Publication Report

The Scottish Suicide Information Database Report 2015:

Contact with multiple healthcare services prior to death

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Contents

Acknowledgements

The Scottish Suicide Information Database (ScotSID) was initiated by Dr Laurence Gruer OBE, former Director of Public Health Science, NHS Health Scotland. He chaired the ScotSID Steering Group until May 2012, when Stephen Platt, Professor Emeritus of Health Policy Research at the University of Edinburgh, took over that role. The ISD ScotSID project team is funded by the Scottish Government's Mental Health and Protection of Rights Division.

The database is held in ISD. The compilation and management of the database is currently undertaken by Angela Prentice, and previously by Dr Parveen Chishti. Data analysis and preparation of this report was mainly by Chris Black, Chris Deans and Dr Alison Burlison, while Stephen Platt provided the literature review. Figures for the whole of Scotland used in Section 3 of the Results were provided by other ISD teams.

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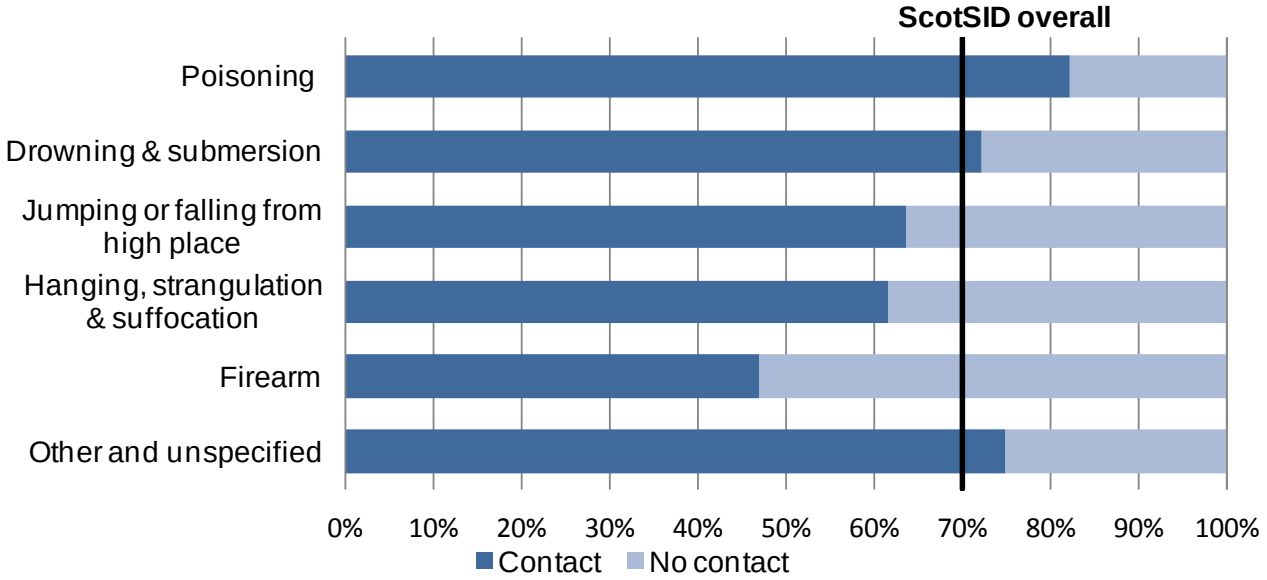
Key points

The last ScotSID report took a broad look at the characteristics and circumstances of those who died from suicide in Scotland. This report focuses on their contact with six healthcare services during a specified period prior to death (see Background below), and compares with the general population.

- A total of 3,013 residents of Scotland died by 'probable suicide' (intentional self-harm or undetermined intent) during the four-year period 2009-2012. Some points below relate to 2010-2012.
- The majority (70%) of those who died by suicide had some type of contact with healthcare services in the specified period prior to death, indicating prior medical and/or psychiatric problems.
- The most common form of recorded contact was a mental health drug prescription (59% in the year prior to suicide), the second most common an A&E attendance (26% in the three months prior to suicide). These contact percentages were much higher than those for the general population (18% and 5.3% respectively).
- One in four people who died by suicide in Scotland had at least one psychiatric inpatient stay or psychiatric outpatient appointment in the 12 months prior to death. This figure is in line with results from other studies.
- Contact with any of the six healthcare services prior to suicide was more common among females (87%) than among males (64%). This difference is likely to reflect the generally higher rate of contact with healthcare services among females in the wider population, particularly for mental health drug prescriptions.
- The level of contact prior to suicide was broadly similar among age groups, except 5-24 years where the contact percentage was 56% compared to 70% overall.
- People who died from suicide who lived in more deprived areas were significantly more likely to have had prior contact than those from less deprived areas.
- Of the individuals who died from suicide, those from 'very remote rural' areas had a lower level of contact (47%) than those from other types of area (range 62-73%).
- The figure below shows that suicide deaths by poisoning (including from medication) had the highest level of contact with the six healthcare services (82%), while firearm deaths and deaths by hanging, strangulation and suffocation had relatively low contact (47% and 62% respectively).

Percentage of ScotSID people in contact with particular healthcare services in the period before death, by method of suicide



- People who died by suicide had had significantly more contact with each of the six healthcare services than had the general population. In particular, they were 42 times more likely to have had a psychiatric hospital stay in the previous year.
- However, as less than 1% of all psychiatric hospital inpatients died by suicide within the following year, it is difficult to predict from these statistics who is at risk.

Background

The overall aim of the Scottish Suicide Information Database (ScotSID) project is to support epidemiological research, policy-making and preventive activity. The database contains information on all suicides registered in Scotland since 1 January 2009, along with demographic details and contacts with particular healthcare services.

Six healthcare services are considered in this report: mental health drug prescriptions dispensed in the community; A&E attendances; psychiatric hospital outpatient appointments; general hospital inpatient stays for mental health, alcohol, drug or injury related diagnoses; psychiatric hospital inpatient stays; and initial assessments by specialist drug treatment services. For A&E attendances, a three-month period of contact before death was used; for all other services the time period was 12 months. For some services, contact will be slightly underestimated due to data limitations, and as some datasets are incomplete for 2009, most of the results presented in this report relate to suicides registered between 2010 and 2012.

Glossary and conventions

2015	Denotes the calendar year 1 January 2015 to 31 December 2015.
2015/2016 or 2015/16	Denotes the financial year 1 April 2015 to 31 March 2016.
2015-2016 or 2015-16	Denotes the 2-year period 1 January 2015 to 31 December 2016.
95% confidence interval	See Confidence interval.
A&E attendance	The presence of a patient at an Accident & Emergency service seeking unplanned medical attention.
Acute inpatient stay	'Acute' hospital inpatient (and day case) activity is recorded on SMR01 discharge records. It includes care in major teaching hospitals, district general hospitals and community hospitals, but excludes obstetric and psychiatric care.
British National Formulary (BNF)	A standard classification of drugs into conditions of primary therapeutic use. The aim is to provide prescribers, pharmacists and other healthcare professionals with sound up-to-date information about the use of medicines. Further information can be obtained from the BNF website.
Coding rules	'Probable suicide' deaths are defined using the following ICD10 codes: Intentional self-harm: X60-X84, Y87.0 and Undetermined intent: Y10-Y34, Y87.2. New rules for coding causes of death were introduced in 2011 by NRS. Some deaths caused by drug misuse, which were coded under the **old** rules as 'mental and behavioural disorders', are classified under the **new** rules as 'self-poisoning of undetermined intent' and consequently as probable suicides. A note on the changes to the way in which causes of death are coded is available in the Death Certificates and Coding the Causes of Death section of the NRS website. All analyses in this report are all based on **old** coding rules for consistency: for further information see the Data held in ScotSID section of the Introduction and Appendix 2.
Community Health Index (CHI)	The Community Health Index or CHI number is the unique national number for any health communication for a given patient. It is a ten-digit number created from a patient's date of birth and four other numbers. All patients who register with a GP are allocated a CHI number.
Confidence interval	The difference between the upper and lower confidence limit defines the confidence interval. The 95% confidence interval indicates the degree of uncertainty around a figure; 95 times out of 100, the interval will include the true underlying rate. The width of the confidence interval depends on the size of the population and

	the underlying variability in the data.
Continuous inpatient stay	An unbroken period of time that a patient spends as an inpatient. A patient may change consultant, significant facility, specialty and/or hospital during a continuous inpatient stay.
Deterministic matching	Used to link datasets for an individual when there is a common unique identifier in both datasets, for example the CHI number. See Appendix 3 for more details.
Discharge	A hospital discharge marks the end of an episode of care. Discharges include deaths, transfers to other specialties/significant facilities and hospitals, and routine discharges home.
EASR	European age-sex standardised rate, usually expressed per 100,000 population. For details on standardising, see ScotPHO Methodology.
Episode (of care)	Individual parts of a continuous inpatient stay recorded on SMR01 and SMR04. Each episode starts with an admission and ends with a discharge, and a new episode is generated when a patient changes specialty, consultant or hospital.
ESP 1976/2013	European Standard Population (ESP), a theoretical population which is defined as having a particular distribution by age and sex. The first version of the ESP was introduced in 1976, and the second in 2013.
ICD10	The International Classification of Diseases and Related Health Problems, Tenth Revision (World Health Organization). A system for classifying diseases, symptoms and external causes of injury according to a list of codes.
Intentional self-harm	A cause of death or morbidity defined by ICD10 codes X60-X84. Events where there is enough information available for a medical or legal authority to determine that the self-harm was intentional.
ISD	Information Services Division of NHS National Services Scotland. (From 1 June 2013, ISD became part of the Public Health and Intelligence Strategic Business Unit.)
NRS	National Records of Scotland (established on 1 April 2011, following the merger of the General Register Office for Scotland (GROS) and the National Archives of Scotland).
OECD	The Organisation for Economic Co-operation and Development, an international organisation aimed at encouraging economic development and world trade It produces an annual publication on the performance of health systems in member countries, which includes an analysis of suicide rates.
ONS	Office for National Statistics.

PIS	Prescription Information System, a national database containing information on all medicines prescribed and dispensed in Scotland.
Population estimates	NRS publish annual mid-year estimates of the Scottish population. These estimates are based on the Census, which is carried out every 10 years. 'Rebased populations' refer to those updated in light of the 2011 Census. 'Unrebased populations' are still based on the 2001 Census.
Prevalence of contact	In this report, prevalence of contact (or contact prevalence) refers to the proportion of the ScotSID cohort or Scotland population who were in contact with a particular service or group of services. It is shown as a percentage.
Probability matching	In linking data from different datasets for an individual, probability matching uses a set of identifiers to estimate the *probability* that two records correspond. See Appendix 3 for more details.
'Probable suicide'	Death for which the underlying cause is classified as 'intentional self-harm' or 'event of undetermined intent'.
Quintiles	Population-weighted quintiles are groups containing one-fifth (20%) of the total population. Quintiles are typically created for a particular measure (e.g. SIMD) by ordering geographical areas such as data zones by the measure, then splitting it in five, so that the top quintile contains the fifth of the population with the highest values, the second quintile the people with the next highest, etc.
ScotSID	Scottish Suicide Information Database, a dataset linking the death records for people who died by suicide to their healthcare service contacts, and potentially other information.
SDMD	Scottish Drug Misuse Database, a national dataset containing information on individuals in contact with specialist drug treatment services. See ISD Drugs and alcohol misuse publications for more information.
SIMD	Scottish Index of Multiple Deprivation, a ranking of small areas (data zones) in Scotland by deprivation level, based on information from multiple sources. The 2012 SIMD release is used in this report. See SIMD on the Scottish Government website.
SMR00	Scottish Morbidity Record 00, the dataset containing information on outpatient attendances. In this report, only psychiatric specialties are considered.
SMR01	Scottish Morbidity Record 01, the dataset containing information on general acute (non-psychiatric, non-obstetric) inpatients and day cases.
SMR04	Scottish Morbidity Record 04, the dataset containing information on psychiatric inpatients.

SMR25	See SDMD above.
Specialty	A division of medicine or dentistry covering a specific area of clinical activity.
Stay	See Continuous Inpatient Stay.
Undetermined intent	A cause of death defined by ICD10 codes; Y10-Y34, Y87.2. Events where available information is insufficient to enable a medical or legal authority to make a distinction between accident, self-harm and assault.
Urban rural classification	The Scottish Government's urban rural classification distinguishes between urban, rural and remote areas within Scotland, based on settlement population and drive time to urban areas. The eight-fold 2013-14 classification is used in this report.

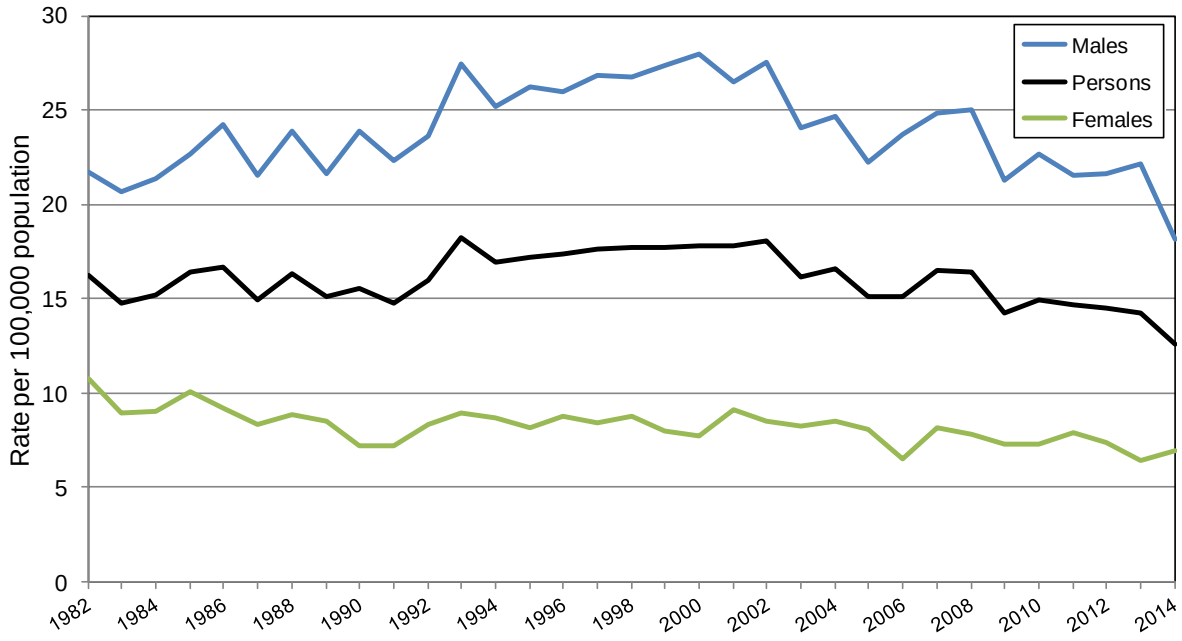
Introduction

Suicide and non-fatal self-harm are important issues for public health policy and practice in Scotland. This introduction briefly outlines some of the epidemiology of suicide in Scotland, including comparisons with other countries, then goes on to describe the Scottish Suicide Information Database (ScotSID). Appendix 4 provides further detail on the policy context.

Suicide in Scotland

The Suicide section of the Scottish Public Health Observatory (ScotPHO) website provides comprehensive data on suicide trends in Scotland by age, gender, geographical area and deprivation level, as well as UK and international comparisons. Most comparisons are based on European age-sex-standardised rates (EASRs) per 100,000 population. Figure 1 below shows the EASRs for males, females and persons between 1982 and 2014. Considering the persons rate, there was a peak in 1993 and again in 2002, after which there has been a downward trend. The number of suicides in 2014 was the lowest for 30 years. A broadly similar pattern was observed for males. For females, rates generally tended to decrease throughout the period.

Figure 1. Suicide rates[1,2] for Scotland, 1982-2014



Source: NRS death registrations.

[1] Probable suicides registered in Scotland, all ages. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] European age standardised rates (EASRs, see glossary) calculated using the European standard population 2013 (ESP2013).

Rates of probable suicides (intentional self-harm and events of undetermined intent combined) appear to be higher in Scotland than in England and Wales, but the rates for England and Wales may be under-estimated due to differences in recording procedures. For further details, please see the ScotPHO suicide webpage for UK comparisons.

Potential differences in recording procedures between countries should also be borne in mind when looking at international comparisons. The ScotPHO suicide webpage for

international comparisons cites comparisons of suicide rates based on intentional self-harm only. The UK rate has been found to be lower than the Organisation for Economic Co-operation and Development (OECD) average, and the Scottish rate has generally been lower than or around the European Union average. However, the effect of the omission of the undetermined intent deaths cannot be quantified.

The Scottish Suicide Information Database (ScotSID)

During the 2008 'Choose Life' summit, NHS Health Scotland made a commitment to lead work to establish a Scottish Suicide Information Database (ScotSID) to improve the quality of information available on suicides in Scotland. A steering group was set up and the Information Services Division (ISD) was commissioned to develop, analyse and maintain the database.

