Public Health Scotland

Estimated Prevalence of Opioid Dependence in Scotland

2014/15 to 2019/20

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:

- Provide estimates for additional NHS Boards or regions of Scotland.
- Provide estimates for additional financial years.
- Explore the potential to provide estimates for 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, criminalised, 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, De Angelis, Ades, & Hickman, 2009). Administrative data collected by 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).

Previous 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 type of statistical approach called 'capture-recapture'. This approach is no longer considered viable in Scotland due to some of the data sets originally used no longer being available (Public Health Scotland, 2020). This, alongside some methodological limitations of capture-recapture that have been described (Jones, et al., 2020; Jones, et al., 2016), motivated use of alternative statistical approaches.

This report describes the 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. This report describes estimates of the number of people with opioid dependence who are at risk of drug-related harm (such as overdose poisoning and other causes of premature mortality, hepatitis C

(HCV) and HIV), with the potential to benefit from opioid agonist therapy (OAT[i]), 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.

All estimates in this report were calculated using a recently developed statistical modelling approach, 'Multi-Parameter Estimation of Prevalence' (MPEP). A brief overview of this approach is provided in the **Methods** section. The 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 2020. Results are stratified[ii] by sex (female, male), age group (15-34, 35-49 and 50-64 years) and financial year. Estimates for three NHS Boards (Greater Glasgow and Clyde, Lothian, Tayside) are also provided. PHS intends to provide NHS Boards with a tool for calculating approximate local estimates where not available from this report, while the provision of more robust model-based estimates for other NHS Boards will be addressed in subsequent reports.

Due to the change in methodology and the slight difference in definition used, the estimates from previous Prevalence of Problem Drug Use in Scotland (Public Health Scotland, 2020) reports should not be directly compared with these new estimates.

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

[ii] The production of stratified estimates using this model is dependent upon there being sufficient numbers of drug-related health 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 health 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.

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.

In 2019/20:

- The estimated number of people with opioid dependence in Scotland was 47,100 (95% Credible Interval (CrI) 45,700 to 48,600). This represents an estimated prevalence of 1.32% (95% CrI: 1.28% to 1.37%) of 15- to 64-year-olds.
- Among males aged 15 to 64 years, the prevalence of opioid dependence was estimated to be 1.85% (95% CrI: 1.79% to 1.91%). Among females aged 15 to 64 years, it was estimated to be 0.82% (95% CrI: 0.79% to 0.85%).
- The prevalence of opioid dependence was estimated as 0.87% (95% CrI: 0.82% to 0.94%) among people aged 15 to 34 years, 2.67% (95% CrI: 2.59% to 2.76%) among people aged 35 to 49 years, and 0.65% (95% CrI: 0.62% to 0.69%) among people aged 50 to 64 years.
- By NHS Board, the estimated prevalence of opioid dependence was 1.77% (95% CrI: 1.69% to 1.85%) in Greater Glasgow and Clyde, 1.25% (95% CrI: 1.18% to 1.33%) in Lothian and 1.36% (95% CrI: 1.28% to 1.45%) in Tayside.
- An estimated 61% of people with opioid dependence received opioid agonist therapy (OAT) at some point during the year, while 74% had received OAT at some point during the period 2015/16 to 2019/20.

The overall prevalence of opioid dependence was relatively stable from 2014/15 to 2019/20. Over the same time period, there was a reduction in opioid dependence among 15- to 34-year-olds and an increase among 50- to 64-year-olds.

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 2019/20. 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). In this instance, the approach used linked PHS-held administrative data on opioid agonist therapy (OAT) prescriptions, drug-related deaths and overdose hospital admissions.

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, but 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 six years, and the number of these people who had at least one OAT prescription during each year[iii]. Across the six-year period, these numbers were relatively

[iii] 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

consistent. The total number of unique individuals in the cohort across the six-year period was 43,791.

Table 1: Number of individuals in the baseline cohort ('observed') and with at least one OAT prescription, by year; 2014/15 to 2019/20

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Observed Cohort	35,142	35,329	35,403	35,345	35,036	34,933
On OAT[iv]	28,302	28,819	29,220	29,356	29,059	28,855

Administrative OAT records are linked to deaths and overdose 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 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; Heikkinen, et al., 2022; Best, Mason, & Richardson, 2012), 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).

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no geographical data are included in the official figures but excluded from this publication.

[iv] '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.

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 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 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 clinical 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 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 overall unobserved (or so-called 'latent') prevalence.

Explanations of technical terms used in this report can be found in the **Glossary**. 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**.

The MPEP model was used to produce estimates for each financial year (1st April to 31st March) from 2014/15 to 2019/20, 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, 2019).

In addition to estimates for Scotland as a whole, estimates were also produced for three NHS Boards: Greater Glasgow and Clyde (GGC), Lothian and Tayside. It was not feasible to produce estimates for all NHS Boards in this initial report. The selection of NHS Boards to include in this report was based on numbers of opioid-related deaths and overdose hospital admissions occurring in those areas (larger numbers increasing the statistical feasibility of prevalence estimation) and prioritisation on the basis of Drug-Related Death (DRD) rates (National Records of Scotland, 2023). GGC and Tayside were the NHS Boards with the highest DRD rates during the study period (2015 to 2019) and also include the Local Authorities with the highest DRD rates during the same era (Glasgow City and Dundee City). Lothian was additionally selected for modelling as it is a large geographical area with comparatively lower DRD rates, in order to investigate what role prevalence may play in lower rates.

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) by NHS Board (Greater Glasgow and Clyde, Lothian, and Tayside).

Unless otherwise indicated, the commentary below focuses on the most recent financial year for which estimates were available (2019/20).

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.

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.

