NISRA
Northern Ireland Statistics and Research Agency
Gníomhaireacht Thuaisceart Éireann um Staitistící agus Taighde

Statistical bulletin

Excess mortality and Covid-19 related deaths in Northern Ireland: March 2020 to December 2021

Key Points

- There were 3,269 excess deaths from 1 March 2020 to 31 December 2021, 11.3% above expected levels (average deaths for the same period over the last five years). In the same period, there were 4,036 Covid-19 related deaths.
- The number of excess deaths for females (1,386) was markedly lower than that for males (1,884), with a smaller difference in the number of Covid-19 related deaths (2,149 males compared to 1,887 females).
- The vast majority of excess deaths (72.7%) and Covid-19 related deaths (73.5%) were those aged 75 and over.
- The number of deaths in hospitals was higher (4.5%) than expected levels, as a net effect of 2,871 Covid-19 related deaths occurring in hospitals, but 2,207 fewer non Covid-19 deaths in hospital. In contrast, there were more non-Covid-19 deaths occurring at home: combined with the 319 Covid-19 related deaths at home, this resulted in the majority of excess deaths (2,620 or 80.4%) occurring at home.
- Armagh City, Banbridge & Craigavon LGD had the largest number of excess deaths (435), accounting for 15.0% of the total number of excess deaths. However, Antrim & Newtownabbey LGD had the highest excess deaths as a proportion above expected levels (15.6%), while Belfast LGD had the lowest (6.4%).
- Excess deaths were higher in rural areas (15.3%) compared to urban areas (9.4% above historic levels). This was most notable in the second half of 2021, where the number of deaths was 23.3% above expected levels.
- In the first two waves of the pandemic (March 2020 to June 2021), the number of deaths where Covid-19 was found to be the underlying cause (2,592) exceeded excess mortality in this period (2,112). Noteworthy levels of excess deaths were found for diseases of the digestive system (114 or 10.5% above historical levels) and malignant neoplasm (143 or 2.4% above historical levels).

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Introduction

The Northern Ireland Statistics & Research Agency (NISRA) publishes official statistics on the number of deaths registered in Northern Ireland[1]. Due to the coronavirus (Covid-19) pandemic, the NISRA weekly deaths release has been supplemented with deaths relating to Covid-19, that is, where Covid-19 or suspected Covid-19 was mentioned anywhere on the death certificate, including in combination with other health conditions.

Additional analysis has been published, which provides a further breakdown of Covid-19 related mortality rates by age, sex and geographical areas[2].

This bulletin reports on excess mortality based on deaths occurring from the start of the pandemic (March 2020) to December 2021 in Northern Ireland, an approach that does not rely on the availability or quality of population estimates or cause of death information. It is for this reason that 'excess mortality' is often used as a standard indicator when comparing deaths between countries[3].

This report is an Official Statistics publication and statistics are produced to high professional standards set out in the Code of Practice for Official Statistics.

[1] Official death statistics for Northern Ireland
[2] Covid-19 related deaths in Northern Ireland, March 2020 to October 2021
[3] For example, see 'Understanding excess mortality' by the Health Foundation

The statistics are:

- produced to meet identified user needs;
- well explained and readily accessible;
- produced according to sound methods; and
- managed impartially and objectively in the public interest and are produced free from any political interference.

The content of this bulletin will be kept under review and more detail may be presented in future.

Covid-19 in Northern Ireland

The first confirmed case in Northern Ireland was reported on 28 February 2020[4]. Cases continued to rise in early March and the first Covid-19 related death occurred on 18 March 2020. Based on deaths registered up to 9 February 2022, there have been 4,036 Covid-19 related deaths in Northern Ireland up to 31 December 2021.

The term 'Covid-19 related deaths' used in this bulletin reflects where Covid-19 or 'suspected' or 'probable' Covid-19 was mentioned anywhere on the death certificate, including in combination with other health conditions. An earlier report showed that Covid-19 was the underlying cause of death for 86.9% of such deaths (3,007 of 3,462 Covid-19 related deaths registered in Northern Ireland up to 30 September 2021).

Excess mortality methodology

Excess mortality is considered to be a good measure of the impact of the Covid-19 pandemic, as it does not rely on the availability or interpretation of the (primary and secondary) causes of death. It captures deaths from all causes, which may be related to a range of factors associated with the pandemic, for example, changes in the availability or uptake of health care services including screening and diagnosing, or the impact of 'lock-down' on health. Some of these effects may take months or years to be fully understood.

Excess mortality can be expressed as a number or as a proportion of the expected number of deaths, which in this analysis is defined as the average number of deaths for the same period over the previous five years. The absolute number of excess deaths allows for any potential under- or over-counting of Covid-19 deaths and is therefore useful when comparing the effect of the pandemic in different populations. Excess deaths are distinctly different from Excess Winter Mortality, which is a measure of seasonality (see below for further detail).

[4] Public Health Agency Covid-19 surveillance reports

Excess Deaths

Excess mortality is the difference between actual deaths from all causes in a period minus the expected number of deaths or 'normal deaths'. It is therefore a mathematical concept; it is not possible to identify if an individual death was an excess death. For example, to determine the number of excess deaths which occurred in Belfast, we look at the number of deaths which occurred in Belfast for the period of interest (March 2020 to December 2021) and subtract from this the 5 year average number of deaths. This means that excess deaths may in some cases be a negative number. In contrast, the analysis of Covid-19 related deaths to which this report makes comparisons, is based on individual deaths where Covid-19 was included on the death certificate. These cannot be automatically classed as 'excess deaths'. Therefore the two analyses should not be combined or differenced as this will not yield valid conclusions. Note that in this report, excess deaths are rounded to the nearest whole number. Unrounded figures are presented in the accompanying spreadsheet.

Excess Winter Mortality

Excess Winter Mortality (EWM)[5] is the difference between the actual number of winter deaths in the four month period December to March and the expected number of deaths. The latter is the average of the number of deaths in the two four-month periods which precede winter (August to November) and follow winter (April to July). As such, it is a measure of seasonality. The latest Excess Winter Mortality figures for Northern Ireland relate to the winter of 2020/2021.

Deaths in 2020 were compared to the average number of deaths in the previous five years, 2015 to 2019. A similar approach for 2021 meant that the 2020 pandemic year is included in the five-year average (2016-2020). This is currently used for weekly death statistics, however, other countries have chosen alternative time periods (see Table 1). Although the resulting annual average differences are relatively small, they could be amplified in some months, certain geographical areas and age cohorts when deriving excess mortality due to the inclusion of 2020, which in turn might dampen the resultant excess mortality figures in Northern Ireland.

Table 1: Expected deaths for 2021 using different methods

Time period used for average deaths	Expected deaths	Compared to 2016-20 average	Used by
2016-2020	15,661	-	NISRA weekly deaths
2015-2019	15,271	-390	Office for National Statistics, National Records of Scotland
2016-2019	15,306	-355	Eurostat

A period with excess mortality can be followed by another period where the number of deaths are below expected levels. A period of high mortality rate might reduce the size of the most susceptible population, say the very elderly or those with underlying health problems, leading to fewer deaths compared to previous years in the following period.

[5] Excess winter mortality in Northern Ireland

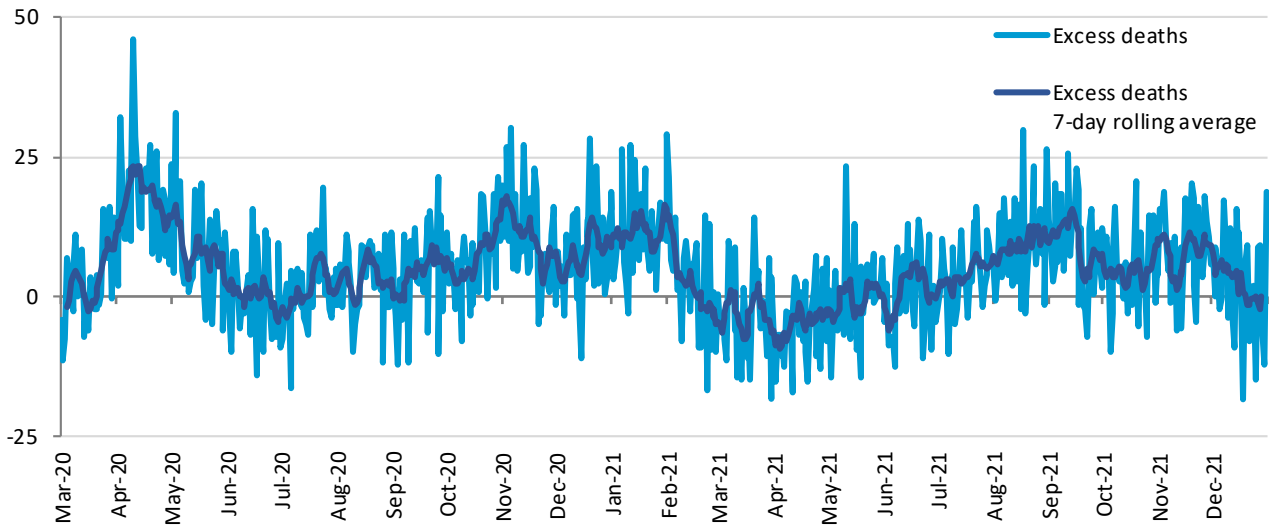
The analysis in this report is based on deaths that occurred (based on date of death) from 1 March 2020 to 31 December 2021, comparing the number of deaths to the average of equivalent months in the previous five years. To allow for delays in the death registration process, the report takes account of registrations up to 9 February 2022 and also builds this period into the five-year average for a more valid comparison. Further information on the methodology is presented in Annex A.