The overall aim of ScotSID is to provide a central repository for information on all probable suicide deaths in Scotland, in order to support epidemiological research, policy-making and preventive activity. At present the database covers demographic information, contact with healthcare services and related health data. It will eventually provide further details relating to the suicide event and an individual's wider social circumstances through inclusion of information from other data sources.

This is the fourth report on the Scottish Suicide Information Database. It presents data on prior healthcare service contacts for people whose deaths from probable suicides were registered with the National Records of Scotland (NRS) during the four-year period 2009 to 2012 (or 2010 to 2012 for some analyses).

Data held in ScotSID

The ScotSID contains finalised NRS death records for all probable suicides registered in Scotland from 1 January 2009, linked to records from the following data sources held by ISD:

- Prescriptions dispensed in the community (Prescribing Information System, PIS) (from January 2009)
- Accident and Emergency (A&E) attendances (from September 2009)
- Psychiatric outpatient appointments (from SMR00) (from January 2008)
- General acute hospital inpatient and day case records (SMR01) (from January 1981)
- Maternity hospital records (SMR02) (from April 1993)
- Psychiatric hospital inpatient and day case records (SMR04) (from January 1981)
- Scottish Drug Misuse Database (SMR25) (from April 2005).

In addition, the suicide death records were linked to suicide review records held by Healthcare Improvement Scotland (HIS). These reviews describe whether an adverse event review was undertaken by the NHS board for an individual in contact with NHS mental health services in the year prior to their suicide, and whether the case was referred to the Mental Welfare Commission for Scotland. Records for 2012-2013 are included, but it was decided by the ScotSID Steering Group in May 2015 not to continue with this dataset as it added little extra value to the ScotSID analyses.

Of these records, information on prescriptions, A&E attendances, psychiatric outpatients, acute hospital inpatients, psychiatric hospital inpatients, and contact with specialist drug treatment services were used in this report. Details of each of these records are given below.

Mental health drug prescriptions

Appendix 5 gives details of the Prescribing Information System (PIS) and its suitability to analyse mental health drug prescribing in the community. An overview is given here.

The PIS is a comprehensive database of details of NHS prescriptions dispensed in Scotland in the community by pharmacists or (generally in remote areas) dispensing doctors. The data include prescribing by GPs, nurses, dentists and pharmacists, and also hospital prescribing where items are dispensed in the community. Hospital dispensed prescriptions are not included in the figures. The data available cannot identify what proportion of the drugs dispensed are actually consumed or when they were consumed, and do not include products purchased 'over the counter'.

Patient-based analysis has been made possible through the recent availability of comprehensive patient-identifiable data using the Community Health Index (CHI) number. For medicines used in mental health, CHI capture rates have become high enough to permit accurate patient analyses for calendar years 2010 to 2012 (93% or higher). ScotSID analyses have been carried out for prescriptions dispensed within 12 months prior to death for probable suicides occurring in the calendar years 2010-2012. In 2009 (particularly January to March), CHI capture rates were slightly lower which may have resulted in a slight undercount, particularly for patients who died in January to March 2010, but these patients are likely to have been included in patient counts through items dispensed to them later on.

This report looks specifically at contact with mental health drug prescriptions, rather than prescriptions for all types of medicine. The drugs included are, with British National Formulary (BNF) section code (see Glossary):

- Hypnotics and anxiolytics indicated for the treatment of anxiety and insomnia (BNF section 4.1)
- Drugs used in psychoses and related disorders (BNF section 4.2)
- Antidepressants (BNF section 4.3).

Note that while these drugs are principally used to treat mental health conditions, they are also used for a number of other conditions. For instance, antidepressants can be prescribed for migraine or chronic pain. As it is not currently possible to identify why a drug was prescribed, all prescriptions for drugs in the above categories are included in the statistics presented in this report.

Due to recent improvements in data recording, this publication uses the date when the prescription was prescribed. The previous ScotSID report used the date that the dispensing location (e.g. pharmacy) was reimbursed for the prescribed item. This change in dates is considered to be more accurate, but had only a minor impact on the results.

A&E attendances

Accident and Emergency treatment is provided in Scotland at:

- Emergency Departments; sites that provide a 24-hour Emergency Medicine consultant-led service.
- Minor Injuries Units and some other sites in rural areas that are GP- or nurse-led.

While Emergency Departments collect episode-based information for individual patients, some minor injuries units only collect aggregate data. Only episode-level data from the ISD A&E data mart can be used in ScotSID, and therefore the ScotSID A&E data are not complete, particularly for some rural areas. Further details are provided on the ISD website.

In addition, A&E episodes can only be linked for records with the CHI number recorded. Recording of CHI number on A&E episodes only became mandatory from September 2009,

and therefore in this report looking at A&E attendances in the three months before suicide, the data are restricted to suicides occurring in calendar years 2010 to 2012. As the completeness of CHI number recording on A&E episodes varied among sites around the period September 2009 to December 2012 from approximately 50-60% to 98%, this is another reason that the true number of attendances at A&E will be underestimated.

A&E attendances with a discharge date which coincided with the date of death on the death registration record were excluded in this report, as these were likely to have resulted from the suicidal act, rather than being a reflection of care prior to suicide.

Psychiatric outpatient appointments (SMR00)
In this report, only outpatient appointments for psychiatric specialties were included, and appointments were included whether the patient attended or not. Not all hospitals submit data for return appointments, as completion of this information is not mandatory. Therefore, the data will underestimate the true number of outpatient appointments offered. More information on outpatient data can be found on ISD's Outpatient Activity webpage.

General acute hospital inpatient stays (SMR01)
Data on inpatient and day case stays for non-obstetric, non-psychiatric specialities are stored in the Scottish Morbidity Record 01 (SMR01). As in the case of A&E attendances, in this publication SMR01 stays with a discharge date which coincided with the date of death were excluded, as these were likely to have resulted from the suicidal act, rather than being a reflection of care prior to suicide. Note that this approach differs slightly from that used in previous ScotSID publications, in that we now exclude the whole stay, rather than a single episode.

Three different sets of stays were used in the analyses in this report:

- *All diagnoses*: all stays were counted.
- *Selected diagnoses, any position*: only stays where at least one episode of the stay had a diagnosis recorded in any position (i.e. the primary position or any of the five supplementary positions) which fell into one of the following categories:
    - Mental and behavioural disorders (ICD10 codes F00-99)
    - Alcohol-related conditions (ICD10 codes E244, E512, F10, G312, G621, G721, I426, K292, K70, K852, K860, O354, P043, Q860, R780, T510, T511, T519, Y573, X45, X65, Y15, Y90, Y91, Z502, Z714, Z721)
    - Drug-related conditions (ICD10 codes F11-16, F18, F19)
    - Injury, poisoning and other external causes (ICD10 codes S00-T99).
- *Selected diagnoses, primary position*: only stays where at least one episode of the stay had a diagnosis recorded in the primary position in one of the categories given above.

Psychiatric hospital inpatient stays (SMR04)
ScotSID also links the death records for probable suicides with data on inpatient and day case stays for psychiatric specialties in Scottish hospitals (SMR04).

Scottish Drug Misuse Database (SDMD)
The Scottish Drug Misuse Database (SDMD) offers a profile of individuals being treated for problem drug use, based on information provided at various points throughout specialist drug treatment. The majority of information is collected when an individual first attends for an initial assessment of their drug misuse problems, however the database has now been extended to allow the collection of information at 12 week, annual and ad-hoc follow-up time points.

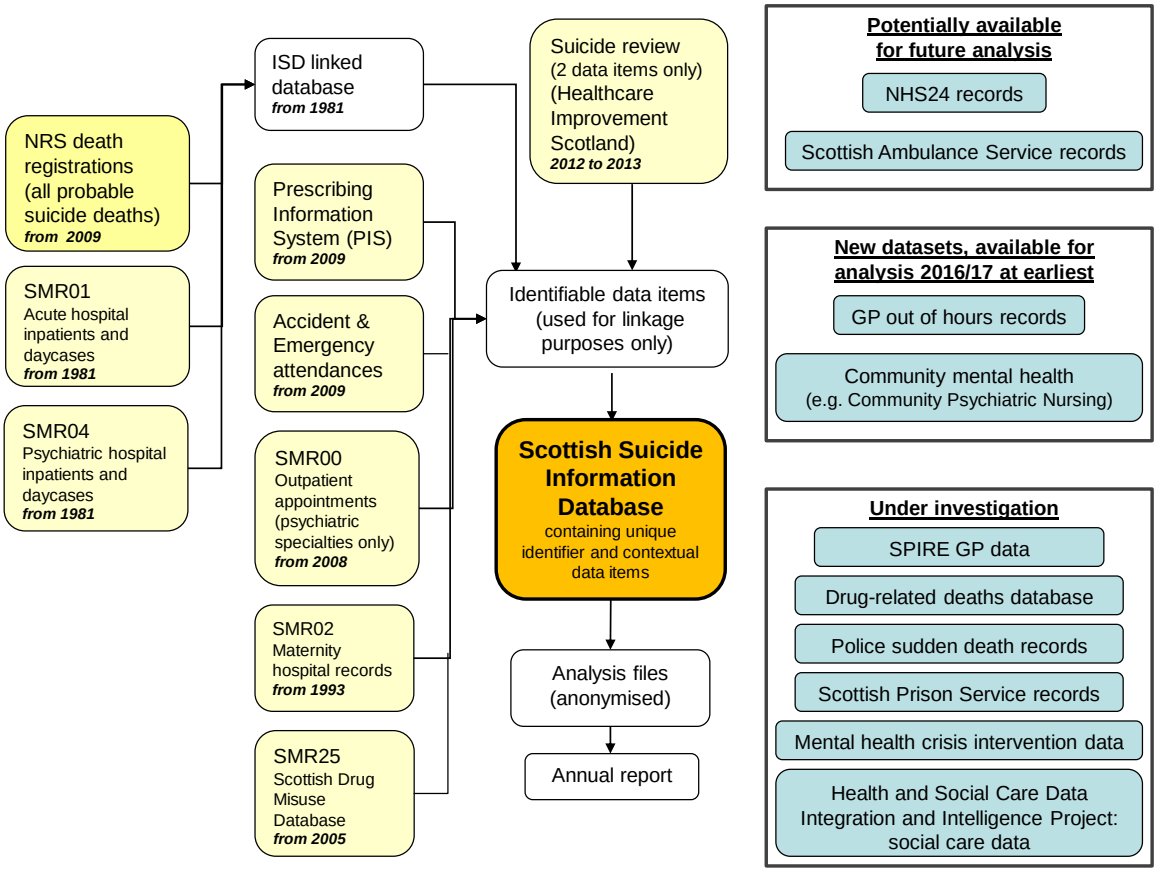
Due to low compliance of services submitting follow-up information to the SDMD, ScotSID only links to the data collected in the initial assessment part. The information presented in this report relates to the client's most recent initial assessment prior to death from suicide. In addition answers to some questions are known to be poorly recorded.

Details of the method used to link these data to the ScotSID cohort can be found in Appendix 3.

More information on the ISD datasets can be found on the ISD website. A list of ScotSID data items was provided in Appendix 5 of the last ScotSID report, and the only recent additions are three under the Prescribing section: Prescribed date, Dispensed date and Prescriber type.

Figure 2 summarises the datasets currently included in ScotSID, together with those we are considering for inclusion in the future.

Figure 2: Data sources for the Scottish Suicide Information Database, at November 2015



It is intended that, over time, relevant information from other data sources will be linked to ScotSID so that it becomes more comprehensive and holds a greater depth of information on individuals' circumstances, the nature of their deaths, and their contact with services. Key gaps include:

- Patients treated in primary care and specialist community-based mental health care services. Comprehensive patient-based information on these is not yet centrally collected and therefore not available to ScotSID.

- Police sudden death records. Unfortunately progress on using this dataset is delayed as further work is required to enable the extraction of relevant information. Further details of planned ScotSID developments can be found in Appendix 6.

Definition of a probable suicide

The National Records of Scotland (NRS) define probable suicides as deaths resulting from:

- intentional self-harm (codes X60–X84, Y87.0 of the International Classification of Diseases, Tenth Revision (ICD10)); and
- events of undetermined intent (ICD10 codes Y10-Y34, Y87.2).

'Events of undetermined intent' are cases where it is not clear whether the death was the result of intentional self-harm, an accident or an assault. Research evidence indicates that most of these deaths are likely to be self-inflicted, but there is insufficient evidence to prove deliberate intent to die (Adelstein et al 1975). It should be recognised, however, that some 'undetermined intent' deaths included in the statistics may not have been suicides.

ScotSID uses the same definition of a probable suicide as NRS. NRS publications include probable suicides occurring to people of any age, but ScotSID excludes any such deaths under the age of 5 years on the basis that they are unlikely to be actual suicides. There were two such cases in the time period 2009-2012, and therefore the total number of suicides used in ScotSID publications (3,059) is two fewer than the number published by NRS (3,061).

In 2011, NRS made a change to the system for classifying deaths, in order to match changes in World Health Organization (WHO) coding rules. This has resulted in some deaths caused by drug misuse, which would previously have been counted under 'mental and behavioural disorders due to psychoactive substance use', now being counted as 'self-poisoning of undetermined intent', and therefore being included in the increased total for probable suicides. This 'new' coding of deaths is used in the publication of suicide deaths for all parts of the UK, however to ensure consistency across the four years of data in this publication, only those 'undetermined intent' deaths classified using the old coding criteria are included here.

Further details of the suicide coding rules change are given in Appendix 2.

Linkage process

NRS reports annually on all deaths in Scotland due to intentional self-harm or undetermined intent, and routinely sends information relating to these deaths to ISD. Ensuring the security and confidentiality of the data, the records are then electronically linked to other databases held by ISD. More information on the record linkage methods used, data confidentiality and information governance, can be found in Appendix 3.

Results

The previous ScotSID report (July/October 2014) looked at probable suicide deaths registered in 2009-2012 in relation to a broad range of characteristics, including previous contact with individual healthcare services. This latest report looks in greater depth at contact with multiple services and draws comparisons with the whole population of Scotland. Only deaths which would be classed as suicide under the old coding rules (see Definition of a probable suicide) are included in this analysis for consistency. Due to refinements to the dataset over time, there are minor differences in some of the numbers presented here compared to the last report.

Of the 3,059 individuals aged 5 years and older included in the entire 2009-2012 ScotSID cohort, 3,013 were residents of Scotland and are included in this report. The remaining 46 individuals were resident outwith Scotland or their country of residence was unknown. As they would be unlikely to have had contact with healthcare services in Scotland prior to death, they have been excluded from this report. For many analyses in this publication it was necessary to use a smaller subset of the ScotSID data including only deaths registered between 2010 and 2012. This subset contains the records of 2,282 residents of Scotland.

Background demographic information about the ScotSID cohort whose deaths were registered in 2009-2012 and in 2010-2012 is given in Table 1. The whole population for Scotland is also included in the table for comparison.

Table 1. Demographics of the ScotSID cohort[1] compared to the total Scotland population

	Total	% male	% under 40 years	% over 65 years	% from most deprived SIMD quintile	% from least deprived SIMD quintile
ScotSID cohort 2009-2012	3,013	73.2	41.1	9.3	32.1	10.0
ScotSID cohort 2010-2012	2,282	73.0	40.2	9.9	31.8	10.2
Scotland population 2011[2]	5,006,314	48.4	45.1	17.9	20.0	20.0

Source: NRS death registrations and 2011 mid-year population estimates

[1] Probable suicides of Scottish residents aged five years and over registered in the stated years. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] National Records of Scotland (NRS) mid-year population estimate 2011.

Table 1 shows that the two ScotSID cohorts were very similar in terms of gender, age and deprivation profile. Compared to the overall population, the ScotSID cohorts had a higher percentage of males and of people in the most deprived deprivation quintile and lower percentages of people under 40 and over 65 years. The European age-sex standardised suicide rate for Scotland was very similar for the three- and four-year periods (14.6 for 2009-12 and 14.7 for 2010-12). Note that, as a result of the exclusion of non-residents described above, these standardised rates are slightly different from those presented in the previous ScotSID report.

This publication looks at the ScotSID cohort's contact prior to death with six healthcare services, which are summarised in Table 2. Note that information on A&E attendances and prescriptions is only available for deaths registered in 2010 onwards. For all datasets except A&E attendances, we examine contact with the services in the 12 months prior to

death; for A&E attendances we only look at the prior three months. This shorter period was chosen for A&E because of its immediacy and the fact that it is not currently possible to select a particular subset of A&E diagnoses such as those likely to be related to suicidal behaviour.

