Article

Coronavirus (COVID-19) Infection Survey, antibody and vaccination data for the UK: 14 April 2021

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

Contact:
Emma Nash and Zoë Willis
infection.survey.analysis@ons.gov.uk
+44 (0)20 7112 0120

Release date:
14 April 2021

Next release:
28 April 2021

Table of contents

1 . Main points

- In England, an estimated 1 in 2 people, or 54.9% of the population (95% credible interval: 49.5% to 60.0%) would have tested positive for antibodies against the coronavirus (COVID-19) – SARS-CoV-2 – on a blood test in the week ending 28 March 2021, suggesting they had the infection in the past or have been vaccinated.

- In Wales, an estimated 1 in 2 people, or 49.1% of the population (95% credible interval: 43.2% to 54.9%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week ending 28 March 2021, suggesting they had the infection in the past or have been vaccinated.

- In Northern Ireland, an estimated 1 in 2 people, or 54.5% of the population (95% credible interval: 47.8% to 64.0%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week ending 28 March 2021, suggesting they had the infection in the past or have been vaccinated.

- In Scotland, an estimated 1 in 2 people, or 46.0% of the population (95% credible interval: 40.3% to 51.6%) would have tested positive for antibodies against SARS-CoV-2 on a blood test in the week ending 28 March 2021, suggesting they had the infection in the past or have been vaccinated.

- Weekly data show a reduction in antibody positivity rates among older individuals in recent weeks, likely because the data do not yet show the impact of second doses of COVID-19 vaccinations; daily modelled antibody estimates by single year of age also show this decline, but the detection of antibodies alone is not a precise measure of the immunity protection given by vaccination.

- Across all four countries of the UK, 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.

2 . Overview

In this article, we refer to the presence of antibodies to, and vaccination against, the coronavirus (COVID-19) within the community population; community in this instance refers to private residential households, and it excludes those in hospitals, care homes and/or other institutional settings.

It takes between two and three weeks after infection or vaccination for the body to make enough antibodies to fight the infection. Antibodies remain in the blood at low levels, although these levels can decline over time to the point that tests can no longer detect them. Having antibodies can help to prevent individuals from getting the same infection again.

We measure the presence of antibodies to understand who has had COVID-19 in the past and the impact of vaccinations. Once infected or vaccinated, the length of time antibodies remain at detectable levels in the blood is not fully known. It is also not yet known how having detectable antibodies, now or at some time in the past, affects the chance of getting COVID-19 again, since 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 are still 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 since an immune response does not rely on the presence of antibodies alone. We also do not yet know exactly how much antibodies need to rise to give protection. 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.

This article presents antibody 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. We also included figures on the proportion of people who have received at least one dose of a vaccine against SARS-CoV-2.

SARS-CoV-2 is the scientific name given to the specific virus that causes COVID-19. More information on our headline estimates of the overall number of positive cases of COVID-19 in England, Wales, Northern Ireland and Scotland are available in our latest bulletin.

Our last publication of antibodies data was 30 March 2021 for the 28-day period up to 14 March 2021. Earlier antibodies data are available as part of a series of articles on the characteristics of those testing positive for COVID-19. To make the antibodies data and analysis easier to find, all releases from 3 February 2021 onwards are published in this Coronavirus (COVID-19) Infection Survey: antibody data for the UK article series.

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. Further information on what the analysis covers is provided at the start of each section.

About this analysis

The analysis on antibodies in this article 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. This can be used to identify individuals who have had the infection in the past or have developed antibodies as a result of vaccination.

Antibody estimates are based on a model where England, Wales and Scotland are included together in a spatial-temporal model with Northern Ireland being modelled separately. This reflects the geography of the four countries with Northern Ireland not sharing a land border with Great Britain. The geo-spatial model incorporates physical land distance between regions. This modelling approach means we are able to provide weekly estimates whilst adjusting to make the estimates representative of the population. The data are modelled on standardised Monday to Sunday surveillance weeks and we present data beginning 7 December 2020. Further information on our new method to model antibodies can be found in our updated methods article.

