

Statistical bulletin

Coronavirus (COVID-19) Infection Survey, antibody and vaccination data, UK: 16 September 2021

Antibody and vaccination data by UK country and regions in England from the Coronavirus (COVID-19) Infection Survey. This analysis has been produced in partnership with the University of Oxford, University of Manchester, Public Health England, and Wellcome Trust. 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.

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Release date:
16 September 2021

Next release:
29 September 2021

Notice

17 September 2021

This publication has been updated with additional content to include a summary of recently published research using antibody and vaccination data from the COVID-19 Infection Survey by our partners at Oxford University.

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1 . Main points

- In England, it is estimated that over 9 in 10 adults, or 93.6% of the adult population (95% credible interval: 92.5% to 94.5%) would have tested positive for antibodies against SARS-CoV-2, the specific virus that causes coronavirus (COVID-19), on a blood test in the week beginning 23 August 2021, suggesting they had the infection in the past or have been vaccinated.
- In Wales, it is estimated that over 9 in 10 adults, or 91.2% of the adult population (95% credible interval: 89.5% to 92.7%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week beginning 23 August 2021, suggesting they had the infection in the past or have been vaccinated.
- In Northern Ireland, it is estimated that over 9 in 10 adults, or 91.9% of the adult population (95% credible interval: 88.4% to 94.0%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week beginning 23 August 2021, suggesting they had the infection in the past or have been vaccinated.
- In Scotland, it is estimated that over 9 in 10 adults, or 93.3% of the adult population (95% credible interval: 91.9% to 94.4%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week beginning 23 August 2021, suggesting they had the infection in the past or have been vaccinated.
- Across all UK countries, the percentage of adults testing positive for antibodies increased or remained high for all age groups in the week beginning 23 August 2021; antibody positivity for those aged 16 to 24 years is increasing steadily across all four UK countries, with estimates ranging between 86.9% and 88.7% for that age group across the UK.

About this bulletin

In this bulletin, we refer to the following.

Antibodies

We measure the presence of antibodies in the community population to understand who has had coronavirus (COVID-19) in the past, and the impact of vaccinations. It takes between two and three weeks after infection or vaccination for the body to make enough antibodies to fight the infection. Having antibodies can help to prevent individuals from getting the same infection again, or if they do get infected, they are less likely to have severe symptoms. Once infected or vaccinated, antibodies remain in the blood at low levels and can decline over time. The length of time antibodies remain at detectable levels in the blood is not fully known.

Community population

In this instance, community population refers to private residential households, and excludes those in hospitals, care homes and/or other institutional settings.

SARS-CoV-2

This is the scientific name given to the specific virus that causes COVID-19.

Data in this bulletin

The analysis on antibodies in this bulletin is based on blood test results taken from a randomly selected subsample of individuals aged 16 years and over, which are used to test for antibodies against SARS-CoV-2. We also present data on the percentage of people aged 16 years and over who report they have received one or more doses of a COVID-19 vaccine since 14 December 2020, and the percentage of people aged 16 years and over who are fully vaccinated since 15 February 2021.

Our antibodies and vaccination estimates are based on modelling of the people visited in the Coronavirus (COVID-19) Infection Survey in the community. Further information on our method to model antibodies and vaccinations can be found in [our methods article](#).

We produce weekly modelled estimates using standard calendar weeks starting Monday. To provide the most timely and accurate estimates possible for antibody positivity, the model will include data for the first four to seven days of the most recent week available, depending on the availability of test results. The antibody and vaccination estimates for the most recent week in this publication includes data from 23 to 29 August 2021.

We are presenting weekly modelled antibody estimates for adults by country, grouped age and single year of age for England, Wales, Northern Ireland and Scotland, as well as by regions in England. We present the same analysis for vaccine estimates of adults who reported they have received one or more doses of a COVID-19 vaccine, and for adults who report they are fully vaccinated.

There is a clear pattern between vaccination and testing positive for COVID-19 antibodies but the detection of antibodies alone is not a precise measure of the immunity protection given by vaccination.

Modelled vaccine estimates are produced to provide context alongside our antibodies estimates and do not replace the [official government figures on vaccinations](#), which are a more precise count of total vaccines issued. While we would expect the overall trend of our estimated number of people who have received vaccines to increase, it is possible that in some weeks, the estimate may remain the same or decrease as a result of sampling variability (for example, we may have a lower number of participants recording a vaccination in the latest week compared with an earlier week).

