

Access to services for mental ill-health and substance use among people released from prison in Scotland (RELEASE): Retrospective observational cohort study protocol

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Abstract

Introduction

Mental health and substance use (MH/SU) problems are highly prevalent among the prison population. However, early and preventative post-imprisonment care appears to be insufficient to meet the MH/SU needs of people released. This is demonstrated by elevated rates of MH/SU-related emergency care and deaths attributable to alcohol, drugs and suicide. Studies examining post-imprisonment healthcare contacts across community, outpatient, inpatient and emergency services for MH/SU are required to address this issue. This protocol paper describes the outcome of data linkage and details our plans for data cleaning and analysis.

Methods

The RELEASE study will follow a retrospective observational cohort design. This is the first study using national individual-level linked administrative health and prison data from Scotland. We report the results of creating the cohort, and outline proposed methods for data preparation and analysis. Within the cohort, the exposed group comprises everyone released from prison in 2015, and the unexposed group consists of a random sample of the general population matched (1:5 ratio) on age, sex, postcode and postcode-derived index of multiple deprivation, and with no prison exposure in the preceding 5 years. Health data (community prescribing, outpatient visits, specialist substance use, psychiatric inpatient, general inpatient, out-of-hours general practice, 24-hour National Health Service [NHS] helpline, ambulance, and emergency services), deaths data, and prison data (admissions, releases, demographic data) were linked to the cohort using unique identifiers. Service contacts associated with MH/SU will be quantified and compared across the two groups using regression modelling, controlling for potential confounding variables, reimprisonment and deaths.

Conclusion

RELEASE is a comprehensive study with potential to inform post-imprisonment MH/SU service delivery, whilst the dataset holds significant potential for exploring other health conditions and outcomes. This research will allow for an unprecedented understanding of post-imprisonment service use patterns in Scotland, and RELEASE will make a significant public health contribution given the overrepresentation of people released in costly emergency care contact and death rates.

Keywords

adult mental ill-health; substance use; criminal justice; administrative health records; linked administrative data; imprisonment; post-imprisonment health access

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Introduction

Mental health and substance use care on release from prison

This protocol paper details the outcome of data linkage of prison and health data to create the RELEASE dataset, and presents data preparation and analysis plans. Analysis will quantify mental ill-health and substance use-related service contacts for people released from Scottish prisons, and compare rates between people released and a matched general population sample.

Mental health and substance use problems account for 18.7% of years lived with disability globally [1]. Prevalence of mental ill-health and substance use problems is far higher among people in prison than in the general population [2]. Almost everyone in prison will be released, indicating the public health importance of ensuring timely post-imprisonment access to appropriate care.

Imprisonment is an opportunity to reach a population who may struggle to engage with healthcare services. However, treatment access can be limited and any treatment gains can be challenged by poor continuity of care on release [3, 4]. The stressors associated with resettlement and post-release supervision, such as surveillance, fear, financial and accommodation insecurity, can exacerbate mental health problems and use of drugs and alcohol [5, 6].

Without adequate support and treatment, MH/SU problems can have serious adverse consequences beyond years lived with disability. People released from prison are more likely to require emergency care for mental ill-health (e.g. self-harm) or substance use (e.g. overdose) than the general population [7–9]. Mortality rates are extremely high, particularly in the early days and weeks post-release, with suicide and substance use-related deaths (alcohol and other drug poisoning with unintentional or undetermined intent) being two of the three most common causes of death [10].

Accessing primary care is essential for facilitating access to specialist MH/SU care [11], but understanding of primary care access specifically for MH/SU is limited [12]. Although people released from prison access primary care at higher rates than the general population, over 50% of people released do not access primary care within the first month following release, when mortality related to MH/SU is highest [10, 11, 13, 14]. Understanding of access to non-emergency specialist MH/SU care on release is similarly limited [15]. Contact rates with community MH/SU services and opioid substitution treatment following release have been shown to be below rates achieved during custody [15–17] suggesting unmet need. How post-imprisonment access compares to that of the general population and between services needs greater exploration. The paucity of research evidence generated outwith North America and Australia indicates a need for research in other countries, given international differences in healthcare systems and in imprisonment practices.

The Scottish context

There are profound public health challenges in relation to general population health in Scotland. Scotland currently experiences elevated rates of drug-related deaths in

comparison to its European neighbours, with overdose deaths 13 times the European average [18]. Suicide rates are high relative to other UK countries [19]. The rates of death due to suicide, drugs and alcohol are even higher within Scotland's prison population. Indeed, compared to the general Scottish population, people released (liberated) from prisons are more likely to die by suicide and from drug or alcohol-related deaths (not only overdoses but deaths related to substance use, e.g. alcoholic liver cirrhosis, alcoholic encephalopathy), and all-cause mortality is most likely to occur in the first month after release [20].

Psychiatric comorbidity characterises the prison population, and adverse life experiences and trauma often precede imprisonment [21]. People in Scotland's prisons are likely to be from communities experiencing multiple deprivation, having been in care, and suffered interpersonal victimisation. Experiences of imprisonment further exacerbate mental ill-health [21]. The criminalisation of substance use may also increase the risk of involvement in the justice system [22], and 78% of people tested positive for illicit substances upon admission to Scottish prisons in 2017/18 [23]. In 2023–24, the average daily prison population in Scotland was 7,860 and rising, placing pressure on prison capacity [24] and causing challenges to meeting health needs in prison, and providing effective transitional MH/SU care [25]. Consequently, many people are released with mental ill-health or substance use problems. It is therefore vital to ensure people released from prison can access appropriate, timely, evidence-based care as a public health priority.

