

Statistical bulletin

Coronavirus (COVID-19) Infection Survey, characteristics of people testing positive for COVID-19, UK: 20 July 2022

Characteristics of people testing positive for COVID-19 from the Coronavirus (COVID-19) Infection Survey. This survey is delivered in partnership with University of Oxford, University of Manchester, UK Health Security Agency (UKHSA) and Wellcome Trust, working with the University of Oxford and partner laboratories to collect and test samples.

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Release date:
20 July 2022

Next release:
21 September 2022

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1 . Main points

- The risk of coronavirus (COVID-19) reinfection was approximately five times higher in the period when the Omicron variants were dominant (20 December 2021 to 1 July 2022), compared with when the Delta variant was dominant (17 May to 19 December 2021).
- Younger people were more likely to be reinfected than older people, from 2 July 2020 to 1 July 2022.
- The percentage of people who tested positive for COVID-19 and reported symptoms in June 2022 remained similar to that in May 2022.
- In June, the most commonly reported symptoms continued to be cough, sore throat, fatigue and headache.

About this bulletin

In this bulletin, we present the latest analysis on reinfections, risk factors associated with reinfection and symptoms reported by strong positive cases of coronavirus (COVID-19). This is part of our series of [analysis on the characteristics of people testing positive for COVID-19](#).

In this bulletin, we refer to the number of COVID-19 infections within the population living in private residential households. We exclude those in hospitals, care homes and/or other communal establishments. We include COVID-19 infections, which we define as testing positive for SARS-CoV-2, with or without having symptoms, on a swab taken from the nose and throat.

More about coronavirus

- 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](#).

More information on our headline estimates of the overall number of positive cases in England, Wales, Northern Ireland and Scotland are available in our [latest weekly bulletin](#). Our [methodology article](#) provides more information on the methods used for our models.

2 . Reinfections with COVID-19, UK

This section looks at the rate of coronavirus (COVID-19) reinfections in the UK, from 2 July 2020 to 11 July 2022.

The [technical article on reinfections](#) provides a more detailed explanation of the methods used, some of which have since been updated. Table 1a in the [accompanying dataset](#) for this bulletin contains our reinfection data.

This analysis includes individuals who have had at least one positive test recorded in the survey and meet our criteria for being "at risk" of reinfection. An individual is classified as "at risk" if it is possible for a test of theirs to be considered a reinfection if it turns out to be positive. The "at-risk period" refers to the period following the first time we could have defined a reinfection based on a combination of the number of days between initial and subsequent positive tests and the number of immediately preceding negative tests, and the viral load and variant type of initial and subsequent positive tests. Full details of the definition used to identify a reinfection in this analysis can be found in [Section 8: Measuring the data](#). A reinfection is therefore only identified when an "at risk" individual has a positive test.

There has been a large increase in the rates for reinfections since Omicron variants became dominant

There has been a large increase in the rates for all first reinfections, and first reinfections with a high viral load, since the Omicron variants became dominant (20 December 2021 onwards). Viral load is approximated by cycle threshold (Ct) values, which are lower with a high viral load. Participant days at risk and Ct values are further defined in our [Glossary](#).

Figure 1: There has been a large increase in the rate of reinfections since the start of the Omicron dominant period

Rate of reinfections per 100,000 participant days at risk, UK, 22 March 2021 to 11 July 2022

Notes:

1. These estimates include first reinfections only (that is, second infections).
2. Where multiple positive tests are available within an infection episode, the minimum Ct value is taken to reflect the greatest viral burden observed.

Download the data

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Table 1 includes analysis of the flow of first infections into second infections broken down by variant dominant period.

Of all reinfections, most have been in the period when the Omicron variant was dominant

A large proportion of reinfections in the Omicron dominant period had first infections in the Alpha (37.9%) and Delta (37.1%) dominant periods. A small proportion of people have had a first and second infection during the same variant dominant period, but the rate is highest for those in the Omicron dominant period (14.6%).

