Information Services Division

NHS
National
Services
Scotland

Prevalence of Problem Drug Use in Scotland

2015/16 Estimates

Publication date
5 March 2019

ISD SCOTLAND

An Official Statistics publication for Scotland

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Acknowledgements

The project was undertaken by the Consultancy Service at ISD Scotland. The team acknowledges the contributions made by the following:

- Scottish Government Drugs Policy and Analytical Services colleagues.
- Social Work Departments and associates who made available the Criminal Justice Social Work Reports.
- Alcohol and Drug Partnerships (ADPs) and associates who assisted in the collection of data from drug treatment services.
- Harms Sub-Group of Partnership for Action on Drugs in Scotland (PADS).
- Police Scotland.
- ISD Scotland data collectors who undertook fieldwork to extract the relevant information from Criminal Justice Social Work Reports.
- ISD Scotland drugs information specialists who provided advice and assistance to the project team, and extracted data for the study from the Scottish Drug Misuse Database.
- ISD Scotland Drug Prevalence Project Team; Gillian Pirie, David Carr, Linsey Galbraith, Duncan Buchanan and Richard Dobbie.
- The Drug Prevalence Project Advisory Group who provided advice on the feasibility and design of the study.
- The Public Benefit and Privacy Panel for Health & Social Care for considering and approving the study protocol.

Background

This report provides estimates of the national and local prevalence of problem drug use for those aged 15 to 64 living in Scotland between April 2015 and March 2016. For this purpose, problem drug use is defined as the problematic use of opioids (including illicit and prescribed methadone use) and/or the illicit use of benzodiazepines, and implies routine and prolonged use as opposed to recreational and occasional drug use.

A study to produce prevalence estimates of problem drug use has been undertaken in Scotland every three years since 2000. ISD undertook the two previous national drug prevalence studies for 2009/10 and 2012/13. Prior to that, drug prevalence estimates for Scotland were produced by researchers from the University of Glasgow in a three-yearly cycle between 2000 and 2006.

Please note that there have been some notable changes to the methodological approach for the 2015/16 study, which mean that direct comparisons with the results from previous studies are difficult to fully interpret. Please refer to Appendix 1 for an explanation of methodological considerations.

Methods

As much of the problem drug using population is hidden, drug prevalence figures can only ever be estimates, combining available data on observed cases with an estimate of the unknown population.

Estimates are derived from statistical models, where techniques commonly known as capture-recapture, are used to quantify the potential size of the hidden population of individuals with problem drug use. Multiple data sources are used to reveal as much of the underlying problem drug using population as possible, and to measure how often people appear in any combination of one or more of the data sources. Combining counts of the known (revealed) population with an estimate of the hidden population provides for an overall estimate of drug prevalence within a given population at risk.

In Scotland estimates are calculated separately for each council area. Council area is therefore the smallest geographical level we report on. They do however provide the building blocks to estimate at higher geographical levels, and as such we provide estimates in this report according to NHS board and regional planning boundaries, as well as for Scotland overall.

Three data sources that could potentially record problem drug use consistently across all council areas of Scotland have been interrogated for the 2015/16 study, these are:

- Clients registering with specialist drug treatment services
- Drug-related hospital admissions
- Criminal Justice Social Work (CJSW) reports

Previous studies included data relating to the Misuse of Drugs Act, provided by the Police. However, the level of detail required for the 2015/16 estimates is not collected centrally by Police Scotland; these estimates are therefore based on the three sources outlined above.

Further information on the data sources and statistical methods are available in Appendix 1.

Main Points

- The number of individuals with problem drug use in Scotland was estimated to be in the range 55,800 to 58,900 during 2015/16. This represents an estimated prevalence rate of approximately 1.62%.
- The majority of individuals with problem drug use were male (71%). The prevalence rate amongst males was 2.35%, this compares to 0.92% for females.
- The rate of problem drug use amongst males and females was highest in the 25 to 34 years age group. The prevalence rates for males were higher than for females in each age group. The rate for males aged 15 to 24 was more than four times higher than the equivalent rate for females.
- The highest regional rate was 1.99% in the West of Scotland compared to 1.37% in the South & East, and 1.17% in the North. The estimates suggest that prevalence rates are tending to be higher in the most populated areas of Scotland, which include large urban areas.
- The latest national prevalence rate is lower than was observed for 2012/13. However, due to some changes to the data included for this study and the margin of uncertainty that surrounds the statistical models and assumptions, it is not possible to conclude that a real reduction has occurred.

Results and Commentary

Estimated Number of Individuals with Problem Drug Use

Presented in this section are estimates of the number of individuals with problem drug use living in Scotland between April 2015 and March 2016. An overall national estimate for Scotland has been calculated and is presented alongside estimates relating to the resident populations of each of Scotland's three Health & Social Care planning regions, fourteen NHS boards and thirty-two council areas.

We have rounded the number of prevalent cases to the nearest hundred, or nearest ten for smaller geographical areas. We do not report figures to single cases which could give the impression of greater accuracy than is truly the case.

Where prevalence is expressed as a percentage of the population, the denominator is taken from mid-year population estimates published by National Records for Scotland.

We must emphasise that the data presented here are estimates and as such carry a degree of uncertainty. To reflect this we present the estimate with an associated range (confidence interval) within which it can be reasonably inferred that the true prevalence level should lie.

A full set of estimates for all geographies are presented in the supporting tables.

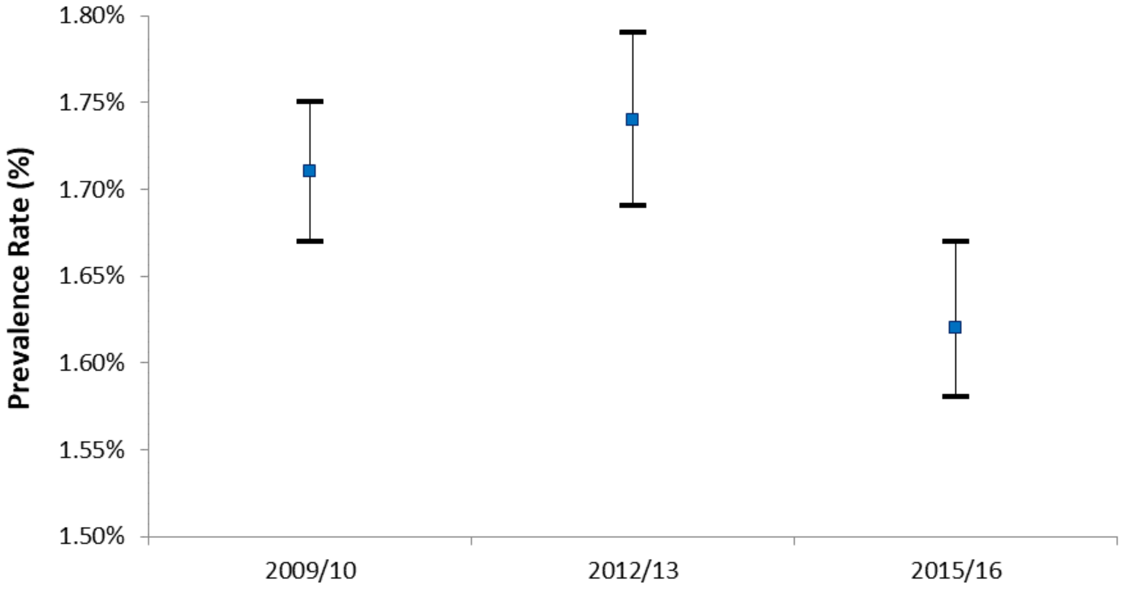
Further information on the statistical methods is available in the Appendix 1.

National Estimates

This section shows the estimated number of individuals with problem drug use and the corresponding prevalence rates for 2015/16 for Scotland as a whole.

- The number of individuals with problem drug use in Scotland during 2015/16, aged 15 to 64 years, was estimated to be 57,300 (95% CI = 55,800 - 58,900). This represents a prevalence rate amongst all those aged 15 to 64 years in Scotland, of 1.62% (95% CI = 1.58% - 1.67%).

Figure 1: Estimated prevalence rates (%) of problem drug use for Scotland; 2009/10*, 2012/13* and 2015/16



* Estimates for 2009/10 and 2012/13 based on four data sources.

- Figure 1 shows the 2015/16 estimated prevalence rate for Scotland plotted against the estimates that were previously published for 2009/10 and 2012/13. The latest national prevalence rate is lower than was observed for 2012/13. However, due to some changes to the data included for this study and the margin of uncertainty that surrounds the statistical models and assumptions, it is not possible to conclude that a real reduction has occurred.

- For this reason we deliberately do not compare prevalence for 2015/16 against previous estimates produced for smaller areas such as NHS boards and council areas in the remainder of this report.

Figure 2: Gender distribution of the estimated number of prevalent cases for Scotland; 2015/16

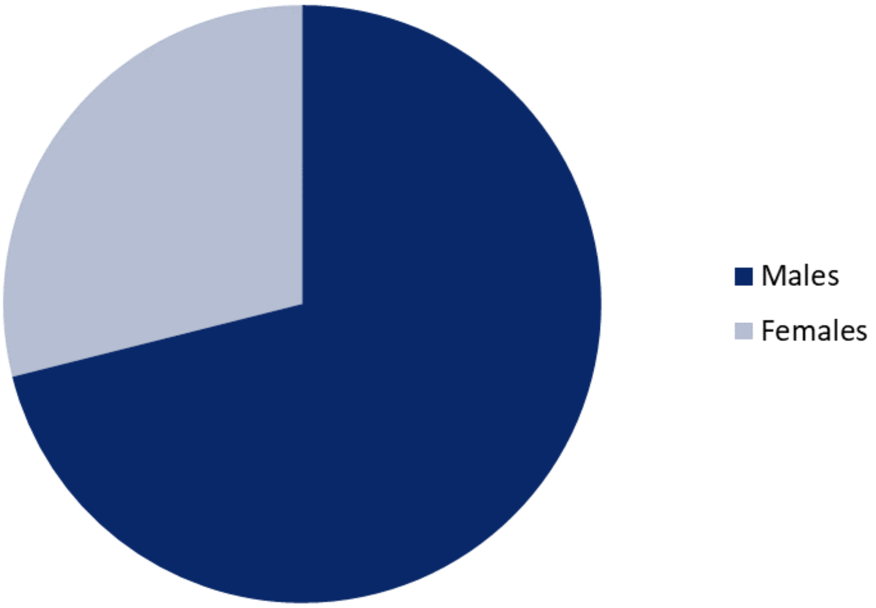
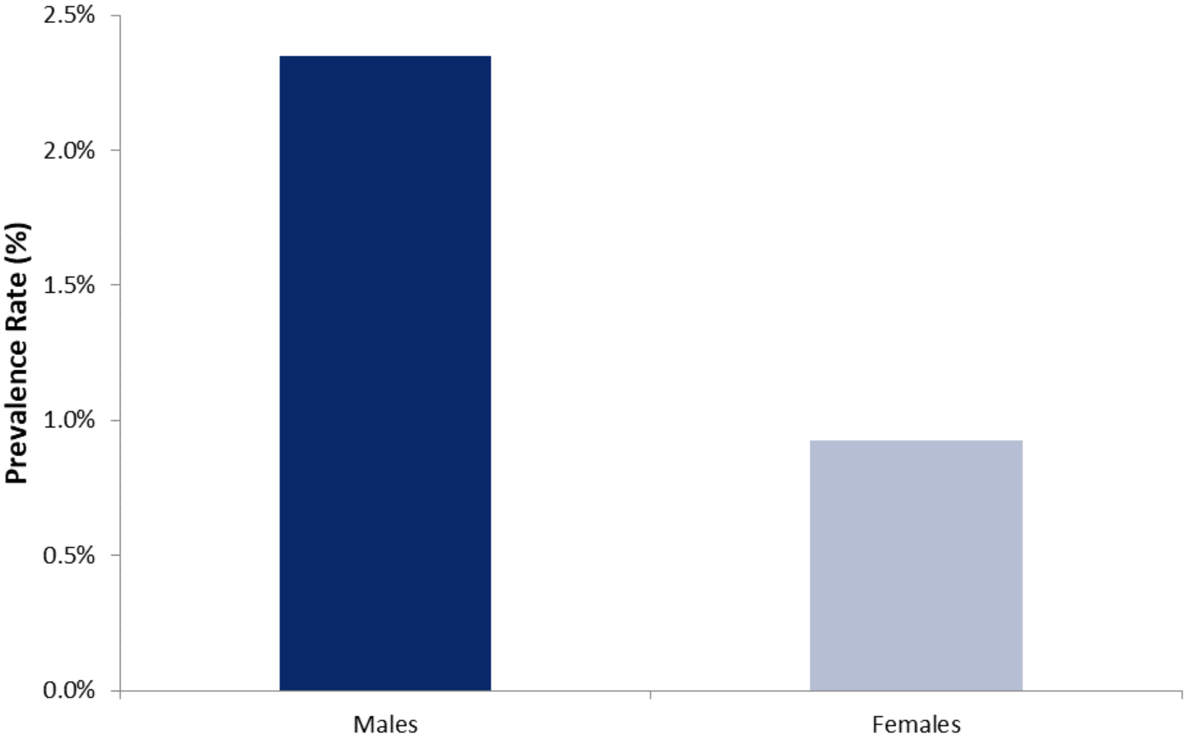


Figure 3: Estimated prevalence rates (%) of problem drug use for Scotland, by gender; 2015/16



- Figure 2 shows that 71% of individuals with problem drug use in Scotland during 2015/16 were male.
- Figure 3 shows that the prevalence rate amongst all males aged 15 to 64 years in Scotland was 2.35%, this compares to 0.92% for females.

