Office for National Statistics

Article

Updated estimates of coronavirus (COVID-19) related deaths by disability status, England: 24 January 2020 to 9 March 2022

Estimates of differences in coronavirus (COVID-19) mortality risk by self-reported disability status for deaths occurring up to 9 March 2022, using linked data from the Office for National Statistics' Public Health Data Asset.

Contact:
Health Statistics and Research
health.data@ons.gov.uk
+44 1633 651809

Release date:
9 May 2022

Next release:
To be announced

Table of contents

1 . Main points

- In this publication, we use self-reported disability status from the 2011 Census; those who said in the Census that their day-to-day activities were “limited a little” or “limited a lot” are referred to as “less-disabled” and “more-disabled” respectively, whereas people reporting no limitation to their activities are referred to as “non-disabled”.

- Between 24 January 2020 and 9 March 2022 in England, the rates of deaths involving coronavirus (COVID-19) for both disabled and non-disabled people significantly decreased between the second (12 September 2020 to 11 June 2021) and third waves of the coronavirus pandemic (12 June 2021 to 9 March 2022), with rates falling below levels seen in the first wave (24 January 2020 to 11 September 2020).

- In each wave of the coronavirus pandemic, age-standardised mortality rates involving COVID-19 for more- and less-disabled people of both sexes remained higher compared with non-disabled people.

- When modelling the risk of death involving COVID-19, after adjusting for age, residence type, geography, socio-economic and demographic factors, health characteristics, and vaccination status, a significantly greater risk of death remains for all disabled people compared with non-disabled people; this remains largely unchanged across the three waves of the coronavirus pandemic.

- The risk of death involving COVID-19 was 1.4 times greater for more-disabled men and 1.3 times greater for less-disabled men, compared with non-disabled men.

- The risk of death involving COVID-19 was 1.6 times greater for more-disabled women and 1.3 times greater for less-disabled women, compared with non-disabled women.

Statistician’s comment

"Death rates involving coronavirus (COVID-19) decreased for both disabled and non-disabled people between second and third waves of the pandemic. However, today's analysis shows a continued elevated risk of COVID-19 mortality in disabled people compared with non-disabled people, which remains largely unchanged across the three waves of the pandemic.No single factor explains this elevated risk and this analysis suggests it is down to a range of disadvantages experienced by disabled people"

Julie Stanborough, Deputy Director Health and Life Events, Office for National Statistics.

2 . Overview of COVID-19 related deaths by disability status

The Office for National Statistics (ONS) previously published an analysis of deaths involving coronavirus (COVID-19) by self-reported disability status and learning disability status in the article: Updated estimates of coronavirus (COVID-19) related deaths by disability status, England: 24 January to 20 November 2020. The previous release used linkage of death registrations to the 2011 Census to account for demographic, socio-economic, geographic and health characteristics also associated with the risk of COVID-19 infection and death.

In previous releases we have reported on deaths by learning disability status. We have not included that analysis in this report as we are developing a programme of work drawing on, among others, Census 2021 data and linkage of administrative data sources. The aim is to provide estimates for different impairment types to reflect the variety of experiences among disabled people, including learning disability.

We explore whether differences in the risk of COVID-19 mortality between disabled and non-disabled people have changed over the course of the coronavirus pandemic and vaccination programme. Therefore, analyses have been extended to cover deaths occurring up to 9 March 2022 and stratified by coronavirus pandemic waves:

- Wave 1 - deaths occurring between 24 January and 11 September 2020
- Wave 2 - deaths occurring between 12 September 2020 and 11 June 2021
- Wave 3 - deaths occurring between 12 June 2021 and 9 March 2022

This article presents a summary of findings and highlights statistically significant differences in mortality rates between disabled and non-disabled populations. Please refer to the accompanying datasets for detailed breakdowns of analysis.

We compared the relative risk of death involving COVID-19 by self-reported disability status across all three waves of the coronavirus pandemic after adjusting for age, place of residence, geography, socio-economic and demographic factors, and health characteristics. Reflecting the progress of the vaccination roll out, our analysis of the second wave further adjusts for first and second vaccination doses, and the third wave adjusts for first, second and third doses. We do this by linkage to vaccination data from the National Immunisation Management Service (NIMS) for vaccination occurring on or after 8 December 2020.

