

## Article

# Analysis of death registrations not involving coronavirus (COVID-19), England and Wales: 28 December 2019 to 1 May 2020

Examines death registrations not involving coronavirus (COVID-19), to understand the apparent increase in deaths compared to the previous five-year average for deaths in the same weeks. Explores explanations for why a greater number of deaths not involving COVID-19 are observed.

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# 1 . Main points

- Between 7 March and 1 May 2020, a total of 130,009 deaths were registered across England and Wales; this represents an excess of 46,380 death registrations compared to the five-year average, and 12,900 of these deaths (27.8%) did not involve the coronavirus (COVID-19).
- This article is based on 98.1% of the total deaths registered and 43,903 excess deaths, because a small proportion of deaths take longer than others to be fully coded and validated ready for analysis.
- Non-COVID-19 excess deaths occur predominantly in older age groups, to a greater extent with increasing age, and especially for the frail elderly with underlying conditions; undiagnosed COVID-19 could help explain the rise in these deaths.
- In the period from Week 11 (ending 13 March) to Week 18 (ending 1 May), over 8,000 fewer deaths were registered in hospitals than in the corresponding period in the weekly average, a decrease of 20.9%; in contrast, almost 11,000 more deaths were registered in care homes, an increase of 60.5%, and over 8,000 more deaths were registered in private homes in this period, an increase of 42.6%.
- Deaths in private homes have also risen, reaching a maximum of almost 2,000 non-COVID-19 excess deaths in week ending 24 April 2020.
- The largest increases in non-COVID-19 deaths compared to the five-year average are seen in deaths due to "dementia and Alzheimer disease" and "symptoms, signs and ill-defined conditions" (the latter mostly indicating old age and frailty); overall, there have been 5,404 excess deaths (an increase of 52.2% on the five-year average) due to dementia and Alzheimer disease and 1,567 excess deaths (an increase of 77.8%) due to "symptoms signs and ill-defined conditions" from Week 11 (ending 13 March) to Week 18 (ending 1 May), which together comprise two thirds of total non-COVID-19 excess deaths in this period.
- Deaths due to causes such as asthma and diabetes increased up to the week ending 24 April 2020 and occurred increasingly outside hospital; this could suggest a delay in care for these conditions is leading to an increase in deaths, although this rise could also be related to undiagnosed COVID-19.
- Changes to registration processes implemented in the [Coronavirus Act 2020](#) have led to an increased number of death registrations made by doctors, increasing registration efficiency overall; at present, it is not clear whether increased efficiency is a cause or result of an increase in weekly registrations, but some further effects may become apparent in the future for conditions where deaths have a longer registration delay.
- There is not enough evidence to suggest the other theories investigated can explain much of the increase in non-COVID-19 death registrations; these other explanations were reduced hospital capacity and increases in deaths caused by stress-related conditions.
- A full analysis of non-COVID-19 excess deaths will only be possible in several months' time when longer-term effects and additional data, both death registrations and other sources, can be considered.

## 2 . Introduction

This article presents provisional analysis of excess deaths in 2020 that did not involve the coronavirus (COVID-19), focussing on the weeks from which death registrations involving COVID-19 were first recorded. These are Week 11 of 2020 (week ending 13 March) up to Week 18 2020 (week ending 1 May). Excess deaths are defined as the number of deaths registered in excess of the five-year average (2015 to 2019). Non-COVID-19 excess deaths are the number of excess deaths that did not have COVID-19 included on the death certificate. This analysis is based on the date that a death is registered rather than when it occurred, which is consistent with the [weekly death registrations release](#). This use of date of registration rather than occurrence allows for a more accurate comparison between weeks because, particularly for recent weeks, a proportion of deaths that occurred have not yet been registered. There is usually an average delay of five days between a death occurring and it being registered, but this can be much longer for deaths referred to coroners. More information on this issue can be found in our [impact of registration delays release](#). The implications of potential changes in time between a death occurring and being registered are considered in this analysis as this could affect the numbers of deaths registered each week.

A breakdown of non-COVID-19 excess deaths is presented by age, sex, regions of England, Wales, place of death and underlying cause of death. A more detailed analysis of deaths due to dementia and Alzheimer disease and due to "symptoms, signs and ill-defined conditions" is also presented as these causes of death make up a large proportion of non-COVID-19 excess.

In this article, we explore possible explanations for non-COVID-19 excess deaths. These are:

- COVID-19 may have been present but undiagnosed or not recorded on the death certificate
- a reluctance to seek care or delay in receiving care could cause deaths where someone already had a serious health condition
- reduced hospital capacity could mean some people with other underlying conditions had not received sufficient care
- an increase in stress because of lockdown could be causing more deaths
- an increase in registration efficiency could lead to more deaths being registered

The analysis does not conclusively explain why these excess deaths are occurring but can give early indications. A full analysis of non-COVID-19 excess deaths will only be possible in several months' time when longer-term effects and additional data, both death registrations and other sources, can be considered.

### More about coronavirus

- Find the latest on [coronavirus \(COVID-19\) in the UK](#).
- All ONS analysis, summarised in our [coronavirus roundup](#).
- View [all coronavirus data](#).
- Find out how we are [working safely in our studies and surveys](#).

## 3 . Quantifying non-COVID-19 excess deaths

In this article, we use the term "due to COVID-19" when referring only to deaths with an underlying cause of death of the coronavirus (COVID-19), and we use the term "involving COVID-19" when referring to deaths that had COVID-19 mentioned anywhere on the death certificate, whether as underlying cause or not. We use the term "non-COVID-19 deaths" to refer to deaths that did not have COVID-19 recorded on the death certificate.

To identify excess deaths, we need to look at any unusual fluctuation in weekly death registrations against five-year averages, which are the average number of death registrations in the equivalent calendar weeks for the years 2015 to 2019 up to Week 18 (week ending 1 May 2020). Beginning with Week 13 (week ending 27 March 2020), the number of deaths registered in each week exceeded the five-year average, reaching a maximum of 207.7% of the five-year average in Week 16 (week ending 17 April 2020). In Weeks 13 to 18, 31.3% of deaths involved COVID-19. If the number of deaths involving COVID-19 in Weeks 13 to 18 is subtracted from the total number of deaths, the remaining number of non-COVID-19 deaths is 117.5% of the five-year average weekly deaths for the same weeks.

The observation of large numbers of non-COVID-19 excess deaths has also been reported in other countries, although methods to measure the excess differ. More information can be found in the "[Measuring the data](#)" section.

We have used the five-year average to compare deaths in 2020 up to Week 18 with the same period for the last five years. Fluctuations in the numbers of deaths registered affect the five-year average, particularly in weeks where bank holidays reduce the opening of registration offices, which can occur in different weeks in different years. The standard deviation of the weekly deaths in 2015 to 2019, which is a measure of the variability of the weekly deaths over the five years, is used to indicate the magnitude of the uncertainty around the five-year average. Excess deaths are presented from Week 1 in 2020, rather than for only the weeks in which COVID-19 deaths were registered, to show where changes have occurred in the number of deaths recorded compared to the five-year average.

Figure 1 shows the total weekly death registrations in 2020 with the corresponding five-year average and its standard deviation. The number of non-COVID-19 weekly deaths is also plotted from Week 11 (week ending 13 March) when deaths involving COVID-19 were first registered. Non-COVID-19 excess deaths shaded in red is the difference between non-COVID-19 weekly death registrations and the five-year average, which is greater than or similar to the standard deviation of the five-year average from Weeks 13 to 18. The analysis throughout this article presents Week 18 as the latest data, as these are the latest for which we have done this analysis of underlying causes of deaths.

In early weeks of 2020 (Weeks 3 to 12), the numbers of deaths registered each week were lower than the five-year average. If in general the 2020 mortality rate was lower than the five-year average, then comparing latest weeks to the five-year average might underestimate excess deaths, because the average presents more deaths than would otherwise have been expected for these weeks in 2020. Periods of slightly below or above average deaths are not uncommon because of the impacts of, for example, winter flu or changes to population size and structure.

### **Figure 1: The number of non-COVID-19-related death registrations has exceeded the five-year average since Week 13 in 2020**

Weekly total death registrations and non-COVID-19 death registrations in 2020 for England and Wales, compared to the five-year average for equivalent weeks up to Week 18

[Download the data](#)

#### **Notes:**

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for COVID-19 are U07.1 and U07.2.
5. Individual weeks may not sum to the year-to-date analysis as previous weeks have been recalculated in order to have the most up-to-date figures.

A detailed breakdown of excess deaths from Weeks 13 to 18 is provided in Figure 2, where deaths involving COVID-19 have been split into those due to COVID-19 and those where COVID-19 was involved but was not the underlying cause. The week with the highest number of non-COVID-19 excess death registrations is Week 17 (week ending 24 April 2020) with 2,706 non-COVID-19 excess death registrations in this analysis.

**Figure 2: The highest number of non-COVID-19 excess deaths was recorded in Week 17 (week ending 24 April 2020) with 2,706 non-COVID-19 excess deaths, 24.8% of the total number of excess deaths**

Breakdown of all excess weekly deaths in Weeks 13 to 18 by relation to COVID-19, compared to the five-year average. Deaths involving but not due to COVID-19 refers to those where COVID-19 was mentioned but was not the underlying cause of death, England and Wales

[Download the data](#)

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## **4 . Characteristics of non-COVID-19 excess deaths**

Figure 3 shows deaths where the coronavirus (COVID-19) is not involved as a percentage of the five-year average for all male and female deaths and for male and female deaths broken down into 10-year age groups. The five-year averages are calculated separately for each age group and sex. The standard deviation of the five-year average is indicated as shading on the plots. The dashed line indicates the week in which COVID-19 death registrations were first recorded (Week 11, week ending 13 March 2020).

