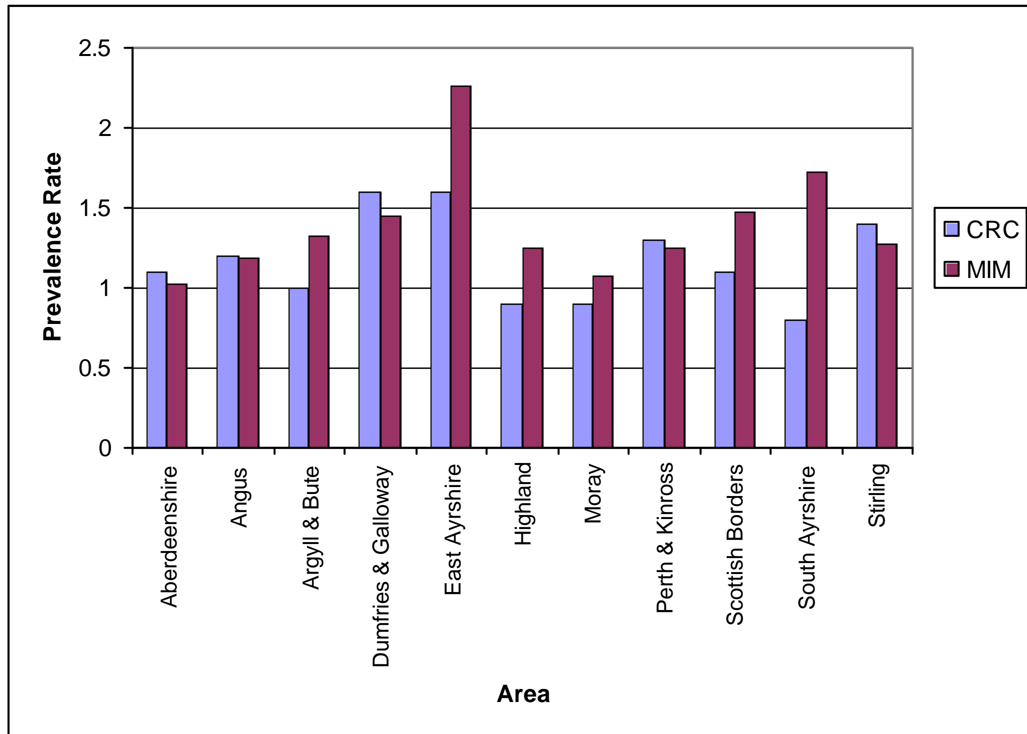
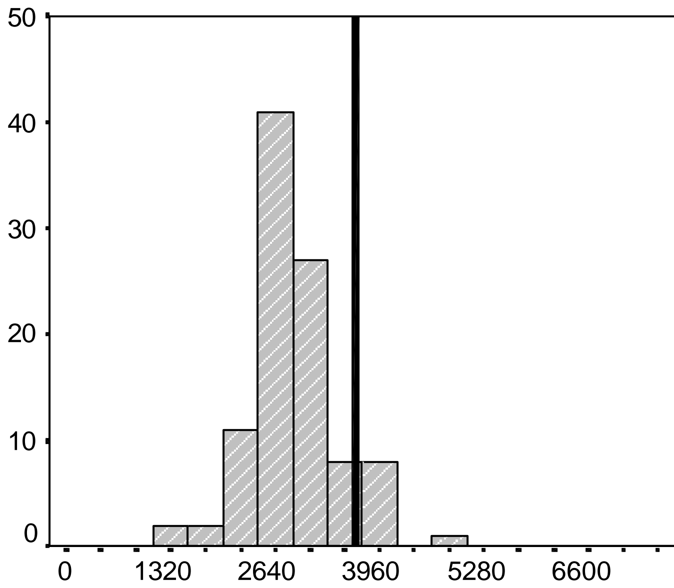


Figure 2.3 gives the distribution of the MIM estimates for Aberdeen, Aberdeenshire, Fife and Moray Council areas. During the analysis the distribution of estimates was graphed for all 29 Council areas. Since further prevalence estimation work was carried out in Grampian NHS Board and Fife NHS Board areas, we chose to illustrate the variation in the 100 MIM estimates we obtained for the four Council areas relating to these NHS Board areas.

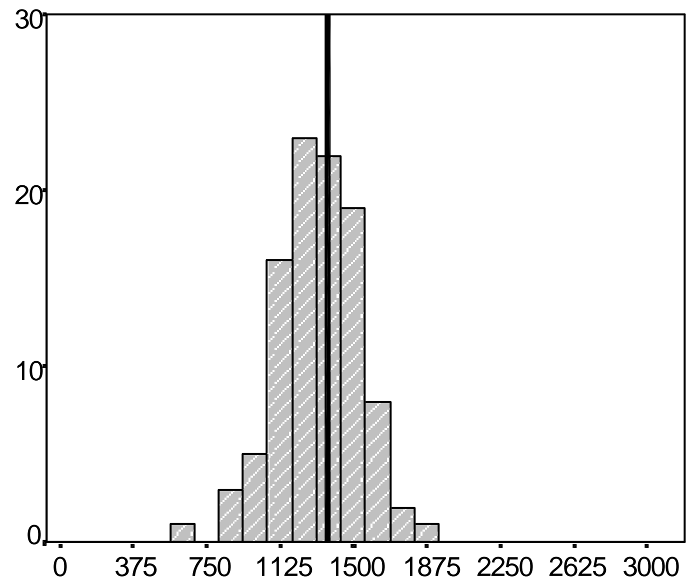
The bold lines in the graphs indicate the capture-recapture estimate for the Council area. The majority of the Aberdeen estimates are to the left of the line indicating an underestimate, whereas the Fife and Moray graphs indicate overestimates for MIM. The majority of MIM estimates for Aberdeenshire peak around the capture-recapture estimates.

Figure 2.3 Distribution of MIM estimates for four Council areas in Scotland

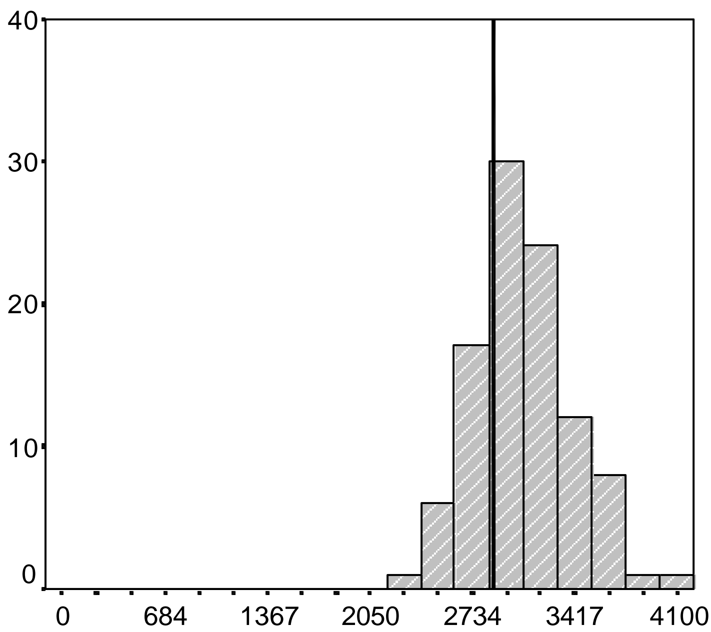
Aberdeen



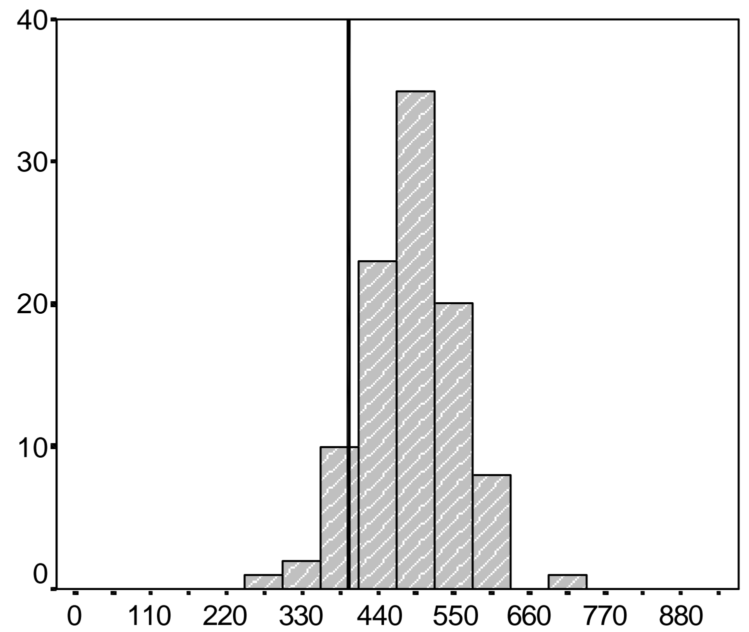
Aberdeenshire



Fife



Moray



In conclusion, it is felt that the MIM approach is not a valid method for estimating the prevalence of problem drug misuse at the local level. In the examples shown above, where eight anchor points have been used we see that, in several Council areas, there are marked differences between the prevalence obtained directly for those Council areas by capture-recapture and those where the MIM approach has extrapolated from other areas. Other research, not presented here, does show that as the number of anchor points increases, then the accuracy of the MIM estimate does improve. However if the MIM approach requires up-to-date capture-recapture estimates for a sizeable number of Council areas in Scotland, then it gets to the stage where it would be just as cost effective to obtain capture-recapture estimates for the whole of Scotland. Even when a large number of anchor points are used, there are some areas of Scotland where the relationship between drug misuse prevalence and the available indicators is different to that found in the rest of Scotland. The main, readily available, indicator used in the MIM approach will probably still be the number of new contacts as summarised within the Scottish Drug Misuse Database. As this does not as yet refer to the total number of drug users in treatment in each area, this is another problem with the MIM / indicator approach as increasing service provision would artificially inflate prevalence estimates.

3 Mapping Problem Drug Use

In this section, we describe the steps that have been followed when presenting the Scottish Drug Misuse Database data and estimates of the prevalence of problem drug use at the NHS Board, Council or LHCC area level. The available information on drug users in contact with treatment or support agencies, or identifiable from criminal justice sources such as the Police, would typically include either the postcode district or postcode sector of residence. We have therefore considered both scenarios.

A prerequisite for making a meaningful description of the distribution of drug use across Scotland's NHS Boards, Councils and LHCCs is obtaining data on the population of Scotland, at the postcode sector or district level, that can be aggregated into LHCCs, Councils or NHS Board areas. To do this, we note which LHCC, Council and NHS Board area the largest section (in terms of population aged 15 to 54) of each postcode sector or postcode district is covered by. With three different levels of aggregating the population (NHS Board, Council or LHCC) and population data available at either the postcode sector or postcode district level, there are six different 'mappings' that we have undertaken within the research. These mappings are:-

- Council by postcode sector
- Council by postcode district
- NHS Board by postcode sector
- NHS Board by postcode district
- LHCC by postcode sector
- LHCC by postcode district

With 15 NHS Board, 32 Council and 83 LHCC areas in Scotland (constructed from either 950 postcode sector or 443 postcode district areas), it would be distracting to include unwieldy tables within this part of the report or repetitive examples of the methods. Elsewhere in this report we focus on the NHS Board areas of Fife and Grampian where we have additionally produced estimates of the prevalence of problem drug use. In this section we highlight one area for each of the six different mappings we have considered. All of this information is provided as an Appendix to this report. We note that the Orkney Isles and Shetland Isles NHS Boards are each covered by one LHCC area and the GPs in the Western Isles have not formed an LHCC. These areas, by the nature of being groups of islands, are clearly and unambiguously comprised of the following groups of postcode sectors:-

Orkney	KW15.1, KW16.3 and KW17.2
Shetland	ZE1.0, ZE2.9 and ZE3.9
Western Isles	HS1.1, HS2.0, HS2.9, HS3.3, HS4.3, HS5.3, HS6.5, HS7.5, HS8.5, HS9.5

For completeness, we also describe how NHS Board areas are comprised of Council areas in west central Scotland where some Councils areas are split across NHS Board boundaries. As LHCC areas can be considered as operational sub-units of NHS Board areas, it is clearly defined which NHS Board area a LHCC area is part of, therefore this breakdown is presented only within the Appendix to this report.

3.1 Councils

Postcode Sector Analyses

In this section we take information from the 2000 mid-year population estimates to ascertain which Council area each postcode sector in Scotland should be assigned to, in terms of the population breakdown of the postcode sector across the Council boundaries. From that information, we can construct lists of postcode sectors for each Council area in Scotland. We also highlight the postcode sectors which are split across more than one Council boundary and discuss the implications in terms of mapping the known drug using population or estimating the prevalence of problem drug use.

Argyll & Bute

Argyll & Bute Council covers a large area extending outwards from Helensburgh to Oban in the north and Campbeltown in the south west, taking in islands such as Bute, Mull and Islay. Because of the size of the area, there are many postcode sectors covering the Council area (55 in total). The following provides a summary of the postcode sectors which can be assigned to the Argyll & Bute Council area:-

- G83.7
- G84 (all 4 sectors)
- PA20 – PA78 (all 50 sectors)

In terms of the postcode sectors that are split across Council boundares, eight persons aged 15 to 54 (1% of the population) in the G83.7 sector are covered by Stirling Council, whereas 141 persons aged 15 to 54 (8% of the population) in PA34.5 and 137 persons (38% of the population) in PA38.4 are covered by Highland Council. By assigning these complete postcode sectors to the Argyll & Bute Council areas, we inflate the population by 286 persons, which is a mere fraction of the total of the Argyll & Bute population.

However, by not including the residents of Argyll & Bute who live in the postcode sectors that are mainly served by other Council areas, we may also be deflating the population. There are three such postcode sectors; FK20.8 (which actually does not have any residents aged between 15 and 54 living in the Argyll & Bute area, but one person presumably aged 55 or over) and the G82.5 sector which has 1237

persons and the G83.8 which has 211 persons. Thus in total we are wrongly assigning 1448 persons to West Dunbartonshire who should actually be assigned to the neighbouring Argyll & Bute Council. This is a small proportion of the population of either Argyll & Bute or West Dunbartonshire, therefore assigning Council area of residence for Argyll & Bute Council by postcode sector of residence does not introduce much error.

We can summarise the preceding analysis in the following table, which highlights the number of residents (aged 15 to 54) of Argyll & Bute who would be wrongly assigned if only the postcode sector of residence was available.

Table 3.1 Postcode Sectors in or around the Argyll & Bute Council area, split across Council boundaries

	Neighbouring Council		
Postcode Sector	Stirling	Highland	W.Dunbartonshire
G83.7	8		
PA34.5		141	
PA38.4		137	
FK20.8			0
G82.5			-1237
G83.3			-211
Total	**8**	**278**	**-1448**

More comprehensive information for the whole of Scotland is contained within the Appendix to this report. However, Table 3.2 presents information on the postcode sectors split across two Council areas where less than 80% of the population reside within the largest section (in terms of Council area). The full table is presented within the Appendix to this report.

