

Article

Updating ethnic contrasts in deaths involving the coronavirus (COVID-19), England: 8 December 2020 to 1 December 2021

Estimates of COVID-19 mortality rates by ethnic group using linked data from the 2011 Census, death registrations, primary care and hospital records, and National Immunisation Management System.

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1 . Main points

- Between 8 December 2020 (the start of the vaccination programme) and 12 June 2021 (the approximate end of the second wave of the coronavirus (COVID-19) pandemic), people from all ethnic minority groups (except the Chinese group and women in the White other ethnic group) had higher rates of death involving COVID-19 compared with the White British population.
- During this period, the rate of death involving COVID-19 was highest for the Bangladeshi ethnic group (5.0 times greater than the White British group for males, and 4.5 times greater for females), followed by the Pakistani (3.1 for males, 2.6 for females) and Black African (2.4 for males, 1.7 for females) ethnic groups.
- Since the start of the third wave of the coronavirus pandemic (from 13 June 2021 onwards) the rate of death involving COVID-19 was higher for all ethnic minority groups (except Chinese people, men from the Mixed ethnic group and women from the White other ethnic group); the risk remained highest for the Bangladeshi ethnic group (4.4 and 5.2 times greater than for the White British ethnic group for males and females, respectively).
- Location, measures of disadvantage, occupation, living arrangements, pre-existing health conditions and vaccination status accounted for a large proportion of the excess rate of death involving COVID-19 in most ethnic minority groups; however, the Bangladeshi ethnic group and men from the Pakistani ethnic group remained at higher risk than White British people in the third wave, even after adjusting for vaccination status.
- Males and females of Black Caribbean and Black African background were at elevated risk in the third wave after adjusting for location, measures of disadvantage, occupation, living arrangements, pre-existing health conditions; after also adjusting for vaccination status, there was no evidence that the risk was greater than for the White British ethnic group.

Statistician's comment

"Today's analysis shows that since the vaccination programme began, the risk of death from COVID-19 has continued to be higher in most ethnic minority groups than in the White British ethnic group.

As already highlighted in our analyses of earlier periods, these differences in mortality are largely explained by socio-demographic and economic factors and health. For the first time, we show that the lower vaccination coverage in some ethnic groups also contributes to the elevated risk of COVID-19 death, particularly in the Black African and Black Caribbean groups."

Vahé Nafilyan, Senior statistician, Health and Life Events Division, Office for National Statistics.

2 . Overview

The Office for National Statistics (ONS) previously published [analysis of deaths involving the coronavirus \(COVID-19\) by ethnic group for England between 24 January 2020 and 31 March 2021](#). In this article, we update the previous analyses to present provisional analysis of deaths involving coronavirus (COVID-19) by ethnic group for deaths occurring in England between 8 December 2020 (the start of the vaccination programme in England) and 1 December 2021, that were registered by 15 December 2021.

In previous analyses we adjusted for differences in location, measures of disadvantage, occupation, living arrangements (retrieved from the 2011 Census), hospital admissions (from [Hospital Episode Statistics](#)) and [certain pre-existing health conditions](#), which are known to increase the risk of dying from COVID-19 (from the [General Practice Extraction Service Data for Pandemic Planning and Research](#)). In this report, we extend previous analyses by also adjusting for vaccination status, by linking to data from the [National Immunisation Management System](#) (NIMS). This enables us to also assess the extent to which the increased risk of COVID-19 mortality in some ethnic groups is explained by [differences in vaccination](#) status.

To explore whether differences in the risk of COVID-19 mortality between different ethnic groups have changed over the course of the coronavirus pandemic and vaccination programme, analyses are presented for two time periods. We classify deaths occurring between 8 December 2020 (the date of the first vaccination in England) and 12 June 2021 as having occurred in the latter part of the [second](#) wave, and deaths from 13 June onwards as having occurred in the third wave. Reflecting the progress of the vaccination roll out, our analysis of the second wave adjusts for first and second vaccination doses, and for the third wave adjusts for first, second and third doses.

To understand the drivers of differences in the rate of death involving COVID-19 between ethnic groups, we used Cox proportional hazards models to estimate how differences in the rates changed when adjusting for a range of factors affecting both the risk of infection and the risk of death if infected. In addition to the models presented in previous analyses, in this latest analysis we also adjust for vaccination status.