Excess deaths – March 2020 to December 2021

Excess deaths have been reported on a registration date basis in the weekly death reports, and can be derived from monthly death registrations. From March 2020 to December 2021 inclusive, 32,220 deaths were registered, which was 3,420 more (+11.9%) than the average over the previous five years of 28,800 deaths in corresponding months.

By considering deaths which occurred in this 22-month period (March 2020 to September 21), including those registered up to the 9 February 2022, 31,604 deaths occurred during this time. This figure is slightly lower than the number of registrations (32,220) in the same period due to a level of registration delay. After accounting for this registration lag period (see Annex A), excess deaths are estimated to be 3,269 deaths or 11.3% higher than in previous years. The daily excess deaths occurring are quite variable in Northern Ireland (see Figure 1).

Figure 1: Daily excess deaths and 7-day rolling average, 1 March 2020 to 31 December 2021



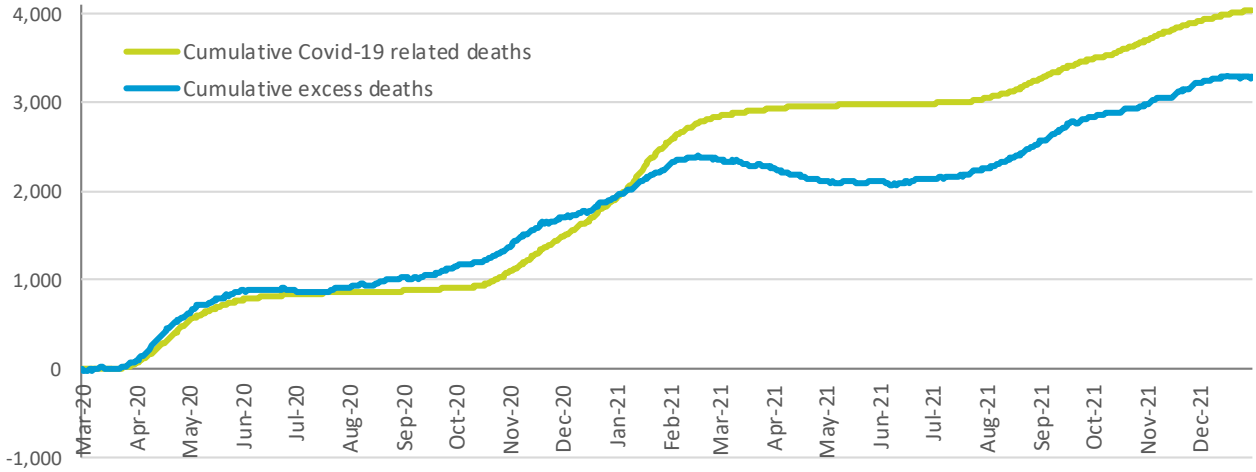
In the first three weeks of March 2020, the number of deaths occurring was broadly similar to previous years. From then on, daily excess deaths remained above zero until the middle of May. During June and July, the number of deaths were at broadly similar levels to the average over the previous five years. For the remainder of the 2020, whilst daily excess deaths remained below the peaks of April, there continued to be more deaths than expected based on the previous five years. This persisted until mid-February 2021.

From March to May 2021, excess mortality was negative: deaths were lower than expected based on average deaths from 2016 to 2020. This can only in part be explained by the effect of including 2020 in the average death calculation. Negative excess deaths are more likely due to high levels of excess deaths in the previous four months.

Excess deaths rose again from mid-June 2021 onwards with excess deaths in August-September 2021 (570) at a similar level to November-December 2020 (571). In the last three months of 2021, the number of deaths remained above expected levels, up until the last two weeks of December when deaths fell to more normal levels.

An alternative presentation of excess deaths is as cumulative totals. Starting from 1 March 2020, excess deaths of subsequent days are added. Figure 2 shows the cumulative excess deaths occurring from 1 March 2020 to 31 December 2021, based on registrations up to 9 February 2022. It also presents the cumulative number of Covid-19 related deaths in this period.

Figure 2: Cumulative number of excess deaths and Covid-19 related deaths, March 2020 to December 2021



Both series follow a broadly similar pattern: there are three periods with rapid increases of Covid-19 related deaths (April to June 2020, November 2020 to February 2021, and August to December 2021) that also see increases in cumulative excess deaths. There are two periods with relatively few Covid-19 related deaths, where cumulative excess deaths are flat (July to October 2020) and even declining (March to July 2021)[6]. On 4 January 2021, cumulative covid-19 related deaths became larger than cumulative excess deaths, and remained so for the rest of 2021.

Over the period March 2020 to December 2021, there were 3,269 excess deaths, compared to 4,036 deaths that included a mention of Covid-19 on the death certificate. The difference between those two figures was 767 deaths or roughly a fifth (19.0%) of Covid-19 related deaths. Note that this gap will be smaller when considering deaths where Covid-19 is the underlying cause of death. A recent report[7] found that Covid-19 was the underlying cause of death for 3,007 deaths out of the 3,462 Covid-19 related deaths (86.9%) registered in Northern Ireland up to 30 September 2021. If this proportion was applied to the 4,036 Covid-19 related deaths, it would still outnumber excess deaths. Further analysis can be found in the section excess deaths by cause of death.

[6] The Office for National Statistics found a similar decline in England and Wales from March to Jun 2021, see Figure 3 of 'Excess mortality and mortality displacement in England and Wales: 2020 to mid-2021'.

[7] Covid-19 deaths and pre-existing conditions

Excess deaths by age and sex

Excess deaths can be calculated for sub-populations, for example, based on socio-demographic characteristics and geography. Figure 3 shows both excess deaths and Covid-19 related deaths by age group.

Figure 3: Excess deaths and Covid-19 related deaths, by age group, March 2020 to December 2021

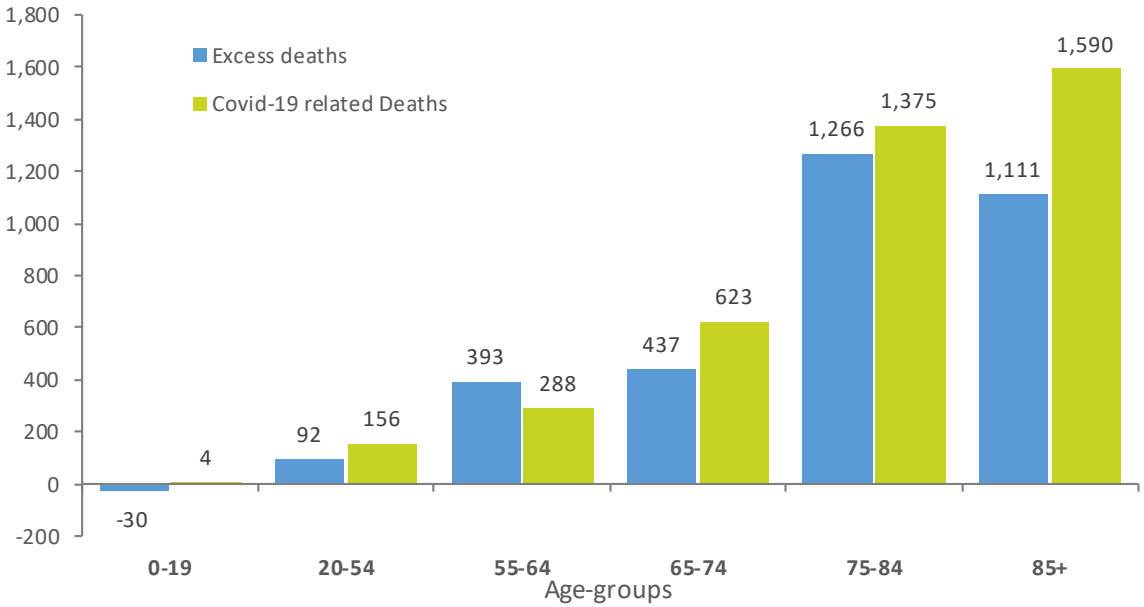


Figure 3 shows that both excess deaths and Covid-19 related deaths increase by age. Around three-quarters of excess deaths (72.7%; 2,378 out of 3,269) and Covid-19 related deaths (73.5%; 2,965 out of 4,036) are accounted for by those aged 75 and over. Only for the age group 55-64 years were excess deaths (393) higher than Covid-19 related deaths (288).

There were 30 negative excess deaths for those aged under 20 years, indicating that the number of deaths in this group in the 22 months from March 2020 to December 2021 was 9.9% lower than the five-year average of previous years. However, the expected number of deaths in this age group was low and were predominately infant deaths and deaths due to external causes of mortality[8], both of which could have longer registration delays as many are referred to the coroner. Deaths of those aged 20 to 54 could also be affected by this delay, as nearly a third[9] of deaths in this age group are known to be due to external causes of mortality (for example, traffic accidents, suicide, and drug related deaths).

The number of excess deaths for females (1,386) was markedly lower than that for males (1,884), with a smaller difference in the number of Covid-19 related deaths (2,149 males compared to 1,887 females – see Figure 5). Male deaths in the 22-month period were 13.3% above expected levels, compared to 9.4% for females.

[8] See Table 6.4 of the Registrar General Annual Report 2019

[9] Table 6.4 of the Registrar General Annual Report 2019 shows that 29.9% (388 out of 1,296) of deaths aged 20 to 54 died of external causes.