Non-COVID-19 deaths are greater than the five-year average for older age groups in weeks after Week 13 (week ending 27 March 2020), with the effect increasing with age.

Earlier in the year, deaths of women were lower than those of men compared with their respective five-year averages for persons aged over 60 years old. This effect is more apparent with increasing age. The effect of seasonal flu in winter 2019 to 2020, which has a greater impact in older age groups, was milder than in the previous five years. Since older women typically comprise a larger proportion of deaths due to seasonal flu than older men, the reduction is more evident in women than in men.

Deaths were higher in men compared to the five-year average up to Week 15 (week ending 10 April 2020), with the difference particularly apparent in Weeks 13 and 14. The proportions compared to the five-year average for men and women were similar in Week 15 and switched to be higher for women from Week 16 (week ending 17 April 2020). The [number of women in the age groups aged 80 years and over is higher than that of men](#), and Figure 3 shows that non-COVID-19 excess deaths occur to a much greater extent in these age groups. The switch from higher male to higher female deaths compared to the five-year average is likely to be linked to causes that predominantly affect older age groups and therefore disproportionately affect women because of the higher proportion of women in these age groups.

### **Figure 3: Non-COVID-19 excess deaths are initially higher for men between Weeks 11 and 14, but they are higher for women from Week 15 onwards**

Non-COVID-19 excess deaths for men and women in 2020, total and broken down by 10-year age groups. The dashed line indicates the week in which COVID-19 deaths were first recorded (Week 11), England and Wales

[Download the data](#)

#### **Notes:**

1. Figures include deaths of non-residents.
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3. All figures for 2020 are provisional.
4. Individual weeks may not sum to the year-to-date analysis as previous weeks have been recalculated in order to have the most up-to-date figures.

The mortality rates per 100,000 people in each age group are plotted for both non-COVID-19 excess deaths, and deaths involving COVID-19, in Figure 4. Both the COVID-19 and non-COVID-19 excess death rates are highest in the 90 years and over age group and decrease rapidly as age decreases, indicating that the major causes of non-COVID-19 excess deaths are ones that have an effect that increases strongly with age. The COVID-19 death rate also increases with age.

Non-COVID-19 deaths are generally below the five-year average for younger age groups from Week 12 (week ending 20 March 2020), particularly those aged 10 to 39 years. However, deaths at these ages are often in circumstances that require a coroner's inquest to determine the cause, which means that registration is typically several months after the date of death. In 2018, 44.6% of [deaths of people aged 5 to 34 years](#) were due to causes where the [median registration delay](#) was 22.5 weeks or longer. These causes are suicide and injury or poisoning of undetermined intent, accidental poisoning, land transport accidents, and homicide and probable homicide.

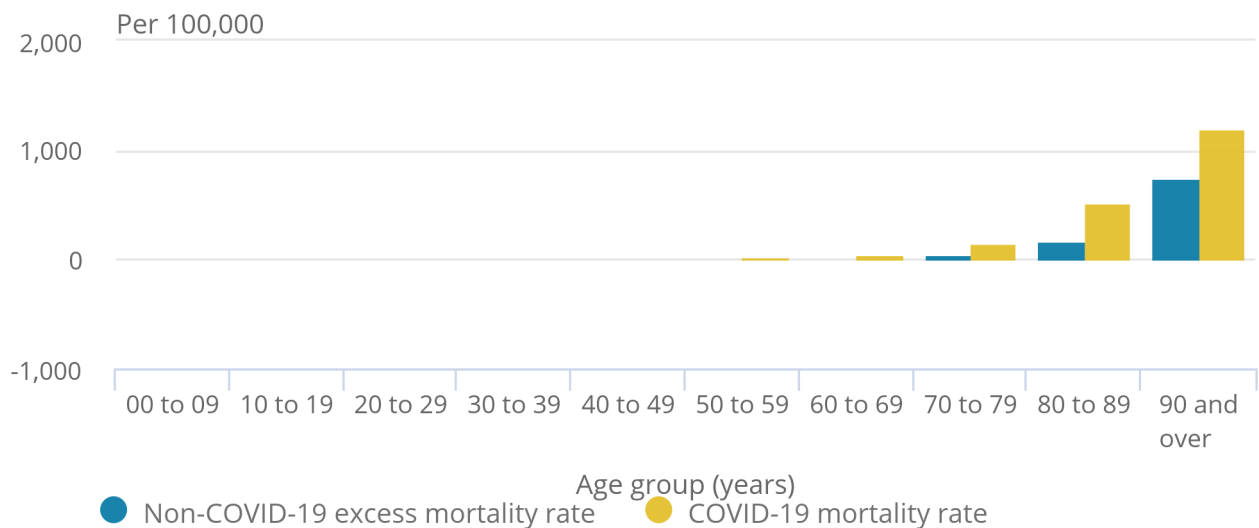
There is therefore a delay in seeing an impact of any changes in registrations resulting from these causes, and recent pressures on registering deaths could mean that there is an increased delay. It is not possible to discern whether fewer deaths have occurred in the most recent weeks for the age groups 10 to 39 years until sufficient time has elapsed for deaths due to these causes to be registered, and they can be analysed based on date of occurrence rather than date of registration.

**Figure 4: The rate of non-COVID-19 deaths per 100,000 is highest in the 90 years and over age category, among whom the rate of deaths involving COVID-19 is also highest**

Total non-COVID-19 excess deaths per 100,000 and deaths involving COVID-19 per 100,000 for each 10-year age group, England and Wales, Week 11 to Week 18

Figure 4: The rate of non-COVID-19 deaths per 100,000 is highest in the 90 years and over age category, among whom the rate of deaths involving COVID-19 is also highest

Total non-COVID-19 excess deaths per 100,000 and deaths involving COVID-19 per 100,000 for each 10-year age group, England and Wales, Week 11 to Week 18



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. Individual weeks may not sum to the year-to-date analysis as previous weeks have been recalculated in order to have the most up-to-date figures.

The age-standardised mortality rates (ASMRs) for non-COVID-19 excess deaths by region for England and for Wales, for both total deaths between 2015 and 2019 and non-COVID-19 deaths in 2020, are plotted in Figure 5.

All regions show a general pattern of lower than average mortality rates earlier in the year until approximately Week 11, when COVID-19 deaths were first registered, then a general increase until a decrease in Weeks 17 and 18. There was a drop in registrations in Week 15 in all regions, which fell to below the five-year average for Wales and the North East. Week 15 includes the moveable Good Friday bank holiday. Based on past years, we would expect the proportion of deaths registered in the week ending Good Friday to be low, with a corresponding increase in the following week. The week that Good Friday falls in varies from year to year.



London and the West Midlands have particularly large differences between their respective five-year average mortality rates and non-COVID-19 2020 mortality rates between Weeks 14 and 17. These regions also have high ASMRs for COVID-19, but so do the North West and North East, where lower non-COVID-19 mortality rates are observed. Wales, the South West and the North East have lower differences in the rates in these weeks compared with other regions. The South West has a particularly low ASMR for deaths due to COVID-19. This suggests there is a relationship between COVID-19 mortality rates and non-COVID-19 mortality rates, but with other factors involved.

One characteristic in which London and the West Midlands differ from the other regions with high COVID-19 mortality rates is their proportion of black and minority ethnic (BAME) populations: these two regions have the highest proportion of their populations as BAME. The higher risk of death from COVID-19 among BAME populations has been looked at in our publication on [COVID-19-related deaths by ethnic group](#). Further information on ASMRs due to COVID-19 by geography can be found in our publication on [deaths involving COVID-19 by local area and socioeconomic deprivation](#) for deaths occurring between 1 March and 17 April 2020.

### **Figure 5: London and the West Midlands have particularly high age-standardised non-COVID-19 mortality rates in Weeks 14 to 17 compared to the five-year average**

Age standardised non-COVID-19 weekly mortality rates, COVID-19 mortality rates and five-year average mortality rates by regions in England and Wales, for Weeks 1 to 18 in 2020

[Download the data](#)

#### **Notes:**

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for COVID-19 are U07.1 and U07.2.
5. Individual weeks may not sum to the year-to-date analysis as previous weeks have been recalculated in order to have the most up-to-date figures.
6. Age-standardised mortality rates allow valid comparisons to be made between areas with different population age-structures.

The number of non-COVID-19 excess death registrations by place of death is plotted in Figure 6, for total excess non-COVID-19 deaths. Figure 7 shows the same for men and women separately. The highest numbers of excess non-COVID-19 deaths are seen in care homes, with a maximum of 2,975 in Week 16, which have increased from below five-year average levels before Week 12. Non-COVID-19 deaths in private homes have also increased to a maximum of 1,760 in Week 17 (week ending 24 April 2020), whereas non-COVID-19 deaths in hospitals have fallen to significantly below the five-year average from Week 14 (week ending 3 April 2020) onwards with 1,901 fewer deaths than the five-year average in Week 16. The increase in deaths in care homes occurs predominantly in women, whereas the increase in deaths occurring in private homes, and decrease in hospitals, do not show much difference by sex. This is likely to be linked to the fact that there are more women living in care homes, with 2.8 women for each man in the [2011 Census](#).



If patients have been discharged from hospital sooner than they may have been typically, because of pressure on the NHS's resources, this could have resulted in some deaths occurring in care homes or private homes that would have otherwise occurred in hospital. In addition, if people with a healthcare need are less willing to visit a hospital, delay doing so or are unable to given current circumstances, this could result in more deaths occurring in other places. The reported lower rates of testing in all settings outside hospital could lead to some deaths in other locations involving COVID-19 not having COVID-19 listed on the death certificate as a contributory factor, leading to apparently higher non-COVID-19 excess deaths.