Figure 4: Age distribution of the estimated number of prevalent cases for Scotland; 2015/16

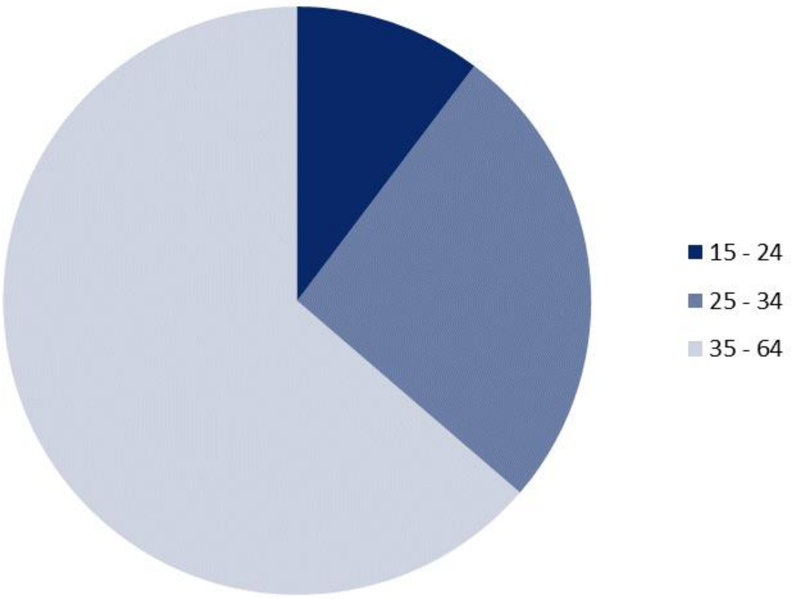


Figure 5: Age and gender distribution of the estimated number of prevalent cases for Scotland (percentages); 2015/16

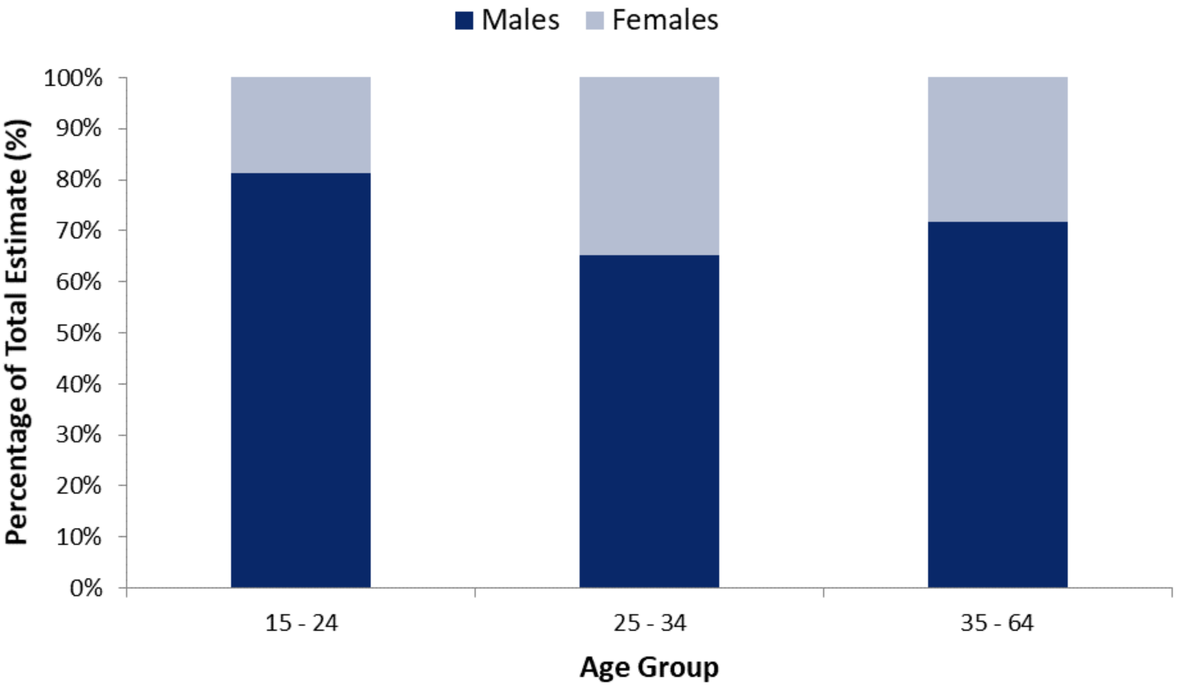
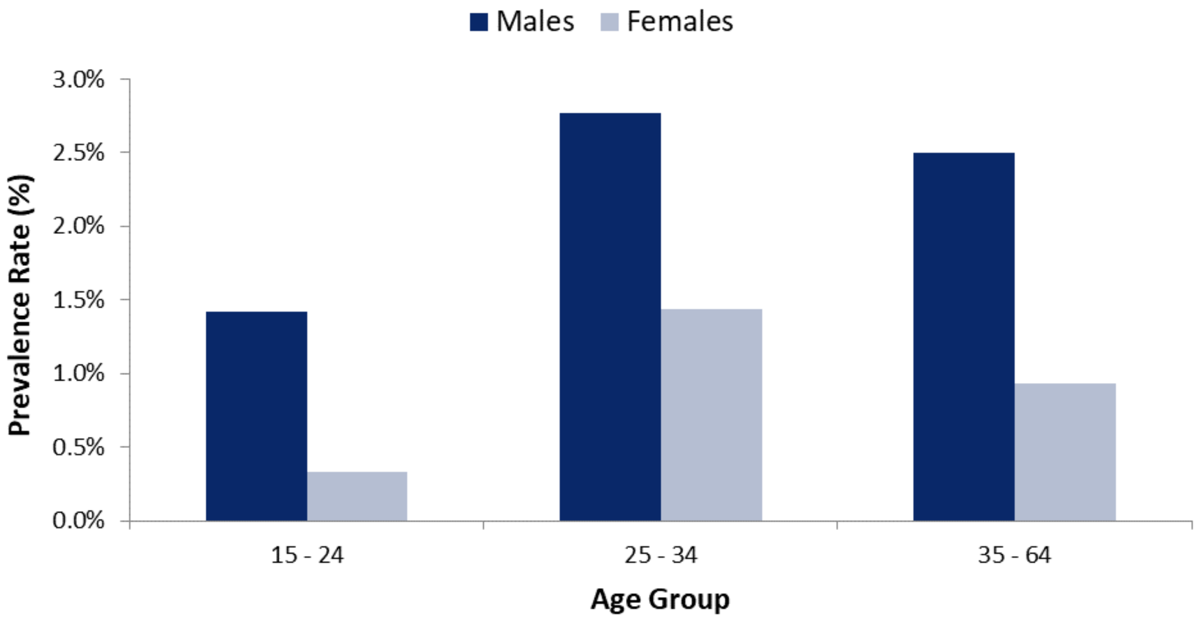


Figure 6: Estimated prevalence rates (%) of problem drug use for Scotland, by age and gender; 2015/16



- Figure 4 shows that 64% of individuals with problem drug use in Scotland during 2015/16 were aged between 35 and 64 years. This compares to 26% for those aged 25 to 34, and 10% for those aged 15 to 24. Please note that the same three age categories were used in the 2009/10 and 2012/13 studies.

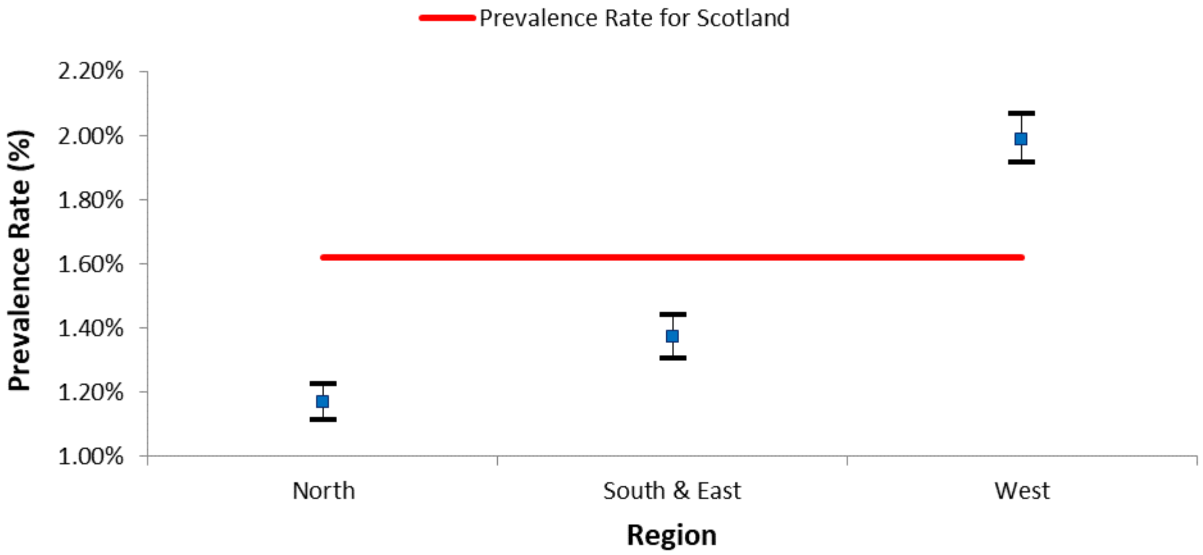
- Figure 5 shows that 81% of individuals with problem drug use in Scotland aged 15 to 24 were male. This compares to 65% of those aged 25 to 34 and 72% of those aged 35 to 64.

- Figure 6 shows that the prevalence rates for males are higher than the rates for females in each of the three age categories. The rate for males in the youngest age category is more than four times higher than the rate for females.

Regional Estimates

This section shows the estimated number of individuals with problem drug use and the corresponding prevalence rates for 2015/16 across all three regional planning areas of Scotland.

Figure 7: Estimated prevalence rates (%) of problem drug use for regional planning areas and Scotland; 2015/16



- Figure 7 compares the estimated prevalence rates for each of the three regional planning areas of Scotland. The highest estimated prevalence rate, amongst all persons aged between 15 and 64 years, was 1.99% (95% CI = 1.92% – 2.07%) in the West of Scotland. Taking account of confidence intervals, there appears a clear pattern of regional variation. The estimate for the West of Scotland appears significantly higher than the estimate obtained for the South & East of Scotland (1.37%, 95% CI = 1.31% – 1.44%), which in turn appears significantly higher than the estimate obtained for the North of Scotland (1.17%, 95% CI = 1.11% – 1.23%).

- The West of Scotland makes up 60.0% of the overall drug prevalence estimate for Scotland, despite making up a lower proportion of the overall Scottish population aged 15 to 64 (49.0%). The pattern changes for the South & East of Scotland, and the North of Scotland, where the prevalence rates are lower than for the West of Scotland. The South & East of Scotland makes up 21.5% of the overall drug prevalence estimate for Scotland, and makes up a similar proportion of the overall Scottish population aged 15 to 64 (25.3%). The North of Scotland makes up 18.5% of the overall drug prevalence estimate for Scotland, but makes up a much larger proportion of the overall Scottish population aged 15 to 64 (25.6%).

Figure 8: Gender distribution of the estimated number of prevalent cases for regional planning areas in Scotland (percentages), 2015/16

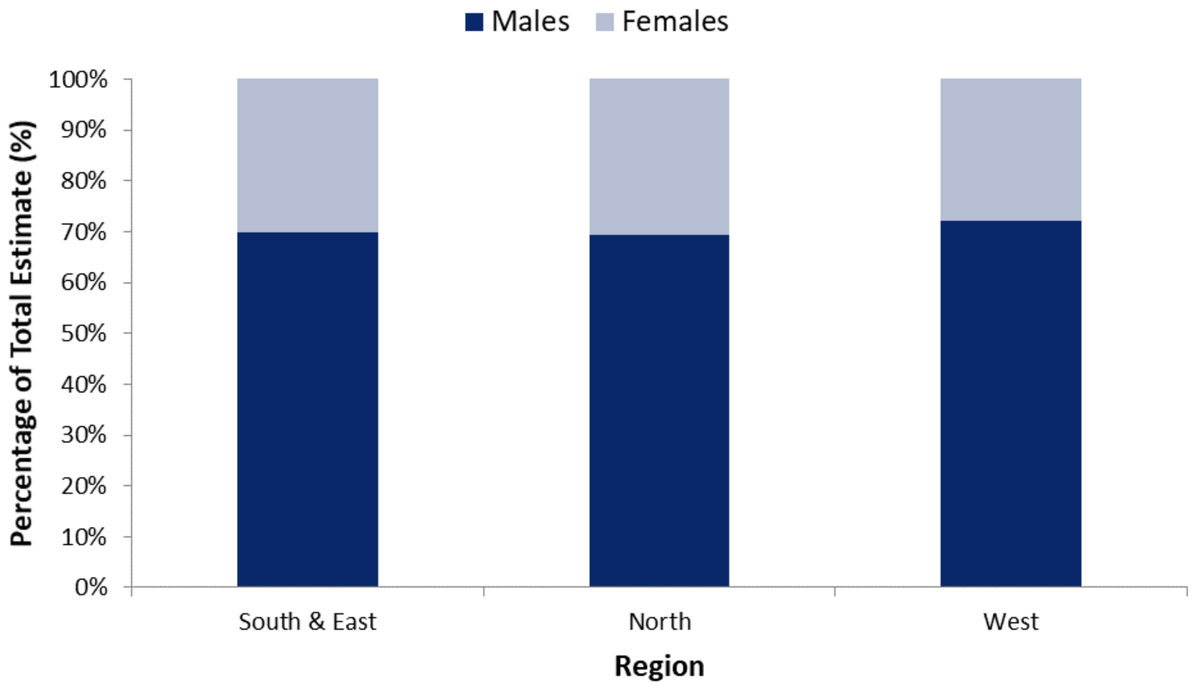
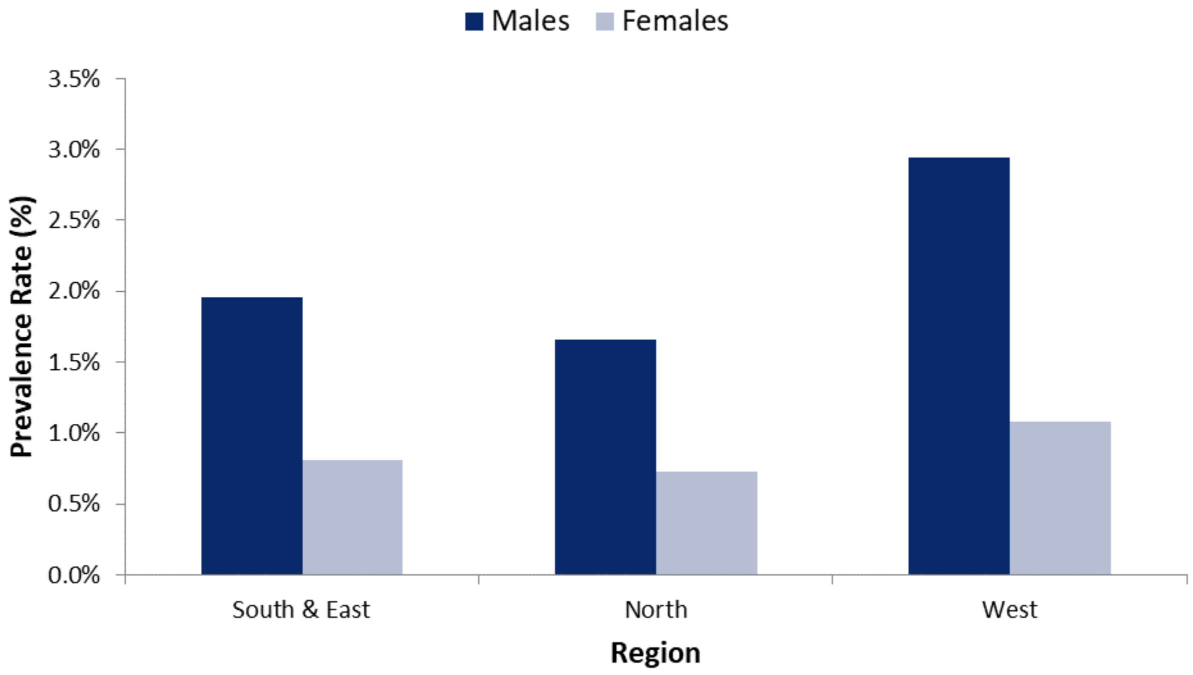


Figure 9: Estimated prevalence rates (%) of problem drug use, by gender, for regional planning areas in Scotland; 2015/16



- Figure 8 shows that 72% of individuals with problem drug use in the West of Scotland were male. This compares to 69% in the North and 70% in the South & East.

- Figure 9 shows that the prevalence rate amongst all persons aged 15 to 64 years in the West of Scotland was 2.94% for males and 1.08% for females. This compares to 1.66% for males and 0.73% for females in the North, and 1.96% for males and 0.81% for females in the South & East. Across all three regions the rate for males is over double the rate for females, with the largest difference between males and females in the West of Scotland.