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 . Age-standardised mortality rates involving COVID-19 by self-reported disability status

Figure 1: More-disabled people had the highest age-standardised COVID-19 mortality rate compared with less- and non-disabled people across all three waves of the coronavirus pandemic

Age-standardised mortality rates for deaths involving COVID-19 with 95% confidence intervals, by sex and self-reported disability status, stratified by waves, England: 24 January 2020 to 9 March 2022

Notes:

1. Office for National Statistics (ONS) figures are based on death registrations involving COVID-19 up to 23 March 2022 for people aged 30 to 100 years occurring between 24 January and 9 March 2022 that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic and Planning Research.

2. Deaths were defined using the International Classification of Diseases, 10th Revision (ICD-10). Deaths involving 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).

3. Disability status was defined according to the 2011 Census question; "Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? - Include problems related to old age" (Yes, limited a lot; Yes, limited a little; and No).

Download the data

.xlsx

Disabled people were identified based on their self-reported disability status in the 2011 Census. A distinction was made between those who reported that their day-to-day activities were "limited a little" or "limited a lot" as a result of a long-term health condition. These two categories are referred to here as "less-disabled" and "more-disabled" respectively, whereas people reporting no limitation to their activities are referred to as "non-disabled". The distinction between less-disabled and more-disabled is based solely on 2011 Census data and not inferred from any other information. Therefore, it only implies a difference based on self-reported activity restrictions.

Figure 1 presents annualised age-standardised mortality rates (ASMRs) involving coronavirus (COVID-19) among both men and women aged between 30 and 100 years. ASMRs allow populations with different age structures to be compared fairly. Disability is more common in older populations; therefore, it is important to adjust for population age structure in this way. In addition, using annualised rates enable periods of different length to be compared fairly. We adjust for time to be able to compare coronavirus pandemic waves of different duration.

Disabled people had a higher rate of death involving COVID-19 across each wave of the coronavirus pandemic, between 24 January 2020 and 9 March 2022, compared with non-disabled people.

More-disabled men had a statistically significantly higher rate of death involving COVID-19 than less-disabled men across each wave; a similar pattern was reflected in disabled women.

In the third wave of the coronavirus pandemic (deaths occurring between 12 June 2021 and 9 March 2022), there was a decrease in the absolute rates of death for disabled and non-disabled people, compared with the first and second waves. However, the relative rates of death between disabled and non-disabled people did not decrease between the second and third wave of the pandemic.

Relative to non-disabled men, mortality rates were 3.1 times higher for more-disabled men in the second wave of the coronavirus pandemic (303.7 per 100,000 person-years in non-disabled men compared with 942.1 per 100,000 person-years in more-disabled men). This raised rate of death for more-disabled men persisted in the third wave.

The mortality rate for more-disabled women was 3.8 times higher than for non-disabled women in the second wave of the coronavirus pandemic (670.2 compared with 174.7 for non-disabled women). In the third wave of the pandemic, the mortality rate for more-disabled women was 4.6 times higher (246.8) than the rate in non-disabled women (54.1).

On average, across all waves, mortality rates for less-disabled men were almost twice as high as rates for men who are not disabled (1.8 times, 1.9 times and 1.9 times, for waves 1, 2 and 3, respectively). Similar patterns were seen in the relative rates for less-disabled women, whereby their rates were 2.0 times, 2.0 times and 2.1 times higher than in non-disabled women across the three waves.

4 . Risk of death involving COVID-19 by self-reported disability status

We used statistical models (Cox proportional hazards regression) to estimate how differences in the risk of death involving coronavirus (COVID-19) changed when adjusting for a range of factors affecting both the risk of infection and the risk of death if infected. This approach helps us to understand which factors may be driving the differences in mortality by disability status.

We report hazard ratios (HR) for each disability status relative to the non-disabled group. The HR is a measure of how much greater or lesser the risk of death involving COVID-19 is in the two disabled groups compared with non-disabled people. A HR greater than 1 indicates a greater risk of death involving COVID-19 compared with the reference group (non-disabled people). A HR less than 1 indicates a lower risk of COVID-19 mortality relative to the reference group.

