Public Health Scotland

Estimated Prevalence of Opioid Dependence in Scotland

2014/15 to 2022/23

An Official statistics in development release for Scotland

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Planned developments

We are continuing to develop this approach and currently have plans to:

- Explore the potential to provide model-based estimates for additional NHS Boards and/or a larger number of age groups.
- Explore the potential to incorporate other types of drug-related events into the statistical models.
- Explore the potential for generating estimates for populations using other types of drugs.

The PHS Drugs Team plans to work with stakeholders to promote the understanding and use of these statistics. We also welcome feedback on any aspect of this report from other users of these statistics. Contact details for the PHS Drugs Team can be found at the end of this report.

Contents

Introduction

Estimating the number of people who are dependent on drugs such as opioids, to inform resource allocation and public health action, is challenging. As a vulnerable, marginalised, partially hidden, and comparatively small population, the number of people with opioid dependence cannot be measured accurately through traditional household, online or telephone surveys. Surveys of self-reported drug use are susceptible to selection and response bias, leading to underestimation of opioid dependence (Sweeting, et al., 2009). Administrative data collected by criminal justice, health and social care services provides information about some people who use drugs, but no single source of data gives a complete picture. Instead, so called 'indirect' approaches are needed, using statistical models to estimate the true population size from incomplete information (EMCDDA, 1997).

This is the second report on findings from a public health surveillance collaboration between Public Health Scotland, the University of Bristol, and Glasgow Caledonian University. These organisations were commissioned by the Scottish Government to establish a new methodology for estimating the prevalence of opioid dependence in Scotland using linked administrative health datasets. The first report (Public Health Scotland, 2024) provided estimates for financial years 2014/15 to 2019/20 based on a recently developed statistical modelling approach, 'Multi-Parameter Estimation of Prevalence' (MPEP) (Jones, et al., 2020; Markoulidakis, et al., 2024)[1]. Prior to that report, official estimates of the number of 'problem drug users' (which was defined as problematic use of opioids and/or illicit use of benzodiazepines) in Scotland were based on a different methodology, called 'capture-recapture' estimation.

The estimates provided in this and the previous report are of the number of people with opioid dependence, defined as those who are at risk of drug-related harm (such as overdose poisoning and other causes of premature mortality, hepatitis C (HCV)

[1] A brief overview of the MPEP approach is provided in the **Methods** section.

and HIV), with the potential to benefit from opioid agonist therapy (OAT[2]), whether they are/were in receipt of OAT or not. Estimates of prevalence are also provided. Prevalence is the number of people with opioid dependence as a percentage of the general population.

This report provides estimates of the number of people with opioid dependence, and prevalence of opioid dependence, among people aged 15 to 64 years living in Scotland between April 2014 and March 2023. Results are stratified[3] by sex (female, male), age group (15-34, 35-49 and 50-64 years) and financial year. Estimates for seven NHS Boards (Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside) are also provided.

In addition to these formal model-based estimates, this report includes crude estimates of prevalence for the other seven NHS Boards (Borders, Dumfries and Galloway, Forth Valley, Highland, Orkney, Shetland, Western Isles). These estimates should be interpreted with caution, as these are not a direct product of the MPEP model. The approach used to calculate these crude local estimates is discussed in **Appendix 3**.

The formal model-based estimates provided are based on joint modelling of opioid-related deaths and opioid-related hospital admission data. While the evidence about prevalence across these two data sources was broadly consistent for 2014/15-2021/22, there was some inconsistency in the evidence for 2022/23. For this reason,

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[2] The term Opioid Agonist Therapy (OAT) is equivalent to the term Opioid Substitution Therapy (OST) used in other PHS publications. See **Glossary**.

[3] The production of stratified estimates using this model is dependent upon there being sufficient numbers of drug-related harm events, that are specific to the population of interest, within each stratification (e.g. by sex, age group and year). For the types of drug-related harm events used in the current model (opioid-related hospital admissions and opioid-related deaths - see **Appendix 1**), it was only possible to provide estimates for a limited number of age groups and NHS Boards in which sufficient event numbers were observed.

estimates for 2022/23 should be interpreted with caution. See **Appendix 4** for further information.

Due to changes in methodology, the estimates in this report should not be directly compared with previous estimates of the prevalence of 'problematic drug use' (Public Health Scotland, 2020).

Furthermore, as the MPEP approach remains in development, some small amendments (see **Appendix 2**) have been made to the model since the team's first report (Public Health Scotland, 2024). As a result, some estimates included in this publication may differ slightly from those reported previously.

Main points

Estimates are presented with 95% credible intervals (CrI) to represent the extent of uncertainty around each finding. All population size estimates have been rounded to the nearest hundred. See the **Glossary** for more information about any technical terms used. Due to some inconsistency in evidence across data sources, 2022/23 estimates should be interpreted with caution (see **Appendix 4** for further details).

In 2022/23:

- The estimated number of people with opioid dependence in Scotland was 43,400 (95% CrI: 41,900 to 45,100). This represents an estimated prevalence of 1.23% (95% CrI: 1.19% to 1.28%) of 15- to 64-year-olds.
- Among males aged 15 to 64 years, the prevalence of opioid dependence was estimated to be 1.74% (95% CrI: 1.67% to 1.81%). Among females aged 15 to 64 years, it was estimated to be 0.75% (95% CrI: 0.73% to 0.78%).
- The prevalence of opioid dependence was estimated as 0.67% (95% CrI: 0.62% to 0.72%) among people aged 15 to 34 years, 2.39% (95% CrI: 2.32% to 2.48%) among people aged 35 to 49 years, and 0.88% (95% CrI: 0.83% to 0.94%) among people aged 50 to 64 years.
- An estimated 66% of people with opioid dependence received opioid agonist therapy (OAT) at least once during the year, while 79% had received OAT at some point during the five-year period 2018/19 to 2022/23.

Between 2014/15 and 2022/23:

- There was evidence of a small reduction (-5,300 (95% CrI: -8,100 to -2,600)) in the estimated number of people with opioid dependence.
- There was a reduction (-8,200 (95% CrI: -9,400 to -7,000)) in the estimated number of people with opioid dependence aged 15 to 34 years and an

increase (5,700 (95% CrI: 4,900 to 6,600)) in the number aged 50 to 64 years.

Methods

A Multi-Parameter Estimation of Prevalence (MPEP) modelling approach was used to estimate the prevalence of opioid dependence in Scotland in financial years 2014/15 to 2022/23. MPEP is a type of Bayesian statistical model that brings multiple linked data sources together to make inferences about the size of the population and prevalence (Jones, et al., 2020; Downing, et al., 2023; Markoulidakis, et al., 2024). In this instance, the approach used linked PHS-held administrative data on opioid agonist therapy (OAT) prescriptions, drug-related deaths and overdose hospital admissions. Further information on the data used in the model is available in **Appendix 1**. A more technical description of the modelling approach is provided in **Appendix 2** and in Markoulidakis, et al., 2024. Note that there has been an adaptation to the model since the previous report. This is described in **Appendix 2**.

The starting point for the model is identification of all individuals in receipt, or recent receipt, of OAT. Throughout this report, the epidemiological term 'cohort' or 'baseline cohort' is used to refer to all people who have received OAT within the current year or the four preceding years - which we might think of as the 'observed' population of people with opioid dependence.

The aim of the modelling exercise is to estimate the number of people with opioid dependence who were not among the baseline cohort - from which the estimated size of the total population with opioid dependence is inferred. In this report, the difference between the estimate of the total number of people with opioid dependence and the size of the baseline cohort is referred to as the 'unobserved population' for brevity. However, we acknowledge these individuals may have been in contact with other services about their drug use.

Table 1 shows the size of the baseline cohort (i.e. 'observed population') for each of the nine years, and the number of these people who had at least one OAT prescription during each year[4,5]. Across the nine-year period, these numbers were relatively consistent. The total number of unique individuals in the cohort across the nine-year period was 48,529.

Table 1: Number of individuals in the baseline cohort ('observed') and with at least one OAT prescription, by year; 2014/15 to 2022/23

Financial Year	Observed Cohort	On OAT
2014/15	35,142	28,302
2015/16	35,329	28,819
2016/17	35,403	29,220
2017/18	35,345	29,356
2018/19	35,036	29,059
2019/20	34,933	28,855
2020/21	34,999	29,051
2021/22	34,614	29,212
2022/23	34,119	28,576

[4] 'On OAT' refers to the population who received at least one OAT prescription at some point during that year. These people may or may not have received OAT for the entire year.

[5] The size of this 'On OAT' group is slightly lower than the official figures on the numbers of people prescribed **OAT in Scotland**. The two main reasons for this difference are i) a wider age range (10 to 95 years) is used in the official figures than in this publication (15 to 64 years), and ii) OAT prescriptions for patients with no geographical data are included in the official figures but excluded from this publication.

Administrative OAT records are linked to deaths and overdose-related hospital admission records as part of the Scottish Public Health Drug Linkage Programme (SPHDLP) (see **Appendix 1** for details).

The number of unobserved people with opioid dependence is estimated from the number of additional drug-related deaths and overdose-related hospital admissions that occurred, outside of the baseline cohort population. To estimate this, some assumptions need to be made about the rates at which these adverse events occur. Since the risk of such adverse events is typically lower for individuals in receipt of OAT (McAuley, et al., 2023; Santo, et al., 2021), and the baseline cohort includes all individuals in receipt of OAT, we base our assumptions about the adverse event rates in the unobserved population on rates observed in the cohort *during periods off OAT* (i.e. when not in treatment).

Key assumptions of the model are:

1. The adverse events modelled are specific to the population of interest (people with opioid dependence), i.e. the particular types of drug-related deaths and overdose-related hospital admissions being modelled only occur among people with opioid dependence and there is no misclassification.

2. Within each demographic group, rates of these adverse events among the unobserved part of the population are represented by and equal to the rates observed among the baseline cohort during periods not on OAT.

3. The baseline cohort includes everyone in receipt of OAT. This means that all drug-related deaths and overdose-related hospital admissions (of the types being modelled) occurring outside of this cohort were among people with opioid dependence who were not currently receiving OAT.

4. Everyone in the baseline cohort is opioid-dependent.

Since, in the analyses presented in this report, the baseline cohort was defined based on any receipt of OAT within the current year or the four preceding years, assumption 4 is dependent on long-term cessation of opioid use being negligible over

a five-year period. This assumption was supported by experts in specialist drug treatment who were consulted during the course of the statistical modelling.

The MPEP approach applied in this report is based on modelling both opioid-related deaths and opioid overdose-related hospital admissions data simultaneously. The approach involves fitting three simultaneous statistical 'regression' models: to (i) drug-related death rates, (ii) overdose hospital admission rates and (iii) the unobserved portion of prevalence, i.e. the size of the 'unobserved population' as a proportion of the general population. Explanations of technical terms used in this report can be found in the **Glossary**.

The MPEP model was used to produce estimates for each financial year (1st April to 31st March) from 2014/15 to 2022/23, stratified by sex (female, male) and age group (15-34, 35-49 and 50-64 years). Denominators for prevalence were taken from mid-year population estimates published by National Records for Scotland (National Records of Scotland, 2024).

In addition to estimates for Scotland as a whole, estimates were also produced for seven NHS Boards: Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside. It was not feasible to produce estimates for all NHS Boards in this report. The selection of NHS Boards to include in this report was based on numbers of opioid-related deaths and overdose-related hospital admissions occurring in those areas (larger numbers increasing the statistical feasibility of prevalence estimation).

For the other seven Scottish territorial NHS Boards (Borders, Dumfries and Galloway, Forth Valley, Highland, Orkney, Shetland, Western Isles), crude prevalence estimates were produced using an alternative method described in **Appendix 3**. Note that these estimates are not based on the formal MPEP model and should be treated with additional caution.

Results and commentary

Estimates are presented in the following sequence: (i) Scotland overall, (ii) stratified by sex, (iii) stratified by age group, (iv) stratified by age group and sex, (v) stratified by NHS Board (Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside).

Unless otherwise indicated, the commentary below focuses on the most recent financial year for which estimates are available (2022/23). All estimates are presented with 95% credible intervals (CrIs) to represent uncertainty (see **Glossary**).

Note that the researchers found statistical evidence of inconsistency across the two data sources (drug-related deaths and overdose-related hospital admissions) for 2022/23, with one data source suggesting higher prevalence than the other. This means that the uncertainty about estimates of prevalence for 2022/23 is greater than the 95% CrIs shown suggest. For this reason, estimates for 2022/23, and estimates of changes in prevalence between 2014/15 and 2022/23, should be interpreted with caution. See **Appendix 4** and **Discussion**.

All population size estimates over 1,000 have been rounded to the nearest hundred. Estimates between 101 and 1,000 have been rounded to the nearest 10, and estimates of 100 or less to the nearest five.

Each chart displaying prevalence estimates includes a line indicating the size of the baseline cohort as a percentage of the relevant general population. These baseline cohort lines indicate the population prevalence of people who received OAT at some point during that year or the preceding four years. As this group was directly observed in the OAT data, it is not possible for the associated total population prevalence to be lower than this percentage; i.e. these lines represent 'lower bounds' for total prevalence. On that basis, the baseline cohort lines provide some indication of the reliability of the overall estimates. These lines also help in interpreting whether changes in estimated overall population size were driven by changes in the size of the 'observed' or unobserved populations.

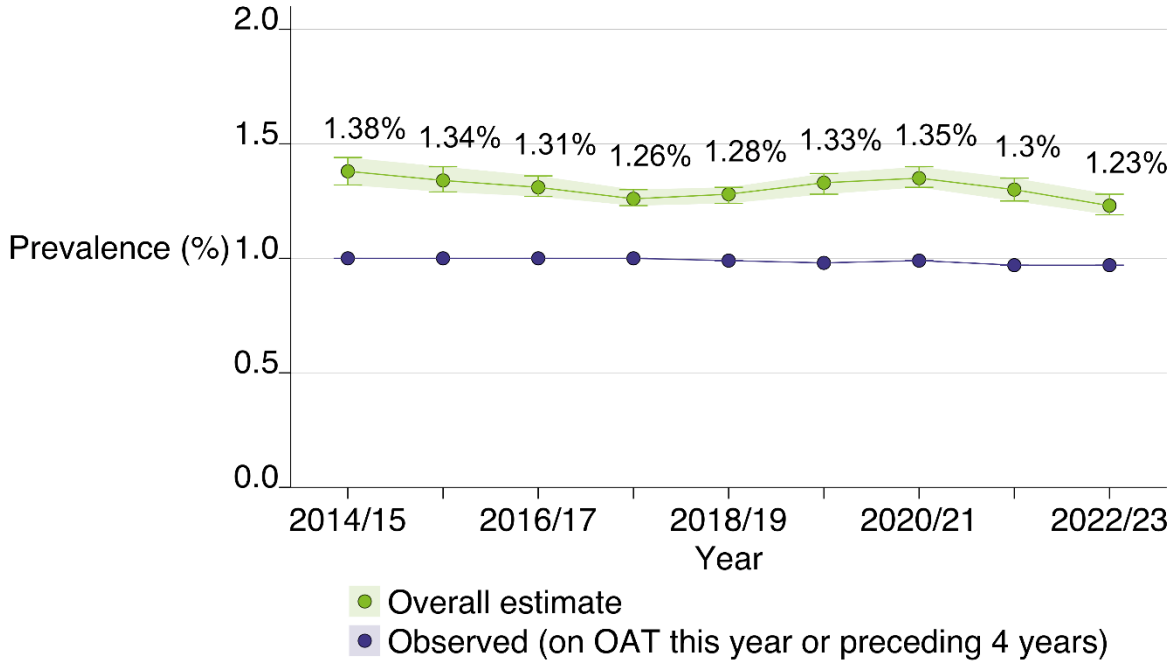
In addition to prevalence estimates, each Results section contains a chart showing the estimated percentage of people with opioid dependence that (1) received at least one OAT prescription during the year ('OAT exposure': see **Glossary**), (2) were among the observed baseline cohort (i.e. received OAT at some point in the preceding four years) but did not receive OAT in the current year, and (3) (the remainder) were 'unobserved', i.e. did not receive OAT during the year or in the preceding four years.