Table 2. ScotSID data sources used in this publication

Description	Database	ScotSID cohort years	Time prior to suicide
Mental health drug prescriptions	Prescribing Information System (PIS)	2010-2012	12 months
Accident and Emergency attendances	A&E	2010-2012	3 months
Psychiatric outpatient appointments	SMR00 (psychiatric specialties only)	2009-2012	12 months
Acute general hospital inpatient stays	SMR01	2009-2012	12 months
Psychiatric hospital inpatient stays	SMR04	2009-2012	12 months
Specialist drug treatment (initial assessments)	SMR25 (Scottish Drugs Misuse Database)	2009-2012	12 months

Further details of each service can be found in the Data held in ScotSID section of the Introduction of this report. It should be noted that some of these routine administrative databases are incomplete and will therefore underestimate prior contact of the ScotSID cohort:

- On the prescribing dataset (PIS), recording of the Community Health Index (CHI) number is less than 100% complete.
- A&E attendances are undercounted overall, due to some records not having a CHI number, and only aggregate data (not individual records) being provided in a few locations.
- The database for psychiatric outpatient appointments includes all new appointments but does not include all return appointments.
- The drug misuse database (SMR25) is used to provide information on initial assessments for specialist treatment, but not on all patients undergoing treatment.

In addition, some data are not currently held centrally so cannot be included in ScotSID. These include contact with GPs for mental health problems which do not result in a prescription, and contact with community mental health teams including Community Psychiatric Nurses.

The overall impact of these limitations will be to underestimate contact with services, but the overall trends and patterns are still considered to be valid. We intend to fill these information gaps gradually over time.

This results section looks at three aspects of the ScotSID data:

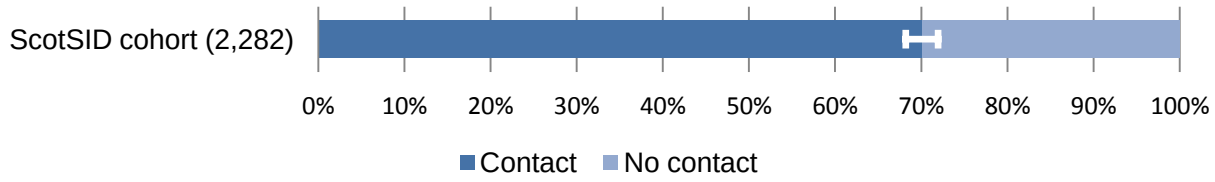
- Contact with particular types of healthcare service
- Contact with multiple healthcare services
- Comparison with the overall population of Scotland.

1 Contact with particular types of healthcare service

Throughout Section 1, all general acute hospital inpatient contacts are limited to the 'selected diagnoses' in primary diagnosis position (see Data held in ScotSID).

Figure 3 shows the percentage of the ScotSID cohort who did and did not have recorded contact with one of the six healthcare services in the period before death. In this and similar charts, the white bar denotes the 95% confidence interval for the prevalence of contact.

Figure 3. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death



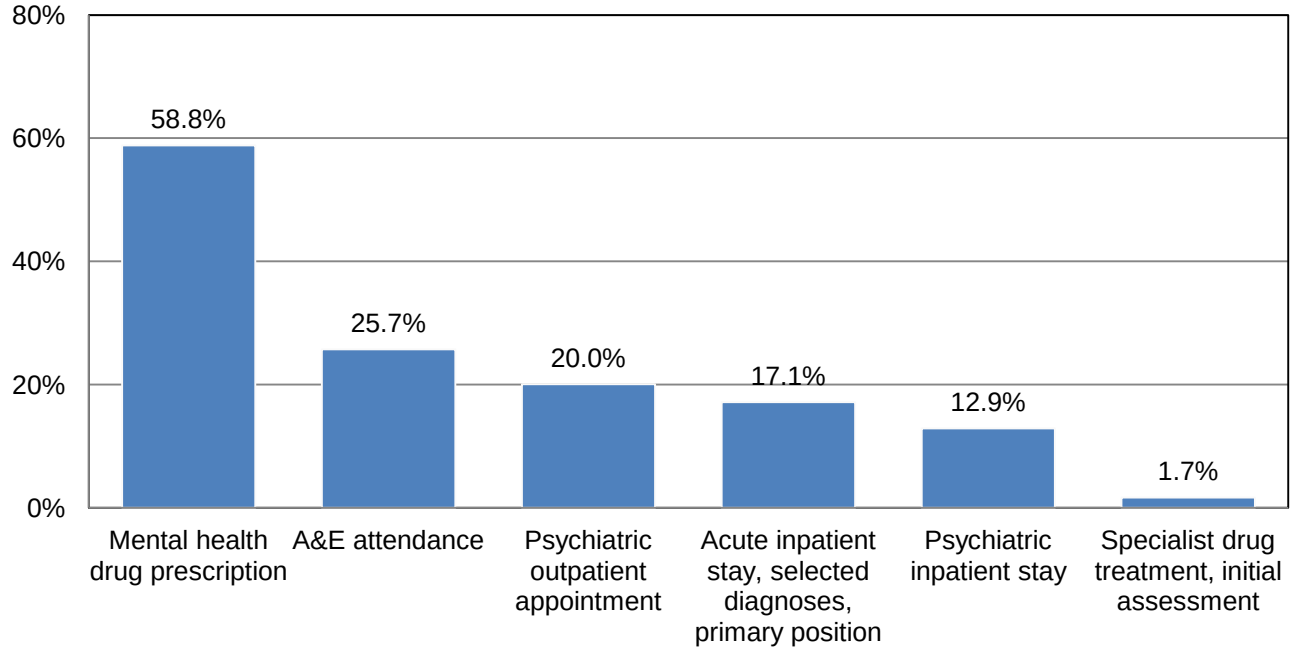
Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

In 70% of cases, people who died by suicide were in contact with some form of healthcare service in the period prior to suicide. This figure is almost certainly an undercount due to the data limitations outlined above and in the Data held in ScotSID section. The finding of a high prevalence of contact highlights the facts that individuals who die by suicide often have prior medical problems and that the majority are in contact with health services at some level. The results presented here cannot, however, be used to assess the effectiveness of services in preventing suicide, as it is not possible to determine the number of people who would have died by suicide without intervention or service contact.

The percentage of the ScotSID cohort who had recorded contact with *each* of the healthcare services is shown in Figure 4.

Figure 4. Percentage of ScotSID cohort[1] in contact with individual healthcare services[2] in the period before death[3]



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012 for mental health drug prescription and A&E attendance, and between 2009 and 2012 for other services. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] Patients were counted once for each service with which they had contact, and might have contacted more than one service. The sum of the percentages across all the services is therefore greater than 100%.

[3] The period before death was defined as three months for A&E attendances and twelve months for all other services.

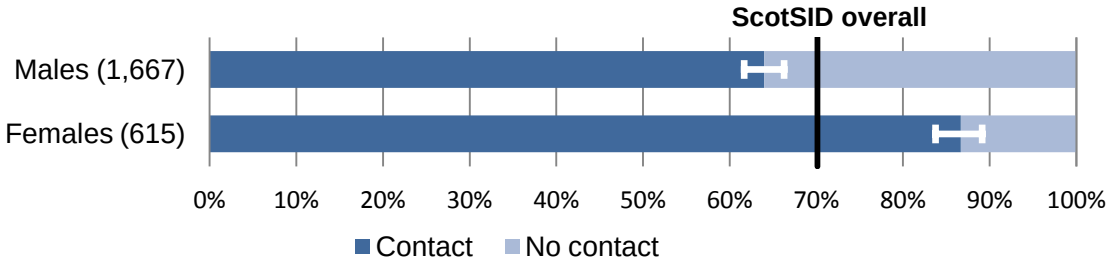
Mental health drug prescriptions were by far the most common form of contact in the ScotSID database, with over half of all probable suicides occurring within 12 months of a mental health drug being prescribed. A quarter of the ScotSID cohort had attended A&E in the previous 3 months, while a fifth had been offered an appointment at a psychiatric outpatient clinic in the previous 12 months.

Many people were in contact with more than one service. Total contact with psychiatric hospital services is of interest to compare with findings from previous studies. About a quarter (25.6%) of the ScotSID cohort had at least one psychiatric inpatient stay or psychiatric outpatient appointment in the year before death, while 7.3% had both. This finding is discussed further in the Literature review section of this report, while Section 2 of the Results examines the specific combinations of services with which members of the ScotSID cohort were in contact.

1.1 By gender

Figure 5 shows the percentage of males and females in the ScotSID cohort who were in contact with any of the healthcare services in the period before death. Contact was significantly ($p < 0.001$, see Appendix 7) more common among females, with 87% having had contact compared to 64% of males. This difference is likely to reflect the generally higher rate of contact with healthcare services for females in the wider population, particularly for mental health drug prescriptions.

Figure 5. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by gender



Source: NRS death registrations, PIS, A&E attendances SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

Table 3 examines these contacts in more depth. It separates out two types of contact—being prescribed a mental health drug and attending an Accident and Emergency Department—from a collection of more 'specialist' forms of healthcare contact (psychiatric outpatient appointments, acute inpatient stays for selected diagnoses, psychiatric inpatient stays, and initial assessments for specialist drug treatment). Note that a person may appear in more than one of these three categories, and therefore the percentages for each row may be greater than 100%.

Table 3. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by gender

	Mental health drug prescribing		A&E		Specialist contact		No previous contact		Total number
Gender	Number	%	Number	%	Number	%	Number	%	
Male	863	51.8	393	23.6	485	29.1	600	36.0	**1,667**
Female	479	77.9	194	31.5	274	44.6	82	13.3	**615**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

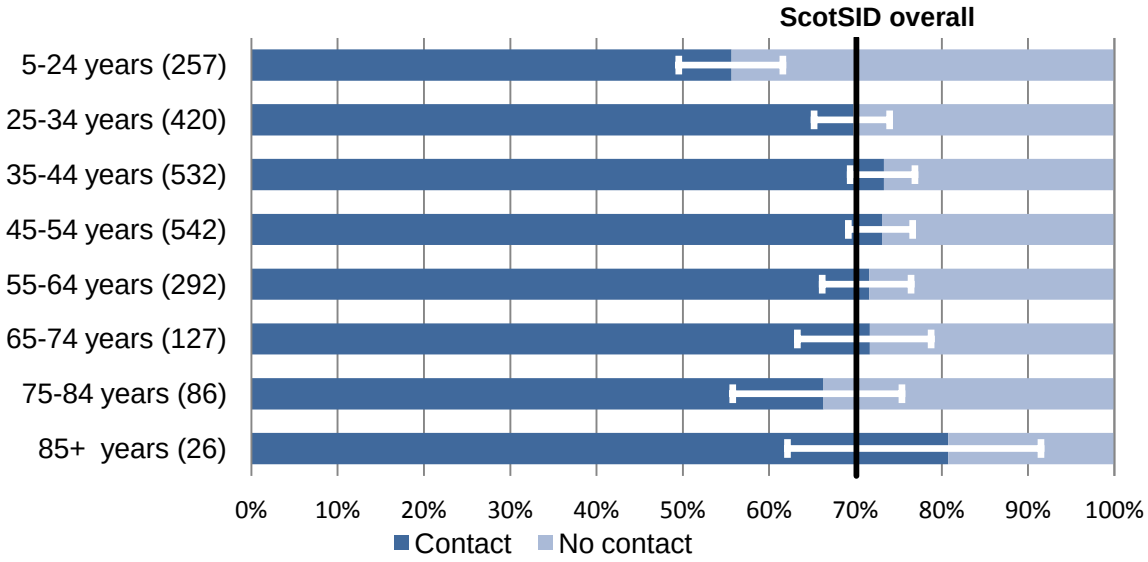
[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.

Table 3 shows that for each contact category there is a significantly higher ($p<0.001$) proportion of contact among females in the ScotSID cohort than among males. Despite this, the *number* of females in the ScotSID cohort with prior contact with healthcare services (533) is still considerably lower than the number of males (1,067), due to the lower rate of suicide among females.

1.2 By age

Figure 6 shows the percentage of different age groups in the ScotSID cohort who were in contact with healthcare services in the period before their death. The only age group which differed significantly from the rest of the cohort was the 5-24 year olds (56%, compared to 66-81%) This finding may reflect a general pattern of less contact with healthcare services among this age group, but it may also indicate that young people have a greater reluctance to seek help.

Figure 6. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by age group



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

Table 4 shows that the low prevalence of contact among young people was also found for mental health drug prescriptions (34% compared to 55-66%). However, the percentages of 5-24 year olds in contact with both A&E and specialist services were close to those for the rest of the ScotSID cohort. There was a significantly higher prevalence of mental health drug prescriptions in the 35-44 year age group, compared with all other age groups combined.

Table 4. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by age group

	Mental health drug prescribing		A&E		Specialist contact		No previous contact		Total Number
Age	Number	%	Number	%	Number	%	Number	%	
5 - 24	88	34.2	68	26.5	74	28.8	114	44.4	**257**
25 - 34	233	55.5	114	27.1	150	35.7	127	30.2	**420**
35 - 44	352	66.2	147	27.6	187	35.2	142	26.7	**532**
45 - 54	342	63.1	121	22.3	189	34.9	146	26.9	**542**
55 - 64	189	64.7	63	21.6	89	30.5	83	28.4	**292**
65 - 74	76	59.8	37	29.1	39	30.7	36	28.3	**127**
75 - 84	47	54.7	27	31.4	25	29.1	29	33.7	**86**
85+	15	57.7	10	38.5	6	23.1	5	19.2	**26**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.

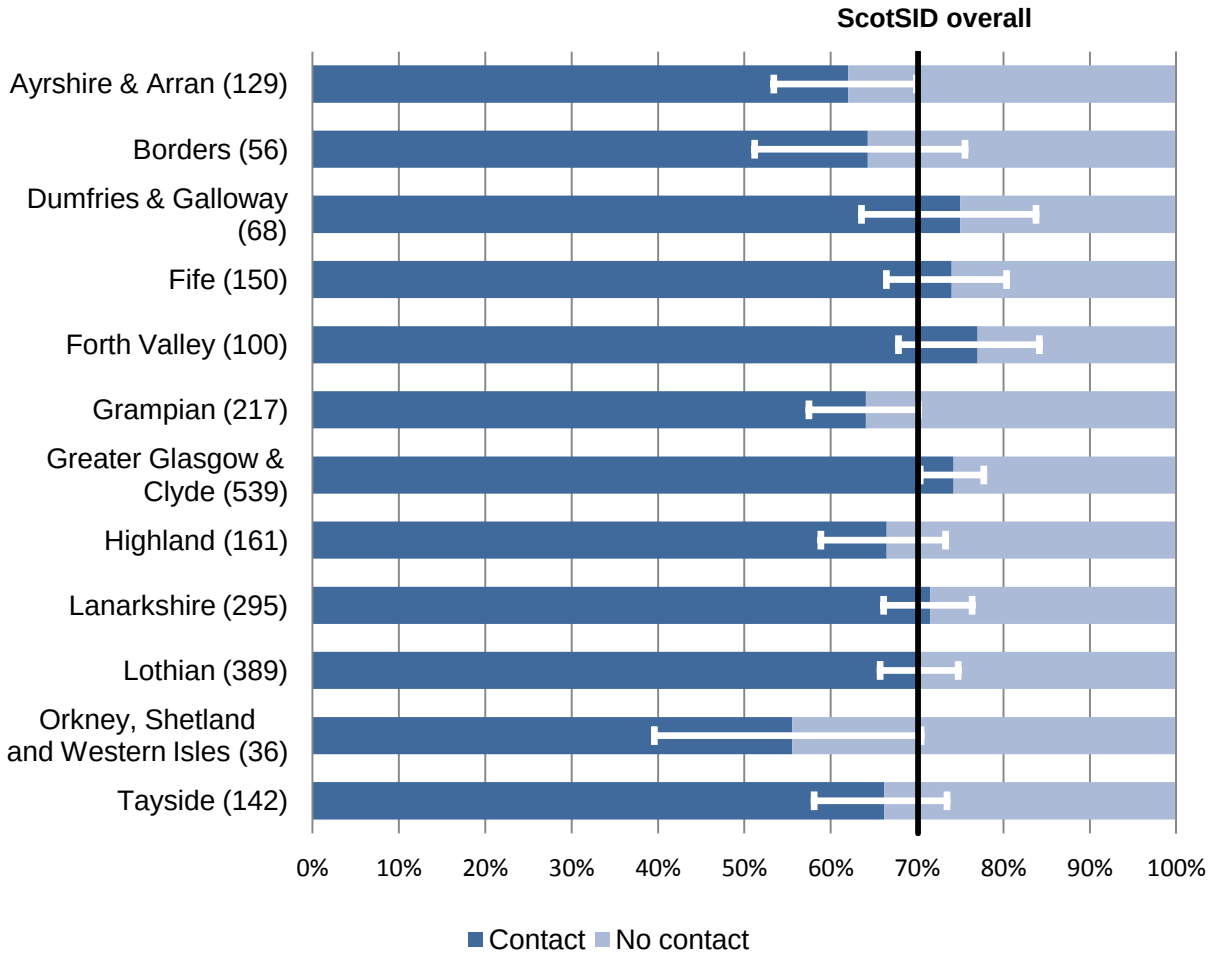
1.3 By NHS board

The previous ScotSID report presented European age-sex standardised rates for all deaths from probable suicide registered in Scotland in 2009-12 (including non-residents). The overall rate was 15.4 deaths per 100,000 population (95%CI 14.6 - 16.1). Rates were also presented by NHS board area (Table 1 in that report) and it was concluded that only one board area, Forth Valley, had a significantly different (lower) rate than expected compared with the Scotland mean.

