Statistical bulletin

Coronavirus (COVID-19) Infection Survey, characteristics of people testing positive for COVID-19, UK: 25 May 2022

Characteristicsof people testing positive for COVID-19 from the Coronavirus (COVID-19) Infection Survey.

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1 . Main points

- Those who reported being vaccinated recently were generally less likely to test positive for coronavirus (COVID-19) than those who reported not being vaccinated, in the fortnight ending 7 May 2022.

- People previously infected with COVID-19 continued to be less likely to test positive than those who had not experienced a prior infection, in the fortnight ending 7 May 2022.

- People who reported that they had travelled abroad in the last 28 days continued to be more likely to test positive for COVID-19 than those who had not, in the fortnight ending 7 May 2022.

- The risk of COVID-19 re-infection was approximately eight times higher in the period when the Omicron variants were most common (20 December 2021 to 13 May 2022), compared with when the Delta variant was most common (17 May to 19 December 2021).

- People who were unvaccinated continued to be more likely to be re-infected with COVID-19 than people who had been vaccinated, from 2 July 2020 to 13 May 2022.

About this bulletin

In this bulletin, we present the latest analysis of the characteristics associated with testing positive for SARS-CoV-2, the coronavirus causing the COVID-19 disease in the UK. We also present analysis on re-infections and risk factors associated with re-infection. 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 . Characteristics associated with testing positive, UK

This analysis was first presented in our [Analysis of populations in the UK by risk of testing positive for coronavirus (COVID-19)](#) September 2021 publication, which provides a more detailed explanation of the methods used. We present findings for the most recent fortnight in this section, but a longer data time series covering 21 November 2021 to 7 May 2022 is available in the [accompanying dataset](#).

Estimates of the likelihood of some specific characteristics affecting an individual testing positive can fluctuate from one fortnight to another, meaning that findings that are statistically significant in one period may not necessarily be statistically significant in another period. This may be because the effect of a characteristic is genuinely changing, or because we do not have sufficient individuals with that characteristic in a particular fortnight to exclude any differences we find being down to chance.

Our latest data for the fortnight ending 7 May 2022 show similar conclusions to our last publication, specifically that:

- people who received a fourth vaccine 15 to 90 days previously, or any vaccine up to 14 days previously, were less likely to test positive than those who reported not being vaccinated

- people who had previously been infected [note 1] with COVID-19 continued to be less likely to test positive than those who had not been previously infected

- people who were previously infected with COVID-19 during the period when the Omicron variants were most common (20 December 2021 onwards) were the least likely to test positive in comparison with those infected prior to this period

- females continued to be less likely to test positive than males

- people who had contact with hospitals continued to be less likely to test positive compared with those living in households where no one had contact with hospitals

- adults living with a child aged 16 years or under continued to be less likely to test positive than those who did not live with a child

- people living in a household with two or three people were more likely to test positive than those living alone

- people who reported that they travelled abroad in the previous 28 days continued to be more likely to test positive than those who had not

- people who reported regularly using lateral flow tests continued to be more likely to test positive compared with those who did not; this is likely related to those at a higher risk of infection being encouraged to take regular lateral flow tests

In the same fortnight:

- people living in multigenerational households were less likely to test positive than those who do not live in multigenerational households

- people who work in the hospitality sector were more likely to test positive than those working in other sectors

Figure 1: People previously infected with COVID-19 and those vaccinated more recently were generally less likely to test positive in the fortnight ending 7 May 2022

Estimated likelihood of testing positive for coronavirus on nose and throat swabs by vaccination status and previous infection, UK, 24 April to 7 May 2022

Notes:

1. The core demographic variables – sex, ethnicity, age, geographical region, urban or rural classification of address, deprivation percentile, household size, and whether the household was multigenerational – are included to adjust for these factors when comparing characteristics. When we report on the effect of these core demographic variables only, they are from a separate model that includes only them.

2. An odds ratio indicates the likelihood of an individual testing positive for COVID-19 given a particular characteristic or variable. Seethe [Glossary](#) for full definition.

3. Figures 1 and 2 present results from the same model. We have presented the results separately to make the graphs more accessible.

4. The "pre-Alpha variant period" is defined as before 16 November 2020, the "Alpha variant period" is defined as 16 November 2020 to 16 May 2021, the "Delta variant period" is defined as from 17 May to 19 December 2021 and the "Omicron variants period" is defined as 20 December 2021 onwards.