Estimates of the number of people with opioid dependence (corresponding to the prevalence estimates shown in the figures) are provided in the **Supplementary tables**. The tables also provide a full set of estimates for all stratifications.

Estimated overall prevalence of opioid dependence in Scotland

Figure 1 shows the estimated prevalence of opioid dependence in Scotland, among the population aged 15 to 64 years, in each year from 2014/15 to 2022/23.

Figure 1: Estimated prevalence (%) of opioid dependence among the population aged 15-64 years in Scotland; 2014/15 to 2022/23



In the most recent year of estimation, 2022/23, prevalence of opioid dependence was estimated as 1.23% (95% CrI: 1.19% to 1.28%). This corresponds to an estimate of 43,400 (95% CrI: 41,900 to 45,100) people with opioid dependence aged 15 to 64 years resident in Scotland in 2022/23.

There is some evidence that prevalence may have reduced between 2014/15 and 2022/23 by 5,300 people (95% CrI: 2,600 to 8,100) or, as prevalence, a change of -0.15% (95% CrI: -0.23% to -0.07%). This should be interpreted with caution, however, due to inconsistency in evidence across data sources for 2022/23 (see **Discussion** and **Appendix 4**).

Figure 1 also shows that the 'observed' prevalence, i.e. size of the baseline cohort as a proportion of the general population, was stable at around 1.0% across this period.

Figure 2 shows the estimated OAT exposure in each year, also indicating the estimated percentage of people with opioid dependence who were 'observed' (i.e. in the baseline cohort) despite not receiving an OAT prescription during the current year, and the percentage that were 'unobserved'.

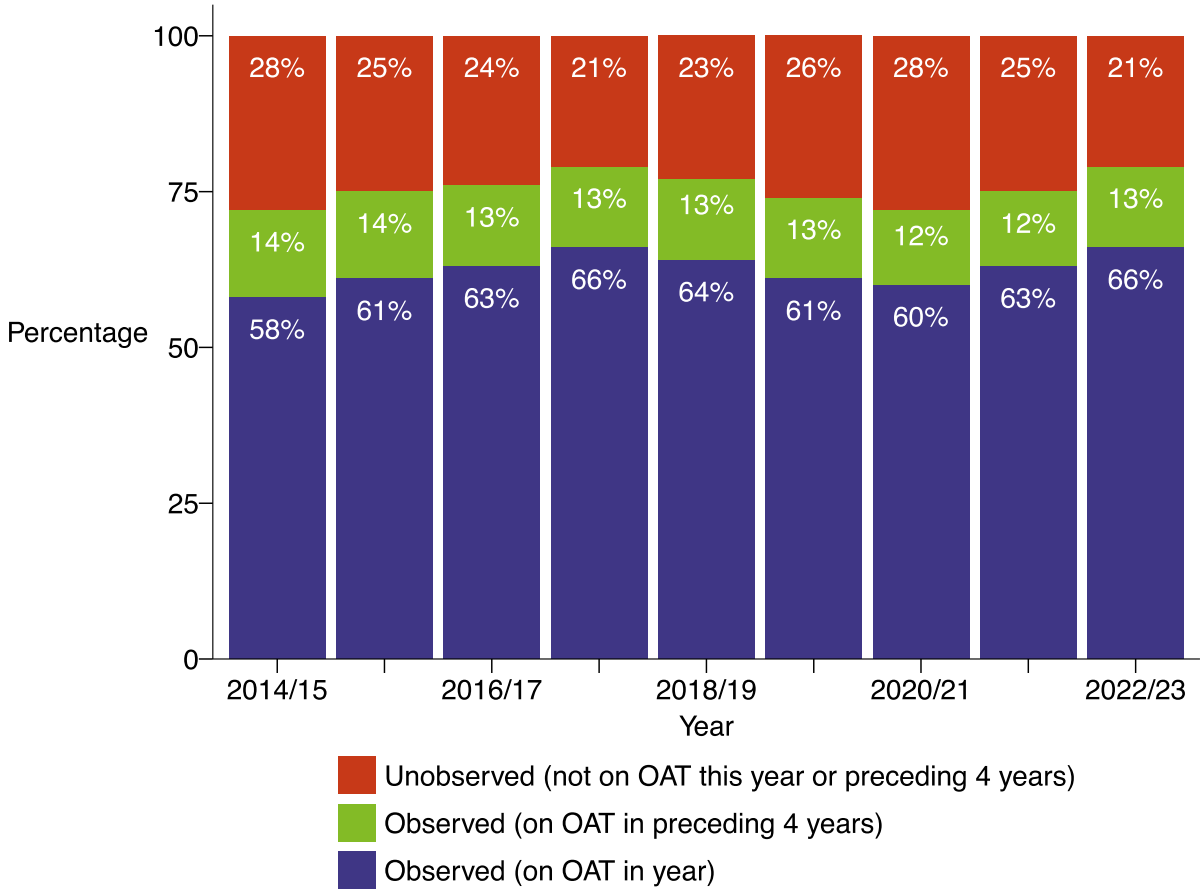
During 2022/23, 28,855 people aged 15-64 years in Scotland received OAT (Table 1). Since the estimated total number of people with opioid dependence was 43,400, the estimated OAT exposure was therefore 66% (95% CrI: 63% to 68%) (Figure 2). An additional 6,078 individuals (13% of the estimated total) had received OAT at some point in the four preceding years but not during 2022/23. The remaining 21% (95% CrI: 19% to 24%) of the total estimated population size were 'unobserved' i.e. did not receive OAT in the last five years.

Across the nine-year period, the estimated percentage of people with opioid dependence who were 'unobserved' ranged from 21% to 28%, while estimated OAT exposure ranged from 58% to 66%[6] (Figure 2).

See Tables 1 and 4 in the **Supplementary tables** for further information.

[6] Note that fluctuations in estimated OAT exposure across the nine-year period are driven mostly by differences in the estimates of the size of the unobserved population, since the cohort size and number of people receiving at least one OAT prescription was relatively stable (Table 1).

Figure 2: Estimated breakdown of treatment status for people with opioid dependence in Scotland; 2014/15 to 2022/23[1]

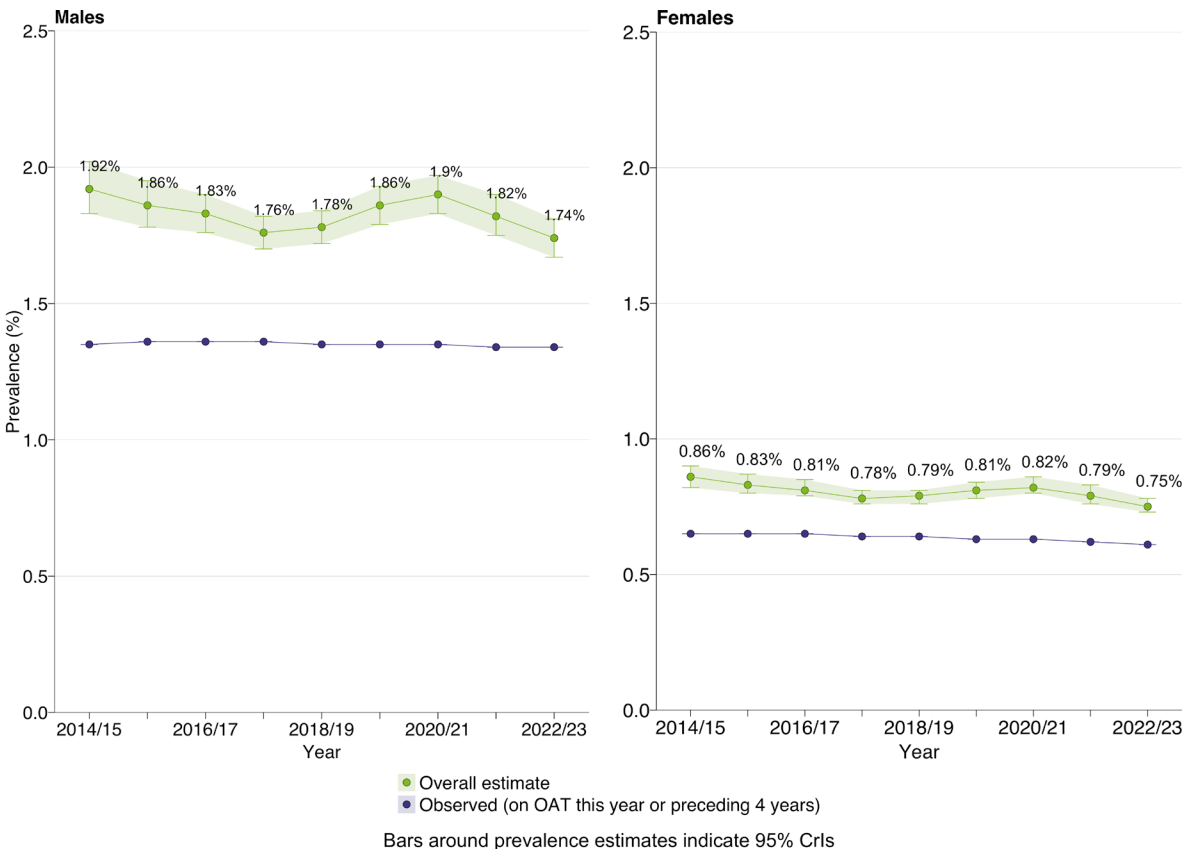


[1] In these plots, 'Observed (on OAT in year)' refers to the population who received at least one OAT prescription at some point during that year (equivalent to 'OAT exposure'). These people may or may not have received OAT for the entire year.

Estimated prevalence of opioid dependence in Scotland by sex

Figure 3 shows the estimated prevalence of opioid dependence for females and males separately.

Figure 3: Estimated prevalence (%) of opioid dependence in Scotland by sex; 2014/15 to 2022/23



In 2022/23, prevalence of opioid dependence was estimated as 1.74% (95% CrI: 1.67% to 1.81%) for males, and 0.75% (95% CrI: 0.73% to 0.78%) for females. This corresponds to an estimate of 29,900 (95% CrI: 38,700 to 31,100) males and 13,500 (95% CrI: 13,100 to 14,100) females with opioid dependence aged 15 to 64 years resident in Scotland in 2022/23 (**Supplementary tables**: Table 2).

There was an estimated reduction of 1,800 (95% CrI: 1,000 to 2,600) females with opioid dependence between 2014/15 and 2022/23 (in terms of prevalence, a change

of -0.10% (95% CrI: -0.06% to -0.15%)). Among males, there was an estimated reduction of 3,500 people (95% CrI: 1,500 to 5,500), or -0.19% (95% CrI: -0.07% to -0.31%) over the same time period. As before, these reductions should be interpreted with caution.

The estimated percentage of people with opioid dependence who were male was consistent across the nine-year period at 69%: i.e. it is estimated that, in each year, just over two-thirds of people with opioid dependence in Scotland were male.

Figure 4: Estimated breakdown of treatment status for males and females with opioid dependence in Scotland; 2014/15 to 2022/23

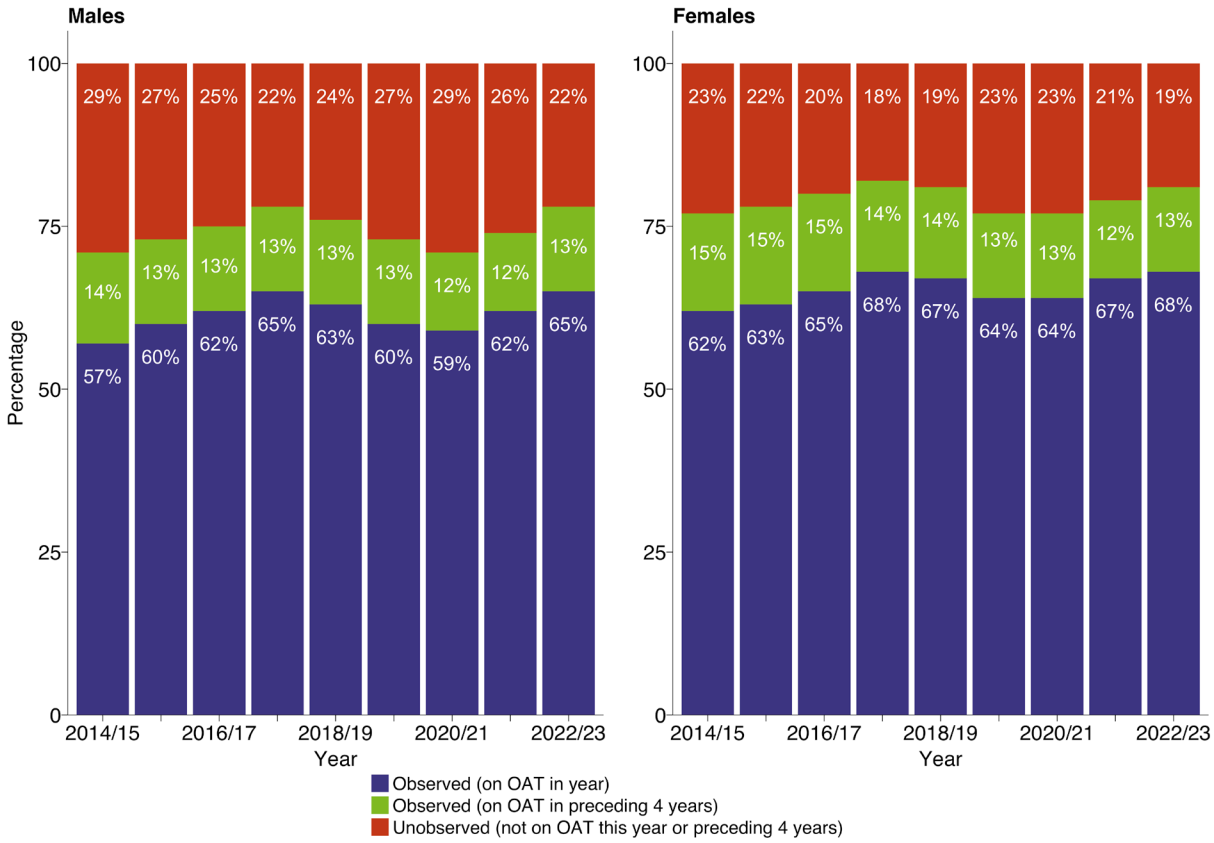
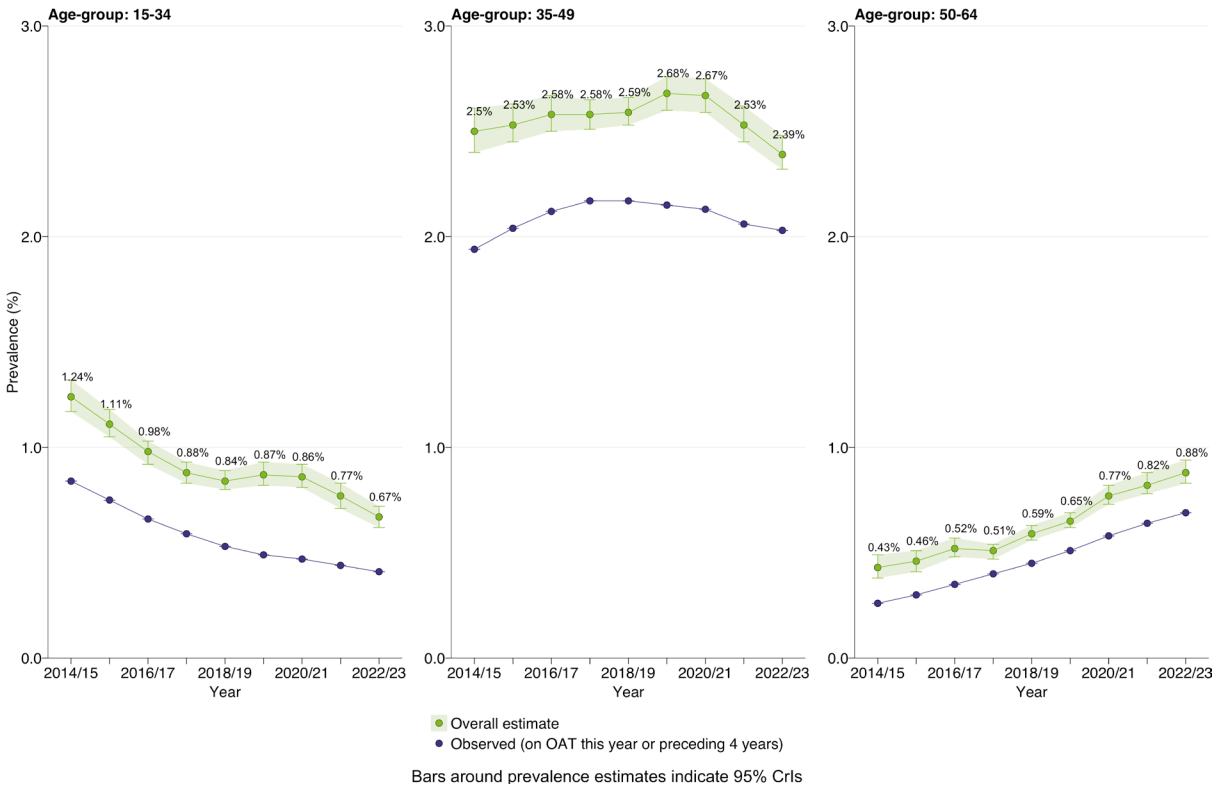


Figure 4 shows estimated OAT exposure for females and males separately. In 2022/23, an estimated 68% (95% CrI: 66% to 71%) of opioid-dependent females received at least one OAT prescription. This was slightly higher than the estimated OAT exposure of 65% (95% CrI: 62% to 67%) among males. See Table 5 in the **Supplementary tables** for more information.