In this Section, we look in more depth at the patterns of contact with services by NHS board.

Figure 7 shows the overall percentage of healthcare service contact in the ScotSID cohort for each NHS board of residence. Whilst there is a little variation among boards, no individual board was found to have a significantly different prevalence of contact compared to the others (range 56-77%). In trying to interpret the variations between boards, it should be borne in mind that the contact proportion is likely to be affected by differences in service provision and rurality in different areas, and that contacts with some key services, such as community mental health, are not included.

Figure 7. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by NHS board of residence



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

Breaking down these figures further to show types of contact, Table 5 shows that Grampian NHS Board had a low proportion of contact with A&E prior to suicide (16%), while Tayside had a significantly high prevalence of contact with specialist services (44%). Although Orkney, Shetland and the Western Isles (considered together) had fairly low rates of contact with each category of service, the results were not significant due to the small number of people involved. Again these results are hard to interpret because of differences in service provision and demographics between NHS boards. In particular, some of the regional variation in A&E contact is likely to be due to differences in the completeness of episode-level data recorded (see Data held in ScotSID).

Table 5. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by NHS board of residence

NHS board of residence	Mental Health Drug Prescribing		A&E		Specialist contact		No previous contact		Total Number
	Number	%	Number	%	Number	%	Number	%	
Ayrshire & Arran	69	53.5	27	20.9	46	35.7	49	38.0	**129**
Borders	29	51.8	16	28.6	14	25.0	20	35.7	**56**
Dumfries & Galloway	45	66.2	15	22.1	27	39.7	17	25.0	**68**
Fife	90	60.0	33	22.0	49	32.7	39	26.0	**150**
Forth Valley	67	67.0	28	28.0	38	38.0	23	23.0	**100**
Grampian	115	53.0	35	16.1	65	30.0	78	35.9	**217**
Greater Glasgow & Clyde	345	64.0	162	30.1	196	36.4	139	25.8	**539**
Highland	92	57.1	30	18.6	54	33.5	54	33.5	**161**
Lanarkshire	176	59.7	87	29.5	77	26.1	84	28.5	**295**
Lothian	224	57.6	114	29.3	124	31.9	115	29.6	**389**
Orkney, Shetland and Western Isles	15	41.7	7	19.4	6	16.7	16	44.4	**36**
Tayside	75	52.8	33	23.2	63	44.4	48	33.8	**142**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

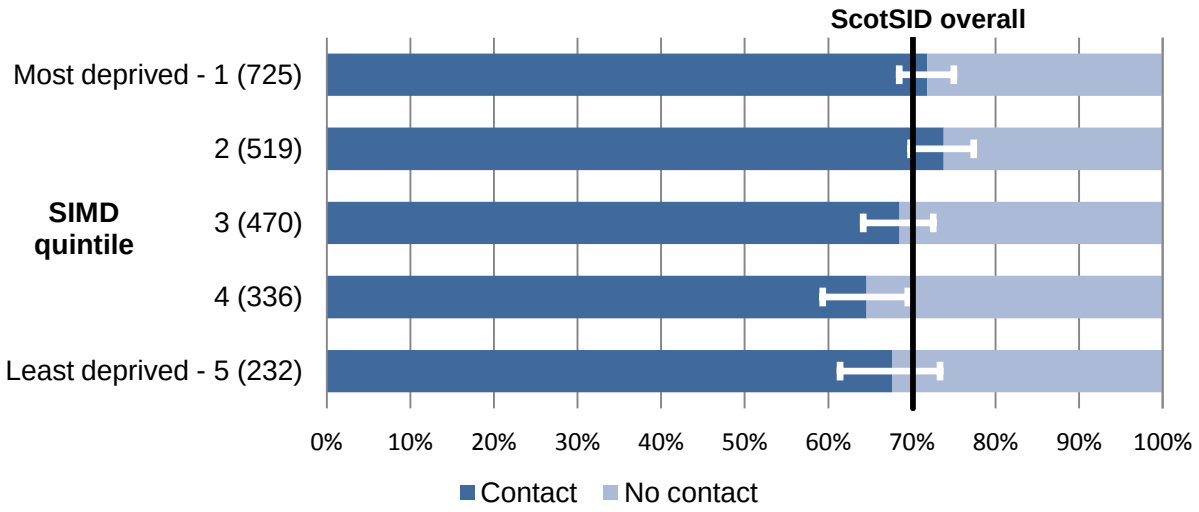
[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.

1.4 By deprivation quintile

The previous ScotSID report examined rates of probable suicide by Scottish Index of Multiple Deprivation (SIMD) quintiles (fifths of the population; see Glossary). There was a strong deprivation effect, with the suicide rate more than three times higher in the most deprived than in the least deprived quintile.

Figure 8 shows the prevalence of contact with particular healthcare services in the ScotSID cohort by SIMD quintile. There was a significant trend (p=0.013, see Appendix 7) towards increased contact with increased deprivation. This pattern is likely to be partly due to a higher prevalence of contact with healthcare services in the general population in more deprived areas.

Figure 8. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by deprivation quintile[3]



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[3] The population is divided into fifths according to the 2012 Scottish Index of Multiple Deprivation (SIMD). See Glossary.

Table 6 shows the number and percentage of contacts with different healthcare services for the SIMD quintiles. For A&E attendances and specialist contact there was a significant association between prevalence of contact and deprivation (p = 0.010 in both cases), with a higher proportion of contact in more deprived areas. There was no signficant relationship between mental health drug prescriptions and deprivation level.

Table 6. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by deprivation quintile[5]

	Mental health drug prescribing		A&E		Specialist contact		No previous contact		Total Number
SIMD quintile	Number	%	Number	%	Number	%	Number	%	
1 - most deprived	428	59.0	219	30.2	260	35.9	204	28.1	**725**
2	332	64.0	121	23.3	185	35.6	136	26.2	**519**
3	265	56.4	108	23.0	148	31.5	148	31.5	**470**
4	186	55.4	86	25.6	90	26.8	119	35.4	**336**
5 - least deprived	131	56.5	53	22.8	76	32.8	75	32.3	**232**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.

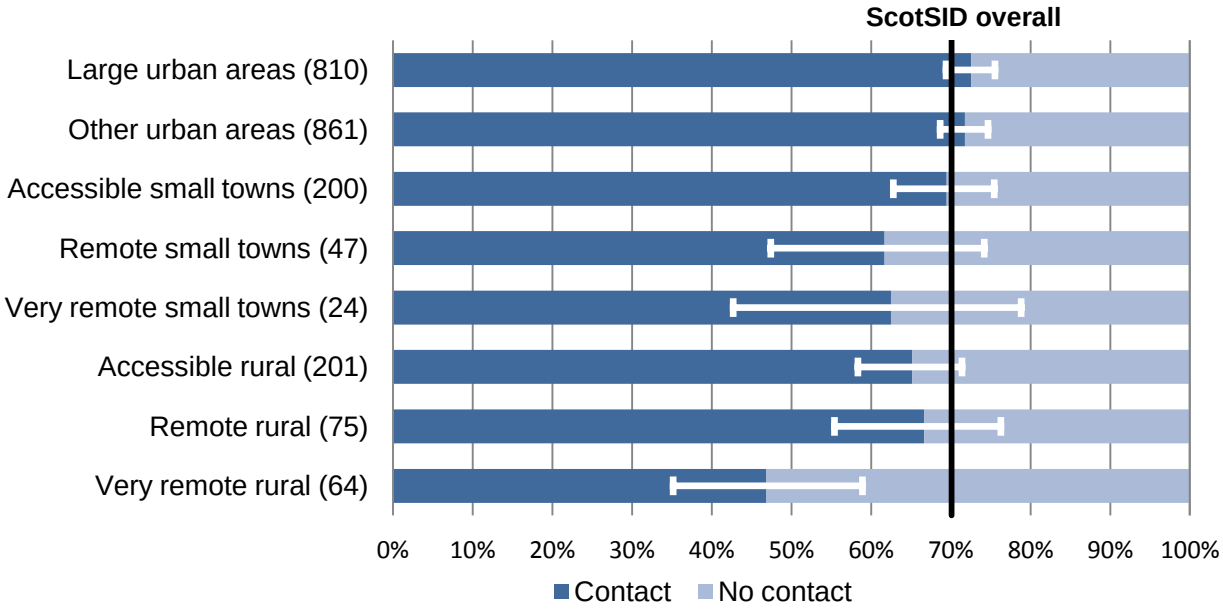
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[5] The population is divided into fifths according to the 2012 Scottish Index of Multiple Deprivation (SIMD). See Glossary.

1.5 By rurality

The previous ScotSID report indicated a tendency towards lower suicide rates in accessible rural areas (as defined by the Scottish Government's 2013-14 urban rural classification), and higher rates in very remote/remote small towns.

Figure 9 shows the prevalence of contact with healthcare services in the ScotSID cohort by urban rural category. Note that the categories range widely in size, with nearly 70% of the total population in the two urban categories, while the remote and very remote small towns and rural categories each contain less than 4% of the population. It is not surprising, therefore, that the majority of suicide deaths also occurred in the urban categories.

Figure 9. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by urban rural classification[3]



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[3] The 2013-14 urban rural classification based on settlement population and distance from urban areas. See Glossary.

Very remote rural areas had a significantly lower prevalence of contact (47%) than other types of area (range 62-73%). Very remote rural areas also had a low prevalence of contact for mental health drug prescribing and specialist contact (39% and 16%, see Table 7). There was also a significantly higher percentage in contact with A&E in large urban areas (31%). There was no significant difference in the prevalence of contact between small towns (considered as a group) and rural areas (considered as a group) for any of the services considered here.

Table 7. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by urban rural classification[5]

Urban rural Classification	Mental health prescribing		A&E		Specialist contact		No previous contact		Total Number
	Number	%	Number	%	Number	%	Number	%	
Large urban areas	484	59.8	248	30.6	274	33.8	222	27.4	**810**
Other urban areas	527	61.2	202	23.5	302	35.1	243	28.2	**861**
Accessible small towns	111	55.5	54	27.0	71	35.5	61	30.5	**200**
Remote small towns	26	55.3	9	19.1	11	23.4	18	38.3	**47**
Very remote small towns	9	37.5	6	25.0	9	37.5	9	37.5	**24**
Accessible rural	118	58.7	45	22.4	55	27.4	70	34.8	**201**
Remote rural	42	56.0	15	20.0	27	36.0	25	33.3	**75**
Very remote rural	25	39.1	8	12.5	10	15.6	34	53.1	**64**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

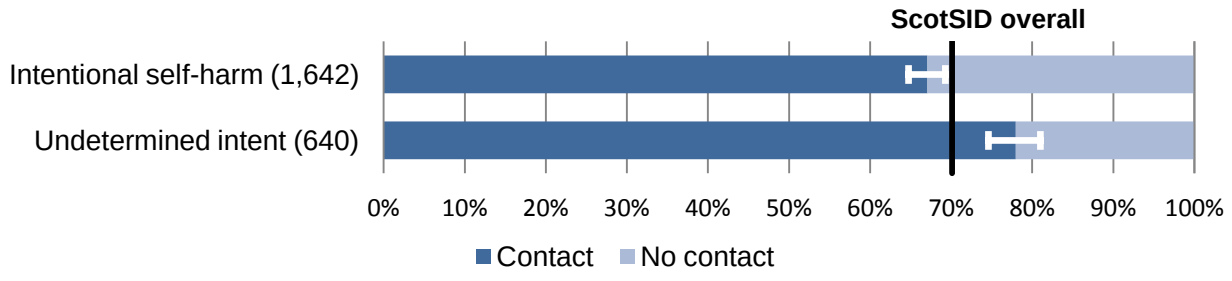
Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[5] The 2013-14 urban rural classification based on settlement population and distance from urban areas. See Glossary.

1.6 By death coding of intent

Figure 10 shows differences in the percentage contact with any healthcare service by coding of intent (intentional self-harm versus undetermined intent). Intentional self-harm deaths had a significantly lower ($p<0.001$) prevalence of contact in the period prior to death (67%) than undetermined intent deaths (78%). It should be noted that a larger proportion of undetermined intent deaths are caused by poisoning, a method which has a high prevalence of healthcare contact, as will be shown later in this section.

Figure 10. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by death coding of intent[3]



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[3] See Definition of a probable suicide.

The increased prevalence of healthcare contact for undetermined intent deaths is also seen for individual services (Table 8). For mental health drug prescribing, A&E and specialist services, undetermined intent deaths had a significantly ($p<0.001$) higher prevalence of contact than intentional self-harm deaths. Again, this may reflect the different proportions of deaths by particular methods which are classed as intentional or of undetermined intent.

Table 8. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by death coding of intent[5]

	Mental health drug prescribing		A&E		Specialist contact		No previous contact		Total number
Coding type	Number	%	Number	%	Number	%	Number	%	
Intentional self-harm	926	56.4	368	22.4	515	31.4	541	32.9	**1,642**
Undetermined intent	416	65.0	219	34.2	244	38.1	141	22.0	**640**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

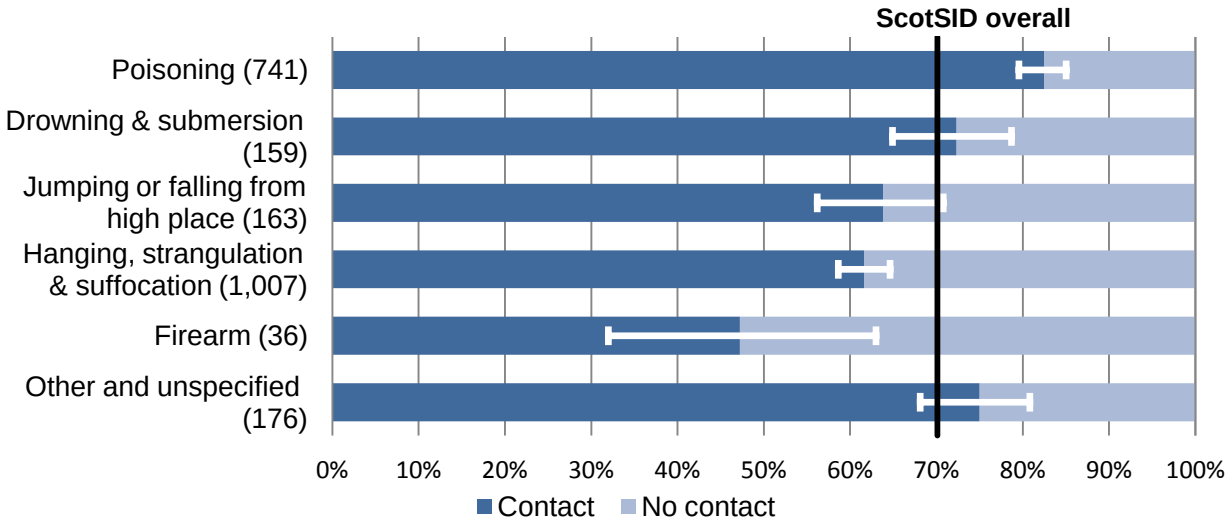
Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).
[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.
[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[5] See Definition of a probable suicide.

1.7 By method

Figure 11 shows the prevalence of healthcare service contact for different suicide methods. There were large differences between methods, with people who died by poisoning having a high prevalence of contact (82%), while hanging, strangulation and suffocation and firearm deaths had a relatively low prevalence of contact (62% and 47%). The 176 deaths from 'other and unspecified' methods included 'jumping in front of a moving object' (32% of these deaths), 'sharp objects' (25%), 'unspecified means' (16%) and 'fire and smoke' (13%).

Figure 11. Percentage of 2010-12 ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, by method



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

The prevalence of healthcare contact for individual services is given in Table 9. A higher proportion of people who died by poisoning had received a mental health drug prescription compared to other methods (72% compared to 47-62%). Some of these poisoning deaths were due to prescription medications. The poisoning deaths also had a relatively high prevalence of contact with A&E.

The deaths from hanging, strangulation and suffocation had a relatively low prevalence of contact for all three categories of healthcare service, and the firearm deaths had the lowest levels of contact (although not significantly low due to the small numbers of firearm deaths). These low contact percentages may be related to the fact that self-harm and suicide by firearm tends to be more spontaneous than other methods, and more lethal (Vyrostek et al 2004).