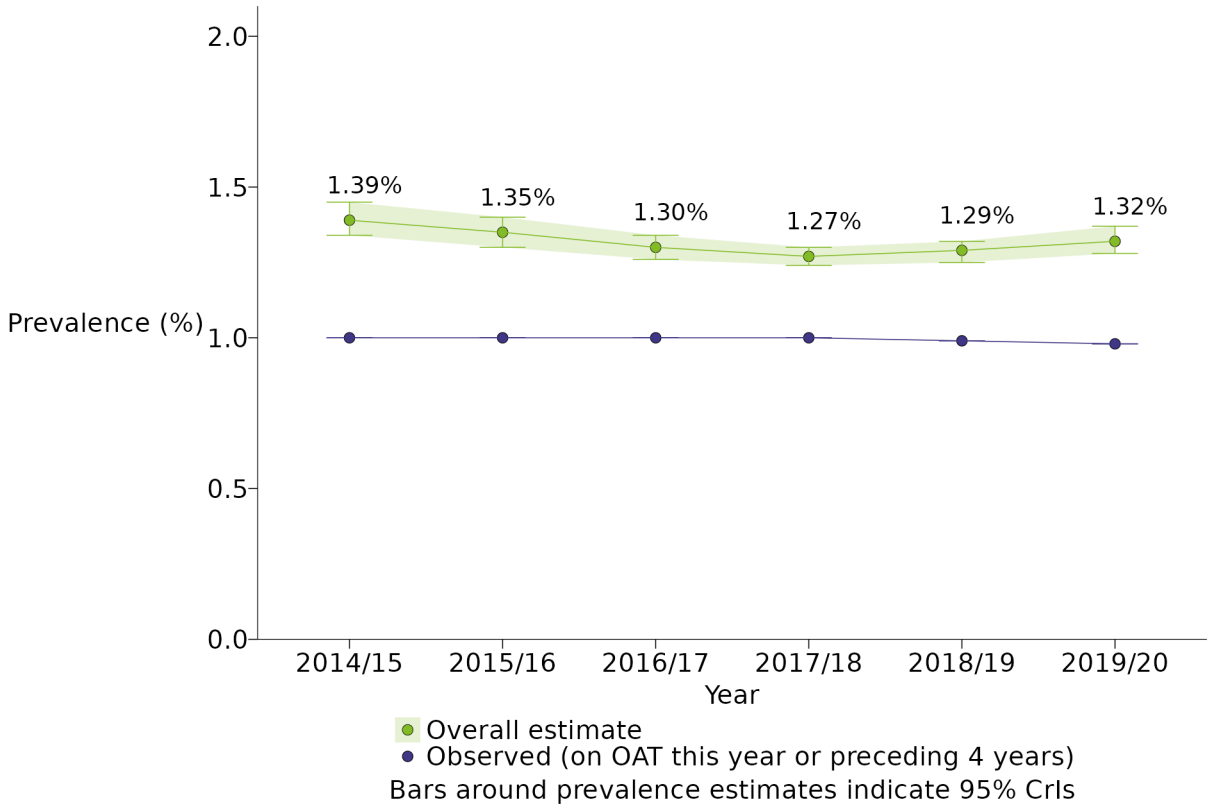
In addition to prevalence estimates, each Results section contains a chart showing the estimated percentage of people with opioid dependence that (1) received at least one OAT prescription during the year ('OAT exposure': see **Glossary**), (2) were among the observed baseline cohort (i.e. received OAT 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 2019/20.

Figure 1: Estimated prevalence (%) of opioid dependence among the population aged 15-64 years in Scotland; 2014/15 to 2019/20



In the most recent year of estimation, 2019/20, prevalence of opioid dependence was estimated as 1.32% (95% CrI: 1.28% to 1.37%). This corresponds to an estimate of 47,100 (95% CrI: 45,700 to 48,600) people with opioid dependence aged 15 to 64 years resident in Scotland in 2019/20.

Estimated prevalence was relatively stable across the six-year time period, ranging from 1.27% in 2017/18 (95% CrI: 1.24% to 1.30%) to 1.39% in 2014/15 (95% CrI: 1.34 to 1.45%) or 45,000 (95% CrI: 43,800 to 46,200) to 49,100 (95% CrI: 47,200 to 51,300) people.

Between 2014/15 and 2019/20 there was an estimated reduction of 2,000 people (estimated change -2,000, 95% CrI: -4,700 to 440) but the wide CrI, which crosses the value of zero (representing no change), means that that this small reduction was not definitive. In terms of prevalence, the estimated change was -0.07% (95% CrI -0.14% to 0.00%). Because this CrI does not quite cross the value of zero, this might be interpreted as weak evidence of a small reduction in prevalence.

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'.

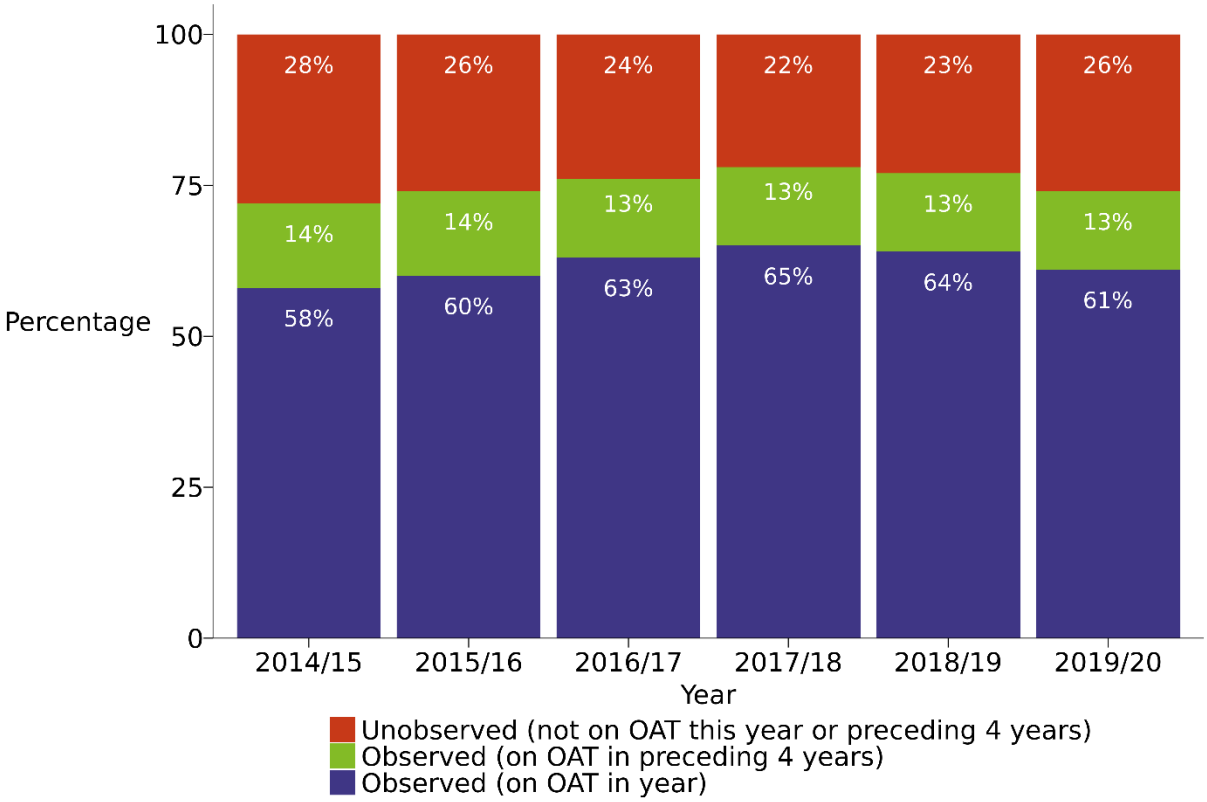
During 2019/20, 28,855 people aged 15-64 in Scotland received OAT (**Table 1**). The estimated OAT exposure was therefore 61% (95% CrI: 59% to 63%) (Figure 2). An additional 6,078 individuals (13% of the estimated total) had received OAT at some point in the four preceding years but not during 2019/20. The remaining 26% (95% CrI: 23% to 28%) of the total estimated population size were 'unobserved' i.e. did not receive OAT in the last five years.

Across the six-year period, the estimated percentage of people with opioid dependence who were 'unobserved' ranged from 22% to 28%, while estimated OAT exposure ranged from 58% to 65%[v] (Figure 2).