Estimated prevalence of opioid dependence in Scotland by age group

Figure 5 shows the estimated prevalence of opioid dependence by age group, among those aged between 15 and 64 years.

Figure 5: Estimated prevalence (%) of opioid dependence in Scotland by age group; 2014/15 to 2022/23



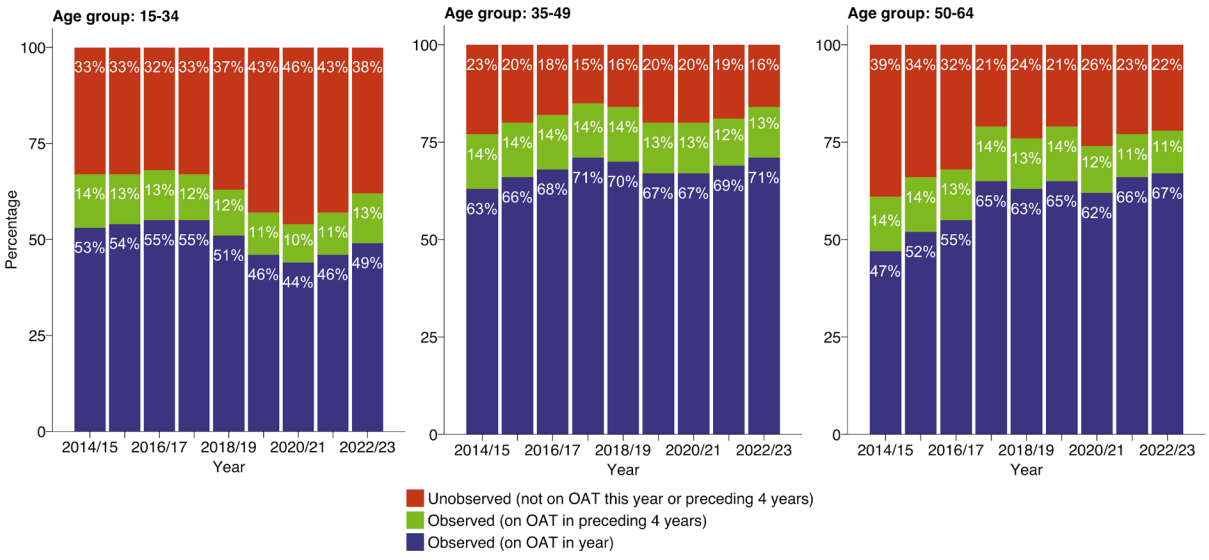
In 2022/23, prevalence of opioid dependence was estimated as 0.67% (95% CrI: 0.62% to 0.72%) among those aged 15 to 34 years, 2.39% (95% CrI: 2.32% to 2.48%) among those aged 35 to 49 years and 0.88% (95% CrI: 0.83% to 0.94%) among those aged 50 to 64 years.

There has been a clear change in age demographics over time. The estimated number of people with opioid dependence aged 15 to 34 years reduced from 17,100

(95% CrI: 16,100 to 18,200) in 2014/15 to 8,900 (95% CrI: 8,200 to 9,600) in 2022/23. Over the same time period, the estimated number of people with opioid dependence aged 50 to 64 years increased from 4,600 (95% CrI: 4,000 to 5,200) to 10,300 (95% CrI: 9,700 to 11,000). These changes were also apparent among the baseline cohort (**Supplementary tables**: Table 3).

Figure 6 shows estimated OAT exposure by age group. In 2022/23, OAT exposure was estimated to be lower, 49% (95% CrI: 45% to 53%), among 15- to 34-year-olds, with only an estimated 62% being 'observed'. Among 35- to 49-year-olds with opioid dependence, the largest group in size, estimated OAT exposure in 2022/23 was 71% (95% CrI: 69% to 74%), while 84% received at least one prescription during the year or the four preceding years. An estimated 67% (95% CrI: 63% to 72%) of people with opioid dependence aged 50 to 64 years received at least one OAT prescription during the year, and 78% in total were 'observed' (i.e. had received OAT during the current year or in the four preceding years). See Table 7 in the **Supplementary tables** for more information.

Figure 6: Estimated breakdown of treatment status for selected age groups of people with opioid dependence in Scotland; 2014/15 to 2022/23



Estimated prevalence of opioid dependence in Scotland by age group and sex

Figure 7 shows the estimated prevalence, and Figure 8 the estimated OAT exposure, for each age-sex group in each of the nine years.

In all nine years, estimated prevalence was highest among men aged 35 to 49 years. In 2022/23, an estimated 3.31% (95% CrI: 3.20% to 3.44%) or 16,300 (95% CrI: 15,800 to 16,900) men in this age group were opioid-dependent. Of these, 15,171 men or 83% (95% CrI: 80% to 86%) were 'observed', i.e. had received OAT during this year or in the four preceding years, with 70% (95% CrI: 68% to 73%) receiving at least one OAT prescription during 2022/23.

The estimated increase in the number of people with opioid dependence aged 50-64 and reduction in number aged 15-34 over the nine-year period was apparent among both males and females (Figure 7).

For each year since 2015/16, the group with the lowest estimated OAT exposure was males aged 15-34. During 2022/23, an estimated 45% (95% CrI: 41% to 49%) of this group received OAT, while 42% (95% CrI: 37% to 47%) were unobserved (i.e. had not received any OAT in the last five years) (Figure 8).

See Tables 4 and 8 in the **Supplementary tables** for more information.

Figure 7: Estimated prevalence (%) of opioid dependence in Scotland by age-sex group; 2014/15 to 2022/23

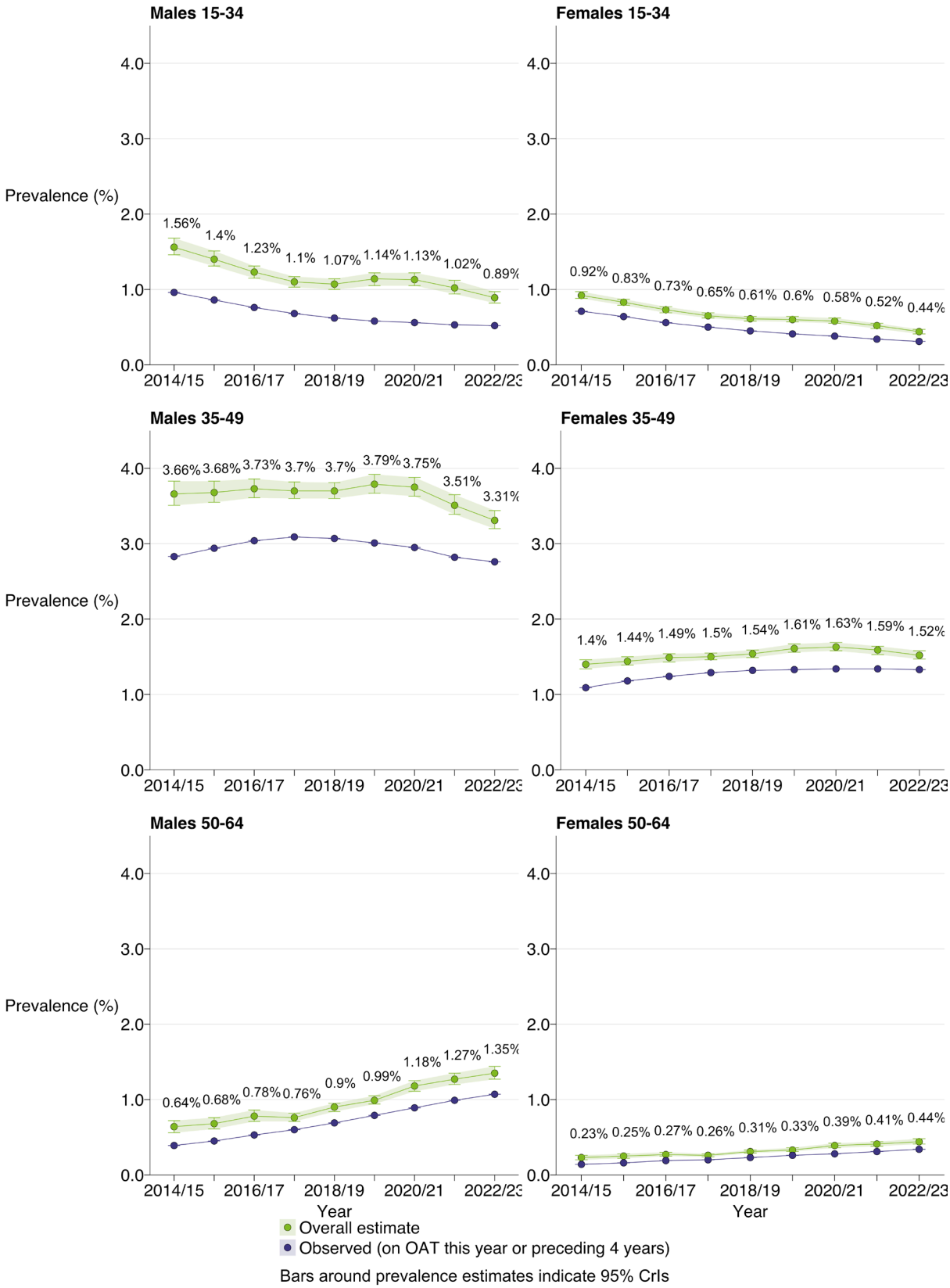
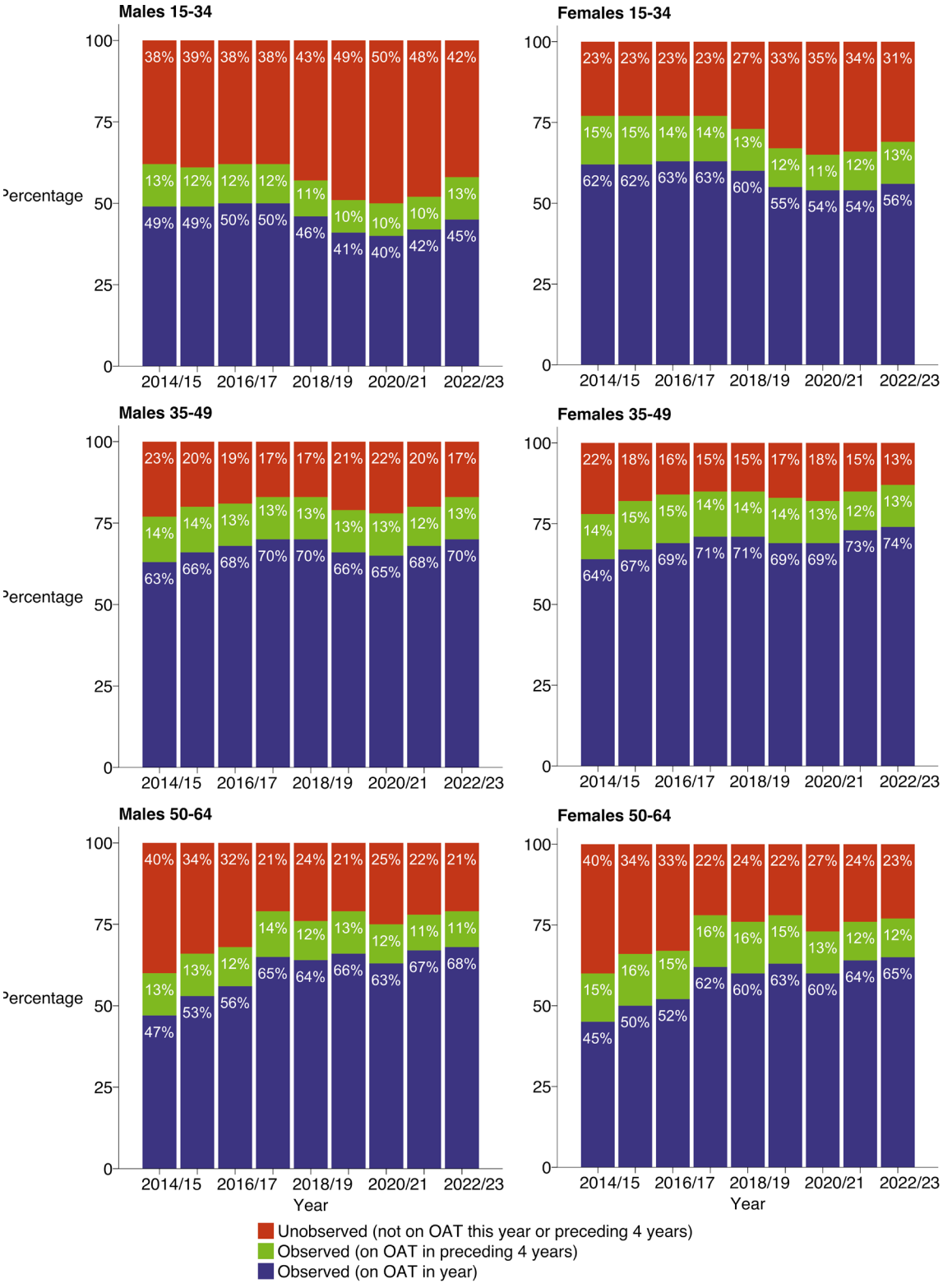


Figure 8: Estimated breakdown of treatment status for selected age-sex groups of people with opioid dependence in Scotland; 2014/15 to 2022/23

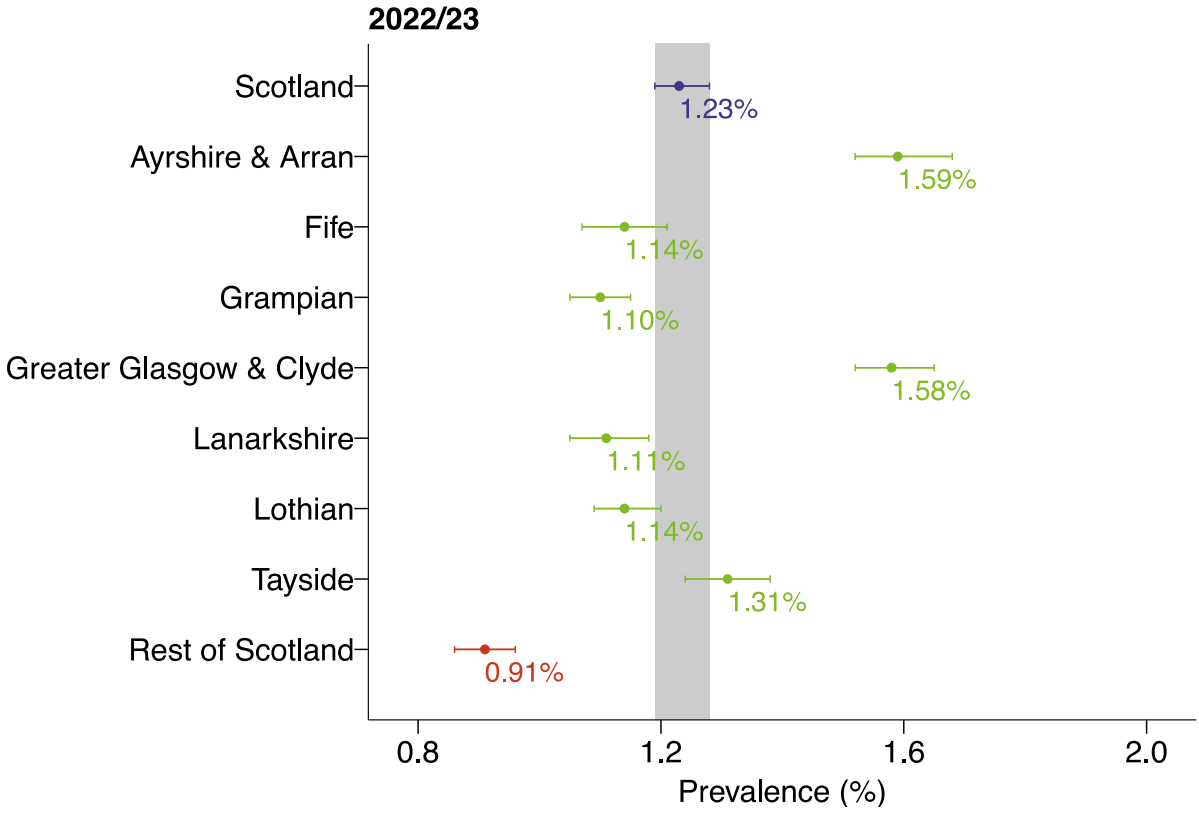


Estimated prevalence of opioid dependence in selected NHS Boards

Figure 9 shows the estimated prevalence of opioid dependence in 2022/23 for each of the seven NHS Boards included in the model (Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside). The overall 2022/23 estimate for Scotland is also shown on Figure 9, with the grey shaded region representing the 95% CrI around this estimate.