The extent to which people released from prison access MH/SU services in Scotland remains unknown. This lack of clarity precludes the development of evidence-based optimisation of support. If people released from prison access services at a rate comparable to or higher than others with the same demographic profiles, yet experience disproportionately high rates of death due to suicide and substance use, it suggests that existing services may not be appropriate to the needs of people who have experienced imprisonment. Addressing the uncertainty about the extent to which people released from prison are accessing services for MH/SU is essential to inform public health and health service responses to improve outcomes for people released from prison.

There are limited data resources in Scotland to generate population evidence on how people experiencing imprisonment access health services. Public Health Scotland – Scotland's national public health agency – is now routinely linking prison and health data to monitor population trends. However, this data resource is not publicly accessible or easily available to independent researchers, nor does it include a well-matched, random general population sample of people who have not experienced imprisonment. RELEASE is the first project to link health and justice data with a matched population sample in the United Kingdom, and will allow us to generate population evidence of international significance.

Research aims and questions

RELEASE will quantify MH/SU service contacts following imprisonment for community prescriptions, outpatient, inpatient and emergency services. For the first time in Scotland, we will provide a holistic overview of patterns of

access. The aims of RELEASE are to (1) quantify service use for MH/SU among people released from prison in Scotland and compare this with a randomly matched general population sample, and (2) explore differences in service access between sub-groups of people released from prison. To achieve these aims, RELEASE will address two research questions:

(RQ1) To what extent are services accessed by people released from Scottish prisons for mental ill-health and substance use, and how does this compare to a general population sample matched on age, sex, postcode, and postcode-derived index of deprivation?

(RQ2) Amongst people released from prison, how does service access differ by demographic characteristics (age, sex, postcode-derived deprivation/rurality variables, ethnicity and other protected characteristics) and liberation types?

Methods

Study design and setting

The data linkage was recently completed. The process and outcome are described below. We additionally present our protocol for conducting a retrospective observational cohort study that compares the use of services for MH/SU for those released from prison in Scotland in 2015 with a demographically matched and randomly selected Scottish general population sample. Reporting will be transparent and consistent with the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement [26].

All health services examined are provided by the National Health Service (NHS), apart from specialist substance use services, (see 'Scottish Drug Misuse Database' below), which include local authority, prison, and third sector services. NHS services in Scotland are free at the point of use and funded by general taxation. Our cohort comprises all people released from a Scottish prison in 2015 (exposed group) and a random sample from the Scottish general population (unexposed group) and followed up for up to five years. We limited follow-up data to early 2020 to avoid confounding effects of service disruptions during and after the COVID-19 pandemic. Data were requested in 2021 when these disruptions were still keenly felt and were anticipated to be provided whilst services were still dealing with post-pandemic strain (2022).

The unexposed group was: (1) matched at a ratio of one prison-exposed individual to five unexposed individuals on age, sex, postcode (district and area), and postcode-derived index of multiple deprivation (Scottish Index of Multiple Deprivation; SIMD); and (2) had no experience of imprisonment between 2010-2015. The matching criteria were successively relaxed as needed to find five matches for each exposed case, according to the match levels set out in Table 1. We chose to rely on postcode area and district to improve our chances of finding matches, as we anticipated that using full postcodes would be challenging since our exposed group would include individuals from remote and rural areas. To compensate for the relaxation of geographical precision, we also matched on SIMD deciles (based on full postcode of residence at index date) to

Table 1: Hierarchical matching criteria

Match Level	Matched Characteristics
1	Year of birth Sex SIMD (2016) decile Postcode district
2	Year of birth Sex SIMD (2016) decile Postcode area
3	Year of birth Sex SIMD (2016) decile
4	Year of birth Sex Postcode area
5	Year of birth Sex

account for potential variability of levels of deprivation in larger geographical areas.

The cohort was linked to routinely collected health and prison service administrative datasets (2010-01-01–2020-02-28) and death records (2015-01-01–2020-02-28), by the Public Health Scotland Electronic Data Research and Innovation Service (eDRIS).

The index date represents the most recent prison release date in 2015, and thus varies between individuals in the exposed group. The pre-index period consists of the four years prior to, but excluding, the index date. The post-index, or follow-up, period includes the four years following, and including, the index date, with follow-up time adjusted for mortality (i.e. less follow-up time in the case of a registered death in the post-index period). Matched controls were assigned the same index date and pre- and post-index periods as their prison-experienced counterparts, unless they had also died during the follow-up period, in which their follow-up time was censored to account for this.

Datasets

The datasets we will analyse are outlined in Table 2, covering nine distinct service types, representing community prescriptions (as a proxy for primary care), outpatient services, inpatient services, and emergency or unscheduled care. Episode-level data are available for all services except for prescribing, where each record represents a prescribed item rather than a service episode.