5. When identifying previous infection, we use all previous positive COVID-19 swab tests, either from the COVID-19 Infection Survey, Test and Trace data in England, or a self-reported positive swab test, to classify an infection as a previous infection if it occurred 120 days or more previously with a prior negative test from the survey, or after four consecutive negative survey test results. This definition differs from the one currently used in our re-infections analysis in Sections 3 and 4. We are keeping this definition under review.

6. The effect of "Any number of vaccines, 21 days or less before the last vaccine" is not included in this figure but is presented in Table 2a of the [accompanying dataset](#). This is because people testing positive before a planned vaccination are advised to postpone their vaccination.

Download the data

[.xlsx](#)

Figure 2: People who reported travelling abroad in the previous 28 days continued to be more likely to test positive for COVID-19 in the fortnight ending 7 May 2022

Estimated likelihood of testing positive for coronavirus on nose and throat swabs by selected characteristics, UK, 24 April to 7 May 2022

Notes:

1. The core demographic variables – sex, ethnicity, age, geographical region, urban or rural classification of address, deprivation percentile, household size, and whether the household was multigenerational – are included to adjust for these factors when comparing characteristics. When we report on the effect of core demographic variables only, they are from a separate model that includes only them.

2. An odds ratio indicates the likelihood of an individual testing positive for COVID-19 given a particular characteristic or variable. See the [Glossary](#) for a full definition.

3. Figures 1 and 2 present results from the same model. We have presented the results separately to make the graphs more accessible.

Download the data

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An additional model examines the effect of behavioural characteristics on the likelihood of testing positive, while controlling for the core demographic variables and significant other characteristics shown earlier in this section. This means that we can identify which behavioural characteristics are associated with testing positive while taking other differences between people reporting different behaviours into account. Results from this behavioural model can be found in Table 4a of the [accompanying dataset](#).

Our findings suggest that in the fortnight ending 7 May 2022:

- people who reported having physical contact with 1 to 5 people aged under 18 years were more likely to test positive than people who had no physical contact with people aged under 18 years

- people who reported having physical contact with 1 to 5 or 11 or more people aged 70 years and over were more likely to test positive than people who had no physical contact with people aged 70 years and over

- people who reported spending more time socialising outside their home continued to be more likely to test positive

We analyse the effect of socially distanced and physical contacts separately. This means that people who reported having no physical contact, which is the reference group for the physical contact analysis, may have reported having socially distanced contact over the same time period.

Notes for: Characteristics associated with testing positive, UK

1. We use all previous positive COVID-19 swab tests, either from the COVID-19 infection survey or from Test and Trace data, or a self-reported positive swab test, to classify an infection as a previous infection if it occurred 120 days or more previously with a prior negative test from the survey, or after four consecutive negative survey test results. We are keeping this definition under review.

3 . Re-infections with COVID-19, UK

This section looks at the rate of coronavirus (COVID-19) re-infections in the UK, from 2 July 2020 to 13 May 2022.

The technical article on re-infections provides a more detailed explanation of the methods used, some of which have since been updated. Tables 5a to 5d in the accompanying dataset for this bulletin contain our re-infections 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 re-infection. An individual is classified as "at risk" if it is possible for a test of theirs to be considered a re-infection if it turns out to be positive. The "at-risk period" refers to the period following the first time we could have defined a re-infection 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 re-infection in this analysis can be found in Section 8. A re-infection is therefore only identified when an "at risk" individual has a positive test.

We have recently updated our definition of a re-infection used in this analysis. This means it now differs from the definition we use for previous infections in analysis of the characteristics associated with testing positive. In addition, this analysis only includes COVID-19 Infection Survey test results, in contrast to the definition we use for previous infections in the characteristics associated with testing positive analysis, which uses data from other sources.

There has been a large increase in the rates for re-infections since the Omicron variants became most common

There has been a large increase in the rates for all re-infections and re-infections with a high viral load since the Omicron variants became most common (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](#).