By NHS Board, the estimated prevalence of opioid dependence in 2022/23 was 1.59% (95% CrI: 1.52% to 1.68%) in Ayrshire and Arran, 1.14% (95% CrI: 1.07% to 1.21%) in Fife, 1.10% (95% CrI: 1.05% to 1.15%) in Grampian, 1.58% (95% CrI: 1.52% to 1.65%) in Greater Glasgow and Clyde, 1.11% (95% CrI: 1.05% to 1.18%) in Lanarkshire, 1.14% (95% CrI: 1.09% to 1.20%) in Lothian, and 1.31% (95% CrI: 1.24% to 1.38%) in Tayside.

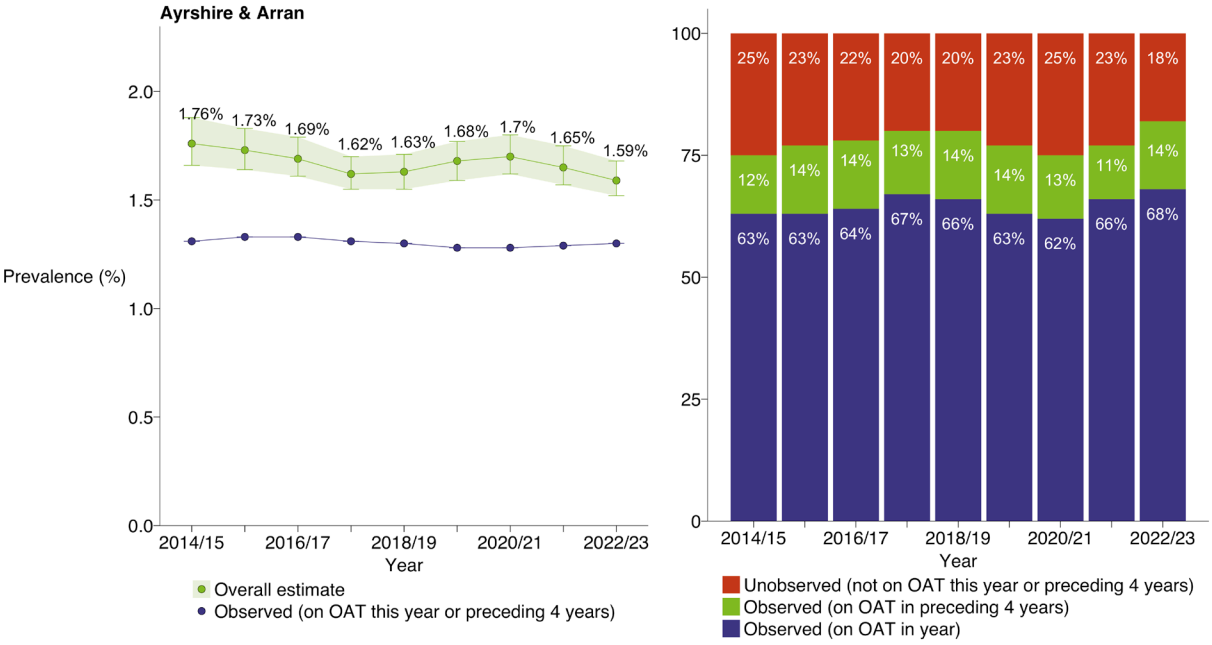
Figure 9: Estimated prevalence (%) of opioid dependence by NHS Board; 2022/23



In order to produce the estimate for Scotland overall, the statistical model also produces an estimate of prevalence in the 'Rest of Scotland'. This represents overall estimated prevalence across the other seven NHS Boards combined: Borders, Dumfries and Galloway, Forth Valley, Highland, Orkney, Shetland, and Western Isles. This is not intended to be interpreted directly, since prevalence is likely to vary across these different regions, but is used later in the report to produce crude prevalence estimates for each of these NHS Boards separately (see **Appendix 3**).

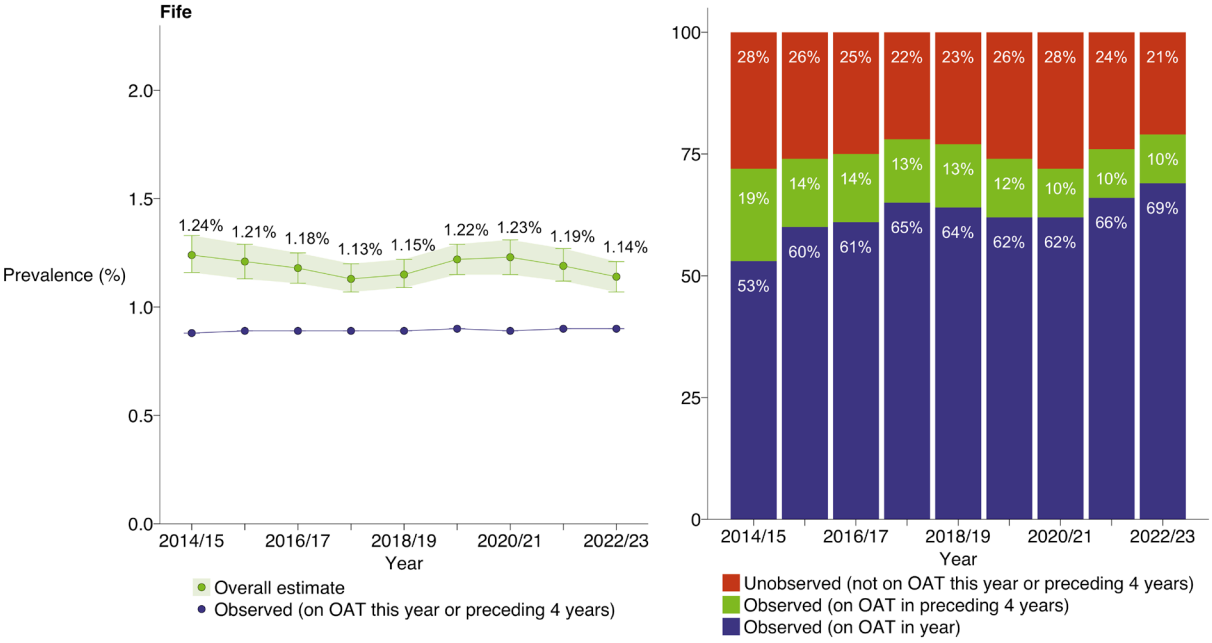
Figures 10 to 16 show estimated prevalence by NHS Board (Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside, respectively).

Figure 10: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Ayrshire & Arran; 2014/15 to 2022/23



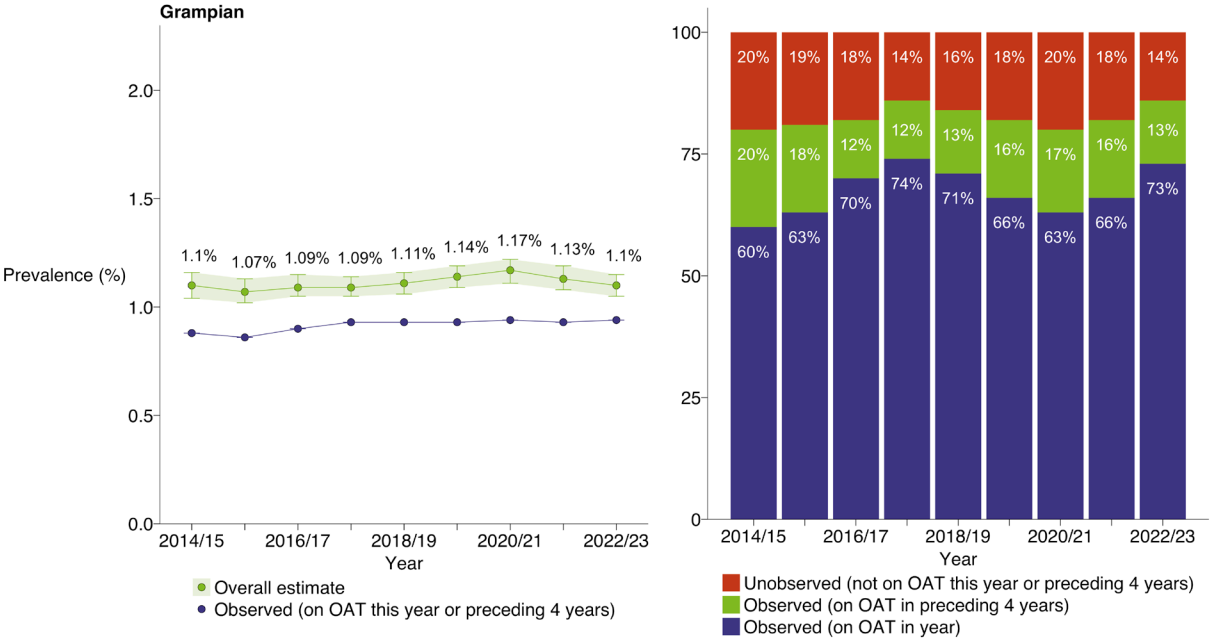
In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Ayrshire and Arran was estimated as 1.59% (95% CrI: 1.52% to 1.68%), or 3,600 (95% CrI: 3,400 to 3,800) people. The estimated OAT exposure was 68% (95% CrI: 64% to 71%) and an estimated 82% (95% CrI: 77% to 81%) had received OAT at some point in the past five years.

Figure 11: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Fife; 2014/15 to 2022/23



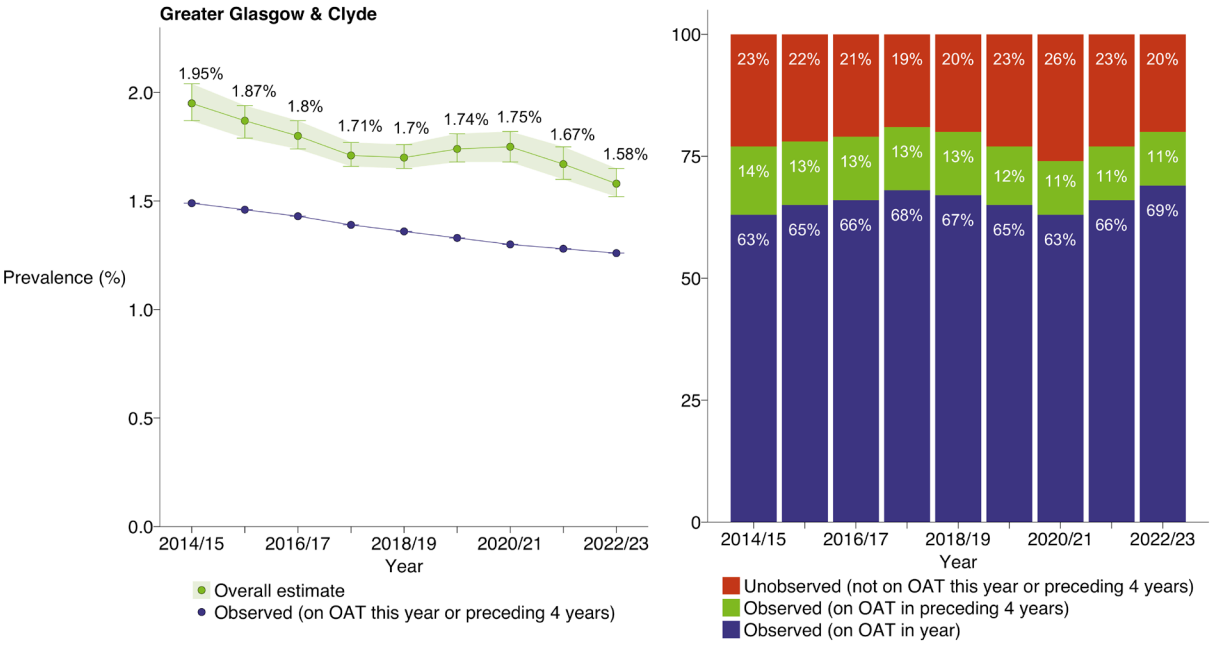
In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Fife was estimated as 1.14% (95% CrI: 1.07% to 1.21%), or 2,700 (95% CrI: 2,500 to 2,800) people. The estimated OAT exposure was 69% (95% CrI: 65% to 73%) and an estimated 79% (95% CrI: 75% to 84%) had received OAT at some point in the past five years.

Figure 12: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Grampian; 2014/15 to 2022/23



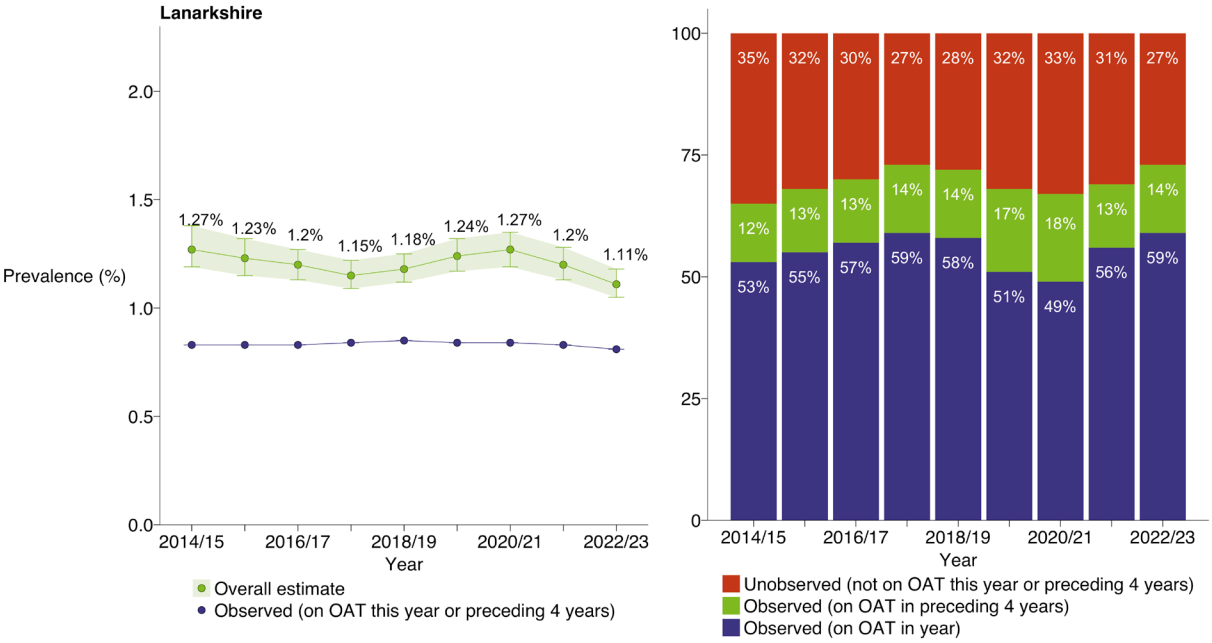
In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Grampian was estimated as 1.10% (95% CrI: 1.05% to 1.15%), or 4,100 (95% CrI: 3,900 to 4,300) people. The estimated OAT exposure was 73% (95% CrI: 69% to 76%) and an estimated 86% (95% CrI: 82% to 89%) had received OAT at some point in the past five years.