Data linkage

eDRIS were responsible for cohort creation, data extraction, and data linkage. RELEASE researchers do not have access to the original datasets. eDRIS pseudo-anonymised the linked dataset, and removed variables not pre-specified for the analysis. The research dataset can only be accessed by named

Table 2: Datasets used for data linkage and analysis

Dataset	Description	Purpose
The Community Health Index (CHI)	A population register used in Scotland for health care purposes. The CHI number uniquely identifies a person on the index and contains basic demographic data.	Unique identifier for each person in the cohort which facilitates linkage to all other datasets.
Outpatient contacts (SMR00)	Episode-level data from patients on new and follow-up appointments at outpatient clinics in all specialities (except Accident and Emergency [A&E] and Genito-Urinary Medicine).	Derive service contacts (outcome) and pre-index health status (covariate).
General hospital admissions (SMR01)	Episode-level data on hospital inpatient and day case discharges from acute specialities from hospitals in Scotland including diagnosis. The dataset contains episode management data.	
Psychiatric hospital admissions (SMR04)	Episode-level data on patients who are receiving care at psychiatric hospitals, including diagnosis, at the point of admission and discharge.	
Specialist addiction services - Scottish Drug Misuse Database (SDMD)	Information about clients seen at specialist drug services, general practitioners and prison drug services. This includes prescription profile, and initial and follow-up information.	
National Health Service 24-hour Helpline (NHS24)	Information about unscheduled care contacts with Scotland's national telehealth and telecare service, including information on the nature and outcome of the call.	
Ambulance call-outs - Scottish Ambulance Service (SAS)	Episode-level data on patients who have used unscheduled emergency transportation. Contains the Advanced Medical Priority Dispatch System (AMPDS) code and information on substance use.	
Out-of-hours general practice (OOH)	Episode-level data on patients receiving out-of-hours primary care services. Contains Read codes (clinical codes used in general practitioner settings in Scotland).	
Accident and Emergency (A&E)	Episode-level data on patients receiving unscheduled care across emergency departments, minor injuries units and community units. Contains International Classification of Diseases 10 th revision (ICD10) codes and diagnostic group codes.	
Community prescribing -Prescribing Information System (PIS)	Records of all medicines prescribed and dispensed in the community in Scotland, and prescriptions written in hospitals that are dispensed in the community. As GPs write the vast majority of these (a small minority are written by other authorised prescribers e.g., nurses, dentists), we can use prescribing data as a proxy for accessing primary care for MH/SU. Contains British National Formulary (BNF) codes, which will be used to identify prescriptions issued for MH/SU-related medicines.	
National Register of Scotland Death Records (NRS DR)	Database containing information on all registered deaths in Scotland with information on cause(s) of deaths.	Used in combination with prison records to calculate 'time-in-community' (i.e. time in the post-index period when the individual can access services, which is used as a denominator when adjusting service contacts for time-in-community), and for descriptive statistics on mortality rates.
Prisoner Records 2 (PR2)	Prison admission and liberation records and demographic data for all people in Scottish Prison Service (SPS) establishments. The dataset is split into two files – admissions and liberations, with demographic data associated with the liberations dataset. The liberation data also contain information regarding the liberation reason (e.g. sentence served, bailed, parole).	Used to reconstruct prison episodes (distinct period where the person was in an SPS establishment), which will then be used as a covariate (time-in-community), and for adjusting service contacts (outcomes) for time-in-community. Demographic data and liberation reasons are also used for subgroup analysis (RQ2).

approved analysts within a secure environment (the National Safe Haven; NSH). Outputs from the analysis will undergo statistical disclosure control processes prior to being released for dissemination. The linkage process is described below using the GUILD guidelines [27].

Linkage and cohort creation

The exposed group of all individuals released from prison in Scotland in 2015 were identified from an extract of routinely collected Scottish Prison Service (SPS) records

(Prisoner Records 2; PR2). Records in Prisoner Records 2 are entered by Scottish Prison Service staff following face-to-face interview with a person on admission to prison. The data collected are designed to be aligned with the Scottish Census variables. Scottish Prison Service securely shared an extract of all people admitted to and liberated from prison between 2010-01-01 and 2020-02-28 with National Records Scotland (NRS); this was used to exclude prison-exposed individuals from the unexposed comparison group. The unexposed group was identified using the Population Spine, which includes all people in Scotland who have been in contact with NHS Scotland and who therefore have a unique Community Health Index (CHI) number. Since the 1970s, every person born in Scotland or in contact with health services has been assigned a Community Health Index number. Importantly, there are no opt-outs from these routinely collected administrative datasets.

The Prisoner Records 2 data was subjected to the following pre-processing prior to linkage: all variables were standardised to the format used in the Population Spine; any titles or unnecessary punctuation removed from names; accented letters anglicised to align with the Population Spine; hyphenations in names standardised; name fields split into multiple name strings and transposed to allow for matching across forename and surname fields; and Soundex transformations (i.e. algorithmically transforming words that sound similar to a common key to help match names that sound similar) of surname to increase the chance of matches where the last name may have been misspelt.