2 . Understanding antibodies, immunity and vaccination estimates

This bulletin presents analysis on past infection and/or vaccination - which we define as testing positive for antibodies to SARS-CoV-2 - for England, Wales, Northern Ireland and Scotland based on findings from the Coronavirus (COVID-19) Infection Survey in the UK. For context, we include estimates from our survey on the percentage of people who reported they have received at least one or more dose of a vaccine against SARS-CoV-2, as well as those who have been fully vaccinated against SARS-CoV-2.

It is not yet known how having detectable antibodies, now or at some time in the past, affects the chance of becoming infected or experiencing symptoms, as other parts of the immune system (T cell response) will offer protection. Antibody positivity is defined by a fixed amount of antibodies in the blood. A negative test result will occur if there are no antibodies or if antibody levels are too low to reach this threshold.

It is important to draw the distinction between testing positive for antibodies and having immunity. Following infection or vaccination, antibody levels can vary and sometimes increase but can still be below the level identified as "positive" in our test, and other tests. This does not mean that a person has no protection against COVID-19, as an immune response does not rely on the presence of antibodies alone.

[A person's T cell response will provide protection](#) but is not detected by blood tests for antibodies. [A person's immune response](#) is affected by a number of factors, including health conditions and age. Our [blog on antibodies and immunity](#) gives further information on the link between antibodies and immunity and the vaccine programme. Our [blog on vaccine effectiveness](#) provides information on the effectiveness of vaccinations against Alpha and Delta variants, which is based upon the research conducted by partners from the University of Oxford.

While the [daily official government figures](#) provide the recorded actual numbers of vaccines against SARS-CoV-2 issued, our vaccination estimates are likely to be different from the official figures. This is because they are estimates based on a sample survey of reported vaccine status and are provided for context alongside our antibodies estimates. We control for the effect of ethnicity by post-stratifying our analysis by White and non-White ethnic groups, rather than individual ethnicities, because of our current sample size. This could result in differences between our survey estimates and the government figures in the numbers of vaccines received for some ethnic minority groups.

Importantly, our survey collects information from the population living in private households and does not include people living in communal establishments such as care homes, hospitals or prisons. The value of showing our estimates of vaccines alongside our estimates of people testing positive for antibodies is to illustrate the relationship between the two.

Differences between official figures and the estimates from this survey differ in scale across each of the four UK nations (some survey estimates are closer to the official reported figures than others) because of differences in reporting dates and the inclusion of National Immunisation Management System (NIMS)¹ data for England. In addition, our sampling method for Northern Ireland is different to the other nations, inviting only people who have previously participated in a Northern Ireland Statistics and Research Agency (NISRA) survey, which could result in a sample of individuals who are more likely to get vaccinated. This should be taken into consideration if comparing vaccine and antibody estimates across the four nations, as vaccine status and antibody positivity are related.

In addition, as our analysis develops, our survey-based estimates will enable possible future analysis of people who have received a vaccine with other characteristics collected in the survey. Our blog provides more information on [what the Office for National Statistics \(ONS\) can tell you about the COVID-19 vaccine programme](#).

Our [methodology article](#) provides further information around the survey design, how we process data, and how data are analysed. The [study protocol](#) specifies the research for the study. The [Quality and Methodology Information](#) details the strength and limitations of the data.

Notes for: Understanding antibodies, immunity and vaccination estimates

1. National Immunisation Management System (NIMS) administrative data are used to validate Coronavirus (COVID-19) Infection Survey self-reported records of vaccination for England. The equivalent of this is currently not included for other countries meaning the estimates for Wales, Northern Ireland and Scotland are produced only from Coronavirus (COVID-19) Infection Survey self-reported records of vaccination.

3 . Percentages of adults testing positive for COVID-19 antibodies and vaccinated against COVID-19 in England, Wales, Northern Ireland and Scotland

The percentage of adults who would have tested positive for coronavirus (COVID-19) antibodies remained high across the UK in recent weeks up to the week beginning 23 August 2021.