Figure 13: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Greater Glasgow and Clyde; 2014/15 to 2022/23



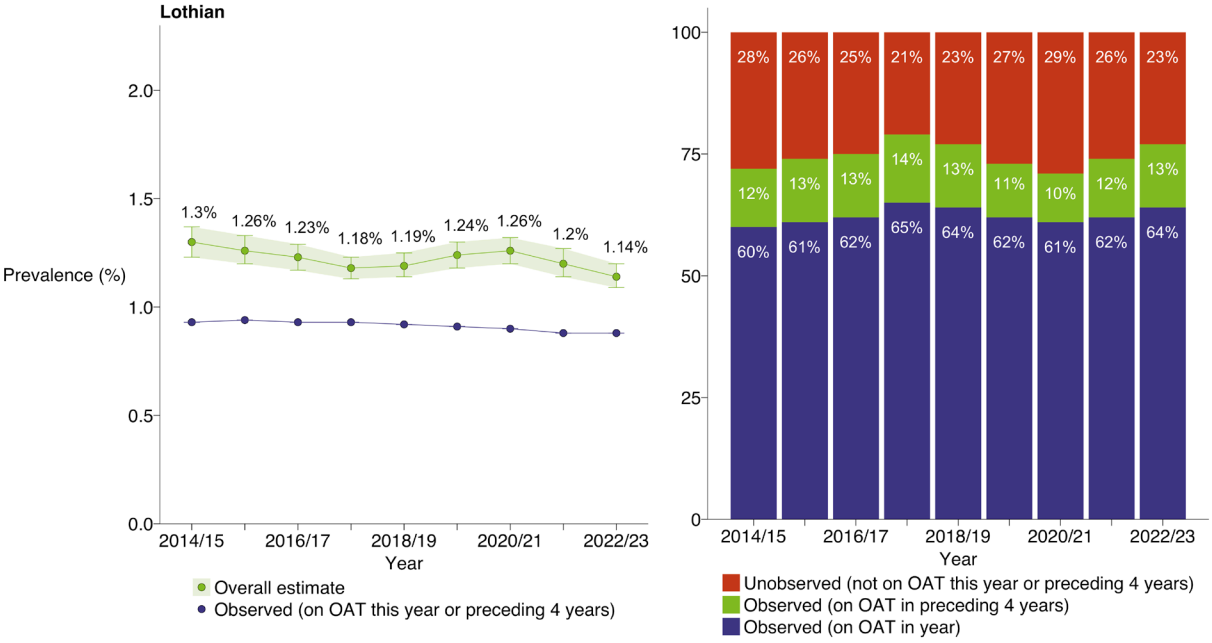
In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Greater Glasgow and Clyde was estimated as 1.58% (95% CrI: 1.52% to 1.65%), or 12,600 (95% CrI: 12,100 to 13,100) people. The estimated OAT exposure was 69% (95% CrI: 66% to 71%) and an estimated 80% (95% CrI: 76% to 83%) had received OAT at some point in the past five years.

Figure 14: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Lanarkshire; 2014/15 to 2022/23



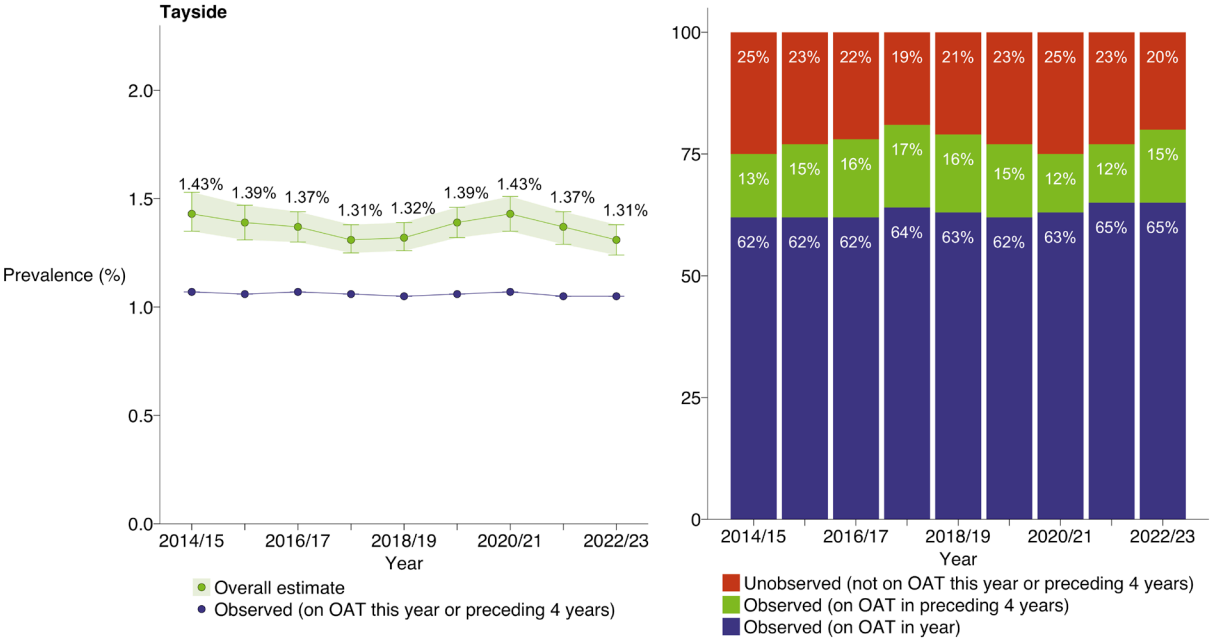
In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Lanarkshire was estimated as 1.11% (95% CrI: 1.05% to 1.18%), or 4,800 (95% CrI: 4,500 to 5,100) people. The estimated OAT exposure was 59% (95% CrI: 55% to 62%) and an estimated 73% (95% CrI: 69% to 77%) had received OAT at some point in the past five years.

Figure 15: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Lothian; 2014/15 to 2022/23



In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Lothian was estimated as 1.14% (95% CrI: 1.09% to 1.20%), or 7,000 (95% CrI: 6,600 to 7,300) people. The estimated OAT exposure was 64% (95% CrI: 61% to 67%) and an estimated 77% (95% CrI: 73% to 81%) had received OAT at some point in the past five years.

Figure 16: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in NHS Tayside; 2014/15 to 2022/23



In 2022/23, prevalence of opioid dependence among people aged 15 to 64 years resident in Tayside was estimated as 1.31% (95% CrI: 1.24% to 1.38%), or 3,400 (95% CrI: 3,200 to 3,600) people. The estimated OAT exposure was 65% (95% CrI: 62% to 68%) and an estimated 80% (95% CrI: 76% to 85%) had received OAT at some point in the past five years.

Crude prevalence estimates for the other seven NHS Boards are presented in **Appendix 3**.

Discussion

Summary and Implications

The estimated number and prevalence of people aged 15-64 years with opioid dependence in Scotland in 2022/23 were 43,400 (95% CrI: 41,900 to 45,100) and 1.23% (95% CrI: 1.19% to 1.28%) respectively. The prevalence of opioid dependence may have changed slightly from 2014/15 to 2022/23, with some evidence of a reduction.

Findings related to 2022/23 should be interpreted with caution, however, due to inconsistencies between the evidence on prevalence from the two types of event data. For 2022/23, modelling based on the opioid-related deaths data suggests slightly higher prevalence than the hospitalisations data (**Appendix 4**). For this reason, there is slightly more uncertainty about the 2022/23 estimates than the 95% CrI indicates. The researchers are exploring potential reasons for the inconsistency: see **Limitations and next steps**.

Between 2014/15 and 2022/23, the size of the 'observed' population of people with opioid dependence - defined as those who have received OAT during the year or in the four years prior - remained stable, at approximately 1% of the Scottish population aged 15-64 years.

In the previous report, a clear reduction was observed in the number of people with opioid dependence aged 15 to 34 years and an increase in the number aged 50 to 64 years between 2014/15 and 2019/20 (Public Health Scotland, 2024). These trends have continued through to 2022/23. It is very likely that these changes were driven primarily through an ageing cohort of people who are opioid dependent in combination with comparatively little growth in the number of new initiates/incident cases. This was shown by Lewer, et al., 2022 in their analysis of duration and incidence of injecting in England and Scotland - which suggested that incidence of opioid use/injecting peaked in late 1990s with lower incidence in the 2000s. The purpose of this report was not to assess the range of factors that could influence these trends.

We note that the changes in age composition were very similar to those observed in other drug-related statistics (Public Health Scotland, 2024b; Public Health Scotland, 2024c) and peer reviewed journal articles (Lewer, et al., 2022; McDonald, et al., 2021; Parkinson, et al., 2018) which also concluded that Scotland has an ageing cohort of people with opioid dependence. Data from the Needle Exchange Surveillance Initiative (Public Health Scotland, 2024c) continues to suggest that people typically initiate injecting drugs in their early 20s, rather than later in life - further indicating that people with opioid dependence in Scotland are getting older rather than initiating opioid use at older ages.

There is no evidence of an increase in the population of people who are opioid dependent, suggesting that observed increases in the number of drug-related deaths (National Records of Scotland, 2024) were due to the increased mortality risk experienced by people who use opioids, with some additional contribution from increased mortality risk associated with the population ageing (McAuley, et al., 2023). In the future, the population estimates generated in this report will be used within a dynamic model to simulate trends in drug-related deaths, OAT, and the population of people who are opioid dependent in Scotland. This work will be conducted as part of a collaborative grant-funded project (**EPHESUS** - 'Evaluating the Public Health Impact of Interventions for the Prevention of Drug-related Deaths in the Population: in Scotland') between PHS, the University of Bristol, and Glasgow Caledonian University, supported by the NIHR.

These estimates suggest that prevalence of opioid dependence is high in Scotland compared to many other countries. In England, estimates based on capture-recapture methodology suggest there were 294,000 opioid users in 2022/23, a prevalence of 0.8% (Office for Health Improvement and Disparities & UK Health Security Agency, 2023). Estimates of the prevalence of opioid dependence across Western Europe, generated using a variety of different methods, are mostly below 0.5%, with Finland reporting the highest estimate outside of the UK at 0.7% (EMCDDA, 2023). Estimates may not be directly comparable across countries due to differences in the methodologies used. However, noting that the size of the baseline cohort (people known to have received OAT in a specific year or the four preceding years) was around 1.0% of the Scottish population aged 15 to 64 years in 2022/23

(Figure 1), there is a clear indication that the prevalence of opioid dependence is higher in Scotland than in other comparable countries. This report also presents estimates for selected NHS Board areas in Scotland. Whilst not directly comparable to the national estimates produced for England and Western European countries, it is notable that the estimated prevalence of opioid dependence in Scottish NHS Board areas, including rural and remote areas, was also higher than these national and international benchmarks.

Estimated OAT exposure was high compared to many sites globally (Larney, et al., 2017), with an estimated 66% of the estimated number of people with opioid dependence having received at least one OAT prescription in 2022/23 and 79% in receipt of OAT at some point during the last five years. Receipt of an OAT prescription is essential for prevention of drug-related harms (Degenhardt, 2019) but is only one component of a prevention strategy. OAT should be considered in the context of the expectations set out by the **Medication Assisted Treatment** (MAT) Standards for Scotland, as part of holistic support package with access to recovery supports. Part of the work proposed as part of EPHESUS will assess the impact of MAT Standards implementation on OAT retention and coverage.

Previous estimates of the number of 'problem drug users' in Scotland in 2015/16 (Public Health Scotland, 2020). were higher than the estimated number of people with opioid dependence in this report. However, these estimates were derived using different statistical approaches and used a slightly different definition of problematic drug use based on opioids and/or benzodiazepines. Therefore, the findings from these two exercises should not be directly compared.

Limitations and next steps

This Official statistics in development report describes the second application of a Bayesian MPEP modelling approach to estimate prevalence of opioid dependence in Scotland. As with any type of modelling approach, the reliability of estimates is dependent on assumptions. Key assumptions underpinning the results presented in this report are listed in the **Methods** section and described in Markoulidakis, et al., 2024.

The model assumes that the baseline cohort includes everyone receiving OAT. However, it is likely that some people receiving OAT have been missed, since the data does not currently include records of OAT prescriptions received while in prison. If some drug-related deaths were in people who have received OAT in prison (but not in the community) and were incorrectly attributed to the 'unobserved' population, estimated prevalence may be biased. The extent of this problem is not anticipated to be substantial. At the time of publication, PHS are making progress in linking Scottish prison custody information to the SPHDLP dataset, potentially addressing this gap in the data. In addition, some community OAT prescriptions may be missing due to 1) the prescribing of injectable buprenorphine via hospital stock order in some areas (ScotPHO); and 2) the absence of a patient Community Health Index (CHI) number: see **Appendix 1**. The impact of gaps in community prescription data is likely minimal on a national level, but variation in prescribing practices and CHI capture across regions and years should be considered when interpreting local estimates.

An additional key assumption is that the events modelled are specific, i.e. only occur among people with opioid dependence. If some of the overdose deaths or hospital admissions included were in people who were not opioid dependent, prevalence could be over-estimated (Markoulidakis, et al., 2024).

As described above and in **Appendix 4**, for the most recent year (2022/23) there was some inconsistency in the evidence about prevalence from the two data sources modelled. Estimates for 2022/23 should therefore be interpreted with caution. The PHS team and researchers are exploring the reasons for this inconsistency, in particular whether there have been any changes in coding of hospital admission episodes. The researchers are also exploring the potential to include an additional event type - incidents attended by Scottish Ambulance Service where naloxone (an opioid antidote) was used to treat an opioid overdose - to further assess the consistency of evidence across multiple indicators.

This report provides estimates of the size of the population with potential to benefit from OAT, but does not explicitly produce estimates of the number of these individuals who may have developed dependence on opioids following prescriptions for chronic pain. The model assumes that people who enter OAT through dependence on prescription opioids and are at risk of drug related harm will be

included but these assumptions will be further explored to gauge whether the models need to be extended.

As the population of people dependent on opioids ages, it can be expected that some people in the population are now aged over 64 years - the current upper limit considered in this report. The PHS team and researchers will consider extending this limit in future iterations of this report.

In this second iteration of the revised methodology, model-based prevalence estimates have been derived for Scotland and for seven of the fourteen individual NHS Boards (compared with three in the initial report). There are some statistical challenges in applying the MPEP model to derive estimates for all NHS Boards, particularly those with the lowest numbers of opioid-related deaths and overdose-related hospital admissions. In **Appendix 3**, we provide crude prevalence estimates for the other seven NHS Boards. These crude estimates rely on additional assumptions about consistency of OAT coverage across these seven Boards, and completeness of OAT prescribing data on a local level. As these additional assumptions may not hold, these crude estimates should be interpreted with caution.

Glossary

Administrative data

Administrative data is information created when people interact with public services, such as the NHS or criminal justice system. These organisations keep records of these interactions for operational purposes: to enable them to carry out their day-to-day work and to deliver services in an effective way. They are also routinely shared with government or other authorised bodies (such as PHS) for the purpose of monitoring and improving performance and may be published in order to provide the public and other stakeholders with information about service activity or demand.

