Statistical bulletin

Coronavirus (COVID-19) Infection Survey, UK: 23 December 2021

Estimates forEngland, Wales, Northern Ireland and Scotland.This survey is being delivered in partnership with University of Oxford, University of Manchester, UK Health Security Agency andWellcomeTrust. This study is jointly led by the ONS and the Department for Health and Social Care (DHSC) working with the University of Oxford and Lighthouse laboratory to collect and test samples.

Contact:
Kara Steel and Byron Davies
infection.survey.analysis@ons.gov.uk
+44 1633 560499

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1 . Main points

- In England, the percentage of people testing positive for coronavirus (COVID-19) increased in the week ending 16 December 2021; we estimate that 1,202,300 people in England had COVID-19 (95% credible interval: 1,146,800 to 1,263,000), equating to around 1 in 45 people.
- In Wales, the trend in the percentage of people testing positive for COVID-19 was uncertain in the week ending 16 December 2021; we estimate that 54,400 people in Wales had COVID-19 (95% credible interval: 44,300 to 65,500), equating to around 1 in 55 people.
- In Northern Ireland, the trend in the percentage of people testing positive for COVID-19 was uncertain in the week ending 16 December 2021; we estimate that 37,800 people in Northern Ireland had COVID-19 (95% credible interval: 29,100 to 47,700) equating to around 1 in 50 people.
- In Scotland, the percentage of people testing positive for COVID-19 increased in the week ending 16 December 2021; we estimate that 76,200 people in Scotland had COVID-19, (95% credible interval: 63,100 to 90,500) equating to around 1 in 70 people.
- In England, the percentage of people testing positive for COVID-19 increased in the North West, Yorkshire and The Humber, East Midlands, East of England, London and the South East in the week ending 16 December 2021.
- In the week ending 16 December 2021, the percentage of people testing positive for COVID-19 in England increased in all age groups except those in school year 7 to school year 11 and those aged 70 years and older, where their trends were uncertain.
- In the week ending 16 December 2021, the percentage of cases compatible with the Omicron variant (B. 1.1.529) has increased in all four UK countries.

Within this bulletin, we summarise some of the latest results from the Coronavirus (COVID-19) Infection Survey. For more detailed information on our methods you can view our COVID-19 Infection Survey methodology article. You can also find out more about comparing methods used in the Coronavirus (COVID-19) Infection Survey and NHS Test and Trace in our article, to better understand comparisons in data sources.

We are bringing our publication forward this week in order to publish before Christmas. As a result we have produced a shortened version of our usual release. For further information on methods and background notes see our previous bulletin.

About this bulletin

In this bulletin, we refer to the number of current COVID-19 infections within the population living in private residential households. We exclude those in hospitals, care homes and/or other communal establishments. In communal establishments, rates of COVID-19 infection are likely to be different. More information about the COVID-19 pandemic from the Office for National Statistics (ONS) and other sources can be found in our Coronavirus (COVID-19) latest insights.

The positivity rate is the percentage of people who have tested positive for COVID-19 on a polymerase chain reaction (PCR) test at a point in time. We use current COVID-19 infections to mean testing positive for SARS-CoV-2, with or without having symptoms, on a swab taken from the nose and throat. This is different to the incidence rate, which is a measure of only the new PCR positive cases in a given time period. All analysis was produced with our research partners at the University of Oxford.

Our estimates are based on confirmed positive test results. The remaining swabs are either negative, which are included in our analysis, or are inconclusive, which are not included in our analysis. Some swabs are test failures, which are also not included in our analysis. We are working with the laboratories to understand consistency in the identification of inconclusive results, that could be weak positive results. The impact of this on our estimates of positive infections is likely to be very small and unlikely to affect the trend.

More information on COVID-19 and taking part in our survey

- If you have any further questions, please email the CIS operations team: COVID-19@ons.gov.uk.
- Find the latest on coronavirus (COVID-19) in the UK.
- Explore the latest coronavirus data from the ONS and other sources.
- View all coronavirus data.
- Find out how we are working safely in our studies and surveys.