Table 3.2 Postcode Sectors split across 2 Council areas

Postcode Sector	Population (age 15-54)	Council 1	%	Council 2	%
G44.3	4,620	E. Renfrewshire	51	Glasgow	49
KA5.5	2,227	S. Ayrshire	53	E. Ayrshire	47
FK10.4	3,658	Clackmannanshire	54	Fife	46
PH12.8	974	Angus	58	Perth & Kinross	42
PA38.4	335	Argyll & Bute	59	Highland	41
AB23.8	6,050	Aberdeen City	60	Aberdeenshire	40
G82.5	3,172	W. Dunbartonshire	61	Argyll & Bute	39
KA6.6	2,527	S. Ayrshire	64	E. Ayrshire	36
KA1.5	3,356	E. Ayrshire	71	S. Ayrshire	29
TD13.5	423	Scottish Borders	75	E. Lothian	25
DD5.3	4,713	Dundee	76	Angus	24
AB54.7	1,297	Aberdeenshire	76	Moray	24
G69.7	5,463	Glasgow	77	N. Lanarkshire	23

The most equally split postcode sector, G44.3, straddles the boundary between East Renfrewshire and Glasgow City. More specifically, G44.3 is split between the areas of Cathcart in Glasgow and Netherlee in East Renfrewshire. There are few data on either drug misuse or social exclusion that go down to a smaller area level than postcode sector, therefore we are not able, in a systematic manner, to consider where most of the problem drug users in a postcode sector are likely to reside. It may, however, be supposed that most, if not possibly all, drug misusers would reside in the Glasgow section. It is interesting to note that Greater Glasgow Primary Care Trust assigns the whole of the G44.3 postcode sector to the South East Glasgow LHCC, rather than the Eastwood LHCC which is mostly in East Renfrewshire.

The FK10.4 postcode sector is almost equally split between the towns of Clackmannan and Kincardine. Kincardine is almost at the extremity of West Fife and residents of Kincardine may be nearer to the local facilities in Clackmannan and Alloa (indeed in terms of postcodes, it is described as Kincardine, Aloa). This may be another postcode sector where most of the drug misusers live in the smaller section.

In terms of the KA5.5, KA6.6 and KA1.5 postcode sectors, it is difficult to judge if there are any marked differences between the East Ayrshire, North Ayrshire and / or South Ayrshire sections of those areas as the postcode sectors are comprised of small former mining villages which would presumably share common characteristics in terms of social exclusion or drug misuse. In terms of the remaining postcode sectors where there is a split of less than 80%, it may be appropriate to assume that most of the drug users in the postcode sector are resident in the larger areas.

Table 3.3 provides a similar assessment of the postcode sectors that are split across three Council areas. In this table, we present some of the postcode sectors that have a three-way split.

Table 3.3 Postcode Sectors split across 3 Council areas

Postcode Sector	Population (age 15-54)	Councils	%
DD2.5	3,128	Angus	46
		Perth & Kinross	45
		Dundee	9
ML12.6	3,948	S. Lanarkshire	85
		Scottish Borders	13
		Dumfries & Galloway	2
FK14.7	2,365	Clackmannanshire	86
		Perth & Kinross	14
		Fife	0
G71.7	3,151	S. Lanarkshire	90
		Glasgow	8
		N. Lanarkshire	2
EH46.7	1,699	Scottish Borders	91
		S. Lanarkshire	8
		Midlothian	1

In total there are 11 postcode sectors that are split across three Council areas and the full table is presented within the Appendix to this report. Apart from the DD2.5 postcode sector, which is almost equally split between Angus and Perth & Kinross (with a smaller percentage in the City of Dundee), the vast majority of the population in each postcode sector resides in one of the three Council areas. Most of the postcode sectors that are split across three areas have relatively small numbers of drug users identified from within the Scottish Drug Misuse Database as residents. For example, within an extract of the Scottish Drug Misuse Database for 2001 / 2002 which we have analysed later in this report, there was only one person in the DD2.5 postcode sector, therefore it is unlikely that making a false judgement as to the true Council area of residence of that one person would affect the Council area tables of the Scottish Drug Misuse Database or any prevalence estimation. Even if in the postcode sectors there were larger numbers of drug users identified as resident from the Scottish Drug Misuse Database, the split across the Council areas is such that assigning all identified drug users to the Council area where the majority live would not seriously affect either the Scottish Drug Misuse Database Council area tables or any prevalence estimation.

Postcode District Analyses

In this section we take information from the 2000 mid-year population estimates to ascertain which Council area each postcode district in

Scotland should be assigned to, in terms of the population breakdown of the postcode district across the Council boundaries. From that information, we can construct lists of postcode districts for each Council area in Scotland. We also highlight the postcode districts which are split across more than one Council boundary and discuss the implications in terms of mapping the known drug using population or estimating the prevalence of problem drug use.

East Dunbartonshire

The East Dunbartonshire Council area covers the settlements of Bearsden, Bishopbriggs, Kirkintilloch, Milngavie and nearby areas. The following postcode districts are mainly within the East Dunbartonshire Council area:-

- G61
- G62
- G64
- G66

The following table summarises the population of East Dunbartonshire that would be assigned wrongly by attributing postcode districts to Council areas on the basis of where the majority of the district reside.

Table 3.4 Postcode Districts in or around the East Dunbartonshire Council area, split across Council boundaries

	Neighbouring Council			
Postcode District	Glasgow	Stirling	N. Lanarkshire	W. Dunbartonshire
G61	121			
G62	0	81		
G64	352		2	
G66			393	
G23	-2			
G65			-773	
G68			-9	
G69	-1			
G81				-14
Total	**470**	**81**	**-387**	**-14**

Summing across the totals in each column gives 150. This means that the population of East Dunbartonshire is inflated by 150 people. There were 949 people from neighbouring areas wrongly classified as being East Dunbartonshire residents and 799 East Dunbartonshire residents wrongly classified as residents of other Council areas.

Again we can extend these analyses to present, in Table 3.5, information on the postcode districts split across two Council areas of Scotland where less than 90% of the population reside within the largest section (in terms of Council area). The more complete table is included within the Appendix to this report.

Table 3.5 Postcode Districts split across 2 Council areas

Postcode District	Population (age 15-54)	Council 1	%	Council 2	%
PH12	974	Angus	58	Perth & Kinross	42
PA38	335	Argyll & Bute	59	Highland	41
AB12	14,589	Aberdeen City	60	Aberdeenshire	40
AB23	6,050	Aberdeen City	60	Aberdeenshire	40
KA6	9,642	East Ayrshire	61	South Ayrshire	39
G46	14,806	East Renfrewshire	62	Glasgow	38
DD5	14,015	Dundee	63	Angus	37
AB21	10,741	Aberdeen City	70	Aberdeenshire	30
DD10	11,258	Angus	72	Aberdeenshire	28
TD13	423	Scottish Borders	75	East Lothian	25
KA5	5,118	East Ayrshire	77	South Ayrshire	23
PH11	1,699	Perth & Kinross	88	Angus	12
FK15	4,948	Stirling	88	Perth & Kinross	12

Table 3.6 provides a similar assessment of the postcode districts that are split across three Council areas. In this abridged table, we present some of the postcode districts which have a three-way split. Those splits where more than 80% of the postcode district is within the main Council area are presented in the Appendix.

Table 3.6 Postcode Districts split across 3 Council areas

Postcode District	Population (age 15-54)	Council	%
G69	17,107	Glasgow	56
		North Lanarkshire	44
		East Dunbartonshire	0
G71	16,240	North Lanarkshire	56
		South Lanarkshire	42
		Glasgow	2
KA2	3,697	East Ayrshire	62
		South Ayrshire	37
		North Ayrshire	1

It should be noted that there is one postcode district, G78, which is split between five Council areas. However, almost 100% of the population of that postcode district is covered by the East Renfrewshire Council area.

As previously mentioned, it would not be possible to identify in a systematic manner which postcode sectors may be more appropriately

assigned to Council or NHS Board area of residence in terms of the known drug using population in that area. It is, however, possible to identify which postcode districts for which it may be better to assign Council area of residence by considering the known population in that postcode district. The biggest problem appears to be around the north of Aberdeen City with both the AB21 and AB23 postcode districts straddling the boundary with Aberdeenshire. From our knowledge of the known populations in these areas (and the socio-economic profile of these areas) it is likely that most of the problem drug users live in the Aberdeen City sections of the postcode districts. As the majority of the populations in these districts live in Aberdeen City, this would be the approach taken anyway. However, the G46 postcode district is one where most of the population lives in East Renfrewshire, but information on the underlying drug using population suggests that most of the problem drug users will reside in Glasgow City. In most of the other areas, it is difficult to distinguish any meaningful pattern in the known drug using population to therefore suggest that Council area of residence should not be based on where the bulk of the population lives. This, however, causes specific problems for the Aberdeenshire Council area. While it would probably be true that most of the problem drug users in the AB12 postcode district live within Aberdeen City, it may also be true that a sizeable proportion of the known drug using population of the south of Aberdeenshire (i.e. that covered by the Kincardine LHCC) would live in the AB12 postcode district. By assigning the whole of AB12 (and similarly the whole of DD10) to other Council areas may significantly reduce the known drug misusing population of that part of Aberdeenshire and thus affect prevalence estimates.

3.2 NHS Boards

Postcode Sector Analyses

In this section we take information from the 2000 mid-year population estimates to ascertain which NHS Board area each postcode sector in Scotland should be assigned to, in terms of the population breakdown of the postcode sector across the NHS Board boundaries. From that information, we can construct lists of postcode sectors for each NHS Board area in Scotland. To summarise the complete analysis within the main part of this report would require a rather large table; however we highlight the issues faced in the Lothian NHS Board area and leave the remainder of the analysis to be described within the Appendix.

Lothian

The Lothian NHS Board area covers the City of Edinburgh and the Council areas of East Lothian, Midlothian and West Lothian. Apart from the capital city, other main settlements include Livingston, Dalkeith and Musselburgh.

The following postcode sectors have been assigned to the Lothian NHS Board area on the basis of the population splits within postcode sectors:-

- EH1 – EH37 (all 99 sectors)
- EH39 (both sectors)
- EH40.3
- EH41 (both sectors)
- EH42.1
- EH47 – EH49 (all 10 sectors)
- EH52 – EH55 (all 9 sectors)

There are, however, some other postcode sectors which are partly within the Lothian NHS Board area and some of the above postcode sectors which are not entirely within this area. As with the Council area analysis described above, Table 3.7 summarises the overlaps with neighbouring NHS Board areas.

Table 3.7 Postcode Sectors in or around the Lothian NHS Board area, split across NHS Board boundaries

	Neighbouring NHS Board		
Postcode Sector	Borders	Forth Valley	Lanarkshire
EH26.8	3		
EH26.9	86		
EH37.5	7		
EH46.7	-1		
EH47.9			2
EH49.6		552	
EH49.7		305	
EH55.8			215
FK1.2		-67	
ML7.5			-489
TD11.3	-11		
TD13.5	-104		
Total	**-20**	**790**	**-272**

Thus from Table 3.7, the population (age 15 to 54) of the Lothian NHS Board area, when assigned on the basis of postcode sectors, is inflated by 498 persons, derived from subtracting 272 and 20 from the 790. This is a small fraction of the total population of the NHS Board area. There are 489 persons, living in the ML7.5 postcode sector near Harthill, who are wrongly assigned to the Lanarkshire NHS Board area; however there are 857 persons around the Polmont / Linlithgow area who, although covered by the Forth Valley NHS Board, are wrongly assigned to Lothian.

Table 3.8 Postcode Sectors split across 2 NHS Board areas

Postcode	**Population**	**NHS Board 1**	**%**	**NHS Board 2**	**%**

Sector	(age 15-54)				
FK10.4	3,658	Forth Valley	54	Fife	46
PA38.4	335	Argyll & Clyde	59	Highland	41
TD13.5	423	Borders	75	Lothian	25
G69.7	5,463	Greater Glasgow	77	Lanarkshire	23
FK15.9	2,899	Forth Valley	86	Tayside	14
G76.9	609	Greater Glasgow	87	Lanarkshire	13
EH49.6	4,864	Lothian	89	Forth Valley	11
ML7.5	4,847	Lanarkshire	90	Lothian	10

Three postcode sectors are split across three NHS Board areas. The FK14.7 postcode sector has 86% in Forth Valley, 14% in Tayside and less than 1% in Fife. The ML12.6 postcode sector has 86% in Lanarkshire, 13% in Borders and 2% in Dumfries and Galloway. The EH46.7 postcode sector has 91% in Borders, 8% in Lanarkshire and 1% in Lothian.

Postcode District Analyses

In this section we take information from the 2000 mid-year population estimates to ascertain which NHS Board area each postcode district in Scotland should be assigned to, in terms of the population breakdown of the postcode district across the NHS Board boundaries. From that information, we can construct lists of postcode districts for each NHS Board area in Scotland.

We use the Forth Valley NHS Board area as an example; however the results for the whole of Scotland are included within the Appendix to this report.

Forth Valley

The Forth Valley NHS Board area contains the Council areas of Clackmannanshire, Falkirk and Stirling. These three Council areas were each District Councils with the previous Central Region, which was coterminous with the Forth Valley Health Board area. The main settlements in Forth Valley are Falkirk and Stirling, and there is a large rural hinterland heading out west and north west from the town of Stirling.

The following postcode districts are assigned to the Forth Valley NHS Board area on the basis of population breakdown within postcode districts:-

- EH51
- FK1 – FK21
- G63

It may not be immediately clear from this list that, for the Forth Valley NHS Board area, having geographical data at the postcode sector area level instead of postcode district area level would not make any difference in attributing NHS Board of residence to data on problem drug use in Scotland. This was because all of the postcode sectors in every postcode district were assigned to Forth Valley NHS Board.

Some of the postcode districts listed above also cover parts of neighbouring NHS Board areas. In a similar manner to the analyses presented for postcode districts that straddle Council boundaries, Table 3.9 summarises these postcode districts in terms of the numbers (aged 15 to 54) in neighbouring areas.

Table 3.9 Postcode Districts in or around the Forth Valley NHS Board area, split across NHS Board boundaries

Postcode District	Argyll & Clyde	Fife	Greater Glasgow	Lothian	Lanarkshire	Tayside
EH49				-857		
FK1				67		
FK10		1,708				
FK14						324
FK15						579
FK19						19
FK20	0					
FK21						29
FK4					5	
FK6					3	
G62			-81			
G63	3					
G67					-1	
G68					-1	
G83	-8					
KY13						-33
Total	**-5**	**1,708**	**-81**	**-790**	**6**	**918**

Thus from Table 3.9, by assigning NHS Board of residence by postcode district (or indeed postcode sector), the Forth Valley NHS Board area is inflated by 1,756 persons aged 15 to 54, which is approximately 1%. Most of this is caused by the FK10 postcode district which includes the Kincardine area of Fife.

In terms of the postcode districts split across two NHS Board areas, the following table lists the postcode districts where less than 90% live in the main NHS Board area for those districts.

Table 3.10 Postcode Districts split across 2 NHS Board areas

Postcode District	Population (age 15-54)	NHS Board 1	%	NHS Board 2	%
G72	23,814	Greater Glasgow	54	Lanarkshire	46
G65	7,582	Greater Glasgow	58	Lanarkshire	42
PA38	335	Argyll & Clyde	59	Highland	41
DD10	11,258	Tayside	72	Grampian	28
TD13	423	Borders	75	Lothian	25
ML12	3,948	Lanarkshire	86	Borders	13
FK14	2,365	Forth Valley	86	Tayside	14
FK15	4,948	Forth Valley	88	Tayside	12

The ML12 postcode district and the FK14 postcode district are actually split across three NHS Board areas, but in these postcode districts, and indeed the other postcode districts that are split across three NHS Board areas, the percentage of the population in the third NHS Board area is very small. Fuller details of these areas are provided in the Appendix to this report.

