NHS National Services Scotland

Hospital onset COVID-19 mortality in Scotland

7 March 2020 to 30 June 2020

26 August 2020

This is a management information publication

Published management information is non-official statistics which may be in the process of being transitioned into official statistics. They may not comply with the UK Statistics Authority's Code of Practice with regard to high data quality or high public value but there is a public interest or a specific interest by a specialist user group in accessing these statistics as there are no associated official statistics available.

Users should therefore be aware of the aspects of data quality and caveats surrounding these data, all of which are listed in this document.

Find out more about management information publications at:
https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/06/National-Statisticians-Guidance-Management-Information-and-Official-Statistics.pdf

Contents

Introduction

National Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) Scotland, part of National Services Scotland, works closely with Public Health Scotland to deliver under the Health Protection Scotland (HPS) COVID-19 response. This release provides data for COVID-19 hospital onset mortality in Scotland for the period 7 March 2020 to 30 June 2020.

Nosocomial transmission of SARS-CoV-2 contributes significantly to the overall burden of infection within these settings. Deaths occurring in patients with COVID-19 are an important measure of patient outcome. Therefore, monitoring COVID-19 mortality in hospital patients and publishing the data is critical in the development and monitoring of local and national improvement plans to improve patient outcomes, inform the development of infection prevention and control measures, shape policy and guide research. Further information on the epidemiology of COVID-19 in healthcare settings can be found on the Health Protection Scotland website.

A report on COVID-19 hospital onset cases is published weekly and is available from: **https://beta.isdscotland.org/find-publications-and-data/population-health/covid-19/hospital-onset-covid-19-cases-in-scotland/**

This report describes 28-day all-cause mortality in cases of COVID-19 that were identified during an inpatient stay in an NHS hospital in Scotland, including those cases which are thought to have developed the infection as a result of nosocomial transmission.

Main points

- Different methodologies are employed to measure mortality in cases of COVID-19. This report uses 28-day all-cause mortality in laboratory confirmed cases of COVID-19 rather than deaths where suspected or confirmed COVID-19 is listed on the death certificate. This is aligned with the daily reporting of deaths by Public Health Scotland.
- Overall more than a quarter of patients who were diagnosed with COVID-19 during an inpatient stay died within 28 days of their first positive test for SARS-CoV-2. A third of patients who developed probable or definite hospital onset COVID-19 died within 28 days.
- The difference in all-cause mortality between the onset categories can largely be explained by differences in the demographics of cases. Cases with probable or definite hospital onset COVID-19 are older than cases diagnosed in the first two days of admission to hospital and are likely to be sicker (although co-morbidity data was not available at the time of writing).
- After adjustment, patients who develop probable or definite hospital onset COVID-19 (day 8 of admission onwards) are at no greater risk of dying than inpatients who likely acquired SARS-CoV-2 in the with community (day 1 or 2 of admission)
- Older hospitalised patients are likely to have longer lengths of stay in hospital, increasing their risk of healthcare associated infection including COVID-19. These patients are also more likely to die from other causes and these are not distinguished in all-cause mortality estimates.
- Preventing transmission of SARS-CoV-2 is critical to reducing morbidity and mortality from COVID-19, particularly in older hospital patients. Infection prevention and control precautions and early detection and management of cases is vital in efforts to reduce the spread of SARS-CoV-2 in hospital settings.

Results and commentary

COVID-19 deaths by hospital onset status

A total of 5,138 cases of COVID-19 were diagnosed during an inpatient stay in Scotland between the first case identified in hospitals on the 7 March and 30 June 2020. The total number of these patients who died within 28 days (all-cause) was 1,420 (27.6%).

Cases of COVID-19 were categorised based on date of first positive SARS-CoV-2 PCR test following admission to a health board. Patients where the first positive sample was taken on day 1 or 2 of admission were likely to have acquired SARS-CoV-2 in the community. For patients where the first positive sample was taken on days 3-7 (indeterminate hospital onset), it is not possible to determine where acquisition was likely to have taken place e.g. in the community or during their hospital stay. Patients where the first positive samples were taken on days 8-14 (probable hospital onset) and days 15+ (definite hospital onset) are the categories where there is a likelihood of nosocomial transmission within the health board.

