Coronavirus (COVID-19) Review: data and analysis, March to October 2020

Office for National Statistics

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Deaths

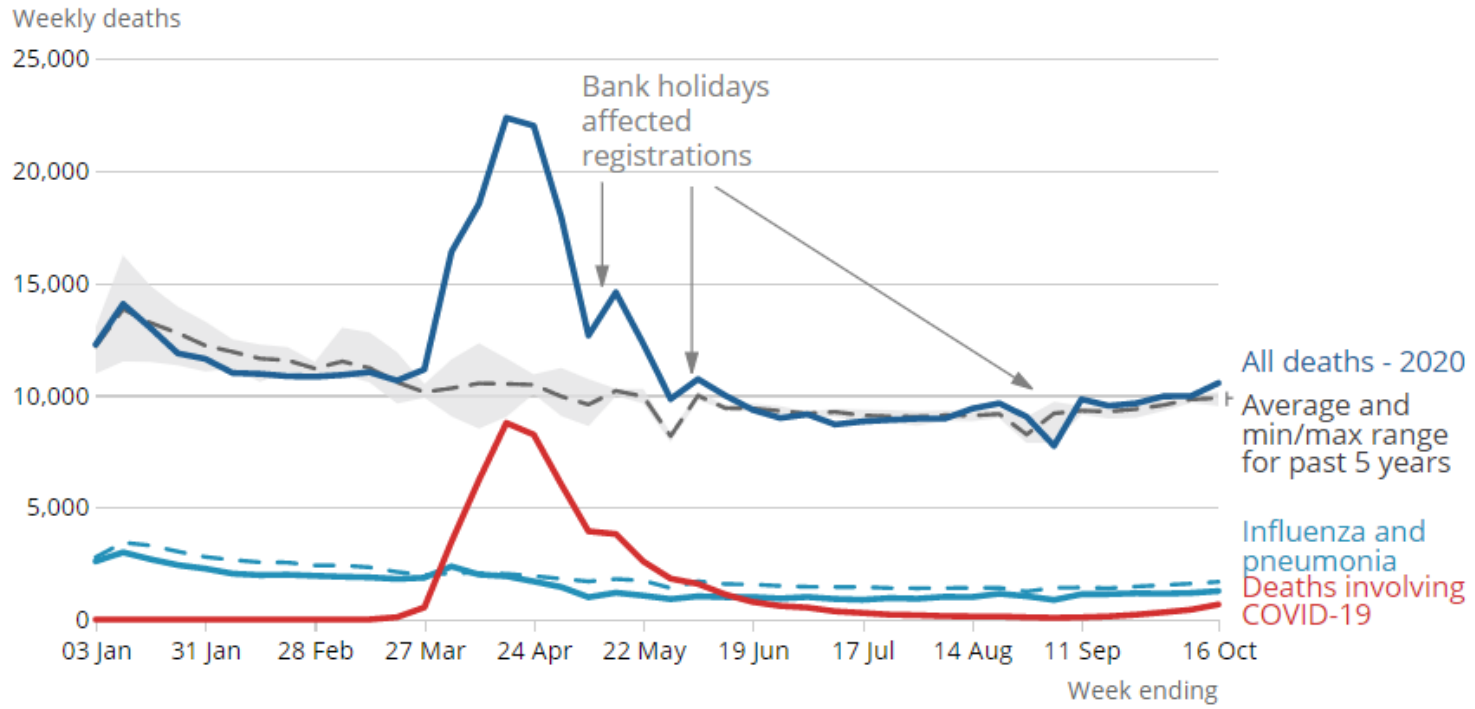
This section includes analysis on the number and rate of death related to COVID-19 as well as how different populations of our society have been affected

The number of deaths registered in England and Wales this year up to 16 October 2020 was 484,206; 55,092 more than the five-year average

- From the start of the year to week ending 20 March 2020, 138,916 deaths were registered, which was 4,822 fewer than the five-year average for these weeks; this was likely because of the mild winter and low flu circulation.
- However, between Weeks 13 and 42 of 2020, 345,320 deaths were registered, which was 55,092 more than the five-year average.
- COVID-19 has had a large impact on the number of deaths registered over the last few months and is the main reason for deaths increasing above what is expected (the five-year average).
- The disease has had a larger impact on those most vulnerable and those at older ages; some of these deaths would have likely occurred over the duration of the year but have occurred earlier because of COVID-19; this could contribute to a period of deaths below the five-year average.
- Looking at the year-to-date, the number of deaths for England was 454,396 and in Wales was 29,112, which is 52,421 (13.3%) and 2,215 (8.2%) more than the five-year average, respectively.

The number of weekly deaths from all causes was above the five-year average throughout April and May 2020

Number of deaths registered by week, England and Wales, 28 December 2019 to 16 October 2020



Source: Deaths registered weekly in England and Wales, provisional

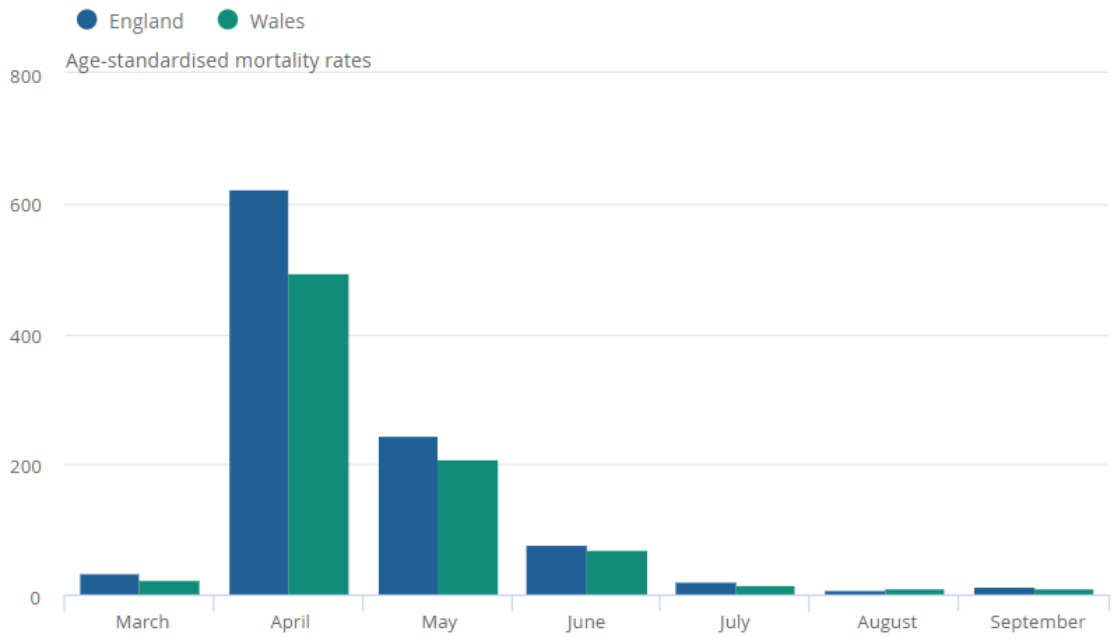
Lead analysts: Sarah Caul and Danielle Cornish

Of the deaths registered by 16 October 2020, 54,325 mentioned COVID-19 on the death certificate, 11.2% of all deaths in England and Wales

- In England, 51,553 deaths registered by 16 October 2020 mentioned COVID-19, 11.3% of all deaths.
- In Wales, 9.5% of all deaths registered so far in 2020 involved COVID-19 (2,697 deaths).
- The age-standardised mortality rate for deaths due to COVID-19 peaked at 623.2 deaths per 100,000 persons in England and 495.1 in Wales in April 2020.
- COVID-19 was the leading cause of death in England and Wales in both April and May 2020. For example in April, the number of deaths due to COVID-19 was more than double the number of deaths due to Dementia and Alzheimer's disease (the next most common cause of death) in England.
- In September 2020, the age-standardised mortality rate of deaths due to COVID-19 was 12.6 per 100,000 persons in England and 10.8 in Wales.
- In September 2020, COVID-19 was the 19th most common cause of death in England and the 24th most common cause of death in Wales.

Mortality rates due to COVID-19 increased for the first time since April 2020

Age-standardised mortality rates for deaths due to COVID-19, England and Wales, deaths registered in March to September 2020



Source: Monthly Mortality Analysis, England and Wales: September 2020

Lead Analyst: Sarah Caul

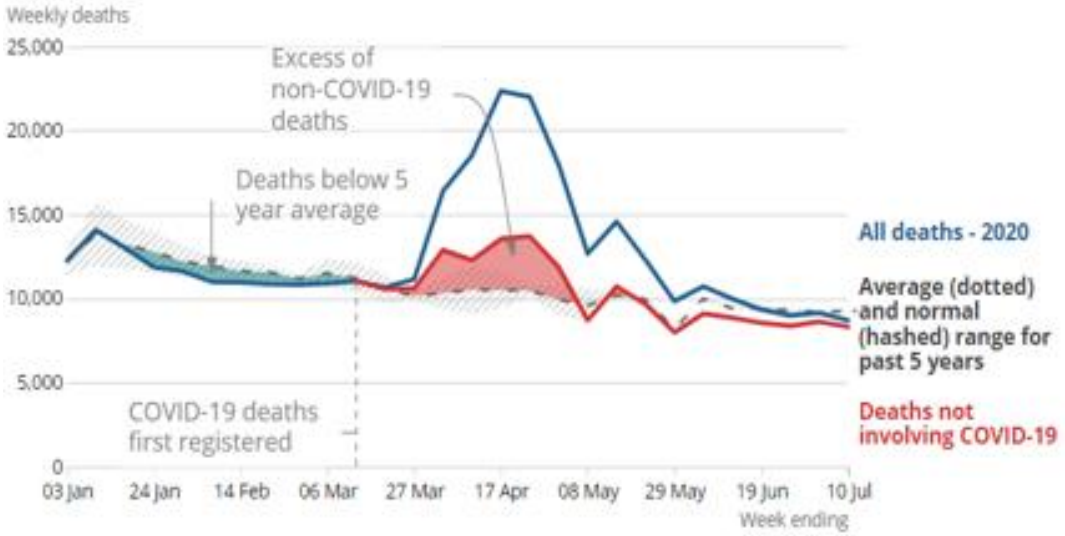
Non-COVID-19 excess deaths peaked during COVID-19 deaths' peak in April 2020, and have since returned to below average levels; but the composition of such deaths remains different