Figure 10: Age distribution of the estimated number of prevalent cases (percentages), for regional planning areas in Scotland (males); 2015/16

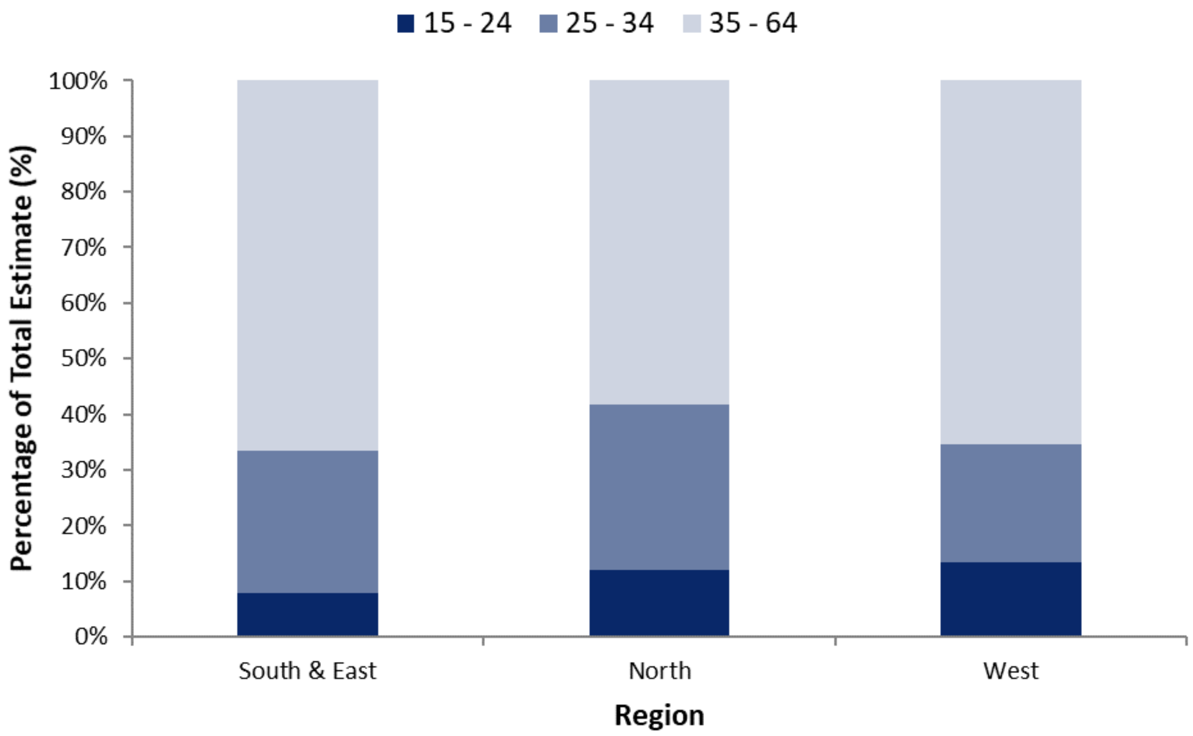


Figure 11: Age distribution of the estimated number of prevalent cases (percentages), for regional planning areas in Scotland (females); 2015/16

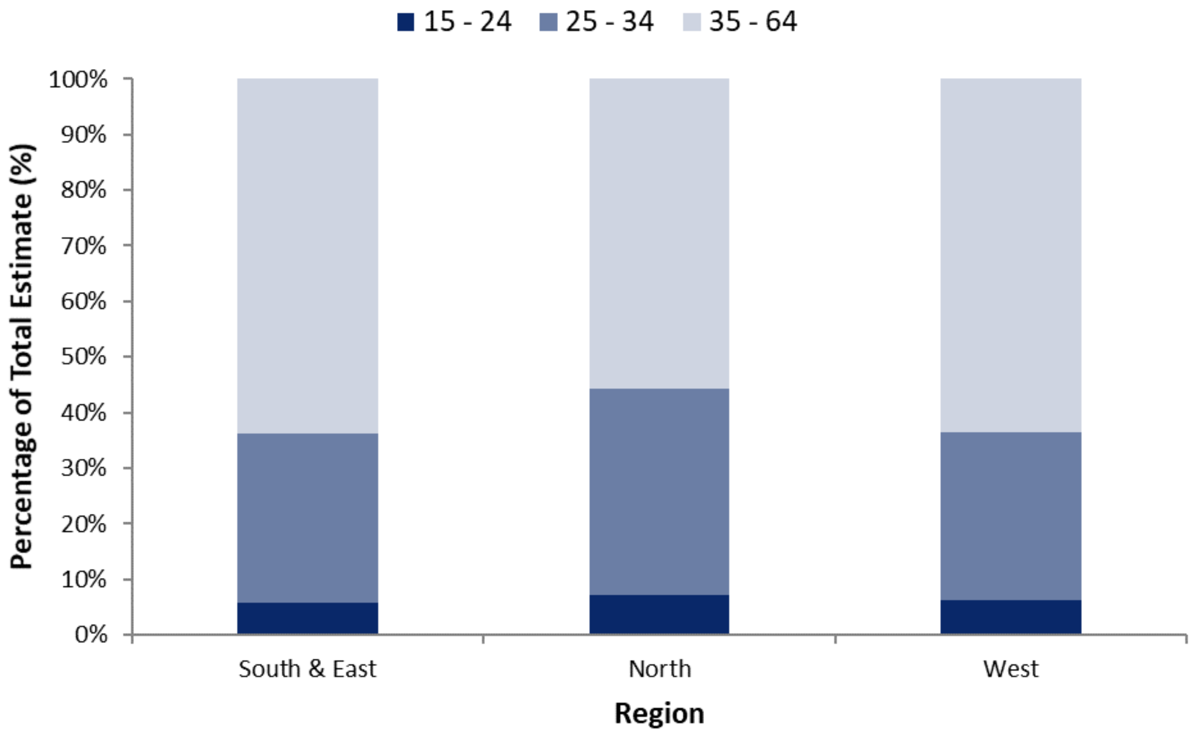


Figure 12: Estimated prevalence rates (%), by age group, for regional planning areas in Scotland (males); 2015/16

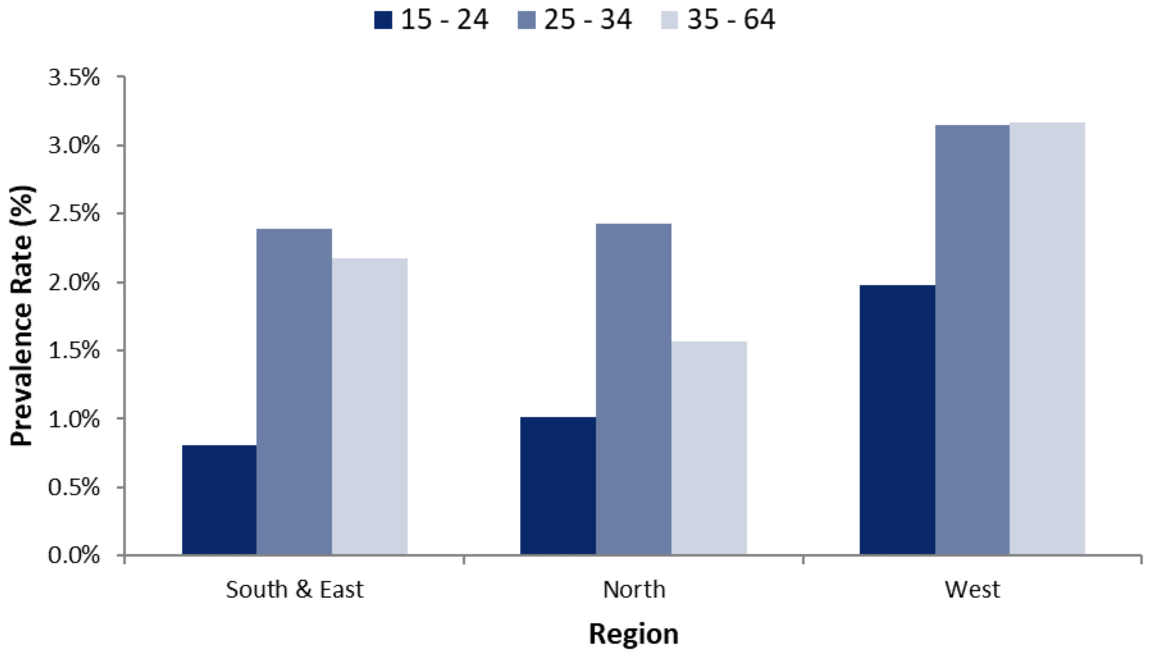
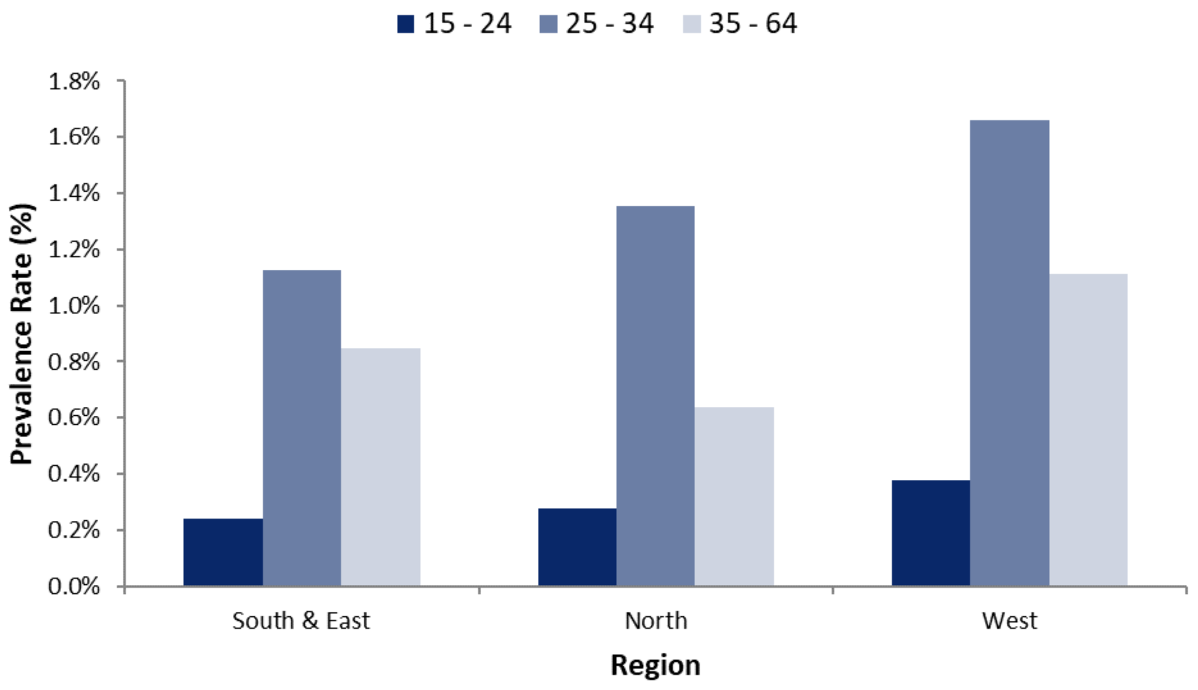


Figure 13: Estimated prevalence rates (%) of problem drug use, by age group, for regional planning areas in Scotland (females); 2015/16



- Figure 10 shows that 65% of males with problem drug use in the West of Scotland during 2015/16 were aged between 35 and 64 years. This compares to 58% in the North and 66% in the South & East.

- Figure 11 shows that 63% of females with problem drug use in the West of Scotland during 2015/16 were aged between 35 and 64 years. This compares to 56% in the North and 64% in the South & East.

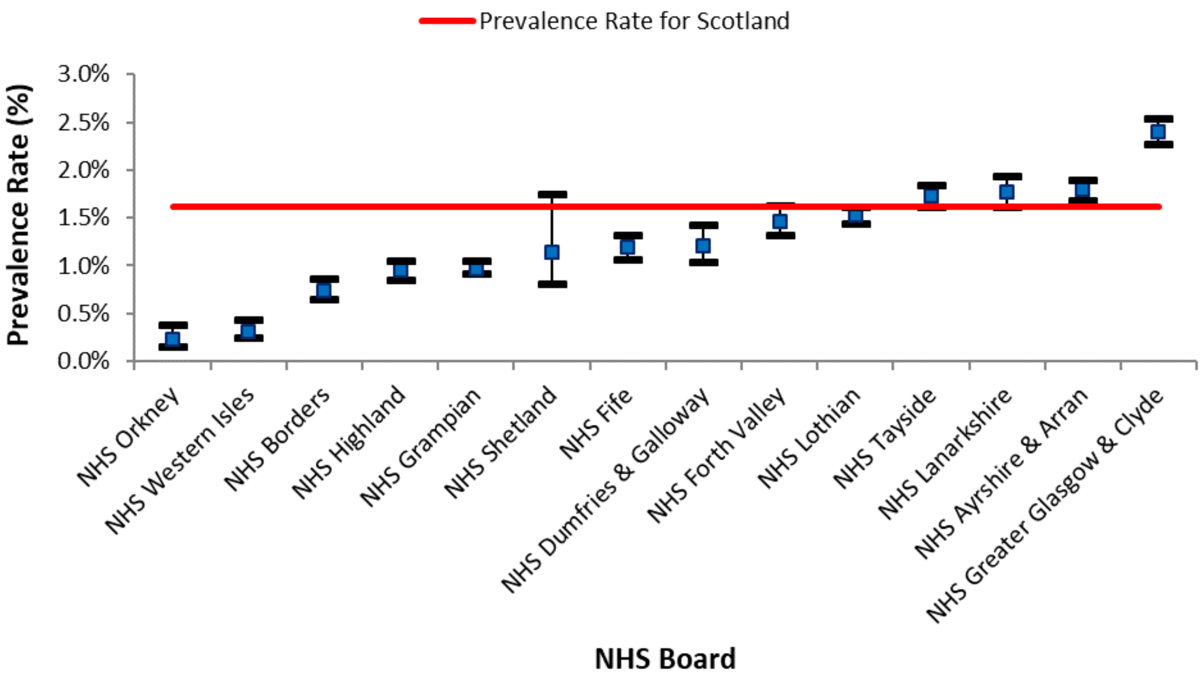
- Figure 12 shows that the highest male prevalence rates for the North and South & East of Scotland are observed for those aged 25 to 34. The rate for the West of Scotland is very slightly higher for those in the oldest age category.

- Figure 13 shows that the female prevalence rates are highest amongst those aged 25 to 34, across all three regions.

NHS Board Estimates

This section shows the estimated number of individuals with problem drug use and the corresponding prevalence rates for 2015/16 across all fourteen NHS board areas in Scotland.

Figure 14: Estimated prevalence rates (%) of problem drug use for NHS boards and Scotland; 2015/16



- Figure 14 compares the estimated prevalence rates for each of the NHS board areas in Scotland. The highest estimated prevalence rate, amongst all persons aged between 15 and 64 years, was 2.40% (95% CI = 2.27% – 2.54%) in the NHS Greater Glasgow & Clyde area. The lowest estimated prevalence was 0.22% (95% CI = 0.15% - 0.37%) in NHS Orkney.