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

[v] Note that fluctuations in estimated OAT exposure across the six-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 2019/20[1]

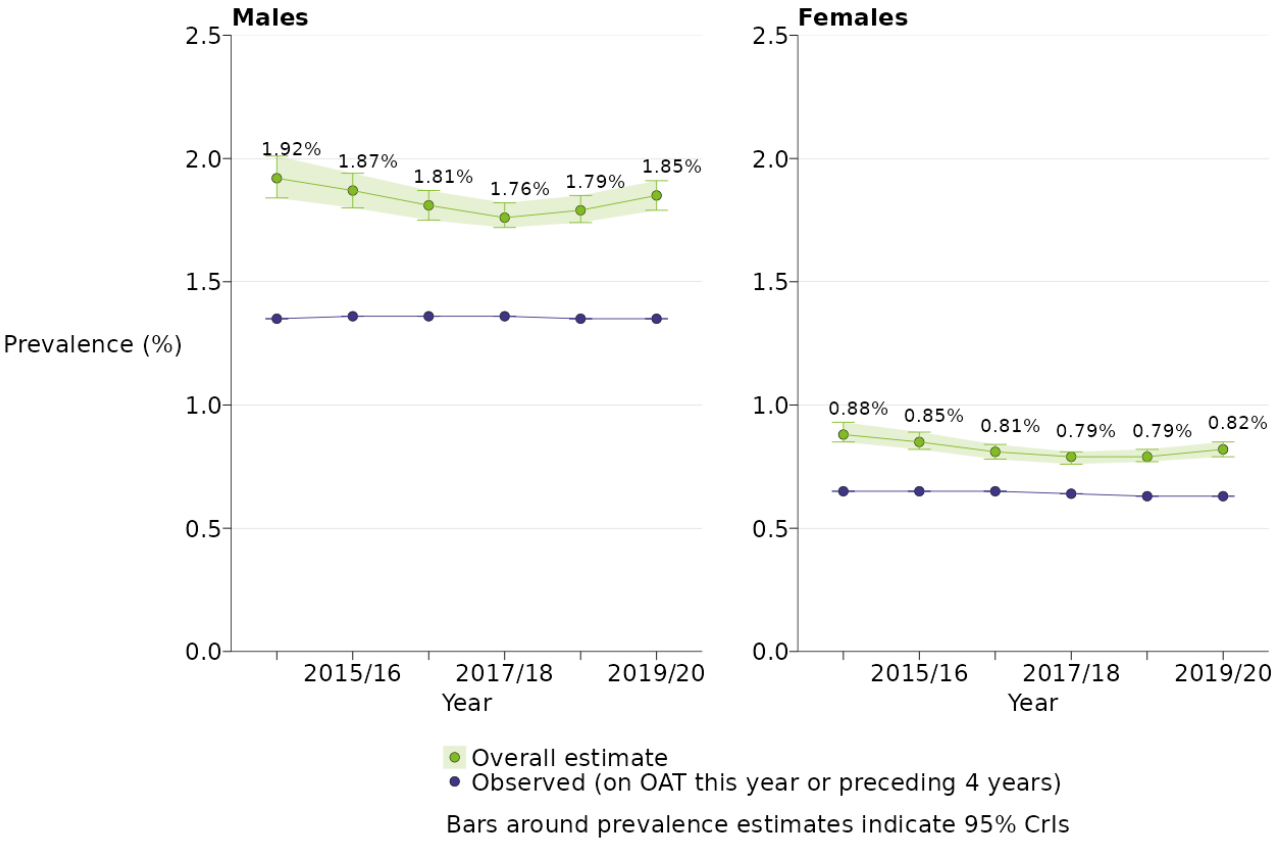


1. In these plots, 'Observed (on OAT in year)' refers to the population who received at least one OAT prescription at some point during that year (equivalent to 'OAT exposure'). These people may or may not have received OAT for the entire year.

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 2019/20



In 2019/20, prevalence of opioid dependence was estimated as 1.85% (95% CrI: 1.79% to 1.91%) for males, and 0.82% (95% CrI: 0.79% to 0.85%) for females. This corresponds to an estimate of 32,300 (95% CrI: 31,400 to 33,400) males and 14,700 (95% CrI: 14,200 to 15,300) females with opioid dependence aged 15 to 64 years resident in Scotland in 2019/20 (**Supplementary tables**: Table 2).

Among females, estimated prevalence ranged from 0.79% in 2017/18 (95% CrI: 0.77% to 0.82%) to 0.88% in 2014/15 (95% CrI: 0.85% to 0.93%), corresponding to a

range of 14,200 (95% CrI: 13,800 to 14,700) to 15,800 (95% CrI: 15,200 to 16,600) females aged 15 to 64 years. In 2019/20, prevalence of opioid dependence among females was estimated at 0.82% (95% CrI: 0.79% to 0.85%), corresponding to 14,700 (95% CrI: 14,200 to 15,300) females aged 15-64.

Among males, estimated prevalence ranged from 1.76% (95% CrI: 1.72% to 1.82%) to 1.92% (95% CrI: 1.84% to 2.01%), which corresponds to a range of 30,800 (95% CrI: 30,000 to 31,700) to 33,300 (95% CrI: 32,000 to 34,800) males aged 15 to 64 years. The prevalence of opioid dependence among males in 2019/20, was estimated at 1.85% (95% CrI: 1.79% to 1.91%), corresponding to 32,300 (95% CrI: 31,400 to 33,400) males aged 15-64.

The estimated percentage of people with opioid dependence who were male was constant across the six-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 2019/20