2 . Percentage of people who had COVID-19 in England, Wales, Northern Ireland and Scotland

Our survey shows that in the week ending 16 December 2021:

- in England and Scotland, the percentage of people testing positive for coronavirus (COVID-19) increased
- the trend in the percentage of people testing positive in Wales and Northern Ireland was uncertain
- our reported headline positivity estimates contain both Omicron (B.1.1.529) and Delta (B.1.617.2 and its genetic descendants) variants

Because of the relatively small number of tests in Wales, Northern Ireland and Scotland in our sample, credible intervals are wider and therefore results should be interpreted with caution. These wide credible intervals mean that differences between the central estimates within and between nations may appear smaller or more exaggerated than they really are.

Figure 1: The percentage of people testing positive for COVID-19 increased in England and Scotland, and the trend was uncertain in Wales and Northern Ireland in the week ending 16 December 2021

Estimated percentage of the population testing positive for coronavirus (COVID-19) on nose and throat swabs, UK, 16 December 2020 to 16 December 2021

Notes:

1. Modelled results are provisional and subject to revision.

2. These statistics refer to infections occurring in private households.

3. All estimates are subject to uncertainty, given that a sample is only part of the wider population. The model used to provide these estimates is a Bayesian model: these provide 95% credible intervals. A credible interval gives an indication of the uncertainty of an estimate from data analysis.

4. Official reported estimates are plotted at a reference point believed to be most representative of the given week.

5. The official estimate presents the best estimate at that point in time. Modelled estimates are used to calculate the official reported estimate. The model smooths the series to understand the trend and is revised each week to incorporate new test results, providing the best indication of trend over time.

6. Official estimates are displayed over a rolling year up to the most recent week. The full time series of our official estimates from 27 April 2020 onwards are available in the Coronavirus (COVID-19) Infection Survey datasets.

Download the data

.xlsx

3 . Sub-national analysis of the number of people who had COVID-19

Our survey shows in the week ending 16 December 2021:

- the percentage of people testing positive increased in the North West, Yorkshire and The Humber, East Midlands, East of England, London, and the South East

- the trend in the percentage of people testing positive was uncertain in the North East, West Midlands, and the South West

Caution should be taken in over-interpreting any small movements in the latest trends. More information on the percentage of people testing positive for coronavirus (COVID-19) across regions in England can be found in the accompanying Coronavirus (COVID-19) Infection Survey datasets.

Sub-regional analysis of the UK

We have not updated our modelled estimates for sub-regions of England, Wales, Northern Ireland and Scotland for this release because this publication has been brought forward in order to publish before Christmas.

4 . Age analysis of the number of people who had COVID-19

Age analysis by category for England

Our age categories separate children and young people by school age:

- "aged two years to school Year 6" includes children in primary school and below
- "school Year 7 to school Year 11" includes children in secondary school
- "school Year 12 to those aged 24 years" includes young adults who may be in further or higher education

This means that 11- to 12-year-olds and 16- to 17-year-olds have been split between different age categories depending on whether their birthday is before or after 1 September.

Our survey shows in the week ending 16 December 2021:

- the percentage of people testing positive for COVID-19 in England increased in all age groups except those in school year 7 to school year 11 and those aged 70 years and older, where their trends were uncertain
- the highest percentage of people testing positive for COVID-19 was in those aged two to school Year 6 at 5.90% (95% credible interval: 5.21% to 6.65%)

Recent analysis on the predictors of Omicron (B.1.1.529) positivity published on 21 December 2021 suggests that positive cases among school age children are much less likely to be compatible with Omicron (B.1.1.529) than positive cases among adults. Therefore, positivity in school age children is still primarily driven by infections with Delta (B.1. 617.2 and its genetic descendants). More information on our analysis of predictors of Omicron (B. 1.1.529) positivity is available in our statement.

More information on the percentage of people testing positive by age breakdown in England can be found in the accompanying dataset for England.

Estimates for non-overlapping 14-day periods (which underpin our modelled estimates) by age group are available in our Coronavirus (COVID-19) Infection Survey datasets and are provided as an alternative measure over time for context.

Age analysis by single year of age over time by country

Our modelled daily estimates of the percentage testing positive for COVID-19 by single year of age over time for all four UK countries, 5 November to 16 December 2021 can be found in our accompanying dataset. These estimates are produced using a different method to the grouped age analysis for England and are therefore not comparable. Caution should be taken in over-interpreting small movements in positivity day to day.

Further analysis on age for Wales, Northern Ireland and Scotland is published by their respective statistical agencies. Analysis for Wales is published in English and Welsh.