In our baseline model, we present HRs adjusted for age only (model 1). We then adjust for:

- type of residence (private household, care home, or other communal establishments), in our second model
- geography (local authority district and population density of the Lower layer Super Output Area), in our third model
- demographic and socio-economic factors (ethnicity, deprivation, household characteristics, socio-economic measures and occupational exposure), in our fourth model
- the number of hospital admissions and the number of days spent in admitted patient care (derived from hospital records since April 2017) and the presence of pre-existing health conditions (derived from primary care records since January 2000), in our fifth model; the model also allowed for the effect of all these health-related factors to vary depending on whether the individual is aged 70 years or over
- vaccination status (we allow vaccination status to vary for each person in our study population, in the period from 8 December 2020 to 9 March 2022), in our sixth model

Figure 2: Elevated COVID-19 mortality risk for disabled people was lower after adjusting for personal, household, occupational and health characteristics, but remained significantly higher than for non-disabled people

Hazard ratios for deaths involving COVID-19 for disabled men and women relative to non-disabled people of the same sex, adjusting for age, residence type, geography, socio-economic and demographic factors, health characteristics, and vaccination status, England: 24 January 2020 to 9 March 2022

Notes:

1. Cox proportional hazards models adjusting for age, residence type, geography (local authority and population density), socio-economic and demographic factors (ethnicity, area, household composition, socio-economic position, highest qualification held, household tenure, and occupation indicators - including keyworkers, exposure to disease and proximity to others), health (hospital admissions since April 2017 and pre-existing health conditions identified from primary care records since January 2000) and vaccination status (from 8 December 2020 onwards).
2. Office for National Statistics (ONS) figures based on death registrations up to 23 March 2022 of people aged 30 to 100 years that occurred between 24 January 2020 and 9 March 2022, that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic Planning and Research.
3. Deaths were defined using the International Classification of Diseases, 10th Revision (ICD-10). Deaths involving 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).

Download the data

.xlsx

Similar to our previous publication, after adjusting for age only, men and women from both disabled groups were at a greater risk of death involving COVID-19 compared with non-disabled people. Further stepwise adjustment for residence type, geography and socio-demographic characteristics accounts for a substantial decrease in the elevated COVID-19 mortality risk for disabled people of both groups and both sexes, relative to non-disabled people (Figure 2).

This decrease in relative risk was greater for more-disabled individuals compared with less-disabled individuals. Adjusting for age only, the relative risk of death was 3.1 times higher for more-disabled men relative to non-disabled men. This raised risk of death was 2.1 times higher after adjusting for residence type, geography and socio-economic characteristics. In comparison, when adjusting for age only, the raised risk of death for less-disabled men was 1.9 times higher compared with non-disabled men, and 1.6 times higher after adjusting for the same additional characteristics.

A similar trend was seen between more- and less-disabled women. After adjusting for age only, the corresponding relative risk for more-disabled women was 3.6 times higher compared with non-disabled women, and 2.4 times higher after further adjusting for residence type, geography and socio-economic characteristics. In comparison, less-disabled women had a risk of death 2.0 times higher after adjusting for age, and 1.7 times higher adjusting for the same additional characteristics.

Several factors may explain the greater decrease in relative risk for more-disabled people, when accounting for age, residence type, geography and socio-economic characteristics. More-disabled people might be disproportionately exposed to a range of disadvantageous conditions reflected in our residence type, geographic and socio-demographic variables.

More-disabled people might be more likely to live in a communal establishment, or be in contact with a keyworker, two variables included in our residence type and socio-demographic characteristics (see Updated estimates of coronavirus (COVID-19) related deaths by disability status, England methodology for further details). These factors are known to increase the risk of COVID-19 related death. Adjusting for these characteristics may highlight a difference in the exposure to disadvantageous circumstances faced by more-disabled individuals, relative to less and non-disabled people.

After controlling for age, residence type, geography and socio-demographic factors, we control for pre-existing conditions and hospital admissions. Subsequently, the relative risk of death decreased from 2.1 to 1.4 times higher for more-disabled men compared to non-disabled men, over the whole of the coronavirus pandemic period. Adjusting for health characteristics, the relative risk of death for less-disabled men also significantly decreased compared with non-disabled men. Similar patterns were also seen for more- and less-disabled women, compared with non-disabled women.

In contrast, further adjusting for vaccination status (Figure 2) does not significantly decrease the elevated risk of COVID-19 death for all disabled individuals of both sexes, relative to their non-disabled counterparts. This shows that the differences in the proportions of disabled and non-disabled people who have received the same number of vaccinations does not further explain the elevated risk of COVID-19 related death faced by disabled people.

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 Monitoring reports of the effectiveness of COVID-19 vaccination on GOV.UK.

For all disabled people, an unexplained elevated risk of COVID-19 mortality remained after adjusting for relevant factors: age, residence type, geography, socio-demographic factors, health characteristics and vaccination status, relative to non-disabled individuals. Fully adjusted models revealed men and women from both disabled groups were at greater risk of death involving COVID-19 compared with non-disabled people (Figure 2).