**Figure 6: Since Week 13, excess non-COVID-19 deaths occurring in hospitals have decreased, while deaths occurring in care homes and private homes have increased**

Non-COVID-19 excess deaths occurring in different types of location, England and Wales, deaths registered in Weeks 1 to 18 2020

[Download the data](#)

**Notes:**

1. Figures include deaths of non-residents.
2. All figures for 2020 are provisional.

**Figure 7: The increase in non-COVID-19 deaths occurring in care homes since Week 13 is particularly apparent for women**

Non-COVID-19 excess deaths occurring in different types of location, for men and women, England and Wales, deaths registered in Weeks 1 to 18 2020

[Download the data](#)

**Notes:**

1. Figures include deaths of non-residents.
2. All figures for 2020 are provisional.

Non-COVID-19 excess deaths in 2020 for the [leading causes of death in 2018](#) (the latest full year we have analysed) are plotted in Figure 8 as a proportion of their respective five-year averages. In addition, non-COVID-19 deaths for three further conditions are included. These are "influenza and pneumonia", "all respiratory diseases" (which includes "influenza and pneumonia"), both of which are major causes of death and can have similar symptoms to COVID-19, and "symptoms, signs and ill-defined conditions", which are mostly deaths certified as caused by "old age" or "frailty" and is a common pre-existing condition in COVID-19 deaths behind dementia and Alzheimer disease. See our publication on [deaths involving COVID-19 occurring in April 2020](#) for more information on pre-existing conditions.

Prior to Week 12, death registrations in 2020 were below average for all these causes except "symptoms, signs and ill-defined conditions". From Week 13 onwards, there has been a general increase across most leading causes of death, with an especially large increase in deaths due to dementia and Alzheimer disease and "symptoms, signs and ill-defined conditions", reaching maximums of 2,775 (220.8% of five-year average) and 607 deaths (242.0% of five-year average), respectively, in Week 16. For Weeks 11 to 18, there were 5,404 excess non-COVID-19 deaths due to dementia and Alzheimer disease and 1,567 excess non-COVID-19 deaths due to symptoms, signs and ill-defined conditions, compared with 10,603 non-COVID-19 excess deaths from all causes.

In comparison, non-COVID-19 death registrations with an underlying cause of "influenza and pneumonia" and "all respiratory diseases" increased from Week 10 to Week 14 but have decreased since Week 14, although not to the lowest levels seen before COVID-19 deaths were first registered.

The number of deaths due to ischaemic heart disease has increased since approximately Week 12, after a slight decrease. This differs from previous findings in our report on [deaths involving COVID-19 occurring in April 2020](#), as the data here are more complete.

### **Figure 8: Deaths due to dementia and Alzheimer disease have greatly increased and to a greater extent than other causes since Week 13**

Non-COVID-19 deaths as a percentage of the five-year average for each underlying cause, England and Wales, deaths registered in Weeks 1 to 18 2020

[Download the data](#)

#### **Notes:**

1. Figures include deaths of non-residents.
2. All figures for 2020 are provisional.
3. The ICD-10 definitions for the conditions plotted are: dementia and Alzheimer disease (F01, F03 and G30), ischaemic heart disease (I20 to I25), chronic lower respiratory disease J40 to J47), cerebrovascular diseases (I60 to I69), malignant neoplasm of the trachea, bronchus and lung (C33 to C34), influenza and pneumonia (J09 to J18), all respiratory diseases (J00 to J99), and symptoms, signs and ill-defined conditions (R00 to R99).

## **5 . Deaths due to dementia and Alzheimer disease**

Deaths due to dementia and Alzheimer disease have been analysed further as they comprise the largest proportion of non-coronavirus (COVID-19) deaths (Figure 8).

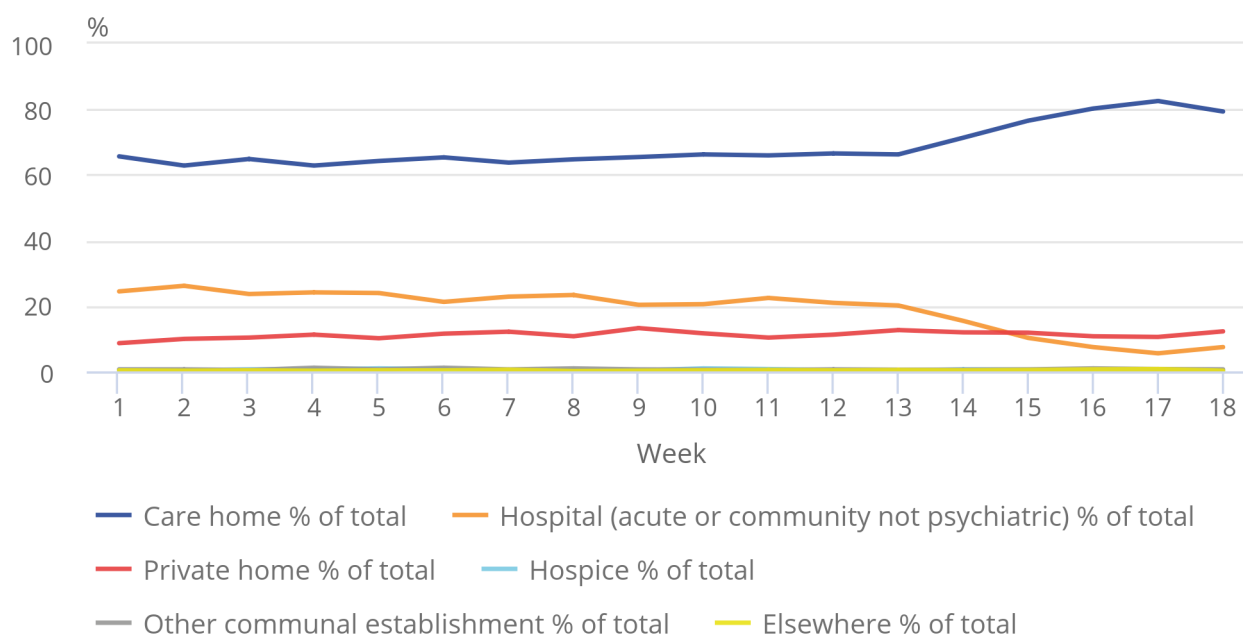
The percentage of deaths due to dementia and Alzheimer disease that occurred in each place of death is presented in Figure 9, showing that the majority occurred in care homes. The number of deaths due to dementia and Alzheimer disease occurring in hospitals has decreased since Week 13 (week ending 27 March 2020), whereas those in care homes have increased, similarly to the changes in deaths due to all causes shown in Figure 7. The proportion of non-COVID-19 deaths due to dementia and Alzheimer disease occurring at home has not increased.

**Figure 9: The proportion of deaths due to dementia and Alzheimer disease has increased in care homes and decreased in hospitals since Week 13**

The proportion of non-COVID-19-related deaths due to dementia and Alzheimer disease that occurred in each place of death, England and Wales, deaths registered in Weeks 1 to 18 2020

### Figure 9: The proportion of deaths due to dementia and Alzheimer disease has increased in care homes and decreased in hospitals since Week 13

The proportion of non-COVID-19-related deaths due to dementia and Alzheimer disease that occurred in each place of death, England and Wales, deaths registered in Weeks 1 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

#### Notes:

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2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.

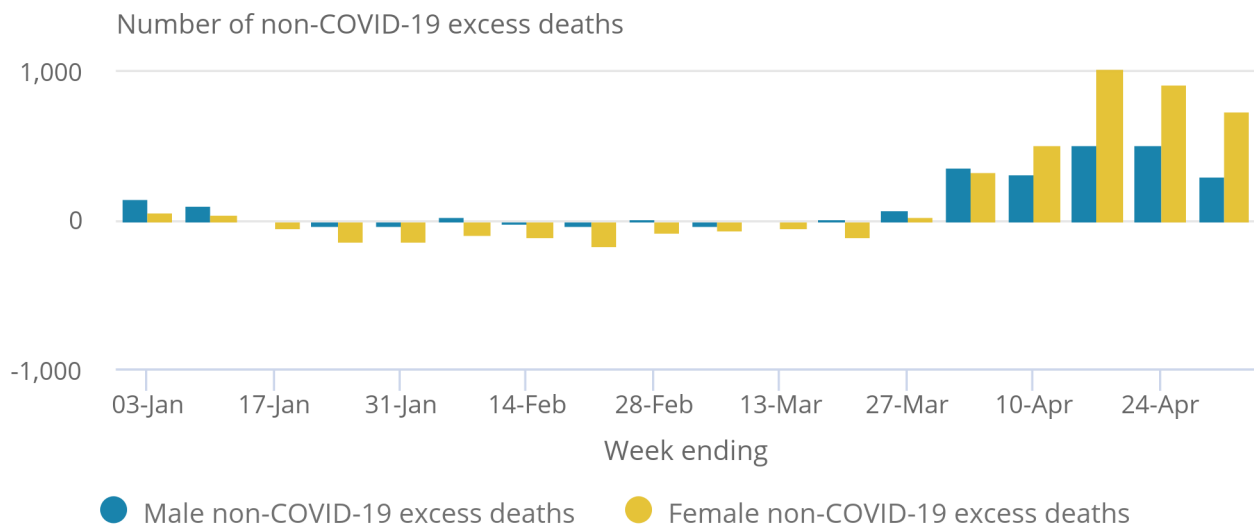
Non-COVID-19 excess deaths due to dementia and Alzheimer disease have been plotted for men and women in Figure 10. Earlier in the year, the lower impact of seasonal flu reduced female deaths more compared to their five-year average than for men, a trend also seen in the total non-COVID-19 deaths in Figure 3. However, since Week 12 (week ending 20 March 2020), deaths for both sexes have risen but deaths for women have risen much faster. Coupled with the fact that the majority of these deaths occur in care homes, this suggests the cause of these excess deaths is having a parallel effect to the seasonal flu, which causes high mortality rates among the frail elderly, particularly in care homes and particularly for women, who make up a [larger proportion of the older age groups than men](#). This increase could be explained by undiagnosed COVID-19, especially if it is less likely that the symptoms of COVID-19 would be identified in the presence of other comorbidities.