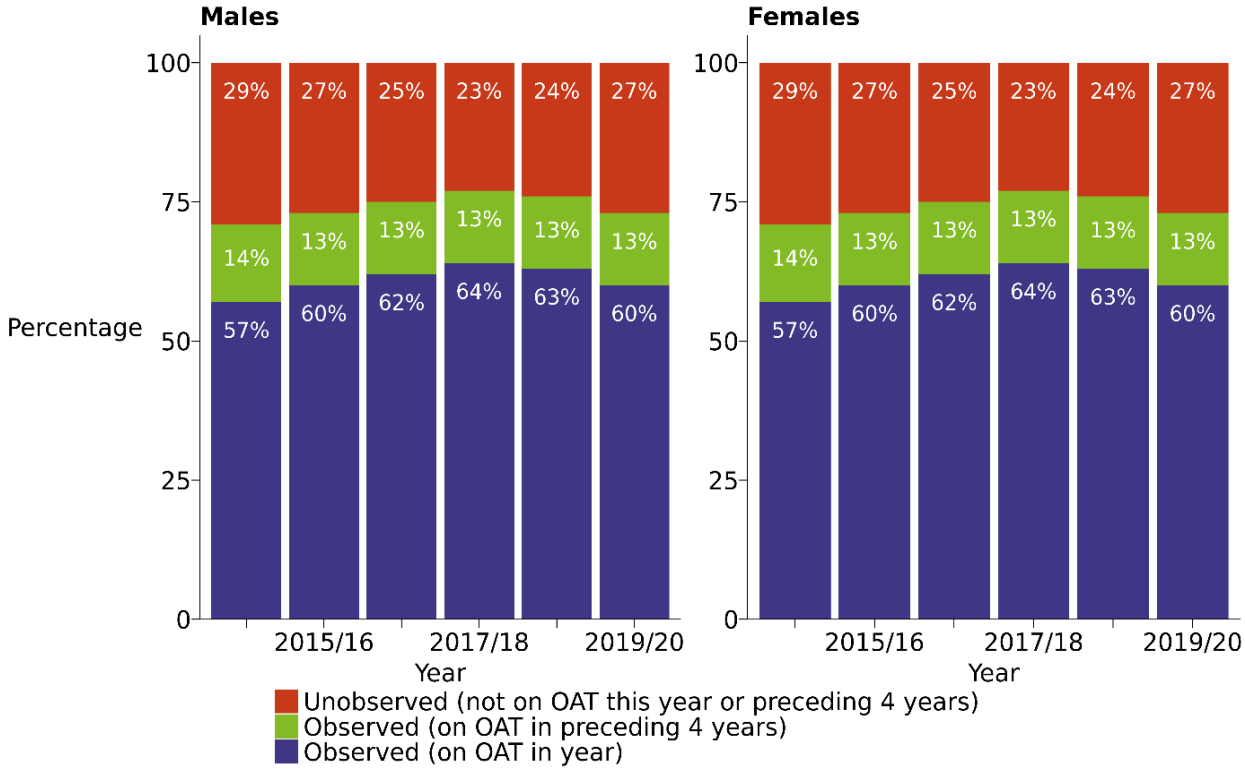
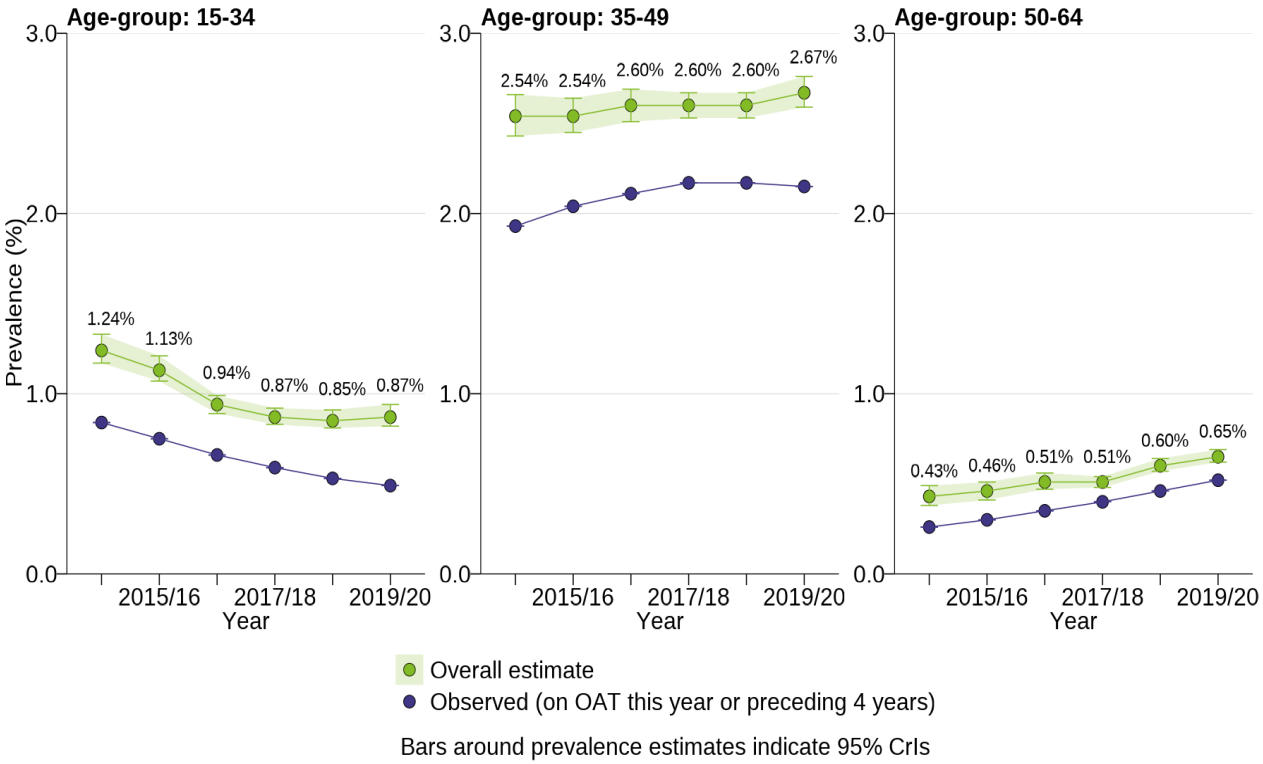


Figure 4 shows estimated OAT exposure for females and males separately. In 2019/20, an estimated 64% (95% CrI: 62% to 66%) of opioid-dependent females received at least one OAT prescription. This was slightly higher than the estimated OAT exposure of 60% (95% CrI: 58% to 62%) among males. See Table 5 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 2019/20



Across each of the six years, estimated prevalence was lowest among those aged 50 to 64 years and highest among those aged 35 to 49 years.

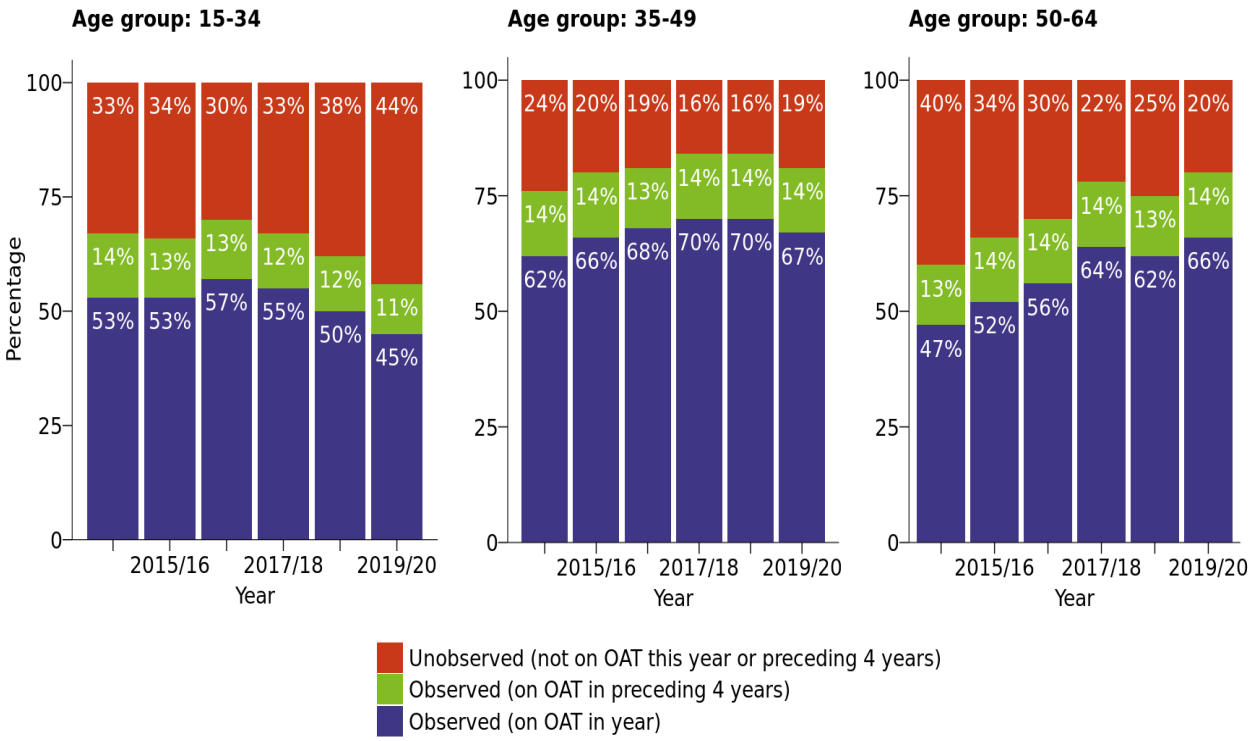
There was strong evidence of a change in age demographics over time. The estimated number of people with opioid dependence aged 15 to 34 years reduced from 17,200 (95% CrI: 16,200 to 18,300) in 2014/15 to 12,100 (95% CrI: 11,300 to 13,000) in 2019/20. Over the same time period, the estimated number of people with opioid dependence aged 50 to 64 years increased from 4,600 (95% CrI: 4,000 to