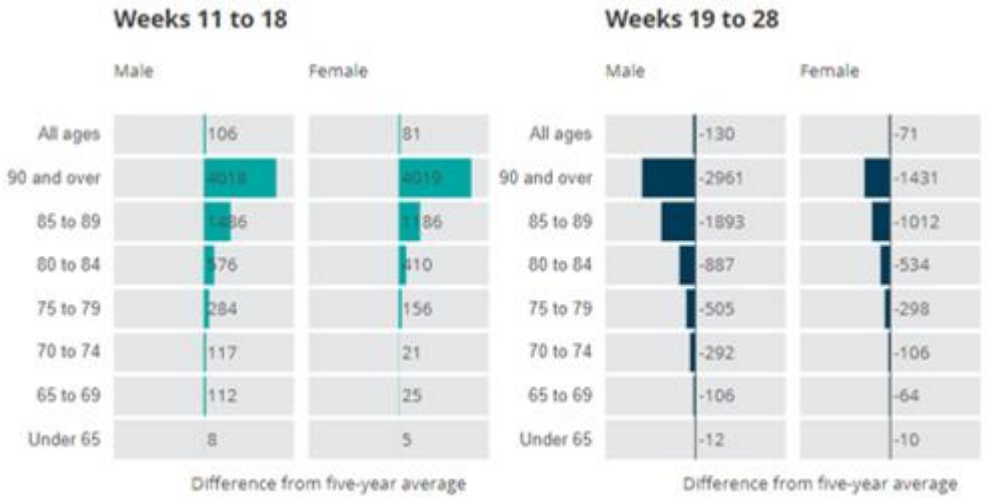
- Between week ending 13 March 2020 (the first week with a death due to COVID-19 registered) and week ending 1 May), non-COVID-19 deaths exceeded the five-year average for the period by 15.3%.
- From then until week ending 10 July 2020, non-COVID-19 deaths have returned to a level comparable with January and February 2020: 6.0% below the five-year average.
- As with COVID-19 deaths, non-COVID-19 deaths remain above five-year average levels for deaths in private homes; non-COVID-19 deaths in hospitals have been below average levels throughout 2020; deaths in care homes not involving COVID-19 increased during the first spike of COVID-19 deaths, then reduced to below average levels since.
- The age groups for which most non-COVID-19 deaths were registered are older age groups, particularly those aged 80 years and over. From weeks ending 2 May to 10 July 2020, the same groups that experienced the greatest increases in mortality in March to May have experienced the greatest reduction in mortality compared with five-year average levels.

Non-COVID-19 excess deaths peaked during COVID-19 deaths' peak in April 2020, and have since returned to below average levels in recent weeks; but the composition of such deaths remains different

- Causes of death such as dementia and Alzheimer's disease, and "symptoms, signs and ill-defined conditions" (usually an indicator of senility) increased for non-COVID-19 deaths when COVID-19 deaths peaked earlier in 2020; while most leading causes of deaths have returned to levels comparable with the start of the year, causes such as diabetes and heart conditions continue to be recorded on death registrations above average levels.
- Deaths in care homes, for older adults, and for some causes of death, which increased to well above average levels earlier in the year, all reduced to below five-year average levels in May to early July 2020. This may suggest deaths were brought forward by only a short amount of time.

Non-COVID-19 excess deaths peaked during COVID-19 deaths' peak in April 2020, and have since returned to below average levels in recent weeks; but the composition of such deaths remains different





Source: Analysis of death registrations not involving coronavirus (COVID-19), England and Wales

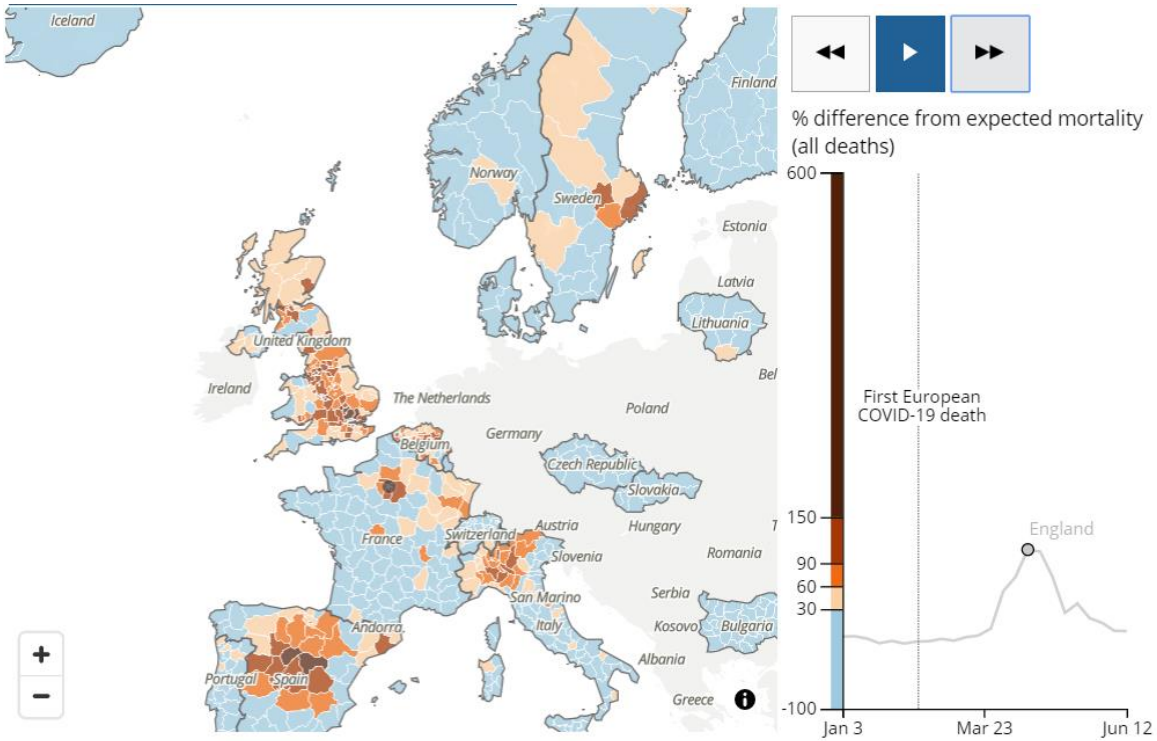
Lead analysts: Greg Ceely

England had the longest continuous period of excess mortality of any European country compared, resulting in England having the highest levels of excess mortality in Europe for the period as a whole

- Because of the pandemic, the first half of 2020 saw extraordinary increases in mortality rates across countries in Western Europe above the 2015 to 2019 average.
- The highest peak excess mortality at national level was in Spain, with some local areas in Northern Italy and Central Spain having excess mortality levels as high as 847.7% of the average.
- Of the four nations of the UK, England had the highest peak excess mortality (107.6% in week ending 17 April 2020).
- While none of the four UK nations had a peak mortality level as high as Spain or the worst-hit local areas of Spain and Italy, excess mortality was geographically widespread throughout the UK during the pandemic, whereas it was more geographically localised in most countries of Western Europe.
- Combined with the relatively slow downward “tail” of the pandemic in the UK, this meant that by the end of May 2020, England had seen the highest overall relative excess mortality out of all the European countries compared.

Peaks of excess mortality were geographically localised in the countries of Western Europe

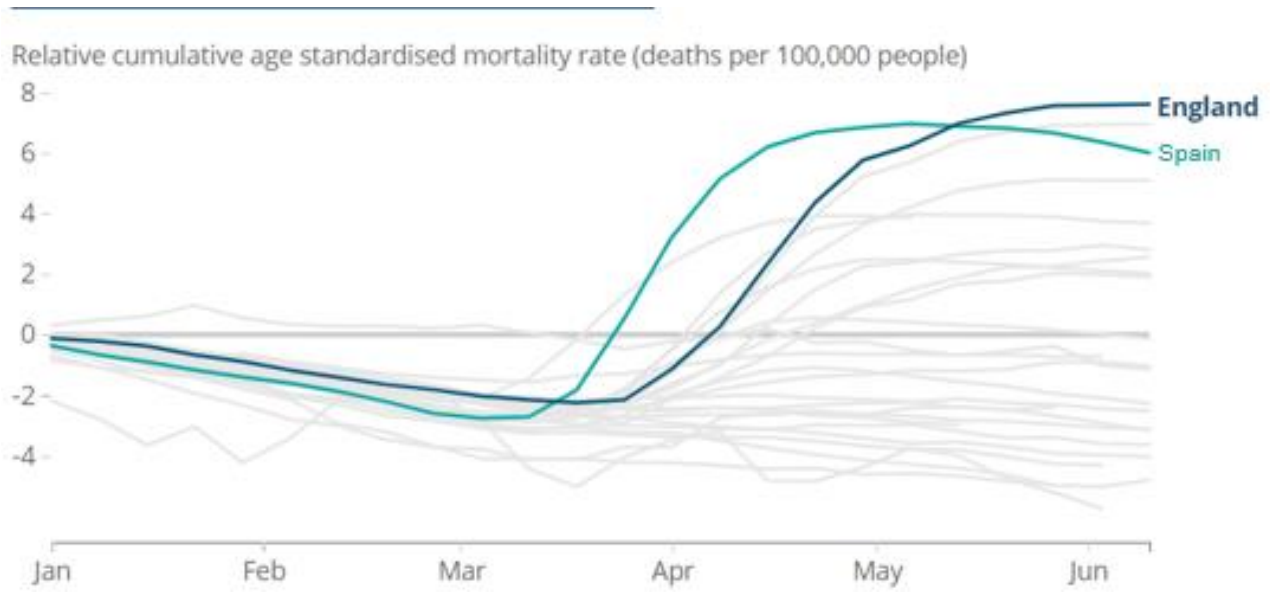
Map showing relative age-standardised mortality rates by week and NUTS3 region of Europe



Source: [Comparisons of all-cause mortality between European countries and regions: January to June 2020]

By week ending 29 May 2020, England had the highest relative cumulative age-standardised mortality rate in Europe

Relative cumulative age-standardised mortality rates for selected European countries



Source: Comparisons of all-cause mortality between European countries and regions: January to June 2020