Figure 5: Excess deaths and Covid-19 related deaths, by sex, March 2020 to December 2021

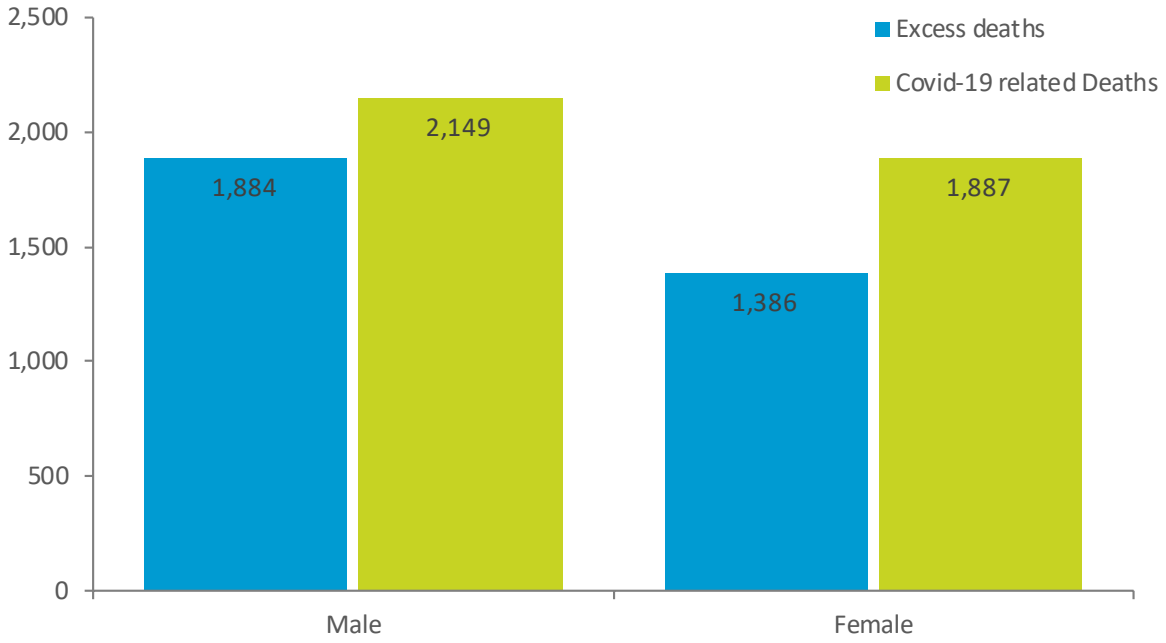
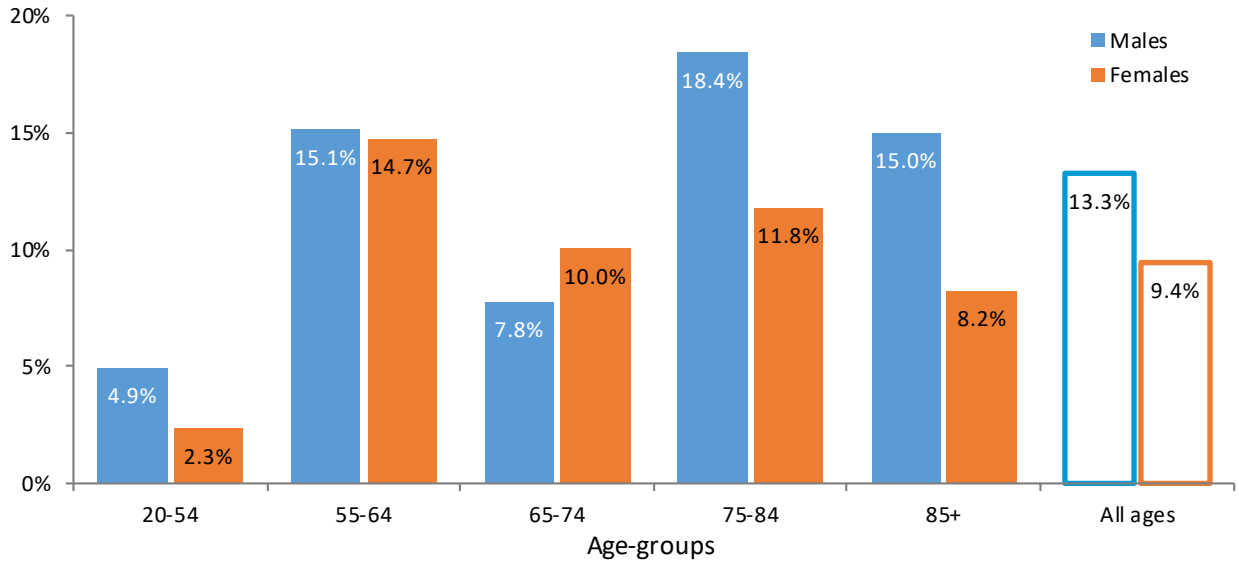


Figure 6 below shows excess deaths by sex and age group as a proportion of the average number of deaths in the previous five years.

Figure 6: Excess deaths as proportion of average deaths in the previous five years, by sex and age group, March 2020 to December 2021

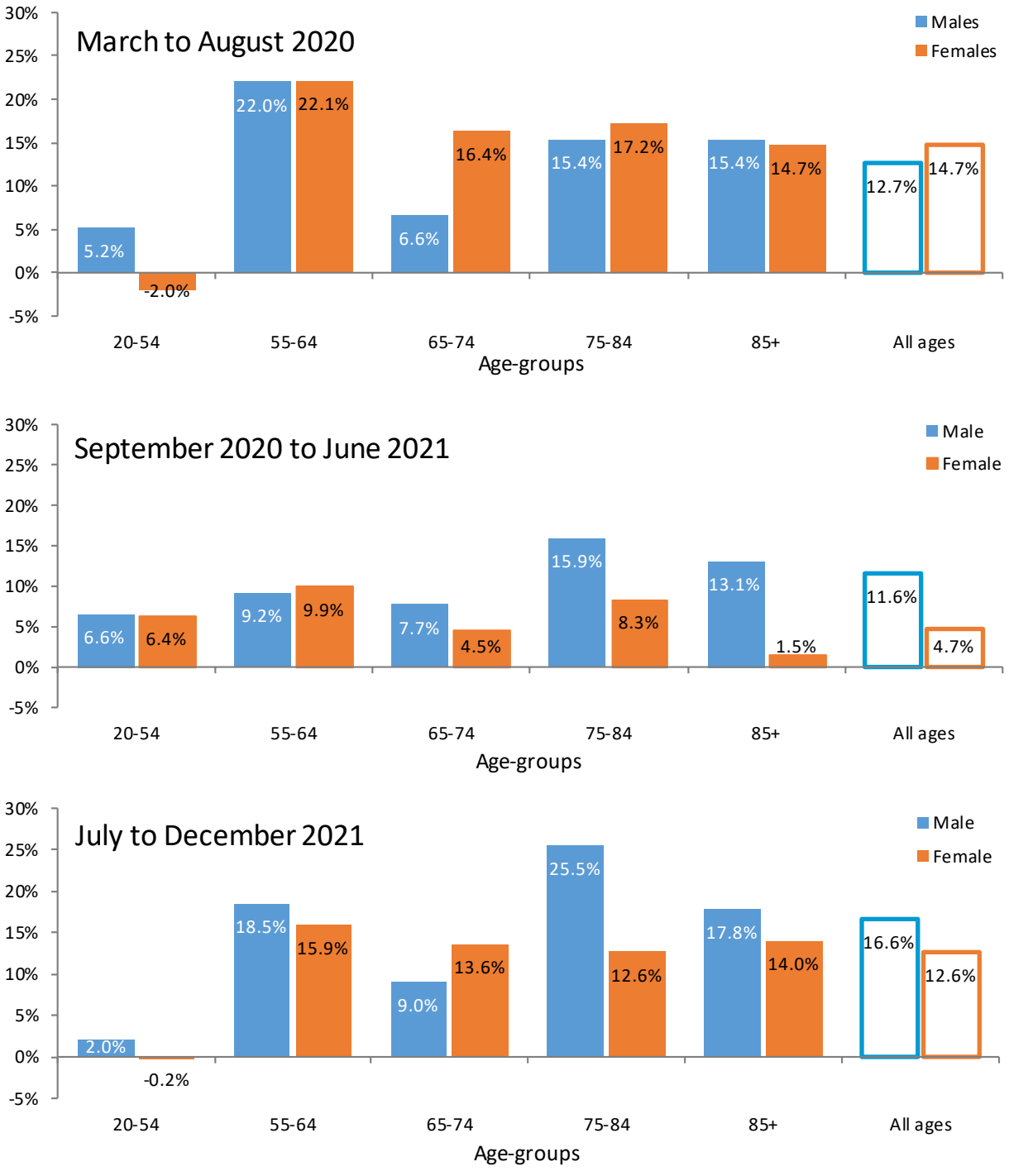


Over all ages, excess deaths were 11.3% above expected levels during the 22 month period. Excess deaths as a proportion of the five-year average are higher for males in all age groups with the exception of those aged 65 to 74 years (7.8% vs. 10.0%). For females, excess deaths as a proportion of expected deaths (14.7%) were highest for those aged 55 to 64 (older working age).

Figure 7 shows equivalent figures for three time periods:

- March to August 2020, a six-month period covering the initial rise and fall of Covid-19 related deaths;
- September 2020 to June 2021, a ten-month period covering the second rise and fall of Covid-19 related deaths; and
- July to December 2021, when Covid-19 related deaths rose again and continued to do so throughout this period.

Figure 7: Excess deaths as proportion of expected deaths, by sex and age group, March to August 2020, September 2020 to June 2021, and July to December 2021



In each period and for both males and females, excess deaths as a proportion of five-year average deaths were higher for the older working age (55-64) compared to the young pensionable age (65-74). Older working age males (55-64 years) had the highest proportion over all age groups from March to August 2020 (22.0%); older working age females had the highest proportion in all three time periods (22.1%, 9.9% and 15.9% respectively).

Excess deaths by place of death

Two-thirds (69.7%) of the 4,036 Covid-19 related deaths from March 2020 to December 2021 occurred in hospital, compared to 21.6% in care homes and 7.9% at home. A small fraction (0.8% occurred in other settings, such as hospices, non-medical communal establishments and non-domestic settings.