Fully adjusted models further show the risk of death involving COVID-19 for more- and less-disabled men were 1.4 and 1.3 times greater, respectively, than for non-disabled men. The corresponding risks for women were 1.6 and 1.3, respectively. More-disabled women were at a statistically significantly higher risk of death than more-disabled men. Adjusting for all relevant factors accounts for the difference in the elevated risk of COVID-19 death between less-disabled men and less-disabled women. More-disabled people of both sexes faced the highest risk of COVID-19 mortality, followed by less-disabled people.

Our previous analysis in Updated estimates of coronavirus (COVID-19) related deaths by disability status, England: 24 January to 20 November 2020 revealed that adjusting for age, residence type, geography, socio-economic and health characteristics fully accounted for the elevated risk of death observed between less-disabled and non-disabled men.

In this release, despite adjusting for similar factors, a smaller but statistically significant elevated risk of death remains for less-disabled men, compared with non-disabled men. This may be because of a number of reasons, among others, this release extends the period of analysis to 9 March 2022, and features vaccination status. In addition, we used an updated version of the General Practice Extraction Service (GPES) Data for Pandemic Planning and Research (GDPPR), which means the models are not strictly comparable over different releases. No changes were made to the way we define disability. Please refer to Updated estimates of coronavirus (COVID-19) related deaths by disability status, England, methodology for more details.

We find that no single factor explains the elevated risk of death involving COVID-19 among disabled people. For both sexes, and for both more- and less-disabled people. The largest reduction in the risk of death was achieved by accounting for socio-economic and geographic characteristics and pre-existing health and hospital admissions in the model. The former group of factors included region, ethnicity, area deprivation, household composition and occupation, all of which affect the risk of death involving COVID-19. Therefore, it can be inferred that a large part (but not all) of the increased risk is because disabled people are disproportionately exposed to a broad range of generally disadvantageous circumstances compared with non-disabled people.

5 . Difference between the risk of death involving COVID-19 during the coronavirus pandemic waves by self-reported disability status

Figure 3: Elevated COVID-19 mortality risk for disabled people (relative to non-disabled people) remained largely unchanged during the first, second and third waves of the coronavirus pandemic

Hazard ratios for deaths involving COVID-19 for disabled men and women relative to non-disabled people of the same sex, in the first (24 January to 11 September 2020), second (12 September 2020 to 11 June 2021) and third (12 June 2021 to 9 March 2022) waves of the coronavirus pandemic, adjusting for age, residence type, geography, socio-economic and demographic factors, health characteristics, and vaccination status, England

Notes:

1. Cox proportional hazards models (adjusted for age, residence type, geography, socio-economic and demographic factors, health variables, and vaccination status (in wave two and three only), stratified by first (24 January to 11 September 2020), second (12 September 2020 to 11 June 2021) and third (12 June 2021 to 9 March 2022) waves of the COVID-19 pandemic.

2. Office for National Statistics (ONS) figures based on death registrations up to 23 March 2022 of people aged 30 to 100 years that occurred between 24 January 2020 and 9 March 2022, that could be linked to the 2011 Census and General Practice Extraction Service Data for Pandemic Planning and Research.

3. Deaths were defined using the International Classification of Diseases, 10th Revision (ICD-10). Deaths involving 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).

Download the data

.xlsx

To explore whether the relative differences in the risk of coronavirus (COVID-19) mortality between disabled and non-disabled people changed over the course of the coronavirus pandemic, we examined deaths across three defined infection waves. We used our fully adjusted models, adjusting for age, residence type, geography, socio-demographic and health characteristics, and vaccination status from 8 December 2020 (see Updated estimates of coronavirus (COVID-19) related deaths by disability status, England, methodology for more information).

Figure 3 shows the hazard ratios (HR) for disabled men and women in the first, second and third waves of the coronavirus pandemic. The excess risk of death involving COVID-19 mortality for all disabled people, relative to non-disabled people remained unchanged between waves one, two and three.

6 . Coronavirus (COVID-19) related deaths by disability status data

Updated estimates of coronavirus (COVID-19) related deaths by disability status, England
Dataset | Released 9 May 2022
Estimates of differences in coronavirus (COVID-19) mortality risk by disability status for deaths occurring up to 9 March 2022, using linked data from the Office for National Statistics Public Health Data Asset.

7 . 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. We use annualised rates, which means that ASMRs are calculated per 100,000 person-years at-risk and can be interpreted as mortality rates per 100,000 population per year.

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 disability status). It also adjusts for other characteristics expected to be associated with the outcome.