Table 9. Number and percentage of 2010-12 ScotSID cohort[1] in contact with specialist[2] and non-specialist healthcare services[3] in the period before death[4], by method

Method	Mental health drug prescribing		A&E		Specialist contact		No previous contact		Total Number
	Number	%	Number	%	Number	%	Number	%	
Poisoning	537	72.5	225	30.4	273	36.8	130	17.5	**741**
Drowning & submersion	98	61.6	45	28.3	62	39.0	44	27.7	**159**
Jumping or falling from high place	87	53.4	33	20.2	60	36.8	59	36.2	**163**
Hanging, strangulation & suffocation	510	50.6	210	20.9	295	29.3	386	38.3	**1,007**
Firearm	17	47.2	6	16.7	7	19.4	19	52.8	**36**
Other and unspecified	93	52.8	68	38.6	62	35.2	44	25.0	**176**
Total	**1,342**	**58.8**	**587**	**25.7**	**759**	**33.3**	**682**	**29.9**	**2,282**

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] Specialist healthcare services include: psychiatric outpatient appointments; acute inpatient stays for mental health, injury, alcohol or drug related primary diagnoses; psychiatric inpatient stays; and specialist drug treatment (initial assessment).

[3] People were counted in each service category with which they had contact, and so might appear in multiple columns. The percentages for each row may therefore be greater than 100%.

[4] The period before death was defined as three months for A&E attendances and twelve months for all other services.

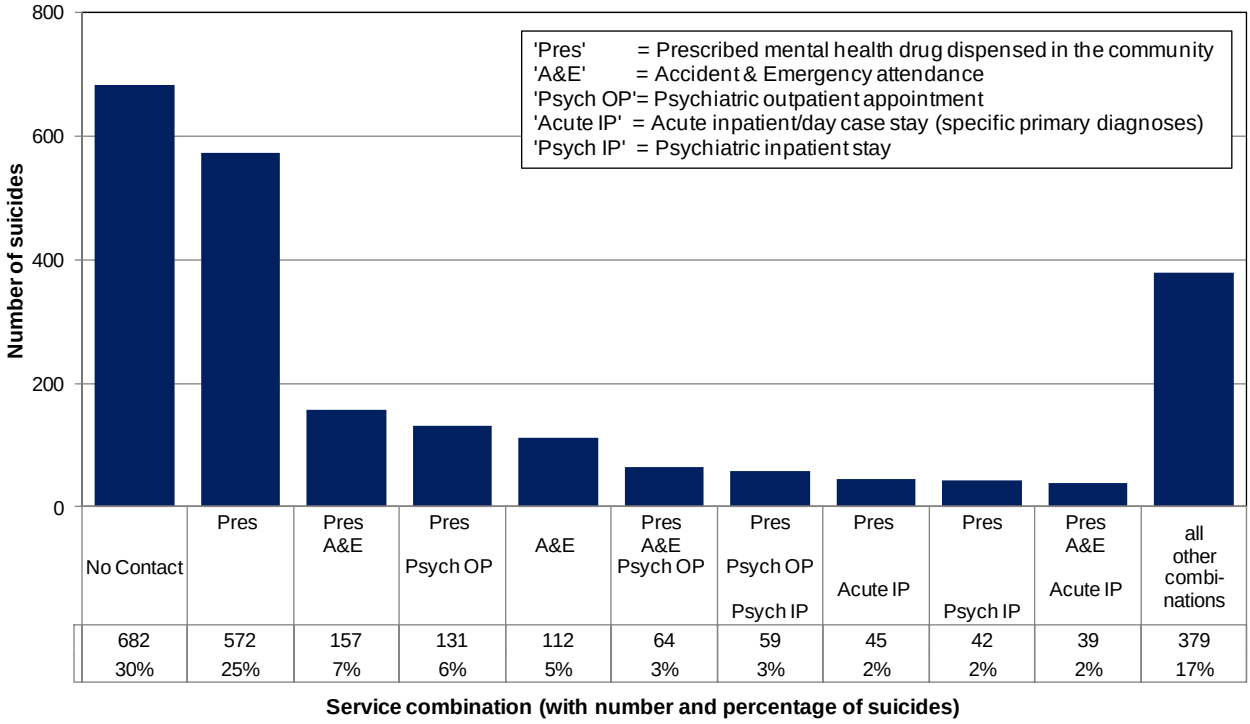
2 Contact with multiple healthcare services

By linking datasets, ScotSID allows us to explore cohort members' contact with multiple healthcare services prior to suicide. In Results Section 1, we investigated contact with particular services, but in this section we look at the specific combinations of services.

Figure 12 shows prior contact with multiple healthcare services ('service combinations'). Each bar represents a group of patients with the same pattern of service access (this might be a single service or a combination of several services). Each individual is included in only one bar. Only the ten most common combinations are shown (including 'no contact'). Less common combinations are added together in the 'all other combinations' bar.

The services included in each bar are listed in a consistent order, and a gap is left if a service was not contacted. For example, the fourth bar represents 131 people (6% of the total) who died from suicide and had been prescribed a mental health drug and had been a psychiatric outpatient (but had not attended A&E, or been an inpatient in an acute or psychiatric hospital). None of the 10 most common combinations shown here included specialist drug treatment; the last bar for 'all other combinations' includes such cases.

Figure 12. The most common combinations of particular healthcare services contacted by the 2010-12 ScotSID cohort[1] in the period[2] before death



Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1 and Data held in ScotSID).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.

As seen previously in Figure 4, mental health drug prescribing was by far the most common type of contact. A quarter of the cohort had this and no other type of contact, and eight of the nine most common combinations (excluding 'no contact' and 'all other combinations') included prescribing. A&E was the second most commonly accessed service and was

represented in four of the nine most common service combinations. A substantial proportion of the ScotSID cohort (17%) was represented by the ‘all other combinations’ bar, where there were small numbers of a wide range of combinations of services.

3 Comparison with the general population

This section compares service usage between the ScotSID cohort and the whole population of Scotland. For simplicity, the prevalence of contact is indicated by crude percentages, although as shown in Table 1 there are substantial demographic differences between the two groups. These differences would ideally be taken into account in order to clarify whether the observed differences in contact prevalence are due to suicidality or the demographic differences between the two groups. We hope to explore this in future work.

Table 10 shows the percentage of the ScotSID cohort who were in contact with the six healthcare services in the period prior to death, compared to the contact percentages for the whole 2011 Scottish population. For those services where a 12-month period prior to death was used for ScotSID, the corresponding calculation for the entire population is based on healthcare records for the whole of 2011. For A&E attendances, where ScotSID used a three-month period, the corresponding calculation for the entire population is also based on a three-month period. Specifically, the records for March-May 2011 were used, as these data were readily available. The prevalence of contact was then calculated using these numbers and the 2011 mid-year population estimates published by National Records of Scotland. The ratio of the two proportions is also given, together with the 95% confidence interval. This ratio expresses the (increased) likelihood of prior contact with each healthcare service among those who died by suicide compared to contact in the general population.

Table 10. Number and percentage of ScotSID cohort[1] in contact with particular healthcare services in the period[2] before death, compared to contact in whole population of Scotland (2011)

Healthcare service contact[3]		ScotSID cohort		2011 Scotland population	Proportion ratio (95% confidence interval)
		Number in contact	%	%	
Mental health drug prescription		1,342	58.8	17.8	3.3 (3.2-3.4)
A&E attendance		587	25.7	5.3	4.9 (4.6-5.2)
Psychiatric outpatient appointment		604	20.0	1.6	12.7 (11.8-13.6)
Acute hospital inpatient stay	All diagnoses	928	30.8	13.2	2.3 (2.2-2.5)
	Selected diagnoses (any position)[4]	623	20.7	2.9	7.1 (6.7-7.7)
	Selected diagnoses (primary position)[4]	516	17.1	1.8	9.4 (8.7-10.1)
Psychiatric hospital inpatient stay	Any admission	388	12.9	0.3	41.6 (37.9-45.7)
	Formal admission	70	2.3	0.1	42.7 (33.8-54.0)
	Informal admission	354	11.7	0.3	43.7 (39.5-48.2)
Specialist drug treatment (initial assessment)		50	1.7	0.2	7.1 (5.4-9.4)

Source: NRS death registrations and 2011 mid-year population estimates, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012 for mental health drug prescription and A&E attendance, and between 2009 and 2012 for other services. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[3] Note that a person can be counted in several rows: for example, the number of people with formal and informal admissions do not sum to number with a psychiatric inpatient stay of any type.
[4] For details, please see General acute hospital inpatients (SMR01) under Data held in ScotSID.

In all services considered here, members of the ScotSID cohort were significantly more likely to have had contact in the period prior to suicide than a member of the general population. The proportion ratios were highest for psychiatric hospital inpatient stays; the contact percentage for the ScotSID cohort was 12.9% compared to only 0.3% in the general population, resulting in a proportion ratio of 41.6. In other words, psychiatric inpatient stays were almost 42 times more likely in the ScotSID cohort in the twelve months prior to suicide than in the general population over a similar time period. There was no significant difference between the proportion ratios for formal and informal admissions.

The next highest proportion ratio was for psychiatric outpatient appointments (12.7), followed by acute hospital inpatient stays for selected diagnoses in primary diagnosis position (9.4). As described in the Data held in ScotSID section, the diagnoses included in this category are those relating to drugs, alcohol, mental disorders or injury. Table 10 shows that the proportion ratio increased from 2.3 to 7.1 to 9.4 as the analysis was refined from all diagnoses, to the selected diagnoses in any diagnosis position, to the selected diagnoses in only the primary position.

Odds ratios have been calculated for this table and are presented in the extended version of Table 10 in the accompanying Excel file.

These results show that there is a higher prevalence of contact with healthcare services in the ScotSID cohort during the period prior to suicide than in the general population during a similar length of time. This is in line with previous work described in the Literature review. This effect is particularly strong in respect of hospital stays for psychiatric conditions, reflecting the fact that the majority of people who die by suicide suffer from mental ill-health (Cavanagh et al 2003).

In light of the large differences in contact between the general population and people who subsequently die by suicide, it is reasonable to ask whether this can be used to identify individuals who are particularly at risk. In other words, how likely is a patient contacting each service to go on to die by suicide? Table 11 seeks to answer this question by comparing the number of people in the ScotSID cohort who had contact with each service in the calendar year 2011 and then died by suicide within twelve months (or three months for A&E attendance), to the total number of people in contact with the service in 2011. By taking a ‘forward look’ at the data in this way, we can calculate the *positive predictive value*, which is the percentage of the 2011 patients who went on to die by suicide. Further details are given in Appendix 7.

Table 11. Percentage of all patients in contact with particular healthcare services in 2011 who died by suicide[1] in the period after contact[2] (positive predictive value)

Healthcare service contact[3]		2011 patients who died by suicide in the period after contact[2]	Total 2011 patients	Positive predictive value (%)
Mental health drug prescription		739	889,503	0.08
A&E attendance		241	263,358	0.09
Psychiatric outpatient appointment		173	79,199	0.22
Acute hospital inpatient stay	All diagnoses	282	659,662	0.04
	Selected diagnoses (any position)[4]	191	144,997	0.13
	Selected diagnoses (primary position)[4]	157	91,565	0.17
Psychiatric hospital inpatient stay	Any admission	120	15,493	0.77
	Formal admission	22	2,725	0.81
	Informal admission	108	13,470	0.80
Specialist drug treatment (initial assessment)		12	11,625	0.10

Source: NRS death registrations, PIS, A&E attendances, SMR00, SMR01, SMR04, SMR25 (see Table 1).

[1] Probable suicides of Scottish residents aged five years and over registered in 2011. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).
[2] The period before death was defined as three months for A&E attendances and twelve months for all other services.
[3] Note that a person can be counted in several rows and therefore, for example, for psychiatric hospital inpatient stays, the formal and informal admissions do not sum to all admissions.
[4] For details, please see General acute hospital inpatients (SMR01) under Data held in ScotSID.

Table 11 shows that the overall risk of a patient in contact with any particular healthcare service going on to die from suicide is low – less than 1% for each type of contact, and as low as 0.04% or 1 in 2,500 for acute hospital inpatients (all diagnoses). Based simply on individual healthcare contacts, it is hard to predict which particular individuals are most at short-term risk of suicide. It is possible that a larger positive predictive value could be obtained by looking at contact with multiple services; this is a possible direction for future ScotSID work.

3.1 Frequency of contact

Some of the rows in Table 10 can be expanded by exploring the frequency of contact in the period before death, again comparing ScotSID with the general population. Currently three datasets have all the necessary data available: A&E attendances; acute hospital inpatient stays; and psychiatric hospital inpatient stays. These three datasets are considered in turn (Tables 12 to15).

Table 12 shows the frequency of A&E attendances in the ScotSID cohort, comparing the percentages for those dying within three months by suicide with the corresponding percentages for the entire resident population of Scotland in one quarter of 2011. For each A&E attendance (up to four or more) the ratio of these proportions is given, with the 95% confidence interval.

Table 12. Frequency of A&E attendances in the 2010-12 ScotSID cohort[1] in the 3 months prior to death, compared to frequency in whole population of Scotland (March-May 2011)

Number of A&E attendances	ScotSID cohort		2011 Scotland population	Proportion ratio (95% confidence interval)
	Number	%	%	
0	1,695	74.3	94.4	0.79 (0.77-0.81)
1	398	17.4	4.7	3.7 (3.4-4.0)
2	108	4.7	0.6	7.4 (6.1-8.9)
3	38	1.7	0.1	13.3 (9.7-18.3)
4 or more	43	1.9	0.1	29.5 (21.9-39.8)
Total	**2,282**	**100.0**	**100.0**	-

Source: NRS death registrations and 2011 Scotland mid-year population estimate, A&E attendances.

[1] Probable suicides of Scottish residents aged five years and over registered between 2010 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

Multiple A&E attendances were considerably more common in the period before suicide than in the general population. While nearly 2% of the ScotSID cohort had 4 or more A&E attendances in the three months prior to suicide, this frequency of contact was seen in just 0.1% of the general population. The proportion ratios show an exponential increase, from 3.7 for one A&E attendance to 29.5 for 4 or more A&E attendances. Thus, one A&E attendance was nearly four times more likely in the ScotSID cohort in the three months prior to suicide than in the general population over a similar time period, while four or more A&E attendances were almost 30 times more likely in the ScotSID cohort.

Table 13 repeats this analysis for the frequency of acute hospital inpatient stays for any diagnosis in the ScotSID cohort during the 12 months before death and the population of Scotland in 2011.

Table 13. Frequency of acute hospital inpatient stays in the 2009-12 ScotSID cohort[1] in the 12 months prior to death, compared to frequency in whole population of Scotland (2011)

Number of acute hospital inpatient stays (all diagnoses)	ScotSID cohort		2011 Scotland population	Proportion ratio (95% confidence interval)
	Number	%	%	
0	2,085	69.2	86.8	0.80 (0.78-0.82)
1	526	17.5	9.2	1.9 (1.8-2.1)
2	175	5.8	2.3	2.5 (2.1-2.9)
3	95	3.2	0.8	3.9 (3.2-4.8)
4 or more	132	4.4	0.9	5.1 (4.3-6.0)
Total	**3,013**	**100.0**	**100.0**	-

Source: NRS death registrations and 2011 Scotland mid-year population estimate, SMR01.

[1] Probable suicides of Scottish residents aged five years and over registered between 2009 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

In the twelve months prior to suicide there was double the chance of a single acute inpatient stay compared to the rate in the general population, and this rises more or less linearly to a five times higher chance for four or more inpatient stays in the one-year period.

Table 14 restricts the acute inpatient analysis to stays caused primarily by a mental health, alcohol, drugs or injury related condition (see Data held in ScotSID).

Table 14. Frequency of acute hospital inpatient stays with selected primary diagnosis[1] in the 2009-12 ScotSID cohort[2] in the 12 months prior to death, compared to frequency in whole population of Scotland (2011)

Number of acute hospital inpatient stays (selected primary diagnosis)	ScotSID cohort		2011 Scotland population	Proportion ratio (95% confidence interval)
	Number	%	%	
0	2,497	82.9	98.2	0.84 (0.83-0.86)
1	345	11.5	1.6	7.1 (6.5-7.9)
2	92	3.1	0.2	18.6 (15.2-22.8)
3	48	1.6	0.03	47.3 (35.6-62.8)
4 or more	31	1.0	0.02	42.6 (29.9-60.7)
Total	**3,013**	**100.0**	**100.0**	-

Source: NRS death registrations and 2011 Scotland mid-year population estimate, SMR01.

[1] Primary diagnosis related to alcohol, drugs, injury or mental health (see Data held in ScotSID).
[2] Probable suicides of Scottish residents aged five years and over registered between 2009 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

While Table 14 shows that, as expected, fewer of the ScotSID cohort had this more specialised contact, stays of this type are rarer in the general population. For this subset of diagnoses the proportion ratio increased steeply from 7.1 for one stay to 47.3 for three stays, a more than six-fold increase. It should be noted that the proportion ratio for four or more stays was slightly lower than that for three stays, which might be an artefact of small numbers or might possibly indicate a ceiling effect at three stays, with no increased risk of suicide beyond this frequency.

Finally, Table 15 looks at the frequency of contact for psychiatric hospital inpatient stays.