Table 1: Estimated flow of first infections into second infections by variant dominant periods, UK, 2 July 2020 to 8 July 2022

Period during first infection	Period during second infection	Estimated percentage (%) of total reinfections
Alpha	Alpha	1.8
Alpha	Delta	7.6
Alpha	Omicron	37.9
Delta	Delta	1.0
Delta	Omicron	37.1
Omicron	Omicron	14.6

Source: Office for National Statistics - Coronavirus (COVID-19) Infection Survey

Notes

1. These estimates include first reinfections only (that is, second infections).
2. We define the Alpha variant period as prior to 17 May 2021, the Delta variant period as 17 May to 19 December 2021, and the Omicron variants period as 20 December 2021 onwards. These are the periods during which these respective variants were most dominant. Other variants were in circulation at the time.

3 . Risk factors associated with COVID-19 reinfections, UK

This section presents analysis of the risk factors associated with a coronavirus (COVID-19) reinfection identified among participants across the UK who had previously tested positive in the survey. This analysis included 67,831 participants "at risk" of reinfection and 6,734 reinfections identified between 2 July 2020 and 1 July 2022.

Our [reinfections technical article](#) outlines the model used to investigate how the rate of reinfection varies over time and between individuals. This model explores multiple factors including:

- age
- sex
- ethnicity
- cycle threshold (Ct) value observed in the initial infection
- deprivation
- household size
- working in patient-facing healthcare
- long-term health conditions
- vaccination status
- the period during which an individual was at risk

We define the Alpha variant period as prior to 17 May 2021, the Delta variant period as 17 May to 19 December 2021, and the Omicron variants period as 20 December 2021 onwards.

People are now around five times more likely to be reinfected in the Omicron dominant period than in the Delta dominant period

The risk of reinfection by characteristic is measured in terms of hazard ratios and presented in Figure 2. In addition to the variables presented in Figure 2, we also looked at the risk of reinfection during the periods when different variants became dominant and the effect of [Ct values](#). A Ct value is a proxy for the quantity of virus (also known as viral load), where a lower Ct value indicates higher viral load.

People are now around five times more likely to be reinfected with Omicron as the dominant variant than when Delta was the dominant variant. This risk of reinfection has decreased since earlier in the Omicron period, where in March 2022, people were around 10 times more likely to be reinfected. This is because the number of reinfections varies across the level of protection provided by past infections, changing infection levels among the population and people experiencing more than two infections (these people are not included in our analysis).

Compared with our reference category of people who had their second vaccine 14 to 89 days ago, those who were unvaccinated and those who had their latest vaccine more than 90 days ago were more likely to be reinfected.

People who reported symptoms within 35 days of the first positive test in their first infection continued to be less likely to be reinfected than those who did not. People continued to be more likely to be reinfected if they had a lower viral load (higher Ct value) in their first infection. Both of these findings may be because of a weaker immune response in "milder" primary infections.

Younger people were more likely to be reinfected than older people, from 2 July 2020 to 1 July 2022.

Hazard ratios for all characteristics included in the model, including for Ct values separately, can be found in Tables 2a and 2b in the [accompanying dataset](#). Estimated rates of reinfection over time can be found in Table 2c in the [accompanying dataset](#).

Figure 2: Younger people were more likely to be reinfected than older people

Reinfection hazard ratios for characteristics included in the model, UK, 2 July 2020 to 1 July 2022

Notes:

1. These estimates include first reinfections only (that is, second infections).
2. A hazard ratio of greater than 1 indicates more risk in the specified group compared with the reference group, and a hazard ratio of less than 1 indicates less risk.
3. The hazard ratio for [deprivation](#) shows how a 10-unit increase in deprivation score, where 1 represents most deprived and 100 represents least deprived, affects the likelihood of testing positive for COVID-19.
4. Although included in the model, periods for which different variants were dominant and the effect of Ct values, are not presented in this figure but are included in Tables 2a and 2b of the [accompanying dataset](#), respectively. The effect of calendar periods is not included in this figure because of the larger scale for effects of the period when Omicron variants were dominant in comparison with other findings.

Download the data

[.xlsx](#)

4 . Symptoms' profile of strong positive cases, UK

This section presents analysis based on people who tested positive for coronavirus (COVID-19) with a strong positive test ([cycle threshold \(Ct\)](#) value less than 30). It considers what percentage of these people reported individual and groups of symptoms [note 1] within 35 days of the first positive test in each infection episode. We present this analysis for the whole of the UK split by month, which covers 1 December 2020 to 24 June 2022, and for the period from 1 April to 24 June 2022 split by UK country. All of our symptoms analysis can be found in Tables 3a to 3f in the [accompanying dataset](#).