Hazard ratio

A hazard ratio (HR) is a measure of the relative differences in the instantaneous rate of mortality between groups. A HR 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.

Coronavirus (COVID-19) deaths

Deaths involving coronavirus (COVID-19) include those with an underlying cause, or any mention, of International Classification of Diseases, 10th Revision (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.

Disability

To define disability in this publication, we refer to the self-reported answers to the 2011 Census question, "Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? - Include problems related to old age" (Yes, limited a lot or yes, limited a little or no). The limited a little and limited a lot categories are referred to in this article as "less-disabled" and "more-disabled" respectively, whereas people reporting no limitation on their activities are referred to as "non-disabled". The distinction between less-disabled and more-disabled is based solely on 2011 Census data and not inferred from any other information. Therefore, it only implies a difference based on self-reported activity restrictions.

This is slightly different to the current Government Statistical Service (GSS) harmonised "core" definition. This identifies a "disabled" person as someone who self-reports having a physical or mental health condition or illness that has lasted or is expected to last 12 months or more that reduces their ability to carry-out day-to-day activities.

The GSS definition is designed to reflect the definitions that appear in legal terms in the Disability Discrimination Act 1995 and the subsequent Equality Act 2010.

Statistical significance

The statistical significance of differences noted within the release are based on non-overlapping confidence intervals.

8 . Data sources and quality

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 2011 Census 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. We linked vaccination data from the National Immunisation Management Service (NIMS) to the PHDA based on NHS number to adjust for vaccination status.

Information about these data sources, how they have been linked, and the methods used for previous publications can be found in Updated estimates of coronavirus (COVID-19) related deaths by disability status, England, methodology.

The study population consisted of people aged 30 to 100 years in England who were alive on 24 January 2020 and could be linked to the 2011 Census and primary care records for current NHS patients. People aged under 30 years were excluded because their living circumstances are more likely to have changed since the 2011 Census.

People living in both private households and communal establishments (such as care homes) in the 2011 Census were included in the analysis. Care home residence status was updated using the NHS Patient Register 2019 for people who were recorded as living in a private household in the 2011 Census but had subsequently moved into a care home.

9 . Strengths and limitations

Strengths

The primary strength of the study is using nationwide linked population-level data. The data combine 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 disability, reflecting an individual's perception.

Limitations

The Public Health Data Asset (PHDA) 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
- people who registered with a general practitioner after the onset of the coronavirus pandemic, as we only account for pre-coronavirus pandemic health characteristics

The measure of disability and many of the socio-demographic variables were derived from the 2011 Census. Consequently, information bias is likely to happen as many older people will have developed disability in the last decade and yet will remain recorded as not disabled. While transitions out of activity limitation are also possible, this is less likely bearing in mind that reported disability tends to increase with age. As such, these contrasts should be treated as conservative estimates of differences.

In addition, some of the socio-demographic characteristics might have changed since the 2011 Census and may not accurately reflect individuals' circumstances during the coronavirus pandemic. To mitigate measurement error, we restricted our analysis to people aged 30 years and over.

10 . Related links

Updated estimates of coronavirus (COVID-19) related deaths by disability status, England: 24 January 2020 to 20 November 2020
Article | Released 11 February 2021
Estimates of differences in COVID-19 mortality risk by self-reported disability status and diagnosed learning disability status for deaths occurring up to 20 November 2020, using linked data from the 2011 Census, death registrations, and primary care and hospital records.

Updated estimates of coronavirus (COVID-19) related deaths by pandemic wave and disability status, England: 24 January to 28 February 2021
Dataset | Released 26 July 2021
Estimates of differences in COVID-19 mortality risk by self-reported disability status for deaths occurring up to 28 February 2021, using linked data from the 2011 Census, death registrations, and primary care and hospital records across each wave of the pandemic.

Disability pay gaps in the UK: 2021
Article | Released 25 April 2022
Earnings statistics for disabled and non-disabled employees in the UK, using regression analysis to provide more insight into factors that affect pay.

Outcomes for disabled people in the UK: 2021
Article | Released 10 February 2022
Outcomes for disabled people in the UK across a number of areas of life, such as employment, education, well-being, loneliness, crime and social participation. Statistical indicators based on annual data from various sources.

Coronavirus and the social impacts on disabled people in Great Britain: March 2020 to December 2021
Article | Released 2 February 2022
Analysis of the impact of the coronavirus (COVID-19) pandemic on disabled people in Great Britain during periods throughout the pandemic from March 2020 to December 2021. Based on estimates from the Opinions and Lifestyle Survey.