

Article

Comparing the risk of death involving coronavirus (COVID-19) by variant, England: December 2021

Analysis comparing the risk of coronavirus (COVID-19) death in people infected by Omicron and Delta variants, after adjusting for age, sex, other socio-demographic factors, vaccination status and health conditions.

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1 . Main points

- The risk of death involving coronavirus (COVID-19) is 67% lower following an Omicron infection compared with a Delta infection.
- The difference in the risk of death involving COVID-19 between Omicron and Delta varied by age, where the reduction in risk was greater among those aged 18 to 59 years (87%) and those aged 60 to 69 years (86%), than among those aged 70+ (55%).
- The difference in the risk of death involving COVID-19 between Omicron and Delta varied by sex, with males having a greater reduction in risk of death than females (75% and 56% respectively).

2 . Identification of coronavirus (COVID-19) infections by variant

This article compares the risk of death involving coronavirus (COVID-19) for individuals in England infected with the Omicron variant with those infected with the Delta variant between 1 and 31 December 2021. We use the Office for National Statistics (ONS) Public Health Data Asset (PHDA) linked to national testing and vaccination data (see [Section 6](#) for further information). Provisional death registrations up until 25 January 2022 have been used to identify deaths involving COVID-19, which refers to deaths that had COVID-19 mentioned anywhere on the death certificate, whether as an underlying cause or not.

The study population included 1,035,163 individuals who tested positive for COVID-19 in December 2021 in England. It covers 36.7% of all positive tests in December 2021. In the study population, 78.6% had Omicron-compatible infections and 21.4% Delta-compatible.

There were 128 deaths involving COVID-19 and 53 deaths not involving COVID-19 in those infected with Omicron, and 189 and 28, respectively, in those infected with Delta. The mean time from positive result to death involving COVID-19 was 13 days for Omicron and 16 days for Delta (see the [accompanying dataset](#) for more information on the study population).

3 . Risk of death involving coronavirus (COVID-19) by variant

We use Cox proportional hazards regression models to measure the risk of death involving coronavirus (COVID-19) following infection by the Omicron variant compared with the Delta variant.

The risk of death involving COVID-19 was estimated to be 67% lower (hazard ratio: 0.33, 95% confidence interval: 0.24 to 0.45) following Omicron infection relative to Delta. This was after adjusting for sex, age, vaccination status, previous COVID-19 infection, calendar time, ethnicity, Index of Multiple Deprivation rank, household deprivation, university degree, keyworker status, country of birth, main language, region, disability, and the number of pre-existing conditions.

We also assessed if the difference in the risk of death involving COVID-19 between Omicron and Delta variants varied by age and sex. The risk of death varied by age, with those aged under 70 years (Aged 18-59 years: hazard ratio: 0.13, 95% confidence interval: 0.06 to 0.30; Aged 60-69 years: hazard ratio: 0.14, 95% confidence interval: 0.05 to 0.36) having a greater reduction in the risk of COVID-19 death with Omicron compared with Delta than individuals aged 70 years and over (hazard ratio: 0.45, 95% confidence interval: 0.16 to 1.24).

We also show that the reduction in the risk of death involving COVID-19 following Omicron relative to Delta is significantly greater in males (hazard ratio: 0.25, 95% confidence interval: 0.17 to 0.37) than females (hazard ratio: 0.43, 95% confidence interval: 0.28 to 0.68).

There was no evidence that the relative risk of death involving COVID-19 varied for Omicron relative to Delta given the number of pre-existing health conditions (see the [accompanying dataset](#)).

Figure 1: The risk of a death involving COVID-19 was estimated to be 67% lower following Omicron infection relative to Delta

Change in risk of death involving COVID-19 for Omicron relative to Delta, for the whole sample and for sex and age group, England, December 2021

Notes:

1. Percentage change in risk of death involving COVID-19 for Omicron variant relative to Delta (reference) adjusted for sex, age, vaccination status, previous COVID-19 infection, calendar time, ethnicity, Index of Multiple Deprivation rank, household deprivation, university degree, keyworker status, country of birth, main language, region, disability, and the number of pre-existing conditions.
2. Horizontal lines on bars represent 95% confidence intervals.

Download the data

[.xlsx](#)

Our results based on death registration data are consistent with another [study](#) investigating the difference in the risk of hospital admissions or deaths within 28 days of a positive COVID-19 test between Omicron and Delta variants.

4 . Risk of death involving coronavirus (COVID-19) by variant data

[Risk of death involving coronavirus \(COVID-19\) by variant, England: December 2021](#)

Dataset | Released 24 February 2022

Analysis comparing the risk of coronavirus (COVID-19) death in people infected by Omicron and Delta variants, after adjusting for socio-demographic factors, vaccination status and health conditions.

5 . Glossary

Coronaviruses

The World Health Organization (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)".

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).

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 age, while adjusting for other characteristics expected to also be associated with the outcome.