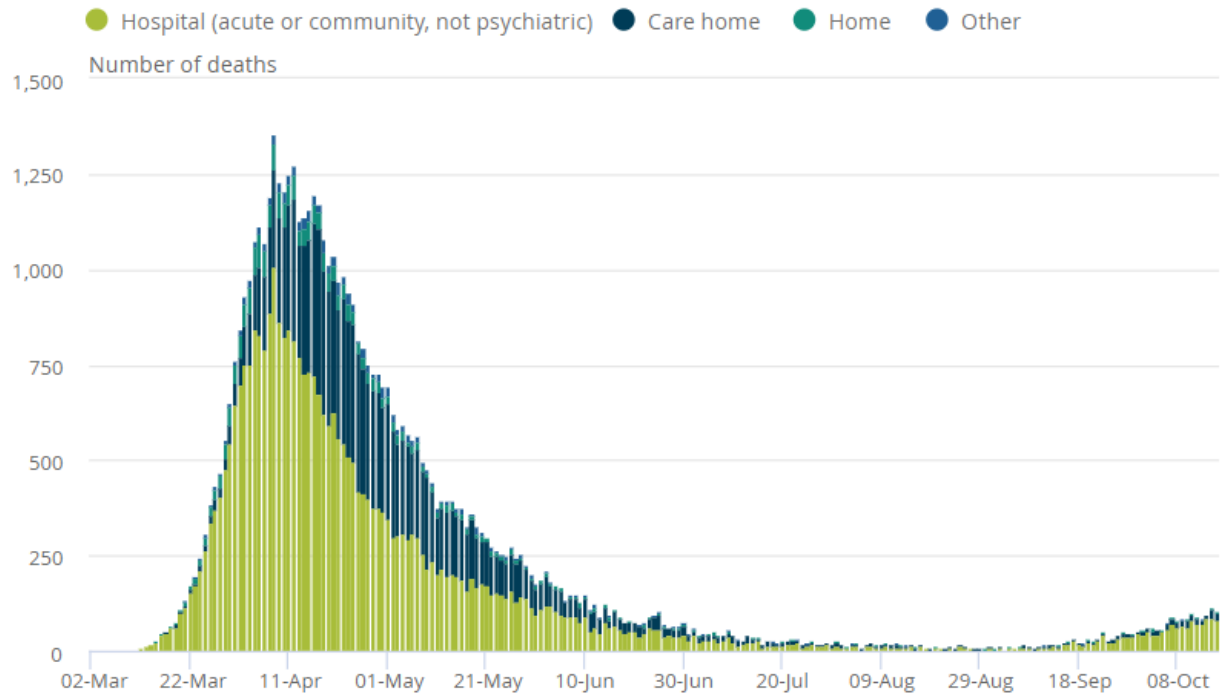
Lead analysts: Annie Campbell and Edward Morgan

Most deaths involving COVID-19 in England and Wales have been in hospitals and care homes, but overall deaths in private homes remain higher than expected based on the five-year average

- Of all deaths involving COVID-19 registered up to Week 42 (week ending 16 October 2020) in England and Wales, 63.9% occurred in hospital (34,709 deaths).
- The remainder mainly occurred in: care homes (29.1%; 15,819 deaths), private homes (4.8%; 2,594 deaths) and hospices (1.4%; 767 deaths).
- The number of excess deaths (above the five-year average) peaked in April 2020 across all settings.
- Excess deaths in hospitals and care homes have since declined, and have been around or below the five-year average since June 2020, but, excess deaths in private homes have remained above the five-year average; in the most recent week of data (Week 42), the number of deaths in private homes was 776 deaths higher than the five-year average.
- Looking in more detail at deaths in private homes in the most recent week of data, males accounted for 364 excess deaths, compared to 412 for females. While those aged 70 years and over accounted for the majority of the excess (662 deaths in people aged 70 years and over, compared with 114 in people aged under 70 years).

More than 75% of all deaths involving COVID-19 occurred in hospitals

Number of deaths involving COVID-19 by place of occurrence, England and Wales, occurring up to 16 October 2020 and registered up to 24 October 2020

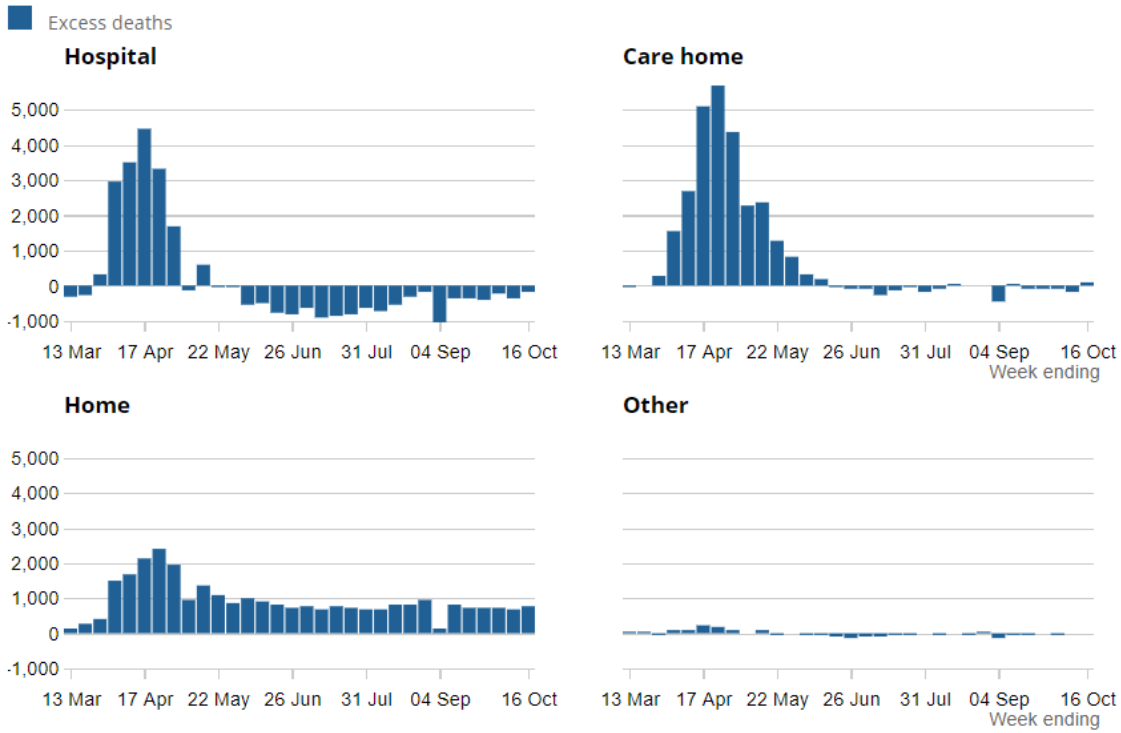


Source: Deaths registered weekly in England and Wales, provisional

Lead analysts: Sarah Caul and Danielle Cornish

Deaths in private homes remain above the five-year average

Number of excess deaths by place of occurrence, England and Wales, registered between 7 March 2020 and 16 October 2020



Source: Deaths registered weekly in England and Wales, provisional

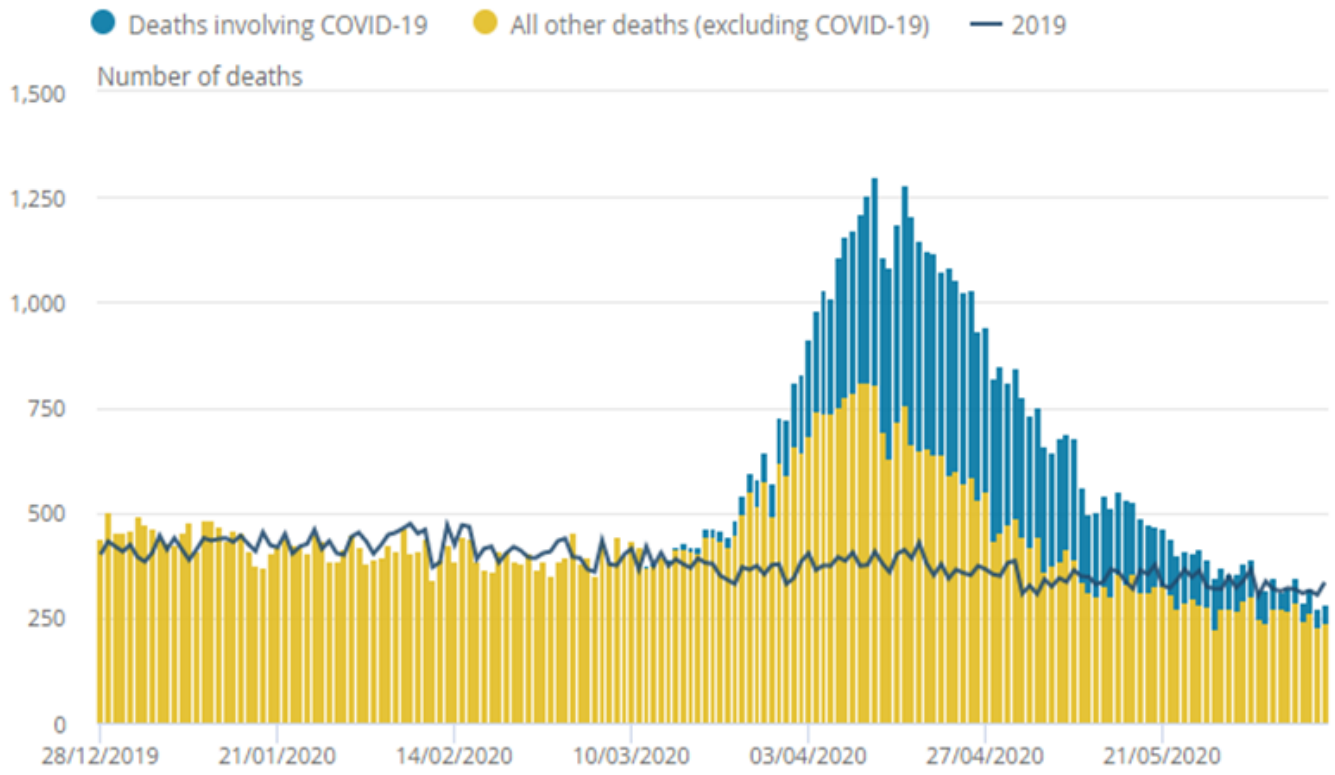
Lead analysts: Sarah Caul and Danielle Cornish

Deaths among care home residents peaked in mid- April; between 2 March and 12 June 2020 (registered up to 20 June 2020), there were 19,394 deaths involving COVID-19, which was 29.3% of all deaths of care home residents.