A total of 428 patients with probable or definite hospital onset COVID-19 died within 28 days of their first positive sample (32.3%). Mortality was highest among patients with probable (35.3%) or definite hospital onset COVID-19 (31.6%) (Table 1).

Table 1: Number of COVID-19 deaths by onset status in Scotland overall: specimen dates up to 30 June 2020.[1,2,3]

Hospital onset status	Mortality within 28 days (n)	Mortality within 28 days (%)	Total Cases
Non-hospital onset (day 1 or 2 of admission)	919	26.1%	3,515
Indeterminate hospital onset (days 3-7)	73	24.3%	300
Probable hospital onset (days 8-14)	96	35.3%	272
Definite hospital onset (days 15+)	332	31.6%	1,051
Scotland	**1,420**	**27.6%**	**5,138**

1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) data, the Rapid Admission Preliminary Inpatient Data (RAPID) data or local admission data, and National Records of Scotland (NRS).
2. The data used has not been adjusted for potential factors that may affect mortality e.g. severity of COVID-19 disease and patient comorbidities.
3. Cases diagnosed in the community (not during an inpatient stay) were excluded from these analyses

A logistic regression model was developed to adjust for confounding between the onset categories (Appendix 3). The model included all cases of COVID-19 identified during the hospital stay and the comparator group was selected as those cases thought to have acquired the infection in the community (day 1 or 2 of admission). After adjustment for the confounding effects of age, sex and month of diagnosis, there was no significant difference between all-cause mortality in cases of indeterminate, probable and definite hospital onset COVID-19 compared with patients diagnosed with COVID-19 during the first 2 days of their admission to the health board (where the inpatient likely acquired the virus in the

community). Age, sex and month of diagnosis were all significantly associated with 28-day all-cause mortality. The model results are presented in **Appendix 3**.

The month of diagnosis was included as survival may have improved as knowledge of the course of the infection improved, or the severity of disease reduced over time. All-cause mortality decreased between March and June, after adjustment for case mix including the distribution of hospital onset cases. The reasons for this will be multifactorial and not intended to be explained by this model.

There are some limitations and caveats to these modelling analyses that must be considered in the interpretation. Age, sex and month are currently the only risk factors with comprehensive data available and further modelling to adjust for other risk factors such as underlying co-morbidity and ethnicity will be undertaken as the data become available. Cases who are in the probable and definite category have a longer length of stay prior to developing COVID-19. This is indicative of underlying medical conditions which will be a risk factor for mortality and some of these patients may have died irrespective of COVID-19. Similarly, it is not known if some of the patients in the non-hospital onset category were emergency admissions due to a severe COVID-19 infection which has implications for the comparison with the probable and definite hospital onset mortality.

The distribution of 28-day all-cause mortality by age and sex for each of the hospital onset categories is described in **Table 2**. The highest all-cause mortality was reported in male patients and in older age groups, where risk of death increased with increasing age. This is line with the outputs from the logistic regression model. These data are unadjusted for underlying co-morbidity and other risk factors and therefore should be interpreted with due caution. The median age of patients who died following a probable or definite hospital onset COVID-19 diagnosis (81 years) was significantly higher than those patients with likely community acquisition (day 1 or 2 of admission) (78 years, unadjusted $p<0.001$).

Information relating to the specialty or setting where these cases are being cared for is not currently available but will be included in future analyses as these data become available. This will be essential for developing local and national focused improvement plans.

The most recent hospital onset COVID-19 report has indicated that in week ending 26th July, there were no cases of probable or definite hospital onset COVID-19 in Scottish hospitals. It will be important to continue to reduce the risk of introduction to hospitals from the community and monitor cases of hospital onset COVID-19 as the NHS remobilises and in the event of a surge in cases over Autumn and Winter.