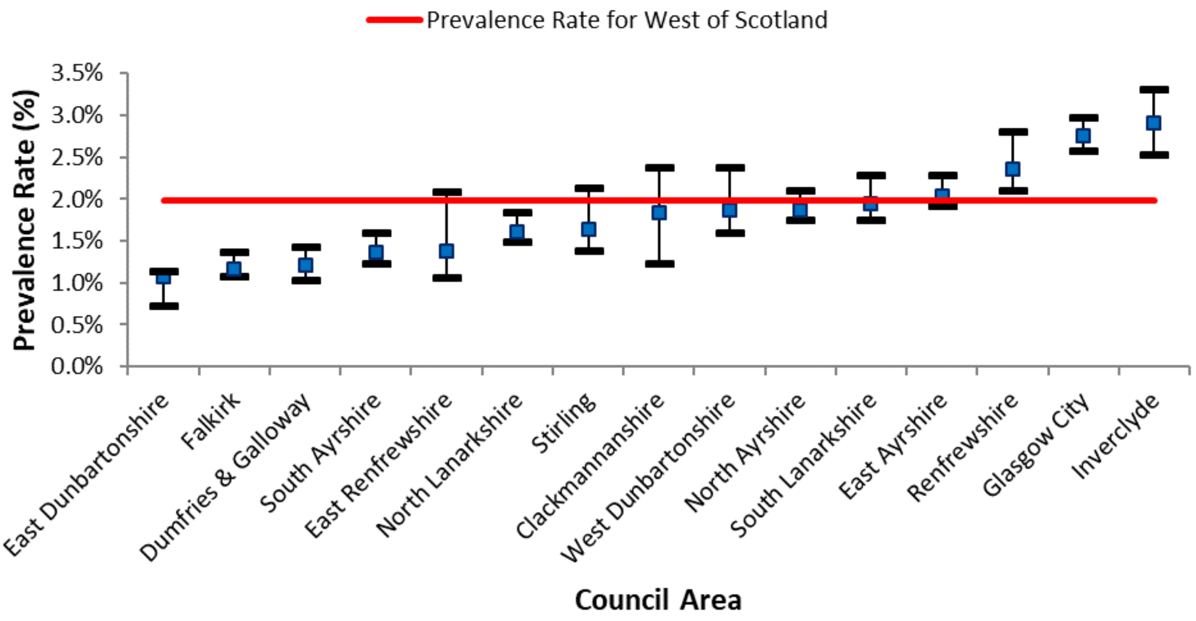
- The estimates suggest that prevalence rates are tending to be higher in the most populated NHS board areas including large urban areas. The four NHS board areas (Greater Glasgow & Clyde, Ayrshire & Arran, Lanarkshire, Tayside) with estimated prevalence rates higher than Scotland overall, account for almost half of the Scottish population aged 15 to 64. By contrast the four NHS board areas with the lowest prevalence rates (Orkney, Western Isles, Borders, Highland) account for less than 10% of the Scottish population aged 15 to 64.

Council Area Estimates

This section shows the estimated number of individuals with problem drug use and the corresponding prevalence rates for 2015/16 across all thirty-two council areas in Scotland.

West of Scotland

Figure 15: Estimated prevalence rates (%) of problem drug use for council areas in the West of Scotland; 2015/16



- Figure 15 compares the estimated prevalence rates for each of the council areas in the West of Scotland. The highest estimated prevalence rate, amongst all persons aged between 15 and 64 years, was 2.91% (95% CI = 2.52% – 3.30%) in Inverclyde. The lowest estimated prevalence rate was 1.07% (95% CI = 0.72% - 1.14%) in East Dunbartonshire.

- The population of Inverclyde, aged 15 to 64 makes up 3.0% of the total population for the West of Scotland combined. By contrast, the prevalence estimate for Inverclyde makes up 4.4% of the overall drug prevalence estimate for the West of Scotland combined.

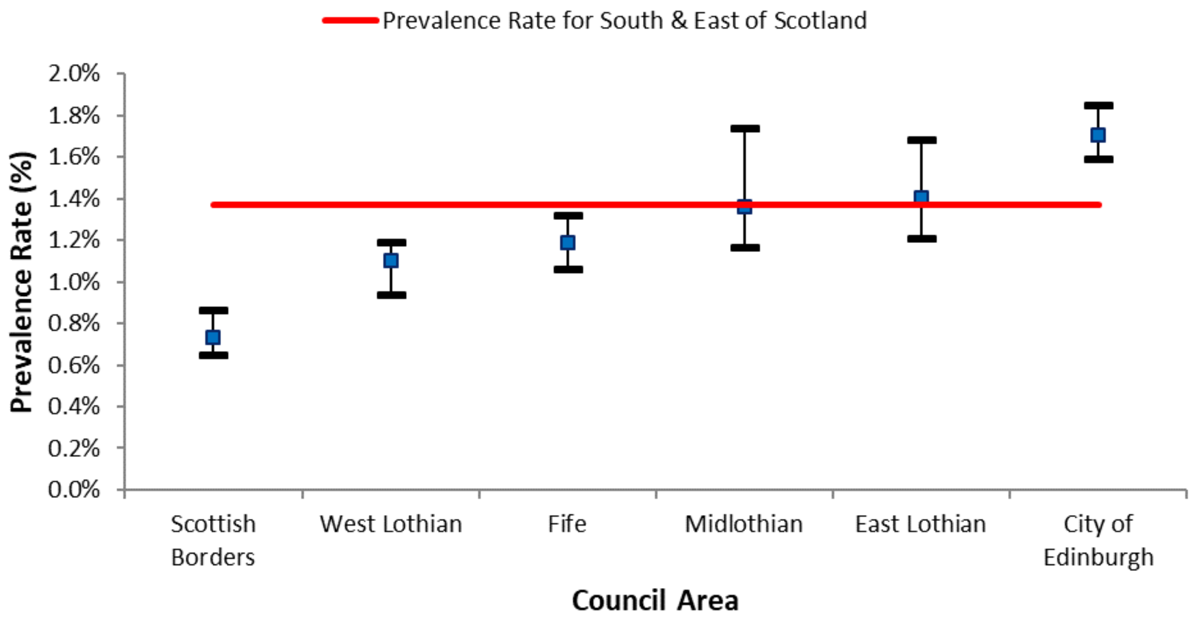
- The population of East Dunbartonshire, aged 15 to 64 makes up 3.8% of the total population for the West of Scotland combined. By contrast, the prevalence estimate for East Dunbartonshire makes up 2.1% of the overall drug prevalence estimate for the West of Scotland combined.

- Please note that during data validation of the drug treatment services data for East Dunbartonshire, it was highlighted that the records submitted represented only around half the expected number. The missing data were related to the cessation of extraction of data from an old assessment system.

- Combined the fifteen council areas of the West of Scotland make up 49.0% of the overall Scottish population aged 15 to 64. This compares to these same council areas contributing 60.0% of the overall Scottish drug prevalence, based on these estimates.

South & East of Scotland

Figure 16: Estimated prevalence rates (%) of problem drug use council areas in the South & East of Scotland; 2015/16



- Figure 16 compares the estimated prevalence rates for each of the council areas in the South & East of Scotland. The highest estimated prevalence rate, amongst all persons aged between 15 and 64 years, was 1.70% (95% CI = 1.59% - 1.85%) in City of Edinburgh. The lowest estimated prevalence was 0.73% (95% CI = 0.65% - 0.86%) in Scottish Borders.

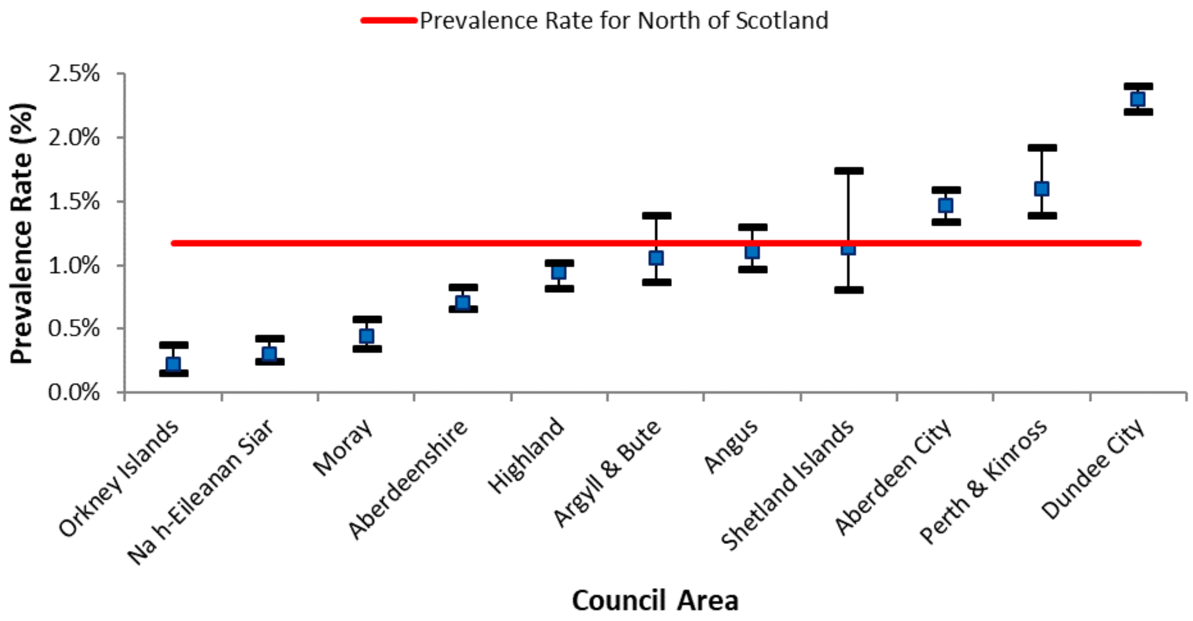
- The population of City of Edinburgh, aged 15 to 64 makes up 39.3% of the total population for the South & East of Scotland combined. By contrast, the prevalence estimate for City of Edinburgh makes up 48.8% of the overall drug prevalence estimate for the South & East of Scotland combined.

- The population of Scottish Borders, aged 15 to 64 makes up 7.8% of the total population for the South & East of Scotland combined. By contrast, the prevalence estimate for Scottish Borders makes up 4.1% of the overall drug prevalence estimate for the South & East of Scotland combined.

- Combined these six council areas make up 25.3% of the overall Scottish population aged 15 to 64. This compares to these same council areas contributing 21.5% of the overall Scottish drug prevalence in 2015/16, based on these estimates.

North of Scotland

Figure 17: Estimated prevalence rates (%) of problem drug use for council areas in the North of Scotland; 2015/16



- Figure 17 compares the estimated prevalence rates for each of the council areas in the North of Scotland. The highest estimated prevalence rate, amongst all persons aged between 15 and 64 years, was 2.30% (95% CI = 2.20% - 2.40%) in Dundee City. The lowest estimated prevalence was 0.22% (95% CI = 0.15% - 0.37%) in Orkney.

- The population of Dundee City, aged 15 to 64 makes up 11.0% of the total population for the North of Scotland combined. By contrast, the prevalence estimate for Dundee City makes up 21.7% of the overall drug prevalence estimate for the North of Scotland combined.

- The population of Orkney, aged 15 to 64 makes up 1.5% of the total population for the North of Scotland combined. By contrast, the prevalence estimate for Orkney makes up 0.3% of the overall drug prevalence estimate for the North of Scotland combined.

- Combined these eleven council areas make up 25.6% of the overall Scottish population aged 15 to 64. This compares to these same council areas contributing 18.5% of the overall Scottish drug prevalence in 2015/16, based on these estimates.

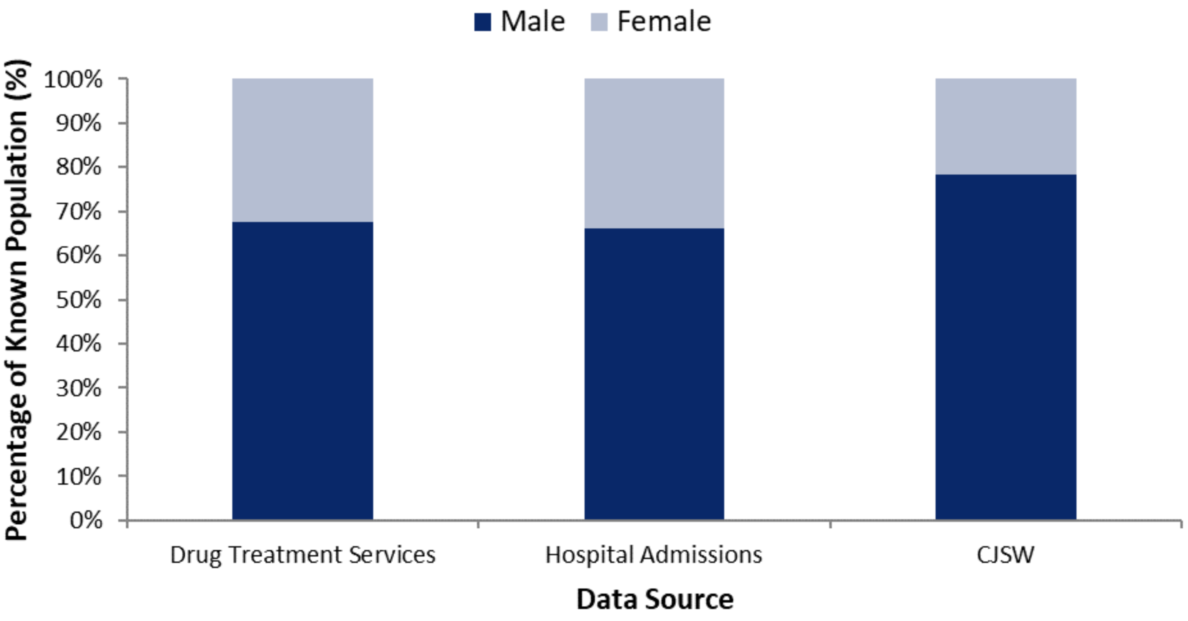
Observed Number of Individuals with Problem Drug Use

Presented in this section are national and regional demographic distributions of the known populations, as observed from the three data sources. The data describe age and gender distributions along with a drug-type breakdown of the combined problem drug use definition.

The number of known cases collected for each council area in each data source are provided in the supporting tables.

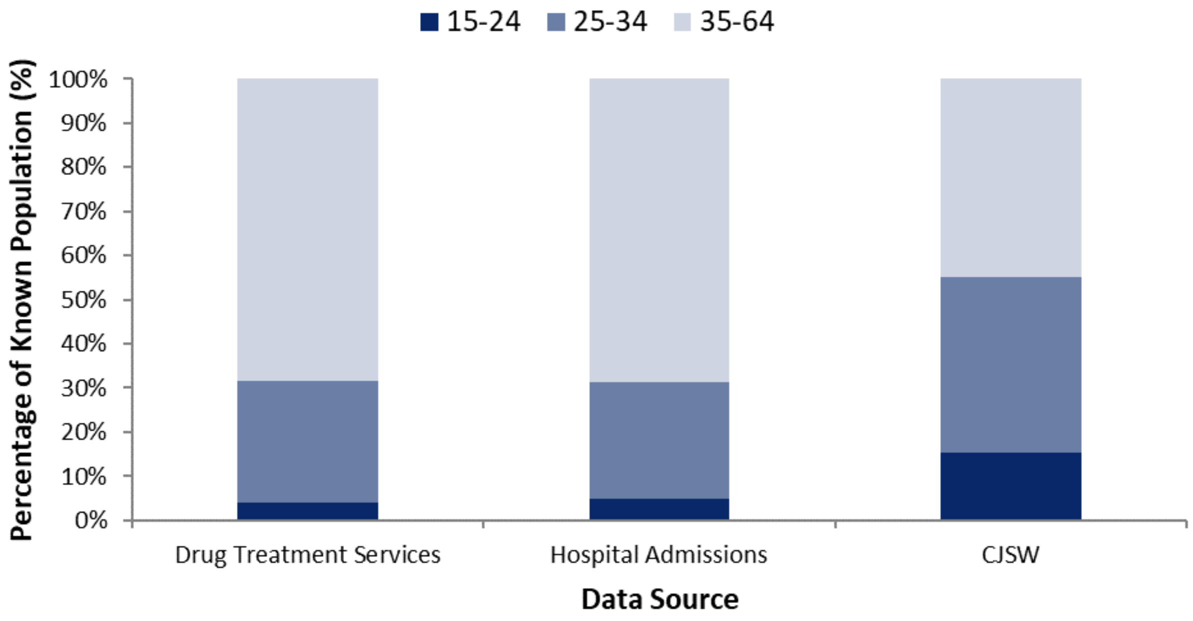
National

Figure 18: Gender distribution of known cases for each of the three data sources (percentages), Scotland; 2015/16



- Figure 18 shows that 67.7% of the observed population receiving specialist drug treatment services during 2015/16, were male. This compares to 66.0% of all those identified through hospital admission records and 78.4% for all those identified through Criminal Justice Social Work (CJSW) Reports.