- During the coronavirus (COVID-19) pandemic, there was an increase in the number of deaths of care home residents above the numbers we saw in 2019.
- Looking at place of death; of deaths involving COVID-19 among care home residents, 74.9% (14,519 deaths) occurred within a care home and 24.8% (4,810 deaths) occurred within a hospital.
- From 2 March 2020, of all deaths in hospital involving COVID-19, 15.5% could be accounted for by care home residents.
- COVID-19 was the leading cause of death in male care home residents, accounting for 33.5% of all deaths, and the second leading cause of death in female care home residents, after Dementia and Alzheimer's disease, accounting for 26.6% of all deaths.
- Dementia and Alzheimer's disease was the most common main pre-existing condition and was involved in 49.5% of all deaths of care home residents involving COVID-19.

The number of deaths among care home residents peaked in mid-April 2020

Number of deaths of care home residents from 28 December 2019 to 12 June 2020, registered up to 20 June 2020, England and Wales



Source: Deaths involving COVID-19 in the care sector, England and Wales: deaths occurring up to 12 June 2020 and registered up to 20 June 2020 (provisional)

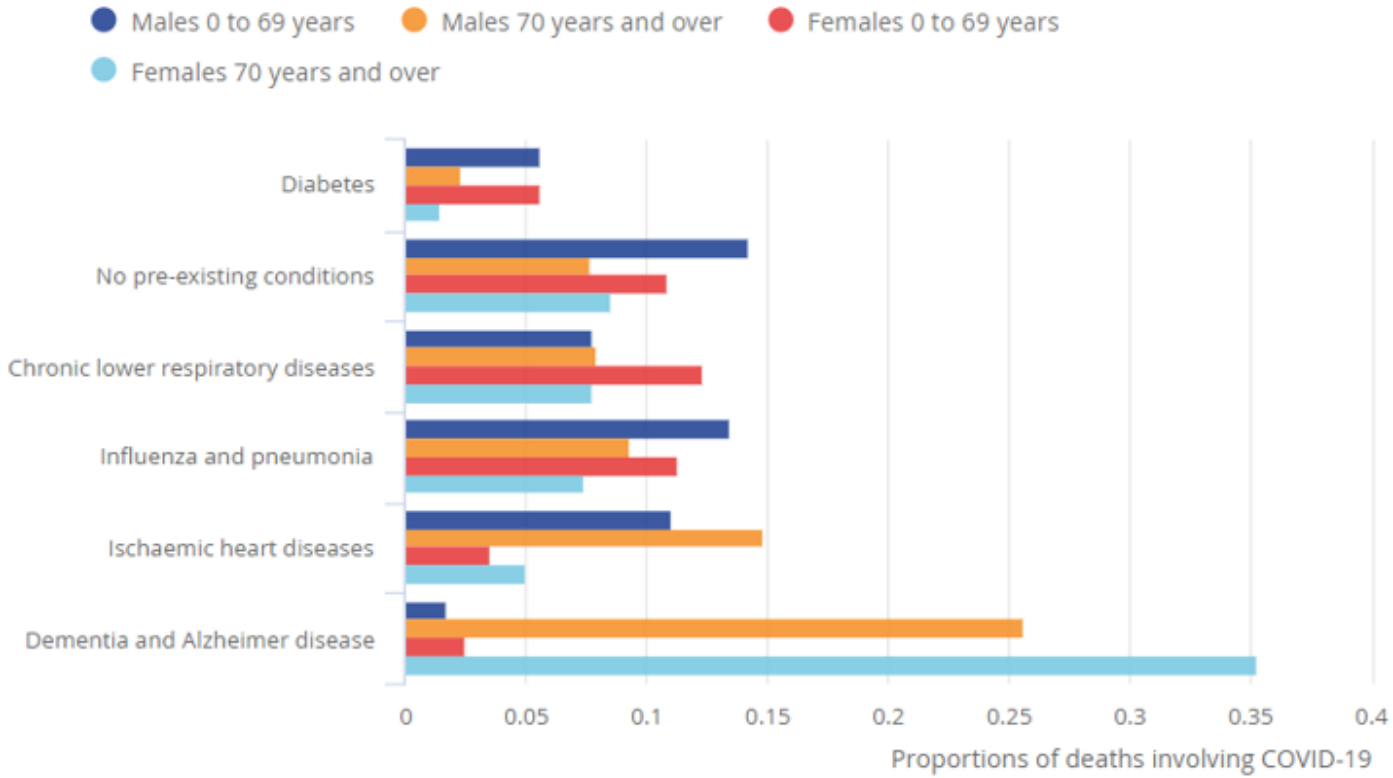
Lead analyst: Sophie John

9 out of 10 deaths involving COVID-19 in March to June 2020 involved at least one pre-existing condition; Dementia and Alzheimer’s disease was the most common main pre-existing condition, followed by ischaemic heart diseases

- Of the deaths involving COVID-19 that occurred in England and Wales in March to June 2020, there was at least one pre-existing condition in 91.1% of cases, while 8.9% had no pre-existing conditions.
- Focussing on the main pre-existing condition (the conditions that is most likely to be the underlying cause of death for a person of that age and sex had they not died from COVID-19), Dementia and Alzheimer’s disease was the most common main pre-existing condition; 25.6% of all deaths involving COVID-19 had Dementia and Alzheimer's disease as a main pre-existing condition.
- Ischaemic heart diseases were the second most common main pre-existing condition, involved in 9.9% of all deaths involving COVID-19.
- The most common main pre-existing conditions differed by age group; for people younger than 70 years, "No pre-existing conditions" ranks much higher than in those aged 70 years and over, where conditions such as Dementia and Alzheimer’s disease are much more prominent.

Dementia and Alzheimer's disease was the most common main pre-existing health condition in deaths involving COVID-19 between March and June 2020

Proportion of deaths involving COVID-19 by main pre-existing condition, sex and age, England and Wales, occurring in March to June 2020



Source: Deaths involving COVID-19, England and Wales: deaths occurring in June 2020

Lead analysts: Annie Campbell and Sarah Caul

There were 3.4 times as many deaths due to COVID-19 compared with deaths due to influenza and pneumonia between January and August 2020 in England and Wales

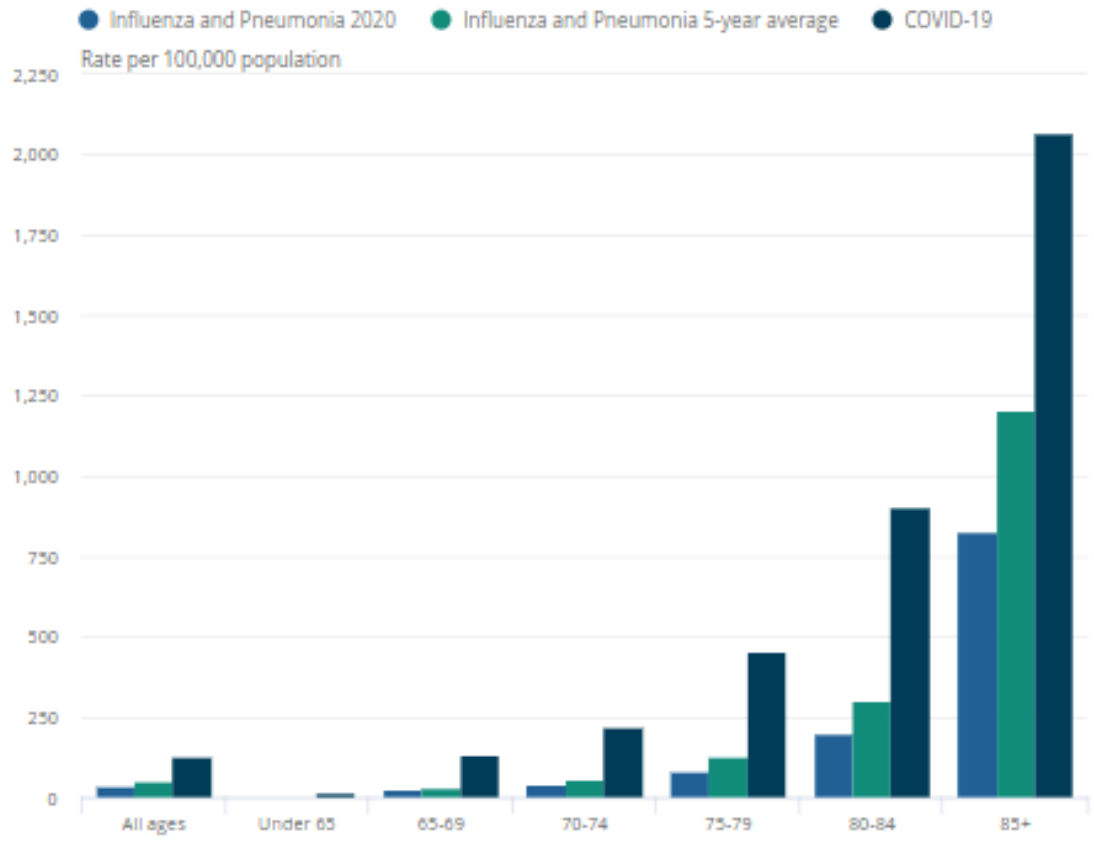
- Of all death occurrences between January and August 2020, there were 48,168 deaths due to COVID-19, compared with 13,619 deaths due to pneumonia and 394 deaths due to influenza.
- Influenza and pneumonia was mentioned on more death certificates than COVID-19, however, COVID-19 was the underlying cause of death in over three times as many deaths between January and August 2020.
- The highest number of deaths due to influenza and pneumonia occurred in January 2020, however, influenza and pneumonia deaths were below the five-year average (2015 to 2019) in every month between January and August 2020.
- Deaths due to COVID-19 were higher than deaths due to influenza and pneumonia between March and June 2020.

COVID-19 mortality rates were statistically significantly higher than mortality rates for influenza and pneumonia

- Age-standardised and age-specific mortality rates for deaths due to COVID-19 were statistically significantly higher than mortality rates due to influenza and pneumonia when compared with the five-year average and 2020 rates.
- The proportion of deaths occurring in care homes due to COVID-19 was almost double the proportion of deaths due to influenza and pneumonia (30.0% and 15.2% respectively).
- In comparison with the deaths due to influenza and pneumonia occurring in the year to 31 August 2020, COVID-19 has been higher than every year monthly data are available (1959 to 2020).