**Figure 10: Non-COVID-19 excess deaths due to dementia and Alzheimer disease in women rose to over double that of men in Week 16**

Excess non-COVID-19 deaths with an underlying cause of dementia and Alzheimer disease for men and women, England and Wales, 2020

Figure 10: Non-COVID-19 excess deaths due to dementia and Alzheimer disease in women rose to over double that of men in Week 16

Excess non-COVID-19 deaths with an underlying cause of dementia and Alzheimer disease for men and women, England and Wales, 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for dementia and Alzheimer disease are F01, F03 and G30.

Deaths due to dementia and Alzheimer disease are investigated further later in this article by looking at the seven most common health conditions mentioned alongside an underlying cause of death of dementia and Alzheimer disease on the death certificate (Figure 11), where conditions directly related to dementia and Alzheimer disease have been excluded. The number of deaths due to dementia and Alzheimer disease that have no other conditions mentioned is also plotted. Since a death certificate can have up to 15 different conditions mentioned, an individual death registration may be included in more than one category.

Deaths with "influenza and pneumonia" as a mention make up the largest contribution to the total number of dementia and Alzheimer disease deaths throughout 2020 compared to the other conditions.

It is possible the conditions "other acute lower respiratory infections" and "influenza and pneumonia" could exhibit similar symptoms to COVID-19 and therefore be mistakenly recorded in place of COVID-19 for deaths with an underlying cause of dementia and Alzheimer disease. There has been a slight rise in the proportion of deaths due to dementia and Alzheimer disease that mention "other acute lower respiratory infections" since Week 11 (week ending 13 March 2020). However, although there is a rise in the proportion of deaths due to dementia and Alzheimer disease that mention "influenza and pneumonia" from Weeks 12 to 14, there is a clear fall from Week 14 (week ending 3 April 2020) onwards. This indicates that while influenza and pneumonia could have been mentioned instead of COVID-19 for some deaths in Weeks 12 to 14, it is unlikely to be responsible for non-COVID-19 excess deaths from Week 14 onwards. Trends in previous years show the proportion of deaths that mention "influenza and pneumonia" to fall slightly at this time of year, but not to the extent that has been observed in 2020. There has also been a rise in the proportion of deaths due to dementia and Alzheimer disease with no other conditions mentioned since Week 13.

The sudden rise in deaths due to dementia and Alzheimer disease is so sharp that it is implausible that the full increase observed could have happened by chance. The absence of large rises in deaths due to this cause that mention conditions that could exhibit similar symptoms to COVID-19 suggests that if COVID-19 is involved in the increase in deaths due to dementia and Alzheimer disease, the usual symptoms of COVID-19 were not apparent. This could fit with recent clinical observations, where [atypical hypoxia has been observed in some COVID-19 patients](#). In someone with advanced dementia and Alzheimer disease, the symptoms of COVID-19 might be difficult to distinguish from their underlying illness, especially with the possibility of communication difficulties.

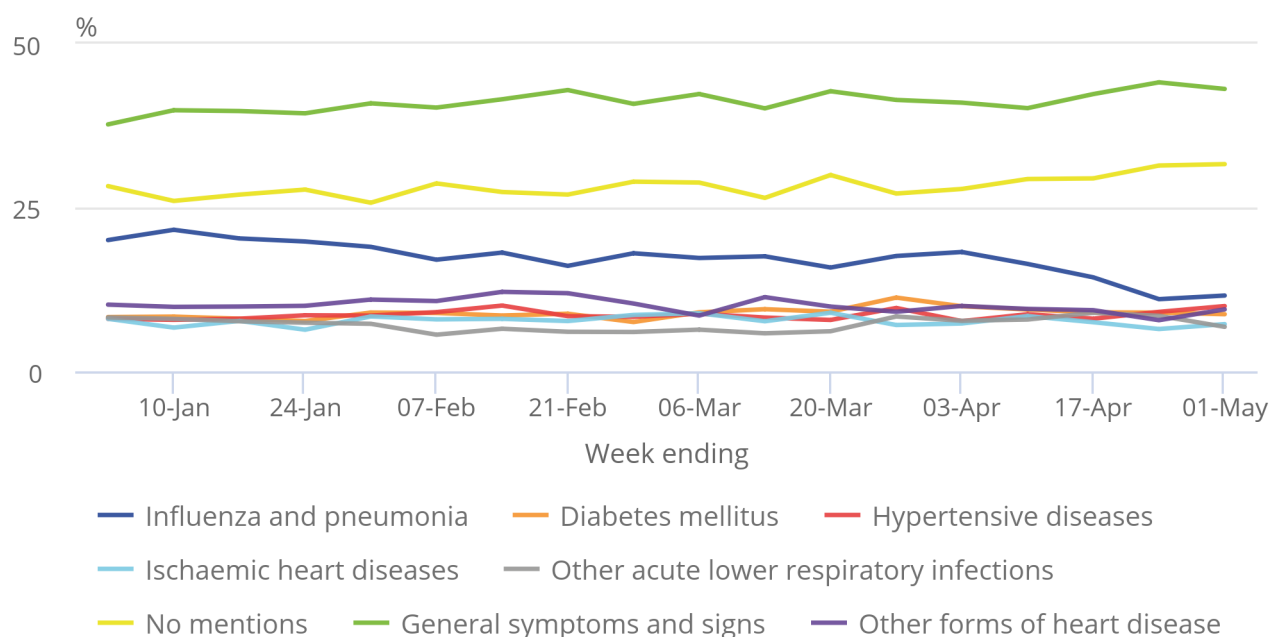
Care home residents have experienced changes to their usual routine as a result of measures to tackle the coronavirus pandemic. Adverse effects of such changes cannot be discounted as another possible explanation of the increase in the number of deaths in care homes.

**Figure 11: The proportion of deaths due to dementia and Alzheimer disease that also mention influenza and pneumonia has fallen since Week 14**

The percentage of all deaths due to dementia and Alzheimer disease that mention specific causes, England and Wales, Weeks 1 to 18 2020

**Figure 11: The proportion of deaths due to dementia and Alzheimer disease that also mention influenza and pneumonia has fallen since Week 14**

The percentage of all deaths due to dementia and Alzheimer disease that mention specific causes, England and Wales, Weeks 1 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

**Notes:**

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2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for dementia and Alzheimer disease are F01, F03 and G30.
5. The ICD-10 definitions for the conditions plotted for mentions are: influenza and pneumonia (J09 to J18), diabetes mellitus (E10 to E14), hypertensive diseases (I10 to I15), ischaemic heart diseases (I20 to I25), other acute lower respiratory infections (J20 to J22), general symptoms and signs (R50 to R69), and other forms of heart disease (I30 to I52).

## 6 . Deaths due to “symptoms, signs and ill-defined conditions”

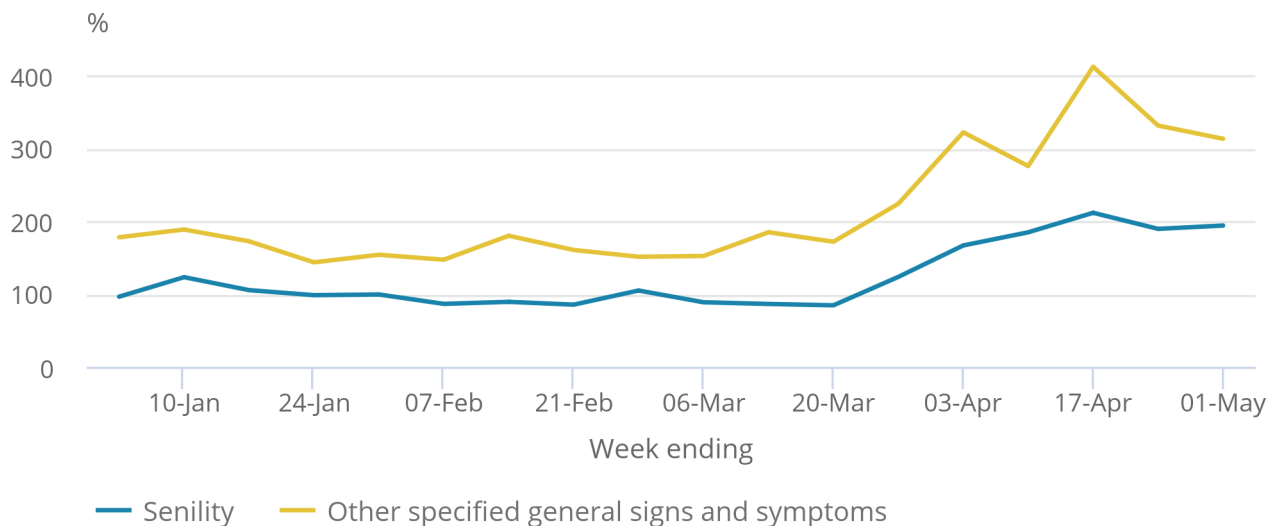
Figure 12 shows conditions within the “symptoms, signs and ill-defined conditions” grouping and how deaths due to these causes have changed compared to the five-year average. Deaths due to senility (old age) have risen since Week 12 (week ending 20 March 2020), as have deaths due to “other specified general signs and symptoms”, which generally refers to frailty and physical debility in old age. This shows that the cause of non-coronavirus (COVID-19) excess deaths particularly affects those who are elderly and frail and that this increase could be attributed to COVID-19 at least in part, given its magnitude.

