

Statistical bulletin

Coronavirus (COVID-19) case rates by socio-demographic characteristics, England: 1 September 2020 to 10 December 2021

Analysis of age-standardised case rates for coronavirus (COVID-19) in England by socio-demographic characteristics between 1 September 2020 and 10 December 2021.

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1 . Main points

- Coronavirus (COVID-19) case rates differed markedly by ethnic group, and the groups at highest risk changed over the second and third waves of the pandemic; in the second wave (1 September 2020 to 22 May 2021), the odds of testing positive for COVID-19 were highest among the Pakistani and Bangladeshi ethnic groups (more than double the odds for the White British group after adjusting for age and sex), whereas since the start of the third wave (23 May 2021), the odds were highest for the White British group.
- Patterns in case rates varied by age group; in the third wave, among those aged under 65, the odds of testing positive were highest for the White British group, but among people aged 65 years and over, the odds of testing positive, when compared with the White British group, were notably higher for the Bangladeshi (49% higher) and Pakistani (46% higher) ethnic groups.
- Case rates also differed by religious affiliation, with people identifying as Muslim or Sikh having the highest rates in the second wave, whereas the Christian group had the highest rates in the third wave.
- In the second wave, case rates were higher in households from lower socio-economic backgrounds than in more affluent ones; in the third wave there was little difference between socio-economic groups other than those who had never worked or were long-term unemployed, who had the lowest rates.
- In both the second and third waves, case rates were lower among disabled people than non-disabled people.

Statistician's comment

"Our analysis of COVID-19 case rates shows how the socio-demographic groups at highest risk of infection have changed over the course of the pandemic. For instance, during the second wave people in Pakistani and Bangladeshi ethnic groups were more likely to receive a positive test for COVID-19, but in the third wave people in the White British group have been most at risk.

"We've also found that patterns differ by age groups, especially in the third wave. Whilst case rates were lower in the Bangladeshi and Pakistani ethnic groups than in the White British group among people aged below 65, they were notably higher among those aged 65 or over. This may partly explain the continued elevated risk of mortality during the third wave for these groups compared to the White British group."

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

2 . Overview of data and methods

The Office for National Statistics (ONS) previously published [analysis of coronavirus \(COVID-19\) case rates by socio-demographic characteristic for England between 1 September 2020 and 25 July 2021](#). In this article, we update the previous analysis to present provisional analyses of case rates by socio-demographic characteristics in England between 1 September 2020 and 10 December 2021.

Following definitions outlined in the [ONS COVID-19 Insights tool](#), we classified tests up to and including 22 May 2021 as having occurred in the second wave, with tests from 23 May 2021 to 10 December 2021 (latest data available) classified as the first part of the third wave. Estimates relating to the second wave in this article update those reported in our previous release. This is mostly because the primary care data used in the analysis is more up-to-date, thus the study population has been revised.

The risk of coronavirus infection is complex and involves a range of inter-related factors. In our previous analysis, we adjusted for differences in age. To understand the drivers of differences in COVID-19 case rates, in this analysis we used logistic regression models to estimate the odds of testing positive for COVID-19. We first adjusted for age and sex, and then present a fully-adjusted model which adjusts for sex, age, geography, socio-demographic characteristics (ethnicity, area deprivation, educational attainment, household tenure, and care-home residence status), and self-reported disability status and the number of pre-existing health conditions.

We also further extend previous work by fitting separate models for those aged under 65 years and those 65 years and over. Easing of lockdown restrictions, such as working from home and limits on social contacts, and the vaccine rollout programme may also have played a part in the changing patterns of COVID-19 case rates by socio-demographic characteristics over the course of the pandemic.

The case rates presented in this release cover approximately 80% of the population and may therefore differ from the administrative data on COVID-19 case rates published by [Public Health England](#) and our estimates of infection from the [Coronavirus Infection Survey](#) (CIS). This is analysis of new recently collected data, and our understanding of it and its quality will improve over time. The estimates presented in this release are experimental statistics as the NHS Test and Trace data is subject to further quality assurance tests.