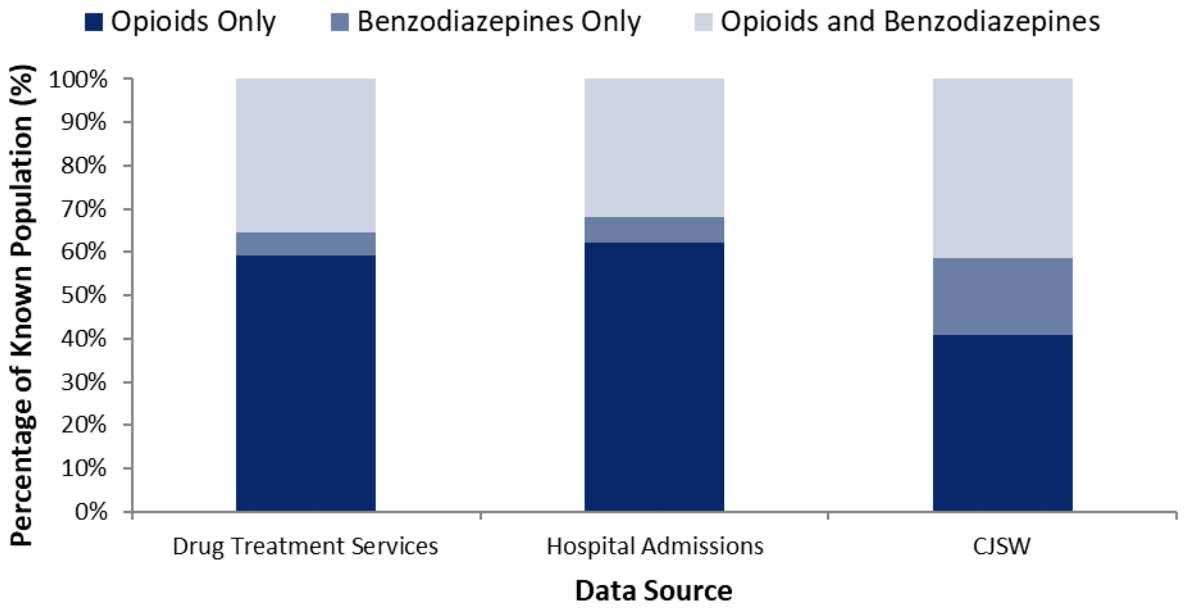
Figure 19: Age distribution of known cases for each of the three data sources (percentages), Scotland; 2015/16



- Figure 19 shows an almost identical age demographic in those identified through specialist drug treatment services and those identified through hospital admissions. It shows that amongst those in contact with specialist drug treatment services or those admitted to hospital, just over 30% were aged between 15 and 34 years. By contrast, the data suggests that more than half (55.0%) of all those identified through Criminal Justice Social Work Reports were aged between 15 and 34 years.

- These data suggest that the age and gender demographic for Scotland overall is very similar for those identified through specialist drug treatment services or through hospital admissions. The profile is different for those identified through Criminal Justice Social Work reports, where a younger, more male dominated cohort emerges.

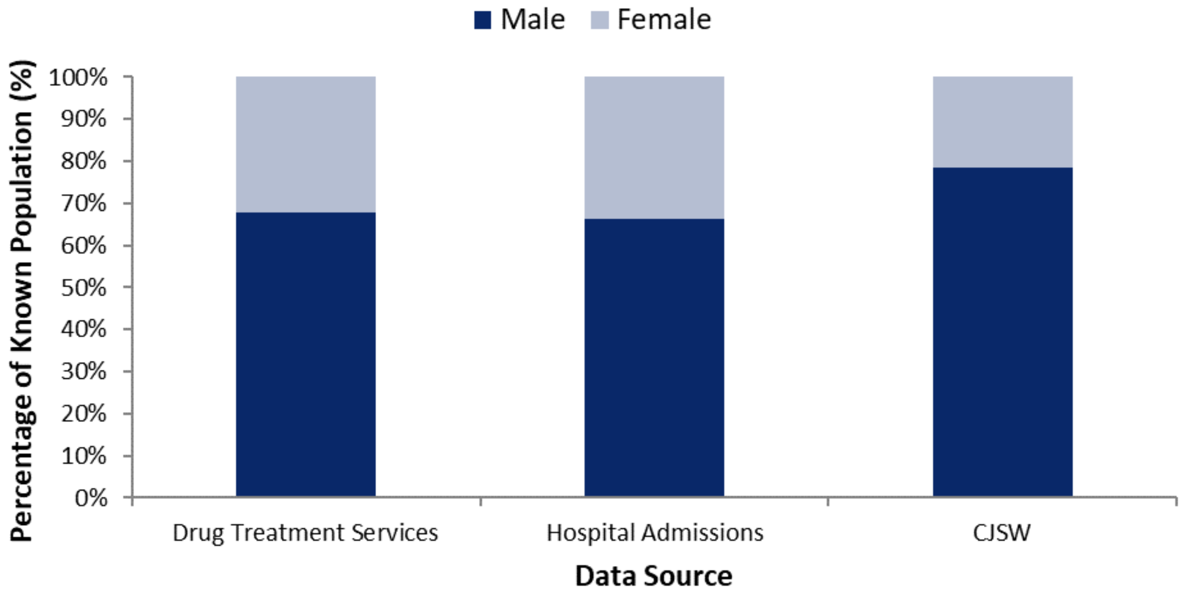
Figure 20: Drugs use category distribution of known cases for each of the three data sources (percentages), Scotland; 2015/16



- We have not estimated prevalence separately for opioids and benzodiazepines. Figure 20 shows that amongst all persons identified as receiving specialist drug treatment or amongst those admitted to hospital, approximately 94% related to the use of opioids. This compares to 82.0% of all those identified through Criminal Justice Social Work Reports, where a much higher proportion of illicit benzodiazepine use was observed.

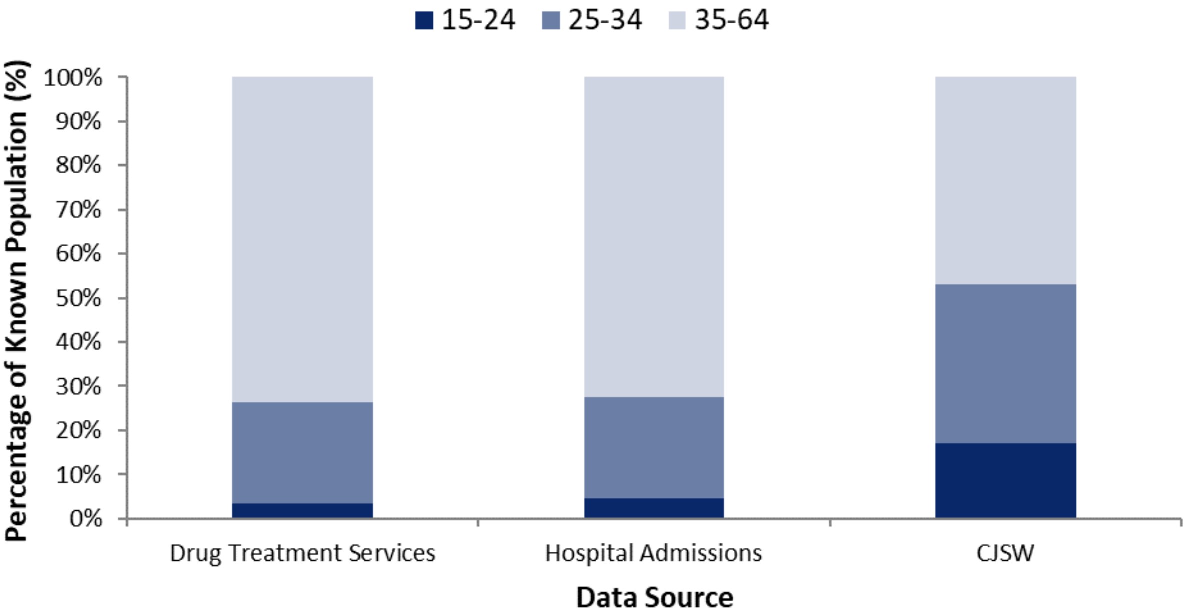
West of Scotland

Figure 21: Gender distribution of known cases for each of the three data sources (percentages), West of Scotland region; 2015/16



- Figure 21 shows that 67.8% of the observed population that were resident in the West of Scotland and receiving specialist drug treatment services during 2015/16, were male. This compares to 66.4% of all those identified through hospital admission records and 78.5% for all those identified through Criminal Justice Social Work Reports.

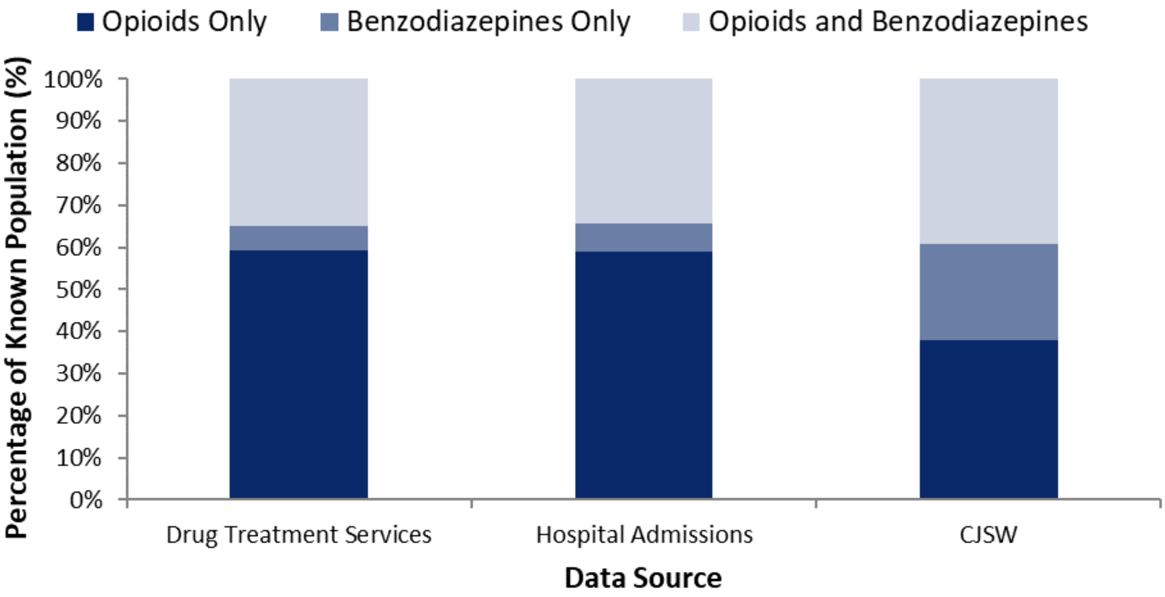
Figure 22: Age distribution of known cases for each of the three data sources (percentages), West of Scotland region; 2015/16



- Figure 22 shows a very similar age demographic in West of Scotland residents identified through specialist drug treatment services and those identified through hospital admissions. It shows that amongst those in contact with specialist drug treatment services or those admitted to hospital, approximately 27% were aged between 15 and 34 years. By contrast, the data suggests that more than half (52.9%) of all those identified through Criminal Justice Social Work Reports were aged between 15 and 34 years.

- These data suggest that the age and gender demographic for the West of Scotland is very similar for those identified through specialist drug treatment services or through hospital admissions. The profile is different for those identified through Criminal Justice Social Work reports, where, as for Scotland overall, a younger, more male dominated cohort emerges.

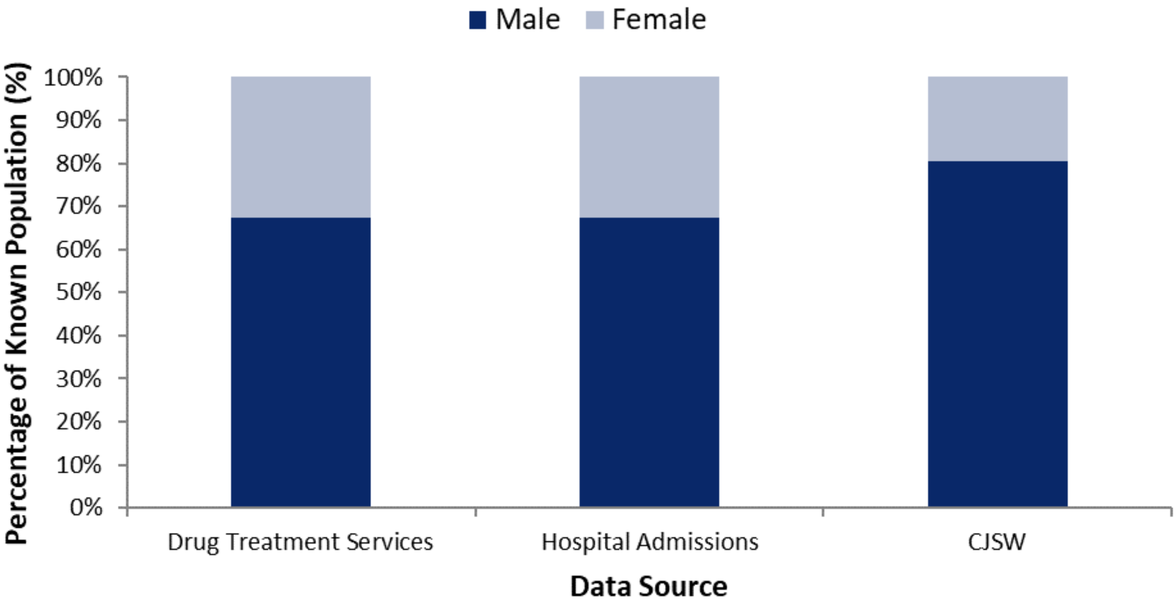
Figure 23: Drugs use category distribution of known cases for each of the three data sources (percentages), West of Scotland region; 2015/16



- Figure 23 shows that amongst all persons resident in the West of Scotland identified as receiving specialist drug treatment or amongst those admitted to hospital, approximately 94% related to the use of opioids. This compares to 77.3% of all those identified through Criminal Justice Social Work Reports, where a much higher proportion of illicit benzodiazepine use was observed.