The average viral load of the people testing positive for COVID-19 also affects whether they are likely to report symptoms. We have seen that the viral load of strong positive results increased during January 2022, as measured by decreases in the average Ct value (see [Glossary](#), for more information on Ct values). This will also affect the prevalence of symptoms within these strong positive cases.

The percentage of people who tested positive for COVID-19 and reported symptoms in June 2022 remained similar to that in May 2022

In June 2022, 61% (95% confidence interval: 60% to 63%) of people testing positive for COVID-19 in the UK with a strong positive test reported any specific symptoms [note 1] or any other self-reported symptoms compatible with COVID-19. This was a slight increase from 60% in May 2022 although confidence intervals overlap (95% confidence interval: 59% to 62%).

The percentage of people with a strong positive test who reported a sore throat, muscle ache, fever and abdominal pain increased in June 2022 compared with May 2022.

The percentage of people reporting loss of taste or smell decreased sharply between November and December 2021 and has since remained at these lower levels. This decrease coincided with increasing infections from the Omicron variants.

The percentage of people testing positive for COVID-19 who reported any symptoms was similar in England, Wales, Northern Ireland and Scotland between 1 April and 24 June 2022.

Because of smaller sample sizes in Wales, Northern Ireland and Scotland in comparison with England, the confidence intervals are wider indicating higher uncertainty.

Figure 3: The percentage of people testing positive for COVID-19 who reported several symptoms, including muscle ache, fever and sore throat, increased in June 2022 compared with May 2022

Unweighted percentage of people testing positive for coronavirus with symptoms, including only those who have strong positive tests (cycle threshold (Ct) value less than 30) by month, UK, 1 December 2020 to 24 June 2022

Notes:

1. All results are provisional and subject to revision.
2. Symptoms are self-reported and were not professionally diagnosed.
3. The data presented are unweighted percentages of people with any positive test result that had a Ct value less than 30.

Download the data

[.xlsx](#)

Notes for: Symptoms' profile of strong positive cases, UK

1. The symptoms respondents were asked to report are: fever, muscle ache (myalgia), fatigue (weakness or tiredness), sore throat, cough, shortness of breath, headache, nausea or vomiting, abdominal pain, diarrhoea, loss of taste or loss of smell. Symptoms are self-reported and were not professionally diagnosed.

5 . Characteristics of people testing positive for COVID-19 data

[Coronavirus \(COVID-19\) Infection Survey, characteristics of people testing positive for COVID-19, UK Dataset | Released 20 July 2022](#)

Characteristics of people testing positive for coronavirus (COVID-19) taken from the COVID-19 Infection Survey.

6 . Collaboration



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The Coronavirus (COVID-19) Infection Survey analysis was produced by the Office for National Statistics (ONS) in partnership with the University of Oxford, the University of Manchester, UK Health Security Agency 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
- Anna Seale - University of Warwick, Warwick Medical School: Professor of Public Health; UK Health Security Agency, Data, Analytics and Surveillance: Scientific Advisor

7 . 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.

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.

Deprivation

Deprivation is based on an [index of multiple deprivation \(IMD\)](#) (PDF, 2.18MB) score or equivalent scoring method for the devolved administrations, from 1, which represents most deprived, up to 100, which represents least deprived. The hazard or odds ratio shows how a 10-unit increase in deprivation score, which is equivalent to 10 percentiles or 1 decile, affects the likelihood of testing positive for COVID-19.

Odds ratio

An odds ratio indicates the likelihood of an individual testing positive for COVID-19 given a particular characteristic or variable. When a characteristic or variable has an odds ratio of one, this means there is neither an increase nor a decrease in the likelihood of testing positive for COVID-19 compared with the reference category. An odds ratio greater than one indicates an increased likelihood of testing positive for COVID-19 compared with the reference category. An odds ratio less than one indicates a decreased likelihood of testing positive for COVID-19 compared with the reference category.

Hazard ratio

A measure of how often a particular event happens in one group compared with how often it happens in another group, over time. When a characteristic (for example, being male) has a hazard ratio of one, this means that there is neither an increase nor a decrease in the risk of reinfection compared with a reference category (for example, being female).