COVID-19 mortality rates were higher than influenza and pneumonia rates for 2020 and the five-year average for all age groups in England

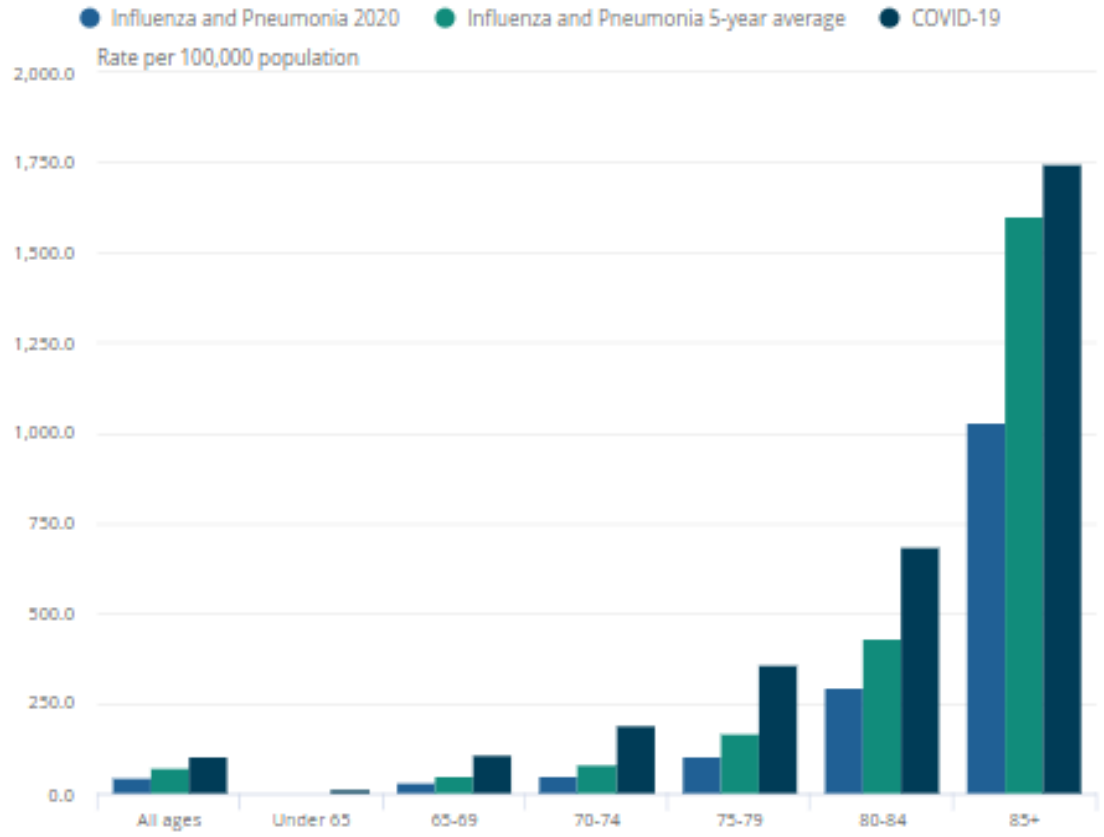
Age-standardised mortality rates for deaths due to influenza and pneumonia, and COVID-19, England, occurring between 1 January and 31 August 2020 and registered by 5 September 2020



Source: Deaths due to coronavirus (COVID-19) compared with deaths from influenza and pneumonia, England and Wales, deaths occurring between 1 January and 31 August 2020

Those aged 85 and over had statistically significantly higher rates than all other age groups for deaths due to influenza, pneumonia and COVID-19 in Wales

Age-standardised mortality rates for deaths due to influenza and pneumonia and COVID-19, Wales, occurring between 1 January and 31 August 2020, registered by 5 September 2020



Source: Deaths due to coronavirus (COVID-19) compared with deaths from influenza and pneumonia, England and Wales, deaths occurring between 1 January and 31 August 2020

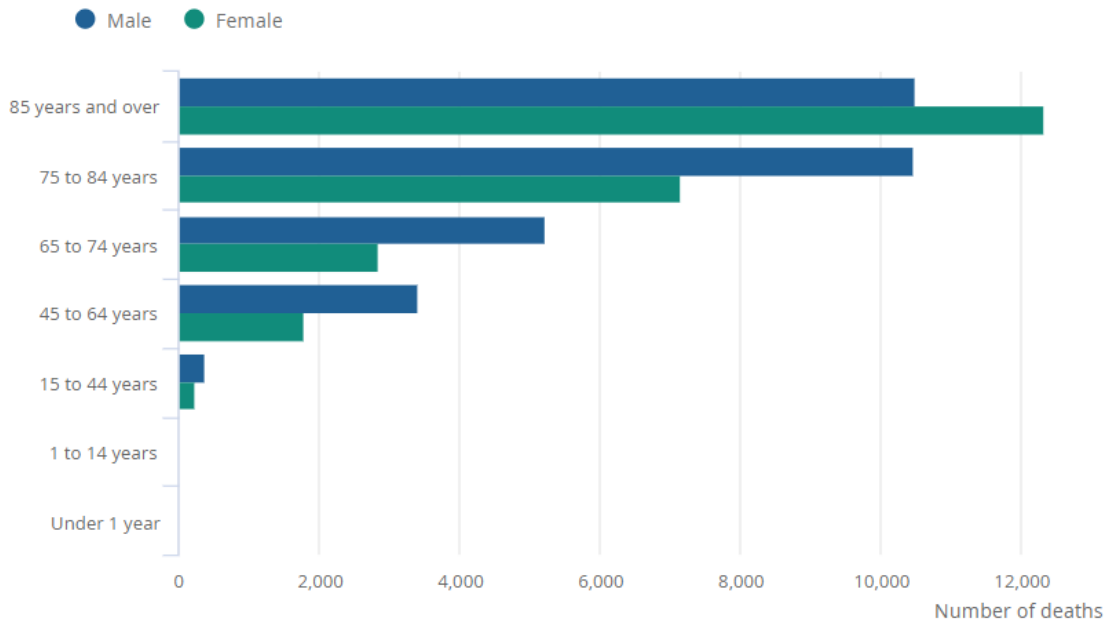
Lead analyst: Rachel Rushton

So far in 2020, males had a higher mortality rate due to COVID-19 than females, and the mortality rate increased with age in both sexes

- Looking at the year-to date (up to 16 October 2020), for all age groups except 85 years and over, there have been more deaths involving COVID-19 in males than in females; so far in 2020, 55.2% of all deaths involving COVID-19 were in males.
- There were more deaths in females in the age group of aged 85 years and over (12,330) than males (10,505), possibly because of the over-85-years female population being larger than the over-85-years male population in England and Wales.
- Age-standardised mortality rates (ASMRs) are a better measure of mortality than the number of deaths, as they account for the population size and age structure; using ASMRs, males had a significantly higher rate of death due to COVID-19 than females between March and June 2020.
- The ASMR for deaths due to COVID-19 for males in England was 781.9 deaths per 100,000 males, compared with 439.0 deaths per 100,000 females in April 2020; in Wales, the rate was 630.6 deaths per 100,000 males compared with 363.2 deaths per 100,000 females.
- Looking at the age-specific mortality rates due to COVID-19, the mortality rate increased consistently with age in both sexes, with those aged 90 years and over having the highest rate of death.

The number of deaths involving COVID-19 was highest in males across the majority of age groups

Number of deaths involving COVID-19 by sex and age group, England and Wales, registered between 28 December 2019 and 16 October 2020



Source: Deaths registered weekly in England and Wales, provisional; Deaths involving COVID-19, England and Wales

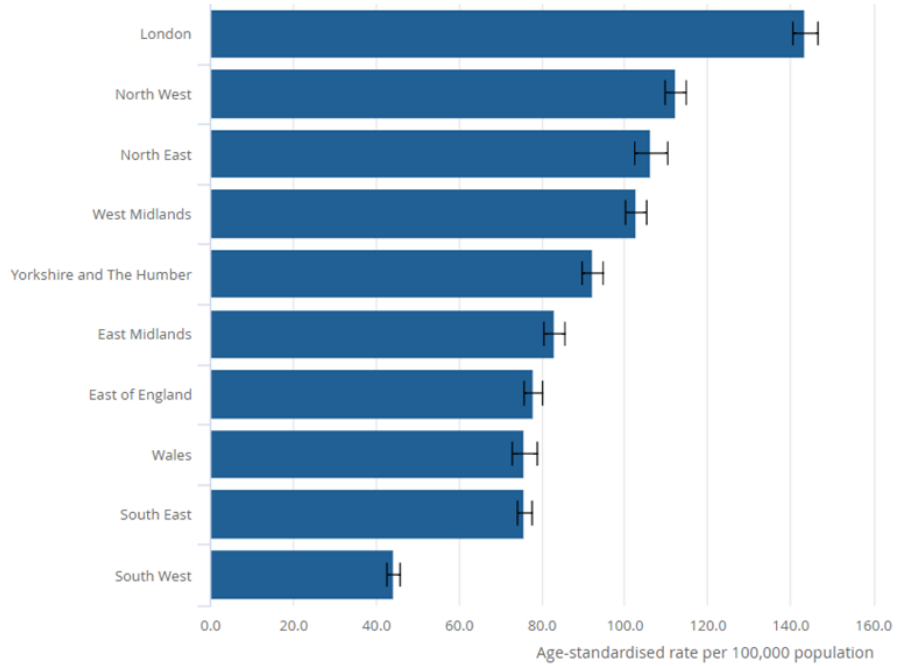
Lead analysts: Sarah Caul and Danielle Cornish

London had the highest age-standardised mortality rate for deaths involving COVID-19 in March to July 2020 while the lowest rates were found in sparse, rural settings across England and Wales

- Between March and July 2020, London had the highest ASMRs with 143.4 deaths involving COVID-19 per 100,000 people; this was significantly higher than any other region in England. Between April and July 2020, London's COVID-19 mortality rate dropped the most between, with a 98.7% decrease.
- Of the 10 local authorities with the highest ASMRs for deaths involving COVID-19 over this period, nine were London boroughs; Brent had the highest overall ASMRs with 218.3 deaths per 100,000 people, followed by Newham (203.4) and Hackney (186.6).
- The most deprived areas in Wales had ASMRs for deaths involving COVID-19 of 121.4 deaths per 100,000, nearly twice as high as in the least deprived areas (66.5 deaths per 100,000 people).
- The highest COVID-19 ASMRs were in urban major conurbations, with 132.8 deaths per 100,000 people; this was statistically significantly higher than all other rural-urban categories in England and Wales; the lowest rates were all found in sparse settings; rural hamlets and isolated dwellings in a sparse setting had the lowest ASMR of 24.4 deaths per 100,000 people.