Credible Interval (CrI)

All estimates from statistical models - such as the estimates of the number or prevalence of people with opioid dependence shown in this report - come with a degree of uncertainty. Alongside such estimates, we show 'credible intervals' which represent the extent of uncertainty associated with each finding. The width of the credible interval gives an indication of the reliability of the value: i.e. the narrower the interval, the more reliable the value. A 95% credible interval indicates the numerical range within which there is a 95% probability (i.e. a 19 in 20 chance) that the true value lies, according to the statistical model.

Opioid Agonist Therapy (OAT)

Opioid Agonist Therapy (OAT), such as methadone and buprenorphine, is treatment prescribed to prevent withdrawal and reduce cravings for opioid drugs. This is equivalent to the term Opioid Substitution Therapy (OST) used in other PHS publications.

OAT exposure

OAT exposure or coverage describes the percentage of people with opioid dependence receiving OAT. In this report, we use the term 'OAT exposure' per financial year to refer specifically to the percentage who received at least one OAT prescription during the year. Note that receipt of at least one OAT prescription in a year does not necessarily imply continuous OAT during the year.

Prevalence

Prevalence of a specific characteristic, such as opioid dependence, is defined as the total number of individuals/cases with the characteristic as a percentage of the general population.

Observed population or baseline cohort

Throughout this report, the terms 'observed population' and 'baseline cohort' are used interchangeably to refer to all people who received at least one OAT prescription during the year or during the four preceding years. In this report and analysis, it is assumed that all people in the baseline cohort are opioid dependent.

Unobserved population

In this report, 'unobserved population' is used to refer to people with opioid dependence who were not among the baseline cohort. The size of the unobserved population (and therefore of the total population) is estimated from the model.

Total population

'Total population' is used in this report to refer to the total number of people with opioid dependence. By definition, it is equal to the size of the observed population plus the size of the unobserved population.

Bibliography

Best, N., Mason, A., & Richardson, S. (2012). Two-pronged strategy for using DIC to compare selection models with non-ignorable missing responses. *Bayesian Analysis*, 109-146.

Degenhardt, D., Grebely, J., Stone, J., Hickman, M., Vickerman, P., Marshall, B., . . . Larney, S. (2019). Global patterns of opioid use and dependence: harms to populations, interventions, and future action. *The Lancet, 394*(10208), 1560-1579.

Downing, B., Hickman, M., Jones, N., Larney, D., Sweeting, M., Xu, Y., . . . Jones, H. (2023). Prevalence of opioid dependence in New South Wales, Australia, 2014–16: Indirect estimation from multiple data sources using a Bayesian approach. *Addiction*, 1994-2006.

EMCDDA. (1997, January 1). *Estimating the prevalence of problem drug use in Europe. Monographs*. Retrieved from https://www.emcdda.europa.eu/html.cfm/index34027EN.html_en

EMCDDA. (2023). *Statistical Bulletin 2023 - problem drug use*. Retrieved from https://www.emcdda.europa.eu/data/stats2023/pdu_en

Heikkinen, M., Taipale, H., Tanskanen, A., Mittendorfer-Rutz, E., Lähteenvuo, M., & Tiihonen, J. (2022). Real-world effectiveness of pharmacological treatments of opioid use disorder in a national cohort. *Addiction*, 1683-1691.

Jones, H. E., Harris, R. J., Downing, B. C., Pierce, M., Millar, T., Aded, A. E., . . . Hickman, M. (2020). Estimating the prevalence of problem drug use from drug-related mortality data. *Addiction*, 2393-2404.

Jones, H., Welton, N., Ades, A., Pierce, M., Davies, W., Coleman, B., . . . Hickman, M. (2016). Problem drug use prevalence estimation revisited: heterogeneity in capture--recapture and the role of external evidence. *Addiction*, 438-447.

Larney, S., Peacock, A., Leung, J., Colledge, S., Hickman, M., Vickerman, P., . . . Strang, J. (2017). Global, regional, and country-level coverage of interventions

to prevent and manage HIV and hepatitis C among people who inject drugs: a systematic review. *The Lancet Global Health*, 1208-1220.

Lewer, D., Croxford, S., Desai, M., & Emanu, E. (2022). The characteristics of people who inject drugs in the United Kingdom: changes in age, duration, and incidence of injecting, 1980–2019, using evidence from repeated cross-sectional surveys. *Addiction*, 2471-2480.

Lewer, D., Croxford, S., Desai, M., Emanuel, E., Hope, V., McAuley, A., . . . Tweed, E. (2022). The characteristics of people who inject drugs in the United Kingdom: changes in age, duration, and incidence of injecting, 1980–2019, using evidence from repeated cross-sectional surveys. *Addiction*.

Markoulidakis, A., Hickman, M., McAuley, A., Barnsdale, L. R., Welton, N. J., Glancy, M., . . . Horsburgh, K. (2024). Prevalence of opioid dependence in Scotland 2015–2020: A multi-parameter estimation of prevalence (MPEP) study. *Addiction*.

McAuley, A., Fraser, R., Glancy, M., Yeung, A., Jones, H. E., Vickerman, P. T., . . . Hutc. (2023). Mortality among individuals prescribed opioid-agonist therapy in Scotland, UK, 2011–20: a national retrospective cohort study. *The Lancet Public Health*, 484-493.

McDonald, S., McAuley, A., Hickman, M., Bird, S., Weir, A., Templeton, K., . . . Hutchinson, S. (2021). Increasing drug-related mortality rates over the last decade in Scotland are not just due to an ageing cohort: A retrospective longitudinal cohort study. *International Journal of Drug Policy*, 103286.

National Records of Scotland. (2024, August 20). *Drug-related deaths in Scotland in 2023*. Retrieved from National Records of Scotland: https://www.nrscotland.gov.uk/publications/drug-related-deaths-in-scotland-in-2023/

National Records of Scotland. (2024, October 8). *Mid-2023 population estimates*. Retrieved from National Records of Scotland: https://www.nrscotland.gov.uk/publications/mid-2023-population-estimates/

Office for Health Improvement and Disparities, & UK Health Security Agency. (2023, October 24). *Opiate and/or crack cocaine use prevalence estimates in England: 2019 to 2020*. Retrieved from https://www.gov.uk/government/publications/opiate-and-crack-cocaine-use-prevalence-estimates

Parkinson, J., Minton, J., Lewsey, J., Bouttell, J., & McCartney, G. (2018). Drug-related deaths in Scotland 1979–2013: evidence of a vulnerable cohort of young men living in deprived areas. *BMC Public Health*, 1-9.

Presanis, A., Ohlssen, D., Spiegelhalter, D., & Angelis, D. (2013). Conflict Diagnostics in Directed Acyclic Graphs, with Applications in Bayesian Evidence Synthesis. *Statistical Science*, 376–397.

Public Health Scotland. (2020, June 2). *Prevalence of Problem Drug Use in Scotland: 2015/16 Estimates, a review of definitions and statistical methods*. Retrieved from https://publichealthscotland.scot/publications/prevalence-of-problem-drug-use-in-scotland-201516-estimates/

Public Health Scotland. (2024, March). *Estimated Prevalence of Opioid Dependence in Scotland 2014/15 to 2019/20*. Retrieved from https://publichealthscotland.scot/publications/estimated-prevalence-of-opioid-dependence-in-scotland/estimated-prevalence-of-opioid-dependence-in-scotland-201415-to-201920/#:~:text=The%20estimated%20number%20of%20people,to%2064%2Dyear%2Dolds.

Public Health Scotland. (2024, September). *Opioid Substitution Therapy (OST) patient analysis for 2013/14 to 2022/23*. Retrieved from https://www.scotpho.org.uk/media/2482/annual_ost_estimates-2023-24_workbook.xlsx

Public Health Scotland. (2024b, April 16). *Drug-related hospital statistics, Scotland 2022/23*. Retrieved from https://publichealthscotland.scot/media/26645/2024-04-16-drhs-report_final.pdf

Public Health Scotland. (2024c, August 1). *Needle Exchange Surveillance Initiative (NESI):Monitoring blood-borne viruses and injecting risk behaviours among people who inject drugs in Scotland, 2008–09 to 2022–23*. Retrieved from https://publichealthscotland.scot/media/28297/nesi-2022-23-report-draft-v10-020824-_final.pdf

Public Health Scotland. (n.d.). *National Therapeutic Indicators. Prescribing Information System*. Retrieved from https://scotland.shinyapps.io/nhs-prescribing-nti/

Santo, T., Clark, B., Hickman, M., Grebely, J., Campbell, G., Sordo, L., . . . Min, J. (2021). Association of Opioid Agonist Treatment With All-Cause Mortality and Specific Causes of Death Among People With Opioid Dependence A Systematic Review and Meta-analysis. *JAMA Psychiatry, 78*(9), 979-993.

ScotPHO, P. (n.d.). *Drug use: Prescribing for drug use*. Retrieved from https://www.scotpho.org.uk/risk-factors/drugs/data/prescribing-for-drug-use/

Sweeting, M., De Angelis, D., Ades, A., & Hickman, M. (2009). Estimating the prevalence of ex-injecting drug use in the population. *Statistical Methods in Medical Research*, 381-395.

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Appendix 1 – Data and data definitions

We modelled data from the Scottish Public Health Drug Linkage Programme (SPHDLP), which uses existing national datasets to construct a comprehensive cohort of the Scottish population of people who use drugs. The SPHDLP covers the period from 1 April 2009 onwards.

Data are linked on Community Health Index (CHI) number, which is a unique patient identifier used throughout health and care services associated with NHS Scotland. The availability of verified CHI numbers for individual data sources (apart from Prescribing Information System (see below)) was generally very high, enabling robust linkage between datasets using historic or current patient identifiers. Consequently, the SPHDLP linkage has a high degree of reliability, with only a small probability of health activity or harm data being assigned to a person incorrectly.

At the time of release of this report PHS are rebranding this programme of work, and from 1 April 2025, this will be renamed to SHIeLD - Substance Use and Health Intelligence Linked Dataset. Future reports will refer to the renamed SHIeLD programme and dataset.

The following linked SPHDLP data sources were used to derive the estimates presented in this report.

Opioid Agonist Therapy (OAT) prescriptions

Scotland's national Prescribing Information System (PIS) contains information about all community prescriptions dispensed in Scotland. Records for any prescription of Opioid Agonist Therapy (OAT) between 1 April 2010 and 31 March 2023 were extracted. Only records with a valid CHI number were included.

The availability of CHI numbers on OAT scripts from PIS was lower than in other SPHDLP data sources due to challenges arising from the range of practices in place for recording OAT prescribing across Scotland. For financial years 2015/16 to 2022/23, CHI numbers were available for between 74% and 82% of OAT prescriptions each year (Public Health Scotland, 2024). Despite this issue, estimates

of the number of people prescribed OAT (based on counts of unique CHI numbers) are considered to be fairly accurate, having been quality assured and compared with figures derived from local NHS Board systems by specialist pharmacists. In the process of modelling data for these estimates, the assumptions described below in the section **Coding of 'on' vs 'off' treatment within the baseline cohort** also helped to minimise issues arising from gaps in an individual's prescribing record due to CHI availability issues.

In addition to issues associated with CHI completeness, it should be noted that the record of community OAT prescriptions may also be incomplete due to practices in specific NHS Boards associated with the administration of injectable buprenorphine. Since such OAT formulations were licensed for medical use in 2020, a number of treatment services have responded to the challenges of administering this medication by obtaining a Home Office licence to hold controlled drugs on their premises. This means that some of the injectable buprenorphine prescribing in affected NHS Boards will be processed as hospital stock orders (in the Hospital Medicines Utilisation Database) rather than as community prescriptions in PIS. This issue affects a relatively low number of OAT prescriptions and therefore has a low impact on the estimates presented in this report. NHS Board level information on the extent of injectable buprenorphine prescribing and the proportion that is processed via hospital stock order is available on ScotPHO (ScotPHO, n.d.).

Note that both the level of CHI completeness for OAT prescriptions and extent of injectable buprenorphine prescribing via hospital stock order vary between NHS Boards. These factors may impact the reliability of some NHS Board-specific estimates.

OAT prescription was defined as any prescription for buprenorphine (including injectable prolonged-release formulations), buprenorphine and naloxone, or methadone hydrochloride. The prescription item names were buprenorphine, buprenorphine and naloxone, Buvidal©, Eptadone©, Espranor©, Gabup©, methadone hydrochloride, Methadose©, Metharose©, Physeptone©, Prefibin©, Suboxone© and Subutex©. Data fields include NHS Board of residence and prescription reimbursement date.

Deaths and Hospital Admissions Data

SPHDLP also includes drug-related deaths registered by National Records of Scotland (NRS) and hospital inpatient admissions recorded by PHS in the SMR01 (acute) and SMR04 (psychiatric) databases. For individuals with opioid dependence (including anyone with an OAT prescription or drug-related hospital admission), SPHDLP also includes data on death from any cause registered by NRS (extracted from PHS's SMR99 database).

Baseline Cohort

The baseline cohort for each financial year was defined as anyone resident in Scotland aged 15 to 64 years who had at least one OAT prescription within the current year or in the four preceding years. More specifically, follow up time for each individual began on 1 April 2014 for individuals who had received any OAT prescription within the four years prior to this date, or on date of first OAT treatment after that date otherwise. Follow up time was censored at the earliest of:

- 31 March 2023
- Date of death (due to any cause)
- Date of leaving Scotland, for those who were known to have left the country[7]
- The end of the financial year (31 March) lying between four and five years since OAT treatment end date.

Censoring after four to five years since the last treatment episode was implemented to reduce potential misclassification due to people moving out of Scotland, or no

[7] PHS's CHI database provided an estimated date for the removal of an individual's record from a GP patient listing in Scotland. However, this information was not available for individuals who entered the baseline cohort since 1st April 2021.

longer being opioid-dependent. Censoring was implemented at the end of a financial year - rather than at precisely five years since last OAT - for statistical modelling reasons, relating to all data being aggregated by financial year in the model.

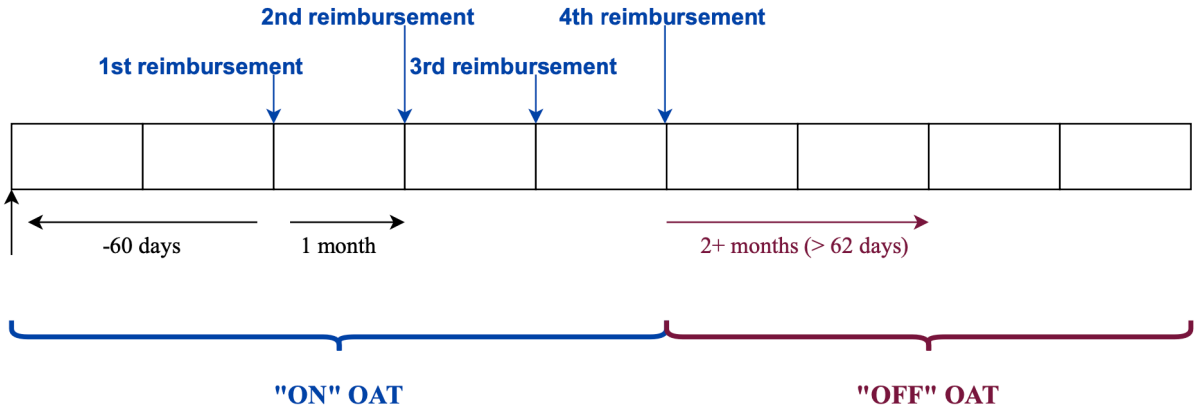
NHS Board of residence for each individual in the baseline cohort was coded based on the most recent OAT prescription received. Note that this avoids double counting of individuals across multiple NHS Boards but does not account for individuals moving between boards over the nine-year time period.

Coding of 'on' vs 'off' treatment within the baseline cohort

For each individual within the baseline cohort, all follow-up time was coded as 'on' and 'off' OAT. Each individual may contribute to both the 'on' and 'off' treatment follow-up time at different points.