Table 2: COVID-19 deaths within 28 days, by onset status, age group and sex: specimen dates up to 21 June 2020. [1,2,3,4]

Age Group / Hospital onset status	Female mortality (n)	Female cases (n)	Female mortality (%)	Male mortality (n)	Male cases (n)	Male mortality (%)	Total mortality (n)	Total cases (n)	Total mortality (%)
0-24	**0**	**41**	**0.0%**	**0**	**35**	**0.0%**	**0**	**76**	**0.0%**
Non-Hospital Onset	0	34	0.0%	0	22	0.0%	0	56	**0.0%**
Indeterminate Hospital Onset	0	3	0.0%	0	4	0.0%	0	7	**0.0%**
Probable Hospital Onset	0	0	0.0%	0	2	0.0%	0	2	**0.0%**
Definite Hospital Onset	0	4	0.0%	0	7	0.0%	0	11	**0.0%**
25-44	**6**	**149**	**4.0%**	**6**	**149**	**4.0%**	**12**	**298**	**4.0%**
Non-Hospital Onset	3	131	2.3%	4	131	3.1%	7	262	2.7%
Indeterminate Hospital Onset	1	9	11.1%	1	8	12.5%	2	17	11.8%
Probable Hospital Onset	1	2	50.0%	0	1	0.0%	1	3	33.3%
Definite Hospital Onset	1	7	14.3%	1	9	11.1%	2	16	12.5%
45-64	**60**	**564**	**10.6%**	**98**	**736**	**13.3%**	**158**	**1,300**	**12.2%**
Non-Hospital Onset	42	474	8.9%	83	638	13.0%	125	1112	11.2%
Indeterminate Hospital Onset	3	27	11.1%	2	32	6.3%	5	59	8.5%
Probable Hospital Onset	6	18	33.3%	4	20	20.0%	10	38	26.3%
Definite Hospital Onset	9	45	20.0%	9	46	19.6%	18	91	19.8%
65-74	**100**	**394**	**25.4%**	**195**	**607**	**32.1%**	**295**	**1,001**	**29.5%**
Non-Hospital Onset	68	270	25.2%	148	432	34.3%	216	702	30.8%
Indeterminate Hospital Onset	5	18	27.8%	7	41	17.1%	12	59	20.3%
Probable Hospital Onset	7	26	26.9%	8	27	29.6%	15	53	28.3%
Definite Hospital Onset	20	80	25.0%	32	107	29.9%	52	187	27.8%
75-84	**200**	**658**	**30.4%**	**321**	**753**	**42.6%**	**521**	**1,411**	**36.9%**
Non-Hospital Onset	123	380	32.4%	204	477	42.8%	327	857	38.2%
Indeterminate Hospital Onset	9	35	25.7%	17	47	36.2%	26	82	31.7%
Probable Hospital Onset	15	53	28.3%	19	43	44.2%	34	96	35.4%
Definite Hospital Onset	53	190	27.9%	81	186	43.5%	134	376	35.6%
85+	**213**	**607**	**35.1%**	**220**	**442**	**49.8%**	**433**	**1,049**	**41.3%**
Non-Hospital Onset	117	284	41.2%	127	242	52.5%	244	526	46.4%
Indeterminate Hospital Onset	19	49	38.8%	9	27	33.3%	28	76	36.8%
Probable Hospital Onset	17	46	37.0%	19	34	55.9%	36	80	45.0%
Definite Hospital Onset	60	228	26.3%	65	139	46.8%	125	367	34.1%
Grand Total	**579**	**2,413**	**24.0%**	**840**	**2,722**	**30.9%**	**1,419**	**5,135**	**27.6%**

1. Three cases have been excluded from this analysis due to missing data
2. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) data, the Rapid Admission Preliminary Inpatient Data (RAPID) data or local admission data, and National Records of Scotland (NRS).
3. The data used has not been adjusted for potential factors that may affect mortality e.g. severity of COVID-19 disease and patient comorbidities.
4. Cases diagnosed in the community (not during an inpatient stay) were excluded from these analyses

Comparison with other mortality data in Scotland

Nearly a third of cases of hospital onset COVID-19 (probable and definite) died within 28 days of the first positive specimen (32.3%). Cases who are in the probable and definite category have, by the design of the case definition, a longer length of stay prior to developing COVID-19. This is indicative of underlying medical condition which will also be a risk factor for mortality and some of these patients may have died irrespective of COVID-19. It is not possible to quantify this with the data currently available and comparison with other published mortality data is difficult due to the different ways in which the deaths are defined and the populations in which they are reported.