From this table, it is clear that the problem districts in terms of assigning Council area of residence are not a problem in terms of NHS Board as they lie entirely within NHS Board areas. The main problem postcode districts now are G72 and G65 postcode districts and while most of the problem drug users will probably reside in the Greater Glasgow sections, allocating the whole population to Greater Glasgow will decrease the known population in Lanarkshire, but not by a significant number. As it is unlikely that there are marked differences in the underlying population in these areas, any misclassification in these areas will not affect estimated drug misuse prevalence rates.

3.3 LHCCs

Postcode Sector Analyses

In this section we take information from the CHI to ascertain which LHCC area each postcode sector in Scotland should be assigned to, in terms of the population breakdown of the postcode sector across the GPs of different LHCCs. From that information, we can construct lists of postcode sectors for each LHCC area in Scotland. However as the residents of each postcode sector may be patients of GPs from several different LHCCs, it is more practical to note only the LHCC which most of the population is associated with, rather than listing the secondary LHCCs for individual postcode sectors. As there are over 80 LHCC areas in Scotland, we restrict this section to one LHCC area, Angus. The information for the whole of Scotland can be found within the Appendix.

Angus

The Angus LHCC covers most of the Angus Council area, apart from Abroath and Friockheim which has its own LHCC. Apart from the coast, the Arbroath and Friockheim LHCC area is completely surrounded by the Angus LHCC area. The main settlements are Forfar, Montrose, Brechin, Carnoustie and Monifieth. The postcode sectors that we have assigned to the Angus LHCC are as follows:-

- DD10.8
- DD10.9
- DD5.4
- DD7 (both sectors)
- DD8 (all 5 sectors)
- DD9 (both sectors)

The remainder of the DD5 postcode district is assigned to the Dundee LHCC area whereas DD10.0 is assigned to the Kincardine LHCC area. As previously noted, some people do not use the nearest GP and there will be many different GPs covering the population that is resident in the postcode sectors listed above.

Table 3.11 Percentage of the population of the Angus LHCC area postcode sectors that have Angus LHCC GPs

Postcode Sector	% in LHCC
DD10.8	100
DD10.9	99
DD5.4	64
DD7.6	98
DD7.7	99
DD8.1	99
DD8.2	87
DD8.3	99
DD8.4	100
DD8.5	97
DD9.6	99
DD9.7	98

Examining Table 3.11 above, one postcode sector perhaps is a cause for concern. Only 64% of the residents of the DD5.4 postcode sector attend GPs within the Angus LHCC. Although the population mid-year estimates for 2000 suggest that only one person within the DD5.4 postcode sector area is covered by the Dundee Council, it is clear that many residents of Monifieth, which is the settlement within DD5.4, attend GPs in Dundee.

Postcode District Analyses

In this section we take information from the CHI to ascertain which LHCC area each postcode district in Scotland should be assigned to, in terms of the population breakdown of the postcode district across the GPs of different LHCCs. From that information, we can construct lists of postcode districts for each LHCC area in Scotland. To highlight the issues faced within this analysis, we focus on the East Sutherland LHCC area.

East Sutherland

The East Sutherland LHCC area covers the settlements of Brora, Bonar Bridge, Dornoch, Golspie, Helmsdale and Lairg. It is in the Highland NHS Board area and covers a large rural area. From the CHI, it is clear that the following postcode districts should be assigned to it:-

- IV24
- IV28
- KW10
- KW8
- KW9

Again, we can look at the CHI to see what proportion of the population of each sector is attending a GP within that LHCC.

Table 3.12 Percentage of the population of the East Sutherland LHCC area postcode districts that have East Sutherland LHCC GPs

Postcode District	% in LHCC
IV24	97
IV28	99
KW10	100
KW8	100
KW9	100

Although it is relatively easy to assign LHCC area of residence on the basis of postcode district in this area of the Highlands, it is important to highlight that this analysis is relevant to non-urban areas as well. The results for the whole of Scotland are included within the Appendix.

Comparison of Methods within Greater Glasgow

The Greater Glasgow NHS Board has created a map which lists the postcode sectors and postcode districts that they suggest are covered by the 16 LHCCs in the area. As previously noted, the Riverside LHCC and the WestOne LHCC cover similar areas, therefore for the purpose of this research, they have been combined into a single Riverside / WestOne LHCC area.

Table 3.13 describes the postcode sectors that we have assigned to each LHCC area and contrasts them with the postcode sectors suggested by the Greater Glasgow NHS Board. Those that differ are highlighted in bold.

Table 3.13 Assignment of postcode sectors to LHCC areas by two different methods

LHCC	Postcode Sectors (CHI)	Postcode Sectors (Map)
Anniesland / Bearsden / Milngavie	G13.1, G61.1, G61.2, G61.3, G61.4, G62.6, G62.7, G62.8	G13.1, G61.1, G61.2, G61.3, G61.4, G62.6, G62.7, G62.8
Bridgeton & Environs	**G1.5**, **G31.1**, G40.1, G40.2, G40.3, G40.4	G40.1, G40.2, G40.3, G40.4
Camglen	G72.2, G72.8, G73.1, G73.2, G73.3, G73.4, G73.5, G76.9	G72.2, G72.8, G73.1, G73.2, G73.3, G73.4, G73.5, G76.9
Clydebank	G60.5, G81.1, G81.2, G81.3, G81.4, G81.5, G81.6	G60.5, G81.1, G81.2, G81.3, G81.4, G81.5, G81.6
Dennistoun	G1.1, G1.2, G2.1, G2.2, G2.5, G21.2, G31.2, G31.3, **G33.1**, G4.0	G1.1, G1.2, **G1.3**, **G1.4**, **G1.5**, G2.1, G2.2, **G2.3**, **G2.4**, G2.5, **G2.6**, **G2.7**, **G2.8**, G21.2, **G31.1**, G31.2, G31.3, G4.0
Drumchapel	G15.6, G15.7, G15.8	G15.6, G15.7, G15.8
Eastern Glasgow	G31.4, G31.5, G32.0, G32.6, G32.7, G32.8, G32.9, G33.2, G33.3, G33.4, G33.5, G33.6, G34.0, G34.9, G69.0, G69.6, G69.7, G69.8. G69.9	G31.4, G31.5, G32.0, G32.6, G32.7, G32.8, G32.9, **G33.1**, G33.2, G33.3, G33.4, G33.5, G33.6, G34.0, G34.9, G69.0, G69.6, G69.7, G69.8. G69.9
Eastwood	G46.6, G76.0, G76.7, G76.8, G77.5, G77.6, **G44.3**	**G43.2**, G46.6, **G46.7**, G76.0, G76.7, G76.8, G77.5, G77.6
Greater Shawlands	G41.2, G41.3, G41.4, G41.5, G43.1, **G43.2**, **G46.7**, G46.8	G41.2, G41.3, G41.4, G41.5, G43.1, G46.8
Maryhill / Woodside	**G1.3**, **G2.3**, **G2.4**, **G2.7**, **G2.8**, G20.0, **G20.6**, G20.7, G20.8, G20.9, G23.5, **G3.6**, **G4.9**	G20.0, G20.7, G20.8, G20.9, G23.5
North Glasgow	G21.1, G21.3, G21.4, G22.5, G22.6, G22.7	G21.1, G21.3, G21.4, G22.5, G22.6, G22.7
Riverside / WestOne	G11.5, G11.6, G11.7, G12.0, G12.8, G12.9, G13.2, G13.3, G13.4, G14.0, G14.9, **G2.6**, G3.8	G11.5, G11.6, G11.7, G12.0, G12.8, G12.9, G13.2, G13.3, G13.4, G14.0, G14.9, **G20.6**, **G3.6**, G3.8, **G4.9**
South East Glasgow	**G1.4**, G42.0, G42.7, G42.8, G42.9, G44.4, G44.5, G45.0, G45.9, G5.0, G5.9	G42.0, G42.7, G42.8, G42.9, **G44.3**, G44.4, G44.5, G45.0, G45.9, G5.0, **G5.8**, G5.9
South West Glasgow	G41.1, **G5.8**, G51.1, G51.2, G51.3, G51.4, G52.1, G52.2, G53.4, G52.4, G53.5, G53.6, G53.7	G41.1, G51.1, G51.2, G51.3, G51.4, G52.1, G52.2, G53.4, G52.4, G53.5, G53.6, G53.7
Strathkelvin	G64.1, G64.2, G64.3, G64.4, G66.1, G66.2, G66.3, G66.4, G66.5, G66.7, G66.8	G64.1, G64.2, G64.3, G64.4, G66.1, G66.2, G66.3, G66.4, G66.5, G66.7, G66.8

From Table 3.13, there are many postcode sectors which the CHI suggests should be assigned to the Maryhill / Woodside LHCC area but the map from Greater Glasgow NHS Board suggests they should be part of neighbouring areas. The G2 postcode sectors are small ones within the city centre; however much of the larger sectors (G20.6, G3.6 and G4.9) should perhaps be in the Riverside / WestOne area. On the whole, there appears to be a reasonable correspondence between the method of assigning postcode sectors to LHCC areas and the method favoured by Greater Glasgow NHS Board.

More generally, we can list the postcode sectors where less than half of the population from the CHI live in the LHCC that we have assigned it to.

Table 3.14 Postcode sectors where the minority of the population reside in the assigned LHCC

Postcode Sector	LHCC name	Population (CHI)	% in LHCC
G76 9	Camglen	1,319	10
G2 8	Maryhill / Woodside	199	17
G1 3	Maryhill / Woodside	105	20
EH3 8	North West Edinburgh	2,349	29
G2 6	Riverside / WestOne	35	31
G1 5	Bridgeton & Environs	1,162	33
G41 1	South West Glasgow	1,859	36
ML1 5	Airdrie	10,564	37
G33 1	Dennistoun	8,220	38
G3 6	Maryhill / Woodside	7,475	39
G4 9	Maryhill / Woodside	6,086	41
G31 1	Bridgeton & Environs	4,409	41
G74 5	East Kilbride	861	42
G71 6	Hamilton / Blantyre	8,482	42
EH3 9	South Central Edinburgh	7,796	44
G2 7	Maryhill / Woodside	380	45
G41 5	Greater Shawlands	5,913	45
PA18 6	Inverclyde	2,674	46
EH1 3	North East Edinburgh	2,157	46
AB22 8	Aberdeen and North	17,659	47
G2 4	Maryhill / Woodside	253	47
G4 0	Dennistoun	8,596	47
G46 7	Greater Shawlands	7,855	47
G13 1	Anniesland / Bearsden / Milngavie	7,920	47
G71 5	Hamilton / Blantyre	7,118	48
G5 8	South West Glasgow	557	48
EH8 8	North East Edinburgh	3,110	48
G1 4	South East Glasgow	390	48
EH14 1	South Central Edinburgh	8,828	49
G1 2	Dennistoun	439	49
G44 3	Eastwood	9,327	49
G13 2	Riverside / WestOne	7,963	49
G22 5	North Glasgow	6,307	50
G31 3	Dennistoun	6,198	50
KA6 5	Carrick & Doon Valley	3,982	50

In Table 3.14, the postcode sectors in Greater Glasgow are highlighted and in many of those postcode sectors, the problem is due to the small numbers of the population living in the postcode sectors in the city centre which are mainly business areas. The EH3.8 and ML1.5 postcode sectors may cause problems when assigning the North West Edinburgh and Airdrie LHCC areas. The biggest problems may,

however, be with the Aberdeen and North LHCC because of problems with the AB22.8 postcode sector, or with the PA18.6 sector within Inverclyde.

Council Area by LHCC

To the knowledge of the research team, there are only a handful of LHCC areas that are split across Council Boundaries. The Aberdeen and North and the Aberdeen West LHCCs both cover parts of Aberdeen City and Aberdeenshire Council areas. The Forth Valley LHCC (South) covers the combined area of Clackmannanshire and Falkirk Councils. The Strathkelvin LHCC covers the part of North Lanarkshire Council that is within the Greater Glasgow NHS Board area as well as the eastern part of East Dunbartonshire Council. The Anniesland / Bearsden / Milngavie LHCC area takes in Anniesland within Glasgow City Council and the Bearsden and Milngavie areas of East Dunbartonshire Council and the Lomond LHCC is split across the Argyll & Bute / West Dunbartonshire Council areas.

NHS Board Area by Council Area

Local Government reorganisation in 1994 broke the link between Health Board and Council area boundaries. This occurred only within the present NHS Board areas of Argyll & Clyde, Greater Glasgow and Lanarkshire. Four Council areas are split across the NHS Board boundaries. These are East Renfrewshire (split between Argyll & Clyde and Greater Glasgow), North Lanarkshire (split across Greater Glasgow and Lanarkshire), South Lanarkshire (split across Greater Glasgow and Lanarkshire) and West Dunbartonshire (split across Argyll & Clyde and Greater Glasgow). In total there are nine Council areas within the area covered by these three NHS Boards.

The population breakdown (aged 15 to 54) across the nine Council areas, in terms of the three NHS Board areas, is as follows:-

Table 3.15 Population of the Argyll & Clyde, Greater Glasgow and Lanarkshire NHS Board areas, by Council area

NHS Board Council Area	**Argyll & Clyde**	**Greater Glasgow**	**Lanarkshire**	**TOTAL**
Argyll & Bute	46,626	-	-	**46,626**
E. Dunbartonshire	-	62,162	-	**62,162**
E. Renfrewshire	14,043	35,791	-	**49,834**
Glasgow City	-	355,788	-	**355,788**
Inverclyde	45,996	-	-	**45,996**
N. Lanarkshire	-	8,887	176,410	**185,297**
Renfrewshire	97,614	-	-	**97,614**
S. Lanarkshire	-	31,462	141,445	**172,907**
W. Dunbartonshire	27,264	25,242	-	**52,506**
TOTAL	**231,543**	**519,332**	**317,855**	**1,068,730**

Summary

To summarise this section, we have described below the differences between the populations of each Council or NHS Board area and those from the approach of assigning NHS Board or Council area of residence on the basis of postcode sector or postcode district.