Table 15. Frequency of psychiatric hospital inpatient stays in the 2009-12 ScotSID cohort[1] in the 12 months prior to death, compared to frequency in whole population of Scotland (2011)

Number of psychiatric hospital inpatient stays	ScotSID cohort		2011 Scotland population	Proportion ratio (95% confidence interval)
	Number	%	%	
0	2,625	87.1	99.7	0.87 (0.86-0.89)
1	245	8.1	0.3	32.2 (28.6-36.4)
2	91	3.0	0.04	73.7 (59.9-90.7)
3	35	1.2	0.01	117.2 (83.4-164.9)
4 or more	17	0.6	0.01	88.3 (54.3-143.6)
Total	**3,013**	**100.0**	**100.0**	-

Source: NRS death registrations and 2011 Scotland mid-year population estimate, SMR04.

[1] Probable suicides of Scottish residents aged five years and over registered between 2009 and 2012. Only deaths classed as suicides under the old coding rules are included (see Definition of a probable suicide).

As was shown in Table 10, psychiatric inpatient stays were much more common among people who died by suicide than in the general population (Table 15). An individual who died by suicide was nearly 120 times more likely to have had three such stays in the twelve months prior to death compared to an individual in the general population over the same time period. It should, however, be noted that only 35 people (1% of the ScotSID cohort) were in this category. As in Table 14, the proportion ratio for four or more stays, although very high (88) was slightly lower than that for three stays.

Literature review: evidence summary and comparisons with ScotSID

The findings of this ScotSID study contribute to our understanding of the amount, type and patterns of contact with a range of healthcare services among people in Scotland who died by suicide over the period 2009-2012. The linked datasets that constitute ScotSID offer an unparalleled opportunity to capture the complexities of healthcare service contacts in this population.

Nevertheless, some limitations around data quality and completeness should be noted. There are data quality issues in the Scottish Drug Misuse Database; comprehensive information about contact in primary care and specialist community-based mental healthcare services is not currently available (although mental health drug prescriptions from primary care are captured in the database, as part of prescriptions dispensed in the community); and additional information on the social context of the suicide death is not yet available (further work is required to progress the extraction of relevant information from Police sudden death records). Further details of these limitations are given under Data held in ScotSID.

When considering the findings from this study in the light of those in research literature, it is not possible to make any comparison about prior contact with primary care; and the overall prevalence of contact with mental health services will be underestimated as a result of the omission of data on community-based services.

Contact with mental health services

In the year prior to death, 20% of the ScotSID cohort had a psychiatric outpatient appointment and 13% had a psychiatric inpatient stay. The prevalence estimate for either type of psychiatric contact was 26%. As for all healthcare services covered in this report, ScotSID cohort members were significantly more likely to have had contact with inpatient and outpatient psychiatric services than members of the general population. In fact, psychiatric inpatient stays were almost 43 times more likely, and psychiatric outpatient appointments nearly 13 times more likely, in the ScotSID cohort in the twelve months prior to suicide than in the general population over a similar time period.

How do these findings compare with those reported in the literature?

Existing literature reviews

We have identified three literature reviews (Booth & Owens 2000; Cavanagh et al 2003; Luoma et al 2002) which provide relevant information (see Table 16)[1]. It should be noted that none of these reviews provided an operational definition of ‘mental health services’.

In their non-systematic review of eight UK-based retrospective cohort studies of contact with ‘mental health services’ (undefined) at/around time of death among people who died by suicide, Booth & Owens (2000) produced a range of prevalence estimates, from 14 to47%, from which a median of 27.5% can be calculated.

In their systematic review of 154 psychological autopsy studies of suicide, conducted worldwide, Cavanagh et al (2003) produced estimates of the prevalence of lifetime contact with ‘mental health professionals’ (undefined) among people who died by suicide,

[1] The review by Luoma et al (2002) supersedes that of Pirkis & Burgess (1997) inasmuch as it covers literature included in the earlier review and incorporates studies that were published subsequently (1997-2000). Therefore, the findings of the review by Pirkis & Burgess are not included here.

presenting findings according to the study design. In case-control studies, median contact prevalence was 46% (range 10-62%), while in cohort studies the median was 29% (range 0-72%). The corresponding median contact prevalence estimate for controls in studies using a case-control design was 21% (range 0-95%). Despite the apparently higher prevalence of contact among cases (46%) compared to controls (21%), the difference between groups was not statistically significant, due to the very large, overlapping confidence intervals.

Luoma et al (2002) undertook a systematic review of the literature on contact with 'mental health care professionals' (undefined) and primary care providers among individuals prior to their death by suicide. Based on an analysis of findings from 40 primary studies, covering Europe, Australia and the USA, and published between 1966 and 1999, the authors estimated that lifetime rates of contact with mental health services averaged 53% (range 39-63%); contact within 12 months of suicide averaged 32% (range 16-46%); and contact within one month of suicide averaged 19% (range 7-28%). When considering these findings, it should be noted that the calculation of averages is somewhat crude, since it does not take account of sample size: prevalence estimates across studies are treated equally, regardless of the number of suicides in a study. This tends to increase the relative importance of small studies, in which prevalence estimates may be more unreliable.

Table 16. Contact with mental health services prior to suicide: findings from reviews

Author and date	Country and time period	Type of review, number of studies (N), and type of primary studies	Contact with mental health services before suicide			Estimates for controls
			<1 month Cum. %	<12 months Cum. %	During lifetime	
Booth & Owens 2000	UK. Various dates.	Non-systematic review. N=8 retrospective cohort studies	**AT DEATH** 27.5 (median; range 14-47)			n/a
Cavanagh et al 2003	Various countries. Various dates.	Systematic review. N=154 case-control and retrospective cohort studies			Case-control studies 46 (median; range 10-62) Cohort studies 29 (median; range 0-72)	21 (median; range 0-95) (Difference between suicides and controls ns)
Luoma et al 2002	Various countries. Various dates.	Systematic review. N=40 studies (psychological autopsies, record reviews)	19 (mean; range 7-28)	32 (mean; range 16-46)	53 (mean; range 39-63)	n/a

New literature review

In order to provide more recent information about contact with psychiatric services (and primary care) prior to suicide, we have also undertaken a systematic review of the

literature. Relevant studies were identified by using two electronic databases, MEDLINE and PsycINFO, from January 2000 until October 2015. The search included articles in English related to completed suicide, on the one hand, and prior contact with health and social services and with the criminal justice system, on the other. Studies of special populations, including clinical follow-up studies of people discharged from psychiatric care, were excluded; only studies of general population suicides were included. Definitions of suicide varied across studies (and in some studies a definition was lacking completely). Studies were based in several countries in North America, Europe, Asia and Australasia. Primary studies comprised two main types of research design: case-control (n=12) and retrospective cohort (n=23). In all but one case-control study the controls were alive and matched to suicide deaths (by age and sex in all studies; and, in some studies, by additional variables, e.g. area of residence). In the remaining study the controls comprised other types of sudden death. Retrospective cohort studies were of three main types: psychological autopsies, record reviews (sometimes with additional sources of information) and record linkage (at national or local/regional level).

The start date for the search (2000) was chosen to avoid duplicating the systematic review of the topic area undertaken by Luoma et al (2002) which covered literature indexed in bibliographic databases until May 2000. Reference lists for each study included in this review were searched. Three relevant primary studies using a retrospective cohort design and published before 2000, omitted from the review by Luoma et al (2002), were identified (Hawton et al 1999; Hydén et al 1996; Isometsa et al 1995) and have been included in this review.

Findings are presented in a three-part table (Appendix 8). In all parts, author and date of publication, country and time period are identified; and data are presented for the percentage of completed suicides who had contact with either mental health services or primary care/general practice during three specific time periods (one month, 12 months and lifetime) prior to death. Mental health service contact comprised inpatient care, outpatient care and other types of treatment (e.g. community-based care; see Appendix 8 for details). The time periods were chosen in order to facilitate comparison with the findings presented in the review by Luoma et al (2002). Where data were only available for other time periods (e.g. three months, or at time of death), the study findings have been included in this review (with the time period clearly noted). Additional information is provided in part A (case-control studies) regarding the suicide sample, the control sample and the differences between suicides and controls with respect to prior contact. In part B (retrospective cohort studies) additional information covers the suicide sample and socio-demographic variation within the sample (e.g. differences in contact by age and/or gender). Additional information in part C (reviews) comprises the type of review and the number and design of primary studies included in the review; and (in one review only) a comparison of estimates of prior contact between suicides and controls (based on findings from case-control studies).

Table 17 summarises the new literature review findings in Appendix 8 by presenting medians and ranges for the prevalence of contact with mental health services during different time periods prior to suicide.

Table 17. Contact with mental health services prior to suicide: summary of findings from new literature review covering the period 2000-2015

Study design	Contact with mental health services prior to suicide		
	<1 month Cum. %	<12 months Cum. %	During lifetime Cum. %
Case-control studies			
Prevalence estimates: median	20	30	38
Prevalence estimates: range	11-30	25-53	8-63
N of studies	6	7	4
Retrospective cohort studies			
Prevalence estimates: median	20	26	35
Prevalence estimates: range	12-52	9-45	19-44
N of studies	8	13	6
All studies			
Prevalence estimates: median	20	28	35
Prevalence estimates: range	11-52	9-53	8-63
N of studies	14	20	10

Total number of studies = 35.
Where multiple estimates are provided for a specific time period in a single study, the highest estimate is used.

Table 17 shows that, in case-control studies, 30% (median; range 25-53%) of suicides were in contact with mental health services during the last year of their life. The corresponding figure based on retrospective cohort studies was 26% (median; range 9-45%). For all studies the prevalence estimate was 28% (median; range 9-53%).

Comparisons between literature reviews and with ScotSID cohort

Prevalence estimates for contact with psychiatric services in the 12 months prior to suicide, from the systematic review by Luoma et al (2002) and the new review conducted for this report, are very similar: between a quarter and a third of suicides would be expected to have had such contact (see Table 18)[2].

The 12 month contact prevalence data reported in the National Confidential Inquiry into Suicide and Homicide by People with Mental Illness (NCISH) are consistent with these estimates. Across the UK, 28% of suicides over the period 2003-2013 were in contact with mental health services during the last 12 months of their life. The prevalence estimates for the nations of the UK were: England 28%; Northern Ireland 27%; Scotland 30%; and Wales 23%.

The prevalence estimate for psychiatric inpatient or outpatient contact over the final 12 months in the ScotSID cohort, 26%, is towards the floor of the expected range (Table 18). The difference between this estimate and that given in the NICSH (2015) report for Scotland (30%) may be attributable to differences in temporal coverage (NICSH: 2003-2013; ScotSID: 2009-2012) and the absence of data on community-based contact in the ScotSID cohort.

[2] Unfortunately there is no estimate of prevalence of contact during the 12 months prior to suicide in the reviews by Cavanagh et al (2003) and Booth & Owens (2000). In the light of findings from other reviews, the lifetime prevalence estimate of 29% provided by Cavanagh et al, derived from retrospective cohort studies, appears to be too low. Their lifetime prevalence estimate, based on case-control studies, of 46% is more plausible. The median estimate of prevalence of contact with mental health services at death (27.5%) in the review by Booth & Owens (2000) appears to be somewhat high, possibly linked to the non-systematic nature of the search process.

Table 18. Prevalence of contact with mental health services in the 12 months prior to suicide: comparison of findings from Luoma et al (2002), the ScotSID literature review, NCISH and ScotSID data

Author and date	Case-control studies Median (range) %	Retrospective cohort studies Median (range) %	All studies Median (range) %
Luoma et al 2002	---	---	32 (16-46)
ScotSID 2015 report literature review	30 (25-53)	26 (9-45)	28 (9-53)
NCISH[1]: Scotland, 2003-2013	---	---	30
ScotSID cohort 2009-2012[2]	---	---	26

[1] National Confidential Inquiry into Suicide and Homicide by People with Mental Illness, 2015 report.
[2] Based on contact with psychiatric hospital outpatient or inpatient services.

Evidence from case-control studies reviewed for this report strongly suggests that the prevalence of contact with mental health services during the 12 months prior to suicide is higher than would be expected in the general population. In all six studies which reported relevant data (12 month contact prevalence estimates among both cases and controls), the proportion of suicide cases in contact with mental health services was significantly greater than the proportion of controls (see Appendix 8). As we have shown, ScotSID data are entirely consistent with these findings: prevalence of contact with psychiatric services was significantly higher among cohort members (outpatient care: 20%; inpatient care 13%) than among members of the general population (outpatient care: <2%; inpatient care: <1%).

Contact with A&E

In the three months prior to death, 26% of the ScotSID cohort had contact with A&E. We found four studies using a retrospective cohort design that reported on contact with A&E or its US equivalent (Emergency Room [ER]) prior to suicide. Weis et al (2006) found that during 2004, 45% of 491 suicide deaths in South Carolina, USA, had ER visits during the previous 18 months (average; range 12-24 months). In their study of 219 'probable suicides' (suicide and open verdict deaths) in Leeds, England during the period 1994-97, Gairin et al (2003) found that 39% had attended A&E during the last 12 months of their life, just over a third (39%) as a result of non-fatal self-harm. Linsley et al (2007) investigated contact with several agencies prior to death in a cohort of 133 suicides and 72 'probable suicides' (open verdicts and accidental deaths) in North-East England during 1999-2001. They report that 12% had contact with an A&E department in the three months before death. Finally, Stark et al (2012) found that 25% of their cohort of 177 suicide and undetermined deaths in the Scottish Highlands during 2001-2004 had contact with an A&E department in the 12 months before death; in the month before death only 4% had such contact.

Given the variability of contact periods covered in the literature and the paucity of data from other studies, it is difficult to assess whether the prevalence of contact with A&E in the ScotSID cohort is higher or lower than expected.

Discussion

Suicide is a complex behaviour, involving a wide range of determinants. The socio-ecological model identifies several types (or levels) of risk factors: systemic (e.g. barriers to accessing care in the health system); societal (e.g. easy access to means of suicide); community (e.g. stresses of acculturation and dislocation); relationship (e.g. social

disconnectedness); and individual (e.g. previous suicide attempt) (World Health Organization 2014).

Mental disorders constitute one of the most potent individual-level risk factors for suicide. In a general population cohort of adults who have died by suicide, such as the ScotSID cohort, up to 90% would be likely to have had a diagnosable mental illness, of which affective disorder would probably be the most common diagnosis (Cavanagh et al 2003)[3]. Consequently, the finding that only about a quarter of the cohort had received inpatient and/or outpatient psychiatric care in the 12 months before death might raise concerns about a possible shortfall between the mental health needs of high risk individuals and the supply of services that meet those needs.

However, it is important to recognise that 70% of the cohort had some contact (as defined in this report) with healthcare services prior to death. Moreover, for reasons given earlier, this percentage is probably an under-estimate. The most common type of contact was receipt of a mental health drug prescription (59% of the cohort), which includes prescribing by GPs, nurses, dentists and pharmacists, and hospital prescribing where items are dispensed in the community. A quarter of the sample had contact with A&E. It is therefore highly likely that some of the shortfall between psychiatric need and supply was filled by a wider range of more generic, non-specialist services.

Two major conclusions arise from the findings of this report, although the implications for effective suicide prevention in Scotland require further consideration and exploration.

First, there is a sizeable minority of the 'at risk' population who are not in contact with services prior to death but who have unmet mental health (and other) needs. What is the explanation and what can be done to close the shortfall? Those who are not in contact with services may feel need that they are unable to express, for a variety of reasons. They, and those close to them, may not recognise their mental ill-health or that this ill-health raises the risk of suicidal thoughts and behaviours. Although unmet mental health needs are not confined to any particular segment of the population, there is evidence that help-seeking for mental health problems is less prevalent among males (rather than females) and younger (rather than older) adults (Rickwood et al 2005; Oliver et al 2005); and these same demographic groups within the ScotSID cohort have been shown to be less likely to contact mental health services (see Appendix 7, part B).

Second, the majority of those who die by suicide have had some type of contact with services in the 12 months before death, perhaps suggesting that, for this group at least, there have been no major barriers impeding access to different types of care. Nonetheless, service use has not prevented their subsequent death by suicide, which might lead to the inference that contact with services has a negative causal impact on suicide risk. This inference would be both controversial and counter-intuitive. On the contrary, receiving effective treatment for a psychiatric disorder should lead to a reduction in suicide risk, at least in comparison with the situation in which such treatment is not received. It is far more plausible to assume that the association is one of selection rather than causation: those who are at greater risk of dying by suicide are more likely to be in contact with mental health services (Hjorthoj et al 2014). *At a population level*, positive aspects of service

[3] The consensus in the literature, that the majority of persons who die by suicide have an identifiable psychiatric condition at the time of death, is challenged in a recent systematic review of studies that have investigated the prevalence of suicide without any identifiable psychiatric condition (Milner et al 2012). The review found that between 5.5% and 66.7% of suicides occurred in the apparent absence of DSM-IV Axis I conditions (i.e., clinical psychiatric disorders, such as anxiety and depression; personality disorders are excluded). However, as the authors themselves note, '[v]ariation in the proportion of suicide cases without a psychiatric condition may reflect cultural specificities in the conceptualization and diagnosis of mental disorder, as well as methodological and design-related differences between studies.'

provision for mental health problems (e.g. higher levels of availability, accessibility and funding) would be expected to be associated with lower suicide risk.