We also present data on the percentage of people aged 16 years and over who have received one or more doses of a COVID-19 vaccination since 14 December 2020. The first COVID-19 vaccination was administered on 8 December 2020, but vaccination rates were too low to model until 14 December 2020. The estimates of the percentage of people vaccinated are based on modelling of the people visited in the COVID-19 Infection Survey in the community in a particular time period. These estimates are then adjusted (post-stratified) using population estimates to be representative (in the same way as for the antibody analysis). However, these estimates may differ from other figures given through administrative data because of a difference in the population denominator (our survey does not include people who live in communal establishments, such as care homes, which are a priority group for the vaccine rollout) or any biases that are adjusted for in our sample.

National Immunisation Management System (NIMS) administrative data is used to validate 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 COVID-19 Infection Survey self-reported records of vaccination. The UK coronavirus dashboard includes daily data for the UK and each constituent country on the actual number of people who have received a COVID-19 vaccination. This is based on individual vaccination records (administrative data held by each nation) and should be used to understand progress of the vaccination programme across the UK. Our estimates are not the same as the figures in the UK coronavirus dashboard and there may be differences between our modelled estimates and these official figures, which are updated more regularly. 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.

Antibody data are a week behind vaccination data as there is a time lag on when antibody data are received, whereas vaccine data are self-reported and more readily available.

We are presenting weekly modelled antibody estimates by country, by grouped age, and by single year of age for England, Wales, Northern Ireland and Scotland, as well as by regions in England. Analysis on antibodies included in Sections 3, 4 and 5 uses data taken from 22 to 28 March 2021 to produce modelled antibody estimates. Modelled antibody estimates for previous weeks can be found in the accompanying dataset.

We are presenting trends in weekly modelled vaccination estimates by country and by grouped age for England, Wales, Northern Ireland and Scotland, as well as by regions in England. The analysis on vaccinations included in Sections 3, 4 and 5 uses data taken from 29 March to 3 April 2021 to produce modelled vaccination estimates. Modelled vaccination estimates can be found in the accompanying dataset.

More about coronavirus

- Find the latest on coronavirus (COVID-19) in the UK.
- All ONS analysis, summarised in our coronavirus roundup.
- View all coronavirus data.
- Find out how we are working safely in our studies and surveys.

3 . Likelihood of testing positive for COVID-19 antibodies and percentage of people who have received one or more doses of a COVID-19 vaccination in England, Wales, Northern Ireland and Scotland

Our survey shows that in the week ending 28 March 2021:

- in England, an estimated 54.9% (95% credible interval: 49.5% to 60.0%) of the population would have tested positive for antibodies to SARS-CoV-2 from a blood sample.

- in Wales, an estimated 49.1% (95% credible interval: 43.2% to 54.9%) of the population would have tested positive for antibodies to SARS-CoV-2 from a blood sample.

- in Northern Ireland, an estimated 54.5% (95% credible interval: 47.8% to 64.0%) of the population would have tested positive for antibodies to SARS-CoV-2 from a blood sample.

- in Scotland, an estimated 46.0% (95% credible interval: 40.3% to 51.6%) of the population would have tested positive for antibodies to SARS-CoV-2 from a blood sample.

In the week ending 3 April 2021, the percentage of people who have received at least one dose of a coronavirus (COVID-19) vaccination continued to increase, with 54.9% to 65.0% of people across the UK having received at least one dose of a COVID-19 vaccination. In the week ending 28 March 2021, antibody positivity levelled off in England, Wales and Scotland.

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, as indicated by larger credible intervals.

Figure 1: The percentage of people testing positive for COVID-19 antibodies and the percentage of people who have been vaccinated in England, Wales, Northern Ireland and Scotland

Modelled percentage of people testing positive for antibodies to SARS-CoV-2, 7 December 2020 to 28 March 2021, and modelled percentage of people who have received one or more doses of a COVID-19 vaccine, 14 December 2020 to 3 April 2021, UK

[Download the data](#)

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. 95% credible intervals are calculated so that there is a 95% probability of the true value lying in the interval.