To reiterate, excess deaths is the difference between actual deaths from all causes in a period minus the expected number of deaths. Figure 8 shows (a) the average number of deaths from March 2020 to December 2021 in the previous five years, broken down by place of death, and (b) deaths from March 2020 to December 2021, broken down by place of death and split into Covid-19 related deaths and non Covid-19 deaths. Note that for the calculation of excess deaths in 2021, expected deaths use 2020 data as part of the five-year average, and thus include a small number of Covid-19 related deaths.

Figure 8: Deaths from March 2020 to December 2021 by place of death, compared to average of previous five years

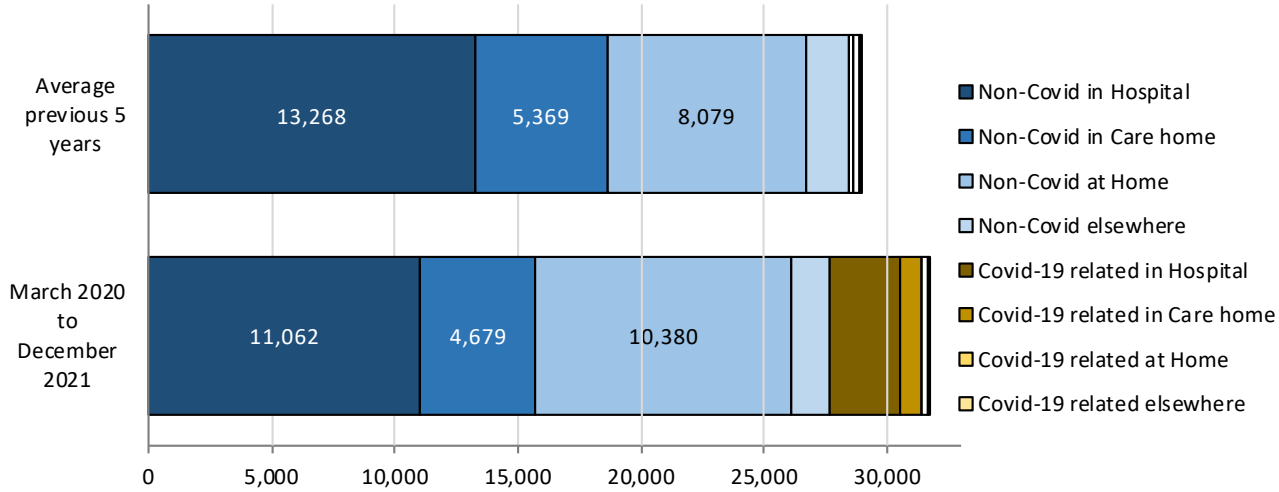
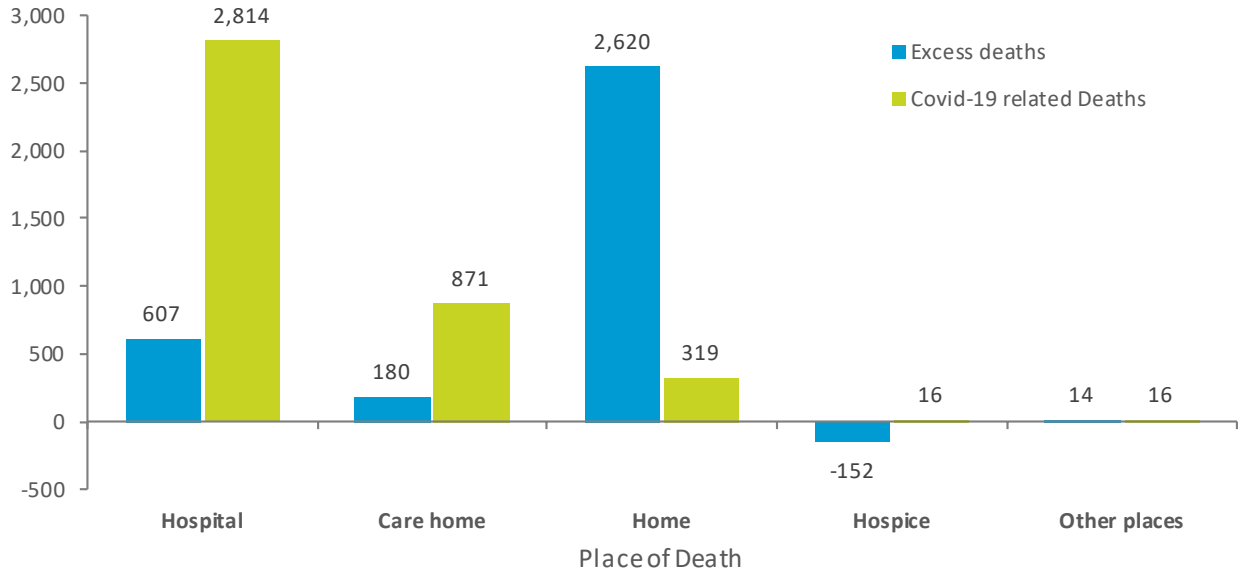


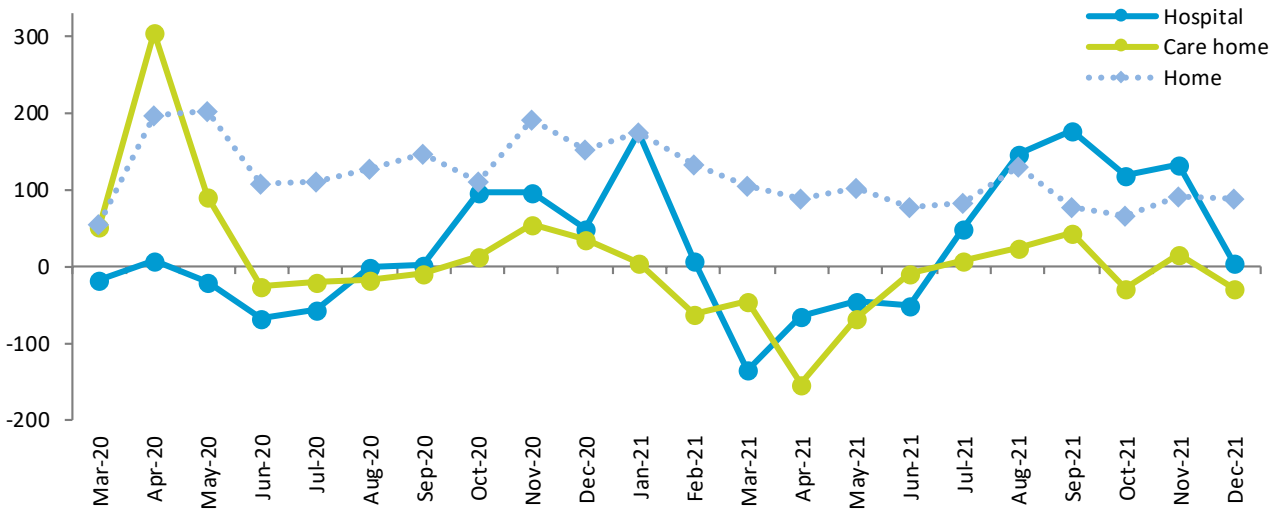
Figure 8 shows that excess deaths from March 2020 to December 2021 (3,269) were smaller than the number of the Covid-19 related deaths in this period (4,036). It also shows that for deaths that were not Covid-19 related, a shift occurred in the number of deaths that occurred in hospitals and to a lesser extent care homes, towards home addresses. Combining these effects leads to excess deaths at home being greater than the Covid-19 related deaths at home. Excess deaths and Covid-19 related deaths for these places of death are shown in Figure 9.

Figure 9: Excess deaths and Covid-19 related deaths, by place of death, March 2020 to December 2021



Excess deaths in hospitals (607) are much lower than the Covid-19 related deaths (2,814). Care homes had also smaller levels of excess deaths (180) compared to Covid-19 related deaths (871). In contrast, the number of excess deaths at home (2,620) was nearly nine times the number of Covid-19 related deaths at home (319) and accounts for 80.4% of the total excess deaths over the period. There were fewer deaths in hospices from March 2020 to December 2021 compared to the previous five years (152 deaths or 16.0% below historic levels). Figure 10 shows excess deaths for each month March 2020 to December 2021 in hospitals, care homes, and at home.