**Figure 12: Non-COVID-19 deaths due to “other specified signs and symptoms”, which includes old age and frailty, have generally risen since Week 12**

Non-COVID-19 deaths as a percentage of the five-year average for codes within “symptoms, signs and ill-defined conditions”, England and Wales, Weeks 1 to 18 2020

Figure 12: Non-COVID-19 deaths due to “other specified signs and symptoms”, which includes old age and frailty, have generally risen since Week 12

Non-COVID-19 deaths as a percentage of the five-year average for codes within “symptoms, signs and ill-defined conditions”, England and Wales, Weeks 1 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for the conditions plotted are: senility (R54), and other specified general signs and symptoms (R68.8).



## 7 . Possible explanations for non-COVID-19 excess deaths

There are various factors that could contribute to non-coronavirus (COVID-19) excess deaths. Five possible explanations will be examined here in more detail. These are:

- whether COVID-19 has been undiagnosed in some cases, leading to an increase in non-COVID-19 deaths being recorded
- whether a delay in accessing or receiving health care has led to more deaths occurring
- whether pressure on the healthcare system because of COVID-19 has resulted in more deaths occurring
- whether an increase in stress-related diseases and/or external stress-related factors has caused an increase in deaths
- whether changes to the death registration process have increased efficiency of registration, leading to an apparent increase in weekly deaths

There may be other causes of non-COVID-19 excess deaths not considered here, and there may also be factors acting to reduce non-COVID-19 excess deaths. The analysis provides provisional indications on the potential of each explanation to contribute to non-COVID-19 excess deaths; however, a full analysis with additional data sources over an extended time will be required to determine the causes with certainty.

### Explanation 1: Undiagnosed COVID-19

There is no reason to believe that COVID-19 has been knowingly omitted from death registrations when it is thought to be a cause or added when it is known to not be involved. However, it is possible that symptoms may not be apparent or that COVID-19 could be mistaken for illnesses with similar symptoms. Some death certificates state that more information will be provided later, and some of these have since been updated to mention COVID-19. This supports the theory that COVID-19 is under-diagnosed at present on death certificates, and it suggests our understanding of non-COVID-19 excess deaths will improve over time, both with future weeks of data and improved data for the weeks already passed.

Deaths involving COVID-19 could have been recorded as non-COVID-19 deaths if the person had a severe underlying condition that was exacerbated by COVID-19. This could include deaths due to conditions such as chronic lower respiratory disease, dementia and Alzheimer disease and "symptoms, signs and ill-defined conditions", possibly where pneumonia has been mentioned as a contributory factor on the death certificate because of the similarity.

There are further conditions that do not necessarily share symptoms with COVID-19 but are common pre-existing conditions in deaths due to COVID-19. The presence of such conditions could contribute to under-diagnosis of COVID-19, if there is an established condition to attribute cause of death to. These conditions include asthma and diabetes, which are discussed in the next subsection exploring the second explanation.

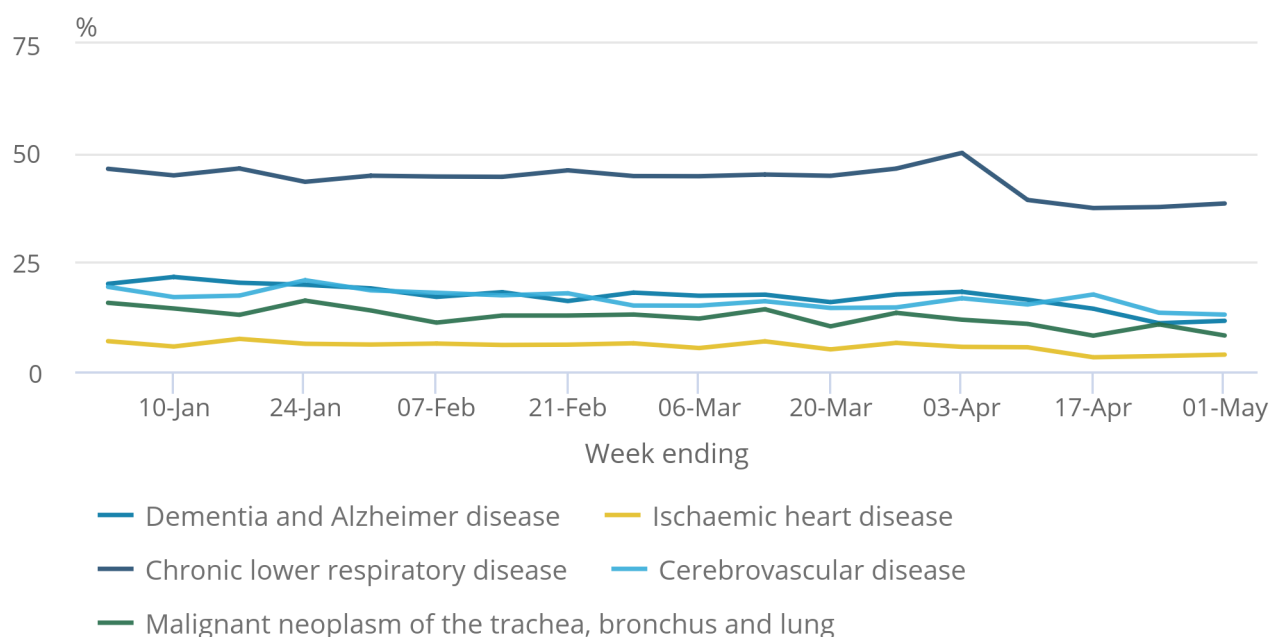
For the leading causes of death, the percentage of non-COVID-19 deaths for each of these causes that mentioned pneumonia or influenza is plotted in Figure 13. There is a slight increase in the number of deaths due to chronic lower respiratory disease with pneumonia and a slight increase in those due to dementia and Alzheimer disease with pneumonia from Weeks 12 to 14. However, from Week 15 (week ending 10 April 2020) onwards, chronic lower respiratory disease and dementia and Alzheimer disease show notably lower proportions of mentions of pneumonia and influenza, with the other leading causes also showing slight decreases in the proportion that mention pneumonia. This makes it unlikely that symptoms of COVID-19 have been mistaken for pneumonia since Week 14 (week ending 3 April 2020). It is possible this contributed to non-COVID-19 excess deaths observed before that time.

### Figure 13: There is no clear increase in the percentage of deaths due to leading causes that also mention pneumonia

The percentage of non-COVID-19 deaths due to each of these underlying causes where pneumonia or influenza is mentioned, England and Wales, Weeks 1 to 18 2020

#### Figure 13: There is no clear increase in the percentage of deaths due to leading causes that also mention pneumonia

The percentage of non-COVID-19 deaths due to each of these underlying causes where pneumonia or influenza is mentioned, England and Wales, Weeks 1 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

#### Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for the conditions plotted are: dementia and Alzheimer disease (F01, F03 and G30), ischaemic heart disease (I20 to I25), chronic lower respiratory disease J40 to J47), cerebrovascular diseases (I60 to I69), malignant neoplasm of the trachea, bronchus and lung (C33 to C34), and influenza and pneumonia (J09 to J18).

The increase in excess deaths due to the leading causes (Figure 8), but not where pneumonia is mentioned, could indicate that in some cases the symptoms of COVID-19 are not apparent, as discussed in [Section 5](#) for dementia and Alzheimer disease.

Earlier in this article, we showed a large increase in deaths of very elderly people with comorbidities (Figure 6), particularly for women and particularly in care homes. This suggests that undiagnosed COVID-19 is a likely explanation for some of non-COVID-19 excess deaths observed in this setting, because of the increased vulnerability of this population and increased likelihood that symptoms would be hard to identify in addition to existing comorbidities. The additional difficulty in communicating symptoms for some people with dementia and Alzheimer disease could explain why there is a large increase for this disease in particular. Similar trends are seen in the effects of [excess winter mortality](#) in years with increased deaths due to respiratory disease, where an increase in deaths due to causes such as dementia and Alzheimer disease is observed in populations with similar characteristics to those described here.

## Explanation 2: Delayed care

Delayed care could result from a reluctance to seek health care because of anxiety about exposure to COVID-19 or burdening the healthcare system, or it could result from overstretching of the healthcare system, such as increases in the time taken for an ambulance to arrive. These could result in an increase in deaths from causes that can be quickly fatal without treatment if earlier symptoms are not treated. Such causes include ischaemic heart disease and other forms of circulatory disease, stroke, sepsis, meningitis, appendicitis, asthma and diabetes. These delays could also result in more deaths occurring at home and in other non-hospital locations, rather than in hospitals.

Excess death registrations as a percentage of the five-year average for selected causes that could be related to a delay in care are shown in Figure 14 for all of the conditions mentioned earlier, excluding appendicitis and meningitis, where the numbers are too small to reliably draw conclusions. For asthma, diabetes mellitus (types 1 and 2) and sepsis, deaths have been included where the condition is mentioned on the death certificate and where it is the underlying cause, as these conditions will often contribute to a death occurring but not being recorded as the underlying cause.