In our baseline model, we adjusted for age only. We then adjusted for:

- residence type (private household, care home, other communal establishments)
- geography (population density, region, rural urban classification)
- socio-economic factors (deprivation, household composition and occupational exposure)
- certain pre-existing health conditions
- vaccination status

For full details of the variables included in the models, see the Definitions tab in the [dataset](#).

See the [Technical Appendix](#) and [Measuring the Data section](#) below for additional details on the data used in this release.

Estimates for the third wave are provisional, as the third wave may extend beyond the study period. Also, it is possible that some deaths involving COVID-19 that occurred in this period have not yet been registered. Similarly, some vaccinations administered during the study period may not yet have been recorded.

3 . Difference between the risk of death involving coronavirus (COVID-19) by ethnic group since the start of the vaccination programme in England

Figure 1 shows how the risk of death involving coronavirus (COVID-19) varied by ethnic background during the latter part of the second wave (8 December 2020 to 12 June 2021), separately for males and females. We report hazard ratios (HRs) for each ethnic group relative to the White British ethnic group (the largest group). A HR greater than one indicates a higher rate of death involving COVID-19 than the reference group (White British).

Where the risk remains broadly the same after adjusting for vaccination status, it does not mean the vaccine is not effective. It simply means differences in vaccination coverage between the groups do not explain observed differences in mortality risk. For analyses of vaccine effectiveness, see [gov.uk](https://www.gov.uk).

During the latter part of the second wave of the coronavirus pandemic (8 December 2020 to 12 June 2021), after adjusting for age (first bar in Figure 1), males from all ethnic minority groups other than the Chinese ethnic group were at elevated risk of COVID-19 mortality compared with males identifying as White British. Females from all ethnic minority groups other than Chinese and White other ethnic groups were also at greater risk. The increased risk relative to the White British population was highest for the Bangladeshi ethnic group (male HR: 5.0, female HR: 4.5), followed by the Pakistani (male HR: 3.1, female HR: 2.6), Black African (male HR: 2.4, female HR: 1.7), Indian (male HR: 2.1, female HR: 1.6), Black Caribbean (male HR: 2.0, female HR: 1.6) and Other (male HR: 1.9, female HR: 1.6) ethnic groups. [Age-standardised mortality rates \(ASMRs\) can be found in the datasets.](#)

Adjusting further for location, measures of disadvantage, occupation, living arrangements, certain pre-existing conditions, and vaccination status (third bar in Figure 1) substantially reduced excess COVID-19 mortality risk for most ethnic groups. Rates of COVID-19 mortality remained highest among the Bangladeshi (male HR: 2.2, female HR: 2.1), Pakistani (male HR: 1.6, female HR: 1.4) and Indian (male HR: 1.5, female HR: 1.3) ethnic groups, and Black African males (HR: 1.5). For some groups (White other, Chinese, Black Caribbean, Mixed, and Black African females) there was no evidence of greater risk of death involving COVID-19 compared with the White British ethnic group.

Figure 1: Between 8 December 2020 and 12 June 2021, differences in COVID-19 mortality compared with the White British population were highest for people of Bangladeshi background and remained highest even after adjustment for personal characteristics

Hazard ratios of death involving COVID-19 by ethnic group and sex, England: 8 December 2020 to 12 June 2021

Notes:

1. ONS figures based on death registrations up to 15 December 2021, for deaths involving COVID-19 that occurred between 8 December 2020 and 12 June 2021, of people aged 30 to 100 years that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic and Planning Research; these figures are provisional.

[Download the data](#)

The first bar in Figure 2 shows age-adjusted HRs (relative to the White British ethnic group) for the third wave (13 June 2021 onwards). In the third wave, the risk of COVID-19 death was higher for all ethnic minority groups except the Chinese group, men from the Mixed ethnic group and women from the White other ethnic group compared with the White British ethnic group. The risk was highest for people from the Bangladeshi (male HR: 4.4, female HR: 5.2), Pakistani (male HR: 3.5, female HR: 4.3), Black Caribbean (male HR: 2.3, female HR: 3.0) and Black African (male HR: 1.6, female HR: 2.4) ethnic groups.