Table 1: Estimated percentage of adults who would have tested positive for SARS-CoV-2 antibodies from a blood sample, week beginning 23 August 2021, UK Countries

Country	Estimated % of adults who would have tested positive for COVID-19 antibodies	95% credible interval	
		Lower	Upper
England	93.6	92.5	94.5
Wales	91.2	89.5	92.7
Northern Ireland	91.9	88.4	94.0
Scotland	93.3	91.9	94.4

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

Notes

1. 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.

In the week beginning 23 August 2021, our estimates suggest the percentage of adults who reported they had received at least one dose of a COVID-19 vaccine remained high or continued to increase, ranging from 92.7% to 94.1% of adults across the UK. The estimated percentage of adults in the UK who are fully vaccinated against COVID-19 also remained high or continued to increase, ranging from 81.7% to 86.7% of adults across the UK in the week beginning 23 August 2021. These vaccination estimates for the community population will differ from official figures as explained in [Section 2](#).

Figure 1: The percentage of adults testing positive for COVID-19 antibodies and the percentage of adults who reported being vaccinated in England, Wales, Northern Ireland and Scotland continued to increase or remained high

Modelled percentage of adults: who tested positive for antibodies to SARS-CoV-2, who have received one or more doses of a COVID-19 vaccine; and who were fully vaccinated, UK countries, 7 December 2020 to 29 August 2021

Notes:

1. All results are provisional and subject to revision.
2. These statistics refer to antibody tests and vaccinations in individuals living in the community, by which we mean private households. These figures exclude individuals in hospitals, care homes and/or other institutional settings.
3. All estimates are subject to uncertainty, given that a sample is only part of the wider population. A credible interval gives an indication of the uncertainty of an estimate from data analysis.
4. The denominators used for vaccinations are the total people in the sample at that particular time point, then post-stratified by the mid-year population estimate.
5. Vaccination data for Northern Ireland start later than the other countries, from 21 December 2021.
6. Our estimates of vaccination are provided for context alongside our antibodies estimates but are likely to be different from the official figures. The [daily official government figures](#) provide the recorded actual numbers of vaccines against SARS-CoV-2 issued.

Download the data

[.xlsx](#)

4 . Percentages of adults testing positive for COVID-19 antibodies and vaccinated against COVID-19 by regions in England

The estimated percentage of adults testing positive for antibodies and percentage of adults who have received at least one vaccine, remained at a high level across all regions of England in the week beginning 23 August 2021. Regional data can be found in our [accompanying dataset](#).

5 . Percentages of adults testing positive for COVID-19 antibodies and vaccinated against COVID-19 by grouped age in England, Wales, Northern Ireland and Scotland

Our survey shows that in recent weeks up to the week beginning 23 August 2021, the percentage of adults testing positive for antibodies increased or remained high for all age groups. We estimate that the antibody positivity for those aged 16 to 24 years is increasing steadily across all four UK countries, with estimates ranging between 86.9% and 88.7% of adults across the UK, for the week beginning 23 August 2021.

Across all four UK countries, antibody positivity remains very high in older age groups (those aged 65 years and over) but has remained level or declined slightly amongst adults in these age groups since the end of July 2021. It is important to note that antibody positivity is defined by a fixed amount of antibodies in the blood. Most older people who are vaccinated will retain higher antibody levels than prior to vaccination but may have a lower number of antibodies than this threshold at the time of testing. This does not mean that these older people have no protection against new infection. More information on [antibodies and immunity](#) can be found in our blog.

Up to late July 2021, our antibody positivity estimates increased with age, with the highest percentage testing positive for antibodies in the older age groups and lowest among the youngest groups across the four UK countries; this reflected the age prioritisation in vaccination programmes in place across the UK. In more recent weeks our estimates suggest those aged 25 to 64 years have similar or slightly higher antibody levels than the oldest age groups (those aged 65 years and over). This is line with vaccinations for many of those in younger age groups occurring more recently.

The percentage of adults who reported they have received at least one dose of a coronavirus (COVID-19) vaccine is lowest in the younger age groups but is increasing.

Across the four UK countries, the estimated percentage of adults aged 25 to 34 years who have received one or more doses of a COVID-19 vaccine ranged from 86.9% to 91.4% – this has increased sharply since the end of May. A similar increase can be seen for those aged 16 to 24 years since June, with between 70.8% and 78.8% reporting having had at least one dose of a COVID-19 vaccine across the UK in the week beginning 23 August 2021.