There is an increase in deaths from all conditions apart from sepsis, with the increases for deaths due to asthma and diabetes particularly large, with deaths in Week 17 (week ending 24 April 2020) at 197.8% and 161.6% of their respective five-year averages. A trend line for all non-COVID-19 deaths is also shown, which reveals that although there is a general increase compared to the five-year average for all of the causes investigated, deaths related to asthma and diabetes are occurring at a significantly higher rate compared to the five-year average. This could indicate that some people suffering from these conditions are not receiving care fast enough to prevent death occurring. It is also plausible that some of these deaths are because undiagnosed COVID-19 had exacerbated the pre-existing condition.

Further analysis is required to distinguish this explanation (in which people suffering from these conditions are not receiving care fast enough) from other possible reasons, such as undiagnosed COVID-19 exacerbating existing conditions. This is particularly important as diabetes and asthma are known to be common pre-existing conditions in deaths due to COVID-19, as seen in our publication on [deaths involving COVID-19 and occurring in April 2020](#) (where asthma is included in chronic lower respiratory diseases).

Figure 14 presents the place of occurrence of deaths due to each of these conditions and shows that deaths due to these conditions have been occurring increasingly in private homes and care homes since Week 14, rather than in hospital. This is particularly evident for asthma and diabetes, which also see large rises in numbers as discussed earlier. We also see a large increase in deaths due to sepsis occurring at home, despite the total number of deaths due to sepsis not showing an increase. This appears to be further evidence that care may not be received in time for these conditions although, as previously stated, there are other reasons that could explain a rise in deaths at home or in care homes.

### Figure 14: Deaths due to asthma and diabetes increased up to Week 14 and occurred increasingly outside hospital

Non-COVID-19 deaths as a percent of the five-year average for each underlying cause potentially related to a delay in care. Plots are shown for the total non-COVID-19 deaths and those that occurred in care homes, private homes and hospitals, England and Wales, Weeks 1 to 18 2020

## Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for the conditions plotted are: ischaemic heart disease (I20 to I25), stroke (I60, I61, I63, I64), asthma (J45 to J46), diabetes mellitus (E10 to E14), sepsis (A392, A393, A394), and all circulatory disease (I00 to I99).
5. The five-year average for sepsis was adjusted because of coding changes.

## Explanation 3: Reduced hospital capacity

As the healthcare system adapts to ensure it has capacity to treat COVID-19 patients, some facilities may be less available because of COVID-19 and care for other diseases may be reduced. The effects might be most apparent in long-term serious diseases where delayed treatment increases mortality within a period of weeks, including renal failure and cancers with a moderate rate of survival, focussing on deaths occurring in hospitals. Cancers with a moderate survival rate are defined as those with survival rates in the second and third quartiles when looking at the [age-standardised five-year survival rate for all persons](#). Excess deaths for these conditions are shown relative to their respective five-year averages in Figure 15. The cancers that were included in this analysis are detailed in the [Glossary](#).

There is no clear change in deaths due to cancers with a moderate survival rate. However, there is a rise in deaths due to renal failure, though numbers are typically relatively low leading to relatively large variations in the data. When considering deaths by location, deaths due to both the cancers investigated here and renal failure in hospitals have reduced. The number that occur at home and elsewhere is rising, which could indicate that people who are very ill with these conditions are remaining at home when previously they may have been admitted to hospital or a hospice for near end-of-life care. To fully understand this explanation, mortality data would need to be combined with data from other sources.

### **Figure 15: No increase is seen in deaths due to cancers with moderate survival rates; deaths due to these causes are occurring increasingly at home and in care homes and decreasing in hospitals**

Non-COVID-19 deaths due to causes that could be related to reduced hospital capacity as a percentage of the five-year average. Plots are shown for the total non-COVID-19 deaths and those that occurred in care home, private homes and hospitals, England and Wales, Weeks 1 to 18 2020

## Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for the conditions plotted are: renal failure (N17 to N19) and cancers with a moderate survival rate (C82 to C85, C32, C64 to C68, C53, C18 to C21, C90 to C95, C65, C570 to C577).

## Explanation 4: Stress-related causes

The changing social conditions resulting from measures to combat COVID-19, such as social distancing and increased isolation, could cause stress leading to an increase in deaths from stress-related causes. These include conditions where stress is known to increase the chance of death occurring, such as myocardial infarction and hypertension, as well as external factors that could become more common when under increased stress, such as suicide, violence, and drug- and alcohol-specific deaths. The recent Office for National Statistics (ONS) [Opinions and Lifestyle Survey \(OPN\)](#) that covered 27 March to 6 April 2020 looked at the social impacts of the coronavirus pandemic and found just over half of adults (53.1%) reported that their well-being was affected and nearly half of adults (46.9%) reported high levels of anxiety.

It is not possible to investigate yet whether there has been an increase in deaths from suicide, drugs or violence using death certificates, as the [time taken for these to be registered](#) is in excess of the period in which we observe an excess in deaths, and effects may be seen over a longer period of time. For alcohol-specific deaths, causes are included according to the ONS definition of deaths due to alcohol-specific causes, except where the median registration delay for that cause is large enough that most deaths will not yet be registered. The conditions included are detailed in the [Glossary](#).

The number of non-COVID-19 excess deaths for each of the stress-related conditions is plotted in Figure 16 as a percentage of the five-year average for that condition. There is a notable rise in deaths due to hypertension after Week 11 (week ending 13 March 2020) and a rise in deaths due to myocardial infarction, which increases the number of deaths from below the five-year average to approximately the five-year average value.

However, the analysis by leading causes earlier (Figure 8) has shown an increase in deaths due to many different causes, not exclusively stress-related causes, so the reasons for the general rise must be understood before we can attribute the rise in myocardial infarction and hypertension deaths to stress. There may also be some reasons for stress to reduce for some people because of changes in social circumstances (for example, not having to commute), which could act to reduce stress-related deaths. Separating out these two opposing effects is challenging.

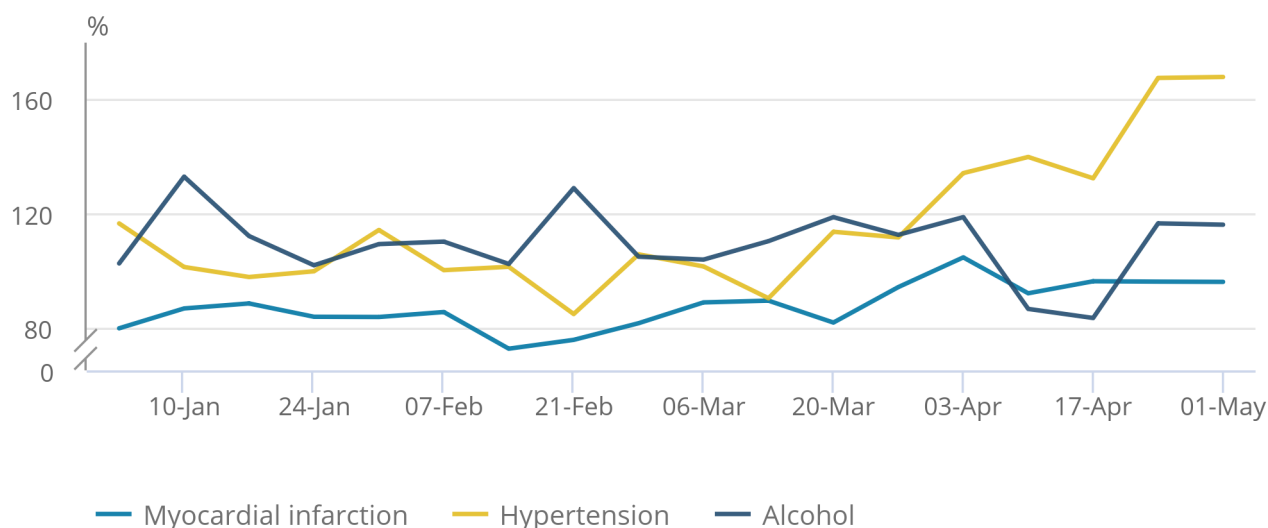
It is likely that we will be able to understand stress-related deaths more fully in the coming weeks and months as longer-term effects can be observed and deaths from causes associated with stress with a longer registration delay are recorded.

## Figure 16: Deaths due to hypertension have risen overall since Week 13

Non-COVID-19 deaths as a percentage of the five-year average for each underlying cause that could be related to stress, England and Wales, Weeks 1 to 18 2020

### Figure 16: Deaths due to hypertension have risen overall since Week 13

Non-COVID-19 deaths as a percentage of the five-year average for each underlying cause that could be related to stress, England and Wales, Weeks 1 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

#### Notes:

1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for the conditions plotted are: myocardial infarction (I21 to I23), hypertension (I10 to I15) and alcohol-specific (E244, G621, G312, G721, I426, K292, K70, K852, K860, Q860 and R780).

## Explanation 5: Death registration changes

Since this article considers death registration data rather than death occurrences, an increase in registration efficiency would mean more deaths are registered in a given time, leading to an apparent short-term increase in weekly deaths. With changes in the process for registration of deaths resulting from the [Coronavirus Act 2020](#) (detailed further in the [Glossary](#)), we expect registration efficiency improvements. However, an increase in death occurrences could also result in an increase in efficiency for registrations in response, as more registrations would need to be made to avoid a "backlog" of deaths to register.

To investigate whether changes in efficiency have occurred, we have analysed the proportion of death registrations made within seven days of a death occurring (Figure 17). Deaths involving COVID-19 have been registered more quickly on average than non-COVID-19 deaths, which is to be expected because deaths attributed to COVID-19 will only have occurred more recently. From Week 13 (week ending 27 March 2020) onwards, non-COVID-19 deaths have also been registered more efficiently than the five-year average for the same weeks.