Table 3.16 Comparison of mapped population and GROS population by Council area

	Population	Mapped Population	
Council Area	**From GROS**	**By Postcode Sector**	**By Postcode District**
Aberdeen	123,240	126,465	134,743
Aberdeenshire	128,371	125,356	113,889
Angus	58,395	58,094	54,167
Argyll & Bute	46,626	45,464	44,842
Clackmannanshire	26,575	28,580	28,580
Dumfries & Galloway	73,642	73,595	73,595
Dundee City	76,509	78,541	85,657
East Ayrshire	64,909	64,028	72,332
East Dunbartonshire	62,162	62,312	62,312
East Lothian	49,422	49,404	49,404
East Renfrewshire	49,834	51,969	53,643
Edinburgh, City of	271,103	271,005	271,005
Eilean Siar	13,775	13,775	13,775
Falkirk	80,324	79,625	79,625
Fife	192,389	190,911	190,911
Glasgow City	355,788	353,885	361,226
Highland	111,033	110,752	110,752
Inverclyde	45,996	46,372	46,372
Midlothian	46,673	46,689	46,689
Moray	45,533	45,203	45,203
North Ayrshire	75,520	75,378	75,378
North Lanarkshire	185,297	185,399	183,527
Orkney Isles	10,163	10,163	10,163
Perth & Kinross	69,965	67,203	67,203
Renfrewshire	97,614	97,227	97,227
Scottish Borders	54,800	54,463	54,463
Shetland Isles	12,359	12,359	12,359
South Ayrshire	59,862	60,870	52,566
South Lanarkshire	172,907	173,237	166,094
Stirling	47,878	48,348	48,348
West Dunbartonshire	52,506	53,921	54,543
West Lothian	92,512	93,089	93,089
Scotland	**2,853,682**	**2,853,682**	**2,853,682**

Table 3.17 Comparison of mapped population and GROS population by NHS Board area

NHS Board	Population From GROS	Mapped Populations By Postcode Sector	By Postcode District
Argyll & Clyde	231,543	231,560	231,560
Ayrshire & Arran	200,291	200,276	200,276
Borders	54,800	54,463	54,463
Dumfries & Galloway	73,642	73,595	73,595
Fife	192,389	190,911	190,911
Forth Valley	154,777	156,553	156,553
Grampian	297,144	297,024	293,835
Greater Glasgow	519,332	524,412	538,440
Highland	111,033	110,752	110,752
Lanarkshire	317,855	313,814	299,786
Lothian	459,710	460,187	460,187
Orkney Isles	10,163	10,163	10,163
Shetland Isles	12,359	12,359	12,359
Tayside	204,869	203,838	207,027
Western Isles	13,775	13,775	13,775
SCOTLAND	**2,853,682**	**2,853,682**	**2,853,682**

When assigning Council or NHS Board area of residence in terms of coterminous postcode sectors or districts, there will be slight differences in estimated population sizes. The largest differences occur within the Greater Glasgow / Lanarkshire NHS Board areas and the Abderdeen City / Aberdeenshire Council areas. It is also clear that in some Council areas and most NHS Board areas, there is little difference in the attributed population size if the postcode sectors (as opposed to the postcode districts) are used in allocating area of residence.

3.4 Mapping the 'Known' Population

The previous sections have outlined the steps that need to be taken before we can map information on drug misuse in Scotland onto NHS Board, Council or LHCC areas. We have obtained an extract from the Scottish Drug Misuse Database for the year 2001 / 2002 with which we can map the 'known' population at the LHCC area level. The Scottish Drug Misuse Database records new contacts at agencies across Scotland, or repeat contacts after a period of six months, therefore there may be a substantial underestimate of the total number of people in contact with agencies.

The extract that we analysed contained information on people who had been noted as using opiates. We did not include the Ayrshire and Arran NHS Board in these analyses as it was not possible to gain the approval to use treatment agency data from that area in the previous

national study. The only fields that we obtained within this extract were:-

- Encrypted subject ID
- Postcode sector
- LHCC code
- LHCC name

We specifically used data from 2001 / 2002 as this time period was after the change to the SMR recording system which requested postcode sector of residence rather than postcode district. The records which include LHCC code and LHCC name were from GP returns to the database where the contributing GP was found to be part of a LHCC. Table 3.18 summarises the validity of the information from this extract from the database.

Table 3.18 Summary of the validity of information from an extract of the Scottish Drug Misuse Database

Description	**n**
All records supplied	9,302
LHCC Code available	1,426
Postcode data available	8,931
of which valid format for postcode data	*8,404*
of which 'No Fixed Abode'	*190*
Postcode sector available	6,314
of which valid postcode sector	***5,992***
of which obsolete postcode sector	*17*
Only postcode district available	*2,090*
of which valid postcode district	***2,074***
Either valid postcode sector or valid postcode district	***8,066***

Thus, in total, the extract contained 9,302 records, 1,426 of which included a LHCC for a GP. There were 371 records that had no information on the postcode sector leaving 8,931 records that contained something within the postcode sector field. There were 190 records that indicated that the individual was of no fixed abode. There were 8,404 records that were in the valid format for a postcode sector or district; 6,314 of these were postcode sectors and 2,090 were postcode districts.

Interestingly, despite the most recent changes to postcode sectors in Scotland being in 1998, there were 17 people with these previous, now obsolete, postcode sectors. Within the extract, there were 305 records which looked like valid postcode sectors but which were not. Worryingly, there was one area of Scotland where there were many invalid postcode sectors with the digit 1 denoting the sector. This may suggest that somewhere in the recording system, postcode districts are being converted to postcode sectors by adding in the digit 1.

In summary, although there were 9,302 records, 8,661 of which had something in the postcode sector field, there were only 5,992 valid postcode sectors (66%) and 2,074 postcode districts (23%). We can therefore map the 8,066 individuals (89% of the total extract) onto LHCC areas.

We begin by mapping those individuals with a valid postcode sector to a LHCC area. We used the method of assigning the LHCC area of residence from the CHI previously described. Although we can produce totals and rates for each LHCC area, it should be remembered that these are new contacts where a valid postcode sector is available. If it is assumed that the number of problem drug users in Scotland is approximately 55,800, as suggested by the previous prevalence study, then we are mapping only about 10% of the problem drug using population onto LHCCs. Within this analysis, some LHCCs may appear to have low levels of recorded drug use only because the treatment agency staff and GPs are not recording the postcode sector of their clients / patients.

As an illustration, we present the LHCC data for the Lanarkshire NHS Board area.

Table 3.19 Extract from the Scottish Drug Misuse Database, by LHCC area in Lanarkshire

LHCC Area	Population (15-54)	SDMD Extract	Rate / ^{000}
Airdrie	36,306	24	0.7
Clydesdale	32,251	14	0.4
Hamilton / Blantyre	69,874	110	1.6
Coatbridge	25,467	22	0.9
East Kilbride	48,802	35	0.7
Cumbernauld	40,400	52	1.3
Motherwell	34,558	47	1.4
Wishaw / Newmains / Shotts	30,556	24	0.8
Total	**318,214**	**328**	**1.0**

From Table 3.19, it is clear that there is marked variation in the proportion of the total population of the LHCC who have been identified from within an extract from the Scottish Drug Misuse Database which has valid postcode sectors.

We can also repeat this analysis for the records with valid postcode districts. For this analysis, we can either examine the records which only have postcode district of residence, or we can augment those postcode district records with postcode sector records by aggregating the valid postcode sectors into postcode districts, i.e. convert G72.0, G72.7, G72.8 and G72.9 all into G72. Table 3.20 summarises the results of that analysis.

Table 3.20 Extract from the Scottish Drug Misuse Database, by LHCC area in Lanarkshire

		SDMD Extract			
LHCC Area	**Population (15-54)**	**District Only**	**Rate / 000**	**District & Sector**	**Rate / 000**
Airdrie	30,182	16	0.5	40	1.3
Clydesdale	32,251	2	0.1	16	0.5
Hamilton / Blantyre	82,842	26	0.3	149	1.8
Coatbridge	25,467	29	1.1	51	2.0
East Kilbride	48,802	5	0.1	40	0.8
Cumbernauld	40,400	48	1.2	100	2.5
Motherwell	40,682	21	0.5	68	1.7
Wishaw / Newmains / Shotts	30,556	2	0.1	26	0.9
Total	**331,182**	**149**	**0.4**	**490**	**1.5**

This table perhaps presents a truer picture of the known drug using population in Lanarkshire as it relates to the eight LHCC areas. Again there is marked variation, but in contrast to the previous table that only examined the records with valid postcode sectors, the Cumbernauld LHCC now has the highest rate. This could suggest that one or more contributing agencies in Cumbernauld are not yet supplying full postcode sector.

What may not be immediately obvious from a comparison of Table 3.19 and Table 3.20 is that we are not maximising the available postcode information. Focussing on the Hamilton / Blantyre LHCC area shows that, although there are 110 individuals whose postcode sector suggests they live in that LHCC area and 26 individuals whose postcode district suggests they live there. Table 3.20 suggest that there are 149 individuals from the Scottish Drug Misuse Database living in the Hamilton / Blantyre LHCC area. The remaining 13 individuals would live in either the G72.7 or G72.8 postcode sectors which are mostly in the Camglen LHCC area in neighbouring Greater Glasgow. By aggregating all four G72 postcode sectors to the G72 postcode district we would be inflating the Hamilton / Blantyre LHCC area known drug users. However, as both the known population and the total population (the numerator and the denominator in the rate) are inflated, the actual rate should not be seriously affected. It would be more accurate to state that there are 136 individuals identifiable from the Scottish Drug Misuse Database as living in the Hamilton / Blantyre LHCC area (110 identified from their postcode sector and 26 from their postcode district), but as it is impossible to attach a total population figure as a denominator to that figure, we cannot obtain a rate for that LHCC with which we can compare with other areas. Thus we can either aggregate all the SDMD data up to postcode district and suggest that there are 149 people in the Hamilton / Blantyre LHCC area (2.1 per thousand of the population aged 15 to 54) or only use the postcode sector data and

suggest that there are 110 people (1.6% of the population aged 15 to 54).

3.5 Discussion

In this section we have described the necessary steps taken before summarising information on the known drug using population, in this case an extract from the Scottish Drug Misuse Database, at the LHCC level. We assigned an LHCC to each postcode sector and postcode district in Scotland on the basis of information from the CHI. This information suggested which GPs the population of the postcode sector or district attended and, as the LHCC code for the GPs who operate within each LHCC area was included, we could determine the main LHCC for each sector or district. We undertook similar analyses for NHS Board and Council area of residence (and therefore DAT area of residence) but used mid year estimates of the population of Scotland by postcode sector area to determine the area. When assigning NHS Board or Council area of residence from postcode data, there are a number of postcode sectors and / or districts that straddle NHS Board or Council boundaries. The main areas have been highlighted, although it appears that there are only a few areas where this issue would seriously affect NHS Board or Council totals. The areas that do raise concerns are the AB12, AB23, DD5, DD10 and G46 postcode districts. However it is only in the DD10 and G46 districts that using postcode sectors would alleviate these problems. Of the postcode sectors where there may be problems, the G44.3 and the FK10.4 sectors are worth examining further as it is suspect that the socio-economic profile of these areas may vary within the postcode sector.

When mapping the extract from the Scottish Drug Misuse Database onto LHCC areas, particularly in the Lanarkshire NHS Board area, the comparatively large number of records that have postcode district instead of sector meant that comparisons between LHCC areas must be made with caution. At such a small area level, the LHCC numbers can be distorted by the reporting practises of even one agency. Until a substantially greater proportion of records within the Scottish Drug Misuse Database include postcode sector, it is preferable to determine LHCC of residence by postcode district data only. This would, however, be at the cost of biasing the estimates in the small number of LHCC areas where there are concerns about postcode districts being largely covered by two or more LHCCs, but at the moment, valid comparisons cannot be compared when using only postcode sectors. This may also have the effect of inflating or deflating some LHCC areas, but as the denominators will also be inflated or deflated, any rates should not be drastically affected.

4 Fife

The 'Kingdom' of Fife has a population of 350,400, 192,389 of which are in the 15 to 54 year age range[1]. The NHS Board and Council areas are coterminous, as is the Fife Police Constabulary area. In contrast to most Scottish Council areas, the population is spread between several large settlements, the largest being Kirkcaldy, with a population of 49,220 (GRO(S), 2001), Glenrothes (42,130), and Dunfermline (39,320). Other settlements include Inverkeithing / Dalgety Bay (27,220), Buckhaven (26,860), Cowdenbeath (19,320), St Andrews (13,370), Cupar (8,800), Burntisland (6,180), Kennoway (5,930), Ballingry (5,890), Kelty (5,850) and Cardenden (5,000).

In 2001 the project team produced a single prevalence estimate for Fife, and thus at the NHS Board, Police Force, DAT and Council area level. This estimate, although stratified by age group and gender, did not provide information on the distribution of drug use across Fife, therefore in the extended study we have focussed on providing more localised estimates by utilising smaller units of analysis, namely LHCCs and SIPs.

4.1 Areas

Fife has five LHCCs and one SIP. Since the population is distributed across Fife in several large settlements, it follows that these areas form the hubs of the LHCCs. The five LHCCs are Dunfermline, Glenrothes, Kirkcaldy / Levenmouth, North East Fife and West Fife.

Dunfermline Local Healthcare Co-operative

Dunfermline LHCC is located in southern Fife in the areas surrounding Dunfermline and Rosyth. It is composed of 35 General Practitioners, treating approximately 60,000 patients. The Co-operative is bordered by West Fife LHCC to the north, east and west, with the Firth of Forth to the south. Due to the shape of the LHCC area and its border with the West Fife LHCC there are several postcode sectors where patients could be in the remit of either LHCC. These sectors include KY11.3, KY11.7, KY11.8, KY11.9, KY12.8 and KY12.9. By examining the populations in each area, all postcode sectors were assigned a LHCC. KY11.3 proved difficult to place with a near fifty-fifty population split between Dunfermline and West Fife. To judge the effect, if any, on the resultant estimates, rates have been calculated for both LHCCs including and excluding KY11.3.

[1] Mid-2000 Population Estimates © Crown copyright. Data supplied by General Register Office for Scotland.

Glenrothes Area Local Healthcare Co-operative

Glenrothes LHCC is formed by 36 General Practitioners operating in and around Glenrothes, treating approximately 51,084 patients. Glenrothes is bordered by three other LHCCs; North East Fife, West Fife and Kirkcaldy / Levenmouth. Settlements covered by the Co-operative include Markinch, Leslie and Thornton. The LHCC splits Kirkcaldy / Levenmouth into two parts by forming a corridor to the coast, taking in Coaltown of Wemyss. This strip of land with Leven to the north and Kirkcaldy to the south splits the KY1.4 sector between the two LHCCs. This feature of the Glenrothes LHCC was taken into account and estimates for the area were calculated with and without KY1.4.

Kirkcaldy / Levenmouth Local Healthcare Co-operative

Kirkcaldy / Levenmouth LHCC consists of 68 GPs in Kirkcaldy district, treating approximately 97,000 patients. The LHCC covers two large areas, one south of Glenrothes, the other to the north east. Settlements covered by the southern part include Kirkcaldy, Kinghorn, Burntisland and West Wemyss. The north eastern section encompasses Windygates, Kennoway, Buckhaven, Methil, Leven and Lundin Links. Whilst constructing the geographical representation of the LHCC, two postcode sectors at either end of the 'Kirkcaldy' section of the Co-operative proved difficult to place, KY3.0 (bordering on West Fife) and KY1.4 (overlapping with Glenrothes). Examination of population figures led to both KY1.4 and KY3.0 being placed in Kirkcaldy/Levenmouth. As mentioned earlier a sensitivity analysis was conducted to measure the effect of the inclusion of KY1.4 on the estimate.

North East Fife Local Healthcare Co-operative

North East Fife LHCC is composed of 55 GPs across 12 practices, treating approximately 73,056 patients. The Co-operative borders two other LHCCs, Glenrothes and the 'Levenmouth' section of Kirkcaldy / Levenmouth. The LHCC covers quite a large area, encompassing the towns of St Andrews, Cupar, Ladybank, Newburgh, Auchtermuchty and Tayport / Newport.