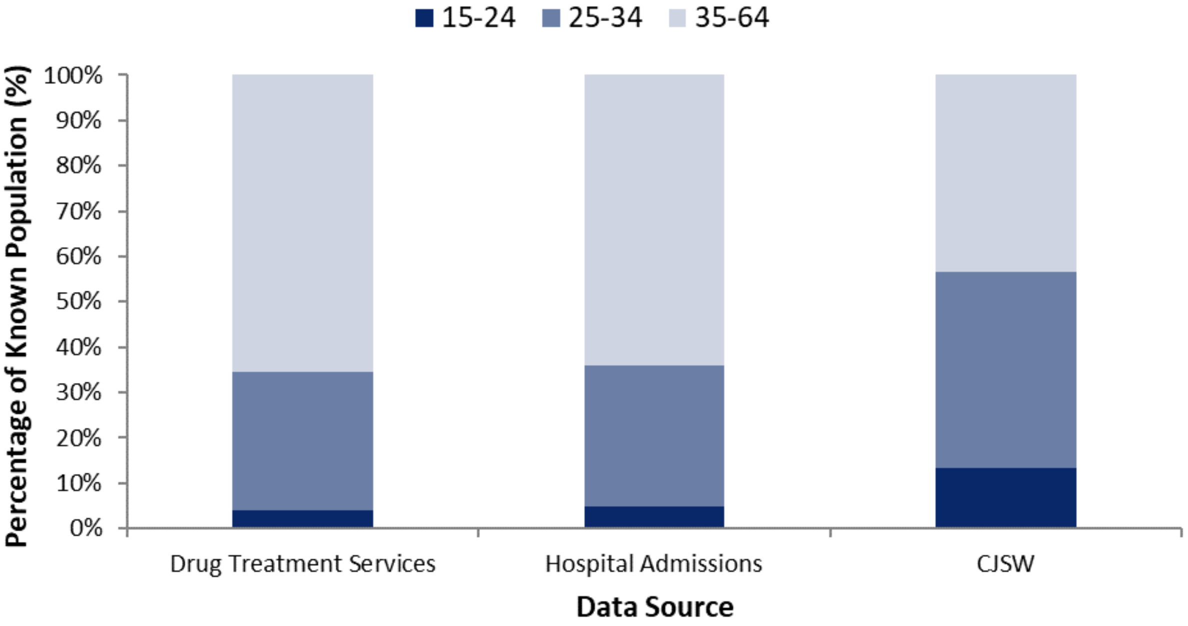
South & East of Scotland

Figure 24: Gender distribution of known cases for each of the three data sources (percentages), South & East of Scotland region; 2015/16



- Figure 24 shows that 67.4% of the observed population that were resident in the South & East of Scotland and receiving specialist drug treatment services during 2015/16, were male. This compares to 67.3% of all those identified through hospital admission records and 80.3% for all those identified through Criminal Justice Social Work Reports.

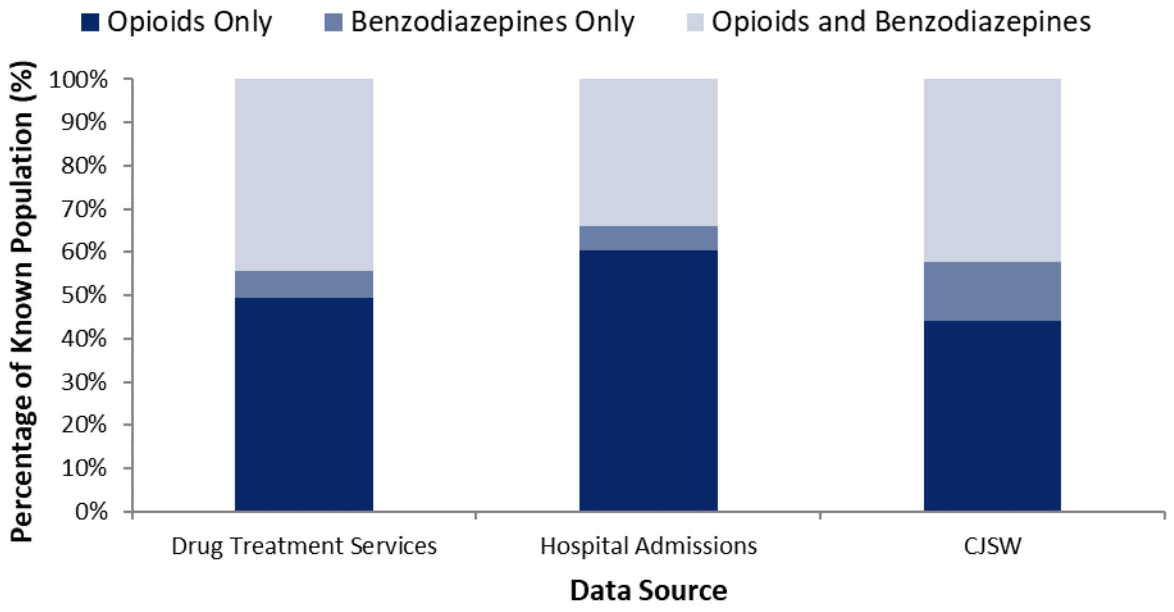
Figure 25: Age distribution of known cases for each of the three data sources (percentages), South & East of Scotland region; 2015/16



- Figure 25 shows a very similar age demographic in South & East of Scotland residents identified through specialist drug treatment services and those identified through hospital admissions. It shows that amongst those in contact with specialist drug treatment services or those admitted to hospital, approximately 35% were aged between 15 and 34 years. By contrast, the data suggests that more than half (56.7%) of all those identified through Criminal Justice Social Work Reports were aged between 15 and 34 years.

- These data suggest that the age and gender demographic for the South & East of Scotland is very similar for those identified through specialist drug treatment services or through hospital admissions. The profile is different for those identified through Criminal Justice Social Work reports, where, as for Scotland overall, a younger, more male dominated cohort emerges.

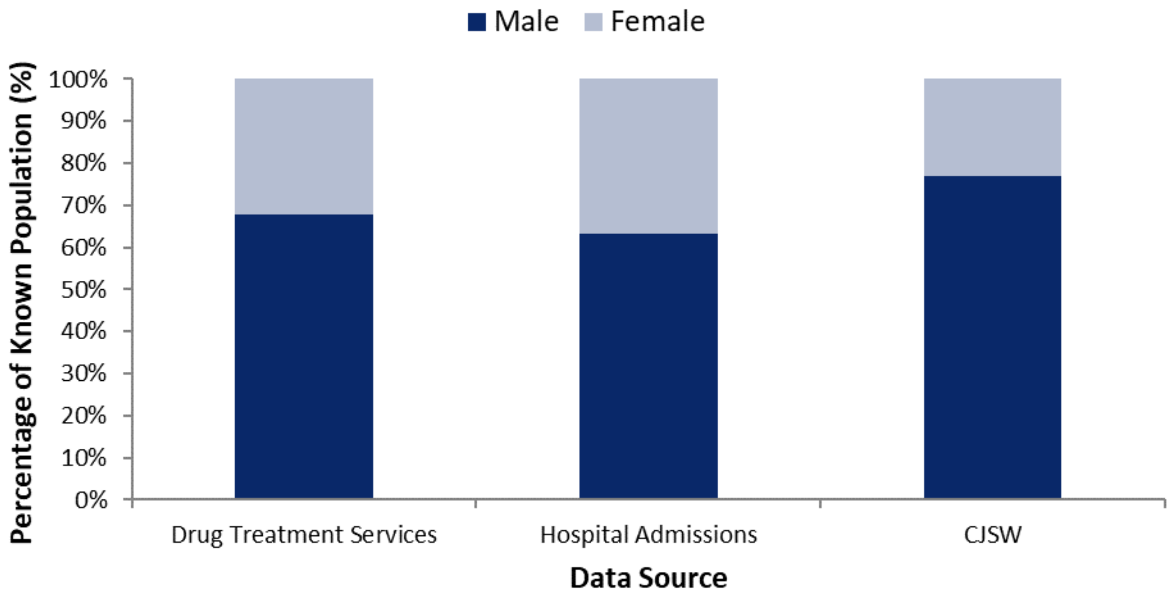
Figure 26: Drugs use category distribution of known cases for each of the three data sources (percentages), South & East of Scotland region; 2015/16



- Figure 26 shows that amongst all persons resident in the South & East of Scotland identified as receiving specialist drug treatment or amongst those admitted to hospital, approximately 94% related to the use of opioids. This compares to 86.3% of all those identified through Criminal Justice Social Work Reports, where a higher proportion of illicit benzodiazepine use was observed.

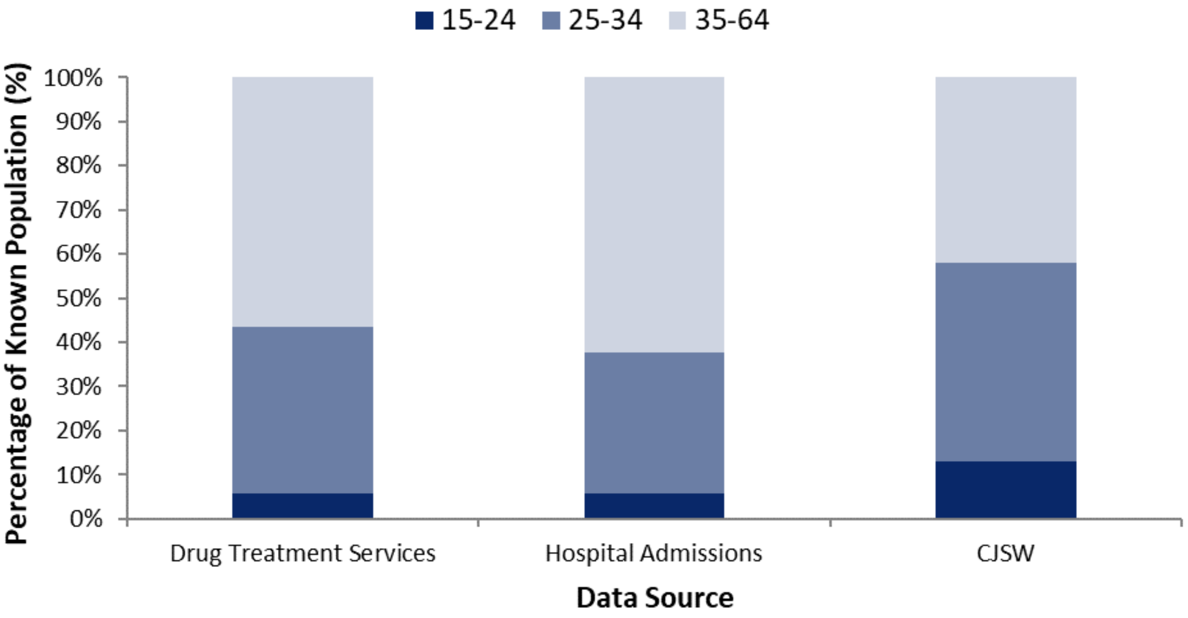
North of Scotland

Figure 27: Gender distribution of known cases for each of the three data sources (percentages), North of Scotland region; 2015/16



- Figure 27 shows that 67.9% of the observed population that were resident in the North of Scotland and receiving specialist drug treatment services during 2015/16, were male. This is higher than amongst all those identified through hospital admission records (63.3%) and lower than amongst all those identified through Criminal Justice Social Work Reports (76.9%).

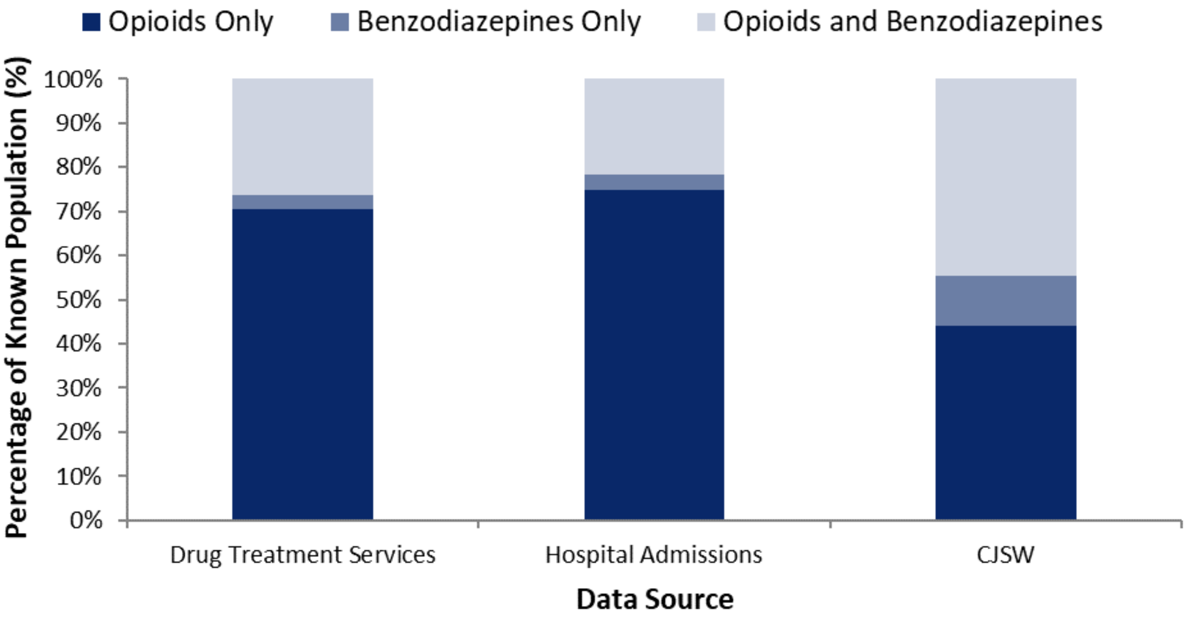
Figure 28: Age distribution of known cases for each of the three data sources (percentages), North of Scotland region; 2015/16



- Figure 28 shows a similar age demographic in North of Scotland residents identified through specialist drug treatment services and those identified through hospital admissions, especially for those aged 15 to 24 years. Unlike the other regions of Scotland, where the age distribution is very similar between drug treatment and hospital admissions for all age groups, there appears to be a slightly older hospital admission cohort emerging in the North of Scotland. By contrast the data shows that amongst those identified through Criminal Justice Social Work Reports, 42% were in the oldest age category which represents a lower proportion than emerged for the West and South & East of Scotland.

- These data suggest that the age and gender demographic for the North of Scotland is more variable across the three data sources compared to the West and South & East of Scotland, where very similar patterns emerged for those identified through specialist drug treatment services or through hospital admissions. The profile for the North still shows the same dominance of a younger male cohort amongst those identified through Criminal Justice Social Work reports. Older females appear to be more prominent amongst the hospital admission cohort for the North compared to the demographic profile amongst those receiving specialist drug treatments.

Figure 29: Drugs use category distribution of known cases for each of the three data sources (percentages), North of Scotland region; 2015/16



- Figure 29 shows that amongst all persons resident in the North of Scotland identified as receiving specialist drug treatment or amongst those admitted to hospital, approximately 96% related to the use of opioids. This compares to 88.8% of all those identified through Criminal Justice Social Work Reports, where a higher proportion of illicit benzodiazepine use was observed.

Glossary

Benzodiazepine	The most commonly prescribed minor tranquilisers, known as anxiolytics (for daytime anxiety relief) and hypnotics (to promote sleep). Includes diazepam (Valium), lorazepam, librium, nitrazepam, temazepam.
Capture-recapture	This form of analysis uses data sources which in some way identify individuals with problem drug use to identify the overlap between the data sources. Further analysis can then be used to estimate the hidden (unknown) population who appear in none of the data sources, which, combined with the known population, generates a prevalence estimate.
Confidence interval	Provides an estimated range of values within which the true value is likely to lie. The width of the confidence interval gives an indication of the reliability of the value (i.e. the smaller the range the more reliable the value).
Error Bars	Error bars are used on graphs to indicate the error, or uncertainty in a reported measurement. They give a general idea of how accurate a measurement is, or conversely, how far from the reported value the true (error free) value might be. The error bars in the charts in this publication are based on the confidence intervals shown in the tables.
Hidden population	The individuals with problem drug misuse who are not captured in any of the datasets used for the study.
Known population	The individuals identified with problem drug use in the datasets used for the study.
Opioid	A drug containing opium or its derivatives, used in medicine for inducing sleep and relieving pain. Includes heroin (diamorphine), morphine, methadone, opium, codeine, pethidine, dihydrocodeine (DF118).
Prevalence	In epidemiology, the prevalence of a health-related state (typically disease, but also other things like drug use) in a statistical population is defined as the total number of cases of the risk factor in the population at a given time. It is used as an estimate of how common a disease is within a population over a certain

	period of time. The prevalence rate is the number of individuals shown as a proportion of the overall population.
Problem drug use	The problematic use of opioids (including illicit and prescribed methadone use) and/or the illicit use of benzodiazepines and implies routine and prolonged use as opposed to recreational and occasional drug use.
Regional planning areas	A structure for planning services, which will directly support joint working activities across NHS boards and social care.