An overview of the linkage process is provided in Figure 1. National Records Scotland used the Population Spine to determine the Community Health Index numbers of each person (process referred to as CHI-seeding) using the Fellegi-Sunter algorithm [28], which is a score-based, probabilistic model (implemented through the BigMatch linkage software) [29]. The linkage score was not made available to the researchers, in accordance with pre-existing information governance protocols, but the overall precision estimate was very high at 99.70% (95% confidence intervals: 98.78%, 100.00%). The Fellegi-Sunter algorithm is a well-established data linkage method which has previously been validated in the context of epidemiological research [30]. National Records of Scotland securely provided the list of Community Health Index numbers of people within the exposed and unexposed groups of the cohort to eDRIS for linkage. Using the Community Health Index numbers, eDRIS linked the cohort to administrative health and death records before replacing Community Health Index numbers with National Records of Scotland-generated identifiers. National Records of Scotland returned the identifiers to Scottish Prison Service who extracted the final prison data, and transferred them to eDRIS for linkage with the health and death data. In total, 8,491 out of 8,917 (95.22%) individuals from the prison data were successfully linked to the Population Spine, which in this context can be considered very high. Once linkage was completed, eDRIS replaced the National Records of Scotland-generated identifiers with pseudo-anonymised identifiers before making the linked dataset available to researchers in the National Safe Haven.

Variable operationalisation

Outcome variables: mental ill-health and substance use-related service contacts

Outcome variables will consist of unique service contacts related to MH/SU with health services (community prescribing, outpatient services, specialist addiction services, NHS 24-hour helpline, out-of-hours general practice, psychiatric inpatient, general inpatient, accident and emergency, and ambulance services). Service contacts associated with MH/SU will be identified through the use of clinical codes (e.g. ICD10) or other diagnostic and contextual variables (see Table 3). Where possible, we will distinguish between mental ill-health and substance use-related service contacts using the diagnostic variables available in each dataset (see 'Classification variables' in Table 3). We have developed the following definitions to guide this process, which we will seek to implement consistently across all datasets:

Mental ill-health contacts are service contacts where the main reason for the contact is related to psychiatric conditions primarily associated with mental ill-health. This also encompasses self-harm, attempted suicide and intentional poisoning, regardless of whether it is caused by a licit or illicit substance.

Substance use contacts are service contacts where the main reason for the contact is primarily related to the current and ongoing use of alcohol and controlled substances, as defined in the Misuse of Drugs Act (1971) [31]. This includes accidental poisonings by the specified substances, but specifically excludes physical conditions (e.g., liver cirrhosis) which are consequences of prolonged substance use. It also includes selected mental and behavioural disorders which are due to the use of alcohol or controlled substances, specifically, acute intoxication, harmful use, dependence syndrome, withdrawal state with or without delirium, and amnesic syndrome.

Dual-diagnosis contacts are service contacts where a combination of one or more mental ill-health-related diagnoses/clinical codes, and one or more substance use-related diagnoses/clinical codes are captured within the same service contact (e.g. depression and acute intoxication).

According to the definitions, every relevant service contact will be classified into three mutually exclusive categories: mental ill-health (MH), substance use (SU), or dual-diagnosis (DD). The extent to which it is possible to apply this three-tiered MH/SU/DD classification varies between datasets, since it is contingent upon more than one condition/symptom being recorded in the data entry process. For some datasets, such as outpatient and specialist addiction services, it is not possible or appropriate to make such distinctions; the outpatient data contains no diagnostic variables, but the clinical speciality codes imply contacts are primarily associated with MH; the data on specialist addiction services consists only of substance use-related service contacts, but lack diagnostic variables. We