West Fife Local Healthcare Co-operative

West Fife LHCC covers the majority of the south west of Fife. It surrounds Dunfermline LHCC and borders with Glenrothes and Kirkcaldy / Levenmouth to the east. It is made up of 49 GPs and 17 practices across the south west of Fife. Areas covered by the LHCC include Dalgety Bay, Inverkeithing, Aberdour and Kelty (to the east of Dunfermline) and Oakley, Saline and Kincardine (to the west). As already mentioned in the Dunfermline section, several postcode sectors fall into more than one LHCC's remit. These sectors include KY11.3, KY11.7, KY11.8, KY11.9, KY12.8 and KY12.9, all bordering

with Dunfermline and KY3.0 with Kirkcaldy / Levenmouth. All sectors were assigned their particular LHCCs. KY11.3, as mentioned above, was subject to a sensitivity analysis to gauge the effect its inclusion may have on the estimates.

Table 4.1 lists the LHCCs constructed for Fife in terms of postcode district and sector, using the methods described in Section 3. Thus the population figures include the whole postcode sectors.

Table 4.1 Fife LHCCs by postcode sector

		Population	
LHCC	**Postcode Sectors**	**15-54**	**Total**
Dunfermline	KY11.2, KY11.3, KY11.4, KY11.7, KY11.8, KY12.0, KY12.7, KY12.8.	35,129	62,429
Glenrothes	KY6.1, KY6.2, KY6.3, KY7.3, KY7.4, KY7.5, KY7.6.	26,570	47,268
Kirkcaldy / Levenmouth	KY1.1, KY1.2, KY1.3, KY1.4, KY2.5, KY2.6, KY3.0, KY3.9, KY8.1, KY8.2, KY8.3, KY8.4, KY8.5, KY8.6.	52,086	98,605
N.E. Fife	DD6.8, DD6.9, KY10.2, KY10.3, KY14.6, KY14.7, KY15.4, KY15.5, KY15.7, KY16.0, KY16.8, KY16.9, KY9.1.	39,348	70,970
West Fife	KY11.1, KY11.9, KY12.9, KY4.0, KY4.8, KY4.9, KY5.0, KY5.8, KY5.9	37,778	68,275

4.2 Data Sources

Treatment Data

The most substantial data source we have drawn upon in this research is the Scottish Drug Misuse Database. This database obtains anonymised demographic data on individuals who are in contact with a range of drug services, including non-statutory agencies and general practitioners. As the database currently collates only information on new contacts at agencies, it cannot on its own be used to provide information on the total number of individuals attending drug services in Fife. The data on drug users held on the Drug Misuse Database were therefore augmented by data held by the area's drug treatment agencies. All of the agencies listed below provided anonymised data for the previous study:-

- Central Fife Substance Misuse Team, Kirkcaldy
- Drug & Alcohol Project, Levenmouth
- Fife Community Drug Team, Buckhaven

- NE Fife Substance Misuse Team, Cupar
- West Fife Community Drug Project, Dunfermline
- West Fife Substance Misuse Team, Dunfermline

The data from these agencies were then combined with the agency returns to the Scottish Drug Misuse Database to obtain a single data source, which was then reviewed to remove erroneous or incomplete data records, those which did not meet the case definition of the study (the use of opiates or benzodiazepines), and to eliminate multiple occurrences of a unique individual.

General Practitioners

In addition to the returns from drug treatment agencies, the Scottish Drug Misuse Database collates information from GPs on patients reporting drug misuse. Data on opiate or benzodiazepine users were extracted from the GP returns to the database to construct a GP data source for each Council area. Along with agency data and the data from the agency returns to the Scottish Drug Misuse Database, these data represent a minimum assessment of the number of drug users in treatment who are resident in Fife. In total there were 28 people identified from this source, 75% were male, the mean age was 28.

Fife Constabulary

Data on individuals who had been detained under the Misuse of Drugs Act were made available by the Fife Constabulary. Although many individuals were detained in connection with cannabis offences, information on individuals detained because of opiate or benzodiazepine offences was collated within a Police source for Fife.

Fife Council Social Work Department

Social Enquiry Reports are compiled by Social Work or corresponding departments to help in assessing the most suitable form of sentencing where an individual is being processed by the criminal justice system. As the report is written in relation to the individual's offending behaviour and a particular crime, any drugs that an individual is using may not be noted if the Social Worker does not feel that this is related to the case. This data source is, however, particularly relevant in identifying drug users who have committed acquisitive crime and who may be less likely to be contacting drug treatment agencies. The Criminal Justice Section of Fife Council Social Work Department granted the research project access to Social Enquiry Reports and these reports were screened by trained data collectors. Thus a Social Enquiry Report data source was compiled for Fife which contained information on those who had the use of opiates or benzodiazepines noted within a report.

Summary of Data

The data from each source was screened for postcode information and the records sorted by LHCC using the links provided in Table 4.1. Incomplete or nonexistent postcode information has resulted in some reduction in the size of all sources. Table 4.2 lists the original samples and the reductions.

Table 4.2 Total sample and sample with LHCC, by source (Fife)

Source	Total Sample	Sample with LHCC
Treatment Data	1,129	1,110
GPs	28	24
SERs	244	218
Police	119	111
Total	**1,520**	**1,463**

When the data are separated into LHCC areas, it becomes apparent that the majority of known problematic drug users reside in Glenrothes and Kirkcaldy / Levenmouth LHCC areas. Approximately 71% of the GP records relate to Kirkcaldy / Levenmouth highlighting the fact that not all GPs contribute to the Scottish Drug Misuse Database. The majority of those in the treatment sample (42%) gave addresses in the Glenrothes area. Both Dunfermline and North East Fife have just one record in the GP sample. Table 4.3 details the known data by source and LHCC.

Table 4.3 Known data by source and LHCC (Fife)

LHCC Area	Combined Treatment	GPs	SERs	Police	Total
Dunfermline	140	1	16	4	**161**
Glenrothes	470	2	88	22	**582**
Kirkcaldy / Levenmouth	246	17	85	64	**412**
North East	66	1	7	3	**77**
West	188	3	22	18	**231**
Total	**1,110**	**24**	**218**	**111**	**1,463**

In four out of five LHCCs the majority of problematic users are in the 25-34 age group, the exception being Glenrothes with 324 known users under the age of 25. The male to female ratio is approximately 3:1. Table 4.4 lists the known data for each LHCC by age and gender.

Table 4.4 Summary of known data by age and gender (Fife)

LHCC	Males	Females		15-24	25-34	35-54
Dunfermline	129	32		29	98	34
Glenrothes	407	175		324	202	56
Kirkcaldy / Levenmouth	305	107		127	207	78
North East	62	15		17	47	13
West	168	63		49	131	51
Total	**1,071**	**392**		**546**	**685**	**232**

4.3 Results

In this section we present a series of prevalence estimates for the five LHCC areas in Fife. We contrast a range of different approaches to analysing the data from the five areas and present the results arising from the following applications of the methods:-

- four-sample capture-recapture
- three-sample capture-recapture
- two-sample capture-recapture
- treatment multiplier

As highlighted above, as there were some postcode sectors which were split across LHCC area boundaries, we have also undertaken a series of sensitivity analyses for these areas to highlight the possible effect of any misclassification of LHCC to known drug users in Fife. We also include an estimate of the prevalence of problem drug use within the one SIP area in Fife.

Four-sample capture recapture method

In this section we detail the results of the four-sample analyses that were applied to the overlap data from the four sources in each LHCC area.

Table 4.5 Four- sample estimates, by LHCC with 95% confidence intervals (Fife)

			Total Estimate	
LHCC	**Model**	**Known**	**n**	**95% CI**
Dunfermline	S2*S3	151	315	211-549
Glenrothes	S1*S2 + S1*S4	537	1,030	849-1,292
Kirkcaldy / Levenmouth	S1*S2 + S3*S4	368	1,130	867-1,535
North East	S1*S2 + S1*S3	74	84	-
West	Independence	216	450	335-649
Total		**1,346**	**3,009**	**-**

We can see from the above table that the four-sample analyses suggests that there are 315 problem drug users in the Dunfermline LHCC area, 1,030 in the Glenrothes LHCC area, 1,130 in the Kirkcaldy / Levenmouth LHCC area and 450 in the West Fife LHCC area. The estimate for North East Fife appears not to be credible in that the vast majority of drug users would have to be known to various contributing organisations. The fact that we were unable to obtain a 95% confidence interval for the North East Fife estimate also brings into question the validity of that estimate.

Three-sample capture-recapture method

We have also undertaken a three-sample analysis in each of the five LHCC areas of Fife. As the GP source is the smallest, and because of close links between GPs and drug treatment agencies in Fife, we have combined the GP source with the Treatment / Scottish Drug Misuse Database data. We again used the Police and Social Enquiry Report data as distinct sources.

Table 4.6 Three-sample estimates, by LHCC with 95% confidence intervals (Fife)

			Total Estimate	
LHCC	**Model**	**Known**	**n**	**95% CI**
Dunfermline	Independence	151	315	211-549
Glenrothes	S1*S3	537	1,029	848-1,290
Kirkcaldy / Levenmouth	S2*S3	368	1,104	852-1,489
North East	S2*S3	74	301	120-1,514
West	Independence	216	468	342-694
Total		**1,346**	**3,217**	**2,373-5,536**

The main differences in combining the GP data with the Treatment / Scottish Drug Misuse Database data is that there is now a credible estimate for North East Fife (although the wide confidence interval is a cause for concern). In most other areas, merging two of the sources did not make much of a difference.

Two-sample capture-recapture method

We can also consider the situation where only two sources of data are available for use within a capture-recapture analysis. There are often valid concerns about using only two samples, in particular it has to be assumed that the two samples are independent. Usually there is no way of testing the validity of that assumption, therefore typically three or more samples are employed. It has, however, often been found in capture-recapture analyses across Scotland that the treatment sources are independent from the more criminal justice type sources such as the Police or the SERs. Therefore we have undertaken two-sample capture-recapture analyses by combining the GP data with those from

the Scottish Drug Misuse Database and the treatment agencies, and also combining the SER data with the Police data to give a 'criminal justice' source.

Table 4.7 summarises the results from the two-sample analyses applied to the data from the five LHCC areas.

Table 4.7 Two-sample estimates, by LHCC with 95% confidence intervals (Fife)

		Total Estimate	
LHCC	**Known**	**n**	**95% CI**
Dunfermline	151	311	165-457
Glenrothes	537	1,202	932-1,473
Kirkcaldy / Levenmouth	368	1,104	796-1,411
North East	74	302	-61-664
West	216	454	298-610
Total	**1,346**	**3,373**	**2,265-4,615**

Table 4.7 does highlight one of the more unfortunate problems of applying the two-sample capture-recapture method in that, using the standard methods for deriving 95% confidence intervals, it is possible to get a negative lower bound for the interval. Clearly 74 would be a more suitable lower bound for that confidence interval, therefore this amended lower bound has been used when summing the confidence intervals to get the confidence interval for the total estimate.

Multipliers

In this section we consider the scenario where it may not have been possible to undertake individual analyses for each of the LHCC areas in Fife, rather the only way of trying to stratify the estimate for the Fife Council area would be to apply a common multiplier to the known populations in each area. For example, from Table 4.2 we have identified 1,110 drug users from collecting data from treatment agencies and combining those data with data from the Scottish Drug Misuse Database. This figure can only be considered as a ***minimum*** estimate of the number of drug users in treatment in Fife in 2000 as it was not an objective of the previous research to undertake a complete census of drug treatment agencies across Scotland. Thus, given that the previous research estimated that there were 2,867 problem drug users in Fife, then a treatment multiplier can be obtained by dividing 2,867 by 1,110 giving a multiplier of 2.58.

As described in a previous section, we have also been given access to a more recent extract from the Scottish Drug Misuse Database which has postcode sector of residence. We can thus obtain a second 'treatment' multiplier, based on new contacts to the Scottish Drug Misuse Database in 2001 / 2002. The 'new contacts' multiplier can be

calculated by dividing 2,867 by the 463 new contacts for Fife giving a multiplier of 6.19. We can also add a column that would give the estimate of the number of drug users in each LHCC if there were a common prevalence rate across the five LHCC areas.

Table 4.8 Estimates derived from treatment multipliers, by LHCC (Fife)

	Multipliers		Common Rate
Area	**All Contacts**	**New Contacts**	
Dunfermline	362	198	528
Glenrothes	1,214	508	399
Kirkcaldy / Levenmouth	635	1,269	782
North East	170	266	591
West	486	625	567

Summary

We have presented prevalence estimates derived from capture-recapture and multiplier methods, and also considered the scenario where drug misuse was equally distributed across the five LHCC areas. We can now present the six different estimates for each area, along with the prevalence rates per population aged 15 to 54. As can be seen from the above tables, one effect of stratifying by LHCC is to increase the overall estimate from the combined Fife estimate previously reported. For example, the three-sample estimates when combined give a total of 3,217 (95% CI 2,373-5,536), compared to the previous estimate of 2,867 (95% CI 2,355-3,636). Although this may seem like a significant increase, it is well within the bounds of the 95% confidence interval and may be more an artefact of stratifying the data than a real difference in prevalence. To assist in making comparison between the Fife estimate and the five LHCC estimates, it is necessary to apply a scaling factor to the LHCC estimates to make sure they sum to the Council area total of 2,867. This scaling factor has been applied to the following tables:-

Table 4.9 Summary of estimates for the Dunfermline LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	300	0.9
3 sample capture-recapture	281	0.8
2 sample capture-recapture	264	0.8
treatment multiplier (all)	362	1.0
treatment multiplier (new)	198	0.6
no multiplier	528	1.5

Table 4.9 lists the scaled estimates for the Dunfermline LHCC area and the corresponding rates. The rates produced using four, three and two

sample estimates are all around the 0.9 mark. The treatment multipliers differ considerably, the first treatment multiplier based on 2000 data gives a slightly higher rate than the capture-recapture estimates. The multiplier calculated using new contacts gives a much lower rate of 0.6. Distributing the drug misuse equally across the five LHCC areas gives Dunfermline a much higher rate of 1.5.

Table 4.10 Summary of estimates for the Glenrothes LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	981	3.7
3 sample capture-recapture	917	3.5
2 sample capture-recapture	1,022	3.8
treatment multiplier (all)	1,214	4.6
treatment multiplier (new)	508	1.9
no multiplier	399	1.5

Examining Table 4.10 we see that the capture-recapture estimates range from 3.5-3.8 but the first treatment multiplier is a much higher 4.6. This is to be expected since the treatment sample is the largest source of data for the Glenrothes LHCC area. The multiplier based on new contacts is much lower at 1.9.

Table 4.11 Summary of estimates for the Kirkcaldy / Levenmouth LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	1,077	2.1
3 sample capture-recapture	984	1.9
2 sample capture-recapture	938	1.8
treatment multiplier (all)	635	1.2
treatment multiplier (new)	1,269	2.4
no multiplier	782	1.5

The Kirkcaldy / Levenmouth estimates detailed in the table above range from 1.8, for the two-sample estimate to 2.1 for the four-sample estimate. The best fitting model was produced using three samples giving a rate of 1.9. Interestingly, the rate calculated using new contacts is double the rate gleaned from all contacts in 2000, indicating a considerable increase in those in treatment in the Kirkcaldy / Levenmouth LHCC area.