5 . Number of new COVID-19 infections in England, Wales, Northern Ireland and Scotland

We have not updated our incidence estimates for England, Wales, Northern Ireland and Scotland for this release because this publication has been brought forward in order to publish before Christmas.

6 . Analysis of viral load and variants of COVID-19

Each week, we publish Cycle threshold (Ct) values, which indicate viral load and act as a proxy for the strength of the virus. We also break down infections by variant based on gene positivity patterns from our swab tests.

The Omicron variant (B.1.1.529) of coronavirus (COVID-19) has changes in one of the three genes that coronavirus swab tests detect, known as the S-gene. This means in cases compatible with the Omicron variant, the S-gene is no longer detected by the current test. When there is a high viral load (for example, when a person is most infectious), absence of the S-gene in combination with the presence of the other two genes (ORF1ab and N-genes) is a reliable indicator of the Omicron variant (B.1.1.529). However, as the viral load decreases (for example, if someone is near the end of their recovery from the infection), the absence of the S-gene is a less reliable indicator of the Omicron variant.

The World Health Organization (WHO) have defined names for Variants of Concern. These are variants that the UK government has under surveillance. You can find out more in the latest SARS-CoV-2 variants of concern and variants under investigation in England briefing document.

UK Variants of Concern:

- Alpha: B.1.1.7
- Beta: B.1.351
- Gamma: P.1
- Delta: B.1.617.2 and its genetic descendants
- Omicron: B.1.1.529 (which includes sublineages BA.1,BA.2 and BA.3)

Infections compatible with the Delta variant have been the most common since the end of May 2021 in England, and since the end of July 2021 in all four UK countries. In the most recent four weeks up to 6 December 2021, results show over 94% of all COVID-19 infections, from which we obtained a genetic sequence, were genetically compatible with the Delta variant or a descendant of the Delta variant.

The following analysis looks at the percentage of positive tests that are compatible with the Omicron variant and Delta variant of the virus in England, Wales, Northern Ireland and Scotland and the regions of England. Our analysis on the percentage of people testing positive by variant is based on PCR gene positivity patterns.

Data should be treated with caution. In particular, there are small numbers of positives detected in Wales, Northern Ireland and Scotland leading to considerable uncertainty surrounding these estimates. There are further uncertainties given that not all cases that are positive only on the ORF1ab and N-genes (denoted Omicron-compatible below) will be the Omicron variant.

Our survey shows in the week ending 16 December 2021:

- the percentage of cases compatible with the Omicron variant (B.1.1.529) increased in all four UK countries
- the percentage of cases compatible with the Delta variant (B.1. 617.2 and its genetic descendants) has decreased in England, Wales and Northern Ireland, and the trend was uncertain in Scotland

Figure 2: The percentage of cases compatible with the Omicron variant increased in all four UK countries in the week ending 16 December 2021

Modelled percentage of positive cases compatible with the Delta variant, and compatible with the Omicron variant, based on nose and throat swabs, daily, from 5 November to 16 December 2021, UK

Notes:

1. All results are provisional and subject to revision.

2. These statistics refer to infections occurring in private households.

3. Omicron variant compatible positives are defined as those that are positive on the ORF1ab-gene and N-gene, but not the S-gene. Delta variant compatible positives are defined as those that are positive on the ORF1ab, N-gene and S-gene, as well as N+S and ORF+S.

4. Data should be treated with caution. Not all cases positive on the S gene will be the Delta variant, but some cases with pattern ORF1ab+N will also be the Delta variant where the S gene was not detected for other reasons, such as low viral load.

Download the data

.xlsx

Also our survey shows in the week ending 16 December 2021:

- the percentage of cases compatible with the Omicron variant (B.1.1.529) increased in all regions except the North East

- in the North East, the trend in the percentage of cases compatible with the Omicron variant (B.1.1.529) was uncertain

- the percentage of cases compatible with the Delta variant (B.1. 617.2 and its genetic descendants) decreased in the East of England, West Midlands, London, South East and South West

- the trend in the cases compatible with the Delta variant (B.1. 617.2 and its genetic descendants) was uncertain for all other regions

More information on the percentage of people testing positive by variant across the regions of England can be found in the accompanying technical dataset.

Caution should be taken in over-interpreting any small movements in the latest trend.