List of Tables

File name	File and size
2019-03-05-Drug-Prevalence-2015-16-Tables.xlsx	Excel 123 Kb

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Further Information

Further Information can be found on the ISD website.

For more information on Drug Prevalence see the Prevalence of Problem Drug Use section of our website. For related topics, please see the Drugs Misuse pages.

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Appendices

Appendix 1 – Background information

This appendix details the ‘capture-recapture’ methodology used to estimate the number of individuals with problem drug use presented in this report. Capture-recapture is one of the most generally accepted methods for prevalence estimation in drug use epidemiology, and these methods have been applied in Scotland since 2000.

This form of analysis requires the collection of two or more data sources which in some way identify individuals with problem drug use. Using a common set of identifiers (initials, date of birth, sex, and area of residence) we can identify the extent of overlaps between the data sources; that is the number of the people that occur in any combination of one or more data source. A statistical modelling technique known as log-linear analysis can then be applied to the distribution of overlaps in order to estimate the scale of the hidden population (i.e. individuals with problem drug use who do not present in any of the data sources).

Combining the hidden population estimate with the known population generates the prevalence estimates.

Collecting the Source Data

Specialist Drug Treatment Services

Each Alcohol and Drug Partnership (ADP) in Scotland was asked to provide data on individuals who had registered for treatment and/or were in receipt of specialist drug treatment (with or without concurrent alcohol treatment) during the period 1st April 2015 to 31st March 2016. Drug treatment services included specialist statutory and non-statutory services, including prison-based services. Please note that ADPs are the focal point for local action on drug misuse and are generally organised according to council area boundaries.

Data obtained from GP consultations was not generally included in the study. However in NHS Lothian, where a significant level of specialist drug treatment is provided by GPs, this information was included. This would affect the observed specialist drug treatment populations for City of Edinburgh, East Lothian, Midlothian and West Lothian council areas. In previous studies this data was likely to have been excluded from the submissions relating to these council areas.

ADPs were guided to source their data from the same services that submit returns to the Scottish Drug Misuse Database (SDMD), including where individuals were being assessed for their drug use via the 3rd sector, if possible. Criteria stipulated that Individuals must have been aged between 15 and 64 years at the time of treatment.

Individuals were eligible for inclusion if they problematically used opioids and/or benzodiazepines. All persons in treatment known to be illicitly taking any of the listed prescription drugs should have been included, as long as use was considered to be routine and prolonged. Similarly, legitimate prescribing, where the drug was being prescribed as treatment for an ongoing drug problem, including Opioid Replacement Therapies (ORTs) such as methadone, should also have been included. This approach is consistent with previous studies; ISD acknowledge that many persons on ORTs will have been stable or progressing towards good outcomes as a result of their treatment.

ADPs were requested to complete an agreed data collection template (comprising: initials, gender, date of birth, postcode district) in respect of all eligible records.

As noted above, data on individuals in receipt of drug treatment services are also submitted to the SDMD. However, there is known data quality and completeness issues in respect of SDMD. Specialist services providing tier 3 and 4 interventions (i.e. structured community and residential treatment) should be submitting information on assessments for specialist drug treatment to both SDMD and the Drug and Alcohol Treatment Waiting Times database (DATWT). These are separate systems which are managed separately locally and have different processes and procedures. Comparison of the numbers of individuals recorded on these systems suggests that SDMD compliance is lower. The Overview of Initial Assessments for Specialist Drug Treatment publication reports that SDMD data was estimated to be 66% complete for 2015/16, when compared with the DATWT database. ADPs were therefore requested wherever possible to provide data obtained directly from services in their locality. For 25 out of 32 council areas in Scotland, direct submission data was provided; the remaining areas were either unable to source data directly from services or were content to have their data sourced entirely from SDMD. To optimise data completeness, directly submitted data was further combined with data extracted from the SDMD on clients who had an initial assessment or follow-up assessment for drug treatment during 2015/16, and who were recorded as using opioids and/or benzodiazepines.

Drug-Related Hospital Admissions

Information was extracted from centrally held data within NHS National Services Scotland (NSS). The data, which was initially sourced from NHS hospital administration systems across Scotland, relates to inpatient and day case admissions to general acute (SMR01) and mental health specialties (SMR04).

The recording of diagnoses on SMR01 and SMR04 comprise a main condition and, optionally, up to five further conditions. All conditions on data submissions for hospital discharges from 1st April 1996 have been coded according to the 10th revision of the International Classification of Diseases and Injuries (ICD-10).

Opioid use was identified using ICD-10 codes **F11** (mental and behavioural disorders due to use of opioids), **T40.0** (poisoning by narcotics and psychodysleptics - Opium), **T40.1** (poisoning by narcotics and psychodysleptics - Heroin), **T40.2** (poisoning by narcotics and psychodysleptics - other opioids including codeine and morphine), **T40.3** (poisoning by narcotics and psychodysleptics - Methadone), and; **T40.4** (poisoning by narcotics and psychodysleptics - other synthetic narcotics e.g. pethidine). Benzodiazepine use was identified using code **F13** (mental and behavioural disorders due to use of sedatives or hypnotics).

This taxonomy represents a change from previous studies which relied on the ICD-10 codes **F11** (opioid use) and **F19** (multiple psychoactive drugs). The codes used for the 2015/16 prevalence study were determined in consultation with the Harms sub-group of Partnership for Action on Drugs in Scotland (PADS), the main group being chaired by the Minister for Public Health and Sport.

Some caution is necessary when using these data as (a) drug misuse may only be suspected and may not always be recorded by the hospital, and (b) where drug misuse is recorded, it may not have been possible to identify which drugs were involved.

The data was extracted according to the standard collection template comprising initials, gender, date of birth, postcode district in respect of all eligible records.

Criminal Justice Social Work Reports

Criminal Justice Social Work Reports (CJSWRs) are prepared by Social Workers, at the request of a Court, to assist in sentencing. They include information on an offender's personal background and circumstances, their physical and mental health, alcohol or drug use, and all relevant offence related information. Criminal Justice Social Work statistics published by the Scottish Government, show that there were a total of 29,846 CJSWRs submitted to the Courts in Scotland in 2015/16 (including supplementary reports).

The CJSWRs eligible for review in this study related to court dates between 1st April 2015 and 31st March 2016. A team of trained NHS data collectors were tasked to review all relevant reports (including supplementary reports) associated with each court episode for evidence of current problematic opioid and/or benzodiazepine use. Multiple court dates/episodes for the same individual were reviewed and (where relevant) were recorded separately.

Councils had the option to either securely transfer CJSWRs to NHS National Services Scotland (NSS) for review, or provide the NHS team access to the CJSWRs for review within local social work offices.

Data collectors were tasked to review all CJSWRs during the designated time period, and for those that implied current problematic use of opioids and or benzodiazepines complete the standard data collection template comprising forename and surname initials, date of birth, gender, postcode district of residence and drugs used, (i.e. opioids, benzodiazepine or both). Detailed listings of drug names under each of the opioids and benzodiazepine categories guided the coding exercise. Also, data collection guidance stipulated that the context should be considered to establish current drug use. In general this included:

- cases where the offence involved or was related to relevant drug(s) misuse
- cases where the client was in treatment for relevant drug(s) misuse
- cases where the individual's relevant drug(s) misuse had been assessed to be a problem, even if the client/offender had stated that they were not currently using drugs or they were in withdrawal or were substituting with another drug.

In respect of data quality and completeness, it is recognised that whilst details of an individual's drug use should be recorded where relevant to the offence or sentencing, drug use may not always be noted in the report. Additionally, where drug use was noted, the narrative may not have contained sufficient specificity in order for data collectors to identify the relevant drugs required for the study.

Police Data

ISD previously undertook prevalence studies for 2009/10 and 2012/13. In both those studies the estimates were based on observed populations derived from four data sources. The same three sources, listed above, were combined with a fourth data source that brought together information provided by the eight individual police force areas for 2009/10 and through Police Scotland for 2012/13. At the time data for the 2012/13 study was being collected, Police Scotland had been newly formed, and compliant data could still be sourced effectively from databases that were still in operation across the legacy force area. The data related to Police reports to the Procurator Fiscal under the Misuse of Drugs Act with mention of opioids and/or illicit benzodiazepines.

During preparations for this latest drug prevalence study, for 2015/16, Police Scotland was again approached regarding the provision of similar data. Despite their best efforts, ISD were advised that data compatible with the definitions required for the study could not be extracted from current databases in the same way as had previously been possible.

Following an impact assessment of methodological revisions, ISD concluded that working with three data sources still allowed for the effective production of drug prevalence estimates, and the project proceeded on that basis. These changes to the methodological approach for the 2015/16 study mean that direct comparisons with the results from previous studies are difficult to fully interpret. Scottish Government were consulted and agreed with a revised proposal to focus on regional variations using a consistent modelling framework for all council areas.

Analytical Methods

Producing Log-Linear Statistical Models

The main unit of analysis is council area, and as such it was necessary to undertake data preparation and statistical modelling separately for each council area. NHS board, region and national estimates have been calculated by summing the estimates for the relevant council areas that comprise these geographies.

One of the underlying assumptions of the form of capture-recapture analysis undertaken for this study is that individuals with problem drug use that present in more than one data source are identified as such. To meet this assumption, the method of finding the overlap between lists must be accurate. Individuals were identified from the above data sources, and matched according to a code comprising initials, date of birth, gender and council area of residence.

Once the data from the three sources (Specialist Drug Treatment Services, Drug-Related Hospital Admissions and Criminal Justice Social Work Reports) were collated and the overlaps between them determined, it was possible to use a technique known as log-linear modelling to estimate the unknown population of individuals with problem drug use in each council area.

One of the challenges of capture-recapture is to find the simplest model that fits the data. The simplest model is one with main effects only, indicating that presence in one data source does not affect the probability of being in another. By analysing the overlaps between three data sources, the fact that persons appearing in one data source increases (or decreases) their chances of appearing in another data source can still be adjusted for during the analysis by introducing interaction terms. With three data sources (and considering no model interaction terms of a higher order than 2-way interactions), there are 7 possible log-linear models that can be fitted to the data for each council area. The remaining six models will include either one or two possible two-way interaction terms between the three data sources; a model with two interaction terms is simpler than a model with one interaction term, with more complex models usually leading to higher prevalence estimates.

Another important consideration with this modelling approach is that all individuals with problem drug use in the council area should be equally likely to appear in any data source. This assumption cannot be met if there is ‘heterogeneity’ within data sources, leading to individuals having different probabilities of appearing in particular data sources. For example, young individuals with problem drug use may be less likely than older individuals with problem drug use to have started treatment and therefore appear in a treatment data source.

To overcome this potential source of bias, the council areas can be split according to demographic characteristics. This process is known as stratification, and for the purposes of this study, all council areas were split according to gender and three age categories (15-24, 25-34 and 35-64).

Instead of solely testing 7 models for each council area overall, the models were tested against each strata within the council area in order to achieve more representative estimates. Working through each strata in a hierarchical order, the 'best' model out of the seven potential models was selected using an objective statistical criteria involving the Akaike Information Criterion or AIC and an assessment of the estimate as measured against a weighted average of all models deemed reasonable. AIC is a measure of how well a model fits, taking its complexity into account, and is defined as follows:

$$\mathbf{AIC} = \mathbf{G^2} - \mathbf{2} \times \mathbf{df}$$

where **G^2** is the likelihood ratio statistics (a measurement of the goodness-of-fit of the model) and **df** is the degrees of freedom associated with the model. The weighted average was based on another criterion, proposed by Schwarz (1978) and Hook and Regal (1997):

$$\mathbf{SIC_i} = \mathbf{G^2} - \mathbf{ln}(\mathbf{known\ population}) \times \mathbf{df}$$

Where $\mathrm{i} = 1, 2, \cdots, 7$ (indexing the models)
(ln denotes the natural logarithm function; all other terms are as defined in the AIC equation above).

Stratification was only used when the model for the entire council area cohort would not fit. The process of model selection is best described in terms of the following hierarchical steps:

1. The models used for evaluation were the 7 models including main effects and only 1 or 2 two-way interactions between pairs of data source effects when evaluating log-linear models of capture-recapture using three data sources for each of the 32 council areas.
2. If the estimate of the total population was more than five times the known population (from all three data sources), the estimate was deemed to be unsatisfactory and was excluded from further analysis.
3. The weighted average of the remaining models was calculated using the SIC (Schwarz Information Criterion) to given greater weight to better models.
4. Models were deemed to be a satisfactory fit if the AIC value was less than zero and the estimated population differed by less than 10% from the weighted estimate.
5. At first instance, an un-stratified model was fitted and if this was satisfactory, the estimate was accepted.
6. If the model with the lowest AIC differed by more than 10% from the weighted estimate, the model with the next lowest AIC (AIC < 0) which agreed with the weighted estimate was chosen.
7. In absence of a satisfactory un-stratified model, separate models were fitted to male and female strata.
8. If no model was fitted to the female stratum, then age strata were fitted (age 15-24, age 25-34 and age 35-64). In such cases, it was not necessary to consider model fits for the male stratum.

9. If a model was fitted to the female stratum but no models fitted satisfactorily to the male stratum, separate models were fitted to age-specific male strata (males 15-24, males 25-34 and males 35-64). If no models fitted satisfactorily to the age-specific male strata either, age strata were fitted (age 15-24, age 25-34 and age 35-64). In such cases, even though a female stratum model was fitted, this was discarded in favour of an age strata model, which did not take sex into account.
10. If still no satisfactory model was found, the process was repeated (beginning with the un-stratified models in Step 5), and the selection criteria was relaxed to include models with AIC < 5.

The estimates quoted here for each council area will therefore either reflect the full estimate resulting from unstratified models, where they were deemed to fit satisfactorily, or a composite estimate formed by summing the best estimates selected for each layer of stratification.

Producing Confidence Intervals

The resulting estimates are inherently subject to random variation, and this is reflected by their confidence intervals. Confidence Intervals are quoted throughout the report and are essential to the interpretation of any perceived patterns in the data. The traditional approach for constructing a confidence interval around an estimate of a hidden population is known as a Wald confidence interval, which is based on the estimate and its standard error. This approach is based on the assumption of asymptotic normality, but sometimes the sample distribution of capture-recapture estimators are strongly asymmetric and thus deviate from normality, frequently leading to unreasonable intervals. In log-linear analyses, the estimates and their standard errors are calculated via the likelihood function which tends to result in wide intervals. Hence, the method used to construct confidence intervals in this (and previous iterations of Drug Prevalence studies for Scotland), is the more general bootstrap method.

Bootstrapping is the practice of estimating prevalence by repeatedly re-sampling the same data and computing the estimate of the unknown population. Cases are selected randomly, with replacement, from the original sample to create each new sample. Typically, each new sample has the same cases as the original sample, but some cases may be selected multiple times and others not at all. After a suitably large number of bootstrap samples are made, the empirical distribution of the estimate is observed and the interval between two percentiles is taken as the confidence interval. To arrive at a 95% confidence interval, the percentiles are 2.5% and 97.5%. The bootstrap method does not assume an underlying distribution of the estimates.

The estimate of the total number of unknown individuals with problem drug use within each area was obtained through the unstratified model, where appropriate, or by summing the stratified estimates. For each stratum, an estimate of the unknown population was derived together with upper and lower confidence limits. However, a confidence interval derived from summing the upper and lower bounds of the stratum does not provide a 95% confidence interval for the summed estimate. Therefore, simulation methods to generate confidence intervals for the summed estimates were used; this involved generating, for each stratum, 10,000 random deviates from a log-normal distribution. Confidence intervals for the sum of the strata were calculated by summing the strata log-normal distributions and deriving the 2.5th and 97.5th percentiles of the summed distribution.