3 . Identity and cultural factors

Ethnic group

Differences in case rates between ethnic groups varied over time. During the second wave, age-standardised COVID-19 case rates were highest for the Bangladeshi and Pakistani groups and lowest for the Chinese group (Figure 1), with rates of 382.4 and 373.8 per 100,000 person-weeks for the Bangladeshi and Pakistani groups, respectively, compared to 90.8 for the Chinese group (see the data tables for estimated rates in full). These differences were only marginally attenuated when adjusting for geographic factors and socio-demographic characteristics. The sex and age adjusted odds ratio (OR) for the Bangladeshi ethnic group was 2.19, whereas the fully adjusted OR was 1.88 (adjusted ORs can be found in the data tables). These figures are consistent with the [differences in COVID-19 mortality](#) seen over the second wave of the coronavirus pandemic. They are also consistent with results from research [monitoring populations at an increased risk of SARS-Cov-2 infection in the community](#) carried out by our academic partners at the University of Oxford based on the Coronavirus Infection Survey.

Figure 1: In the second wave, the odds of testing positive for COVID-19 were highest among the Pakistani and Bangladeshi ethnic groups, even after adjusting for geography and socio-economic factors, whereas in the third wave, the odds were highest for the White British group

Adjusted odds ratios and weekly age-standardised COVID-19 case rates by ethnic group, 1 September 2020 to 10 December 2021, England

Notes:

1. Figures based on positive tests from NHS Test and Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. Self-reported ethnic group is derived from the 2011 Census. Other ethnic group encompasses Asian other, Black other, Arab and Other ethnic group categories in the classification.

Download the data

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Mass testing was not available during the first wave, so it was not possible to calculate case rates for this period. Estimates for the third wave of the coronavirus pandemic should be considered provisional because our period of analysis does not encompass all tests occurring during the third wave, which goes beyond 10 December 2021.

During the third wave, however, case rates were highest in the White British group, at 359.7 cases per 100,000 person-weeks. Stratifying the analyses by broad age group (those under 65 years compared with people aged 65 years and over) gives results that may partially explain the continued [higher rates of mortality among ethnic minority groups](#) seen in the third wave. Notably, among people aged under 65 years, all ethnic minority groups had lower odds of testing positive than the White British group. Conversely, during the third wave (up to 10 December 2021) among people aged 65 years or over, the fully adjusted odds of testing positive were notably higher for the Bangladeshi (OR 1.63), Pakistani (OR 1.35) and Indian (OR 1.32) ethnic groups.

Religion

For religious affiliation, during the second wave of the pandemic, case rates per 100,000 person-weeks were highest for people who identified as Muslim (334.9) and Sikh (321.6). The age and sex fully adjusted OR compared with the Christian population was 1.87 for the Sikh group and 1.82 for the Muslim group, with further adjustments only accounting for 15% and 29% of the excess risk, respectively.

During the third wave, those who identified as Christian had the highest rates at 353.8 cases per 100,000 person-weeks, whereas the lowest rates were found in the Buddhist and Muslim groups at 221.4 and 226.7 cases per 100,000 person-weeks, respectively. The fully adjusted odds of testing positive for SARS-CoV-2 were highest among those identifying as Christian; the lowest OR was observed in the Muslim population at 0.63.

During the third wave, the adjusted odds of testing positive were lower than the Christian group for all other religions among people aged under 65 years but were higher among people aged 65 years or over in the fully adjusted models for people identifying as Sikh, Hindu, Muslim, or Jewish.

Figure 2: Differences in COVID-19 case rates compared with the Christian group were highest for people identifying as Muslim or Sikh during the second wave of the pandemic, even after adjusting for geography, socio-economic factors and health, whereas the Christian group had the highest case rates in the third wave

Adjusted odds ratios and weekly age-standardised COVID-19 case rates by religious group, 1 September 2020 to 10 December 2021, England

Notes:

1. Figures based on positive tests from NHS Test and Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. Self-reported religious affiliation is derived from the 2011 Census.