In fact, there is mixed evidence from studies using an ecological design: some report no association (e.g. Johannessen et al 2011; Shah et al 2010), while others report a *negative* association, i.e. a *higher* level of service linked to *lower* suicide rates (e.g. Pirkola et al 2009; Tondo et al 2006). However, the absence of evidence of a *positive* association between provision of services and suicide incidence, i.e. a *higher* level of services linked to *higher* suicide rates, should be noted.

In responding to the finding of a high prevalence of contact with services in the ScotSID cohort, health service planners will want to consider possible improvements to the organisation, reach and delivery of services targeted at groups at high risk of suicide, while healthcare providers will want to consider improvements to the identification, engagement and effective treatment of individuals at high risk. However, it is important to be realistic about the challenges of assessing suicidality. In their nationwide psychological autopsy investigation of suicide in Finland, Isometsa et al (1995) found that only a small minority spontaneously communicated their suicide intent during the last healthcare appointment. De Leo et al (2013) note that patients who die by suicide may not be suicidal at the time of the last contact or may deliberately fail to reveal their suicide intentions. Isometsa et al (1995) speculate that even patients who want to communicate their suicidality may be unable to do so as a result of depression, hopelessness or ambivalence.

Realism about the challenge of accurately predicting suicide risk at the individual level is also necessary. Even the most powerful risk factors for suicide have poor predictive ability (see Table 11). Gairin et al (2003) take self-harm as an example. Even though an individual with one episode of hospital-treated self-harm has a massively increased risk of future suicide (up to a hundredfold) compared to an individual in the general population who has never self-harmed, most people treated in hospital following self-harm will not die by suicide in the next year. The poor positive predictive value is a consequence of low specificity of the predictive factor and low prevalence of the outcome.

Conclusions

What do we know from the literature?

- Contact with mental health services is consistently higher among suicide cohorts than among the general population, suggesting that attending healthcare services with symptoms of mental ill-health is more common among those who go on to die by suicide.
- Based on systematic literature reviews, it is estimated that between a quarter and a third of people who die by suicide have had contact with mental health services in the 12 months prior death. Data from the National Confidential Inquiry into Suicides and Homicides by people with mental illness (NCISH) are consistent with this estimate (23-30% across different UK nations), as is the overall figure for the prevalence of mental health hospital contacts (a psychiatric inpatient stay or psychiatric outpatient appointment) recorded in the ScotSID cohort (26%).
- Where reported in the literature, women who die by suicide tend to have higher rates of a diagnosis of mental ill-health and contact with mental health services than men who die by suicide. ScotSID data are consistent with this finding.

What does the 2015 ScotSID report add?

- The 2015 ScotSID report is based on suicides occurring between 2009 and 2012. Together with the information provided by the NCISH, it provides a more up-to-date picture of healthcare service contacts among people who die by suicide in comparison with other published literature.
- The 2015 ScotSID report describes healthcare contacts across the spectrum, from community prescribing through A&E attendances to specialist inpatient and outpatient mental health care. Despite some data completeness limitations, we found that 70% of those who died by suicide in Scotland had some recent contact with services, and many had multiple contact with a range of services.
- After being prescribed a mental health drug, the next most common health service contact was with an A&E service. This merits further exploration within the Scottish context, especially in light of the recent report identifying greater use of emergency healthcare services by people with mental health problems (Dorning et al 2015).
- People living in ‘very remote rural’ areas had a significantly lower likelihood of contact with health services in the year prior to suicide (47% versus 70% overall). There were no significant differences in any other urban rural category of residence.

- There was a significant relationship between level of contact and deprivation, with people from more deprived areas being more likely to have had contact prior to suicide.
- There were significant differences in the ScotSID cohort between different suicide methods and the likelihood of recent healthcare service contact. Those who died from poisoning (e.g. an overdose) were most likely to have had recent contact (82%), whilst those who died through firearms were least likely (47%).
- There is a cohort of people who die by suicide who appear not to be in contact with any of the core health services currently included in ScotSID. Individuals within this group merit further focussed investigation to better understand their characteristics and potential needs.

Potential future direction for ScotSID data and analysis

- Continue to explore bringing additional data from healthcare and other sources into ScotSID.
- Develop more detailed analysis of suicide deaths by overdose, and features of prescribing in this sub-group.
- Develop more detailed analysis of prescribing information as a proxy for indicators of co-morbidity.
- Refine the statistical analysis to take into account known demographic differences between the ScotSID cohort and the wider Scotland population.
- Undertake further analysis of healthcare contacts to examine frequency of contacts over the time leading up to suicide, and whether it is possible to identify any intensification or withdrawal from contact.
- Consider examining patient pathways – the patterns of patient movement between healthcare services.
- Consider including reporting of ‘in-hospital’ suicides to complement NCISH reporting of these events.

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Further information

Further information can be found on the ISD website.

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Appendices

A1 – ScotSID Steering Group membership, November 2015

Name	Title/Organisation
Alana Atkinson	Programme Manager, National Programme for Suicide Prevention, NHS Health Scotland
Alison Burlison	Principal Information Analyst, Information Services Division
Andy McCann	Chief Inspector, Police Scotland
Angela Prentice	Information Manger, Information Services Division
Anna Wimberley	Clinical Governance Support and Development, Healthcare Improvement Scotland
Cameron Stark	Consultant in Public Health Medicine, NHS Highland
Chris Black	Senior Information Analyst, Information Services Division
Chris Deans	Information Analyst, Information Services Division
David Christmas	Consultant Psychiatrist, NHS Tayside
Elaine Strange	Service Manager, Information Services Division
Frank Dixon	Statistician, National Records of Scotland
James Jopling	Executive Director for Scotland, Samaritans
John Mitchell	PMO General Psychiatry, Mental Health and Protection of Rights Division, Scottish Government
Kirsty Licence	Consultant in Public Health Medicine, Information Services Division
Liz Scowcroft	Research Manager, Samaritans
Niall Kearney	Head of Mental Health Improvement Unit, Scottish Government
Stephen Platt	Emeritus Professor of Health Policy Research, University of Edinburgh; Chair of ScotSID Steering Group

A2 – ScotSID cohort and suicide coding rules

The ScotSID cohort

The number of ‘probable suicide’ deaths included in ScotSID differs slightly from the number published by National Records of Scotland (NRS). Both use the same definition and old coding rules, and are based on the year in which a death is registered. However, unlike NRS, ScotSID excludes deaths of children aged less than 5 years (which are considered unlikely to be suicides). There were two such cases among deaths registered in the period 2009-2012. Therefore the total number of probable suicides including people resident outwith Scotland who have died here quoted in this publication (3,059) is two fewer than the number published by NRS (3,061). The ScotPHO website suicide topic publishes the same numbers as NRS.

Changes in suicide coding rules

In 2011, NRS changed its coding practice to take account of changes made by the World Health Organization (WHO) to coding rules for certain causes of death. As a result there is a difference in how deaths data were coded in 2011 onwards compared to previous years, with some deaths previously coded under 'mental and behavioural disorders' now being classified as 'self-poisoning of undetermined intent' and consequently as suicides. NRS publish their annual mortality statistics for ‘probable suicides’ based on both the old and the new coding rules for 2011 onwards**.**

Based on NRS figures for all ages, the new coding rules increased the Scotland ‘probable suicide’ total by 117 deaths (from 772 to 889) in 2011, and by 68 deaths (from 762 to 830) in 2012. This ScotSID report presents 2011 and 2012 data based on the old rules (as estimated by NRS), ensuring consistency with the 2009 and 2010 data and facilitating the exploration of temporal trends. Full details on changes to the coding of causes of death between 2010 and 2011 can be found on the NRS website.

A3 – Record linkage, data confidentiality and information governance

Record linkage

Record linkage is a means of identifying records in different databases that relate to the same individual. For the purposes of the ScotSID database, two approaches were employed in order to link the different records together:

- Deterministic (or exact) matching – uses a common unique identifier (e.g. Community Health Index (CHI) number)
- Probability matching – uses a set of personal identifiers to estimate the *probability* that the two records correspond and to decide the threshold (level) of agreement for matching of records.

Deterministic matching was used when there was a common unique identifier between the datasets to be linked, for example the CHI number.

For linking other datasets where there was no common identifier, or there were completeness/data quality issues with the CHI number, probability matching was used. The person-identifiable information used includes forename, surname, previous name, Community Health Index (CHI) number, gender, postcode, date of birth and date of death/date death registered. Probability matching takes account of typing errors, movement of individuals between geographical areas and other issues that may arise during data recording. This allows the 'linker' to quantify levels of agreement and disagreement between records.

CHI became mandatory for A&E attendances in September 2009, and therefore ScotSID (deterministic) linkage with A&E data was only possible for records after this date. For linkage to the Scottish Drugs Misuse Database, where CHI is not recorded, probability matching was used.

Data confidentiality and information governance

ScotSID links existing information relating to individuals who are thought to have died by suicide, from a range of sources. The specific data elements that were linked for this report include individuals' death records, hospital A&E, outpatient and inpatient attendance records, and prescriptions dispensed in the community. It is envisaged that future linkages will eventually extend to data sources such as police sudden death reports and GP records. The linkage of this information will enable a more complete picture to be built up of those individuals who are thought to have died by suicide and will help identify high risk groups.

Full Privacy Advisory Committee (PAC) approval was obtained for the linkage of data items from individuals' ISD health records into ScotSID.

ScotSID is held within ISD in accordance with established information security and data protection/ confidentiality procedures. Access is limited to authorised ISD personnel only. Although information on those who have died is not directly covered by the Data Protection Act 1998, ISD considers that such data are protected by a Duty of Confidence and their confidentiality needs to be protected. ISD produced the document 'How the Scottish Suicide Information Database project meets the six Caldicott Guardian principles' which was disseminated to all NHS board Caldicott Guardians.

The person-identifiable data are stored separately from any contextual information and used only for linkage purposes to incorporate other datasets. For the purposes of this report, analysis was undertaken on a pseudo-anonymised dataset (data for which the personal identifiers had been removed and replaced with a unique identifier).

A4 – Policy context

Choose Life

The Scottish Government's Choose Life strategy and action plan was launched in 2002. This ten-year action plan had seven objectives, the last of which stated:

'Knowing What Works: improving the quality, collection, availability and dissemination of information on issues relating to suicidal behaviour (and self-harm) and on effective interventions to ensure the better design and implementation of responses and services and use of resources.'

As part of the action plan, Choose Life set a target to reduce suicides in Scotland by 20% between 2002 and 2013, and a wide range of actions were implemented to support people at risk of suicide. Progress towards the target was measured using 3-year rolling rates, and between 2000-02 and 2011-13 there was an overall decrease of 19%.

During the 2008 'Choose Life' summit, NHS Health Scotland made a commitment to lead work to establish a Scottish Suicide Information Database, in order to address the dearth of contextual information available within a central resource. This led to ISD being commissioned by NHS Health Scotland to develop, analyse and maintain such a database (ScotSID).

Suicide Prevention Strategy 2013-2016

Following an engagement process involving stakeholders and members of the public, the Scottish Government's suicide prevention strategy was developed and published in 2013.

The strategy is structured around five themes, with 11 specific commitments for action. The key theme most pertinent to ScotSID is: *D Developing the evidence base*, where commitment 9 states:

'We will continue to fund the work of ScotSID and the Scottish element of the National Confidential Inquiry into Suicide and Homicide and we will also contribute to developing the national and international evidence base. In doing so we will work with statutory, voluntary sector and academic partners.'

The new strategy builds upon the success of the last 10 years, with new commitments for suicide prevention activities in communities and in services, supported by research evidence which has emerged in recent years.

A5 – Prescribing Information System

The Prescribing Information System (PIS) is a comprehensive database of details of NHS prescriptions dispensed in the community in Scotland. ISD maintains the system, and the data come from Practitioner Services which processes NHS prescriptions for payment. The data include prescribing by GPs, nurses, dentists and pharmacists, and also hospital prescribing where items are dispensed in the community. Hospital dispensed prescriptions are not included in the figures. The data available cannot identify what proportion of the drugs dispensed are actually consumed or when they were consumed, and do not include products purchased 'over the counter'.

The following mental health medicines prescribed from the British National Formulary (BNF) were included in ScotSID:

- Hypnotics and anxiolytics indicated for the treatment of anxiety and insomnia (BNF 4.1)
- Drugs used in psychoses and related disorders (BNF 4.2)
- Antidepressant drugs (BNF 4.3).

Patient-based analysis has been made possible through the recent availability of comprehensive patient-identifiable data using the Community Health Index (CHI) number. Prior to April 2009, the proportion of prescriptions with a valid CHI number recorded was generally not comprehensive enough to make patient-based analysis possible. For medicines used in mental health, CHI capture rates have improved, becoming high enough to permit accurate patient analyses for financial years 2009/10 to 2012/13.

ScotSID analyses have been carried out for prescriptions dispensed within 12 months prior to death for probable suicides occurring in the period 2010-2012. Prior to April 2009, CHI capture rates were slightly lower which may have resulted in a slight undercount for patients who died in January to March 2010, but these patients are likely to have been included in patient counts through items dispensed to them later on. Table A6 shows the CHI recording completeness, calculated as the percentage of dispensed items that have a valid CHI number attached and are therefore included in the analysis.

Table A6: CHI recording completeness for Scotland, by drug type, 2009 to 2012

Topic[1]	2009	2010	2011	2012
Hypnotics and anxiolytics (BNF 04.01)	87.5%	92.7%	92.8%	94.5%
Drugs used in psychoses and related disorders (BNF 04.02)	87.5%	93.8%	94.0%	95.2%
Antidepressant drugs (BNF 04.03)	90.1%	95.4%	95.4%	97.0%

[1] BNF – British National Formulary sub-section.

Note that in the last ScotSID report, the date used to identify prescriptions for ScotSID cases was the 'paid date'. This is the last day of the month in which the prescription was processed by Practitioner Services and payment issued to the dispenser. In some cases, the 'paid month' may not be the same month that the prescription was prescribed and/or dispensed. In this report, the 'dispensed date' was used in place of paid date as this was considered to be more relevant to the timing of the health service contact with the patient.

A6 – Future ScotSID developments

The overall aim of the Scottish Suicide Information Database is to provide a central repository for information on all probable suicide deaths in Scotland, in order to support epidemiological research, preventive activity, and policy making. Further investigation of potential additional data sources will help ScotSID to continue to develop and capture a wider range of information on the health and wider social circumstances of individuals.

Police sudden death reports, from the Crown Office and Procurator Fiscal Service (COPFS)

The COPFS has a duty to investigate all sudden and unexplained deaths, as well as deaths in suspicious circumstances. Deaths are usually reported to the Procurator Fiscal by the police, a doctor or the Registrar of Births, Deaths and Marriages. The COPFS's Scottish Fatalities Investigation Unit holds information on all sudden, suspicious, accidental and unexplained deaths, in a central location for all 11 Procurator Fiscal areas in Scotland.

It was hoped that useful data from police sudden death reports would be added to ScotSID in 2014. However, this has had to be put on hold while information governance issues are considered and addressed.

Primary care information

A pilot exercise, exploring the feasibility of extracting data on possible suicides from GP notes, was completed in 2011. Further investigation into obtaining GP data is on hold while a new national GP information system (the Scottish Primary Care Information Resource: SPIRE) is developed. This may provide a more efficient way of accessing primary care data for record linkage. Following a successful application for extracting data, it is hoped that some relevant data would be available from all practices by summer 2017, for those practices which choose to participate in SPIRE.

A7 – Statistical methodology

This appendix explains the statistical methods used in this publication. The Glossary also contains basic details of many of the terms mentioned below.

Measures of association
The *proportion ratios* in Table 10 and Tables 12-15 are calculated by dividing the percentage of people with contact in the ScotSID cohort by the equivalent percentage for the Scotland population. In the accompanying Excel spreadsheet for this publication, the *odds ratio* is also provided for these tables. This is calculated by dividing the *odds* of contact in the ScotSID cohort (number of people with contact divided by number of people without contact) by the odds of contact in the general population.

Table 11 examines the *positive predictive value* associated with contact with each healthcare service. This is calculated by taking everyone in contact with the service in a particular year (2011 in this report) and looking at how many went on to die by suicide within one year of their last contact. The positive predictive value is then calculated by dividing the number of people who died by suicide by the total number of people in contact in the specified period. Essentially, this measure describes how likely it is that patients in contact with the healthcare service will die by suicide.

95% confidence intervals
The 95% confidence intervals presented in this report are calculated using a number of established methods.

The confidence intervals for the percentage of the ScotSID cohort in contact with healthcare services, shown in Figure 3 and Figures 5-11, are calculated according to the Wilson Score method recommended by the APHO.

The confidence intervals for the proportion ratios in Table 10 and Tables 12-15 are calculated according to the Katz logarithm method (Laake et al 2015), while confidence intervals for the unadjusted odds ratios presented in the same tables in the accompanying Excel file are calculated according to Woolf's method (Laake et al 2015).