95% confidence intervals

A confidence interval is a measure of the uncertainty around a specific estimate. If a confidence interval is 95%, it is expected that the interval will contain the true value on 95 occasions if repeated 100 times. As intervals around estimates widen, the level of uncertainty about where the true value lies increases. The size of the interval around the estimate is strongly related to the number of deaths, prevalence of health states and the size of the underlying population. At a national level, the overall level of error will be small compared with the error associated with a local area or a specific age and sex breakdown. More information is available on our [uncertainty pages](#).

Deaths involving COVID-19

For this analysis we define a death as involving COVID-19 if the International Classification of Diseases 10th edition (ICD-10) code U07.1 (COVID-19, virus identified) is mentioned on the death certificate.

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 one indicates the rate of mortality is higher, and likewise less than one lower, in the population group under study compared with a reference group.

6 . Data sources and quality

Methodology

Our analysis is based on the Office for National Statistics (ONS) Public Health Data Asset (PHDA), linked to national testing data taken in the community from NHS Test and Trace (pillar 2). The Public Health Data Asset (PHDA) is a linked dataset combining the 2011 Census, the General Practice Extraction Service (GPES) data for coronavirus (COVID-19) pandemic planning and research, the Hospital Episode Statistics (HES), death registration data and COVID-19 vaccination data from the National Immunisation Management Service (NIMS). The data were restricted to PCR positive tests taken in England between 1 and 31 December 2021 in the community and analysed by Lighthouse laboratories.

Provisional death registrations up until 25 January 2022 have been used to identify deaths involving COVID-19, which refers to deaths that had COVID-19 mentioned anywhere on the death certificate.

The COVID-19 variant was ascertained using S-gene target failure (SGTF). Tests were identified Omicron-compatible if S-negative, N-positive, ORF1ab-positive (with mean Ct less than 30) or Delta-compatible if S-positive, N-positive, ORF1ab-positive or ORF1ab-positive, S-positive or N-positive, S-positive, and mean Ct less than 30.

We used cause-specific Cox proportional hazard regression models to estimate the hazard ratio of COVID-19 related death for individuals infected with Omicron versus Delta variants. For non-COVID-19 deaths, individuals were censored at the date of death if this occurred before the end of the study date. We adjusted for sex, age, vaccination status, previous COVID-19 infection, calendar time, ethnicity, Index of Multiple Deprivation rank, household deprivation, university degree, keyworker status, country of birth, main language, region, disability, and the number of pre-existing conditions (as defined in the [Qcovid 3 risk model](#)). To test whether the relative risk of mortality of Omicron varied by specific characteristics, we included interactions between variant type and age, and variant type and sex. In addition, we fitted separate fully adjusted models for those aged 18 to 59 years, those aged 60 to 69 years, and those aged 70 years and over to look at interactions between variant and the number of health conditions (zero, one to two, or three and more).

Strengths

We used a large sample of positive cases from the national testing programme, allowing to precisely estimate the relative risk of COVID-19 death following infection with Omicron and Delta variants. We used death certificate data to confirm COVID-19 mortality, preventing our sample being conflated with non-COVID-19 related deaths of individuals that die of other causes following a positive COVID-19 test. We also compared the outcomes during the same time period overcoming any differences because of changes in management of infected patients over the time period of the pandemic. We also adjusted for a wide range of potential confounding factors.

Limitations

Provisional death registrations and death occurrences data are used in this article. This enables timely analysis to be completed to monitor mortality trends. However, as the data for 2021 are provisional, they are subject to change. This article uses death occurrences registered up to 25 January 2022. Because of registration delays, more deaths may be registered at later dates, leading to an increase in the death occurrences. This is especially true for more recent deaths. The data are for England only, as vaccinations data for Wales are not yet available and the Public Health Data Asset (PHDA) covers England only.

7 . Future developments

Impact of coronavirus (COVID-19) variants on health outcomes

Importantly, our results indicate that the risk of a death involving coronavirus (COVID-19) following infection with Omicron relative to Delta is significantly lower, however mortality is only one metric to measure the impact of infection. Subsequent work will investigate long-term outcomes of infection, such as the prevalence of long COVID following Omicron infection.

8 . Related links

[Deaths registered in England and Wales](#)

Bulletin | Released weekly

Provisional counts of the number of deaths registered in England and Wales, including deaths involving coronavirus (COVID-19), in the latest weeks for which data are available.

[Monthly mortality analysis, England and Wales: December 2021](#)

Bulletin | Released 21 January 2022

Provisional death registration data for England and Wales, broken down by sex, age and country. Includes deaths due to coronavirus (COVID-19) and leading causes of death.

[Deaths involving COVID-19 by vaccination status, England: deaths occurring between 1 January and 31 December 2021](#)

Bulletin | Released 4 February 2022

Age-standardised mortality rates for deaths involving coronavirus (COVID-19) by vaccination status, broken down by age group; deaths occurring between 1 January and 31 December 2021 in England.