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Country of birth

During the second wave, overall case rates were higher for people born outside of the UK than those born in the UK, at 203.1 cases per 100,000 person-weeks compared to 171.7 cases. However, during the third wave, rates were higher among those born in the UK (345.0 compared with 238.2 for non-UK born). In the fully adjusted model, those born outside of the UK have odds ratios relative to those born in the UK of 1.19 during the second wave and 0.79 during the third wave.

Figure 3: After adjusting for personal characteristics, COVID-19 case rates were higher among people born outside of the UK in the second wave, whereas in the third wave case rates were higher among people born in the UK

Adjusted odds ratios and weekly age-standardised COVID-19 case rates by country of birth, 1 September 2020 to 10 December 2021, England

Notes:

1. Figures based on positive tests from NHS Test & Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. Country of birth is derived from the 2011 Census.

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4 . Socio-economic factors

National Statistics Socio-economic classification

During the second wave, COVID-19 case rates were highest among people living in households where the household reference person was in a semi-routine or routine occupation, at 197.1 and 192.5 cases per 100,000 person-weeks, respectively, whereas case rates were lowest among people where the household reference person was in a higher managerial occupation (140.6 cases per 100,000 person-weeks). During the third wave, however, rates were highest among people where the household reference person was in a lower or higher; managerial, administrative or professional occupation (356.5 and 346.9 cases per 100,000 person-weeks respectively) and lowest among people where the household reference person had never worked or were long-term unemployed (254.3 cases per 100,000 person-weeks). We also find that during the second wave, COVID-19 case rates were highest in the most deprived areas, as measured by the Index of Multiple Deprivation, whilst rates were highest in the least deprived areas in the third wave ([see the data tables](#)). This is consistent with other [data sources](#).

Figure 4: In the second wave, case rates were higher in households from lower socio-economic backgrounds than in more affluent ones.

Adjusted odds ratios and weekly age-standardised COVID-19 case rates by NS-SEC of the household reference person, 1 September 2020 to 10 December 2021, England

Notes:

1. Figures based on positive tests from NHS Test and Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. National Statistics socio-economic classification (NS-SEC) of the household reference person was derived from the 2011 Census.

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Rural-urban classification

During the second wave, rates were highest in major or minor conurbations and lowest in villages, hamlets and isolated dwellings with case rates of 215.0 and 118.8 cases per 100,000 person-weeks, respectively. During the third wave, however, rates were lowest in major or minor conurbations (308.7), while the highest rates were seen in towns and fringes (360.1). After adjusting for age and sex only, the odds ratio (OR) for major or minor conurbations relative to villages, hamlets and isolated dwellings during the third wave was 0.94, while the fully adjusted models gives an OR of 1.12, suggesting the reduced relative rates can be explained by socio-economic and health factors. Recent research based on Coronavirus Infection Survey (CIS) data found that rural-urban classification was consistently associated with the risk of infection in the second and third wave. In line with Public Health England, we find substantial variation in case rates across regions, especially in the third wave (see reference Table 9).

Figure 5: Throughout the second and third waves of the coronavirus pandemic, case rates were higher in urban areas than rural areas after adjusting for personal characteristics

****Adjusted odds ratios and weekly age-standardised COVID-19 case rates by rural urban classification, 1 September 2020 to 10 December 2021, England⁸⁸**

Notes:

1. Figures based on positive tests from NHS Test and Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. Rural Urban Classification was derived from postcodes held in GP records.

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5 . Disability

Over the whole analysis period and across the second and third waves of the coronavirus (COVID-19) pandemic, COVID-19 case rates were highest among non-disabled people and lowest for disabled people who were “limited a lot” in their day-to-day activities. During the second wave, rates per 100,000 person-weeks for the non-disabled, disabled and “limited a little”, and disabled and “limited a lot” groups were 174.0, 162.9, and 159.9, respectively. During the third wave, differences between the groups were much larger, with rates being 337.6, 272.0, and 212.6, respectively. Several factors may contribute to these differences. Firstly, as [disabled people have a greater risk of death involving COVID-19](#) than non-disabled people, they may have been more likely to shield and follow social distancing guidance. Secondly, [disabled people have also been vaccinated more rapidly](#) than non-disabled people, which could explain the lower case rates compared to non-disabled people in the third wave.