Figure 1: Overview of data linkage process and proposed cleaning and analysis

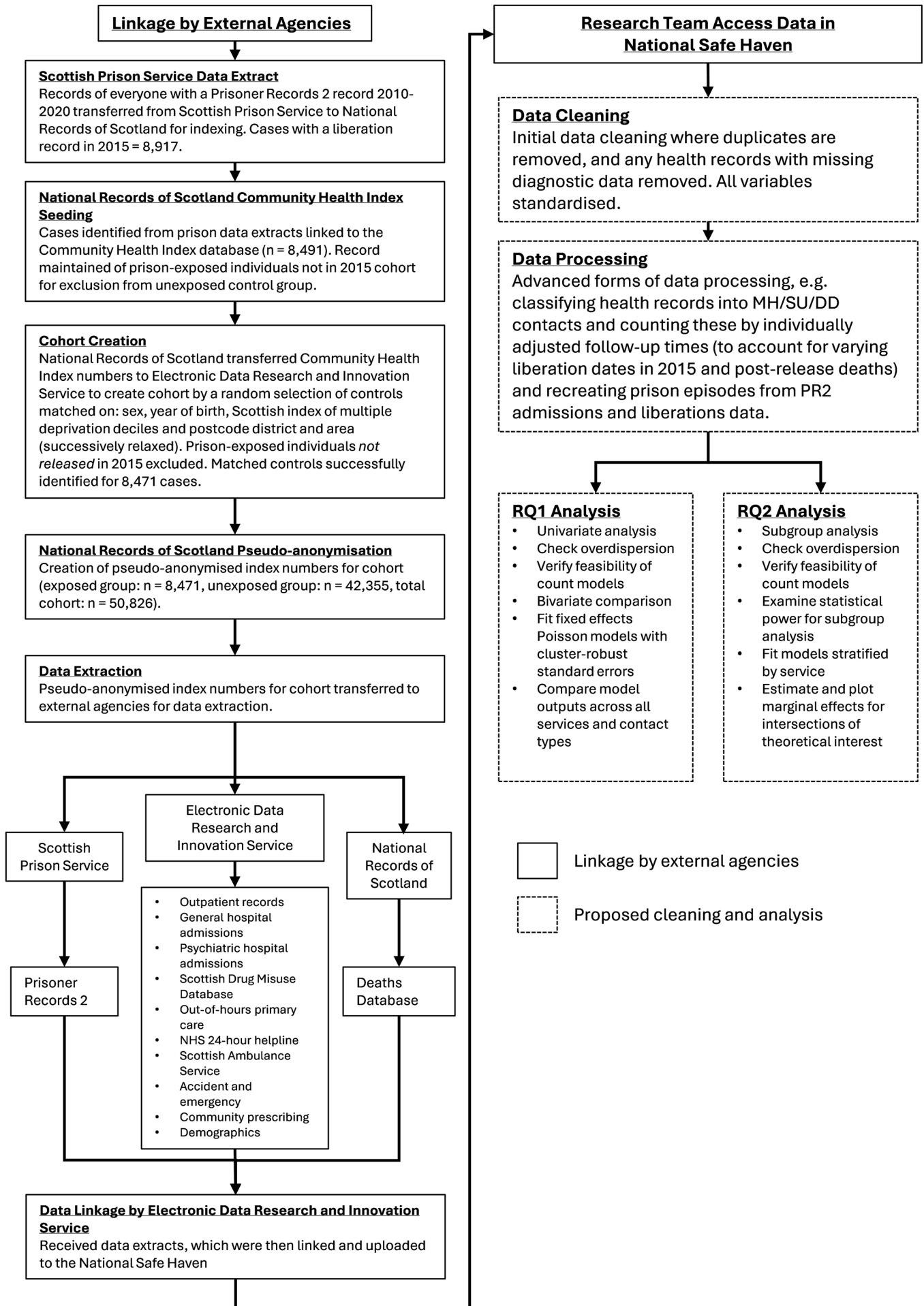


Table 3: Datasets and MH/SU/DD service contact classification

Dataset	Classification variables	Delineation
Outpatient contacts (SMR00)	Clinical speciality of service	MH
General hospital admissions (SMR01)	ICD10 diagnoses	MH, SU, DD
Psychiatric hospital admissions (SMR04)	ICD10 diagnoses	MH, SU, DD
Specialist addiction services (SDMD)	(all contacts SU)	SU
NHS 24-hour Helpline (NHS24)	Symptoms reported	MH, SU
Scottish Ambulance Service (SAS)	AMPDS codes, complaint codes, substance use-specific variables	MH, SU, DD
Out-of-hours general practice (OOH)	Read codes	MH, SU, DD
Accident and emergency (A&E)	ICD10 diagnoses, diagnostic group codes, intent of injury	MH, SU
Community prescribing (PIS)	BNF codes of prescribed items	MH, SU, DD

will therefore categorise the former contacts as MH and the latter as SU.

The boundaries between mental and behavioural disorders induced by psychoactive substance use within ICD10 are often imprecise, and we expect a high prevalence of comorbidity in our research population. To address this, we closely attended to ICD10 diagnoses determined to be induced by psychoactive substance use, and we will categorise acute intoxication, harmful use, dependence syndrome, withdrawal state and amnesic syndrome as SU. Conversely, psychotic disorders and other/unspecified mental and behavioural disorders will be categorised as MH. Our rationale for this is that we expect the latter will lead to treatment by adult mental health services, and the former by addiction services or treatments. For transparency and to allow for reproducibility, all clinical codes and classification variables highlighted in Table 3, which will be used to inform the delineation of mental ill-health and substance use-related conditions/symptoms are provided as supplementary tables and files on our Github (<https://github.com/rkjellgren/RELEASE/>).

Episodes and service contacts

Whilst contacts with health services can be conceptualised as episodes, we are specifically interested in contacts as potential points of intervention. We will create an algorithm for counting service contacts by MH/SU/DD, which also accounts for the time between contacts *within* services, but not *between* them. For instance, if there are several ambulance call-outs related to mental ill-health for one individual on the same day, we will count these as one MH ambulance contact. If, however, the person first calls the NHS 24-hour helpline, which may trigger an ambulance call-out, then we would count that as one MH helpline contact and one MH ambulance contact.

Some datasets (e.g. general hospital admissions, psychiatric hospital admissions, ambulance call-outs, out-of-hours general practice, accident and emergency, NHS 24-hour helpline) contain unique identifiers that can be used to link service contacts to episodes. For general inpatient and psychiatric inpatient contacts, 'continuous inpatient stay' markers are available [32]. We will use these markers to account for episodes of continuous care, with each episode representing

a series of contacts *within* a service clearly linked to the same issue(s). In datasets from the *Unscheduled Care Datamart*, which includes ambulance call-outs, out-of-hours general practice contacts, accident and emergency contacts and NHS 24-hour helpline calls, there is a similar marker referred to as the 'continuous unscheduled care pathway' marker. This marker allows analysts to reconstruct complex patient care pathways from these services (e.g. an initial phone call to NHS24, followed by an ambulance call-out and then subsequent admission at an accident and emergency department). Given our aim of quantifying service contacts and comparing them across different services, we will focus on service contacts across services rather than reconstructing such pathways, even though some of those contacts may be linked to more complex pathways across services. This allows us to conceptualise each contact with a service as an opportunity for MH/SU intervention within that service, and conduct service-level comparisons.