After adjusting further for other factors (third bar in Figure 2), most ethnic groups had a similar risk to the White British group; only Bangladeshi males (HR: 2.2), Bangladeshi females (HR: 2.1) and Pakistani males (HR: 1.2) remained at higher risk of death involving COVID-19 than the White British ethnic group. This is consistent with patterns observed in the latter part of the second wave, where Bangladeshi and Pakistani groups also remained at higher risk of mortality even after adjustment.

People from Black Caribbean and Black African ethnic groups were at higher risk of COVID-19 mortality than White British people after adjusting for age (first bar in Figure 2) and remained so after adjusting for demographic and socio-economic factors and pre-existing health conditions (second bar in Figure 2). However, after adjusting for vaccination status, there was no evidence of greater risk of death involving COVID-19 compared with the White British ethnic group, suggesting that differences in vaccination coverage between the Black Caribbean and Black African ethnic groups and the White British ethnic group explain a large part of the excess risk.

Figure 2: Between 13 June 2021 and 1 December 2021, risk of COVID-19 mortality compared with the White British population remained higher among Bangladeshi people and Pakistani men, even after adjustment for personal characteristics.

Hazard ratios of death involving COVID-19 by ethnic group and sex, England: 13 June 2021 to 1 December 2021

Notes:

1. ONS figures based on death registrations up to 15 December 2021, for deaths involving COVID-19 that occurred between 13 June 2021 and 1 December 2021, of people aged 30 to 100 years that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic and Planning Research; these figures are provisional.

[Download the data](#)

Our findings demonstrate that people from most ethnic minority groups have experienced greater rates of death involving COVID-19 compared with people of White British ethnic background during the coronavirus pandemic. Although the patterns of excess COVID-19 mortality risk by ethnic group have changed over the course of the coronavirus pandemic, the Black African, Bangladeshi, Black Caribbean and Pakistani ethnic groups were among the groups with highest risk of COVID-19 mortality in all three waves. In the [first](#) wave, the risk of COVID-19 mortality was highest for the Black African group, whereas during the [second](#) and third waves, the risk was consistently highest among Bangladeshi men and women.

Previous analyses showed that differences in [location, measures of disadvantage, occupation, living arrangements](#), and [certain pre-existing health conditions](#) explained a large proportion (but not all) of the excess COVID-19 mortality risk observed in some ethnic groups. This analysis shows that differences in vaccination coverage between ethnic groups also contribute to the elevated risk of death observed in some groups. Notably, in the third wave, adjusting for vaccination status eliminates the remaining excess risk for the Black African and Black Caribbean ethnic groups, the two groups with the [lowest vaccination rates among those aged over 50](#). Adjusting for vaccination status also eliminates the remaining unexplained risk for Pakistani women, White other men and the Other group (which includes those in the Other Asian, Arab, Other Black and Other [harmonised standard](#) ethnicity categories).

In the third wave, in the fully adjusted model, the risk of COVID-19 mortality is similar to the White British ethnic group for all ethnic groups except the Bangladeshi group and Pakistani men.

Remaining unexplained risk may be attributable to factors that we have not been able to account for in the analysis. The Cabinet Office Race Disparity Unit has [explored the evidence around COVID-19 risk factors](#), but further work is needed to increase our knowledge and understanding of the possible mechanisms underlying this unexplained risk.

4 . Ethnic contrasts in COVID-19 deaths data

[Updating ethnic contrasts in deaths involving the coronavirus \(COVID-19\), England](#)

Dataset | Released 26 January 2022

Age-standardised mortality rates (ASMRs) (deaths occurring between 24 January 2020 and 1 December 2021) and hazard ratios (deaths occurring between 8 December 2020 and 1 December 2021) for deaths involving COVID-19 by ethnic group, England.

5 . Glossary

Age-standardised mortality rates

Age-standardised mortality rates (ASMRs) are used to allow comparisons between populations that may contain different proportions of different ages. The 2013 European Standard Population is used to standardise rates.

Cox proportional hazards regression model

The Cox proportional hazards regression model is a multiple regression procedure that measures the association between a time-to-event outcome and a characteristic of interest (such as ethnic group), while adjusting for other characteristics expected to also be associated with the outcome.

Hazard ratio

A hazard ratio is a measure of the relative differences in the instantaneous rate of mortality between groups. A hazard ratio greater than 1 indicates the rate of mortality is higher, and likewise, less than 1 lower in the population group under study compared with a reference group.