Table 4.12 Summary of estimates for the North East Fife LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	80	0.2
3 sample capture-recapture	268	0.7
2 sample capture-recapture	257	0.7
treatment multiplier (all)	170	0.4
treatment multiplier (new)	266	0.7
no multiplier	591	1.5

In Table 4.12 above, the prevalence rates for the capture-recapture estimates range from 0.2 to 0.7. Disregarding the considerably lower four-sample estimate, without a confidence interval, the range shrinks to a more respectable 0.6-0.7. The treatment rate based on new contacts is higher than the rate calculated using all contacts for 2000 indicating an increase in users in treatment.

Table 4.13 Summary of estimates for the West Fife LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	429	1.1
3 sample capture-recapture	417	1.1
2 sample capture-recapture	386	1.0
treatment multiplier (all)	486	1.3
treatment multiplier (new)	625	1.7
no multiplier	567	1.5

The scaled capture-recapture estimates for West Fife produce similar rates for the West Fife LHCC area. The highest rate presented in the table above (1.7) relates to the multiplier based on new contacts. All three multipliers give higher estimates than those produced using the capture-recapture method.

Table 4.14 lists the best fitting models for the six LHCC areas in Fife, with scaled estimates and the corresponding prevalence rates.

Table 4.14 Selected models for the six LHCC areas (Fife)

			Scaled Estimate		Rate	
LHCC	**Category**	**Known**	**n**	**95% CI**	**n**	**95% CI**
Dunfermline	4-sample	151	282	189-492	0.8	0.5-1.4
Glenrothes	4-sample	537	923	760-1,157	3.5	2.9-4.4
Kirkcaldy / Levenmouth	3-sample	368	989	763-1,334	1.9	1.5-2.6
North East	2-sample	74	270	66-595	0.7	0.2-1.5
West	4-sample	216	403	300-581	1.1	0.8-1.5

Examining the above table we see that Kirkcaldy / Levenmouth LHCC area has the largest estimate of problematic drug use, but Glenrothes has by far the highest rate. Three out of the five best fitting estimates are gleaned from four samples; the exceptions are Kirkcaldy / Levenmouth and North East Fife. The point estimates calculated for Kirkcaldy / Levenmouth using four and three samples are both similar, but the three-sample estimate was selected due to its narrower confidence interval. Confidence intervals also determined the selection of the two-sample estimate for North East Fife. The point estimates produced based on three and two samples were 301 and 302 respectively, but the two-sample estimate with the tighter confidence interval was selected.

Sensitivity Analyses

There were two postcode sectors in which the population of the sector is almost equally split across two LHCC areas. The KY11.3 postcode sector has approximately 58% of the population in the Dunfermline LHCC with the remaining 42% in the neighbouring West Fife LHCC. The KY1.4 sector has 57% of the population in the Kirkcaldy / Levenmouth LHCC with the rest in the Glenrothes LHCC.

KY11.3

Examining the KY11.3 data in the sample, we found that its removal from the Dunfermline analysis reduced the estimate from 315 to 282. This affected the rate slightly, lowering it from 0.9 to 0.8. Conversely, the addition of KY11.3 to West Fife, although increasing the estimate, had no affect on the overall rate for West Fife.
Table 4.15 details the affects of including or excluding K11.3 from the Dunfermline or West Fife LHCC area analyses, including the chosen estimates, models and prevalence rates.

Table 4.15 Four sample estimates including and excluding KY11.3

			Total Estimate		Prevalence %	
Category	**Model**	**Known**	**n**	**95% CI**	**%**	**95% CI**
Dunfermline - KY11.3	S2*S3	136	282	189-490	0.8	0.6-1.5
Dunfermline	S2*S3	151	315	211-549	0.9	0.6-1.6
West Fife	Independence	216	450	335-649	1.2	0.9-1.7
West Fife + KY11.3	Independence	231	484	361-698	1.2	0.9-1.8

KY1.4

As seen below, focussing on the KY1.4 data in our sample, yielded only slight differences in estimates for both Glenrothes and Kirkcaldy / Levenmouth LHCC areas. When examining the rates, we see that the addition of KY1.4 data reduces the prevalence rate for the Glenrothes area from 3.9 to 3.5.

Table 4.16 Four sample estimates including and excluding KY1.4

			Total Estimate		Prevalence %	
Category	**Model**	**Known**	**n**	**95% CI**	**%**	**95% CI**
Kirk/ Leven - KY1.4	S1*S2 + S3*S4	367	1,149	877-1,572	2.3	1.8-3.2
Kirk/ Leven	S1*S2 + S3*S4	368	1,130	867-1,535	2.2	1.7-2.9
Glenrothes	S1*S2 + S1*S4	537	1,030	849-1,292	3.9	3.2-4.9
Glenrothes + KY1.4	S1*S2 + S1*S4	538	1,029	850-1,286	3.5	2.9-4.4

Fife Social Inclusion Partnership

Fife's area-based SIP includes the following neighbourhoods; Kirkcaldy, Levenmouth, Dunfermline and Central Fife Coalfields. By comparing the postcode sector of residence with those that the SIP covers, we obtained the following summary of the known population and prevalence estimates.

Table 4.17 Summary of known data by age and gender (Fife SIP)

Source	Males	Females		15-24	25-34	35-54
Combined Treatment	258	123		161	159	61
General Practitioners	1	0		0	0	1
Social Enquiry Reports	77	18		59	31	5
Police	33	21		9	30	15
Total	**369**	**162**		**229**	**220**	**82**

Table 4.18 Four and three and two sample estimates with 95% confidence intervals (Fife SIP)

			Total Estimate		Prevalence %	
	Model	**Known**	**n**	**95% CI**	**%**	**95%CI**
4 sample	S1*S2 +S1*S4	482	1,063	855-1,369	2.3	1.9-3.0
3 sample	S1*S3	482	1,063	855-1,369	2.3	1.9-3.0
2 sample		482	1,320	998-1,641	2.9	2.2-3.6

4.4 Discussion

In this section we have provided prevalence estimates for each of the LHCC areas of Fife, as well as the only SIP area. We have compared different methods and undertook sensitivity analyses to examine the effects of any misclassification of two postcode sectors that are almost equally split across LHCC area boundaries. When comparing the effect of including or excluding the KY11.3 postcode sector in either the Dunfermline or West Fife LHCC areas, there appeared little difference in the rates. Interestingly, although there was only one person in the KY1.4 postcode sector, the inclusion or exclusion of this person did seem to affect the rates in the Glenrothes and the Kirkcaldy / Levenmouth LHCCs even though this person did not seriously affect the absolute estimates.

The pattern of drug use across Fife is perhaps what would have been expected, with the North East Fife LHCC area having the lowest level of drug use. Indeed, for this LHCC area, there were difficulties in fitting capture-recapture models to the low levels of overlaps and the resultant estimates had wide confidence intervals. The Glenrothes

LHCC area had by far the highest prevalence rate, even higher than the SIP area. From the four-sample analysis, it was estimated that approximately 3.5% of the population aged 15 to 54 in 2000 were opiate or benzodiazepine users. This contrasts with the Fife Council estimates of 1.5%.

5 Grampian

The Grampian NHS Board area has a population of 523,400, 297,144 of which are aged between 15-54. The region is comprised of three local authorities; Aberdeen City, Aberdeenshire and Moray. In 2001 prevalence estimates were produced at the NHS Board and Police Force area levels, and at the level of the three Councils. The research described in this report has focussed on Grampian's LHCCs and SIP in order to produce estimates that will provide information on the distribution of problematic drug users across the region.

5.1 Areas

The Grampian NHS Board area contains eight LHCCs and one SIP. With previous research the Councils were described as either rural areas (Aberdeenshire and Moray) or non-rural (Aberdeen City); the nature of LHCCs means that some e.g. Aberdeen and North span both urban and rural areas.

Aberdeen Inner City Local Healthcare Co-operative

As the name suggests, this LHCC covers the inner city area of Aberdeen. It is composed of 90 GPs and 18 practices, treating approximately 135,305 patients. Areas covered by the Co-operative include Garthdee, Torry, Mastrick and Woodside. The Co-operative is bordered to the south by Kincardine LHCC and to the north by Aberdeen and North. When assigning postcode districts to the LHCCs, AB12 stood out as an overlap area. This district straddles both Inner City and Kincardine, with Cove and Kincorth in Inner City and Portlethen in Kincardine. AB12 was assigned to the Inner City LHCC but a sensitivity analysis was carried out to judge the effect of AB12 inclusion in both of the LHCCs. In addition, an extract of information from GPs who contribute to the Scottish Drug Misuse Database where the postcode sector or postcode district of residence could be compared to the LHCC which the GP was part of suggested that both the AB10 and AB16 postcode districts may straddle the Aberdeen Inner City / Aberdeen West LHCC areas. Both of theses postcode districts were assigned to the Aberdeen Inner City LHCC but sensitivity analyses were carried out to examine the effect of including or excluding these postcode districts from each LHCC area.

Aberdeen and North Local Healthcare Co-operative

As previously noted, the Aberdeen and North LHCC area covers part of Aberdeen City to the North and some of Aberdeenshire. Its 37 GPs treat approximately 54,000 patients across this area. Settlements covered by the LHCC include Bucksburn and Bridge of Don to the north of the city and Ellon, Potterton and Whitecairns in Aberdeenshire.

Aberdeen West Local Healthcare Co-operative

The Aberdeen West LHCC covers settlements in Aberdeenshire to the west of the city, including Westhill, Peterculter and Milltimber. It also stretches past Cults and into the west side of the city. The LHCC includes 51 GPs and treats 80,500 patients. As mentioned previously, the AB10 and AB16 postcode districts may straddle the Aberdeen West and Aberdeen Inner City areas.

Banff and Buchan Local Healthcare Co-operative

The Banff and Buchan LHCC is composed of 50 GPs and 15 practices, treating 85,000 patients across the north of Grampian. The LHCC area includes the towns of Peterhead, Fraserburgh, Banff and Macduff.

Central Aberdeenshire Local Healthcare Co-operative

The Central Aberdeenshire LHCC area is surrounded by five LHCC areas; Aberdeen and North and Banff and Buchan to the north, Moray to the west, Deeside to the south and West Aberdeen to the east. The LHCC is comprised of 30 GPs treating 47,000 patients in areas such as Inverurie, Huntly, Insch, Alford and Strathdon.

Deeside Local Healthcare Co-operative

The Deeside LHCC area is one of the two Co-operatives on the southern edge of Grampian NHS Board area. It borders Moray, Central Aberdeenshire and Kincardine. The LHCC is composed of 17 GPs treating 21,510 patients. Settlements covered by Deeside LHCC include Ballater, Aboyne and Banchory.

Kincardine Local Health Care Co-operative

Kincardine is the southern-most LHCC area in the Grampian NHS Board area. It has borders with the Deeside LHCC area and the Inner City LHCC area. The LHCC is made up of 22 GPs, caring for 35,000 patients in areas such as Laurencekirk and Stonehaven. As mentioned earlier, patients in AB12 could fall under the remit of either Kincardine or Inner City LHCC, therefore a sensitivity analysis was undertaken to assess the effect of AB12 patients on the estimates for both LHCCs.

Moray Local Healthcare Co-operative

The Moray LHCC area is coterminous with the Moray Council area and offers care to approximately 84,143 patients in the north west of the Grampian NHS Board area. The LHCC area borders three other LHCC areas; Deeside, Central Aberdeenshire and Banff and Buchan. Elgin is the main settlement in Moray, and the Moray LHCC area also includes the towns of Aberlour, Buckie, and Lossiemouth.

Table 5.1 lists the LHCCs constructed for the Grampian NHS Board area in terms of postcode district and sector, using the methods described in Section 3 of this report. The population figures are therefore obtained by summing the whole populations of these postcode sectors.

Table 5.1 Grampian NHS Board area LHCC areas by postcode sector

		Population	
LHCC Areas	**Postcode Sectors**	**15-54**	**Total**
Aberdeen & North	AB12.4, AB21.0, AB21.7, AB21.9, AB22.8, AB23.8, AB41.6, AB41.7, AB41.8, AB41.9	43,413	72,630
Aberdeen Inner City	AB10.1, AB11.5, AB11.6, AB11.7, AB11.8, AB11.9, AB12.3, AB12.5, AB15.4, AB15.5, AB15.6, AB15.7, AB16.5, AB16.6, AB16.7, AB24.1, AB24.2, AB24.3, AB24.4, AB24.5, AB25.1, AB25.2, AB25.3	78,627	132,942
Aberdeen West	AB10.6, AB10.7, AB13.0, AB14.0, AB15.8, AB15.9, AB32.6, AB32.7	31,160	54,493
Banff & Buchan	AB42.0, AB42.1, AB42.2, AB42.3, AB42.4, AB42.5, AB43.6, AB43.7, AB43.8, AB43.9, AB44.1, AB45.1, AB45.2, AB45.3, AB53.4, AB53.5, AB53.6	43,518	79,052
Central	AB33.8, AB36.8, AB51.0, AB51.3, AB51.4, AB51.5, AB51.7, AB51.8, AB52.6, AB53.8, AB54.4, AB54.6, AB54.7, AB54.8	28,484	51,168
Deeside	AB31.4, AB31.5, AB31.6, AB34.4, AB34.5, AB35.5	10,970	20,917
Kincardine	AB30.1, AB39.2, AB39.3, DD10.0	15,649	27,613
Moray	AB37.9, AB38.7, AB38.9, AB55.4, AB55.5, AB55.6, AB56.1, AB56.4, AB56.5, IV30.1, IV30.4, IV30.5, IV30.6, IV30.8, IV31.6, IV32.7, IV36.1, IV36.2, IV36.3	45,203	84,366
TOTAL		**297,024**	**523,181**

Unfortunately, due to the change in postcodes in the Aberdeen area in 1996 and also partly to alleviate the concerns of at least one contributing agency within the area, it is only possible to identify the postcode district of residence for some individuals. We have therefore only worked with postcode district within these analyses and we present below the postcode districts we have assigned to each LHCC.

Table 5.2 Grampian NHS Board area LHCC areas by postcode district

		Population	
LHCC Areas	**Postcode Districts**	**15-54**	**Total**
Aberdeen Inner City	AB10, AB11, AB12, AB16, AB24, AB25	84,685	140,063
Aberdeen & North	AB21, AB22, AB23, AB41	38,503	64,872
Aberdeen West	AB13, AB14, AB15, AB32	30,012	55,130
Banff & Buchan	AB42, AB43, AB44, AB45, AB53	45,136	81,894
Central	AB33, AB36, AB51, AB52, AB54	26,866	48,326
Deeside	AB31, AB34, AB35	10,970	20,917
Kincardine	AB30, AB39	12,460	21,830
Moray	AB37, AB38, AB55, AB56, IV30, IV31, IV32, IV36	45,203	84,366
TOTAL		**293,835**	**517,398**

Comparing Table 5.1 with Table 5.2 shows that, when only looking at postcode districts, the Aberdeen and North LHCC loses part of its area to the Aberdeen Inner City LHCC, as does the Aberdeen West LHCC. The Central Aberdeenshire LHCC loses some of its population to the Banff and Buchan LHCC. The Moray LHCC and Deeside LHCC areas remain the same; however both the Kincardine population figures, and the total population figures, decrease as the DD10.0 postcode sector is re-assigned to join the rest of the DD10 postcode district to the Angus LHCC area. The effect of the inflation of the Aberdeen Inner City LHCC is considered within the sensitivity analyses described below.