Prescription dates are only available for a minority of dispensed items in the Prescribing Information System (PIS). Treatment dates were therefore estimated from reimbursement dates using a previously applied algorithm (McAuley, et al., 2023; Public Health Scotland, 2024):

Treatment episodes were coded as commencing 60 days before the reimbursement date and ending 12 days before the reimbursement date. We defined a continuous episode of treatment as a pattern of regular monthly dates of reimbursement with no more than two months between them. For each individual, if the time between the end date of one prescription period, and the start date of the next prescription period was less than 62 days, we assumed these prescriptions comprised one treatment episode, and that the individual was on treatment throughout the entire time. Otherwise, each prescription was coded as one treatment episode and the time between the two episodes considered as time off treatment. All remaining follow-up time was coded as off-treatment. The figure provides an illustrative example.



Ensuring adverse events are specific to opioid dependence

A key assumption of the prevalence estimation model is that the adverse event data modelled are highly specific to the population with opioid dependence, i.e. do not occur outside of this population. Critically, it is not necessary to include in the model all adverse events that are due to opioids. Instead, it is necessary to identify a subset of such events that can be assumed to only occur among people with opioid dependence.

Opioid-related deaths

Deaths were only included in the model if they were coded as accidental fatal drug-related poisonings AND there was toxicology/postmortem evidence of opioids being implicated in the death.

Accidental fatal drug-related poisonings were defined as those with main underlying cause of death coded with one of the following ICD10 codes:

- F11.2: Mental and behavioural disorders due to use of opioids, with Dependence syndrome
- F19.2: Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances, Dependence syndrome

- X42: Accidental poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified (including heroin, methadone, morphine, opium).

Only accidental fatal drug-related poisoning with the 'HMMB' flag in the additional drug-related death data supplied to PHS by NRS were included. This flag indicates that toxicology screening and postmortem pathology examination identified that at least one of the following was implicated in, or potentially contributed to, death: heroin/morphine, methadone or buprenorphine.

It was recognised that a small number of these deaths might have been accidental overdoses among people receiving opioid painkillers for long-term or chronic conditions, who were not necessarily among the population of interest for this modelling exercise (those with the potential to benefit from OAT). To further ensure specificity, deaths among individuals who were known to have been in receipt of strong opioid analgesic prescriptions for a lengthy period of time were therefore excluded. A SPHDLP dataset listing individuals prescribed strong opioid analgesics on a long term (more than two years) basis (as defined by National Therapeutic Indicator (Public Health Scotland)) was used to identify and exclude these individuals (n=518 deaths over this nine-year time period).

Therefore, deaths included in the model were defined by matching all of the following criteria: a) death classified as drug-related by NRS, b) one of the accidental overdose codes listed above was the main underlying cause of death, c) heroin/morphine, methadone or buprenorphine was implicated in, or potentially contributed to, death as indicated by the HMMB flag, and d) the individual was not known to have received strong opioid prescriptions on a long term basis.

Aggregate information on numbers of opioid-related deaths included in the model are available in Table 9 of the **Supplementary tables.**

Note that there is a high degree of confidence in mortality data completeness. Where a death certificate cannot be issued, cases are referred to the procurator fiscal and postmortem and toxicology tests are carried out. Therefore the potential for missing or incorrectly coding an opioid overdose death is very small.

Opioid-related hospital admissions:

Non-fatal drug-related poisoning hospital admissions were included if they had any of the following ICD-10 codes as the primary diagnostic code (in the main or secondary position of the first episode):

- T40.0: Poisoning by narcotics and psychodysleptics; Opium
- T40.1: Poisoning by narcotics and psychodysleptics; Heroin
- T40.3: Poisoning by narcotics and psychodysleptics; Methadone

In initial exploratory analyses for the first report in this series (Public Health Scotland, 2024), hospital admissions for a wider range of ICD-10 codes related to opioid use, namely F11 (Mental and behavioural disorders due to use of opioids), were also included. However, analysis of these admissions among the cohort suggested individuals had an increased likelihood of an F11 admission occurring during periods when they were prescribed OAT or if they had a history of OAT. Discussions with clinical staff subsequently confirmed that prescribing records are reviewed when making clinical notes and may influence diagnostic coding. Due to the risk of this leading to bias in the model, the decision was taken to exclude F11 codes when modelling hospital admission data.

The remaining T codes listed above are specific to street drugs or drugs used for the treatment of opioid dependence. It is unlikely that overdoses involving these drugs would occur among people who were not opioid dependent. Although a small number of individuals are prescribed methadone for chronic conditions, other pharmaceutical opioids are preferred for analgesia and therefore accidental opioid overdoses associated with prescribed medications are more likely to be coded with T40.2 (Poisoning by narcotics and psychodysleptics; Other opioids) or T40.4 (Poisoning by narcotics and psychodysleptics; Other synthetic narcotics). Other types of opioid poisonings are coded to alternative ICD-10 codes (for example, X62: Intentional self-poisoning: opioids) which reflect clinician's views of the associated causes of the hospital admission.

Only acute inpatient admissions from PHS's SMR01 dataset were included. Psychiatric admissions (SMR04) were not included as these hospitals do not typically deal with opioid overdoses[8]. Hospital admissions were excluded if they ended in death (n = 42), to avoid double-counting of adverse events included in the deaths data.

Aggregate information on numbers of opioid-related hospital admissions included in the model are available in Table 10 of the **Supplementary tables**.

[8] In each financial year since 1997/98, fewer than ten psychiatric hospital admissions in Scotland have included an ICD-10 diagnostic code for accidental opioid overdose. For further details see **PHS's Drug-Related Hospital Statistics dashboard**.

Appendix 2 – Multi-Parameter Estimation of Prevalence (MPEP) modelling approach

All data (observation time [i.e. person years at risk], deaths, hospital admissions) were aggregated by:

- Financial year: 2014/15, 2015/16, 2016/17, 2017/18, 2018/19, 2019/20, 2020/21, 2021/22, 2022/23
- Sex: Female, Male
- Age group: 15 to 34, 35 to 49, 50 to 64 years
- Baseline cohort and treatment status: in cohort on OAT, in cohort off OAT, out of cohort
- NHS Board: Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, Tayside. The other seven NHS Boards were grouped and labelled as 'Rest of Scotland' for modelling purposes.

Statistical models were fitted to counts of opioid-related deaths and hospital admissions within the baseline cohort. These models estimated how the risk of death or hospital admission among people with opioid dependence varied by year, sex, age group, treatment status and NHS Board, and accounted for varying observation time across groups. Since previous evidence suggested that the 'treatment effect' (protective effect of OAT) on these events may have changed over time (McAuley, et al., 2023), the treatment effect on deaths and hospital admissions was also assumed to vary by year. Inclusion of combinations of the other factors in these models (e.g. to allow for the treatment effect varying by sex or age group) was guided by fitting models with and without these extra terms and choosing the final model with the best fit to the data.

Numbers of opioid-related deaths and hospital admissions occurring outside of the baseline cohort were used to estimate the size of the unobserved population and therefore the total number of people with opioid dependence in each age/sex/region/year group. It was assumed that - within each age/sex/region/year

group - the rate at which these events occurred among the unobserved population was equal to the 'off-treatment' rates estimated from the models above.

Alongside the two statistical models for opioid-related deaths and hospital admissions, a third model was simultaneously fitted to the unobserved portion of prevalence. This model estimated how the unobserved portion of prevalence (i.e. the number of 'unobserved' people with opioid dependence as a proportion of the general population) varied by year, sex, age group and region. Inclusion of combinations of these factors in these models (e.g. to allow the sex difference in prevalence to vary by age group) was guided by fitting models with and without these extra terms and choosing the final model with the best fit to the data.

A more detailed description of the modelling approach is provided by Markoulidakis, et al., 2024. See also Jones, et al., 2020, Downing, et al., 2023 for background on development of the MPEP approach.

Changes in methodology since last report

One change to the MPEP model has been made since the previous Official statistics in development report in this series. In the first report, the regression model structure for prevalence was fitted to overall or total prevalence on the log-odds scale. In the updated model, prevalence is separated into two components: observed and unobserved. Here, observed prevalence is the size of the observed cohort as a proportion of the general population. The regression model structure is now fitted to 'unobserved' prevalence rather than total prevalence. This small alteration was found to make the model much more computationally stable, running significantly faster and facilitating further model development such as modelling an increased number of NHS Boards.

Additionally, there has been a change in the Bayesian statistical software used for model fitting since the previous report. Analyses in the first report were performed using JAGS (Just Another Gibbs Sampler), while the current analyses were conducted using Stan. Both JAGS and Stan use Markov Chain Monte Carlo (MCMC) methods to fit Bayesian statistical models. The researchers have found Stan to offer

improved computational efficiency for fitting MPEP. Results for the current report were produced using Stan.

Appendix 3 – Crude Estimates of Prevalence for other NHS Boards

Background

The production of stratified estimates using the MPEP model is dependent upon there being sufficient numbers of drug-related harm events, that are specific to the population of interest, within each stratification (e.g. by sex, age group, year, and NHS Board). For the types of drug-related harm events used in the current model, it was only possible to provide estimates for some NHS Boards.

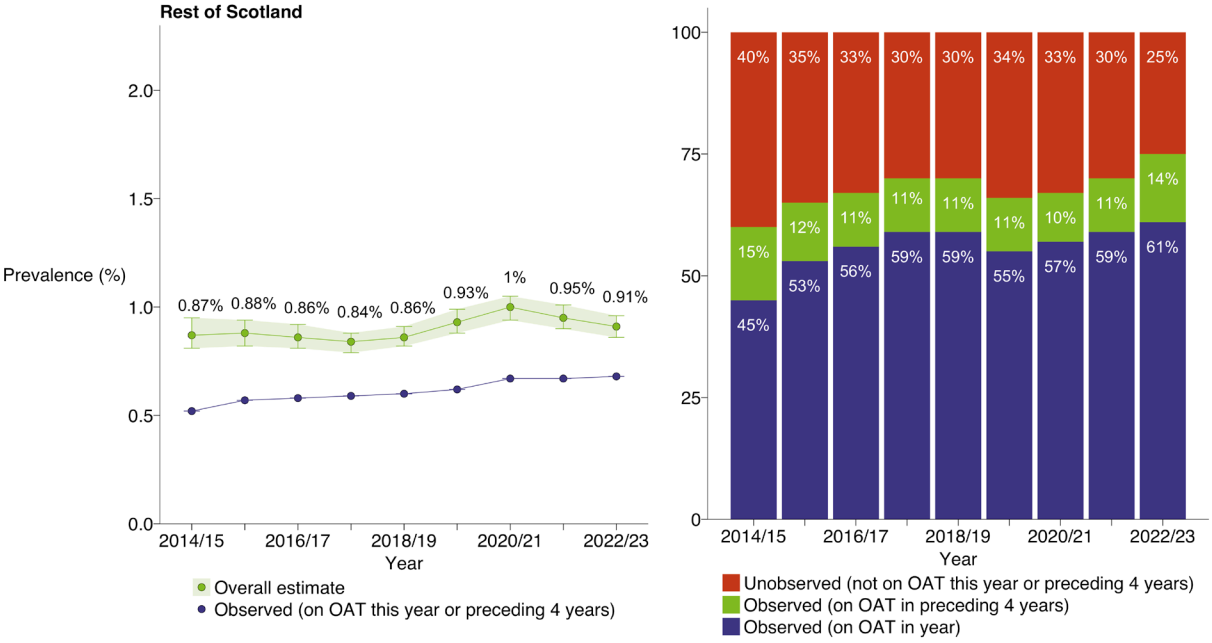
This appendix describes how crude estimates of the prevalence of opioid dependence were produced for the seven Scottish territorial NHS Boards not included in the main body of the report: Borders, Dumfries and Galloway, Forth Valley, Highland, Orkney, Shetland, and Western Isles. Estimates are provided for each financial year from 2015/16 to 2022/23.

It is envisaged that these estimates may be useful for understanding local drug use patterns, population healthcare needs and service planning. However, as these estimates are not based directly on the MPEP model, it is important to be aware of how they were generated and the limitations of this approach. These estimates rely on additional assumptions (described below) and are therefore expected to be less accurate than those derived from the MPEP model.

Methods

Since the data and MPEP model covered Scotland overall, in addition to producing estimates for each of the seven NHS Boards shown in the main body of this report, the MPEP model also inherently produces estimates of prevalence in the ‘Rest of Scotland’, for each year. These, and the implied breakdown of treatment status in 'Rest of Scotland', are shown in Figure 17.

Figure 17: Estimated prevalence (%) of opioid dependence (left) breakdown of treatment status (right) for people with opioid dependence in the other NHS Boards; 2014/15 to 2022/23



Corresponding to the panel on the right of Figure 17, for each year 2015/16 to 2022/23, estimated percentages for OAT exposure and the observed population in the 'Rest of Scotland' are shown in Table 2.

Table 2: Estimated percentage of people with opioid dependence who were prescribed OAT during the year (Estimated % OAT exposure) or within the last 5 years (Estimated % observed) by financial year; Rest of Scotland; 2015/16 to 2022/23

Year	Estimated % OAT exposure	Estimated % observed
2015/16	53% (49%, 56%)	65% (60%, 69%)
2016/17	56% (52%, 59%)	67% (63%, 72%)
2017/18	59% (56%, 63%)	71% (67%, 75%)
2018/19	59% (55%, 62%)	70% (66%, 74%)

Year	Estimated % OAT exposure	Estimated % observed
2019/20	55% (52%, 59%)	66% (63%, 70%)
2020/21	57% (54%, 60%)	67% (63%, 71%)
2021/22	59% (56%, 63%)	70% (66%, 74%)
2022/23	61% (57%, 64%)	75% (71%, 79%)

The data used for statistical modelling includes details of the NHS Board of residence for all individuals who received OAT in the 'Rest of Scotland'. Therefore, for each NHS Board and each year, the number of people who were 'OAT exposed' and the number 'observed' is known. Using these data, we can produce crude estimates of the number of people with opioid dependence in each NHS Board by either:

1) dividing the 'number of people exposed to OAT' in the NHS Board by the estimated proportion of OAT exposure from Table 2, or

2) dividing the number 'observed' in each NHS Board by the estimated proportion observed from Table 2.

The two estimates should be similar, but would be unlikely to match exactly, since the true proportions of OAT exposure or observed will likely vary across the seven NHS Boards. The crude estimates provided in this Appendix are based on a simple statistical model that puts these two pieces of information together - similar in essence to averaging across these two calculations. The 95% CrIs around these crude estimates account for the uncertainty in estimated proportions reflected in Table 2, and additional uncertainty related to likely variation in these proportions across individual NHS Boards.

Assumptions & Limitations

These estimates are crude and should be interpreted with caution. Specifically, they rely on assumptions that:

1. the percentages of people exposed to OAT and observed in each of these seven NHS Boards are similar. If an NHS Board has higher engagement with OAT than average across these seven Boards, the true prevalence might be slightly lower than the estimates provided, while if engagement is lower, the true prevalence may be slightly higher.

2. OAT prescribing records are sufficiently complete to identify all individuals receiving OAT. If community prescribing data misses some individuals who were receiving OAT, then the true prevalence may be slightly higher than the estimates provided. All estimates and apparent trends over time should be interpreted alongside knowledge of local data completeness.

Since these estimates also depend on the accuracy of OAT exposure estimates for 'Rest of Scotland', the assumptions underpinning the MPEP model (which produced the Table 2 estimates) also remain relevant.

Results

Tables 3 to 8 report the crude estimates of opioid dependence prevalence by NHS Board for each financial year between 2015/16[9] and 2022/23: Borders (Table 3), Dumfries and Galloway (Table 4), Forth Valley (Table 5), Highland (Table 6), Orkney (Table 7), Shetland (Table 8), and Western Isles (Table 9).

In these tables, all population size estimates have been rounded to the nearest hundred if the estimate is over 1000, to the nearest ten if the estimate is between 100

[9] Crude estimates are not supplied for 2014/15 due to low CHI completeness for community OAT prescriptions in specific NHS Boards.

and 1000, and to the nearest five if the estimate is below 100. See the **Glossary** for more information about any technical terms used.