Producing Age-Sex Estimates at Council Area Level

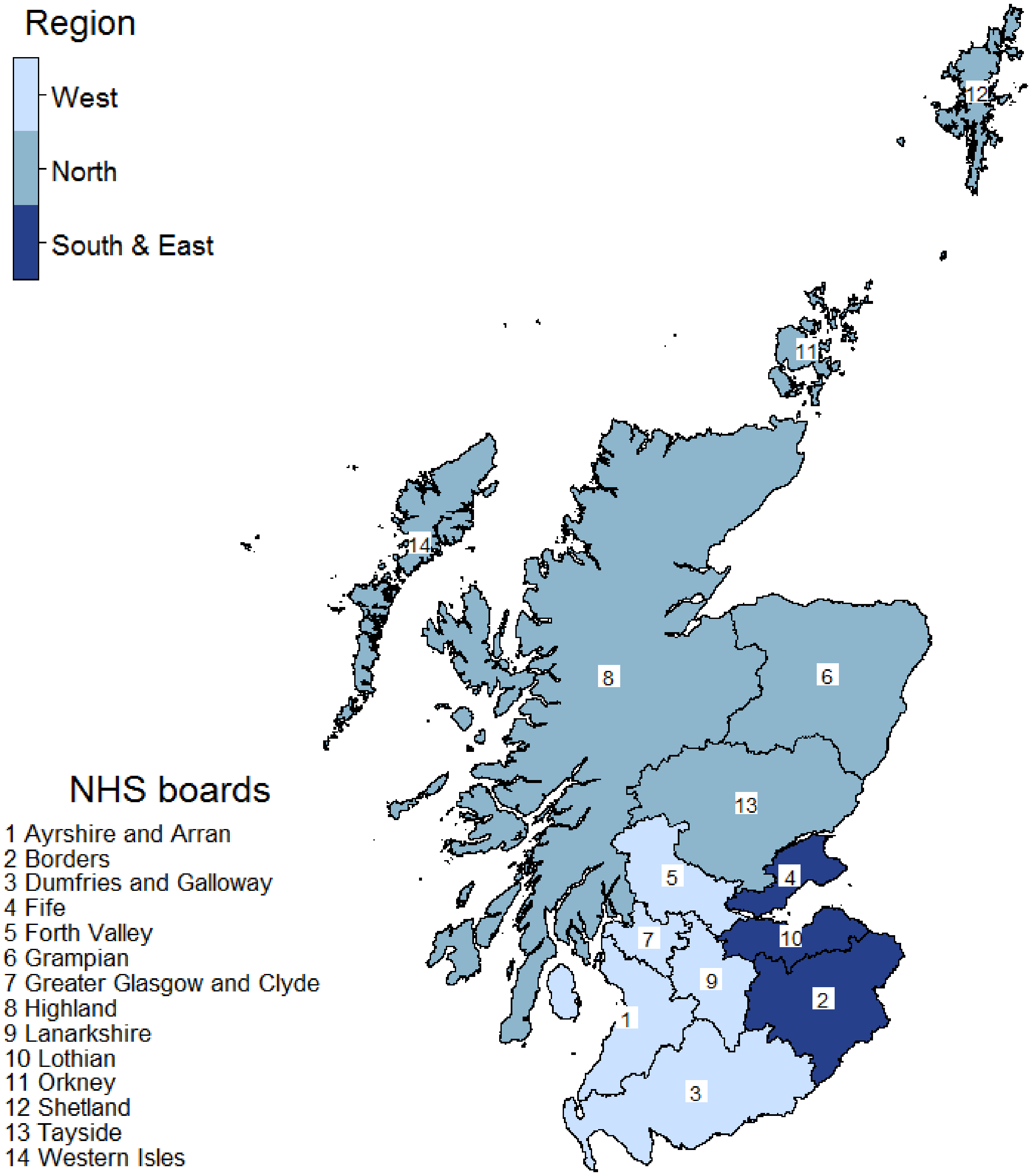
As mentioned above, an overall estimate for each council area could be derived either by observing the estimate from a single best-fitting log-linear model (un-stratified) or by summing the estimates for each of the best-fitting stratified models. An unstratified estimate was always accepted if a satisfactory model could be isolated before attempting to construct a stratified estimate. However, it is recognised that it is of interest to estimate how much of this total estimate for each council area could be attributed to each sex and age group (15-24, 25-34, 35-64). The unstratified nature of many of the estimates is prohibitive in this regard. It was considered desirable therefore to have a consistent approach to calculating such age-sex estimates for each council area regardless of how the total estimate was ascertained in the log-linear modelling process using the hierarchical steps outlined above.

With this in mind the regional planning areas have provided a stable modelling baseline on which to determine age and sex distributions for all estimates.

The following steps have been followed:

1. The known populations were aggregated to regional level (South & East, North and West) and the log-linear modelling process was applied at this level rather than at council area level. The purpose of this was to calculate weights for each age-sex strata (females 15-24, females 25-34, females 35-64, males 15-24, males 25-34 and males 35-64) in each region.
2. Since the aim was to estimate weights rather than prevalence, the hierarchical steps were modified so that only male age-specific and female age-specific models (the latter of which were not fitted in the main analysis) were considered.
3. The ‘best’ model was selected using the same criteria as before (i.e. AIC < 5 and the percentage difference between each model and the weighted average being less than 10%). This resulted in a total of 18 selected models (one for each age-sex strata for three regions). However, for two strata (males 25-34 in the North and West regions), no models had AIC < 5 and, in these cases, the model with the lowest AIC that still satisfied the 10% percentage difference rule was selected.
4. The total estimates for each council area were then weighted using the estimates from the regional log-linear models for each age-sex strata (females, males, females 15-24, females 25-34, females 35-64, males 15-24, males 25-34 and males 35-64). For example, the ‘male 35-64’ estimate for each council area was calculated by taking the total estimate (from the main analysis) and then multiplying this by the proportion of males aged 35-64 in the relevant region, as estimated from the selected models.

NHS Board Areas within Regional Planning Boundaries


Region
West
North
South & East
NHS boards
1 Ayrshire and Arran
2 Borders
3 Dumfries and Galloway
4 Fife
5 Forth Valley
6 Grampian
7 Greater Glasgow and Clyde
8 Highland
9 Lanarkshire
10 Lothian
11 Orkney
12 Shetland
13 Tayside
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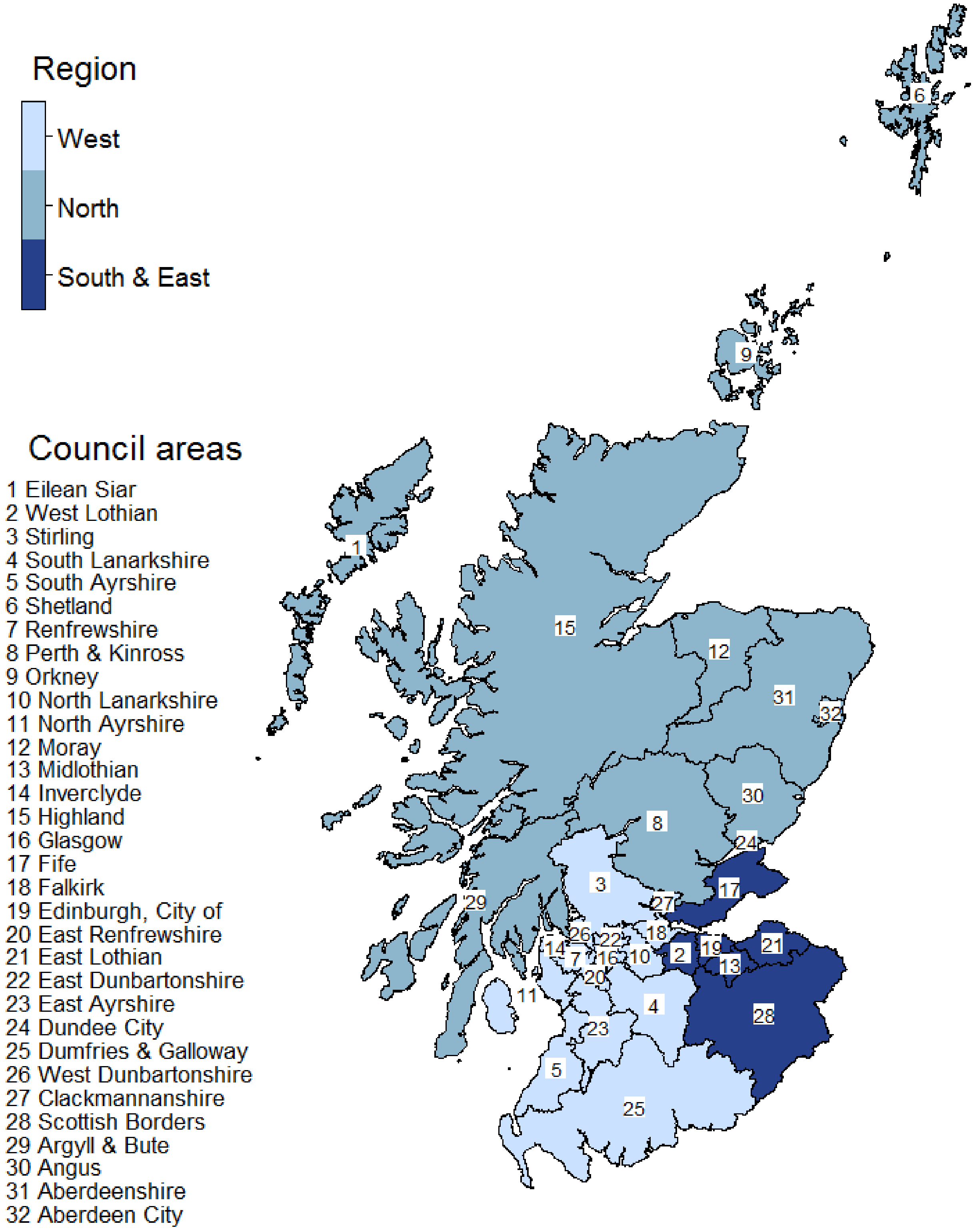
Council Areas within Regional Planning Boundaries


Region
West
North
South & East
Council areas
1 Eilean Siar
2 West Lothian
3 Stirling
4 South Lanarkshire
5 South Ayrshire
6 Shetland
7 Renfrewshire
8 Perth & Kinross
9 Orkney
10 North Lanarkshire
11 North Ayrshire
12 Moray
13 Midlothian
14 Inverclyde
15 Highland
16 Glasgow
17 Fife
18 Falkirk
19 Edinburgh, City of
20 East Renfrewshire
21 East Lothian
22 East Dunbartonshire
23 East Ayrshire
24 Dundee City
25 Dumfries & Galloway
26 West Dunbartonshire
27 Clackmannanshire
28 Scottish Borders
29 Argyll & Bute
30 Angus
31 Aberdeenshire
32 Aberdeen City

Appendix 2 – Publication Metadata

Metadata Indicator	Description
Publication title	Prevalence of Problem Drug Use in Scotland - 2015/16 Estimates
Description	The report contains estimates of the prevalence of problem drug use (opioids and benzodiazepines) in 2015/16 for council areas, NHS boards and regional planning areas in Scotland.
Theme	Health and Social Care
Topic	Drugs and Alcohol Misuse
Format	PDF report with Excel tables
Data source(s)	Drug treatment services / Scottish Drug Misuse Database, SMR01 and SMR04, Criminal Justice Social Work Reports
Date that data are acquired	December 2017 to October 2018
Release date	05/03/2019
Frequency	As commissioned
Timeframe of data and timeliness	The timeframe for this publication is April 2015 to March 2016.
Continuity of data	A change has been implemented to the number of baseline data sources used to estimate prevalence. The statistical methods are otherwise the same as were used by ISD to report on prevalence for 2012/13 and 2009/10. The reduction of data sources may impact on the level of prevalence compared to previous studies. A full explanation of data sources and statistical methods, including comment on potential impact of change is provided in Appendix 1.
Revisions statement	N/A
Revisions relevant to this publication	N/A.
Concepts and definitions	See main report
Relevance and key uses of the statistics	Relevant to understanding extent of problem drug use in Scotland. Statistics will be used for policy making and service planning.
Accuracy	These data are estimates and users are advised to note the confidence intervals, which are provided to quantify a degree of uncertainty around any given point. Data have been provided from a number of sources, and where new data has been collected, validation (including assessment of completeness) has been undertaken through providers. Where data have been incorporated from routine sources, validation and data completeness are controlled through organisational protocols.
Completeness	Data collected from all areas of Scotland in line with previous studies. See above section on Accuracy.
Comparability	Data is not considered directly comparable with the previous studies produced by ISD Scotland. Data may not be directly comparable with similar measures produced outwith Scotland, or through independent research studies.
Accessibility	It is the policy of ISD Scotland to make its web sites and products accessible according to published guidelines. See attached link for further details: http://www.isdscotland.org/About-ISD/Accessibility/
Coherence and clarity	The report is available as a PDF file with tables clearly linked for ease of use.
Value type and unit of measurement	Estimated number and percentage of individuals with problem drug use
Disclosure	There is considered to be a low risk of disclosure.
Official Statistics designation	Official Statistics

UK Statistics Authority Assessment	Not undergoing assessment
Last published	04/03/2016
Next published	To be confirmed.
Date of first publication	September 2001
Help email	richard.dobbie@nhs.net
Date form completed	21/02/2019

Appendix 3 – Early access details

Pre-Release Access

Under terms of the "Pre-Release Access to Official Statistics (Scotland) Order 2008", ISD is obliged to publish information on those receiving Pre-Release Access ("Pre-Release Access" refers to statistics in their final form prior to publication). The standard maximum Pre-Release Access is five working days. Shown below are details of those receiving standard Pre-Release Access.

Standard Pre-Release Access:

Scottish Government Health Department

NHS Board Chief Executives

NHS Board Communication leads

Appendix 4 – ISD and Official Statistics

About ISD

Scotland has some of the best health service data in the world combining high quality, consistency, national coverage and the ability to link data to allow patient based analysis and follow up.

Information Services Division (ISD) is a business operating unit of NHS National Services Scotland and has been in existence for over 40 years. We are an essential support service to NHSScotland and the Scottish Government and others, responsive to the needs of NHSScotland as the delivery of health and social care evolves.

Purpose: To deliver effective national and specialist intelligence services to improve the health and wellbeing of people in Scotland.

Mission: Better Information, Better Decisions, Better Health

Vision: To be a valued partner in improving health and wellbeing in Scotland by providing a world class intelligence service.

Official Statistics

Information Services Division (ISD) is the principal and authoritative source of statistics on health and care services in Scotland. ISD is designated by legislation as a producer of ‘Official Statistics’. Our official statistics publications are produced to a high professional standard and comply with the Code of Practice for Official Statistics. The Code of Practice is produced and monitored by the UK Statistics Authority which is independent of Government. Under the Code of Practice, the format, content and timing of statistics publications are the responsibility of professional staff working within ISD.

ISD’s statistical publications are currently classified as one of the following:

- National Statistics (i.e. assessed by the UK Statistics Authority as complying with the Code of Practice)
- National Statistics (i.e. legacy, still to be assessed by the UK Statistics Authority)
- Official Statistics (i.e. still to be assessed by the UK Statistics Authority)
- other (not Official Statistics)

Further information on ISD’s statistics, including compliance with the Code of Practice for Official Statistics, and on the UK Statistics Authority, is available on the ISD website.