5,200) to 7,400 (95% CrI: 7,000 to 7,900). These changes were also apparent among the baseline cohort (**Supplementary tables**: Table 3).

In 2019/20, prevalence of opioid dependence was estimated as 0.87% (95% CrI: 0.82% to 0.94%) among those aged 15 to 34 years, 2.67% (95% CrI: 2.59% to 2.76%) among those aged 35 to 49 years and 0.65% (95% CrI: 0.62% to 0.69%) among those aged 50 to 64 years.

Figure 6 shows estimated OAT exposure by age group. In 2019/20, an estimated 66% (95% CrI: 62% to 69%) of people with opioid dependence aged 50 to 64 years received at least one OAT prescription during the year, and 80% in total were 'observed' (i.e. had received OAT during the current year or in the four preceding years). OAT exposure was estimated to be lower, 45% (95% CrI: 42% to 49%), among 15- to 34-year-olds, with only an estimated 56% being 'observed'. In contrast to the other age groups, OAT exposure was estimated to have reduced over this six-year period (from 53% to 45%) among 15- to 34-year-olds. Among 35- to 49-year-olds with opioid dependence, the largest group in size, estimated OAT exposure in 2019/20 was 67% (95% CrI: 65% to 69%), while 81% received at least one prescription during the year or the four preceding years. See Table 7 in the **Supplementary tables** for more information.

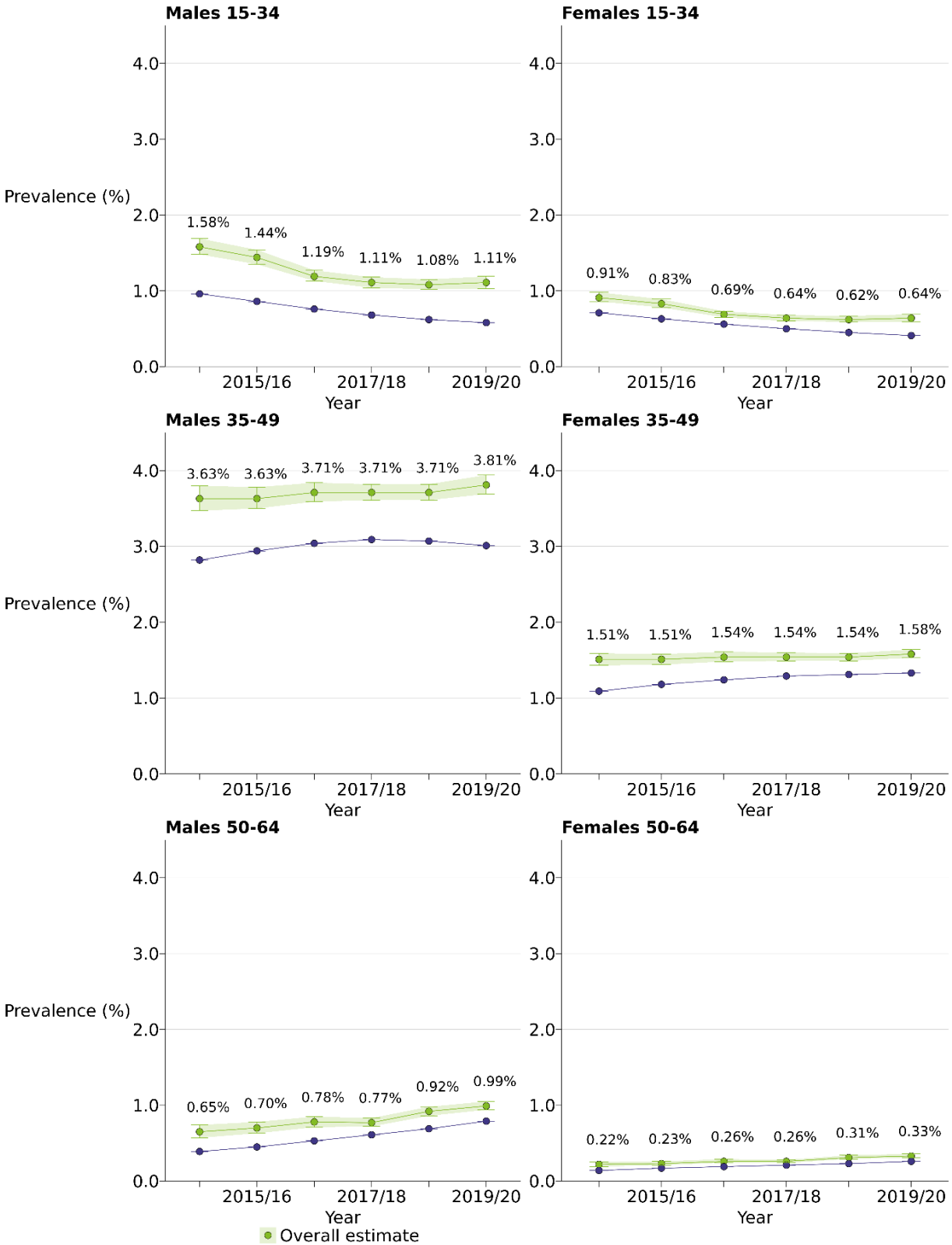
Figure 6: Estimated breakdown of treatment status for selected age groups of people with opioid dependence in Scotland; 2014/15 to 2019/20



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 six years.