One reason efficiency may appear to increase is if the number of registrations that typically have longer delays has reduced. This includes deaths registered by coroners, where cause of death needs to be confirmed, as is shown in Figure 18. There has been a decrease in death registrations made by coroners where an inquest was required, first observed in Week 13, and an increase in coronial registrations with no inquest or post-mortem since Week 16 (week ending 17 April 2020). This could be explained by the Coronavirus Act 2020 removing the requirement for deaths to go to inquest where they have reason to suspect the death was due to COVID-19. This would increase efficiency in registering cases that would have typically gone to inquest. Conversely, there may also be delays to investigations themselves, but for deaths that occurred during the coronavirus pandemic, these will not yet be present in the data.

The proportions of registrations following certification by a doctor in 2020 (week ending 1 May 2020) has increased, which results in an apparent increase in registration efficiency, as the average time taken to register a death after certification by a doctor (four days) is much shorter than when registered by a coroner (14 days without an inquest and 148 days with an inquest). This suggests that despite observing efficiency improvements in registrations, these improvements themselves are unlikely to be driving much of the increase in death registrations observed in recent weeks.

The impact of death registration efficiency will become much clearer in future death registration data, because most inquests that began after the Coronavirus Act 2020 was in effect are probably yet to appear in the data. Similarly, if efficiency has increased registrations, we may expect to observe a drop in registrations in the future when the number of deaths occurring to be registered has reduced.

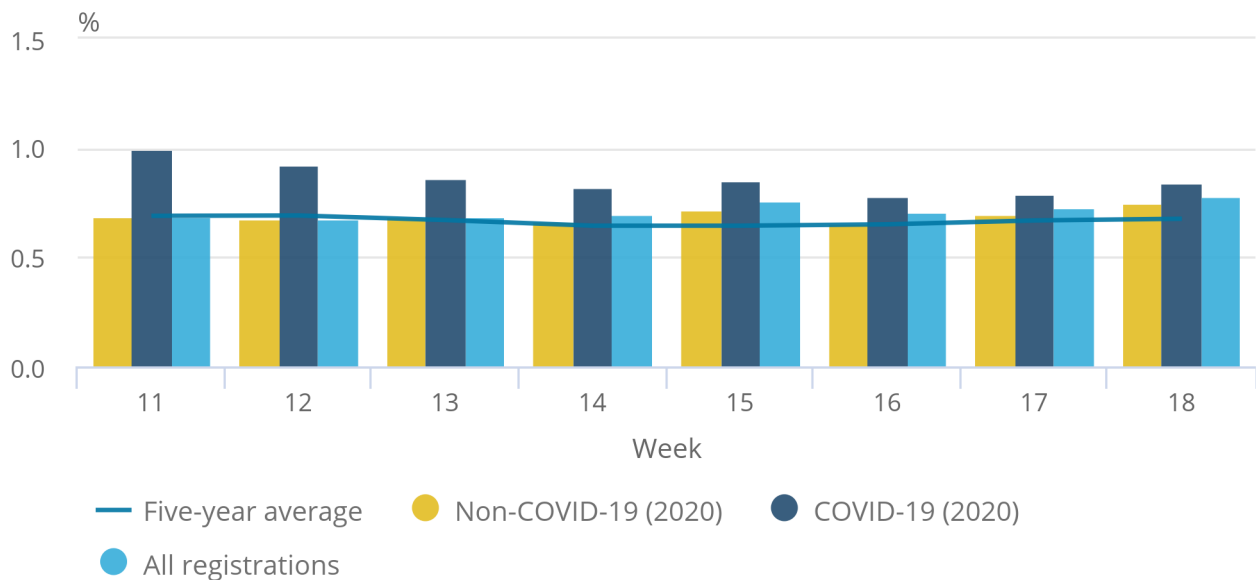


### Figure 17: All death registrations have been more efficient than the five-year average, especially in deaths involving COVID-19

The proportion of registrations made within seven days of death occurrence, by COVID-19-related deaths, England and Wales, Weeks 11 to 18 2020

### Figure 17: All death registrations have been more efficient than the five-year average, especially in deaths involving COVID-19

The proportion of registrations made within seven days of death occurrence, by COVID-19-related deaths, England and Wales, Weeks 11 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

#### Notes:

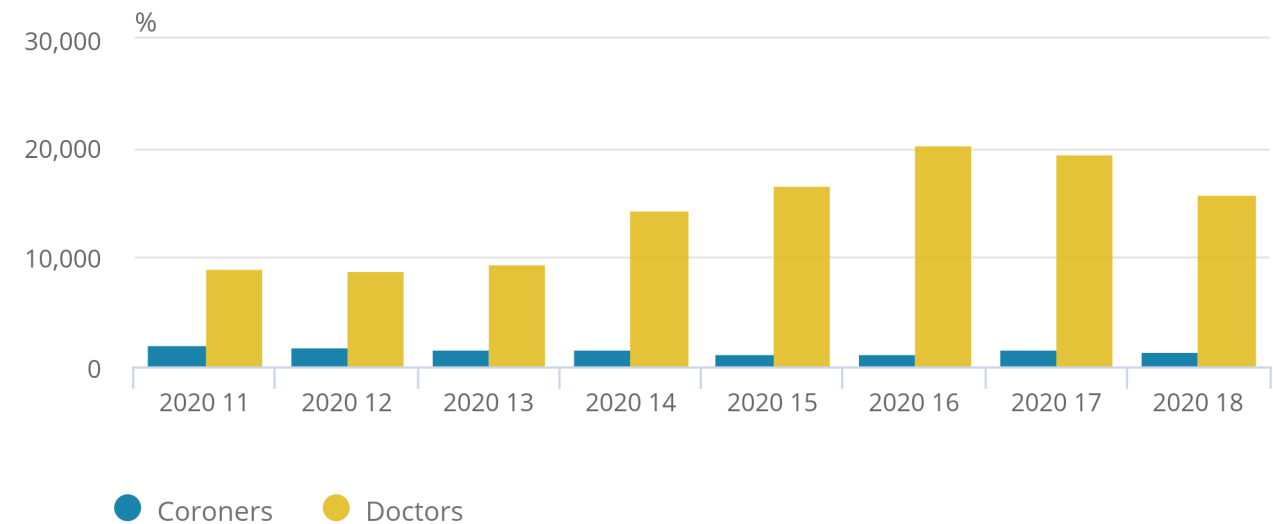
1. Figures include deaths of non-residents.
2. Based on date a death was registered rather than occurred.
3. All figures for 2020 are provisional.
4. The ICD-10 definitions for COVID-19 are U07.1 and U07.2.

**Figure 18: The proportion of death registrations made by doctors has increased since the Coronavirus Act 2020 was passed in Week 13**

Percentage of death registrations made by doctors and coroners in England and Wales, Weeks 11 to 18 2020

Figure 18: The proportion of death registrations made by doctors has increased since the Coronavirus Act 2020 was passed in Week 13

Percentage of death registrations made by doctors and coroners in England and Wales, Weeks 11 to 18 2020



Source: Office for National Statistics – Analysis of death registrations not involving coronavirus (COVID-19)

Notes:

- 1. Figures include deaths of non-residents.
- 2. Based on date a death was registered rather than occurred.
- 3. All figures for 2020 are provisional.
- 4. The ICD-10 definitions for COVID-19 are U07.1 and U07.2.
- 5. The bars for both registration types shown may not sum to the weekly totals as a small number of registrations are uncertified.

8 . Glossary

## Alcohol-specific causes

The following conditions are included in analysis of [alcohol-specific deaths](#), as they have a median registration delay short enough to understand trends in the latest weeks of data. These are alcohol-induced pseudo-Cushing's syndrome (E24.4), degeneration of nervous system due to alcohol (G31.2), alcoholic polyneuropathy (G62.1), alcoholic myopathy (G72.1), alcoholic cardiomyopathy (I42.6), alcoholic gastritis (K29.2), alcoholic liver disease (K70), alcohol-induced acute pancreatitis (K85.2), alcohol-induced chronic pancreatitis (K85.2), fetal-induced alcohol syndrome (dysmorphic) (Q86.0) and excess alcohol blood levels (R78.0). The causes that have not been included because of long median registration delays are mental and behavioural disorders because of the use of alcohol (F10), accidental poisoning by and exposure to alcohol (X45), intentional self-poisoning by and exposure to alcohol (X65), and poisoning by and exposure to alcohol, undetermined intent (Y15), which accounted for 20.2% of deaths due to alcohol-specific conditions in 2018. The median registration delays for 2018 can be found in our publication on [registration delays](#).

## Cancers with a moderate survival rate

For this article, cancers were analysed if treatment is likely to be extending life within a reasonable timescale. Those where survival is very high or very low were excluded as they are less likely to appear affected by reduced hospital capacity in the time frame presented. The cancers included in analysis are Non-Hodgkin lymphoma; cancer of the larynx, kidney, cervix, kidney and urinary tract, anus, bladder, urinary tract, colon, and ovary; rectal and colorectal cancers; leukaemia; and myeloma. These are the cancers with five-year age-standardised survival rates for all persons in the second and third quartiles, as found in our publication on [cancer survival rates](#).

## Coronavirus (COVID-19)

COVID-19 refers to the "coronavirus disease 2019" and is a disease that can affect the lungs and airways. It is caused by a type of coronavirus. [Further information](#) is available from the World Health Organization (WHO).