Deaths involving coronavirus (COVID-19)

Deaths involving coronavirus (COVID-19) include those with an underlying cause, or any mention, of ICD-10 codes U07.1 (COVID-19, virus identified), U07.2 (COVID-19, virus not identified) or U09.9 (post-COVID condition). A doctor can certify the involvement of COVID-19 based on symptoms and clinical findings — a positive test result is not required.

6 . Measuring the data

These analyses use data from the Office for National Statistics' (ONS) Public Health Data Asset (PHDA), and build on the methods used in [previous publications](#). The PHDA combines Census 2011 records, death registrations, [Hospital Episode Statistics \(HES\)](#) and primary care records retrieved from the [General Practice Extraction Service \(GPES\) Data for Pandemic Planning and Research \(GDPPR\)](#), with England coverage only. Information about these data sources, how they have been linked, and the methods used for previous publications can be found in the [Technical Appendix](#).

The analyses in this report build on the methods described in the [Technical Appendix](#) to also incorporate the following updates.

Firstly, in addition to the data sources described in the Technical Appendix, these analyses also include vaccination data from the [National Immunisation Management System](#) (NIMS) to adjust for vaccination status. We used NIMS data for the period 8 December 2020 (the day of the first vaccination in England) to 1 December 2021. This data was linked to 2011 Census based on NHS number. Our analysis of the second wave includes first and second vaccination doses, and for the third wave includes first, second and third doses. The analysis does not differentiate between booster doses and third doses provided for other reasons. Vaccination status was included in the model as a time-varying covariate, and we considered a person vaccinated once 14 days had passed since the dose was administered. Of people aged 30 years and over who received at least one dose of a vaccine, 79% were linked to the ONS PHDA.

Secondly, we also updated the list of [pre-existing health conditions](#) we adjusted for to align with the [update of the COVID-19 risk prediction model known as QCovid2](#) used by the NHS.

The study population comprised 28.8 million people (aged 30 to 100 years) enumerated at the 2011 Census and living in either private households or communal establishments in England at the start of the vaccination roll-out. We modelled the hazard of death involving COVID-19 during the outcome period using a sample of the study population. The sample included all those who died from any cause during the outcome period and a weighted random sample of those who did not (1% of people identifying as White British and 10% of each of the other ethnic groups).

7 . Strengths and limitations

Strengths

The primary strength of the study is using nationwide linked population-level data that combines a rich set of demographic and socio-economic factors from the 2011 Census with death registrations data, pre-existing health conditions from electronic health records, and vaccination status from the National Immunisation Management System. Unlike studies based only on electronic health records, our study relies on self-identified ethnicity, with very few missing data, limiting the potential for exposure misclassification bias.

Limitations

The Public Health Data Asset only contains information on people who were enumerated at the 2011 Census. It therefore excludes people living in England in 2011 but not taking part in the 2011 Census (estimated to be about 5%); respondents who could not be linked to the 2011 to 2013 NHS Patient Registers (5.4% of census respondents); people who have immigrated since 2011; and people not registered with a general practitioner at the start of the pandemic.

Many of the socio-demographic variables were derived from the 2011 Census. Some of these characteristics might have changed since the 2011 Census and may not accurately reflect individuals' circumstances during the pandemic. To mitigate measurement error, we restricted our analysis to people aged 30 years and over.

8 . Related links

[Updating ethnic contrasts in deaths involving coronavirus \(COVID-19\), England: 24 January 2020 to 31 March 2021](#)

Bulletin | Released 26 May 2021

Estimates of differences in COVID-19 mortality risk by ethnic group for deaths occurring up to 31 March 2021, using linked data from the 2011 Census, death registrations, and primary care and hospital records. Risk of COVID-19 mortality is compared between the first and second waves of the pandemic.

[Coronavirus and vaccination rates in people aged 50 years and over by socio-demographic characteristic, England: 8 December 2020 to 12 December 2021](#)

Bulletin | Released 24 December 2021

First, second, third dose and booster COVID-19 vaccination rates among people aged 50 years and older who live in England, including estimates by socio-demographic characteristic.

[Risk prediction of COVID-19 related death and hospital admission in adults after COVID-19 vaccination: national prospective cohort study](#)

Design and validation of a population-based risk algorithm to estimate the risk of COVID-19 related mortality and hospital admission in UK adults after one or two doses of COVID-19 vaccination.

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