5.2 Data Sources

Treatment Data

The most substantial data source we have drawn upon in this research is the Scottish Drug Misuse Database. This database obtains anonymised demographic data on individuals who are in contact with a range of drug services, including non-statutory agencies and general practitioners. As the database currently collates only information on new contacts at agencies, it cannot on its own be used to provide information on the total number of individuals attending drug services in Grampian. The data on drug users held on the Drug Misuse Database were therefore augmented by data held by the area's drug treatment agencies. The agencies listed below provided anonymised data for the previous study:-

- Drugs Action, Aberdeen
- Substance Misuse Service, Royal Cornhill Hospital, Aberdeen

The data from these agencies were then combined with the agency returns to the Scottish Drug Misuse Database to obtain a single data source, which was then reviewed to remove erroneous or incomplete data records, those which did not meet the case definition of the study (the use of opiates or benzodiazepines), and to eliminate multiple occurrences of a unique individual.

General Practitioners

In addition to the returns from drug treatment agencies, the Scottish Drug Misuse Database collates information from GPs on patients reporting drug misuse. Data on opiate or benzodiazepine users were extracted from the GP returns to the database to construct a GP data source for each Council area. Along with agency data and the data from the agency returns to the Scottish Drug Misuse Database, these data represent a minimum assessment of the number of drug users in treatment who are resident in Grampian. In total there were 110 people identified from this source, 71% were male.

Grampian Police

Data on individuals who had been detained under the Misuse of Drugs Act were made available by Grampian Police. Although many individuals were detained in connection with cannabis offences, information on individuals detained because of opiate or benzodiazepine offences was collated within a Police source for Grampian.

Grampian Social Work Departments

Social Enquiry Reports are compiled by Social Work or corresponding departments to help in assessing the most suitable form of sentencing where an individual is being processed by the criminal justice system. As the report is written in relation to the individual's offending behaviour and a particular crime, any drugs that an individual is using may not be noted if the Social Worker does not feel that this is related to the case. This data source is, however, particularly relevant in identifying drug users who have committed acquisitive crime and who may be less likely to be contacting drug treatment agencies. The Criminal Justice Section of all three Council Social Work Departments granted the research project access to Social Enquiry Reports and these reports were screened by trained data collectors. Thus a Social Enquiry Report data source was compiled for Grampian which contained information on those who had the use of opiates or benzodiazepines noted within a report.

Summary of Data

The data from each source were screened for postcode information and the records sorted by LHCC using the links provided in table 5.2. Incomplete or nonexistent postcode information has resulted in some reduction in the size of all sources. Table 5.3 lists the original samples and the reductions.

Table 5.3 Total sample and sample with LHCC, by source (Grampian)

Source	Total Sample	Sample with LHCC
Treatment Data	1,232	1,123
GPs	110	103
SERs	448	415
Police	445	432
Total	**2,235**	**2,073**

Table 5.4 details the known data by source and LHCC. From this table, it is apparent that the majority of problematic drug users reside in the Inner City and Banff and Buchan LHCCs areas. Approximately 56% of the GP records relate to Inner City LHCC and just over half of the treatment sample (52%) belongs to the same LHCC. Kincardine has no Police data pertaining to the area and only six records in total.

Table 5.4 Known data by source and LHCC (Grampian)

LHCC Area	Combined Treatment	GPs	SERs	Police	Total
Inner City	589	58	244	198	**1,089**
Aberdeen & North	72	3	21	26	**122**
Aberdeen West	33	6	14	18	**71**
Banff & Buchan	331	14	83	130	**558**
Central	30	12	25	18	**85**
Deeside	14	5	9	2	**30**
Kincardine	1	2	3	0	**6**
Moray	53	3	16	40	**112**
Total	**1,123**	**103**	**415**	**432**	**2,073**

In all eight LHCC areas the majority of problematic users are in the 15-24 age group. Unsurprisingly, Inner City LHCC area has the largest number of older drug users; Banff and Buchan comes second with 41 35-54 year olds. The male to female ratio for Grampian is approximately 3:1; Aberdeen and North LHCC has the largest ratio with five male users to every female. Table 5.5 lists the known data for each LHCC area by age and gender.

Table 5.5 Summary of known data by age and gender (Grampian)

LHCC Area	Males	Females		15-24	25-34	35-54
Inner City	813	276		553	434	102
Aberdeen & North	101	21		57	56	9
Aberdeen West	51	20		42	27	2
Banff & Buchan	420	138		304	213	41
Central	62	23		42	29	14
Deeside	20	10		17	10	3
Kincardine	5	1		3	2	1
Moray	85	27		49	47	16
Total	**1,557**	**516**		**1,067**	**818**	**188**

5.3 Results

In this section we present a series of prevalence estimates for the eight LHCC areas in Grampian. We contrast a range of different approaches to analysing the data from the eight areas and present the results arising from the following applications of the methods:-

- four-sample capture-recapture
- three-sample capture-recapture
- two-sample capture-recapture
- treatment multiplier

As highlighted above, AB10, AB16 and AB12 are split across LHCC boundaries, so we have also undertaken a series of sensitivity analyses for these areas to highlight the possible effect of any misclassification of LHCC to known drug users in Grampian. We also include an estimate of the prevalence of problem drug use within the one SIP area in Grampian.

Four-sample capture recapture

In this section we detail the results of the four-sample analyses that were applied to the overlap data from the four sources in each LHCC area.

Table 5.6 Four sample estimates, by LHCC area with 95% confidence intervals (Grampian)

LHCC Area	Model	Known	Total Estimate	
			n	95% CI
Inner City	S1*S2 + S2*S3	968	3,211	2,716-3,855
Aberdeen & North	Independence	116	702	370-1,660
Aberdeen West	S1*S4	66	217	117-527
Banff & Buchan	Independence	463	880	768-1,023
Central	S2*S3 + S1*S3	74	241	145-471
Deeside	S2*S4	27	56	30-163
Kincardine	-	6	6	-
Moray	Independence	103	426	255-820
Total		**1,823**	**5,739**	**4,401-8,519**

We can see from the above table that the four-sample analyses suggests that there are 3,211 problem drug users in the Inner City LHCC area, 702 in the Aberdeen and North LHCC, 217 in the Aberdeen West LHCC, 880 in the Banff and Buchan LHCC, 241 in the Central Aberdeenshire LHCC, 56 in Deeside LHCC and 426 in the Moray LHCC. There is no estimate for Kincardine LHCC due to the lack of data.

Three-sample capture-recapture

We have also undertaken a three-sample analysis in each of the seven LHCC areas in Grampian, excluding Kincardine. As the GP source is the smallest, and because of close links between GPs and drug treatment agencies in Grampian, we have combined the GP source with the Treatment / Scottish Drug Misuse Database data. We again used the Police and Social Enquiry Report data as distinct sources.

Table 5.7 Three sample estimates, by LHCC area with 95% confidence intervals (Grampian)

			Total Estimate	
LHCC Area	Model	Known	n	95% CI
Inner City	S1*S2 + S2*S3	968	3,836	2,881-5,365
Aberdeen & North	Independence	116	668	354-1,572
Aberdeen West	S1*S3	66	196	103-527
Banff & Buchan	Independence	463	878	765-1,024
Central	S2*S3	74	354	156-1,258
Deeside	Independence	27	171	47-2,533
Kincardine	-	6	6	-
Moray	Independence	103	410	248-787
Total		**1,823**	**6,519**	**4,554-13,066**

Combining the GP data with the Treatment/Scottish Drug Misuse Data slightly reduces the estimates in all LHCC areas apart from Central Aberdeenshire and Deeside. The increased Deeside estimate is accompanied by a much wider confidence interval than the corresponding 4-sample estimate. In most other areas, merging two of the sources together did not make much of a difference.

Two-sample capture-recapture

We can also consider the situation where only two sources of data are available for use within a capture-recapture analysis. There are often valid concerns about using only two samples; in particular it has to be assumed that the two samples are independent. Usually there is no way of testing the validity of that assumption, therefore typically three or more samples are employed. It has, however, often been found in capture-recapture analyses across Scotland that the treatment data are independent from the more criminal justice type data such as the Police or the SERs. Therefore we have undertaken two-sample capture-recapture analyses by combining the GP data with those from the Scottish Drug Misuse Database and the treatment agencies, and also combining the SER data with the Police data to give a 'criminal justice' source.

Table 5.8 summarises the results from the two-sample analyses applied to the data from the eight LHCC areas.

Table 5.8 Two sample estimates, by LHCC area with 95% confidence intervals (Grampian)

		Total Estimate	
LHCC area	**Known**	**n**	**95% CI**
Inner City	968	3,091	2,550-3,633
Aberdeen & North	116	844	76-1,612
Aberdeen West	66	393	-13-798
Banff & Buchan	463	898	756-1,039
Central Aberdeenshire	74	234	91-378
Deeside	27	187	-152-526
Kincardine	6	6	-
Moray	103	432	153-711
Total	**1,823**	**6,085**	**3,719-8,697**

Table 5.8 again highlights the more unfortunate problem of applying the two-sample capture-recapture method in that, using the standard methods for deriving 95% confidence intervals, it is possible to get a negative lower bound for the interval. The known values for both the Aberdeen West and Deeside LHCC areas have been used as lower bounds when summing the confidence intervals to get the confidence interval for the total estimate.

Treatment Multiplier

In this section we consider the scenario where it may not have been possible to undertake individual analyses for each of the LHCC areas in Grampian, rather the only way of trying to stratify the estimate for the Grampian Health Board area would be to apply a common multiplier to the known populations in each area. For example, from Table 5.3 we have identified 1,123 drug users from collecting data from treatment agencies and combining those data with data from the Scottish Drug Misuse Database. This figure can only be considered as a ***minimum*** estimate of the number of drug users in treatment in Grampian in 2000 as it was not an objective of the previous research to undertake a complete census of drug treatment agencies across Scotland. Thus, given that the previous research estimated that there were 5,415 problem drug users in Grampian, then a treatment multiplier can be obtained by dividing 5,415 by 1,123 giving a multiplier of 4.82. We can thus obtain a second 'treatment' multiplier, based on new contacts to the Scottish Drug Misuse Database in 2001 / 2002 as previously described. Table 5.9 presents the prevalence estimates for each of the eight LHCC areas if these multipliers were applied to the known populations from each source. We can also add a column that would give the estimate of the number of drug users in each LHCC if there were a common prevalence rate across the eight LHCC areas.

Table 5.9 Estimates derived from various multipliers, by LHCC (Grampian)

	Multipliers		**Common Rate**
LHCC Area	**All Contacts**	**New Contacts**	
Inner City	2,840	1,751	1,561
Aberdeen & North	347	346	710
Aberdeen West	159	230	553
Banff & Buchan	1,596	2,339	832
Central Aberdeenshire	145	242	495
Deeside	68	81	202
Kincardine	5	58	230
Moray	256	369	833

Summary

We have presented prevalence estimates derived from capture-recapture and multiplier methods, and also considered the scenario where drug misuse was equally distributed across the eight LHCC areas. We can now present the six different estimates for each area, along with the prevalence rates per population aged 15 to 54. As can be seen from the above tables, one effect of stratifying by LHCC is to increase the overall estimate from the combined Grampian NHS Board estimate previously reported. For example, the three-sample estimates

when combined give a total of 6,519 (95% CI 4,554-13,066), compared to the previous estimate of 5,415 (95% CI 3,997-8,504). Although this may seem like a significant increase, it is well within the bounds of the 95% confidence interval and may be more an artefact of stratifying the data than a real difference in prevalence. To assist in making comparison between the NHS Board area estimate and the eight LHCC estimates, it is necessary to apply a scaling factor to the LHCC estimates to make sure they sum to the NHS Board area total of 5,415. This scaling factor has been applied to the following tables.

Table 5.10 Summary of estimates for the Aberdeen Inner City LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	3,030	3.6
3 sample capture-recapture	3,186	3.8
2 sample capture-recapture	2,751	3.2
treatment multiplier (all)	2,840	3.4
treatment multiplier (new)	1,751	2.1
no multiplier	1,561	1.8

Examining the scaled estimates and rates in Table 5.10 it is clear that the common rate calculated for all LHCC areas in Grampian (1.8) is considerably lower than those produced by the treatment multiplier (all) and capture-recapture methods. Focussing on the capture-recapture estimates we see similar rates for the three and four sample estimates, with the two-sample one slightly lower at 3.2. The two treatment multipliers gave quite different estimates. The multiplier based on all contacts gave a rate of 3.4, similar to the capture-recapture rates and the multiplier based on new contacts produced the lower rate of 2.1.

Table 5.11 Summary of estimates for the Aberdeen and North LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	662	1.7
3 sample capture-recapture	555	1.4
2 sample capture-recapture	751	2.0
treatment multiplier (all)	347	0.9
treatment multiplier (new)	346	0.9
no multiplier	710	1.8

From Table 5.11 the capture-recapture prevalence rates for Aberdeen and North LHCC area range from 1.4 to 2.0. Table 5.6 listed the four-sample estimate as the best fitting model; this gives a rate of 1.7 mid-way between the three and two sample estimates. The estimates based on treatment multipliers are both considerably lower at 0.9.

Table 5.12 Summary of estimates for the Aberdeen West LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	205	0.7
3 sample capture-recapture	163	0.5
2 sample capture-recapture	350	1.2
treatment multiplier (all)	159	0.5
treatment multiplier (new)	230	0.8
no multiplier	553	1.8

Focussing on the capture-recapture estimates for Aberdeen West LHCC area (listed in Table 5.12 above) we see that the more complex three and four sample models give similar rates whereas the unrefined two-sample rate is much higher at 1.2. The treatment multiplier rate based on new contacts is slightly higher than the one based on all contacts in 2000.

Table 5.13 Summary of estimates for the Banff and Buchan LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	830	1.8
3 sample capture-recapture	729	1.6
2 sample capture-recapture	799	1.8
treatment multiplier (all)	1,596	3.5
treatment multiplier (new)	2,339	5.2
no multiplier	832	1.8

The treatment multipliers produce the highest prevalence rates for Banff & Buchan LHCC area. The multiplier based on new contacts is considerably larger (5.2) than the rate based on all contacts in 2000. This would indicate an increase in the amount of users in treatment in the Banff & Buchan LHCC area. The capture-recapture prevalence rates for the LHCC area range from 1.6 to 1.8; the four-sample rate, 1.8, has the best fitting model.

Table 5.14 Summary of estimates for the Central Aberdeenshire LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	227	0.8
3 sample capture-recapture	294	1.1
2 sample capture-recapture	208	0.8
treatment multiplier (all)	145	0.5
treatment multiplier (new)	242	0.9
no multiplier	495	1.8

Examining table 5.14 we see that the rates produced using capture-recapture and multiplier methods range from 0.5-1.1. The capture-recapture based estimates are at the higher end of the range, the best fitting model (four-sample) produced a rate of 0.8.

Table 5.15 Summary of estimates for the Deeside LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	53	0.5
3 sample capture-recapture	142	1.3
2 sample capture-recapture	166	1.5
treatment multiplier (all)	68	0.6
treatment multiplier (new)	81	0.7
no multiplier	202	1.8

Examining the scaled estimates and rates listed in Table 5.15, we see that the capture-recapture based prevalence rates for Deeside LHCC range from 0.5 to 1.5. The treatment multiplier referring to all contacts gives a rate of 0.6, the new contacts rate is slightly higher at 0.7.