Figure 10: Excess deaths, by month and place of death, March 2020 to December 2021



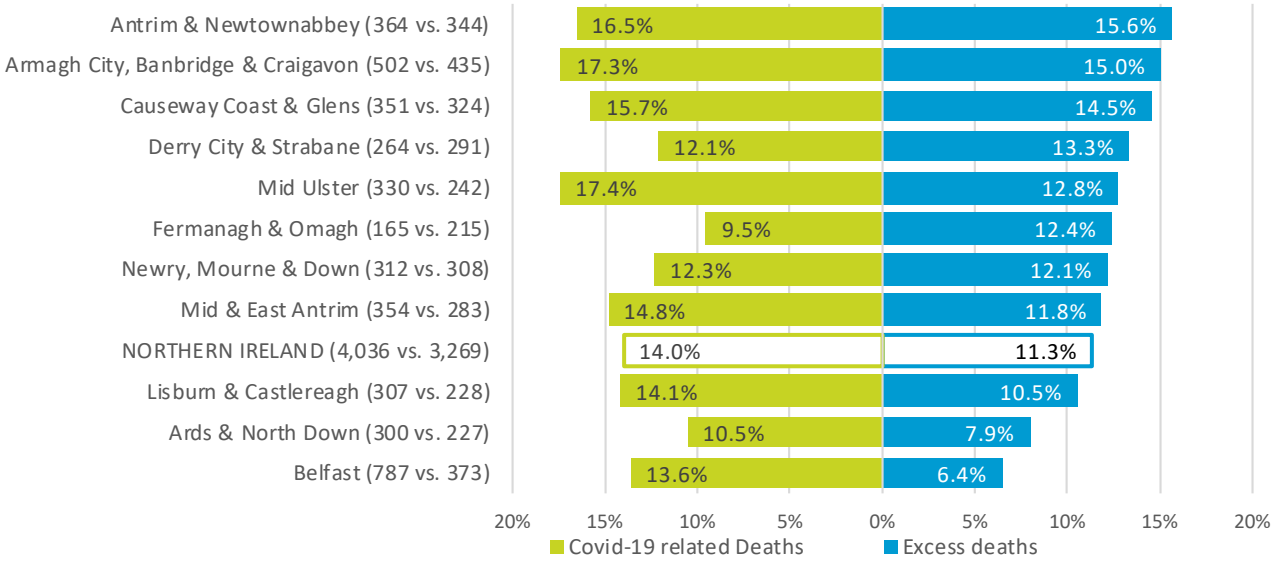
Excess deaths in hospitals were around zero or negative from March to September 2020, as well as from February to June 2021: there were fewer deaths in hospital compared to the average number of deaths in hospital in the previous five years. From October 2020 to January 2021, and again from July to November 2021, excess deaths in hospital were positive. Excess deaths at home have remained at substantial positive levels from April 2020 onwards, given that in the previous five years, on average around 350 people died at home each month.

Excess deaths in care homes peaked in April with 305 deaths, indicating that the number of deaths in this month was 126.6% higher than the average number of deaths in the April of the previous five years (241). From June 2021 onwards, monthly deaths were around expected levels in care homes. The trough in April 2021 can in part be explained by the peak of April 2020, which together with April deaths in 2016 to 2019 was used to calculate expected deaths.

Excess deaths by Local Government District

NISRA publishes weekly numbers of deaths by Local Government District (LGD) based on the date of registration, providing counts for all deaths and Covid-19 related deaths. Deaths are attributed to Districts based on the usual address of residence [10]. In this report, for each District, excess deaths are calculated on an occurrence basis, and compared to the number of Covid-19 related deaths. Figure 11 presents both figures as a proportion of the average number of deaths in the previous five years.

Figure 11: Covid-19 related deaths and excess deaths as proportion of average deaths, by Local Government District, March 2020 to December 2021

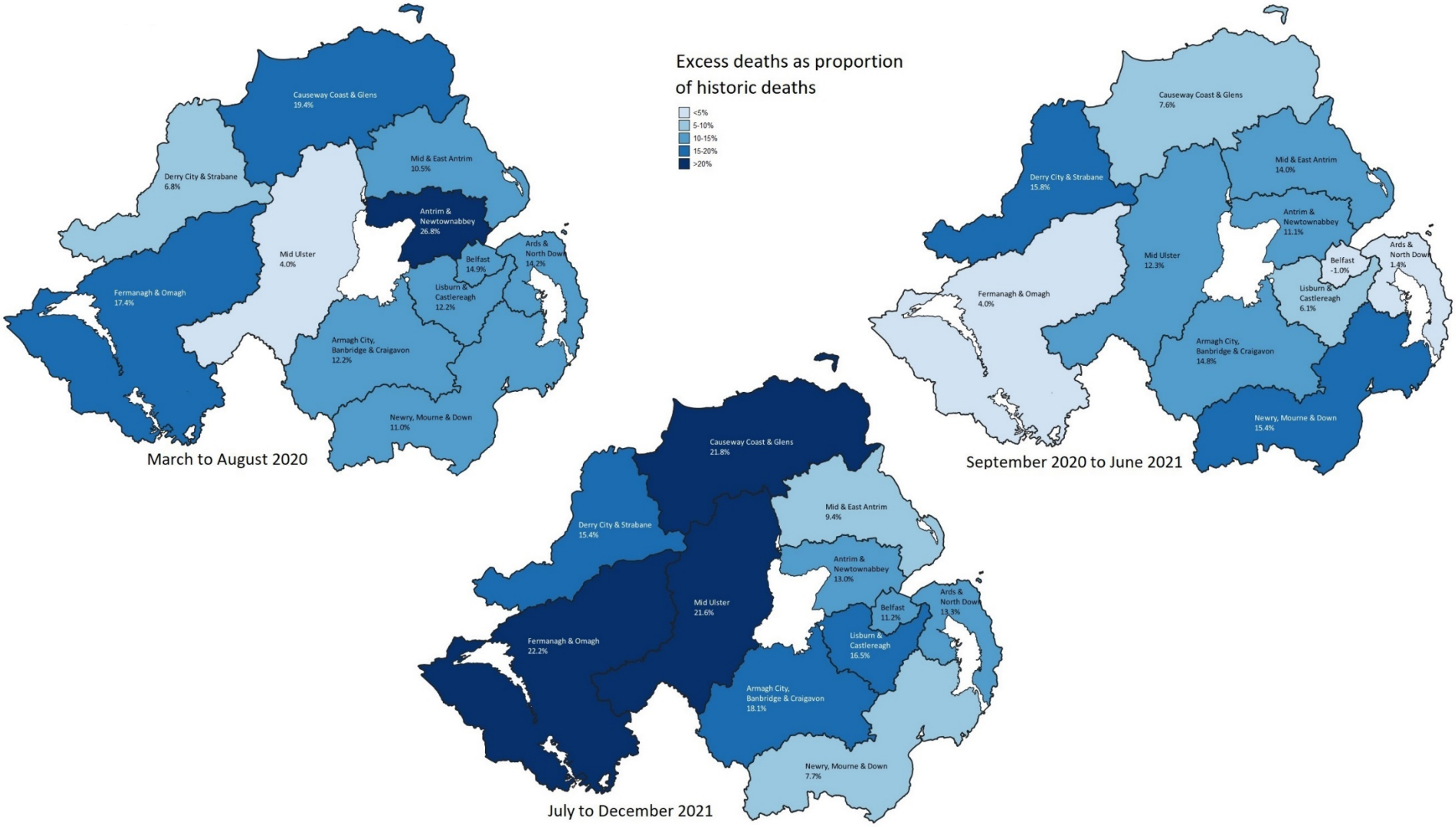


Armagh City, Banbridge & Craigavon LGD has the largest number of excess deaths (435), accounting for 15.0% of excess deaths in Northern Ireland (3,269). However, Antrim & Newtownabbey LGD had the highest excess deaths as a proportion of average deaths in the previous five years (15.6%). Belfast LGD had the smallest excess deaths as a proportion of historic deaths (6.4%). Only in Derry City & Strabane LGD and Fermanagh & Omagh LGD did excess deaths exceed the number of Covid-19 related deaths. By contrast, Belfast LGD saw excess deaths being less than half of the number of Covid-19 related deaths.

Figure 12 shows a map of excess deaths relative to average deaths in the previous five years by Local Government Districts. Further information is available in the accompanying Excel file.

[10] For a small number of deaths where the address is missing or outside Northern Ireland, the place of death is used to allocate to a geographical area.

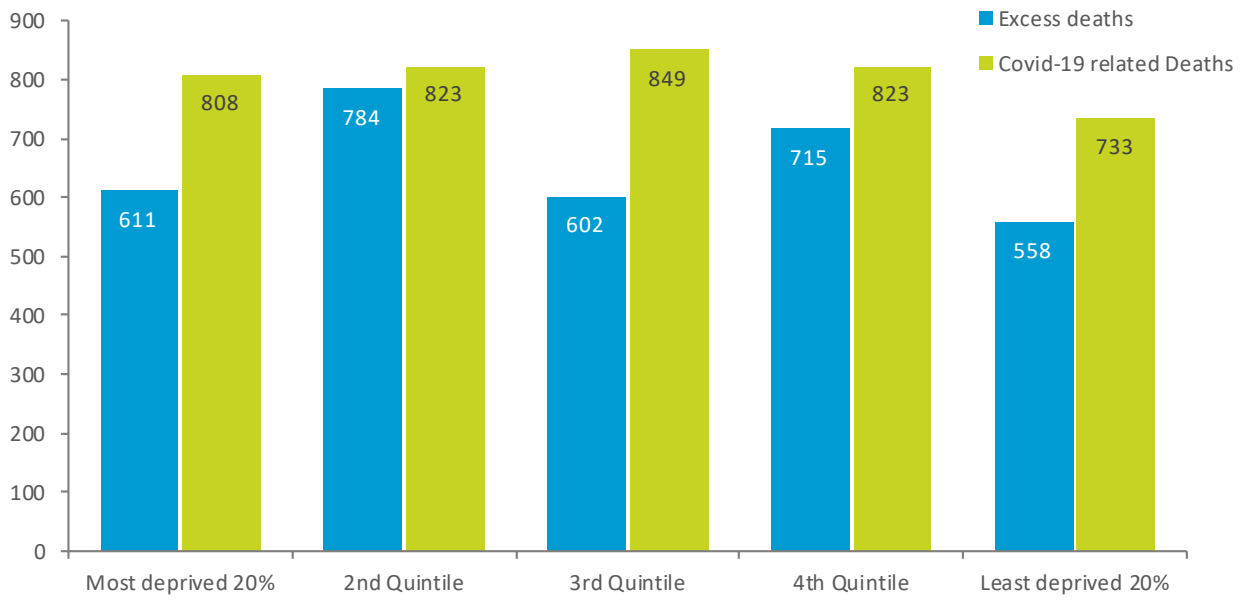
Figure 12: Excess deaths as proportion of average deaths in the previous five years, by Local Government District and wave



Excess deaths – Deprivation

Excess deaths can also be calculated for grouped small areas with similar characteristics such as Super Output Areas (SOAs) based on their deprivation ranking. Figure 13 shows the excess deaths during the period March 2020 to December 2021 as a proportion of the average number of deaths in the previous five years, for SOAs grouped into deprivation quintiles according to the Northern Ireland Multiple Deprivation Measure 2017.