All-cause mortality data is available for other infection types commonly associated with nosocomial infection. In 2017, nearly a fifth of cases of *Staphylococcus aureus* bacteraemia; 13.3% of *Clostridioides difficile* cases aged 15 years and older; and 14.2% of cases of *Escherichia coli* bacteraemia had died within 30 days of their diagnosis.[1] These mortality estimates are not directly comparable as the population of cases will include hospitalised and non-hospitalised cases and the duration of follow up differs.

The COVID-19 analyses are restricted to hospitalised patients and it would be anticipated that these patients are sicker and require hospital care. Crude mortality rates in Scotland, use in the calculation of hospital standardised mortality ratios, for January to March 2020 indicate that 4.0% and 9.9% of patients aged 60-79 years and 80+ years, respectively die within 30 days of an admission to hospital.[2] A UK study of mortality in nosocomial COVID-19 in older people reported that 27.0% of cases of nosocomial COVID-19 (diagnosed 15 or more days after admission) had died within seven days.[3] After adjustment, nosocomial mortality was reduced compared with community acquired COVID-19 in hospitalised patients. Any comparisons between differing mortality measures must be treated with caution.

The number of cases and deaths reported in other monitoring systems are designed to support early identification and management of COVID-19 in hospital settings. This includes systems that measure what is recorded on the death certificate. All-cause mortality includes deaths where COVID-19 may not have been either the underlying or contributory cause of death. In addition, deaths due to COVID-19 infection of long duration will be underestimated in 28-day all-cause mortality e.g. cases who have died more than 28 days after their first positive sample would not be included using 28-day all-cause mortality. All-cause mortality is not subject to the same biases as death certification that are introduced as a result of subjectivity or changes in the way deaths were registered during the early stages of the pandemic. In addition, death certification includes cases of presumed COVID-19 without a positive SARS-CoV-2 test and these are not included in 28-day all-cause mortality measure.

Implications for improved outcomes and infection prevention

As SARS-CoV-2 is a new and emerging pathogen, new international evidence around effective treatments, diagnostics, and prevention and control are being published at a rapid pace. Within Scotland and across the UK there are a number of organisations reviewing the evidence, contributing to the research and ensuring that key measures are reflected in the COVID-19 national response guidance.

As 28-day all-cause mortality is no different in patients admitted to hospital with likely community acquisition to those who develop probable or definite hospital onset COVID-19, preventing transmission of SARS-CoV-2 in all settings is critical to reducing morbidity and mortality from COVID-19.

A focus on the broader public health interventions along with the application of infection prevention and control precautions in line with current guidance will reduce the risk of transmission. In healthcare settings, early detection and appropriate management through testing of symptomatic patients and screening of high risk asymptomatic patients with early identification of any contacts, particularly when there is an unexpected case or outbreak, is vital in efforts to reduce the spread of SARS-CoV-2 in these settings.

References

1. Health Protection Scotland. Healthcare Associated Infection Annual Report 2018. https://www.hps.scot.nhs.uk/web-resources-container/healthcare-associated-infection-annual-report-2018/ (2019).
2. Public Health Scotland. Hospital Standardised Mortality Ratios 11 August 2020 - Data & intelligence from PHS. *Hospital Standardised Mortality Ratios* https://beta.isdscotland.org/find-publications-and-data/health-services/hospital-care/hospital-standardised-mortality-ratios/ (2020).
3. Carter, B. *et al.* Nosocomial COVID-19 infection: examining the risk of mortality. The COPE-Nosocomial study (COVID in Older PEople). *J. Hosp. Infect.* (2020) doi:10.1016/j.jhin.2020.07.013.

Contact

Laura Imrie
Clinical Lead, National Antimicrobial Resistance and Healthcare Associated Infections (ARHAI) Scotland
NHS National Services Scotland
Phone: 0141 300 1922
Email: NSS.HPSHAIIC@nhs.net

Further information

Further Information can be found on the HPS website.