Table 5.16 Summary of estimates for the Kincardine LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	-	
3 sample capture-recapture	-	
2 sample capture-recapture	-	
treatment multiplier (all)	5	0.04
treatment multiplier (new)	57	0.5
no multiplier	230	1.8

The table of scaled estimates for Kincardine LHCC area does not include capture-recapture estimates, due to a lack of overlaps between the Kincardine data sources. The rates based on treatment multipliers vary considerably with the rate based on all contacts (0.04), reflecting the scarcity of data available for Kincardine at LHCC level.

Table 5.17 Summary of estimates for the Moray LHCC area

Method	Scaled Estimate	Rate
4 sample capture-recapture	402	0.9
3 sample capture-recapture	341	0.8
2 sample capture-recapture	384	0.8
treatment multiplier (all)	256	0.6
treatment multiplier (new)	369	0.8
no multiplier	833	1.8

Table 5.17 lists the scaled estimates and rates for the Moray LHCC area. The capture-recapture estimates are close in value; this is clearly

shown in the narrow range of the rates (0.8-0.9). The treatment multiplier based on new contacts for 2001(0.8) is slightly larger than the rate calculated from all contacts for 2000 (0.6), indicating an increase in those receiving treatment in the Moray LHCC area.

Table 5.18 details the best fitting models for the LHCC areas in Grampian, including estimates and the corresponding 95% confidence intervals.

Table 5.18 Selected models for LHCC areas (Grampian)

			Scaled Estimate		Rate	
LHCC	**Category**	**Known**	**n**	**95% CI**	**n**	**95% CI**
Inner City	4-sample	968	3,030	2,471-3,863	3.6	2.9-4.6
Aberdeen & North	4-sample	116	662	337-1,664	1.7	0.9-4.3
Aberdeen West	4-sample	66	205	106-528	0.7	0.4-1.8
Banff & Buchan	4-sample	463	830	699-1,025	1.8	1.5-2.3
Central	4-sample	74	227	132-472	0.8	0.5-1.8
Deeside	4-sample	27	53	27-163	0.5	0.2-1.5
Moray	3-sample	103	341	226-789	0.8	0.5-1.7

It is clear from Table 5.18 that Aberdeen Inner City LHCC has the highest estimate of problematic drug use. Banff & Buchan and Aberdeen & North do not even come close with estimates of 830 and 662. All of the best fitting models were produced from four sources, with the exception of Moray. The three-sample estimate for Moray was chosen because it had a narrower confidence interval than the estimate based on four sources. We have excluded the Kincardine LHCC area from this table due to the previously described problems of obtaining prevalence estimates for this area.

Sensitivity Analyses

From the CHI, it was noted that, although the AB12 postcode district was mainly in the Aberdeen Inner City LHCC, a substantial amount of its population was covered by the Kincardine LHCC. The AB12 postcode district has most of the population in the Inner City LHCC with a small proportion in the neighbouring Kincardine LHCC. It was similarly noted that there might be difficulties in determining the LHCC of residence (either Aberdeen Inner City or Aberdeen West) for residents of the AB10 and AB16 postcode districts.

As previously noted, the analysis for Grampian was conducted at a district level. This did not give rise to any complications when calculating estimates for LHCC areas in Aberdeenshire and Moray, but it affected the LHCC areas in and around Aberdeen City. Three postcode districts are split across LHCCs in the Aberdeen City area.

AB12

AB12 is split between Aberdeen Inner City LHCC area and Kincardine LHCC area. Removing the data relating to this from Inner City reduces the prevalence from 3,211 to 3,117 but increases the rate from 3.8 to 4.4. This is due to the effect of the removing of the large AB12 population from the denominator when calculating the rate.

The addition of AB12 data to the Kincardine sample gives an estimate of 205. Tables 5.19 details the sensitivity analysis for AB12, including chosen models, estimates and rates.

Table 5.19 Four sample estimates including and excluding AB12

			Total Estimate		Prevalence %	
Category	**Model**	**Known**	**n**	**95% CI**	**%**	**95% CI**
Inner City	S2*S3 + S3*S4	968	3,211	2,716-3,855	3.8	3.2-4.6
Inner City - AB12	S2*S3 + S3*S4	923	3,117	2,619-3,770	4.4	3.7-5.4
Kincardine	-	6	6	-	-	-
Kincardine +AB12	Independence	55	205	112-466	0.8	0.4-1.7

AB10

AB10 straddles Inner City LHCC and Aberdeen West LHCC areas. When removed from the Inner City sample the estimate is reduced from 3,211 to 2,619. The rate is also reduced slightly from 3.8 to 3.6. The addition of the data to the Aberdeen West sample has a greater effect, increasing the rate from 0.7 to 2.4.

Tables 5.20 details the sensitivity analysis for AB10, including chosen models, estimates and rates.

Table 5.20 Four sample estimates including and excluding AB10

			Total Estimate		Prevalence %	
Category	**Model**	**Known**	**n**	**95% CI**	**%**	**95% CI**
Inner City	S2*S3 + S3*S4	968	3,211	2,716-3,855	3.8	3.2-4.6
Inner City – AB10	S2*S3 + S3*S4	843	2,619	2,212-3,150	3.6	3.1-4.4
Aberdeen W	S1*S4	66	217	117-527	0.7	0.4-1.8
Aberdeen W + AB10	S1*S4	200	1,032	554-2,401	2.4	1.3-5.6

AB16

AB16 is another sector split between Aberdeen Inner City LHCC area and Aberdeen West LHCC area. When AB16 is removed from the Aberdeen Inner City estimate it reduces the figure from 3,211 to 2,646. This substantial reduction in the estimate for Aberdeen Inner City LHCC area is matched by a considerable reduction in the overall population of the area, therefore the prevalence rate stays at 3.8.

As with the AB10 analysis the addition of AB16 data to the Aberdeen West sample alters the estimate considerably, increasing it from 217 to 1,324. The corresponding rate increases from 0.7 to 2.9.

Tables 5.21 details the sensitivity analysis for AB16, including chosen models, estimates and rates.

Table 5.21 Four sample estimates including and excluding AB16

			Total Estimate		Prevalence %	
Category	**Model**	**Known**	**n**	**95% CI**	**%**	**95% CI**
Inner City	S2*S3 + S3*S4	968	3,211	2,716-3,855	3.8	3.2-4.6
Inner City - AB16	S1*S2 + S3*S4	693	2,646	2,112-3,404	3.8	3.1-4.9
Aberdeen W	S1*S4	66	217	117-527	0.7	0.4-1.8
Aberdeen W + AB16	Independence	355	1,324	1,013-1,794	2.9	2.2-3.9

Great Northern Partnership

This Aberdeen City based SIP covers Fersands, Alexander/Hayton, Middlefield and Printfield. It cover parts of the AB24 and AB16 postcode districts and, as we could stratify only the known population by postcode district, we analysed the data for the combined AB16 / AB24 area, and then the individual postcode districts. The following tables present the results from these analyses.

Table 5.22 Summary of known data by age and gender

Source	**Males**	**Females**		**15-24**	**25-34**	**35-54**
Combined Treatment	245	95		176	132	32
General Practitioners	27	9		24	10	2
Social Enquiry Reports	129	19		96	46	6
Police	89	35		57	51	16
Total	**490**	**158**		**353**	**239**	**56**

Table 5.23 Four and three and two sample estimates with 95% confidence intervals

			Total Estimate		Prevalence %	
	Model	Known	n	95% CI	%	95%CI
4 sample	S1*S4	577	1,649	1,339-2,085	4.7	3.8-6.0
3 sample	S2*S4	577	1,559	1,254-1,997	4.5	3.6-5.7
2 sample		577	1,870	1,443-2,296	5.4	4.1-6.6

Table 5.24 Four and three and two sample estimates with 95% confidence intervals (AB16)

			Total Estimate		Prevalence %	
	Model	Known	n	95% CI	%	95%CI
4 sample	S1*S2	288	833	643-1,121	5.3	4.1-7.2
3 sample	Independence	288	833	643-1,121	5.3	4.1-7.2
2 sample		288	853	596-1,110	5.4	3.8-7.1

Table 5.25 Four and three and two sample estimates with 95% confidence intervals (AB24)

			Total Estimate		Prevalence %	
	Model	Known	n	95% CI	%	95%CI
4 sample	S1*S4 + S2*S4	289	802	604-1,121	5.1	3.9-7.2
3 sample	S2*S4	289	800	593-1,144	5.1	3.8-7.3
2 sample		289	1,033	675-1,391	6.6	4.3-8.9

5.4 Discussion

In a similar manner to the analyses described previously for Fife, we obtained prevalence estimates for each of the LHCC areas covered by the Grampian NHS Board area. Unfortunately, due to changes in postcodes and the lack of postcode sector data from one source, we could only use postcode districts to stratify the known population into LHCC area. Due to the nature of the postcode sectors and districts in Aberdeen, this was not found to be a significant problem as, even if we did have postcode sectors, there would be some difficulties in assigning LHCC. There was the added problem in Grampian that, because of the changes in postcodes, it was not always possible to find the proportion of each postcode sector that attended the different GP practices in the city. Because of this, we undertook sensitivity analyses to examine any differences in assigning LHCC around the Aberdeen Inner City / Aberdeen West boundary. From previous research, and again within this research, the AB12 postcode district proved to be a problem, particularly when deriving estimates for the Kincardine LHCC. This issue would only have been partially alleviated if postcode sectors were available.

There were only a few people identified as problem drug users within the Kincardine LHCC area. This resulted in difficulties in obtaining prevalence estimates and even when other methods were used, the prevalence estimates were low with wide confidence intervals.

The Aberdeen Inner City LHCC area had the highest prevalence rates of all the Grampian NHS Board area LHCC areas. This LHCC area also includes the SIP area, and even higher rates were found when focussing on that area. There are slight concerns that, when looking at the individual postcode sectors within the SIP, the estimated rates are even higher. This may be due to focussing on such a small area and may warrant further analysis.

The sensitivity analyses did not raise major issues about the effects of any misclassification of postcode district to LHCC for the Aberdeen Inner City LHCC area, apart from the higher rate for Aberdeen West LHCC area. Including the AB10 or AB16 postcode districts with the more affluent Aberdeen West LHCC does make a marked difference to the estimates for that LHCC. The affect of switching AB12 between Aberdeen Inner City and Kincardine is not of much importance to the Aberdeen Inner City LHCC, apart from lowering the population denominator and thus increasing the rate. However, for the Kincardine LHCC, it would mean that there were sufficient numbers to obtain a capture-recapture estimate. It would however appear that the drug user in the AB12 postcode district may be more likely to be in the Aberdeen Inner City LHCC and thus the problem of obtaining a valid estimate for the Kincardine LHCC area remains.

6 Discussion and Conclusions

This report has highlighted several aspects of describing information on drug misuse by geographical area, whether it is at the NHS Board, Council or LHCC area level. It has almost been taken as read that it is straightforward to assign NHS Board or Council area of residence by means of postcode district or postcode sector. While this is generally true, there are some areas of the country where either postcode sectors or postcode districts are split across NHS Board or Council boundaries. Unfortunately, the drive towards collecting postcode sector of residence within the SMR24 reporting system will only partially alleviate this problem in some areas. It is, however, a laudable improvement to the database and all contributing agencies should be encouraged to supply valid postcode sectors for their new clients. Within an extract of the database from 2001 / 2002 used within this research, only two-thirds of the records had a valid postcode sector. This almost negates the benefits of assigning LHCC area by means of postcode sector of residence when either summarising or making comparisons of the database information at the LHCC area level. Until there are substantially more records with valid postcode sector, aggregating to postcode district of residence appears the most appropriate way of assigning LHCC of residence.

Aside from mapping the Scottish Drug Misuse Database to LHCC area across the whole of Scotland (apart from Ayrshire and Arran) we have also obtained prevalence estimates for the LHCC areas within the Fife and Grampian NHS Board areas. Although it has been possible to derive prevalence estimates for most of the LHCC areas, difficulties arose in two LHCC areas (North East Fife and Kincardine) where there were few people identified as using drugs. This may primarily be due to the socio-economic profile of these areas, but it should also be noted that the Kincardine LHCC area is quite small (approximately 15,000 people aged 15 to 54). Other methods, including multiplier methods, suggest that the drug using population of these areas is small.

The experience of the research in Fife and Grampian, and to a lesser extent when mapping the Scottish Drug Misuse Database for the whole population, suggests that it may not be as important to collect postcode sector data as originally thought. Indeed, given the concerns of contributing agencies, particularly the police, there may be merit in consistently restricting data collection to postcode district. In many areas having sector data would not make significant improvement in the precision of estimates. Although only collecting postcode district may introduce additional bias in some areas, it should be remembered that prevalence rates are required to make comparisons, and these are not influenced as much as absolute numbers when slightly inflating or deflating the size of most LHCC areas.

There were marked differences in the prevalence estimates across the LHCC areas within each NHS Board. The Glenrothes LHCC area, for

example, has prevalence rates similar to the Glasgow Council level estimates. It should, however, be remembered that when stratifying the Glasgow estimate by LHCC area, there might be some LHCC areas with far higher prevalence rates. This research does however suggest that there are large differences in prevalence rates across the country. Although it would be wrong to state that there are areas free from problem drug use, there will be some LHCC areas that have to deal with the burden of drug misuse to a far greater extent than their neighbouring LHCC areas. If the prevalence estimation can be replicated for the whole country, such analyses would be an important tool for Drug Action Teams in developing their strategic response to drug misuse within their areas.

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Appendix

This Appendix should be read in conjunction with the main report which details the methods used when providing information on problem drug use in Scotland at the NHS Board, Council and LHCC area levels. It takes the format of a series of tables. All the information is supplied in an electronic format in a series of Microsoft Excel worksheets. The list of tables is given below. There are two systems for numbering the tables. A table number such as Table 3.2 denotes that the table is related to Table 3.2 in the main report. The second table number, in this case A2, denotes the order within the electronic version of the Appendix on the CD. Where appropriate, we give some limited notes for the tables below.

Table		Description
A1		Postcode sectors in only one Council area
A2	(3.2)	Postcode sectors split across 2 Council areas
A3	(3.3)	Postcode sectors split across 3 Council areas
A4		Postcode districts in only one Council area
A5	(3.5)	Postcode districts split across 2 Council areas
A6	(3.6)	Postcode districts split across 3 Council areas
A7		Postcode sectors in only one NHS Board area
A8		Postcode sectors in multiple NHS Board areas
A9		Postcode districts in only one NHS Board area
A10		Postcode districts in multiple NHS Board areas
A11	(3.11)	Percentage of the population of each postcode sector in the assigned LHCC
A12	(3.12)	Percentage of the population of each postcode district in the assigned LHCC
A13		Postcode sector lookup table
A14		Postcode district lookup table
A15	(3.17)	Population of the NHS Board areas

Notes

A1	In this, and all tables, Mid-2000 Population Estimates © Crown copyright. Data supplied by General Register Office for Scotland.
A6	There is one postcode district, G78, split across five Council areas.
A11, A12	The CHI population figures came from an extract from the CHI provided by ISD. The % in the LHCC column should be interpreted with caution, as there are some postcode sectors where many residents attend GPs which are not formally part of the LHCC.