4. The denominators used for vaccinations are the total people in the sample at that particular time point, then it is post-stratified by the mid-year population estimate.

5. Vaccination data for Northern Ireland starts from 21 December 2020, later than the other countries, because there was not enough data to produce modelled estimates any earlier.

4 . Regional analysis of the likelihood of testing positive for COVID-19 antibodies and of the percentage of people who have received one or more doses of a COVID-19 vaccination in England

Antibody positivity varied between regions, from the lowest in the North East at 51.8% (95% credible interval: 45.9% to 57.7%) to the highest in the West Midlands at 59.0% (95% credible interval: 53.6% to 64.2%) in the week ending 28 March 2021.

The percentage of people who have been vaccinated also varied between regions, from the lowest in London at 56.1% to the highest in the South West at 68.1% in the week ending 3 April 2021. The percentage of people who have received at least one dose of a coronavirus (COVID-19) vaccination continues to increase while antibody positivity has generally levelled off. Variation in regional COVID-19 infection rates and regional vaccination roll out and uptake could result in variation in antibody positivity across regions.

Figure 2: COVID-19 antibody positivity and the percentage of people who have been vaccinated varies across regions in England

Modelled percentage of people testing positive for antibodies to SARS-CoV-2, 7 December 2020 to 28 March 2021, and modelled percentage of people who have received one or more doses of a COVID-19 vaccine, 14 December 2020 to 3 April 2021, by region, England

[Data download](#)

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. 95% credible intervals are calculated so that there is a 95% probability of the true value lying in the interval.

4. The denominators used for vaccinations are the total people in the sample at that particular time point, then it is post-stratified by the mid-year population estimate.

5 . Age analysis on the likelihood of testing positive for COVID-19 antibodies and the percentage of people who have received one or more doses of a COVID-19 vaccination in England, Wales, Northern Ireland and Scotland

In the week ending 28 March 2021, in England, the percentage of people testing positive for antibodies for those aged 16 to 64 years ranged from 38.7% to 74.8%. For those aged 65 years and over, antibody positivity ranged from 77.6% to 84.5%. The highest percentage of people testing positive for antibodies was in those aged 65 to 69 years at 84.5% (95% credible interval: 79.4% to 88.5%).

In Wales in the week ending 28 March 2021, the percentage of people testing positive for antibodies for those aged 16 to 64 years ranged from 31.3% to 63.6%. For those aged 65 years and over, antibody positivity ranged from 68.0% to 79.7%. The highest percentage of people testing positive for antibodies was in those aged 65 to 69 years at 79.7% (95% credible interval: 72.9% to 85.3%).

In Northern Ireland in the week ending 28 March 2021, the percentage of people testing positive for antibodies for those aged 70 years and over was 78.0% (95% credible interval: 63.6% to 89.7%). Because of small sample sizes, this analysis uses different age groups to antibody analysis to England, Northern Ireland and Scotland, with everyone over the age of 70 years included in the same age group. For those aged 16 to 69 years, antibody positivity ranged from 27.4% to 65.6%.

In Scotland in the week ending 28 March 2021, the percentage of people testing positive for antibodies for those aged 16 to 64 years ranged from 27.4% to 59.1%. For those aged 65 years and over, antibody positivity ranged from 66.6% to 82.9%. The highest percentage of people testing positive for antibodies was in those aged 65 to 69 years at 82.9% (95% credible interval: 76.9% to 87.8%).

Antibody positivity is decreasing in the older age groups and is lowest in the younger age groups where vaccination rates are lower because of older age group prioritisation. The percentage of people who have received at least one dose of a coronavirus (COVID-19) vaccination is lowest in the younger age groups but is increasing. More than 97% of people aged 70 years and over have received at least one dose of a COVID-19 vaccination across the UK.

The percentage of people testing positive for antibodies varies by age group between nations. This could be explained by varying COVID-19 infection rates and the varying approaches to vaccine distribution in different nations as well as past infections. This survey does not include those that 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 Heath England (PHE) dashboard.