Figure 7: Estimated prevalence (%) of opioid dependence in Scotland by age-sex group; 2014/15 to 2019/20



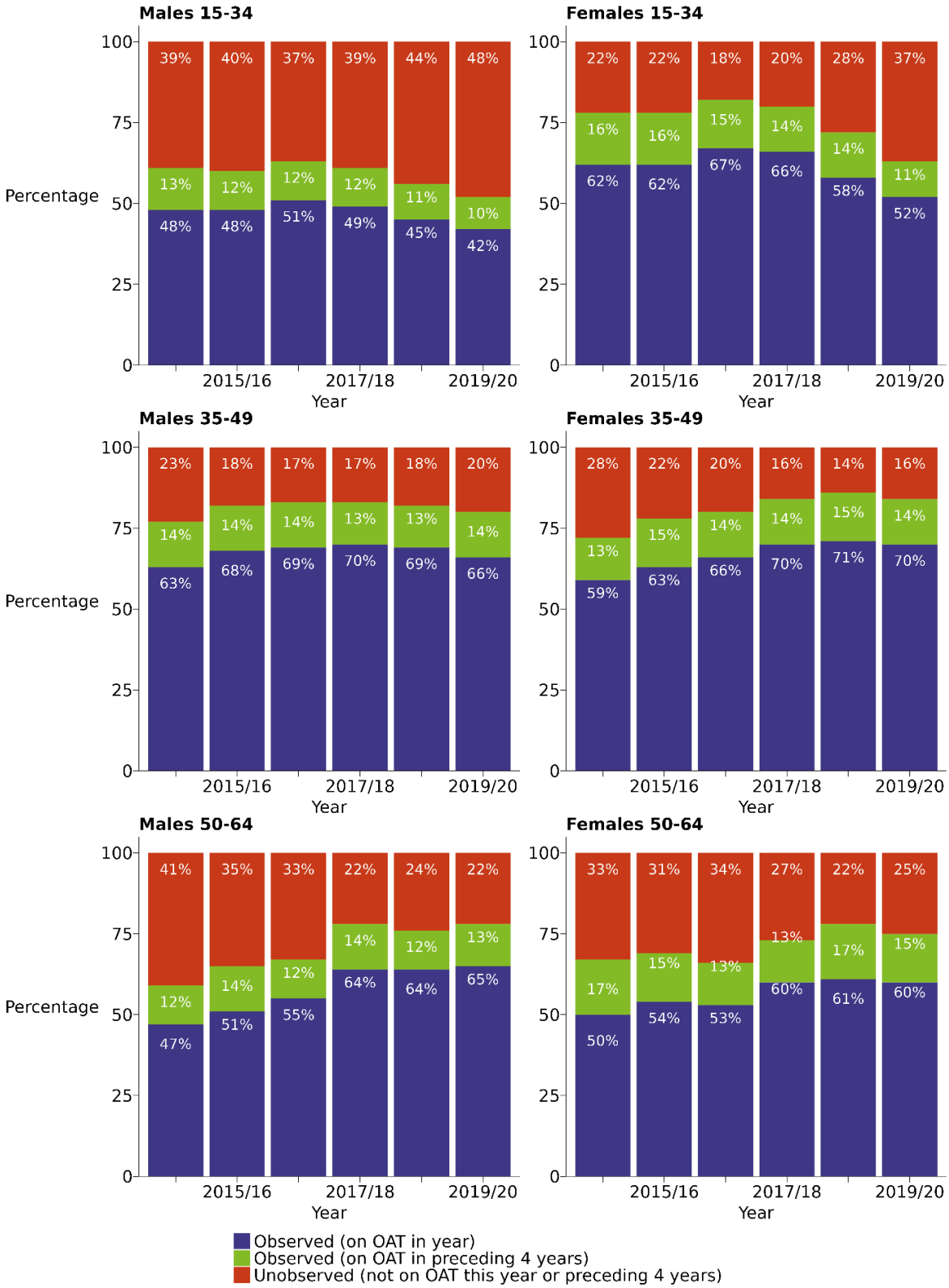
In all six years, estimated prevalence was highest among men aged 35 to 49 years. In 2019/20, an estimated 3.81% (95% CrI: 3.69% to 3.94%) or 19,200 (95% CrI: 18,600 to 19,900) men in this age group were opioid-dependent. Eighty per cent (95% CrI: 76% to 82%) of these men, i.e. 15,175 men, were 'observed', i.e. had received OAT during this year or in the four preceding years, with 66% (95% CrI: 63% to 68%) receiving at least one OAT prescription during 2019/20.

The estimated increase in the number of people with opioid dependence aged 50-64 and reduction in number aged 15-34 over the six-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 2019/20, an estimated 42% (95% CrI: 39% to 45%) of this group received OAT, while 48% (95% CrI: 43% to 51%) 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.

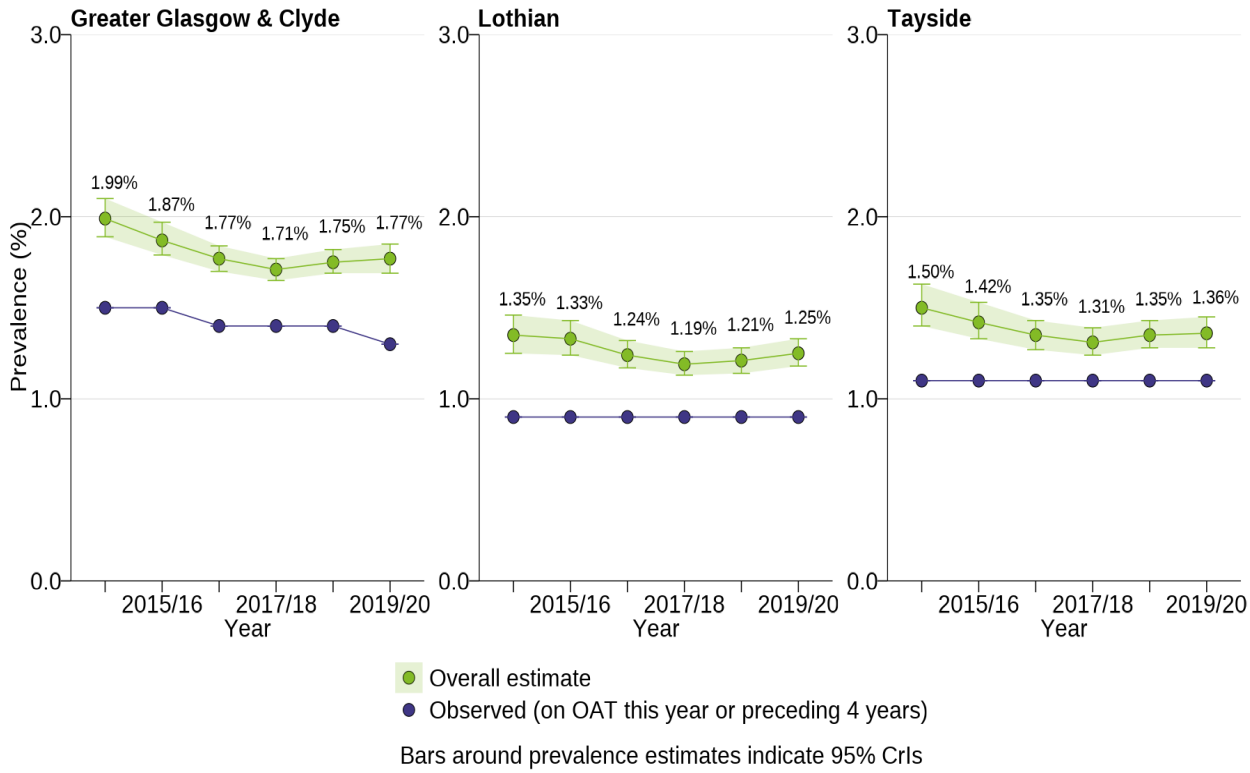
Figure 8: Estimated breakdown of treatment status for selected age-sex groups of people with opioid dependence in Scotland; 2014/15 to 2019/20



Estimated prevalence of opioid dependence in Greater Glasgow and Clyde, Lothian, and Tayside

Figure 9 shows the estimated prevalence, and Figure 10 the estimated OAT exposure, for NHS Boards Greater Glasgow and Clyde, Lothian, and Tayside in each of the six years.