Figure 6: Across the second and third waves of the pandemic, disabled people had lower odds of having a positive test than non-disabled people after adjusting for personal characteristics

Adjusted odds ratios and weekly age-standardised COVID-19 case rates by disability status, 1 September 2020 to 10 December 2021, England

Notes

1. Figures based on positive tests from NHS Test and Trace data between 1 September 2020 and 10 December 2021, where individuals could be linked to the ONS Public Health Data Asset; these figures are provisional.
2. Disability status was defined using 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; Yes, limited a little; and No).

Download the data

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6 . COVID-19 case rates by socio-demographic characteristics data

[Coronavirus \(COVID-19\) case rates by socio-demographic characteristics, England](#)

Dataset| Released 14 February 2022

Analysis of age-standardised case rates of coronavirus (COVID-19) in England by socio-demographic characteristics.

7 . Glossary

Age-standardised COVID-19 case rates

Age-standardised coronavirus (COVID-19) case rates were calculated as the number of positive cases per 100,000 person-weeks at-risk. A case was defined as a person who had at least one positive COVID-19 test in a given time period. Age-standardised rates allow comparisons between populations that may contain proportions of different ages. The age distribution within each group was standardised to the 2013 European Standard Population.

Positive test

The outcome was receiving a positive polymerase chain reaction (PCR) or lateral flow device (LFD) test result for COVID-19 in NHS Test and Trace data. We excluded positive tests from the same individual occurring within 120 days of an initial positive test as these may have been part of the same [infection episode](#).

Confidence interval

A confidence interval gives an indication of the degree of uncertainty of an estimate, showing the precision of a sample estimate. The 95% confidence intervals are calculated so that if we repeated the study many times, 95% of the time the true unknown value would lie between the lower and upper confidence limits. A wider interval indicates more uncertainty in the estimate. Overlapping confidence intervals indicate that there may not be a true difference between two estimates.

For more information, see our methodology page on [statistical uncertainty](#).

Odds ratios

An odds ratio (OR) is a measure of the relative risk of an outcome in one population compared with a different population, where ORs greater than one indicate the outcome is more likely while less than one is less likely.

8 . Measuring the data

We linked NHS Test and Trace data (pillar 1 and pillar 2) to the Office for National Statistics (ONS) Public Health Data Asset (PHDA) using NHS number. The ONS PHDA is a linked dataset combining the 2011 Census, mortality records, the General Practice Extraction Service (GPES) data for coronavirus pandemic planning and research and Hospital Episode Statistics (HES).

The study population consists of all people aged 10 years or over in 2020, living in England and registered with a general practitioner on 1 November 2019, who were enumerated at the 2011 Census, and alive on 1 September 2020. This amounts to 39,006,194 individuals, which is 78.4% of the [mid-year 2020 population estimate](#) of people aged 10 years and over in England.

The NHS Test and Trace data contain test results for up to 10 December 2021, with 5,767,584 individuals with a positive test.

All individual level socio-demographic characteristics (for example, ethnic group, religious affiliation, disability status) come from the 2011 Census. Geographic variables (region, rural-urban classification, and area-based deprivation) were derived based on data from postcodes held in GP records.

See our previous release on [coronavirus \(COVID-19\) case rates by socio-demographic characteristics](#) for details of study strengths and limitations

9 . Related links

[Coronavirus \(COVID-19\) Infection Survey. characteristics of people test positive for COVID-19, UK](#)

Bulletin| Released 19 January 2022

Characteristics of people testing positive for COVID-19 from the Coronavirus (COVID-19) Infection Survey. This survey is being delivered in partnership with the University of Oxford, University of Manchester, UK Health Security Agency and Wellcome Trust, This study is jointly led by the ONS and the Department of Health and Social Care (DHSC) working with the University of Oxford and Lighthouse Laboratory to collect and test samples.

[Coronavirus \(COVID-19\) latest insights](#)

Interactive tool | Updated as and when data become available

The latest data and trends about the coronavirus (COVID-19) pandemic from the Office for National Statistics (ONS) and other official sources.