Table 1: Estimated rate of COVID-19 re-infections per 100,000 participant days at risk, over the periods before and after the Omicron variants became most common
UK, 2 July 2020 to 13 May 2022

Definition	Period	Number of participants at risk	Number of identified re-infections	Estimated rate of re-infections (per 100,000 participant days at risk)	Lower 95% confidence interval	Upper 95% confidence interval
All re-infections	Up to 19 December 2021	30,067	699	11.7	10.8	12.6
	20 December 2021 onwards	50,879	4,729	86.0	83.5	88.4
Re-infections with Ct less than 30	Up to 19 December 2021	30,067	413	6.9	6.2	7.6
	20 December 2021 onwards	50,879	3,552	64.6	62.5	66.7

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

Notes

1. In this analysis, we define a new positive test as a re-infection 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 re-infection in this analysis can be found in Section 8: Measuring the data.

2. Up to 19 December 2021, infections were likely to be compatible with Alpha, Delta, or other variants. From 20 December 2021 onwards, substantial numbers of infections compatible with the Omicron variants were observed in the survey.

3. A confidence interval gives an indication of the degree of uncertainty of an estimate.

4 . Risk factors associated with COVID-19 re-infections, UK

This section presents analysis of the risk factors associated with a coronavirus (COVID-19) re-infection identified among participants across the UK who had previously tested positive in the survey. This analysis included 50,180 participants "at risk" of re-infection and 5,428 re-infections identified between 2 July 2020 and 13 May 2022.

Our [re-infections technical article](#) outlines the model used to investigate how the rate of re-infection 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.

The risk of re-infection was approximately eight times higher in the period when the Omicron variants were most common

The risk of re-infection by characteristic is measured in terms of hazard ratios and presented in Figure 3. In addition to the variables presented in Figure 3, we also looked at the risk of re-infection during the periods when different variants became most common 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.

- Compared with the period when the Delta variant was most common, the risk of re-infection was approximately eight times higher in the period when the Omicron variants were most common (95% confidence interval: 6 to 10 times higher).

- People who were unvaccinated continued to be more likely to be re-infected than people who had been vaccinated.

- People who reported symptoms within 35 days of the first positive test in their first infection continued to be less likely to be re-infected than those who did not, and people continued to be more likely to be re-infected 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.

- Older people continued to be less likely to be re-infected.

Hazard ratios for all characteristics included in the model, including for Ct values separately, can be found in Tables 6a and 6b in the accompanying dataset. Estimated rates of re-infection over time can be found in Table 6c in the accompanying dataset.

Figure 3: People who were unvaccinated were more likely to be re-infected with COVID-19 compared with people who had been vaccinated

Re-infection hazard ratios for characteristics included in the model, UK, 2 July 2020 to 13 May 2022

Notes:

1. 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.

2. 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.

3. Although included in the model, the effects of periods in which different variants were most common, and the effect of Ct values, are not included in this figure but are presented in Tables 6a and 6b of the [accompanying dataset](#), respectively. The effect of calendar periods is not included in this figure because of the much larger scale of the effect of the period when the Omicron variants were most common in comparison with otherfindings.

Download the data

[.xlsx](#)

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 25 May 2022
Characteristics of people testing positive for coronavirus (COVID-19) taken from the COVID-19 Infection Survey.

6 . Collaboration

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.

Multigenerational household

A household was classed as multigenerational if it included individual(s) aged school Year 11 or younger and individual(s) aged school Year 12 to those aged 49 years and individual(s) aged 50 years and over.

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 re-infection compared with a reference category (for example, being female).

Participant days at risk

The risk of re-infection 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 re-infected compared with someone who has experienced their first infection more recently. Therefore, this analysis uses "participant days at risk" to determine the number of re-infections.

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.

Characteristics associated with testing positive analysis

All estimates of the likelihood of testing positive for COVID-19 by characteristic in [Section 2](#) 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.

The analysis is based on statistical models at the UK level and include all participants aged two years and over. Demographic variables included in all models are age, region, sex, ethnicity, deprivation, household size, multigenerational household, and urban or rural classification. Additional variables are included only if found to be significant in the two weeks presented in the bulletin. More information on the methods used in this analysis can be found in our [Coronavirus (COVID-19) Infection Survey technical article: analysis of populations in the UK by risk of testing positive for COVID-19, September 2021](#).

Re-infections with COVID-19 analysis

All estimates of COVID-19 re-infections in Sections 3 and 4 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 re-infection to reflect the shorter time between re-infections that have occurred during the period when most infections were with the Omicron variants, compared with earlier variants.

A re-infection 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.

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 re-infections of COVID-19: June 2021](#)
Technical article | Released 29 June 2021
Data about re-infections 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.