## Coronavirus Act 2020

The [Coronavirus Act 2020](#) is legislation to mitigate some impacts that COVID-19 would otherwise have had on the country's infrastructure.

Sections of the Coronavirus Act 2020 reduce the burden on staff registering deaths. This was implemented on 25 March 2020 and includes sections that:

- increase the time that a person is required to have been seen by a medical professional before death from 14 days to 28 days (or after death), before automatic referral to a coroner
- increase flexibility for the system of registration of birth, deaths and stillbirths and reduce the requirements to attend in person
- allow coroners not to conduct an inquest with a jury where it is suspected that a death was caused by COVID-19

## Coronaviruses

The WHO defines coronaviruses as "a large family of viruses that are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS)". Between 2001 and 2018, there were 12 deaths in England and Wales because of a coronavirus infection, with a further 13 deaths mentioning the virus as a contributory factor on the death certificate.

## Due to COVID-19

Due to COVID-19 refers only to deaths with an underlying cause of death as COVID-19.

## Excess deaths

Excess deaths denote the number of deaths greater than the expected number of deaths. For example, suppose on average 100 people died on this day over the past five years, but 120 died on the same day this year; this would mean there are 20 excess deaths.

## Involving COVID-19

Involving COVID-19 refers to deaths that had COVID-19 mentioned anywhere on the death certificate, whether an underlying cause or not.

## Non-COVID-19 excess deaths

Non-COVID-19 excess deaths refer to the number of deaths greater than the expected number of deaths where COVID-19 was not mentioned on the death certificate. For example, suppose on average 100 people died on this day in the past five years, but 150 died on the same day this year where 30 of those deaths mention COVID-19; this would mean there are 20 non-COVID-19 excess deaths.

## Pre-existing condition

A pre-existing condition is defined as any condition that either preceded the disease of interest (for example, COVID-19) in the sequence of events leading to death or was a contributory factor in the death but was not part of the causal sequence.

## Registration delay

Registration delay is the time between date of death occurrence and date of registration for that death, measured in days.

# 9 . Measuring the data

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the [Mortality statistics in England and Wales QMI](#).

To meet user needs, we publish very timely but provisional counts of death registrations in England and Wales in our [Deaths registered weekly in England and Wales, provisional dataset](#). These are presented by sex, age group and regions (within England) as well as for Wales as a whole. To allow time for registration and processing, these figures are published 11 days after the week ends.

To meet further user needs, we are providing more information in our [Deaths involving COVID-19, England and Wales bulletin](#). This information is presented by sex and age group. We are also providing age-standardised mortality rates (ASMRs) and age-specific mortality rates for recent time periods and breakdowns of deaths involving the coronavirus (COVID-19) by associated pre-existing health conditions.

The information used to produce these statistics is based on details collected when certified deaths are registered with the local registration office. The counts of deaths from specific conditions are updated with each [weekly publication](#) as the coding of the underlying cause is not always complete at the time of production. The doctor certifying a death can list all causes in the chain of events that led to the death and pre-existing conditions that may have contributed to the death. Using this information, we determine an underlying cause of death. More information on this process can be found in our [user guide](#).

In England and Wales, deaths should be registered within five days of the death occurring, but there are some situations that result in the registration of the death being delayed. For example, when a death needs to be investigated by a coroner.

Week 16 (week ending 17 April 2020) includes the Easter Monday bank holiday. Based on past years, we would expect the proportion of deaths registered in the week including Easter Monday to drop for the period. The [Coronavirus Act 2020](#) permitted Registry Offices to continue to take death registrations over the holiday period this year. This may reduce the usual drop in registration of deaths occurring in the week.

The figures in this report are populated with more recent and updated data than earlier Office for National Statistics (ONS) publications covering the same time period. This provides more accurate, stable figures that were not available in previous publications where there was a requirement for more timely data.

These figures are different from the daily surveillance figures on COVID-19 deaths published by the Department of Health and Social Care (DHSC) on the GOV.UK website, for the UK as a whole and its constituent countries. Figures in this report are derived from the formal process of death registration and may include cases where the doctor completing the death certificate diagnosed possible cases of COVID-19, for example, where this was based on relevant symptoms but no test for the virus was conducted. Our figures also include any deaths that occur outside hospital. Our blog [Counting deaths involving the coronavirus \(COVID-19\)](#) helps to explain the differences.

In contrast to the GOV.UK figures, we include only deaths registered in England and Wales, which is the legal remit of the ONS. Table 1 provides an overview of the differences in definitions between sources.

Table 1: Definitions of COVID-19 deaths between different sources

	<b>DHSC COVID-19 (as published on GOV.UK) before 29 April</b>	<b>DHSC COVID-19 (as published on GOV.UK) from 29 April</b>	<b>ONS COVID-19 deaths registered</b>	<b>ONS COVID-19 death occurrence (actual date of death)</b>	<b>NHS England</b>
Coverage	UK (however we only include England and Wales breakdowns for comparable coverage with ONS data)	UK (however we only include England and Wales breakdowns for comparable coverage with ONS data)	Registrations in England and Wales  In discussions with devolved nations to create UK estimates in the near future	Registrations in England and Wales  In discussions with devolved nations to create UK estimates in the near future	England
Inclusion	Deaths in hospitals  Deaths where patient has been tested for COVID-19	Includes any place of death, including care homes and community  Deaths where patient has been tested for COVID-19	Any place of death, including Nursing homes  Deaths where COVID-19 has been mentioned on the death certificate	Any place of death, including Nursing homes  Deaths where COVID-19 has been mentioned on the death certificate	Deaths in hospitals  Deaths where patient has been tested for COVID-19
Timeliness	Provided daily but not officially registered	Provided daily but not officially registered	Weekly registrations are 11 days behind because of the time taken to register, process and publish  Registered in the week ending 8 May (Week 19)	Weekly registrations are 11 days behind because of the time taken to register, process and publish  Deaths which occurred in Week 19 but were registered up to 2 May	Updated daily for each date of death

Source: Office for National Statistics – Deaths registered weekly in England and Wales

Our [User guide to mortality statistics](#) provides further information on data quality, legislation and procedures relating to mortality and includes a [glossary of terms](#).

## 10 . Strengths and limitations

Deaths are cause coded using the World Health Organization's (WHO) [International Classification of Diseases \(ICD\)](#). Deaths are coded to ICD-10 using IRIS software (version 2013). Cause of death reported here represents the final underlying cause of death for ages 28 days and over. This takes account of additional information received from medical practitioners or coroners after the death has been registered.

Figures are based on the date the death was registered, not when it occurred. Deaths considered unexpected, accidental or suspicious will be referred to a coroner who may order a post-mortem or carry out a full inquest to ascertain the reasons for the death; the investigation is known as an "inquest" and can take months and sometimes years. The amount of time it takes to complete an inquest creates what is known as a "registration delay", which is a lag between the date of death and the date of death registration. This means that there are some deaths that have occurred but have not been registered yet. More information on registration delay can be found in our [impact of registration delays release](#).

Figures produced for excess deaths are calculated by comparing the number of deaths recorded each week in 2020 with the five-year average – the average number of deaths recorded in the corresponding week in 2015 to 2019. The five-year average is an estimate of the expected number of deaths each week. Other methodologies are also possible when estimating weekly deaths, although each method has its strengths and limitations. Mortality statistics from the Office for National Statistics (ONS) are usually compared against the five-year average to calculate excess deaths. The limitation with this methodology is in the variance of each year's data, particularly around bank holidays, which affect the numbers of registrations and can occur in different weeks in different years. Other factors causing variation in the five-year average are the relative impact of the winter flu season and changes in the size and age of the population.

In early weeks of 2020 (Weeks 3 to 12), the numbers of deaths registered each week were generally lower than the five-year average registrations. If in general the 2020 mortality rate was lower than the five-year average, then comparing latest weeks to the five-year average might underestimate excess deaths, because the average presents more deaths than would otherwise have been expected for these weeks in 2020. However, this could also mean there were more vulnerable people still alive at the start of the coronavirus pandemic than typically for this time of year in other years, so we may have expected higher numbers of deaths in Weeks 13 to 18 to compensate.

In this publication, the difference between the weekly deaths in 2020 and the five-year average (excess deaths) and the weekly deaths as a percentage of the five-year average are used to quantify the extent to which mortality is higher or lower than expected. An alternative method of calculating the number of excess deaths is to calculate the number of deaths beyond the upper confidence limit, which could result in an underestimation of excess deaths. [Other methods](#) of comparing recorded deaths to the predicted numbers include p scores and z scores. The p score is calculated by dividing the observed excess deaths by the predicted deaths. The z score is instead calculated by dividing excess deaths by the variation in the predicted deaths.

The majority of figures in this report are the number of deaths or comparisons of proportions, not age-standardised mortality rates (ASMRs). ASMRs account for the population size and age structure, while the number gives the total number of deaths.

Provisional death registrations and death occurrences data are used in this bulletin. This enables timely analysis to be completed to monitor mortality trends. However, as the data are provisional, they are subject to change.

Further analysis was explored but excluded from this report where data were insufficient, such as suicides, drugs and violence where the registration or health implications are delayed. At a future date when more data are available, further analysis on these data could be explored.

We have used the most up-to-date communal establishment file we have for both 2019 and 2020 data. Therefore, there is some potential for under and over coverage within the figures provided.

## Daily registrations

It is noteworthy to mention bank holidays fell on 10 April and 13 April 2020 to mark the Easter break. In the five-year average, Easter typically results in a delay in registrations because of this. However, in the current circumstances, registrars are working more flexibly and often over the weekend and holidays; therefore, this has diluted this pattern of registrations for 2020 somewhat.