Figure 13: Excess deaths and Covid-19 related deaths, by deprivation quintiles, March 2020 to December 2021



Excess deaths are highest in the second and fourth deprivation quintiles, with the other quintiles at similar levels. The number of Covid-19 related deaths in each quintile were comparable, suggesting that deprivation had no clear effect over the whole period March 2020 to December 2021. In contrast, age-standardised mortality rates (ASMRs) from a separate report[11] showed a clear gradient: the most deprived area had the highest ASMR for both Covid-19 related deaths and non Covid-19 deaths. This is likely due to higher mortality rate in these areas to start with – least deprived areas have shown a greater increase relative to the five year average.

Northern Ireland Multiple Deprivation Measures

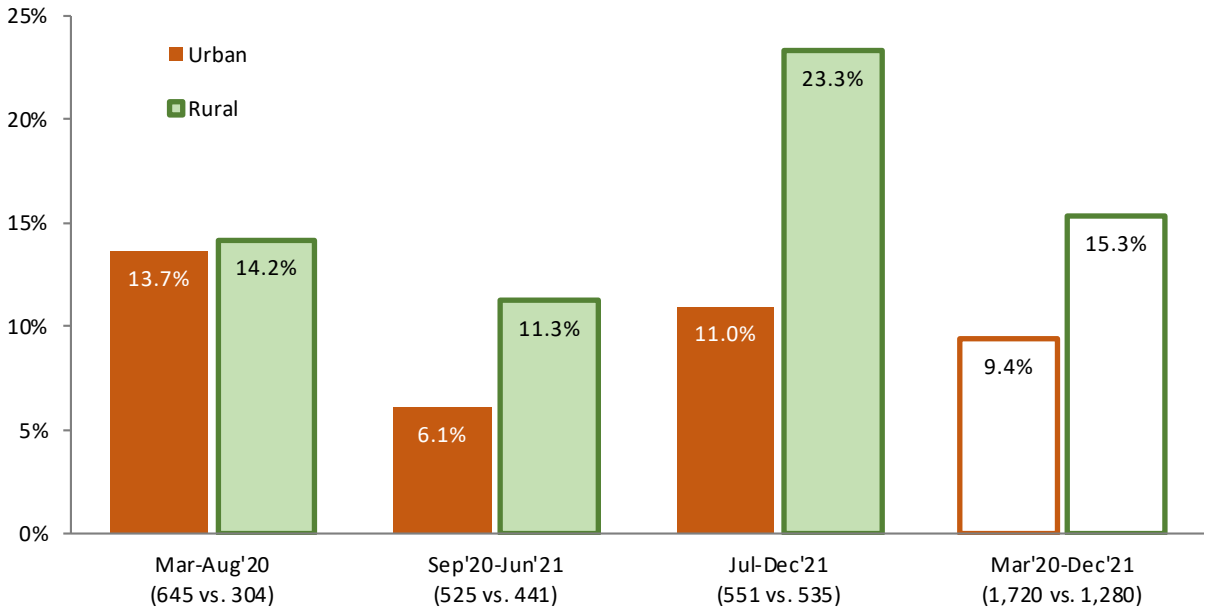
The Multiple Deprivation Measure (NIMDM 2017) is a measure of area disadvantage, combining seven separate domains of deprivation. It was used to assign deaths to one of five groups (or quintiles), ranging from most deprived to least deprived, based on their usual address of residence. If the usual address of the deceased was not provided or the deceased was resident outside of Northern Ireland, the place of death address was used.

[11] Covid-19 related deaths in Northern Ireland, March 2020 to October 2021

Excess deaths by rurality

Super Output Areas can also be grouped into urban, rural and mixed urban/rural areas[12]. Figure 14 compares excess mortality as a proportion of average deaths between urban and rural SOAs.

Figure 14: Excess deaths as a proportion of average deaths, for urban and rural SOAs, for March to August 2020, September 2020 to June 2021, and July to December 2021



Excess deaths as a proportion of the five-year average number of deaths were similar in urban (13.7%) and rural (14.2%) areas in the first wave of the pandemic. In the second and third waves, the proportions in rural SOAs were around double those in urban SOAs. Excess deaths in rural SOAs (1,280 or 15.3% above expected levels) exceeded the number of Covid-19 related deaths (1,180) over the whole 22-month period. In contrast, the number of Covid-19 related deaths in urban areas (2,569) was greater than their excess deaths (1,720). This suggests that rural areas are more affected by the indirect effects of the pandemic. Note that in the pre-pandemic years, standardized all-cause mortality rates in rural areas was lower than those in urban areas[13]. Further investigations will be required to understand the differences between urban and rural areas.

Excess deaths by cause of death

All deaths will be coded in accordance with the International Statistical Classification of Diseases, Injuries and Causes of Death, (ICD) (Tenth Revision). Classification of the underlying cause of death is done by reference to the death certificate and additional information from the certifying doctor. Excess deaths can be calculated for specific causes of deaths. This will help understand the reasons for the difference between excess deaths and Covid-19 related deaths, when broken down by age groups or geographical areas.

[12] Review of the Statistical Classification and Delineation of Settlements
[13] See the Health inequalities annual report 2021, published by the NI Department of Health

At the time of writing (February 2022), the coding of deaths *registered* up to 31 December 2021 has been completed. This analysis looks at the first two waves, covering a 16-month period (March 2020 to June 2021). Of the 22,886 deaths that occurred in this period, 39 (0.2%) were registered after 31 December 2021 and hence the underlying cause of death is currently not available. These may be coroner's cases where it takes a longer period to establish the circumstances surrounding the death.

Table 2 below shows excess deaths by cause of death for March 2020 to June 2021, which represents peak mortality during the first wave with 2,112 excess deaths, 10.1% above average deaths during the same period over the previous five years.

Table 2: Excess deaths as a proportion of average deaths in the previous five years, by cause of death, March 2020 to June 2021 (16 months)

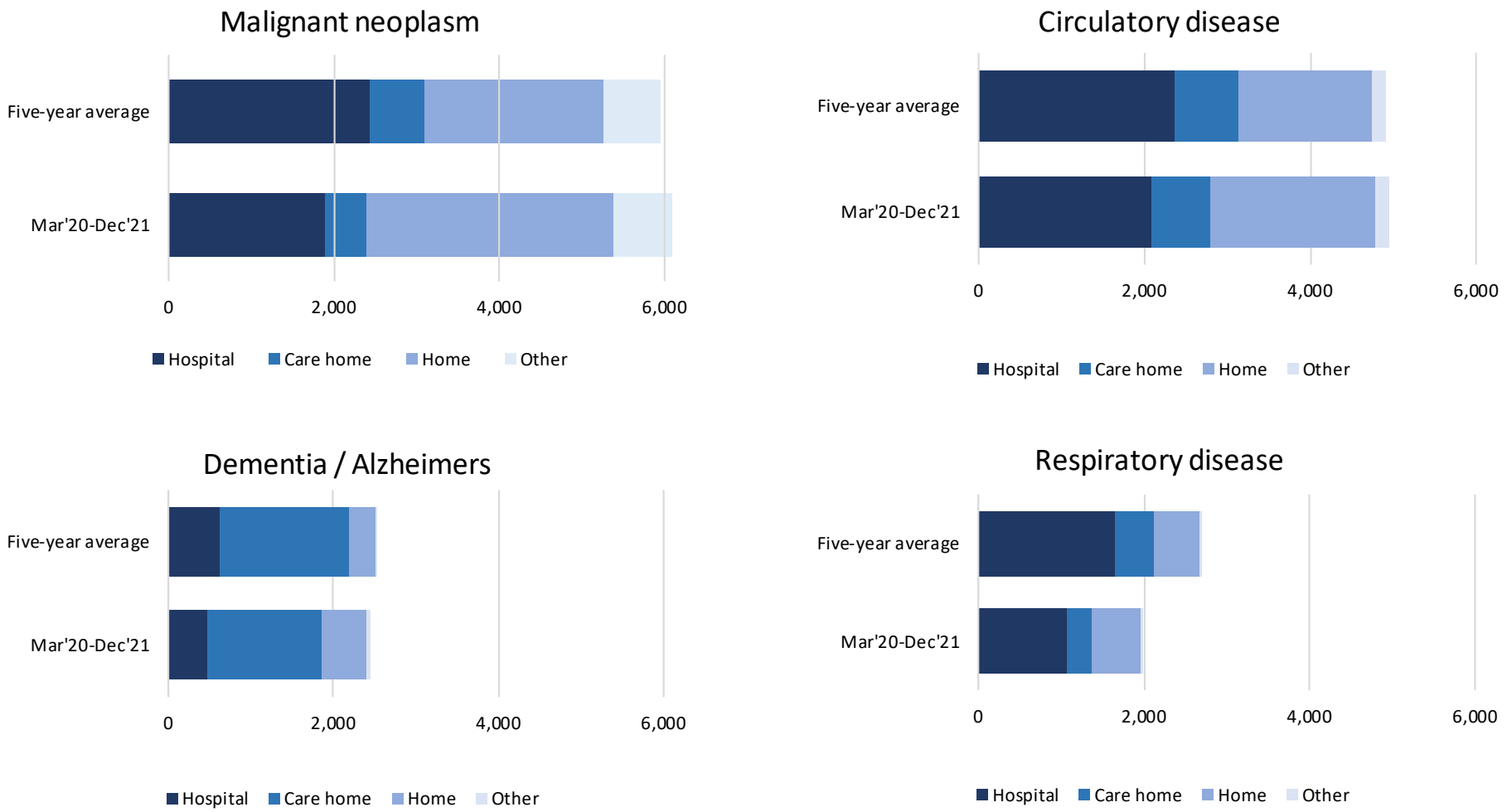
Underlying cause of death	Excess deaths	Excess as proportion of five-year average deaths
Covid-19	2,440[14]	-
Malignant neoplasm	143	2.4%
Dementia and Alzheimer's disease	-91	-3.6%
Diseases of circulatory system	44	0.9%
Diseases of respiratory system	-708	-14.8%
Diseases of digestive system	114	10.5%
External causes	10	0.7%
Other causes	121	5.5%
Uncoded cause of death	39	-
Total	**2,112**	**10.1%**

The number of deaths where Covid-19 was found to be the underlying cause (2,592) exceeds excess mortality in this period (2,112). Noteworthy excess deaths were found for diseases of the digestive system (114 or 10.5% above historical levels) and malignant neoplasm (143 or 2.4% above historical levels). There were 708 fewer deaths from diseases of the respiratory system from March 2020 to June 2021 compared to the same period in the previous five years (negative excess deaths).