London had the highest COVID-19 mortality rate between March and July 2020

Age-standardised mortality rates for deaths involving the coronavirus (COVID-19), per 100,000 population, English regions and Wales, deaths occurring between 1 March and 31 July 2020



Source: Deaths involving COVID-19 by local area and socioeconomic deprivation: deaths occurring between 1 March and 31 July 2020

Lead analysts: Sarah Caul and Danielle Cornish

People of Black and South Asian ethnic background have increased risk of death involving COVID-19 compared with those of White ethnic background

Deaths involving COVID-19 by ethnic group in England and Wales for period 2 March to 28 August 2020

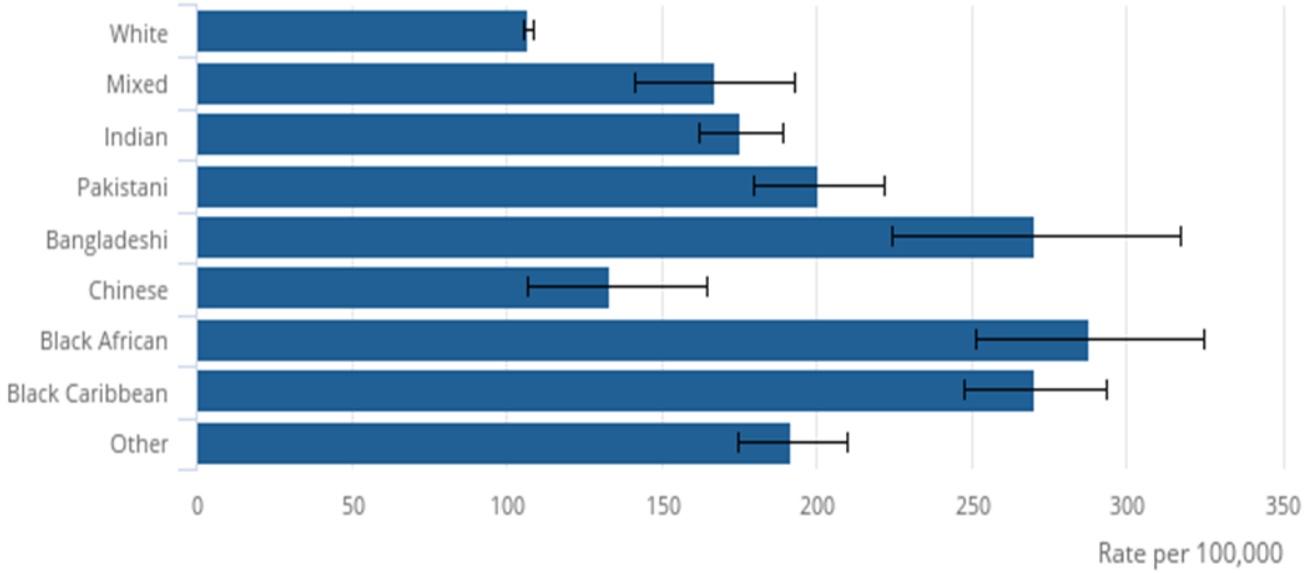
- Males and females of Black and South Asian ethnic background were shown to have increased risks of death involving COVID-19 compared with those of White ethnic background.
- Males of Black African ethnic background had the highest rate of death involving COVID-19, 2.7 times higher than males of White ethnic background.
- Females of Black Caribbean ethnic background had the highest rate of death involving COVID-19, 2.0 times higher than females of White ethnic background.
- All ethnic minority groups other than Chinese had a higher rate than the White ethnic population for both males and females.

When adjusting for age, rates of death involving COVID-19 remain greater for most ethnic minority groups, most notably for people of Black African, Black Caribbean, Bangladeshi and Pakistani ethnic background

- For residents in private households in England, based on a statistical model adjusting for age, the rate of death among Black African males was 3.8 times higher than those of White background, while for Black African females the rate was 2.9 times higher.
- Taking account of geography, socio-economic characteristics and health measures, including pre-existing conditions, males of Black African background retained a 2.5 times higher rate than those of White background, while for females a 2.1 times greater risk remained.
- For males, all ethnic minority groups other than Chinese retained a raised rate of COVID-19 mortality following adjustments; for females, all other than Bangladeshi, Chinese and Mixed ethnic groups retained a raised rate of COVID-19 mortality.
- In the care home population, males of Asian ethnic background and females of Black and Asian ethnic backgrounds also had a raised rate of death involving COVID-19 compared with people of White ethnic background after taking account of geography and health measures.

Males of Black African ethnic background had the highest rate of death involving COVID-19, more than 2.7 times higher than males of White ethnic background

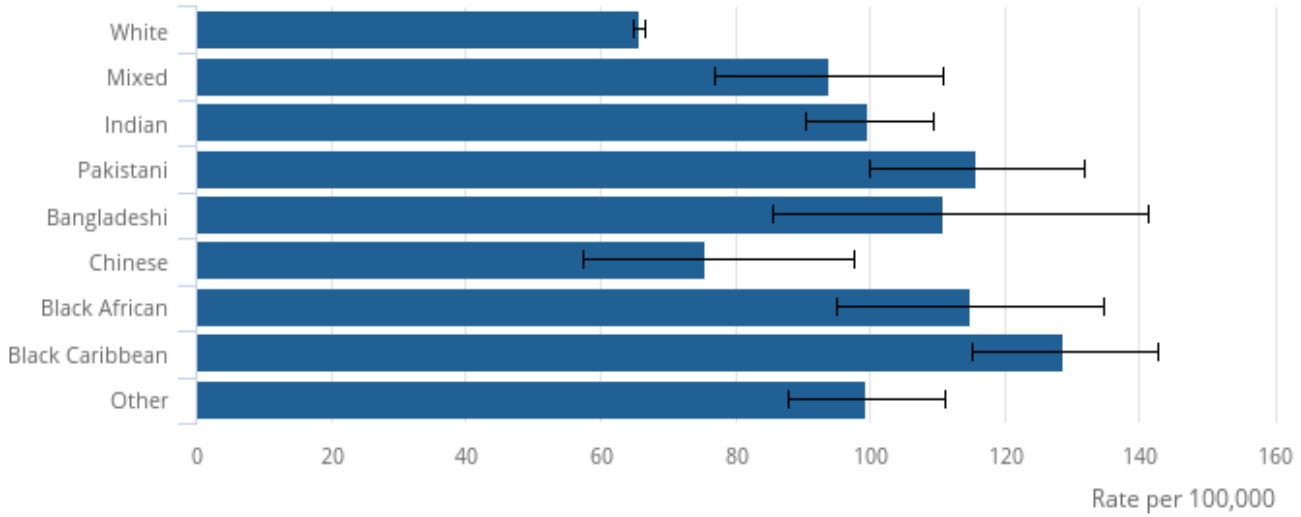
Age-standardised rates of death involving the coronavirus (COVID-19) among males aged 9 years and over by ethnic group, England and Wales, deaths occurring between 2 March and 28 July 2020 and registered by 24 August 2020



Source: Updating ethnic contrasts in deaths involving the coronavirus (COVID-19), England and Wales: deaths occurring 2 March to 28 July 2020

Females of Black Caribbean ethnic background had the highest rate of death involving COVID-19, 2 times higher than females of White ethnic background

Age-standardised rates of death involving the coronavirus (COVID-19) among females aged 9 years and over by ethnic group, England and Wales, deaths occurring between 2 March and 28 July 2020 and registered by 24 August 2020



Source: Updating ethnic contrasts in deaths involving the coronavirus (COVID-19), England and Wales: deaths occurring 2 March to 28 July 2020

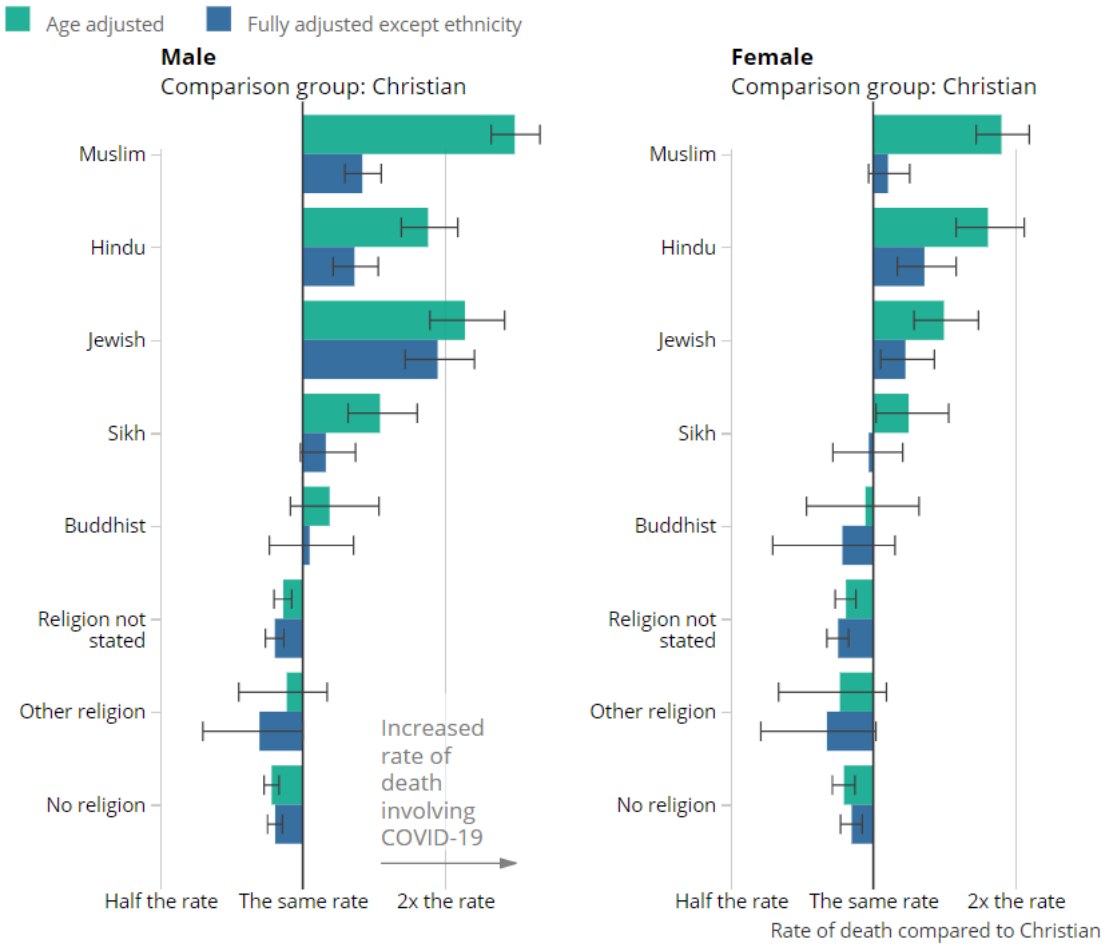
Lead Analysts: Chris White and Daniel Ayoubkhani