For more information on types of infections included in this report, please see the COVID-19 pages on the HPS website.

The next release of this publication will be 26 November 2020 (subject to additional cases in the intervening period).

Rate this publication

Please provide feedback on this publication to help us improve our services.

Appendices

Appendix 1 – Publication metadata

Metadata indicator	Description
Publication title	Hospital onset COVID-19 mortality in Scotland
Description	This release provides information on hospital onset COVID-19 mortality, there is a need for consistent reporting using standardised case definitions.
Theme	Infections in Scotland
Topic	COVID-19
Format	Word document
Data source(s)	**COVID-19 Cases:** **Case data source:** Electronic Communication of Surveillance in Scotland (ECOSS) **Admissions data Source:** Rapid Admission Preliminary Inpatient Data (RAPID) or Local Patient Admissions Systems **Mortality data source:** National Records of Scotland (NRS)
Date that data are acquired	19 August 2020
Release date	26 August 2020
Frequency	Quarterly (subject to additional cases in the intervening period).
Timeframe of data and timeliness	Timeframe of this publication was decided by first positive sample in Scotland which fell into anyone of the hospital onset categories (i.e. 7 March 2020) The latest iteration of data is 30 June 2020, therefore the data are 6 or 7 weeks in arrears.
Continuity of data	Quarterly updates (subject to additional cases in the intervening period).
Revisions statement	These data are not subject to planned major revisions. However, National ARHAI Scotland aims to continually improve the interpretation of the data and therefore analysis methods are regularly reviewed and may be updated in the future.
Revisions relevant to this publication	Data are continually validated by NHS boards, NRS and within the ECOSS laboratory database. Any changes to cases taken within hospital settings, which are validated by NHS boards, are tracked by National ARHAI Scotland. Changes to retrospective data for the non-hospital onset, indeterminate hospital onset, probable hospital onset and definite hospital onset groups are outlined in the table below if applicable.
Concepts and definitions	The transmission of COVID-19 is thought to occur mainly through respiratory droplets and through contact with contaminated surfaces. Further information on the epidemiology of COVID-19 in healthcare settings can be found on the Health Protection Scotland website. As sustained community transmission has occurred as the pandemic has progressed, it has become more challenging to identify true cases of hospital transmission. A system for monitoring COVID-19 is critical to tracking nosocomial transmission in healthcare settings to inform infection, prevention and control measures.

Deaths occurring in patients with COVID-19 are an important measure of patient outcome. Therefore, monitoring COVID-19 mortality in hospital patients and publishing the data is critical to improve care of patients, inform the development of infection prevention and control measures, shape policy and guide research.

The data provided are national data for Scotland representing the 14 NHS boards and one NHS special health board.

The agreed nosocomial case definition for the UK is based on the number of days since admission to an NHS health board to the date of specimen sampling for a positive SARS-CoV-2 RT-PCR test. Time since admission to specimen sampling is categorised as:

- community onset (first positive specimen taken in the community), non-hospital onset (first positive specimen on day 1 or 2 of admission to NHS board);
- indeterminate (first positive specimen on days 3 to 7 of admission to NHS board);
- probable (first positive specimen on days 8 to 14 of admission to NHS board); and
- definite hospital onset (first positive specimen date was 15 or more days after admission to NHS board).

Note that for the purposes of this report, cases diagnosed in the community (not during an inpatient stay) were excluded from these analyses to restrict the comparisons within the hospitalised patient population.

These definitions are necessary due to the maximum incubation period of 14 days for COVID-19 (see table below):

Day of sampling post admission	Nosocomial categorisation
Before admission	Community onset COVID-19 (not included in this report)
Day 1 of admission/on **admission to NHS board**	Non-hospital onset COVID-19
Day 2 of admission	Non-hospital onset COVID-19
Day 3 of admission	Indeterminate hospital onset COVID-19
Day 4 of admission	Indeterminate hospital onset COVID-19
Day 5 of admission	Indeterminate hospital onset COVID-19
Day 6 of admission	Indeterminate hospital onset COVID-19
Day 7 of admission	Indeterminate hospital onset COVID-19
Day 8 of admission	Probable hospital onset COVID-19
Day 9 of admission	Probable hospital onset COVID-19
Day 10 of admission	Probable hospital onset COVID-19