Figure 15 shows the number of deaths from March 2020 to June 2021, and in equivalent periods of the previous five years, for four causes of death and broken down by place of death. In each of these cases, number of deaths in hospitals and care homes are lower during the pandemic (negative excess deaths), and are higher for deaths at home. For example, where historically hospitals were the most common place for death due to malignant neoplasms (41.0% compared to 36.2% at home), in the period March 2020 to June 2021, 49.3% of deaths due to malignant neoplasms occurred at home and 31.2% occurred in hospital.

[14] There were 761 Covid-19 deaths in March to June 2020, which became part of the five-year average to calculate excess deaths in 2021. As such, a fifth of these deaths (152) were included in the expected Covid-19 deaths and thus excess Covid-19 deaths was calculated as all Covid-19 deaths minus expected Covid-19 deaths (2,592 – 152 = 2,440).

Figure 15: Deaths from March 2020 to June 2021, by place of death and selected causes of death, compared to five-year average



Strengths and limitations

Death statistics form a high quality data source, given the legal requirement of timely registration of all deaths that occurred in Northern Ireland, which is administered by a District Registrar, electronically recorded and managed by the General Register Office and quality assured by statisticians in NISRA[15].

The excess deaths calculation does not require population estimates; the underlying assumption is that the population is stable in both size and age distribution. Neither does it require information on the cause of death. An earlier paper[16] that reported age-standardized mortality rates of all causes and Covid-19 related deaths used detailed population estimates in its analysis. It is recommended that these papers are read together to gain greater understanding of the impact of the Covid-19 pandemic in Northern Ireland.

The Northern Ireland population was not the same as in the previous five years, with annual increases of around 0.5% and an aging population[17]. The excess deaths methodology captures this effect by looking at annual increases in the number of deaths, which reflects both the age and size of the population. The average annual increase in the number of deaths from March to December was 180 deaths between 2011 and 2019. Compared to the 3,269 excess deaths in the 22 months from March 2020 to December 2021, the underlying trend in deaths due to population change would have had a relatively small impact.

There was also a variation in the number of deaths between years due to, for example, seasonal weather. In the years 2015 to 2019, for which the five year average of 12,762 deaths was used as a baseline, the number of deaths ranged from 12,398 to 13,081 (see accompanying tables). Again, the 1,931 excess deaths in 2020 was much greater than the magnitude of such annual variation.

There are still a number of unknowns in the analysis of excess mortality during the pandemic. Firstly, the pandemic has not finished, with further Covid-19 related deaths at the start of 2022, continued pressure on the health service, unknown health outcomes for those who have recovered from Covid-19, and the possibility of new variants. Secondly, there will have been a number of deaths that occurred in 2021, but which have not yet been registered. In the previous five years, deaths registered up to 9 February of the following year, were around 500 lower than eventually registered. Finally, there are nearly 400 deaths that have both occurred and were registered during the pandemic up to December 2021, where coding of cause of death has not been completed.

Background Notes

The information used to produce statistics on deaths occurring in Northern Ireland is based on registrations recorded on the Northern Ireland General Register Office's Registration System (NIROS). Daily extracts of registration records from NIROS are processed by the NISRA Vital Statistics Unit.

[15] See Quality and Methodology Information (QMI) for Northern Ireland death statistics
[16] Covid-19 related deaths in Northern Ireland, March 2020 to October 2021
[17] NISRA produces official population statistics for Northern Ireland

Deaths involving Covid-19 are defined as those where Covid-19 was mentioned on the death certificate, either as the underlying cause of death or as a contributory cause. Cause of death is coded according to the International Statistical Classification of Diseases and Related Health Conditions 10th Revision (ICD-10). The relevant codes included in this publication are U07.1 and U07.2.

Super Output Areas (SOA)

Northern Ireland is split into 890 spatial areas known as Super Output Areas (SOAs), with an average population of around 2,100 people. The number of SOAs in each of the 11 Local Government Districts (LGDs) varies, ranging from 49 in Fermanagh & Omagh LGD to 174 in Belfast LGD.

Multiple Deprivation Measure (NIMDM, 2017)

The Northern Ireland Multiple Deprivation Measure 2017 (NIMDM 2017) is a measure of multiple deprivation at the Super Output Area (SOA) level. It is comprised of seven distinct domains of deprivation which can be recognised and measured separately. The overall MDM is conceptualised as a weighted area level aggregation of these specific domains of deprivation.

Urban-Rural Classification

The Review of the Statistical Classification and Delineation of Settlements (March 2015) defined the boundaries of towns and villages. It also provided a default definition for urban areas (settlements with a population of 5,000 and over) and rural areas (smaller settlements and open countryside, as well as banded drive-times. Further detail can be found from the NISRA website.

Administrative Data Research Northern Ireland (ADR NI)

Administrative Data Research Northern Ireland (ADR NI) is a partnership between the Administrative Data Research Centre Northern Ireland (ADRC NI, comprising Queen's University Belfast and Ulster University), and the Northern Ireland Statistics and Research Agency (NISRA). Together they support the acquisition, linking and analysis of administrative data sets, developing cutting-edge research to improve knowledge, policymaking and public service delivery.

Links to Relevant Publications

A range of data and analysis on Covid-19 in Northern Ireland and its effect on the economy and society can be accessed from the NISRA website.

Other relevant publications include:

- Weekly death registrations in Northern Ireland
- Covid-19 related deaths and pre-existing conditions in Northern Ireland: March 2020 to November 2021
- Covid-19 related deaths in Northern Ireland: March 2020 to October 2021
- Covid-19 related health inequalities in Northern Ireland (Department of Health)
- Coronavirus (Covid-19) cases and risk in the UK
- Covid-19 Health Surveillance Monitor (Ireland)
- Deaths registered weekly in England & Wales

- Analysis of death registrations not involving coronavirus (COVID-19), England and Wales: 28 December 2019 to 10 July 2020
- Deaths involving coronavirus (Covid-19) in Scotland
- Weekly Data on Deaths Registered in Scotland
- COVID-19 Deaths and Cases Statistics (Central Statistics Office, Ireland)
- Vital statistics (Central Statistics Office, Ireland)

List of Tables

Data accompanying this bulletin are available from the NISRA website in Excel format. The spreadsheet includes the following tables.

Table number	Table title
Table 1	Deaths by month for 2015-2021, and calculation of excess deaths in 2020 and 2021
Table 2	Excess deaths and Covid-19 related deaths, March 2020 to December 2021
Table 3	Excess deaths and Covid-19 related deaths, by sex and 5-year ageband
Table 4	Excess deaths and Covid-19 related deaths, by sex and age group
Table 5	Excess deaths and Covid-19 related deaths, by place of death
Table 6	Excess deaths and Covid-19 related deaths, by month and place of death
Table 7	Excess deaths and Covid-19 related deaths, by Local Government District
Table 8	Excess deaths and Covid-19 related deaths, by Assembly Area
Table 9	Excess deaths and Covid-19 related deaths, by deprivation quintile
Table 10	Excess deaths and Covid-19 related deaths for rural, urban and mixed urban/rural areas, March 2020 to December 2021
Table 11	Excess deaths and Covid-19 related deaths, by drive time to Belfast
Table 12	Excess deaths and Covid-19 related deaths, by Travel To Work Area
Table 13	Excess deaths and Covid-19 related deaths, by District Electoral Area
Table 14	Excess deaths and Covid-19 related deaths, by underlying cause of death
Table 15	Excess deaths and Covid-19 related deaths by place of death and cause of death

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Northern Ireland Statistics and Research Agency
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Annex A – Excess deaths methodology

'Excess deaths' is the difference between the observed number of deaths and the expected number of deaths. The first key question for determining excess deaths is to define the expected number of deaths. There are broadly three different methods:

1. Number of deaths based on population estimates and projected mortality rates. For example, the 2018-based population projections for Northern Ireland projected 16,184 deaths between mid-2019 and mid-2020, and 16,374 between mid-2020 and mid-2021. To date, 16,671 and 16,930 deaths have been registered that occurred in these two periods. The recently published 2020-based population projections for Northern Ireland projected 16,791 between mid-2020 and mid-2021.
2. Advanced modelling methods can be used to account for seasonality in deaths and corrects for delays in the collection and processing of death data. A well-known example is the EuroMOMO project, which provides weekly excess deaths for a number of European countries, including Northern Ireland. Modelling is also used by the US National Centre for Health Statistics, and Our World in Data.
3. The number of deaths during a similar period in previous years. NISRA's weekly deaths statistics report uses the average number of deaths in the previous 5 years. This approach does not require population estimates, although it implicitly assumes that the population has been relatively stable and no other events in that period, such as extreme weather or major disease outbreaks, had a measured impact on the number of deaths.