The risk of death involving COVID-19 varies across religious groups, with those identifying as Muslims, Jewish, Hindu and Sikh showing a higher rate of death than other groups

- Those of Hindu, Jewish, Muslim and Sikh affiliation had the highest rates of death involving COVID-19 while those of “No Religion” had the lowest.
- Only males and females of Jewish affiliation retained an increased risk of death after adjusting for ethnic background and a medley of socio-demographic characteristics.

How the risk of death involving COVID-19 varies by religious group for males and females

Hazard ratios of death involving COVID-19 by religious group and sex, England and Wales, 2 March to 15 May 2020



Source: Coronavirus related deaths by religious group, England and Wales: 2 March to 15 May 2020

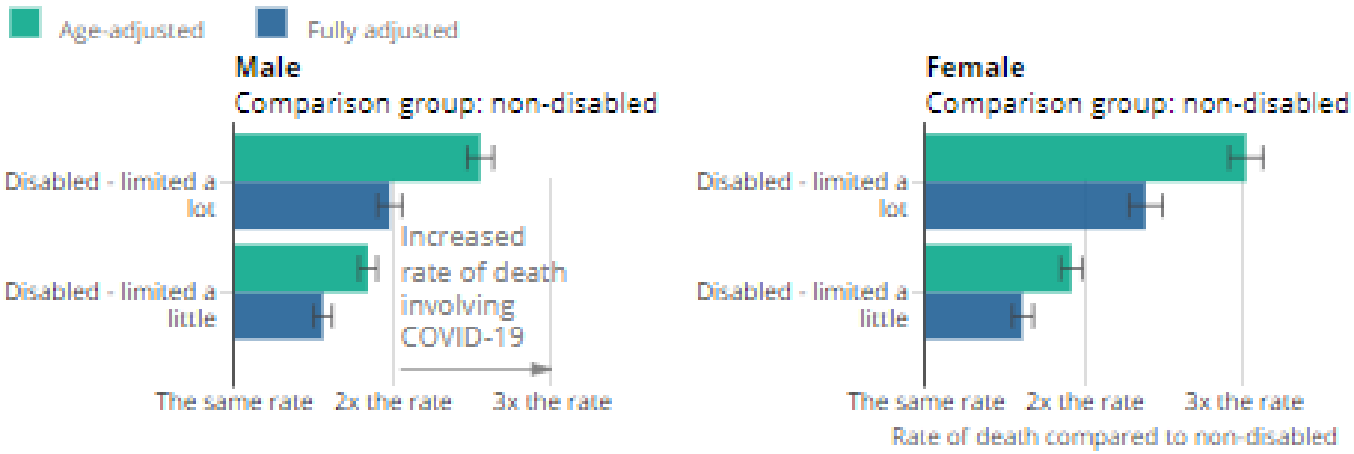
Lead analyst: Charlotte Gaughan

Risk of death involving COVID-19 varies by disability status in England and Wales

- Between 2 March and 14 July 2020, disabled people made up almost 60% of all deaths involving COVID-19; disabled people made up around 16% of the study population followed from the 2011 Census.
- Disability is more common in older populations; age-standardised mortality rates (ASMRs) allow populations with different age structures to be compared more fairly; males aged 65 years and over who were disabled and limited a lot had the highest age-standardised COVID-19 mortality rate at 860.8 per 100,000.
- Females aged 9 to 64 years who were disabled and limited a lot who had a rate of death involving COVID-19 10.8 times greater than non-disabled females and 6.5 times greater for males.
- Relative gaps in ASMRs were smaller in the 65 years and over age group; males aged 65 years and over, who were disabled and limited a lot, were 2.4 times more likely and females were 3.1 times more likely to die than their counterparts who were non-disabled.
- Males and females disabled and limited a lot in daily activities had a 2.0 and 2.4-times higher rate of death respectively than those non-disabled after adjusting for socio-demographic characteristics.

How the risk of death involving COVID-19 varies by disability status for males and females

Hazard ratios of death involving COVID-19 by disability status and sex, England and Wales, 2 March to 14 July 2020



Source: Coronavirus (COVID-19) related deaths by disability status, England and Wales: 2 March to 14 July 2020

Lead Analyst: Daniel Ayoubkhani

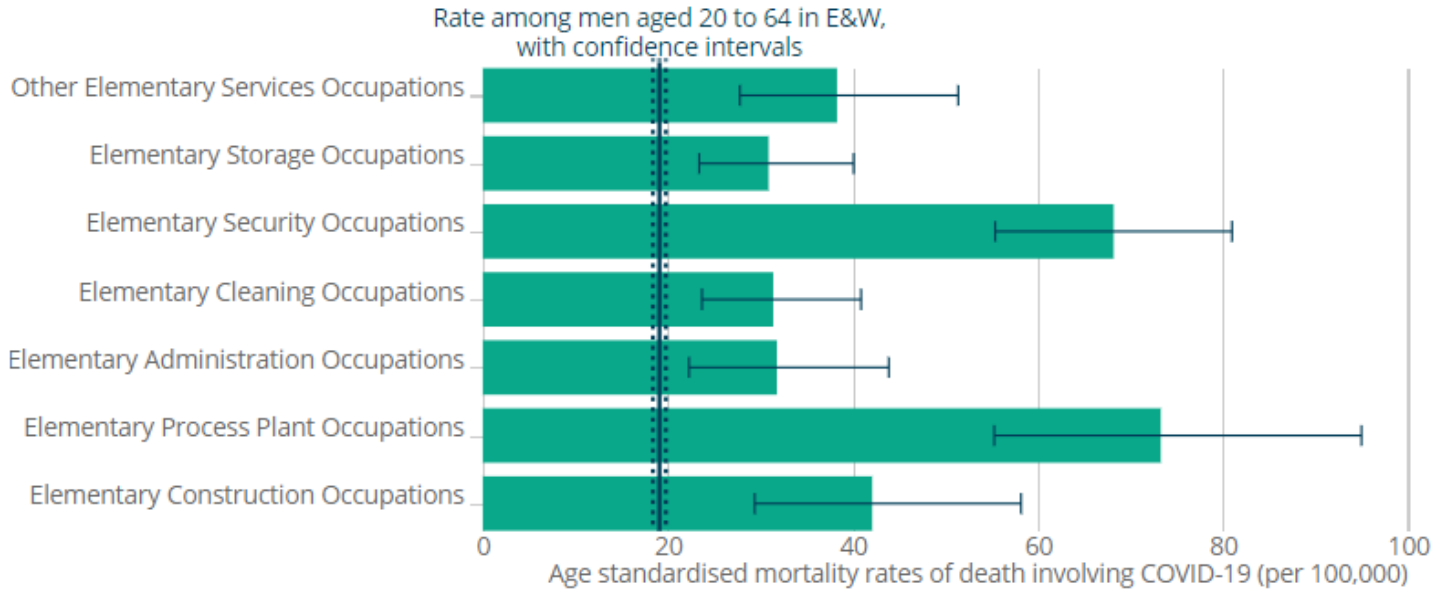
Occupations involving close and frequent interaction with others generally had the highest rates of death involving the COVID-19 among those of working age in England and Wales

For deaths registered between 9 March and 25 May 2020:

- Among men, elementary workers had the highest rate of death involving COVID-19, double the rate seen among men of the same age in the general population; this group includes jobs such as factory workers, security guards, construction workers, and cleaners.
- Men working in a range of other occupations with either direct or indirect contact with others had elevated rates, including bus drivers and taxi drivers, chefs, and sales and retail assistants.
- Women and men working in health and social care occupations, those on the frontline of the pandemic, also had elevated rates when compared with those of the same age and sex in the population.
- Social care occupations had the highest rates in the health and social care sector, explained by the number of registered deaths among men and women working as care workers and home carers.
- Of the individual health care occupations, elevated rates were only found among men and women working as nurses.