Significance tests
Where p values are quoted in the text of this report, they refer to values calculated according to chi-squared tests comparing each category with the rest of the ScotSID cohort. A Bonferroni correction (Laake et al 2015) is also applied where there are more than two categories, to take into account the reduced significance in these cases. For the deprivation quintile results, it is more appropriate to use a significance test which takes into account the fact that the categories have a definite order. The p values in this case were therefore calculated according to an ordinal test based on Somers' D (Newson, 2006).

In all cases significance was evaluated at the five percent level ($p < 0.05$).

A8 – Findings of the ScotSID literature review

A. Case-control studies

Author/ Date	Country/ Time period	Suicide sample	Control sample	Contact with mental health services before suicide			Contact with primary care/general practice before suicide			Comparison with controls
				<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Chen et al 2006	Hong Kong 2002-2004	N=150 suicides (coroner defined). N=121 diagnosed with psych. illness ('diagnosable case')	Live general population, matched for age and sex			39 (total cohort) 48 (diag-nosable cases)				Suicide group significantly more likely to have been in contact with psychiatric services (and to have received emotional treatments.
De Leo et al 2013	Australia 2006-2008	N=261 suicides (coroner defined) aged 35+ years	Sudden deaths	**3 MONTHS** 30 (contacted psych-iatrist)			**3 MONTHS** 77 (inc. other profess-ionals) 31 (GP only)			After adjustment for age and gender, suicides had significantly more contact with psychiatrist and significantly less contact with GP only.
Hjorthøj et al 2014	Denmark 1996-2009	N=2,429 suicides (undefined)	Live general population, matched for age and sex		53 (any psych. care) 19 (psych. IP)					Statistically significant association between suicide and level of contact with the psychiatric system.
Liu et al 2012	Taiwan 2006	N=4,406 suicides (undefined) aged 15+ years	All living members of the total insured population	20 (OP for mental disorders)	30 (OP for mental disorders)		72	85		Among suicides the average number of OP visits per person-year was two times higher than that of the controls.

Author/ Date	Country/ Time period	Suicide sample	Control sample	Contact with mental health services before suicide			Contact with primary care/general practice before suicide			Comparison with controls
				<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Morrison & Laing 2011	Canada 2003-2006	N=854 suicides (ICD-10 X60-84) aged 25-64 years (out of total cohort of 940)	All living members of the total population in same age group			8 (community mental health service contact)				Suicides more likely to have had community mental health service contact.
NCISH 2014[4]	England 2002-2011	N=2384 suicides (coroner-defined suicide and open verdicts) registered with primary care, aged 16+ years	Living primary care patients, matched for age, sex and GP practice.		48 (psychotropic drug treatment) 8 (MH referral)	63 (MH diagnosis)		63		Suicides consulted their GP more often in the 12 months prior to suicide. Suicides consulted more frequently throughout the previous year. The increasing rate of consultation became more marked 2-3 months before suicide. A greater proportion of suicides had a MH diagnosis recorded at any time. Suicides more likely to be receiving psychotropic medication.
Owens et al 2004	England 1995-1998	N=474 suicides and probable suicides (open verdicts), aged 18+ years.	Live general population, matched for age, sex, and population group (urban, rural, and seaside town)	**AT DEATH** 23						Data not provided

[4] NICSH (2014) *Suicide in primary care in England: 2002-2011*. Manchester: University of Manchester. http://www.bbmh.manchester.ac.uk/cmhs/research/centreforsuicideprevention/nci/reports/SuicideinPrimaryCare2014.pdf

Author/ Date	Country/ Time period	Suicide sample	Control sample	Contact with mental health services before suicide			Contact with primary care/general practice before suicide			Comparison with controls
				<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Renaud et al 2006	Canada 1995-2000	N=53 suicides (coroner definition) aged 12-18 years in contact with child welfare services, social services, rehabilitation programmes and juvenile detention	Live persons in contact with child welfare services etc. (see adjoining), matched for age, sex and geographical area	13 (OP care for psychiatric illness)	28 (OP care for psychiatric illness) 17 (IP care for psychiatric illness)	28 (IP care for psych-iatric illness)				Suicide group had higher rates of psychiatric medical visits and lifetime hospitalisation for psychiatric illness.
Renaud et al 2009	Canada 2000-2003	N=55 suicides (coroner defined) aged 11-18 years	Live general population, matched for age, sex and geographical area	20 13 (psych-iatrist)	42 24 (psych-iatrist)		19	66		Contact with mental health services and psychiatrist was significantly higher in the suicide group. Hospitalisation rates were also higher in the suicide group.
Renaud et al 2014	Canada 2002-2005	N=67 suicides (coroner defined), aged under 26 years	Live general population, matched for age, sex and region		27 (received MH services)					Data not provided.
Reutfors et al 2010	Sweden 1991-2003	N=20,675 suicides (ICD-9 E950-959; ICD-10 X64-84) and undetermined deaths (ICD-9 E980-989; ICD-10 Y10-34), aged 18+ years	Live general population, matched by age, sex and county of residence	11 (IP for mental disorder)	25 (IP for mental disorder)					Suicides significantly more likely to have received IP care for mental disorder.
Rodi et al 2010	Slovenia 1993-2003	N=105 suicides (via examination of medical death certificates), aged 15-39 years; medical records available for n=77.	Live general population, matched by age and sex				39			Significantly greater proportion of suicide group visited a primary care physician.

B. Retrospective cohort studies

Author/ Date	Country/ Time period	Suicide sample	Contact with mental health services before suicide			Contact with primary care/ general practice before suicide			Sociodemographic variation
			<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Ahmedani et al 2014	USA 2000-2010	N=5,894 suicides (ICD-10 X60-84), members of Health Plan	24 (MH diagnosis)	45 (MH diagnosis)		29	90		Women and older adults were most likely to have contact.
Andersen et al 2000	Denmark 1991-1995	N=472 suicides (ICD-9 E950-959)	13 (disch. psychiatric hospital)			66			Women had more contact.
Chang et al 2009	Taiwan 2001-2004	N=12,477 suicides (ICD-9 E950-959)		25 (contact with psychiatrist)			72		Significantly more females contacted healthcare services prior to suicide.
Chang et al 2012	Taiwan 2001-2004	N=862 persons aged 12-24 years (ICD-9 E950-959)	18 (OP psych.) 4 (IP psych.)			21			Females made greater use of services.
Chen et al 2009	Taiwan 2000-2004	N=9,803 suicides (ICD-9 E950, E952, E953)		23 (contact with psychiatrist)					
Cho et al 2013	South Korea 2004	N=11,523 suicides (not defined)		25 (contacted med. care for psych. disorders)					N. med. care visits greater in women. N med. Care visits by <65 year age group greater than that of the other age groups.
Deisenhammer et al 2007	Austria 1996-2002	N=665 suicides (taken from 'suicide register'; not further defined)		16 (psych. IP)		47 (at death)			n/a

Author/ Date	Country/ Time period	Suicide sample	Contact with mental health services before suicide			Contact with primary care/ general practice before suicide			Sociodemographic variation
			<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Dougall et al 2014	Scotland 1981-2010	N=16411 suicides aged 15+ years (ICD-9 E950–959; ICD-10 X60-84, Y87.0)			33 (psych. disorder on discharge from psych. hospital) (0-30 year follow-up)				Greater proportion of women had previous IP episode. Women more likely to have had last discharge from psychiatric hospital. Greater proportion of women had recorded psych. disorder on discharge from general hospital.
Farand et al 2004	Canada 1992-1996	N=435 suicides (coroner defined) aged <19 years		9 (psych. visit) 6 (IP, psych. diagnosis)			73		
Gairin et al 2003	England 1994-1997	N=219 (122 suicides and 97 open verdicts, coroner defined)		42					
Giupponi et al 2014	Italy 1997-2007	N=396 suicides (not defined)	**AT DEATH** 52			45			Suicides known to MH professionals more frequently women and unemployed/unstably employed.
Harwood et al 2000	England 1995-1998	N=195 (160 suicides and 35 probable suicides [27 open verdicts and 8 accidents]), aged >59 years	**AT DEATH** 21 (under psych. care)	26		50			

Author/ Date	Country/ Time period	Suicide sample	Contact with mental health services before suicide			Contact with primary care/ general practice before suicide			Sociodemographic variation
			<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Hawton et al 1999	England 1990-1995	N=174 (123 suicides and 51 probable suicides), aged <25 years. Information relating to GP contact available for N=102	**AT DEATH** 22 (under psych. care)	30	44 (OP) 20 (IP) 19 (IP and OP)	34	78		
Hydén et al 1996	Sweden 1979-1990	N=1721 suicide (ICD-9 E950-959) and undetermined deaths (E980-989)			37 (IP psych. care) 13 (OP psych. care)			28	More women had experienced psychiatric care.
Isometsa et al 1995	Finland 1987-1988	N=1397 suicides (following "medicolegal examination")	7 (psych. IP) 12 (psych. OP)			16			
Lee et al 2008	Taiwan 1998-2004	N=19,426 suicides (ICD-9 E950-959), aged 15+ years	13	22					Females more likely to use MH services. Those aged 55+ years less likely to have been in contact with MH services.
Linsley et al 2007	England 1999-2001	N=205 (133 suicides [coroner defined], 72 probable suicides [43 open verdicts and 29 accidental deaths] [researcher defined])		30					

Author/ Date	Country/ Time period	Suicide sample	Contact with mental health services before suicide			Contact with primary care/ general practice before suicide			Sociodemographic variation
			<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
NCISH 2015[5]	UK 2003-2013	N=49,251 suicides (deaths by intentional self-harm [ICD-10 X60-84] and undetermined deaths [ICD-10 Y10-34]), aged 10+ years		28 (UK and England) 27 (N Ireland) 30 (Scotland) 23 (Wales)					
Pearson et al 2009	England 2003-2005	N=286 suicides (ICD-10 X60-84) and undetermined deaths (ICD-10 Y10-34) within 12 months of contact with mental health services; GP case notes available for n=247					91		
Stanistreet et al 2004	England 1995	N=97 suicides and undetermined deaths (coroner defined); GP case notes available for N=80.			27 (contact with specialist MH worker)	38			
Stark et al 2012	Scotland 2001-2004	N=177 (106 suicide [ICD-10 X60-84] and 71 undetermined deaths [ICD-10 Y10-34]), aged 15+ years; at least one set health service case notes available for N=175	19	38		46	85		No association between service contact and gender in final month. People in contact with services in final month were older.

[5] NICSH (2014) *Annual report: England, Northern Ireland, Scotland and Wales July 2015*. Manchester: University of Manchester. www.bbmh.manchester.ac.uk/cmhs/research/centreforsuicideprevention/nci/reports/NCISHReport2015bookmarked.pdf

Author/ Date	Country/ Time period	Suicide sample	Contact with mental health services before suicide			Contact with primary care/ general practice before suicide			Sociodemographic variation
			<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	<1 month *Cum. %*	<12 months *Cum. %*	During lifetime *Cum. %*	
Sveticic et al 2012	Australia 1994-2007	N=7126 suicides (not defined) (N=6655 non-indigenous suicides and N=471 indigenous suicides)			24 (indigenous population) 43 (non-indigenous) 42 (combined)				
Weis et al 2006	USA 2004	N=491 suicides (not defined)			**OVER ~8 YEAR PERIOD** 19				

C. Reviews

Author/ Date	Country/ Time period	Type of review/ N/type primary studies	Contact with mental health services before suicide			Contact with primary care/general practice before suicide			Estimates for controls
			<1 month Cum. %	<12 months Cum. %	During lifetime	<1 month Cum. %	<12 months Cum. %	During lifetime	
Booth & Owens 2000	UK Various dates	Non-systematic review. N=8 retrospective cohort studies	**AT DEATH** 27.5 (median; range 14-47)						n/a
Cavanagh et al 2003	Various countries. Various dates.	Systematic review. N=154 case control and retrospective cohort studies			Case control studies 46 (median; range 10-62; 95%CI 25-60) Cohort studies 29 (median; range 0-72; 95%CI 22-37)				**DURING LIFETIME** 21 (median; range 0-9; 95%CI 2-67) (Difference between suicides and controls ns)
Luoma et al 2002	Various countries. Various dates.	Systematic review. N=40 studies (psychological autopsies, record reviews)	19 (mean; range 7-28)	32 (mean; range 16-46)	53 (range 39-63)		77 (mean; range 57-90)	45 (mean; range 20-76)	n/a

A9 – Publication metadata (including revisions details)

Metadata indicator	Description
Publication title	The Scottish Suicide Information Database Report 2015
Description	This publication presents detailed information on prior healthcare service contacts for residents of Scotland whose deaths from 'probable suicide' (intentional self-harm and undetermined intent) were registered between January 2009 and December 2012.
Theme	Health and Social Care
Topic	Public Health
Format	PDF Document
Data source(s)	Linked data in ScotSID are from: death registrations (National Records of Scotland; NRS), psychiatric outpatient attendances (from SMR00), general hospital inpatient and day case records (SMR01), maternity records (SMR02), psychiatric hospital inpatient and day case records (SMR04), Scottish Drug Misuse Database (SMR25), Accident and Emergency (A&E) attendances, prescriptions dispensed in the community (Prescribing Information System; PIS), and suicide review records (Healthcare Improvement Scotland; HIS).
Date that data are acquired	Range of dates up to October 2015
Release date	15 December 2015
Frequency	Annual
Timeframe of data and timeliness	Data based on 2009-12 finalised death registrations (taking the same period as in the last report, for a more in depth look at contact with multiple services). The most recent (2012 calendar year) finalised registrations were released by NRS in August 2013. ISD then linked in a range of other datasets as they became available, with the latest being SMR25 data in March 2014. Data from SMR01 and SMR04 are based on the October 2015 update of the linked catalog.
Continuity of data	In 2011, NRS made a change to the way deaths are classified, to match changes in World Health Organization coding rules. The new coding rules resulted in some drug misuse deaths previously coded under 'mental and behavioural disorders' being classified as 'self-poisoning of undetermined intent' and therefore included as 'probable suicides'. To ensure consistency across the four years of data in the main report, only those undetermined intent deaths classified using the **old coding** criteria are included.
Revisions statement	The inclusion of additional datasets into ScotSID over time will help develop the database to capture a wider range of information on the health and social circumstances of

	individuals.
Revisions relevant to this publication	This report is based on similar criteria to the 2014 one: * year of death registration (the 2012 report was based on year of death). It makes little difference to the results, but aligns with NRS publications and permits more timely reporting. * the new NHS board boundaries which came into effect on 1 April 2014 (the 2012 report used the previous board configuration). Due to refinements to ScotSID over time, there are minor differences in some of the numbers presented in this report compared to the 2014 report.
Concepts and definitions	The definition of a probable suicide for ScotSID is based on the NRS classification of deaths due to intentional self-harm or undetermined intent based on old coding rules. (Further details under Continuity of data above.) Full details on changes to the coding of causes of death between 2010 and 2011 can be found on the NRS website. As deaths of people aged less than 5 are not likely to be suicides, these have been excluded from the ScotSID statistics in this publication.
Relevance and key uses of the statistics	The overall aim of ScotSID is to provide a central repository for information on all probable suicide deaths in Scotland, in order to support epidemiological research, policy-making and suicide prevention.
Accuracy	Quality checks are conducted by ISD. Figures are compared to previously published data and expected trends.
Completeness	Please see the Data held in ScotSID section of this report. In addition, completeness rates of the SMRs held by ISD and contained in ScotSID can be found on ISD's SMR completeness webpage.
Comparability	Some data contained in the report are comparable to those of other countries. Comments on this are made where relevant in the report.
Accessibility	It is the policy of ISD Scotland to make its web sites and products accessible according to published guidelines.
Coherence and clarity	All ScotSID tables and charts are accessible via ISD's Mental Health webpage.
Value type and unit of measurement	Numbers, percentages, proportion ratios, odds ratios, crude and European age-sex standardised rates per 100,000 population, and 95% confidence intervals.
Disclosure	ISD's Statistical Disclosure Control Protocol is followed. The likelihood and impact of disclosure were assessed as low and medium risk respectively, and the only disclosure control applied was aggregating the Island NHS boards in Figure 7 and Table 5.
Official Statistics designation	Official Statistics

UK Statistics Authority Assessment	Not submitted for assessment
Last published	29 July 2014, revised 28 October 2014
Next published	Summer 2016
Date of first publication	20 December 2011
Help email	nss.isdmentalhealth@nhs.net
Date form completed	23 November 2015

A10 – Early access details (including Pre-release access)

Pre-release access

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

Standard pre-release access:

Scottish Government Health Department

NHS Board Chief Executives

NHS Board Communication leads

Early access for quality assurance

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

Members of the ScotSID Steering Group (see Appendix 1).

A11 – ISD and Official Statistics

About ISD

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

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

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

Mission: Better Information, Better Decisions, Better Health

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

Official Statistics

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

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

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

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

These statistics are Official Statistics.