Day 11 of admission	Probable hospital onset COVID-19
Day 12 of admission	Probable hospital onset COVID-19
Day 13 of admission	Probable hospital onset COVID-19
Day 14 of admission	Probable hospital onset COVID-19
Day 15 of admission and onwards to discharge	Definite hospital onset COVID-19
Post discharge	Community onset COVID-19 (not included in this report)

The hospital onset cases in this report represent cases presenting in hospital and do not include COVID-19 associated with hospital care that present on readmission to hospital or post-discharge.

Start point of duration

Admission to health board was agreed as the appropriate point to start counting the duration of hospital stay to first positive specimen date, rather than the date of admission to a single hospital, since patients can be transferred between hospitals which would lead to restarting the clock to 'day 1' each time and therefore underestimating the number of nosocomial infections.

Any discharges and re-admissions which occur within the same calendar day will be classed as a continuous stay; the clock will not be restarted in these instances, only when a readmission occurs on the second day or more after any discharge.

For definite, probable, indeterminate and non-hospital onset (day 1 or 2 of in-patient stay), the NHS board reported is where the first sample was taken, established either using Rapid Admission Preliminary Inpatient Data (RAPID) data and validated by the boards, or using individual NHS board's internal admissions systems. Since the definition of hospital-onset COVID-19 was determined using date of admission to NHS board, the board assigned may not represent the board of attribution of hospital-onset COVID-19 infection (Table above).

Minimum data required for hospital onset COVID-19 cases to be validated:

- CHI number
- Date of positive SARS-CoV-2 RT-PCR test
- Date of admission to health board when patient tested positive for COVID-19
- NHS board where first positive test undertaken

Mortality definition

In this report, all-cause mortality within 28 days of the COVID-19 diagnosis (laboratory specimen date) is used. Therefore, the data includes deaths where COVID-19 may not have been either the underlying or contributory cause of death. All-cause mortality depends solely on the number of deaths identified, and is not subject to bias that may be introduced as a result of inaccuracies in completion of the death certificate or coding of the cause of death. Using 28-days as the time period makes the assumption that most deaths related to COVID-19 will occur within this timeframe. Deaths occurring after this time period are more difficult to

	assess as being specifically related to COVID-19, though they are known to occur. Therefore, care should be taken when interpreting this data and when comparing published data on COVID-19 mortality that use different definitions.
Relevance and key uses of the statistics	Surveillance data are essential for monitoring trends and assisting in outbreak investigations and to understand the extent of ongoing transmission within the hospital setting. HPS offers support to NHS boards across Scotland to aid their local COVID-19 prevention strategies.
Accuracy	It is acknowledged that patients can be transferred between NHS health boards and if transferred into a different health board during the same hospital stay, then the clock would be restarted to 'day 1' which could lead to an underestimation of cases. However, the decision to restrict start date to admission to a single NHS health board represents the requirement to report at the health board-level. Any discharges and re-admissions which occur within the same calendar day will be overlooked - the clock will not be restarted in these instances, only when a readmission occurs on the second or more day after any discharge. COVID-19 cases identified after discharge from hospital but within 14 days may be associated with the hospital. These cases, including those identified on readmission to hospital, are not included as hospital onset. This may result in under-reporting of COVID-19 cases associated with hospital care. All-cause mortality depends solely on the number of deaths identified, and is not subject to bias that may be introduced as a result of inaccuracies in completion of the death certificate or coding of the cause of death.
Completeness	Surveillance data are collected using the ECOSS system that allows data collectors in NHS boards to validate ECOSS records as well as identifying additional cases that may not be included in the Electronic Communications of Surveillance in Scotland (ECOSS) system. This therefore means that completeness is near to 100%. For mortality data, sufficient time is allowed for all cases to be followed up for 28 days. Some delays in reporting of death may occur but this will be minimal and completeness is near to 100%.
Comparability	The agreed nosocomial case definition for the UK has been adopted to allow comparison across the four nations. However, geographical differences for example NHS board versus NHS Trust have to be considered. The case numbers presented here are only for those COVID-19 cases who are inpatients with an admission to an NHS hospital, i.e. community cases are excluded. The data are therefore not comparable with the weekly reporting of hospital onset cases: **https://beta.isdscotland.org/find-publications-and-data/population-health/covid-19/hospital-onset-covid-19-cases-in-scotland/** Comparison with other published COVID-19 mortality data is difficult due to the different ways in which the deaths are defined and the populations in which they are reported. Any comparisons between differing mortality measures must be treated with caution.
Accessibility	It is the policy of HPS to make its web sites and products accessible according to published guidelines.
Coherence and clarity	Tables and charts are accessible via the HPS website at: **https://www.hps.scot.nhs.uk/a-to-z-of-topics/covid-19/hospital-onset-covid-19-cases-in-scotland/**
Value type and unit of measurement	At national level, the number and proportion of COVID-19 cases who died within 28-days (all-cause) of a COVID-19 diagnosis are classed as definite hospital onset,