Figure 9: Estimated prevalence (%) of opioid dependence; NHS Boards Greater Glasgow and Clyde, Lothian, Tayside; 2014/15 to 2019/20



In 2019/20, the estimated prevalence of opioid dependence in Greater Glasgow and Clyde was 1.77% (95% CrI: 1.69 to 1.85%), or 14,100 (95% CrI: 13,500 to 14,800) people. There was some evidence of a small reduction from 1.99% (95% CrI: 1.89% to 2.10%) or 15,400 (95% CrI: 14,700 to 16,300) since 2014/15. As with Scotland

overall, estimated prevalence was highest among men aged 35-49: an estimated 5.62% (95% CrI: 5.35% to 5.92%) of this group, or 6,200 (95% CrI: 5,900 to 6,500) were opioid-dependent in 2019/20.

The estimated prevalence in Lothian in 2019/20 was 1.25% (95% CrI: 1.18% to 1.33%) or 7,700 (95% CrI: 7,200 to 8,200) people aged 15 to 64 years. This was similar to the estimate for 2014/15 (7,900, 95% CrI: 7,300 to 8,600).

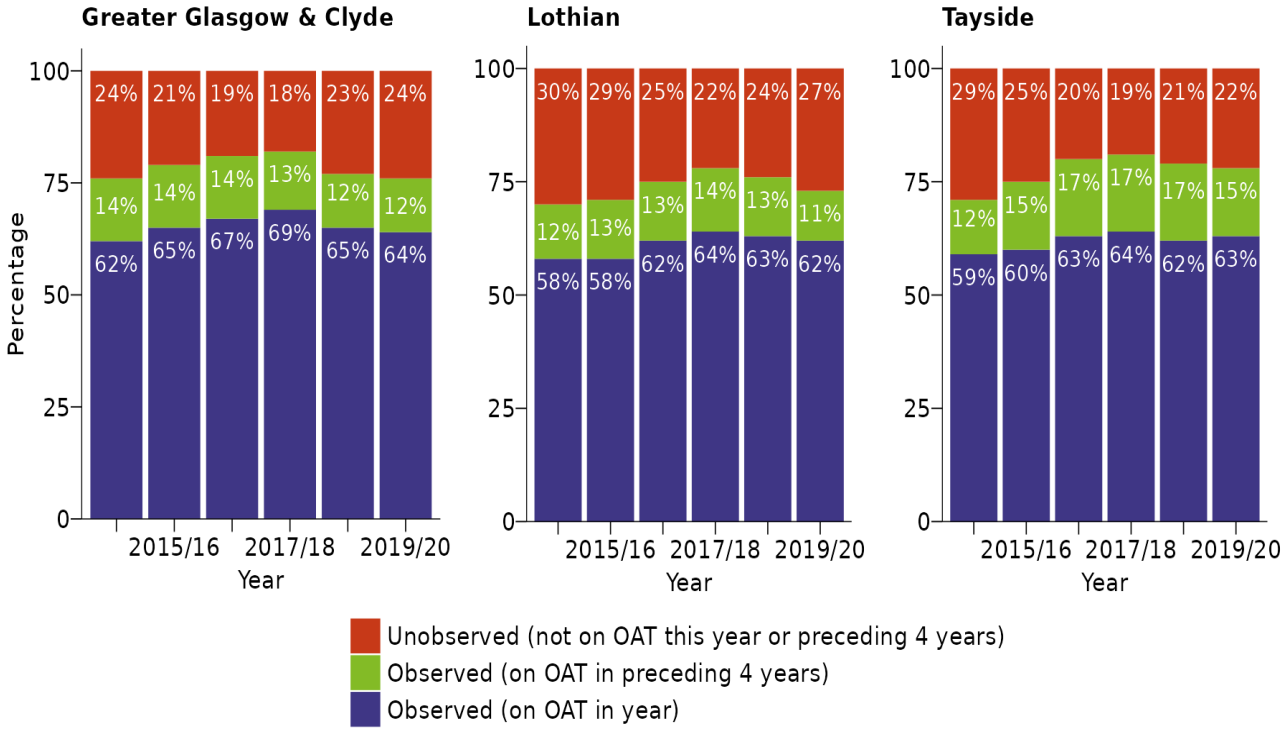
In Tayside, estimated prevalence in 2019/20 was 1.36% (95% CrI: 1.28% to 1.45%), or 3,600 (95% CrI: 3,400 to 3,800) people aged 15 to 64 years. There was some evidence of a small reduction since 2014/15, when the estimated number of people with opioid dependence was 4,000 (95% CrI: 3,700 to 4,300).

Estimated OAT exposure was very similar across these three NHS Boards. In 2019/20, estimated OAT exposure was 64% (95% CrI: 61% to 67%) in Greater Glasgow and Clyde, 62% (95% CrI: 58% to 66%) in Lothian and 63% (95% CrI: 60% to 67%) in Tayside (Figure 10), compared with 61% (95% CrI: 59% to 63%) for Scotland overall (Figure 2).

The estimated percentage 'unobserved' in 2019/20 was 24% (95% CrI: 21% to 28%) in Greater Glasgow and Clyde, 27% (95% CrI: 22% to 31%) in Lothian and 22% (95% CrI: 27% to 26%) in Tayside (Figure 10), compared with 26% (95% CrI: 24% to 28%) for Scotland overall (Figure 2).

For these NHS Boards, further details of the estimated numbers and prevalence associated with each stratification can be found in Tables 1 to 8 in the **Supplementary tables**.

Figure 10: Estimated breakdown of treatment status for people with opioid dependence in NHS Boards Greater Glasgow and Clyde, Lothian and Tayside; 2014/15 to 2019/20



Discussion

Summary and Implications

The estimated number and prevalence of people aged 15-64 with opioid dependence in Scotland in 2019/20 were 47,100 (95% CrI: 45,700 to 48,600) and 1.32% (95% CrI: 1.28% to 1.37%) respectively. Overall prevalence was estimated to have remained relatively stable between 2014/15 and 2019/20, with some weak evidence indicating that it might have fallen by a small amount. There was also evidence of a small overall reduction in prevalence in Greater Glasgow and Clyde, although estimated prevalence remained high at 1.77% (95% CrI: 1.69% to 1.85%) in 2019/20.