Our Coronavirus (COVID-19) Infection Survey: technical dataset contains several tables relating to analysis on variants, including the genetic lineages of the virus seen in the samples we sequence. More information on how we measure variants from positive tests on the survey can be found in our Understanding COVID-19 Variants blog . Our COVID-19 Infection Survey methods article gives more detail about how we sequence the virus' genetic material.

The sequencing is produced by Northumbria University and analysis is produced by research partners at the University of Oxford. Of particular note are Dr Katrina Lythgoe, Dr David Bonsall, Dr Tanya Golubchik, and Dr Helen Fryer. Genome sequencing is funded by the COVID-19 Genomics UK (COG-UK) consortium. COG-UK is supported by funding from the Medical Research Council (MRC) part of UK Research and Innovation (UKRI), the National Institute of Health Research (NIHR), and Genome Research Limited operating as the Wellcome Sanger Institute.

7 . Test sensitivity and specificity

The estimates provided in Sections 2 to 6 are for the percentage of the private-residential population testing positive for coronavirus (COVID-19), otherwise known as the positivity rate. We do not report the prevalence rate. To calculate the prevalence rate, we would need an accurate understanding of the swab test's sensitivity (true-positive rate) and specificity (true-negative rate).

While we do not know the true sensitivity and specificity of the test, our data and related studies provide an indication of what these are likely to be. In particular, the data suggest that the false-positive rate is very low - under 0.005%. We do not know the sensitivity of the swab test. However, other studies suggest that sensitivity (the rate of true-positive test results) may be somewhere between 85% and 98%.

You can find more information on sensitivity and specificity in our COVID-19 Infection Survey methods article and our blog that explains why we trust the data from the COVID-19 infection survey. You can find more information on the data suggesting that our test's false-positive rate is very low in a paper written by academic partners at the University of Oxford.

8 . Coronavirus (COVID-19) Infection Survey data

Coronavirus (COVID-19) Infection Survey: England
Dataset | Released 23 December 2021
Findings from the Coronavirus (COVID-19) Infection Survey for England.

Coronavirus (COVID-19) Infection Survey: Northern Ireland
Dataset | Released 23 December 2021
Findings from the Coronavirus (COVID-19) Infection Survey for Northern Ireland.

Coronavirus (COVID-19) Infection Survey: Scotland
Dataset | Released 23 December 2021
Findings from the Coronavirus (COVID-19) Infection Survey for Scotland.

Coronavirus (COVID-19) Infection Survey: Wales
Dataset | Released 23 December 2021
Findings from the Coronavirus (COVID-19) Infection Survey for Wales.

Coronavirus (COVID-19) Infection Survey: technical data
Dataset | Released 23 December 2021
Technical and methodological data from the Coronavirus (COVID-19) Infection Survey, England, Wales, Northern Ireland and Scotland.

9 . Collaboration

The Coronavirus (COVID-19) Infection Survey analysis was produced by the Office for National Statistics (ONS) in collaboration with our research partners at the University of Oxford, the University of Manchester, UK Health Security Agency (UK HSA) and Wellcome Trust. Of particular note are:

- Sarah Walker - University of Oxford, Nuffield Department for Medicine: Professor of Medical Statistics and Epidemiology and Study Chief Investigator
- Koen Pouwels - University of Oxford, Health Economics Research Centre, Nuffield Department of Population Health: Senior Researcher in Biostatistics and Health Economics
- Thomas House - University of Manchester, Department of Mathematics: Reader in Mathematical Statistics

10 . Glossary

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 methodology page on statistical uncertainty.

Credible interval

A credible interval gives an indication of the uncertainty of an estimate from data analysis. The 95% credible intervals are calculated so that there is a 95% probability of the true value lying in the interval.

Cycle threshold (Ct) values

The strength of a positive coronavirus (COVID-19) test is determined by how quickly the virus is detected, measured by a cycle threshold (Ct) value. The lower the Ct value, the higher the viral load and stronger the positive test. Positive results with a high Ct value can be seen in the early stages of infection when virus levels are rising, or late in the infection, when the risk of transmission is low.

False-positives and false-negatives

A false-positive result occurs when the tests suggest a person has COVID-19 when in fact they do not. By contrast, a false-negative result occurs when the tests suggest a person does not have COVID-19 when in fact they do. For more information on false-positives and false-negatives, see our methods article and our blog.