	probable hospital onset, indeterminate hospital onset, and non-hospital onset. The data are further broken down by age group and sex. For adjusting the data to account for confounding, month of diagnosis is also included in combination with age group, sex and hospital onset status.
Disclosure	The HPS protocol on Statistical Disclosure Control Protocol is followed.
Official Statistics designation	Management Information
UK Statistics Authority Assessment	Not assessed
Last published	NA
Next published	26 November 2020 (subject to additional cases in the intervening period)
Date of first publication	26 August 2020
Help email	NSS.HPSHAIIC@nhs.net
Date form completed	19 August 2020

Appendix 2 – Early access details

Pre-Release Access

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

Standard Pre-Release Access:

Scottish Government Health Department

NHS board Chief Executives

NHS board Communication leads

Appendix 3 – Model results for adjusted hospital onset COVID-19 mortality (all-cause at 28 days)

Univariable and multivariable logistic regression results on 28-day mortality outcome of COVID-19 cases

Variable		Alive within 28 days (%)	Mortality within 28 days (%)	OR (univariable)	OR (multivariable)
Sex	F	1834 (76.0)	579 (24.0)	-	-
	M	1882 (69.1)	840 (30.9)	1.41 (1.25-1.60, p<0.001)	1.57 (1.38-1.79, p<0.001)
Age group (years)	0-49	527 (94.3)	32 (5.7)	-	-
	50-59	629 (89.6)	73 (10.4)	1.91 (1.25-2.98, p=0.003)	1.87 (1.22-2.92, p=0.005)
	60-69	651 (79.7)	166 (20.3)	4.20 (2.87-6.34, p<0.001)	4.09 (2.79-6.18, p<0.001)
	70-79	844 (66.4)	427 (33.6)	8.33 (5.82-12.35, p<0.001)	8.56 (5.96-12.72, p<0.001)
	80+	1065 (59.6)	721 (40.4)	11.15 (7.84-16.43, p<0.001)	12.55 (8.77-18.58, p<0.001)
Hospital onset status	Non-hospital onset	2596 (73.9)	919 (26.1)	-	-
	Indeterminate hospital onset	227 (75.7)	73 (24.3)	0.91 (0.69-1.19, p=0.492)	0.78 (0.58-1.04, p=0.097)
	Probable hospital onset	176 (64.7)	96 (35.3)	1.54 (1.18-1.99, p=0.001)	1.19 (0.90-1.57, p=0.206)
	Definite hospital onset	717 (68.4)	331 (31.6)	1.30 (1.12-1.51, p=0.001)	0.90 (0.76-1.05, p=0.181)
Month of specimen	March	1031 (70.9)	424 (29.1)	-	-
	April	2182 (72.4)	833 (27.6)	0.93 (0.81-1.07, p=0.292)	0.83 (0.71-0.96, p=0.012)
	May	426 (74.2)	148 (25.8)	0.84 (0.68-1.05, p=0.130)	0.65 (0.51-0.82, p<0.001)
	June	77 (84.6)	14 (15.4)	0.44 (0.24-0.77, p=0.006)	0.32 (0.17-0.56, p<0.001)

OR = Odds ratio