Among men, those working in elementary occupations had the highest rate of death involving COVID-19

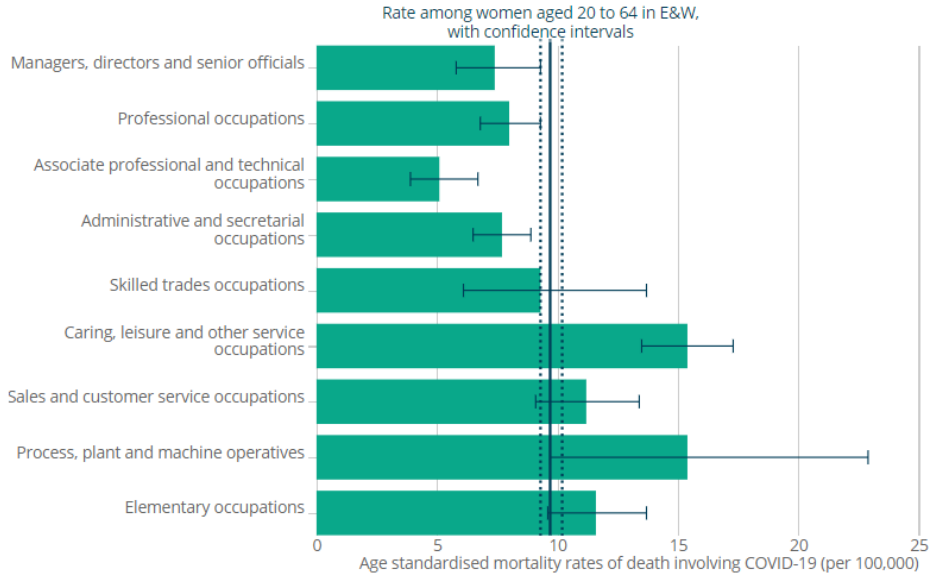
Age-standardised mortality rates of death involving the coronavirus (COVID-19) in England and Wales, deaths registered between 9 March and 25 May 2020



Source: Coronavirus (COVID-19) related deaths by occupation, England and Wales: deaths registered between 9 March and 25 May 2020

Women in caring, leisure, and other service occupations had the highest rate, explained by deaths among care workers and home carers

Age-standardised mortality rates of death involving the coronavirus (COVID-19) in England and Wales, women, deaths registered between 9 March and 25 May 2020



Source: Coronavirus (COVID-19) related deaths by occupation, England and Wales: deaths registered between 9 March and 25 May 2020

Lead analyst: Ben Windsor-Shellard

Rates of death involving COVID-19 by occupation were statistically significantly lower during lockdown than before lockdown

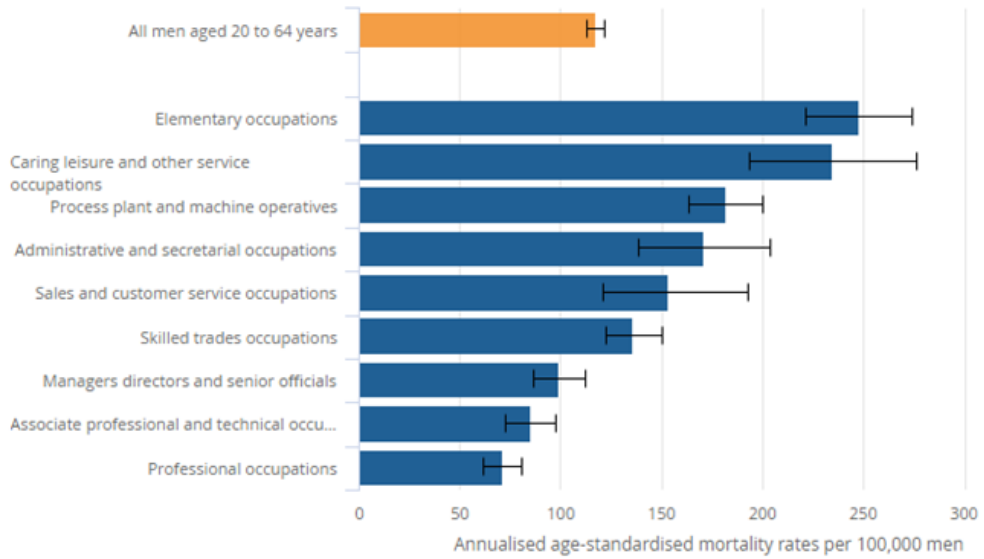
- Between 9 March and 30 June 2020, prior to the widespread easing of lockdown restrictions, 5,330 deaths involving COVID-19 in the working age population (those aged 20 to 64 years) of England and Wales were registered.
- 72.0% of the total number (3,839 deaths) were likely to be the result of an infection acquired before lockdown.
- For both sexes, age-standardised rates of death involving COVID-19 by occupation were statistically significantly lower during lockdown than before lockdown.

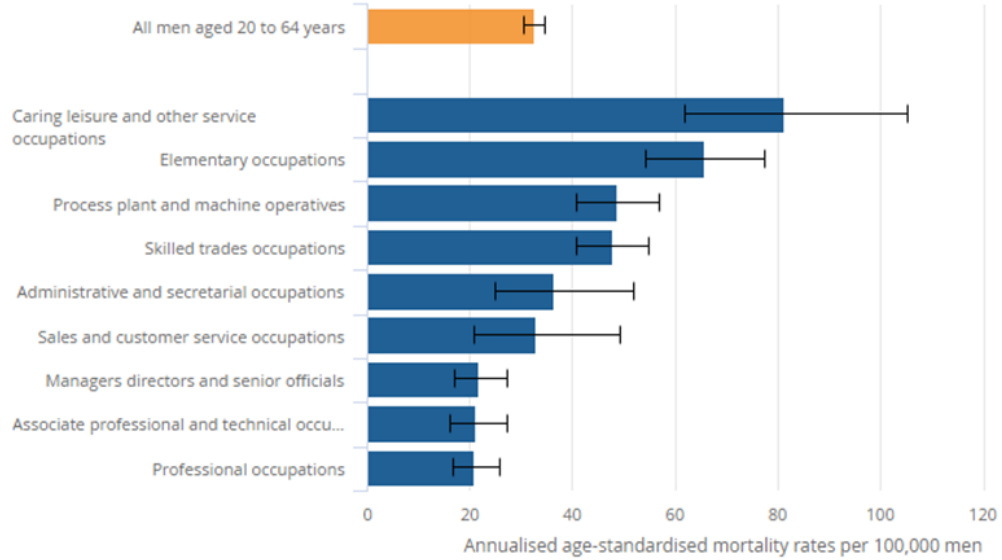
Some occupations continued to have high rates of COVID-19 mortality during lockdown

- Across the entire time period, some groups of occupations continued to have high rates of death involving COVID-19, when compared with rates among those of the same age and sex in the population.
- Among men, four of the nine major occupation groups (elementary; caring, leisure and personal services; process, plant and machine operatives; and skilled trades) had statistically significantly higher rates of death involving COVID-19 both before and during lockdown, when compared with rates among those of same age and sex in the population.
- Among health and social care professionals, rates of death involving COVID-19 in men were around three times higher when the virus was more likely acquired before lockdown than during lockdown; in women, rates were around two times higher.
- Reasons for these findings are complex, but factors like the level of exposure to others before and during lockdown, the ability to work from home, whether an occupation was furloughed, and where someone lives could all be playing a role.

For all groups of occupations, mortality rates among men were statistically significantly lower during lockdown, similar findings are true for women

Annualised age standardised rates of death involving COVID-19, deaths registered in England and Wales between 9 March 2020 and 30 June 2020 and occurred on or before 25 April 2020 (left) and on or after 26 April 2020 (right)





Coronavirus (COVID-19) related deaths by occupation, before and during lockdown, England and Wales: deaths registered between 9 March and 30 June 2020

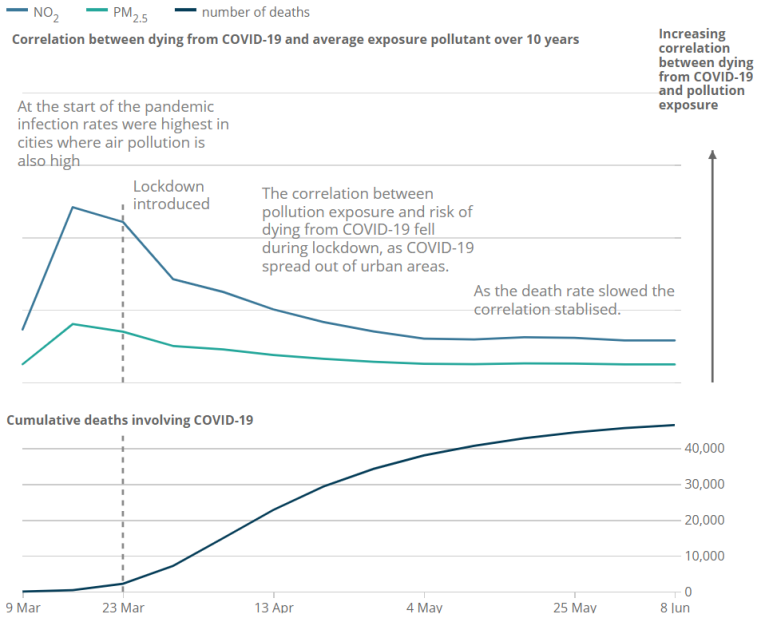
Lead analyst: Ben Windsor-Shellard and Asim Butt

The effects of long-term exposure to air pollution as a factor that increases COVID-19 mortality appear smaller than those reported in previous studies

- Some studies have suggested that long-term exposure to air pollution before the pandemic is associated with severe symptoms from COVID-19 and a greater risk of death.
- Our analysis shows that deaths involving COVID-19 were more common in highly polluted areas, particularly early in the pandemic.
- However, the correlation between pollution and mortality fell as deaths rose and lockdown was introduced, before levelling off in early May.
- Early COVID-19 deaths and exposure to dirty air was partly down to the outbreak in London (where pollution levels are generally higher than the rest of the country); up to the week when lockdown began (week ending 27 March 2020), 45% of COVID-19 deaths in England had occurred in the capital; by the week ending 12 June 2020 (cut-off date for this analysis), this had fallen to 18%.
- As the virus spread across the country and deaths became more evenly distributed, the correlation between air pollution exposure and COVID-19 mortality decreased.

Polluted areas initially had higher rates of COVID-19 deaths, but this trend decreased as the death toll rose

Correlation between COVID-19 deaths in England and 10-year exposure to nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$)



Source: Does exposure to air pollution increase the risk of dying from the coronavirus (COVID-19)?; Coronavirus (COVID-19) related mortality rates and the effects of air pollution in England

Lead analyst: Adam Dutton

Air pollution exposure could be a contributing factor if it causes COVID-19 deaths, with the BAME population more likely than those of White ethnicity to live in inner city areas

- Ethnicity is strongly correlated with pollution exposure, with ethnic minorities more likely to live in polluted areas; however, when controlling for ethnicity in our model, air pollution exposure has no statistically significant impact on COVID-19 deaths.
- Air pollution is just one of many factors that could be driving disproportionate outcomes for minority ethnic groups; the increased risk of dying from COVID-19 (found when ethnicity is not controlled for) is likely to be an overestimate of the true effect.
- Our previous analysis on COVID-19 death rates among people of Black, Asian and Minority Ethnicity (BAME) are higher.
- Air pollution may or may not be one of the drivers of COVID-19-related higher mortality amongst ethnic minorities; however, the many risk factors correlated with dense populations could not be fully disentangled at this level of granularity and without a strong control for infection rate.