Time periods

The pre-index period is the four years prior to, but excluding, the index (liberation) date, while the post-index period is the four years following, and including, the index date. The four-year periods represent an unusually long follow-up period compared to most similar studies [14, 33, 34] and achieve consistency within the date range of our datasets (i.e. five years would be impossible for someone liberated on 2015-12-31). All service contacts and other relevant covariates will be calculated based on the pre-index and post-index periods.

Prison episodes and time spent in the community

Prison episodes will be reconstructed from Prisoner Records 2 admission and liberation data. This is important for two reasons. First, since some health services can be accessed whilst in prison (e.g. temporary leave for a procedure in a hospital), reconstructed prison episodes can be used to exclude service contacts that occurred whilst someone was in prison, thereby allowing us to only count post-release contacts. Second, we can use reconstructed prison episodes to compute individuals' 'time-in-prison', and its complement, 'time-in-community'. We define time-in-prison as the sum of time (in

months) an individual spent in prison. Time-in-community is defined as the time (in months) an individual is *not* in prison and alive (assessed by cross-referencing recorded deaths). As will be explained below, time-in-community will be used as an offset variable in statistical count models.

Prisoner Records 2 data, though inherently episodic, is split into admissions and liberations without a linking indicator beyond dates. Movements within the justice system are also recorded in Prisoner Records 2. As an example, someone in prison may be called for a police interview, or to court, and then return to prison, thus resulting in new admission and liberation records being created, even though they may still be serving time for the same sentence. The data also includes irregularities, such as successive admissions or liberations, reflecting real-world administrative functions and potential recording errors.

To address these issues, we will apply a bespoke algorithm that we have developed to reconstruct prison episodes, following consultation with Scottish Prison Service and other researchers. The full details of the algorithm are available on request, but it involves the following steps: (1) merge likely duplicate records; (2) sort admissions and liberations in chronological order; (3) infer episodes from consecutive admission-liberation pairs, assuming each admission was followed by a liberation, and that only the latest record in a run of successive liberations was considered valid. Finally, we do not have access to data on detention reasons, so cannot distinguish between sentence type (remand, sentence, recall), offence type, or time served for specific sentences.

Data analysis

Data quality

We will use the statistical software package, R [35], to clean, wrangle and process the data. We will manually review data to identify errors, sense-check and review the code. In line with principles of open science, we will publish our code where possible for transparency and reproducibility. We will assess data missingness for variables where we would expect an entry and will assume that no record in relation to MH/SU reflects no event rather than an unrecorded event [36]. Where feasible, we will use multiple imputation to address missing values across key predictor variables [37].

Cohort description

We will describe the demographic characteristics of the cohort. This will include age, sex, and postcode-derived indicators of deprivation and rurality. Ethnicity data has previously been reported to be poor in health datasets but is routinely recorded by Scottish Prison Service. In addition, we will describe other characteristics (disability, ethnicity, religion, sexual orientation, veteran status) of the exposed group (those released from prison) within the cohort, provided data quality and completion rates are sufficient.

Covariates

For the statistical models (see below), we have selected covariates based on the existing literature and hypotheses about their contribution to service contact patterns. We will

take a data-driven approach to determine the final functional forms and inclusion of covariates in the models. The set of covariates differs between RQ1 and RQ2, with the latter containing additional sociodemographic variables unique to the Prisoner Records 2 data, as well as the variables used for matching (age, sex, SIMD decile). Prisoner Records 2 includes liberation reason (e.g. having completed a sentence or liberated with supervision in the community, including probation), which is an important covariate for RQ2. All variables are listed in Table 4.

Analytical methods

RQ1 We will first conduct a univariate analysis to examine the distributions of our outcome and predictor variables. For outcome variables, we will examine overdispersion using the Wald test to determine if Poisson models are appropriate. We will conduct a bivariate comparison of service contacts between the exposed/unexposed groups and calculate incidence rate ratios (IRRs), and perform appropriate statistical tests based on the underlying distributions of the outcome variables. We will use Poisson models with time-in-community specified as an offset variable, and model the cluster identifier as a fixed effect. This is necessary to account for the clustered structure of the data; each exposed case shares postcode, sex, age and SIMD decile with their matched unexposed controls. Failing to account for the clustered structure could lead to biased standard errors [39]. In addition to modelling the cluster identifier to represent group affiliation as a fixed effect, we will also calculate robust clustered standard errors [40].

Our modelling strategy involves fitting a model for every combination of service and type of contact (see Table 2), and making an overall assessment of the patterns. This means that we will have a total of 21 outcome variables, where every variable represents service contacts in the post-index period for every unique combination of service and contact type (e.g. 1x MH, 1x SU, 1x DD for general inpatient contacts and so on). Whilst challenging due to the volume of output this will produce, it will allow for the most nuanced appreciation of how service access is patterned. This is important because our research population is characterised by high rates of comorbidity in a context where needs can often only be met in one service (e.g. unable to access MH services when actively using substances). The same covariates will be used across all models (see Table 3) to ensure comparability across services and types of contacts.