These estimates of vaccination are based on reported vaccination status in our survey and are likely to be different from the [official figures](#) for the UK.

When antibodies are measured over time by age, it is possible to see the impact of the vaccination programme between first and second doses. In March 2021, antibody positivity decreased among people aged 80 years and over and increased from April 2021 as a result of second doses. A similar decrease and subsequent increase were seen in those aged in their 70s at the end of March 2021; for those aged in their 60s and 50s, antibody positivity flattened before increasing in April 2021 and May 2021 respectively.

The percentage of adults testing positive for antibodies varies by age group between the four nations of the UK. This could be explained by different historical trends in COVID-19 infection rates and the approaches to vaccine distribution in different nations. This survey does not include people who live in care homes, one of the priority groups identified by the [Joint Committee on Vaccination and Immunisation \(JCVI\)](#). Daily and weekly counts of vaccine doses administered by nation can be seen in the [Public Health England \(PHE\) dashboard](#).

In the data used to produce estimates for Wales, Northern Ireland and Scotland, the number of people sampled who tested positive for antibodies to SARS-CoV-2 or who have been vaccinated is low compared with England. This means there is a higher degree of uncertainty in estimates for these nations when our analysis splits the sample into smaller groups (for example, age groups) as indicated by larger credible intervals.

Modelled antibody estimates and modelled vaccine estimates relate to the adult community population (aged 16 years and over) who live in private households. The true figure among the older age groups in the population may be different. In England, an estimated [90% of people aged 80 years and over live in private households](#) and 10% live in other establishments such as care homes.

Figure 2: The percentage of adults testing positive for COVID-19 antibodies continues to increase among those aged 16 to 24 years and remains high for other age groups across the UK

Modelled percentage of adults: who tested positive for antibodies to SARS-CoV-2, who have received one or more doses of a COVID-19 vaccine, and who were fully vaccinated, by grouped age, UK countries, 7 December 2020 to 29 August 2021

Notes:

1. All results are provisional and subject to revision.
2. These statistics refer to antibody tests and vaccinations reported in the community, by which we mean private households. These figures exclude individuals in hospitals, care homes and/or other institutional settings.
3. In Northern Ireland, the number of people sampled who tested positive for antibodies to SARS-CoV-2 or reported receiving a COVID-19 vaccination is low compared with England, Wales and Scotland; therefore, people aged 50 to 69 years are included in the same age group, and those aged 70 years and over are included in the same age group.
4. All estimates are subject to uncertainty, given that a sample is only part of the wider population. A credible interval gives an indication of the uncertainty of an estimate from data analysis.
5. The denominators used for vaccinations are the total people in the sample at that particular time point, then post-stratified by the mid-year population estimate.
6. Our estimates of vaccination are provided for context alongside our antibodies estimates but are likely to be different from the official figures. The [daily official government figures](#) provide the recorded actual numbers of vaccines against SARS-CoV-2 issued.

Download the data

[.xlsx](#)

6 . Percentage of adults testing positive for COVID-19 antibodies by single year of age in England, Wales, Northern Ireland and Scotland

The analysis in this section presents modelled daily estimates of antibody positivity by single year of age for England, Wales, Northern Ireland and Scotland separately, between 5 July and 29 August 2021. The modelled data in this section are produced using a different method to the weekly modelled estimates presented in [Section 5](#) and so cannot be compared. Each data point represents a modelled estimate of antibody positivity for a particular day.

This more granular analysis shows a similar pattern to our grouped age analysis, with antibody positivity rising or remaining high for most ages in England, Wales, Northern Ireland and Scotland. A decrease in antibody positivity in the older age groups can also be seen in our single year of age analysis. This reflects the amount of antibodies detected in the test and does not mean that these older people have no protection against new infection. More information on [antibodies and immunity](#) can be found in our blog.