Table 3: Crude estimates of prevalence of opioid dependence in NHS Borders, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	540 (450, 680)	0.78% (0.64%, 0.97%)
2016/17	570 (480, 700)	0.82% (0.69%, 1.00%)
2017/18	570 (490, 680)	0.82% (0.70%, 0.98%)
2018/19	580 (500, 680)	0.83% (0.72%, 0.99%)
2019/20	660 (560, 800)	0.96% (0.81%, 1.16%)
2020/21	710 (600, 850)	1.03% (0.88%, 1.23%)
2021/22	650 (550, 790)	0.94% (0.80%, 1.14%)
2022/23	570 (500, 680)	0.83% (0.72%, 0.98%)

Table 4: Crude estimates of prevalence of opioid dependence in NHS Dumfries & Galloway, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	1300 (1100, 1600)	1.41% (1.16%, 1.76%)
2016/17	1300 (1100, 1600)	1.43% (1.20%, 1.75%)
2017/18	1300 (1100, 1500)	1.41% (1.21%, 1.68%)
2018/19	1300 (1100, 1500)	1.45% (1.25%, 1.73%)
2019/20	1400 (1200, 1700)	1.56% (1.32%, 1.88%)
2020/21	1400 (1200, 1600)	1.55% (1.32%, 1.85%)
2021/22	1400 (1200, 1600)	1.54% (1.31%, 1.86%)
2022/23	1300 (1100, 1500)	1.47% (1.27%, 1.76%)

Table 5: Crude estimates of prevalence of opioid dependence in NHS Forth Valley, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	2300 (1900, 2900)	1.18% (0.97%, 1.47%)
2016/17	2200 (1900, 2700)	1.13% (0.95%, 1.38%)
2017/18	2100 (1800, 2500)	1.07% (0.92%, 1.27%)
2018/19	2200 (1900, 2600)	1.10% (0.95%, 1.30%)
2019/20	2300 (1900, 2700)	1.15% (0.98%, 1.38%)
2020/21	2200 (1900, 2700)	1.14% (0.97%, 1.36%)
2021/22	2100 (1800, 2500)	1.06% (0.91%, 1.28%)
2022/23	2000 (1700, 2300)	1.01% (0.88%, 1.20%)

Table 6: Crude estimates of prevalence of opioid dependence in NHS Highland, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	990 (820, 1200)	0.49% (0.41%, 0.61%)
2016/17	940 (800, 1100)	0.47% (0.40%, 0.57%)
2017/18	900 (780, 1100)	0.45% (0.39%, 0.53%)
2018/19	940 (820, 1100)	0.47% (0.41%, 0.56%)
2019/20	1000 (850, 1200)	0.50% (0.43%, 0.61%)
2020/21	1400 (1200, 1700)	0.70% (0.60%, 0.84%)
2021/22	1400 (1200, 1600)	0.69% (0.58%, 0.83%)
2022/23	1300 (1100, 1600)	0.66% (0.57%, 0.79%)

Table 7: Crude estimates of prevalence of opioid dependence in NHS Orkney, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	20 (15, 25)	0.14% (0.11%, 0.20%)
2016/17	20 (15, 25)	0.13% (0.10%, 0.18%)
2017/18	20 (15, 30)	0.16% (0.12%, 0.21%)
2018/19	25 (20, 35)	0.19% (0.15%, 0.25%)
2019/20	30 (25, 40)	0.23% (0.18%, 0.30%)
2020/21	35 (30, 45)	0.25% (0.20%, 0.33%)
2021/22	35 (30, 45)	0.25% (0.20%, 0.32%)
2022/23	45 (35, 55)	0.34% (0.28%, 0.43%)

Table 8: Crude estimates of prevalence of opioid dependence in NHS Shetland, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	150 (130, 200)	1.03% (0.84%, 1.31%)
2016/17	150 (130, 190)	1.02% (0.85%, 1.27%)
2017/18	150 (120, 180)	1.00% (0.85%, 1.20%)
2018/19	160 (130, 190)	1.07% (0.91%, 1.29%)
2019/20	180 (150, 220)	1.25% (1.05%, 1.53%)
2020/21	180 (150, 220)	1.28% (1.08%, 1.55%)
2021/22	170 (140, 200)	1.17% (0.98%, 1.43%)
2022/23	160 (140, 190)	1.14% (0.97%, 1.38%)

Table 9: Crude estimates of prevalence of opioid dependence in NHS Western Isles, by year; 2015/16 to 2022/23

Year	Estimated number of people (95% CrI)	Estimated prevalence (95% CrI)
2015/16	20 (15, 25)	0.11% (0.08%, 0.16%)
2016/17	20 (15, 25)	0.11% (0.09%, 0.15%)
2017/18	20 (15, 25)	0.12% (0.10%, 0.16%)
2018/19	20 (15, 25)	0.12% (0.10%, 0.16%)
2019/20	25 (20, 35)	0.16% (0.13%, 0.21%)
2020/21	25 (20, 35)	0.16% (0.13%, 0.21%)
2021/22	25 (20, 35)	0.16% (0.14%, 0.21%)
2022/23	25 (20, 30)	0.16% (0.13%, 0.20%)

Appendix 4 – Consistency of evidence on prevalence from two event types

Prevalence estimates presented in this report were based on joint modelling of opioid-related deaths and hospital admissions. As discussed by Markoulidakis, et al., 2024, the model can also be used to produce estimates from each of the two data sources separately. These can be used to check whether the evidence from the two data sources is consistent.

Figure 18 and Table 10 show prevalence estimates and 95% CrIs based on each data source modelled separately, alongside the results from the joint model which were presented in the main body of this report. Estimates based on separate data sources were close for most years, but differences were most apparent in 2022/23. For this year, prevalence was estimated to be 1.17% (95% CrI: 1.12% to 1.25%) based on numbers of hospitalisations, but 1.29% (95% CrI: 1.23% to 1.36%) based on numbers of opioid-related deaths. The estimate based on modelling both data sources together (provided in the main body of this report) was 1.23%, with 95% CrI (1.19% to 1.28%) not including either of the estimates (1.17%, 1.29%) based on modelling each data source in isolation. This indicates that the 95% CrIs for 2022/23 estimates provided in this report are insufficiently wide.

Table 10 also includes Bayesian node split or consistency p-values, which formally assess whether the estimates derived from the two different types of event are consistent with each other (Presanis, et al., 2013). Lower values of this measure indicate higher levels of conflict or inconsistency. This value is lowest, and below 0.05 (indicating the p-value was statistically significant at the conventional level), for 2022/23.

By repeating this exercise for different demographic groups, it was seen that the inconsistency was primarily driven by differences in estimates of the number of males aged 15 to 34 years with opioid dependence. In 2022/23, prevalence in this group was estimated to be 1.08% (95% CrI: 0.94% to 1.23%) based on hospitalisations, but 0.73% (95% CrI: 0.66% to 0.81%) based on opioid-related deaths.

Due to these inconsistencies, all estimates provided for 2022/23, including estimates of changes in prevalence between 2014/15 and 2022/23, should be interpreted with caution.

Supplementary tables 9 and 10 show numbers of opioid-related deaths and hospitalisations included in the model for each year, stratified by OAT status. It can be observed that the number of hospitalisations included in the model reduced considerably in recent years and that (more importantly in terms of driving the prevalence estimates) the proportion of hospitalisations that were not linked to the observed cohort has also decreased.

The research team plans to investigate whether any changes in coding of hospitalisations were implemented after the pandemic period and whether a similar pattern was observed for other types of events (e.g., ambulance callouts, emergency department visits etc.). In future years, the research team aims to reduce the impact of any issues with opioid overdose hospitalisations by including other event types specific to opioid dependence within the statistical model.

Figure 18: Estimated prevalence (%) of opioid dependence by data source; Data Sources: Opioid-related deaths, Opioid-related hospitalisations, Joint (both data sources); 2014/15 to 2022/23

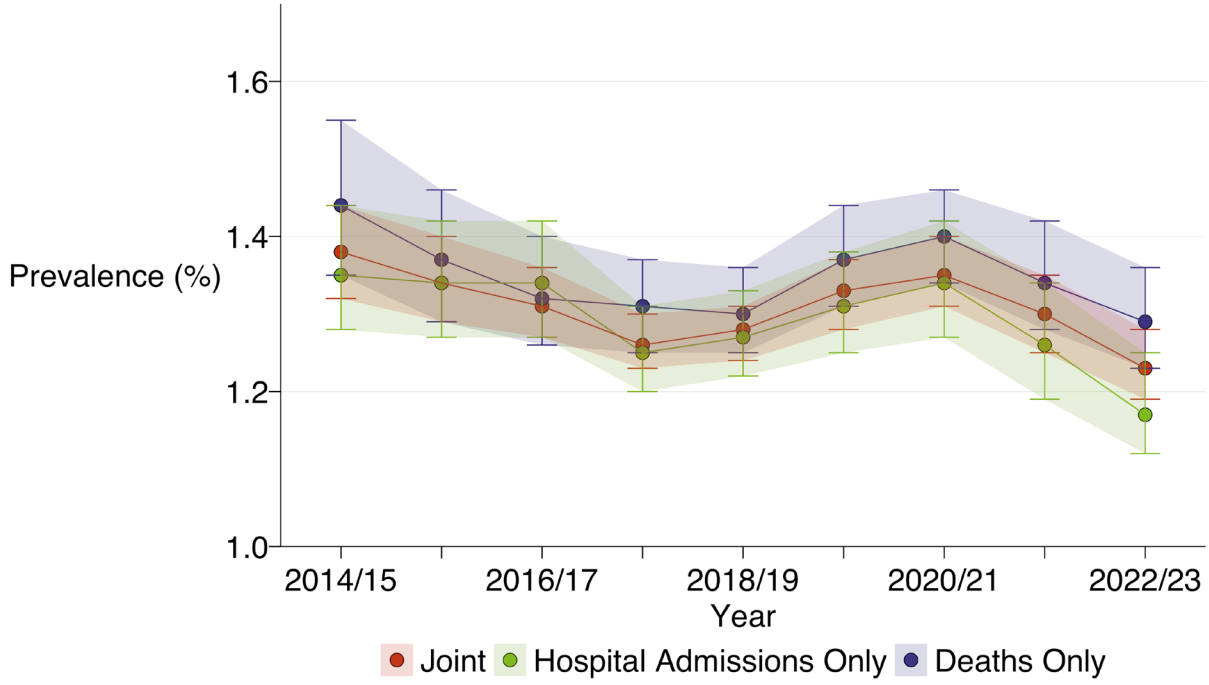


Table 10: Estimated prevalence (%) and 95% CrIs of opioid dependence by data source; Data Sources: Opioid-related deaths, Opioid-related hospitalisations, full model (both data sources); 2014/15 to 2022/23

Year	Deaths	Hospitalisations	Full Model (both data sources)	Consistency p-value
2014/15	1.44% (1.35%, 1.55%)	1.35% (1.28%, 1.44%)	1.38% (1.32%, 1.44%)	0.20
2015/16	1.37% (1.29%, 1.46%)	1.34% (1.27%, 1.42%)	1.34% (1.29%, 1.40%)	0.68
2016/17	1.32% (1.26%, 1.40%)	1.34% (1.27%, 1.42%)	1.31% (1.27%, 1.36%)	0.72
2017/18	1.31% (1.25%, 1.37%)	1.25% (1.20%, 1.31%)	1.26% (1.23%, 1.30%)	0.20
2018/19	1.30% (1.25%, 1.36%)	1.27% (1.22%, 1.33%)	1.28% (1.24%, 1.31%)	0.50
2019/20	1.37% (1.31%, 1.44%)	1.31% (1.25%, 1.38%)	1.33% (1.28%, 1.37%)	0.30
2020/21	1.40% (1.34%, 1.46%)	1.34% (1.27%, 1.42%)	1.35% (1.31%, 1.40%)	0.40
2021/22	1.34% (1.28%, 1.42%)	1.26% (1.19%, 1.34%)	1.30% (1.25%, 1.35%)	0.20
2022/23	1.29% (1.23%, 1.36%)	1.17% (1.12%, 1.25%)	1.23% (1.19%, 1.28%)	0.04

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Appendix 6 – Publication metadata

Publication title

Estimated Prevalence of Opioid Dependence in Scotland, 2014/15 to 2022/23

Description

The report contains estimates of number of people with opioid dependence, and prevalence, in Scotland, from 2014/15 to 2022/23.

Theme

Health and Social Care

Topic

Drugs

Format

PDF Report and Excel **tables**

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Annual

Timeframe of data and timeliness

The timeframe for the data used in this publication is financial years 2009/10 to 2022/23.

Continuity of data

SPHDLP data definitions were consistent across the timeframe for the data used in this publication.

Revisions statement

None

Revisions relevant to this publication

None

Concepts and definitions

See **Glossary** and **Appendix 1**

Relevance and key uses of the statistics

This report provides information on the estimated number of people with opioid dependence in Scotland for financial years 2014/15 to 2019/23. Information on the size and demographics of this population is used by a range of national and local stakeholders for strategic planning purposes, and by statistics producers and researchers for understanding the population context in which public health interventions are being delivered.

Accuracy

The estimates described in this report are derived from a complex statistical modelling process, which is described in **Appendix 2**. While the methodology and results have been subject to extensive peer review, the estimates described in this report may be subject to change as new data (additional years or event types) are incorporated within the model.

All estimates are presented with 95% credible intervals (CrIs) to represent uncertainty (see **Glossary**).

All population size estimates have been rounded to the nearest hundred for values over 1,000, the nearest ten for values between 101 and 1,000, and the nearest five for values of 100 or less.

For all years and stratifications shown in **Supplementary tables** 5, 6, 7 and 8, the number of people categorised as 'unobserved' is the rounded estimate of the total population size minus the number of people in the 'observed' cohort (i.e. the sum of the number of people 'On OAT in year' and 'On OAT in preceding four years').

Completeness

Estimates for seven NHS Boards (Ayrshire and Arran, Fife, Grampian, Greater Glasgow and Clyde, Lanarkshire, Lothian, and Tayside) are provided. Crude estimates for the other seven NHS Boards are provided in Appendix 3. Provision of more robust model-based estimates for these other NHS Boards is an aim of subsequent reports. Information about completeness issues associated with SPHDLP is provided in **Appendix 1**.

Comparability

Due to the change in methodology and the slight difference in the definition used, the findings from previous Prevalence of Problem Drug Use in Scotland (Public Health Scotland, Estimated Prevalence of Opioid Dependence in Scotland 2014/15 to 2019/20, 2024) (Public Health Scotland, Prevalence of Problem Drug Use in Scotland: 2015/16 Estimates, a review of definitions and statistical methods, 2020) reports should not be directly compared with these new estimates.

Accessibility

It is the policy of Public Health Scotland to make its websites and products accessible according to published guidelines. More information on accessibility can be found on the **PHS website**.

Coherence and clarity

All reasonable efforts have been made to present the findings of this work in plain English and, where appropriate, further explain any technical concepts and definitions in the **Glossary**.

Value type and unit of measurement

Counts, numbers and percentages.

Disclosure

The **PHS protocol on Statistical Disclosure Protocol** is followed.

Official statistics accreditation

Official statistics in development

UK Statistics Authority assessment

N/A

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N/A

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Appendix 7 – Early access details

Pre-release access

Under terms of the 'Pre-release Access to Official Statistics (Scotland) Order 2008', PHS 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 Department of Health and Social Care (DHSC)

NHS board chief executives

NHS board communication leads

Early access for management information

These statistics will also have been made available to those who needed access to ‘management information’, i.e. as part of the delivery of health and care:

Early access for quality assurance

These statistics will also have been made available to those who needed access to help quality assure the publication:

Appendix 8 – PHS and official statistics

About Public Health Scotland (PHS)

PHS is a knowledge-based and intelligence driven organisation with a critical reliance on data and information to enable it to be an independent voice for the public's health, leading collaboratively and effectively across the Scottish public health system, accountable at local and national levels, and providing leadership and focus for achieving better health and wellbeing outcomes for the population. Our statistics comply with the **Code of Practice for Statistics** in terms of trustworthiness, high quality and public value. This also means that we keep data secure at all stages, through collection, processing, analysis and output production, and adhere to the Office for National Statistics '**Five Safes**' of data privacy.

Translations and other formats are available on request at:
phs.otherformats@phs.scot or 0131 314 5300.