RQ2 For RQ2, we will model service contacts for the exposed group only, and incorporate covariates used in the matching process, as well as additional covariates specific to the Prisoner Records 2 data: ethnicity, other characteristics, and liberation types (see Table 3). Liberation types refer to the conditions on which a person is released from prison, for example on parole, home detention curfew, or with no further involvement. Statistical power will be an important consideration in developing the final models, given that we expect relatively low numbers on some of the protected characteristics variables, and we will only stratify our models by service (as opposed to service and contact type, as in RQ1). The final inclusion of specified variables will depend

Table 4: Covariates

Research Question	Variable	Notes
RQ1	Cohort group (exposed/unexposed)	Dichotomous variable indicating the cohort group (i.e. released from prison in 2015 or matched controls who have not been imprisoned during the study period).
RQ1	Cluster identifier	A variable which links each exposed case to their five matched unexposed controls (i.e. a 'cluster'). Modelled as a fixed effect to account for the clustered structure of the data.
RQ2	Sex*	
RQ2	Age*	
RQ1/RQ2	Previously diagnosed MH/SU conditions	Two dichotomous variables to capture the presence of a MH or SU diagnosis in the pre-index period.
RQ1/RQ2	Previous service contact for MH/SU	Dichotomous variable for each service (e.g. for models with general inpatient contacts as an outcome, the predictor would be having had one or more general inpatient service contacts in the pre-index period).
RQ1/RQ2	Elixhauser co-morbidity index [38]	Based on diagnostic information from the pre-index period.
RQ1/RQ2	Time-in-community	Derived from Prisoner Records 2 and National Records of Scotland Deaths database
RQ2	NHS Health board of residence	Derived from postcode registered at the index date (or closest to).
RQ2	SIMD deciles*	
RQ2	Urban-rural classification	
RQ2	Liberation type	The specific reason, or type, of liberation (e.g. sentence served, or liberated on licence or parole).
RQ2	Disability	
RQ2	Ethnicity	
RQ2	Religion	
RQ2	Sexual orientation	
RQ2	Armed Forces veteran status	

*These are variables used as matching characteristics in the selection of matched controls and will not be adjusted for in RQ1, where we will be controlling for cohort group (i.e. exposed vs. unexposed).

on data quality. To aid the interpretation of the models, particularly where there may be complex interactions between different demographic characteristics, we will calculate and plot marginal effects according to intersections of theoretical interest.

Lived/living experience/expertise involvement

The research team includes people with personal and family/friend experience of imprisonment, as well as professionals with experience providing healthcare to people in custody and on release. We have established a Lived

Experience Advisory Panel (LEAP) to meet regularly throughout the research project. LEAP members are people with experience of imprisonment in Scotland and were recruited via existing team networks. The LEAP will ensure the research focuses on improving the lives of those who have been imprisoned, and that results are thoughtfully interpreted and disseminated effectively to different stakeholder groups (e.g., people with experience of imprisonment, family and friends, service providers, policymakers). LEAP colleagues will be paid at National Institute for Health and Care Research (NIHR) rates [41] and will be supported to contribute by the research team.

Discussion

This research will provide the first national-level description of how people who have been in prison access services for MH/SU in Scotland. It will compare patterns of service use to a general population sample matched on age, sex, postcode, and postcode-derived index of deprivation to uncover disparities in service access. Furthermore, it will provide insights into how service use varies within the subgroup of people released from prison, based on various demographic characteristics.

The RELEASE dataset will be the only contemporary dataset in Scotland which integrates prison, health services and mortality data. This dataset offers unprecedented potential to inform improvements in public health and the health of justice-involved people in Scotland, and potentially beyond. Whilst the proposed analysis is focused on MH/SU, the richness and quality of the data will allow for future research into mortality, morbidity and service contacts for other conditions. We will identify opportunities for further analysis using the RELEASE dataset and welcome collaboration.

Our research will contribute to the growing international literature on health service access following release from prison [11, 14, 42, 43]. By drawing from multiple datasets to ascertain contacts for MH/SU, we aim to provide a holistic picture of healthcare access patterns, and determine differences between populations, services, and conditions.

A better understanding of service access patterns will enable us to provide vital evidence to enhance healthcare delivery for people released from prison in Scotland, a group who are known to have exceptionally poor health and disproportionately high rates of death from suicide and substance use [20].

Strengths and limitations

This is the first study in the UK, and one of few in Europe, to use linked administrative data to understand post-imprisonment healthcare access. Our cohort will have national coverage of all people released from prison in Scotland and of services at all levels of care (community, inpatient and emergency), allowing us to develop a holistic overview of healthcare access patterns. By drawing from routinely collected administrative data, we will avoid and minimise bias introduced through recruitment and loss to follow-up, issues common to other research approaches, and particularly with justice-involved people. Our research team benefits from people with personal and professional experience of the justice and health systems in Scotland, is advised by the LEAP, and our proposal was reviewed by the NHS Scotland's Public Benefit and Privacy Panel for Health and Social Care (HSC-PBPP). We elaborated our proposed research in response to the feedback from both the LEAP and HSC-PBPP and will continue to engage with the LEAP to optimise communication of results in accessible and acceptable formats.

The period of study does not include the disruptions to service access for MH/SU during and since the COVID-19 pandemic. We ceased follow-up in February 2020 to ensure that patterns observed were those seen during a period of stability, thus giving a more realistic account of service contact to inform service recovery and development. When data were requested in 2021 and anticipated to be received

(2022), these disruptions were keenly felt and thus pre-and post-COVID analyses were not planned. Changes in Scottish healthcare provision since these data were recorded include improvements in efforts to address opioid use (e.g., same-day prescribing of opioid substitution treatment, naloxone provision) [44]. However, these do not address high levels of poly-substance use in the prison population, and mental health services remain under-resourced and difficult to navigate, with continued reports of exclusion where someone uses substances [45, 46]. Nonetheless, our findings will provide a unique opportunity to inform service recovery by describing patterns of MH/SU service use and establishing a baseline for evaluating subsequent efforts to improve service access for those who experience MH/SU needs following imprisonment.