There was a reduction in the estimated number of people with opioid dependence aged 15 to 34 years and an increase in the number aged 50 to 64 years. This change in age demographics was also clear from the 'observed' population. It is widely recognised that opioid dependence is a chronic, relapsing condition that generally commences in late adolescence and may last for several decades. It is very likely therefore that the change in age demographics over time is primarily driven by ageing among the population with opioid dependence rather than a high cessation rate among 15- to 34-year-olds and/or an increase in the number of people aged 50 to 64 years experiencing opioid dependence for the first time. The purpose of this report was not to assess the range of factors (for example, cessation of opioid use following treatment, migration) that could influence these trends, nor was it possible to provide estimates for a larger number of narrower age groupings. However, these changes in age composition were very similar to those observed in other drug-related statistics (Public Health Scotland, 2022a; Public Health Scotland, 2022b) and peer reviewed journal articles (Lewer, Croxford, Desai, & Emanu, 2022; McDonald, et al., 2021; Parkinson, Minton, Lewsey, Bouttell, & McCartney, 2018) which have provided further detail on such trends and concluded that Scotland has an ageing cohort of people with opioid dependency.

This relative stability of prevalence suggests that observed increases in the number of drug-related deaths (National Records of Scotland, 2023) were not due to changes in the size of the underlying population of people with opioid dependence in Scotland.

Instead, the increased number of deaths were likely due to the increased mortality risk experienced by people who use opioids (McAuley, et al., 2023).

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 2019/20, 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 2019/20 (Figure 1), there is a clear indication that the prevalence of opioid dependence is higher in Scotland than in other comparable countries.

Estimated OAT exposure was high compared to many sites globally (Larney, et al., 2017), with an estimated 61% having received at least one OAT prescription in 2019/20. Almost three quarters of the estimated population of people with opioid dependence had received OAT at some point during the last five years.

Previous estimates of the number of 'problem drug users' in Scotland in 2015/16 were higher than the estimated number of people with opioid dependence in this report (Public Health Scotland, 2020). 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, so the findings from these two exercises should not be directly compared.

Limitations and next steps

This Official statistics in development report describes the first 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. A more detailed description of the methodology used, and results from sensitivity analyses exploring some of these assumptions, will be available in an accompanying journal article. Some additional potential issues - including potential bias resulting from incompleteness of OAT prescribing data - will be explored in future model development and subsequent reports.

In this first iteration of the revised methodology, prevalence estimates have been derived for Scotland as a whole and for three NHS Boards. There are some statistical challenges in using the MPEP model to derive estimates for all NHS Boards, particularly those with the lowest numbers of opioid-related deaths and overdose hospital admissions. However, it is a key aim of subsequent iterations to extend the model, possibly via incorporation of additional data sources, to produce these estimates.

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.

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Further information

Further information and data for this publication are available from the **publication page** on our website.

The next release of this publication will be March 2025.

Open data

Data from this publication are available to download from the **Scottish Health and Social Care Open Data portal**.

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Appendices

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 01/04/2009 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.

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 2014 and 31 March 2020 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 2019/20, CHI numbers were available for between 75% and 81% of OAT prescriptions each year (Public Health Scotland, 2023). 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.

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 2020
- Date of death (due to any cause)

- Date of leaving Scotland, for those who were known to have left the country[vi]

- 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 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.

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

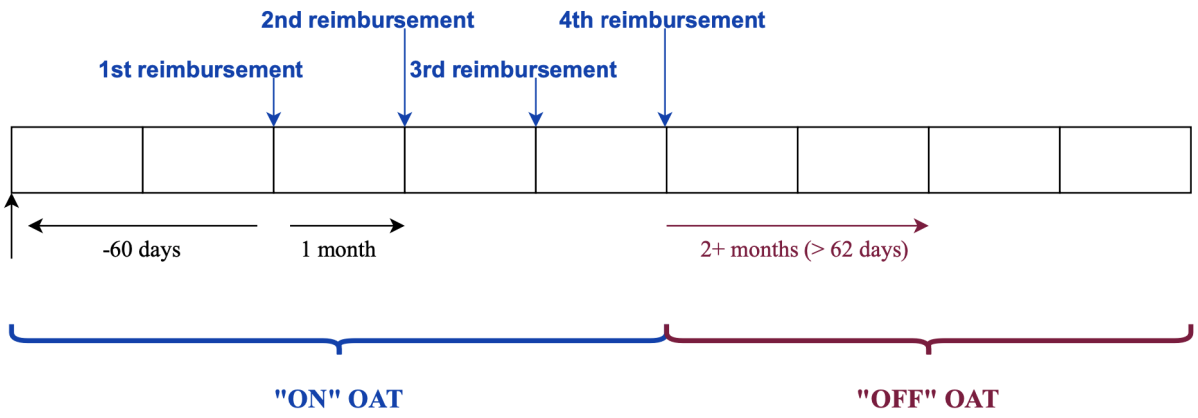
For each individual within the baseline cohort, all follow-up time was coded as 'on' and 'off' OAT. Each individual may contribute to both the 'on' and 'off' treatment follow-up time at different points.

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):

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

[vi] PHS's CHI database provided an estimated date for the removal of an individual's record from a GP patient listing in Scotland.

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=310 deaths over this six-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**.

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, 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 of 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[vii]. Hospital admissions were excluded if they ended in death (n = 31), 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**.

[vii] 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
- 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: Greater Glasgow and Clyde, Lothian, Tayside, and rest of Scotland. (Note: although estimates are not presented for 'rest of Scotland', these are derived as part of the model and used to calculate estimated prevalence for Scotland as a whole)

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 region, 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 latent (i.e. unobserved) prevalence. This modelled estimated how prevalence varied by year, sex, age group and region as covariates. Inclusion of combinations of these factors in these models (e.g. to allow for 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.

More detailed descriptions of the modelling approach will be available in a forthcoming accompanying journal article. See also Jones, et al., 2020 and Downing, et al., 2023 for background on development of the MPEP approach.

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Appendix 4 – Publication metadata

Publication title

Estimated Prevalence of Opioid Dependence in Scotland, 2014/15 to 2019/20

Description

The report contains estimates of number of people with opioid dependence, and prevalence, in Scotland, from 2014/15 to 2019/20.

Theme

Health and Social Care

Topic

Drugs

Format

PDF Report and Excel **tables**

Data source(s)

Scottish Public Health Data Linkage Programme

Date that data are acquired

December 2023

Release date

19 March 2024

Frequency

Annual

Timeframe of data and timeliness

The timeframe for the data used in this publication is financial years 2009/10 to 2019/20.

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 2019/20. 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. Demographic stratifications with an estimated size of 100 people are not described in further detail in the charts and tables accompanying this report.

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 three NHS Boards (Greater Glasgow and Clyde, Lothian, Tayside) are provided. PHS intends to provide NHS Boards with a tool for calculating approximate local estimates, while the provision of more robust model-based estimates for other NHS Boards will be addressed in 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, 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

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Appendix 5 – 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 6 – 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.

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