WHO definition of Excess Death/Mortality:

"Mortality above what would be expected based on the non-crisis mortality rate in the population of interest. Excess mortality is thus mortality that is attributable to the crisis conditions. It can be expressed as a rate (the difference between observed and non-crisis mortality rates), or as a total number of excess deaths."

(ODI/HPN paper 52, 2005, Checchi and Roberts)

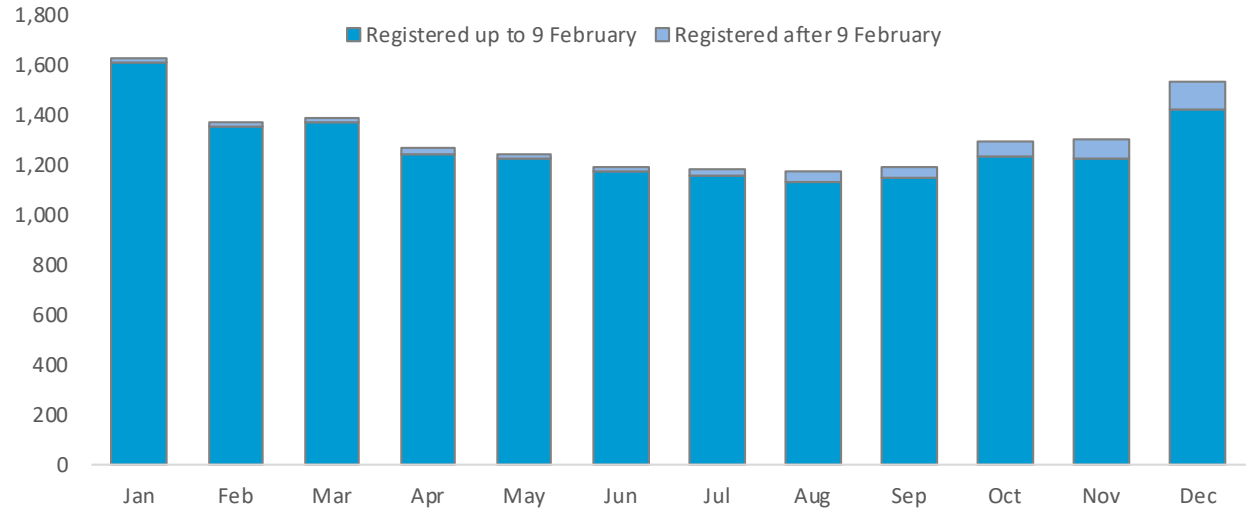
Most NISRA publications on deaths are based on the date of registration. All statistics remain provisional until the publication of the Registrar General Annual report. The advantage of this is that death statistics can be finalised and are not affected by late registrations. Weekly death statistics are also reported on a registration basis. The majority of deaths are registered within five days, but it could be considerably longer if a case is referred to the coroner.

During the Covid-19 pandemic, a number of changes have been made to the usual process of certifying and registering a death which have been enabled by the Coronavirus Act 2020, which came into effect on 25 March 2020. This could lead to fewer cases being referred to coroners, and informants registering deaths by phone rather than in person. There is some evidence that these changes are leading to a shorter lag between the date of death and the date of registration.

The analysis in this report is based on deaths that occurred from 1 March 2020 to 31 December 2021, comparing deaths in this period to the average of the previous 5 years. It is recognised that there could be deaths that occurred in this period, but that have not yet been registered. This is most likely in the more recent months.

This analysis includes deaths registered up to 9 February 2022, therefore allowing for 27 working days after the end of June to register deaths. Deaths that occurred in the same period of the previous years have had more time to be registered and the analysis adjusts for this. Figure A has broken down the average number of deaths in 2015-19 into those that were registered within 27 working days of the following year, and those that have been registered since. It shows that this effect of registration delay was largest for the most recent months.

Figure A: Average deaths in 2015-19, by month and registration cut-of date



Based on these figures, there are three possible approaches in deriving excess deaths in these four months:

1. Deaths which occurred in March 2020 to December 2021 and registered by 9 February 2022 (31,604), compared to the average number of deaths occurring over the same months of the previous five years and which have been registered to date (thus including late registrations) (28,892). This results in 2,712 excess deaths, or 9.4% above the five-year average;
2. Deaths which occurred in March 2020 to December 2021 and registered by 9 February 2022 (31,604), compared to the average number of deaths occurring over the same months in the previous five years, including death registrations up to 27 working days of the following year (28,335). This results in 3,269 excess deaths, or 11.5% above that five-year average; or
3. Adjusting the number of deaths occurring between March 2020 and December 2021 to account for late registrations, and compare to the average number of deaths in the previous five years which has been registered to date.

The first approach is most likely to result in an underestimate of excess deaths, as the number of deaths during the pandemic that have yet to be registered will be greater than late registrations in the same period of the previous five years. The second approach could provide an overestimate if the changes[18] in the certification and registration of deaths have reduced the lag between occurrence and registration.

Finally, the third approach would rely on assumptions being made on the method of adjustment. This adjustment could be done by applying the observed difference from the five-year average, either in levels (558 deaths) or as a proportion (2.0%). This would still not capture a possible reduction in the registration lag, and may require different adjustments for different populations. For example, drug-related deaths or suicides will commonly go through the coroner and could have a long registration lag: such deaths are typically seen in young males and urban deprived areas[19].

To put the possible measures of excess death into context, excess deaths based on deaths registered from March 2020 to December 2021 was 3,420[20], and the number of Covid-19 related deaths that occurred in this period was 4,036. These figures align more with the second approach, suggesting that the impact of late registration was sizable. It was decided to use the second approach to estimate the number of excess deaths, but to present this excess as a proportion of historical deaths registered to date, i.e. the 3,269 excess deaths are 11.3% higher than the five-year average of 28,892 deaths. This methodology is demonstrated in Tables A.1 and A.2 on the next page.

[18] These changes include registration by telephone rather than in person, and fewer cases referred to the coroner (when the deceases has not been seen by their GP in the last 28 days, and died of natural causes). Further detail on these changes are in the background notes (page 2) of the weekly deaths report.

[19] See Drug-related Deaths in Northern Ireland: Socio-Demographic Analyses

[20] This figure is taken from the monthly death statistics.

Table A.1: Deaths by month and year of death, 2015-2020 (March to December)

Month	2015	2016	2017	2018	2019	Average 2015-19 (A)	Average 2015-19 at cut-off (B)	2020 (C)	Excess Deaths (C - B)	As proportion of average 2015-19 (C - B) / A
March	1,395	1,338	1,370	1,492	1,357	1,390.4	1,385.0	1,467	82.0	5.9%
April	1,275	1,228	1,207	1,252	1,366	1,265.6	1,257.8	1,777	519.2	41.0%
May	1,234	1,234	1,280	1,169	1,293	1,242.0	1,235.8	1,514	278.2	22.4%
June	1,241	1,207	1,165	1,150	1,204	1,193.4	1,188.4	1,198	9.6	0.8%
July	1,127	1,236	1,209	1,153	1,194	1,183.8	1,178.4	1,207	28.6	2.4%
August	1,100	1,204	1,177	1,191	1,187	1,171.8	1,161.4	1,265	103.6	8.8%
September	1,210	1,173	1,216	1,184	1,186	1,193.8	1,185.2	1,308	122.8	10.3%
October	1,289	1,296	1,351	1,233	1,301	1,294.0	1,284.4	1,500	215.6	16.7%
November	1,224	1,338	1,355	1,172	1,401	1,298.0	1,285.4	1,630	344.6	26.5%
December	1,454	1,546	1,652	1,402	1,592	1,529.2	1,512.2	1,739	226.8	14.8%
March-Dec	**12,549**	**12,800**	**12,982**	**12,398**	**13,081**	**12,762.0**	**12,674.0**	**14,605**	**1,931.0**	**15.1%**

Table A.2: Deaths by month and year of death, 2016-2021

Month	2016	2017	2018	2019	2020	Average 2016-20 (A)	Average 2016-20 at cut-off (B)	2021 (C)	Excess deaths (C - B)	As proportion of average 2016-20 (C - B) / A
January	1,482	1,651	1,937	1,413	1,521	1,600.8	1,585.6	1,934	348.4	21.8%
February	1,311	1,391	1,445	1,302	1,333	1,356.4	1,341.4	1,400	58.6	4.3%
March	1,338	1,370	1,492	1,357	1,467	1,404.8	1,386.4	1,301	-85.4	-6.1%
April	1,228	1,207	1,252	1,366	1,777	1,366.0	1,347.4	1,201	-146.4	-10.7%
May	1,234	1,280	1,169	1,293	1,514	1,298.0	1,277.2	1,263	-14.2	-1.1%
June	1,207	1,165	1,150	1,204	1,198	1,184.8	1,162.2	1,182	19.8	1.7%
July	1,236	1,209	1,153	1,194	1,207	1,199.8	1,173.6	1,299	125.4	10.5%
August	1,204	1,177	1,191	1,187	1,265	1,204.8	1,162.2	1,452	289.8	24.1%
September	1,173	1,216	1,184	1,186	1,308	1,213.4	1,170.4	1,451	280.6	23.1%
October	1,296	1,351	1,233	1,301	1,500	1,336.2	1,276.0	1,421	145.0	10.9%
November	1,338	1,355	1,172	1,401	1,630	1,379.2	1,301.8	1,546	244.2	17.7%
December	1,546	1,652	1,402	1,592	1,739	1,586.2	1,476.4	1,549	72.6	4.6%
Jan-Dec	**15,593**	**16,024**	**15,780**	**15,796**	**17,459**	**16,130.4**	**15,660.6**	**16,999**	**1,338.4**	**8.3%**

Source: NISRA