Participant days at risk

The risk of reinfection varies from person to person, depending on when they were first infected. People who were first infected in the early part of the survey have had more opportunity to become reinfected compared with someone who has experienced their first infection more recently. Therefore, this analysis uses "participant days at risk" to determine the number of reinfections.

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

8 . Measuring the data

More information on measuring the data is available in the [Coronavirus \(COVID-19\) Infection Survey statistical bulletin](#).

Our [methodology article](#) provides further information around the survey design, how we process data and how data are analysed.

Reinfections with COVID-19 analysis

All estimates of COVID-19 reinfections in Sections 2 and 3 are unweighted. The sample for this analysis includes only those who have tested positive for COVID-19 on a swab test, and so there was no known population of which weighted estimates could be representative.

Since the bulletin published 30 March 2022, we have updated our definition of a reinfection to reflect the shorter time between reinfections that have occurred during the period when most infections were with the Omicron variants, compared with earlier variants.

A reinfection was identified in this analysis if any one of the following three conditions were met.

For time since previous infection and number of negative tests, if there is either:

- a positive test 120 or more days after an initial first positive test and following one or more negative tests
- a positive test 90 or more days after an initial first positive test and following two or more negative tests, or, for positive tests on or after 20 December 2021 when Omicron became the main variant, following one or more negative tests
- a positive test 60 or more days after an initial first positive test and following three or more negative tests
- a positive test after an initial first positive test and following four or more negative tests

For high viral load:

Where both the first positive test and subsequent positive test have a high viral load, or there has been an increase in viral load between first positive test and subsequent positive tests.

For evidence of different variant types:

Where there is evidence, based on either genetic sequencing data or gene positivity from the polymerase chain reaction (PCR) swab test, that the variant differs between positive tests.

Symptoms analysis

The analysis in Section 4 looks at each person who tested positive for COVID-19 and had a strong positive test in the UK. The strength of the 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.

Participants who only have positive tests with high Ct values (see [Glossary](#)) within a positive episode are excluded from this analysis to exclude the possibility that symptoms are not identified because we pick up individuals either very early or later on in their infection.

The analysis considers all symptoms reported at survey visits within 35 days of the first positive test in the episode. At each survey visit individuals are asked whether they had experienced a range of possible symptoms [note 1] in the seven days before they were tested, and also separately whether they felt that they had symptoms compatible with a COVID-19 infection in the last seven days. This includes symptoms reported even when there is a negative test result within this timeframe or a positive test result with a higher Ct value. Positive episodes are defined as "a new positive test 120 days or more after an initial first positive test and following a previous negative test, or, if within 120 days, a subsequent positive test following four consecutive negative tests".

Notes for: Measuring the data

1. The symptoms respondents were asked to report are: fever, muscle ache (myalgia), fatigue (weakness or tiredness), sore throat, cough, shortness of breath, headache, nausea or vomiting, abdominal pain, diarrhoea, loss of taste or loss of smell.

9 . Strengths and limitations

More information on strengths and limitations is available in the [Coronavirus \(COVID-19\) Infection Survey statistical bulletin](#).

10 . Related links

[Coronavirus \(COVID-19\) Infection Survey, UK](#)

Bulletin | Updated weekly

Estimates for England, Wales, Northern Ireland and Scotland.

[Coronavirus \(COVID-19\) Infection Survey: antibody and vaccination data for the UK](#)

Bulletin | Updated fortnightly

Antibody and vaccination data by UK country and regions in England from the Coronavirus (COVID-19) Infection Survey.

[Coronavirus \(COVID-19\) Infection Survey technical article: predictors of positivity across countries of the UK](#)

Technical article | Released 28 October 2021

Analysis of predictors of positivity across countries of the UK for coronavirus (COVID-19) from the COVID-19 Infection Survey.

[Coronavirus \(COVID-19\) Infection Survey technical article: analysis of reinfections of COVID-19: June 2021](#)

Technical article | Released 29 June 2021

Data about reinfections from the Coronavirus (COVID-19) Infection Survey.

[COVID-19 Infection Survey: methods and further information](#)

Methodology article | Updated 7 February 2022

Information on the methods used to collect the data, process it, and calculate the statistics produced from the 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.