Modelled antibody estimates and modelled vaccine estimates relate to the community population (aged 16 years and over) who live in private households and do not include establishments such as care homes. The true figure among the older age groups in the population may be different. An estimated 90% of people aged 80 years and over live in private households and 10% live in other establishments such as care homes.

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, as indicated by larger credible intervals.

Figure 3: Percentage of people testing positive for COVID-19 antibodies and percentage of people who have been vaccinated by grouped age in England, Wales, Northern Ireland and Scotland

Modelled percentage of people testing positive for antibodies to SARS-CoV-2, 7 December 2021 to 28 March 2021, UK, and modelled percentage of people who have received one or more doses of a COVID-19 vaccine, 14 December 2020 to 3 April 2021, by grouped age, UK

Data download

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. 95% credible intervals are calculated so that there is a 95% probability of the true value lying in the interval.

5. The denominators used for vaccinations are the total people in the sample at that particular time point, then it is post-stratified by the mid-year population estimate.

6 . Age over time analysis of the likelihood of testing positive for COVID-19 antibodies 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 and Scotland, and Northern Ireland separately. The modelled data in this section are produced using a different method to the weekly modelled estimates presented in Section 5 and so they cannot be compared. Figure 4 shows the percentages testing positive for coronavirus (COVID-19) antibodies by single year of age from 3 February to 28 March 2021 for each of the four UK countries. Each data point represents a modelled estimate of antibody positivity for a particular day.

Figure 4 shows a decrease in the estimated percentage of people testing positive for antibodies in the older ages in early to mid-March 2021. Antibody positivity has since risen again in the older ages. This is likely to reflect the increase in individuals receiving the second dose of a COVID-19 vaccination. Antibodies may have been at detectable levels within a few weeks of their first vaccination, but levels can then decrease to below levels defined as positive by the test. There are still many people who are yet to receive their second dose, so we will regularly monitor antibody positivity as the vaccination programmes continue.

This trend differs slightly to the weekly modelled antibody positivity estimates in Section 5, likely because the weekly modelled antibody positivity estimates are not yet reflecting the increase in individuals having received a second dose, which will change their subsequent antibody response.

Figure 4: The percentages testing positive for COVID-19 antibodies by single year of age in England, Wales, Northern Ireland and Scotland

Modelled percentage of people testing positive for antibodies to SARS-CoV-2, by single year of age, 3 February to 28 March 2021, UK

Data download

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.

It is unclear if decreasing levels of antibodies means that protection is decreasing. Further work to understand this is being undertaken.

7 . Coronavirus (COVID-19) Infection Survey data

Coronavirus (COVID-19) antibody and vaccination data for the UK
Dataset | Released 14 April 2021
Antibody and vaccination data for the UK taken from the Coronavirus (COVID-19) Infection Survey.

8 . 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, Public Health England 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

9 . 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.

10 . Data sources and quality

More information on measuring the data and its strengths and limitations 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.

11 . 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 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
Article | Updated fortnightly
Characteristics of people testing positive for COVID-19 from the COVID-19 Infection Survey, including antibody data by UK country, and region and occupation for England.

Coronavirus and vaccination rates in people aged 70 years and over by socio-demographic characteristic, England
Article | Updated 29 March 2021
First dose COVID-19 vaccination rates among people aged 70 years and older who live in England, both in private households and communal establishments. Includes estimates for the population as a whole by age and sex, and for ethnic minorities, religious groups, those identified as disabled and by area deprivation.

COVID-19 Infection Survey: methods and further information
Methods article | Updated 26 March 2021
Information on the methods used to collect and process the data, and calculate the statistics produced from the COVID-19 Infection Survey pilot.

COVID-19 Infection Survey (CIS)
Article | Updated 14 May 2020
Whether you have been invited to take part, or are just curious, find out more about our COVID-19 Infection Survey and what is involved.

Coronavirus (COVID-19) roundup
Web page | Updated as and when data become available
Catch up on the latest data and analysis related to the coronavirus pandemic and its impact on our economy and society.

Coronavirus (COVID-19) latest insights
Interactive tool | Updated as and when data become available
Explore the latest data and trends about the coronavirus (COVID-19) pandemic from the ONS and other official sources.