Figure 3: The percentages testing positive for COVID-19 antibodies by single year of age in England, Wales, Northern Ireland and Scotland

Modelled percentage of adults testing positive for antibodies to SARS-CoV-2, by single year of age, UK countries, 5 July to 29 August 2021

Notes:

1. All results are provisional and subject to revision.
2. These statistics refer to antibody tests reported in the community, by which we mean private households. These figures exclude individuals in hospitals, care homes and/or other institutional settings.
3. The method used to generate the data differs from the modelled weekly estimates of antibody positivity by age and so is not comparable.

Download the data

[.xlsx](#)

7 . Further academic research on antibodies and vaccinations using COVID-19 Infection Survey data

Antibody and vaccination data from the COVID-19 Infection Survey was analysed in a research paper produced by our partners at Oxford University and [published as preprint](#) on 16 September 2021. The paper looks at how much antibodies change over time and how this varies between the Pfizer and AstraZeneca vaccines, by key characteristics. We summarise some of the relevant findings.

On average, antibody levels are initially higher and decline more slowly in people who have received two doses of the Pfizer vaccine compared with those who have received two doses of the AstraZeneca vaccine. In people who had received the Pfizer vaccine, the speed of decline in antibodies was faster in:

- men
- older people
- those reporting white ethnicity
- those with long-term health conditions

People receiving their second AstraZeneca dose a longer time after their first dose experienced a slightly higher peak in antibodies compared with those who had a shorter time between doses (considering gaps between 7 to 13 weeks). For people receiving their second Pfizer vaccine a longer time after their first vaccine, the peak level of antibodies was slightly lower and for those aged under 70 years, the decline was slightly slower compared with those who had a shorter gap between doses. Those aged over 70 years had a much faster decline if they had received their second vaccination only three weeks after their first.

With both vaccines, prior infection significantly increased the peak in antibody levels after the second dose and slowed the decline in antibodies.

After second doses of both vaccines, the peak level of antibodies was also higher in:

- women
- people in patient-facing healthcare roles
- people without long-term health conditions

Further detail and comparisons are available in [SARS-CoV-2 anti-spike IgG antibody responses after second dose of ChAdOx1 or BNT162b2 in the UK general population](#).

8 . Coronavirus (COVID-19) Infection Survey data

[Coronavirus \(COVID-19\) antibody and vaccination data, UK](#)

Dataset | Released 16 September 2021

Antibody and vaccination data by UK country and regions in England from the Coronavirus (COVID-19) Infection Survey. This analysis has been produced in partnership with the University of Oxford, University of Manchester, Public Health England and Wellcome Trust. 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.

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, Public Health England (PHE) 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 our methodology page on [statistical uncertainty](#).

Credible interval

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

11 . 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. The [Quality and Methodology Information](#) explains the strengths and limitations of the data, methods used, and data uses and users.

12 . Strengths and limitations

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

13 . Related links

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

Bulletin | Updated weekly

Estimates for England, Wales, Northern Ireland and Scotland. This survey is being delivered in partnership with the University of Oxford, University of Manchester, Public Health England and Wellcome Trust.

[Coronavirus \(COVID-19\) Infection Survey: characteristics of people testing positive for COVID-19 in England](#)

Bulletin | Updated fortnightly

Characteristics of people testing positive for COVID-19 from the Coronavirus (COVID-19) Infection Survey, including antibody data by UK country, and region and occupation for England. Antibodies data published before 3 February 2021 are available in this series.

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

QMI | Released 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 and users.

[Coronavirus \(COVID-19\) Infection Survey technical article: waves and lags of COVID-19 in England. June 2021](#)

Technical article | Released 29 June 2021

Data about the waves and lags of coronavirus from the Coronavirus (COVID-19) Infection Survey. This analysis has been produced in partnership with the University of Oxford.

[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. This analysis has been produced in partnership with the University of Oxford.

[Coronavirus \(COVID-19\) Infection Survey technical article: analysis of positivity after vaccination](#)

Technical article | Released 17 June 2021

Data about positivity after vaccination from the Coronavirus (COVID-19) Infection Survey. This analysis has been produced in partnership with the University of Oxford.

[Coronavirus \(COVID-19\) Infection Survey: characteristics of people testing positive for COVID-19 in England](#)

Article | Released 20 May 2021

Characteristics of people testing positive for COVID-19 from the Coronavirus (COVID-19) Infection Survey, including antibody data by UK country, and region and occupation for England. Antibodies data published before 3 February 2021 are available in this series.