There are limitations to using administrative data. Data quality depends upon accurate data entry in busy real-world service settings, and the availability and completeness of relevant analytical variables. Inevitably, assumptions must be made about the data to resolve such issues, and a challenge in our context relates to consistently identifying service contacts for MH/SU across multiple and heterogeneous datasets with variable quality of diagnostic variables (e.g. outpatient and specialist addiction services data). Our cleaning process will minimise the potential for bias due to missing data, and obviously erroneous entries. While the potential for inaccuracies that remain undetected to the research team may persist, with a large sample, we anticipate that data-entry errors are likely random and thus will have minimal impact on the overall analysis.

Practice variation across health boards and service types, particularly in screening and capturing MH/SU needs at service presentations for other issues, may lead to variation in clinical coding. This may result in an underestimation of how often people in need of MH/SU support present to services.

We are identifying where people are *accessing* support for MH/SU in NHS services and, in the case of specialist addiction services data, through NHS, local authority and third-sector services [47]. However, our design will not be able to distinguish where there is unmet need for which people do not access support, nor where support is sought from alternative providers that people released from prison may feel more comfortable approaching. As such, our results cannot be considered an estimate of overall need or prevalence, which will likely be higher given the known barriers to accessing health care faced by underserved groups. Nonetheless, it will present vital analyses that highlight the opportunities for modifying healthcare delivery to better meet the needs of this population.

Finally, caution needs to be exercised when interpreting the geographical convergence between the exposed and unexposed groups, given that matching will not be conducted using full postcodes. Nevertheless, accounting for multiple deprivation is arguably more important than precise geographical location, given its strong association with both justice and health outcomes.

Conclusion

People released from prison are at an increased risk of poor health outcomes, suicide and substance use-related deaths. With Scotland's comparatively high imprisonment rate, there

is a substantial population with significant MH/SU needs for whom improving service delivery and service use is a significant public health issue. The RELEASE study uses a retrospective observational cohort design and linked administrative health and justice data to quantify service use for MH/SU amongst people released from prison, and in comparison to the general Scottish population, and is in a strong position to inform future service delivery for people released from prison.

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Statement on conflicts of interest

CC and RK work at the Salvation Army Centre for Addiction Services and Research. The Salvation Army part fund this centre but are not involved in funding or any aspect of the conduct of the study. The RELEASE team report no other potential conflicts of interest.

Ethics statement

The study has been approved by HSC-PBPP (Project Reference 2021-0145), and by the University of Stirling Ethics Committee (Project Number 7144). Studies linking health data in Scotland are approved under stringent controls on data storage, access, and retention to protect people's privacy and confidentiality, and our research will adhere to NSH and Public Health Scotland ethics, processes and statistical disclosure control policy, since the data will be stored by Public Health Scotland in the NSH environment.

Data availability statement

The authors are unable to share the data used for the RELEASE project. The dataset created and described in this article is subject to a data sharing agreement between the research team and the Electronic Data Research and Innovation Service of Public Health Scotland, which stipulates that access to the dataset is only available for a specified period, and by named researchers of the project, subject to approval by the National Health Service Scotland Public Benefit and Privacy Panel for Health and Social Care. We will make our R code available at our GitHub:

<https://github.com/rkjellgren/RELEASE>. Researchers can apply for access to Scottish national datasets through Research Data Scotland: <https://www.researchdata.scot/>.

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Abbreviations

A&E:	Accident and Emergency	NRS:	National Records of Scotland
AMPDS:	Advanced Medical Priority Dispatch System	NRSD:	National Register of Scotland Death Records
BNF:	British National Formulary	NSH:	National Safe Haven
CHI:	Community Health Index	OOH:	Primary Care Out-of-Hours Dataset
DD:	Dual-diagnosis	PIS:	Prescribing Information System
eDRIS:	Public Health Scotland Electronic Data Research and Innovation Service	PR2:	Prisoner Records 2
GP:	General Practice	RECORD:	Reporting of studies conducted using observational routinely-collected health data
GUILD:	Guidance for Information about Linking Data sets	RQ:	Research Question
HSC-	NHS Scotland Public Benefit and Privacy	SAS:	Scottish Ambulance Service
PBPP:	Panel for Health and Social Care	SDMD:	Scottish Drug Misuse Database
ICD10:	International Classification of Diseases 10 th Revision	SIMD:	Scottish Index of Multiple Deprivation
IRR:	Incidence Rate Ratio	SMR00:	Scottish Morbidity Records – Outpatient Appointments and Attendances Dataset
LEAP:	Lived Experience Advisory Panel	SMR01:	Scottish Morbidity Records – General Acute and Inpatient Day Case Dataset
MH:	Mental ill-health	SMR04:	Scottish Morbidity Records – Mental Health Inpatient and Day Case Dataset
NHS:	National Health Service	SPS:	Scottish Prison Service
NHS24:	National Health Services Telehealth Service	SU:	Substance Use
NIHR:	National Institute of Health and Care Research		