11 . Measuring the data

Reference dates

We aim to provide the estimates of positivity rate (the percentage of those who test positive) and incidence that are most timely and most representative of each week. We decide the most recent week we can report on based on the availability of test results for visits that have already happened, accounting for the fact that swabs have to be couriered to the labs, tested and results returned. On most occasions, the reference dates align perfectly, but sometimes this is not feasible. This week, the reference week for positivity is 10 to 16 December 2021.

Within the most recent week, we provide an official estimate for positivity rate based on a reference point from the modelled trends. For positivity rates, we can include all swab test results, even from the most recent visits. Therefore, although we are still expecting further swab test results from the labs, there was sufficient data for the official estimate for infection to be based on a reference point after the start of the reference week. To improve stability in our modelling while maintaining relative timeliness of our estimates, we are reporting our official estimates based on the midpoint of the reference week. This week, the reference day for positivity rates is Monday 13 December 2021.

Response rates

Response rates for England, Wales, Northern Ireland and Scotland cannot be regarded as final response rates to the survey since those who are invited are not given a time limit in which to respond, and different modes of sampling are not comparable. Response rates for each nation are found in the Coronavirus (COVID-19) Infection Survey: technical dataset. We provide response rates separately for the different sampling phases of the study. Additional information on response rates can be found in our COVID-19 Infection Survey methods article.

Survey fieldwork

Survey fieldwork for the pilot study began in England on 26 April 2020. In Wales, fieldwork began on 29 June 2020, in Northern Ireland fieldwork began on 26 July 2020 and in Scotland fieldwork began on 21 September 2020.

Other Coronavirus Infection Survey (CIS) analysis and studies

This study is one of a number of studies that look to provide information around the coronavirus pandemic within the UK. For information on other studies see Section 11: Measuring the data in our previous bulletin dated 30 April 2021.

12 . Strengths and limitations

These statistics have been produced quickly in response to developing world events. The Office for Statistics Regulation (OSR), on behalf of the UK Statistics Authority, has reviewed them on 14 May 2020 and 17 March 2021 against several important aspects of the Code of Practice for Statistics and regards them as consistent with the Code's pillars of trustworthiness, quality and value.

The estimates presented in this bulletin contain uncertainty. There are many sources of uncertainty, including uncertainty in the test, in the estimates and in the quality of data collected in the questionnaire. Information on the main sources of uncertainty are presented in our Coronavirus (COVID-19) Infection Survey Quality and Methodology Information report, our methodology article, and our blog that explains why we trust the data from the COVID-19 infection survey.

13 . Related links

Coronavirus (COVID-19) Infection Survey: characteristics of people testing positive for COVID-19 in countries of the UK
Bulletin| Updated fortnightly
The characteristics of people testing positive for coronavirus (COVID-19) from the COVID-19 Infection Survey. This survey is being delivered in partnership with the University of Oxford, the University of Manchester, UK Health Security Agency and Wellcome Trust.

Coronavirus (COVID-19) Infection Survey: antibody and vaccination data for the UK
Bulletin | Updated fortnightly
Antibody and vaccination data by UK country and English regions 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.

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.

Deaths registered weekly in England and Wales, provisional
Bulletin | Updated weekly
Provisional counts of the number of deaths registered in England and Wales, including deaths involving COVID-19, by age, sex and region, in the latest weeks for which data are available.

Coronavirus (COVID-19) Infection Survey technical article: Analysis of characteristics associated with vaccination uptake
Technical article | Released 15 November 2021
Analysis of populations in the UK by likelihood of being vaccinated against COVID-19 using the Coronavirus (COVID-19) Infection Survey. This survey is being delivered in partnership with University of Oxford, University of Manchester, UK Health Security Agency and Wellcome Trust.

COVID-19 Infection Survey: methods and further information
Methodology article | Updated 24 August 2021
Information on the methods used to collect the data, process it, and calculate the statistics produced from the Coronavirus (COVID-19) Infection Survey.

The Coronavirus (COVID-19) Infection Survey QMI
Methodology article | Updated 16 July 2021
Quality and Methodology Information for the Coronavirus (COVID-19) Infection Survey (CIS), detailing the strengths and limitations of the data, methods used, and data uses and users.