UK Health Security Agency

COVID-19 vaccine surveillance report

November 2024

Contents

Executive summary

Rigorous clinical trials have been undertaken to understand the immune response, safety profile, and efficacy of all coronavirus (COVID-19) vaccines approved for use in the UK as part of the regulatory process. Ongoing monitoring of the vaccines as they are rolled out in the population is important to continually ensure that clinical and public health guidance on the vaccination programme is built upon the best available evidence.

UK Health Security Agency (UKHSA), formerly Public Health England (PHE), works closely with the Medicines and Healthcare Regulatory Agency (MHRA), NHS England, and other government, devolved administration, and academic partners to monitor the COVID-19 vaccination programme. Details of the vaccine surveillance strategy are set on the page COVID-19: vaccine surveillance strategy (1). As with all vaccines, the safety of COVID-19 vaccines is continuously being monitored by the MHRA. They conclude that overall, the benefits of COVID-19 vaccines outweigh any potential risks (2).

This report contains updates on vaccine effectiveness, vaccination in pregnancy, and vaccine impact on the proportion of the population with antibodies to COVID-19.

Vaccine effectiveness

Vaccine effectiveness (VE) is estimated by comparing rates of disease (or positivity among those tested) in vaccinated individuals to rates in unvaccinated individuals. Below we outline the latest real-world evidence on vaccine effectiveness from studies in UK populations.

Effectiveness against symptomatic disease

Vaccine effectiveness against symptomatic COVID-19 has been assessed in England based on testing data linked to vaccination data from the Immunisation Information System (IIS) (formerly National Immunisation Management System (NIMS)) (3), cohort studies such as the COVID-19 Infection Survey, and GP electronic health record data.

Effectiveness against hospitalisation

Several studies have estimated vaccine effectiveness against hospitalisation, all of which indicate higher levels of protection against hospitalisation than symptomatic disease with all vaccines against the Alpha, Delta and Omicron variants (4 to 8). Given that Omicron generally causes milder disease than previous variants and that population immunity is high from previous infection and vaccinations (9), an increasing proportion of individuals hospitalised with a positive COVID-19 test are likely to have COVID-19 as an incidental finding rather than the primary reason for admission (8). We therefore use strict definitions to define a COVID-19 hospitalisation – at least 2 days stay in the hospital and a respiratory code in the primary diagnostic field.

Analyses for booster vaccination campaigns in autumn 2022 (10) and spring 2023 (11) assessed the incremental effectiveness within those who had had prior doses. Both campaigns showed effectiveness peak at around 50% shortly after vaccination with waning to about 30% after a few months and with a continued waning to no protection after about 6 months (12).

Effectiveness of the spring 2024 booster

The 2024 spring booster programme, which commenced 15 April 2024, was recommended by the Joint Committee on Vaccination and Immunisation (JCVI) for adults aged 75 years and older, residents in care homes for older people, and those aged 6 months or over with a weakened immune system. The products offered were mRNA monovalent Omicron XBB.1.5 vaccines (Pfizer-BioNTech and Moderna).

VE was estimated against hospitalisation amongst those aged 75 years and older for both vaccine manufacturers from 15 April 2024 against all Omicron sub-lineages in circulation at the time (Table 1). We compared the odds of testing positive in hospital for COVID-19 in those who received a spring booster against those who did not receive a spring

booster, regardless of previous vaccination history. The effectiveness measured is therefore the incremental protection on top of any from previous vaccinations or infections. Individuals with 2 or more spring boosters and individuals who have received a spring booster less than 12 weeks after their previous vaccine were excluded.

Incremental effectiveness of the spring 2024 booster against hospitalisation was highest in the period 2 to 4 weeks post-vaccination at 44.5%. There was some evidence of waning by 10 or more weeks post-vaccination, with a reduction to 24.4%.

Table 1. Vaccine effectiveness (VE) of the spring 2024 booster against hospitalisation amongst those aged 75 years and older in England

Spring booster	Interval after dose	Controls	Cases	VE (95% C.I.)
No booster	-	7,621	2,220	Baseline
Pfizer or Moderna XBB.1.5 booster	9 to 13 days	359	76	28.2 (6.9 to 44.6)
	2 to 4 weeks	1,397	250	44.5 (35.4 to 52.2)
	5 to 9 weeks	1,829	491	40.8 (32.9 to 47.7)
	≥ 10 weeks	835	305	24.4 (10.3 to 36.3)

Long-term effectiveness of the autumn 2023 booster

An autumn booster programme was recommended by the JCVI for adults aged 65 years and older, as well as those in a clinical risk group, care home staff and residents, frontline health and social care workers, carers, and household contacts of people with immunosuppression. Vaccinations began 11 September 2023, with the most at risk (adult care home residents and people who are immunosuppressed) prioritised for vaccination. The products offered were bivalent Original/Omicron BA.4-5 vaccine (Pfizer-BioNTech) and monovalent XBB.1.5 vaccine (Pfizer-BioNTech and Moderna). The bivalent BA.4-5 boosters were rolled out first, followed by the XBB boosters. This campaign showed peak VE of about 50% at 2 to 4 weeks post-vaccination (12).

Relative VE was estimated against hospitalisation amongst those aged 65 years and older from 15 April 2024 to assess the long-term impact of the Autumn 2023 campaign (Table 2). Among those hospitalised who tested for COVID-19 from 15 April 2024, we compared the odds of testing positive for COVID-19 in those who received an autumn booster against those who did not receive an autumn booster, regardless of previous vaccination history. The effectiveness measured is therefore the incremental protection on top of any from previous vaccinations or infections. Only individuals who have not received a Spring 2024 booster were included. Individuals with 2 or more autumn boosters were excluded.

Incremental long-term VE against hospitalisations for both the bivalent and monovalent autumn boosters remained at 31.7% 20 to 24 weeks post-vaccination. There was some evidence of waning, with a reduction to 12.1% at 30 or more weeks post-vaccination.

Table 2. Long-term vaccine effectiveness (VE) of the autumn 2023 booster against hospitalisation amongst those aged 65 years and older in England

Autumn booster	Interval after dose	Controls	Cases	VE (95% C.I.)
No booster	-	4,550	1,426	Baseline
Pfizer/Moderna BA4/5 or XBB.1.5 booster	20 to 24 weeks	474	72	31.7 (10.8 to 47.7)
	25 to 29 weeks	2,451	417	25.4 (14.6 to 34.9)
	≥ 30 weeks	4,112	1,246	12.1 (3.5 to 19.9)

Effectiveness against mortality

Vaccine effectiveness against mortality with the Omicron variant (all sub-lineages using tests taken until 5 September 2022) has been estimated for those aged 65 years and older using a test-negative case control study design (all vaccines combined) and is published in earlier versions of this report. Due to the small numbers of deaths within those hospitalised, VE against mortality has not been assessed for recent boosters.

Vaccine effectiveness publications

UKHSA and collaborators have published a significant amount of research into vaccine effectiveness. Further results and details of methods used can be accessed at the Monitoring reports of the effectiveness of COVID-19 vaccination page.

Vaccination in pregnancy

Pregnant women have been included in the priority groups of people advised by the Joint Committee on Vaccination and Immunisation (JCVI) to have an Autumn dose of vaccine each year between 2022 and 2024 inclusive. The JCVI statement on the COVID-19 vaccination programme for autumn 2024, 8 April 2024 - GOV.UK highlighted that the current situation consists of high levels of population immunity and circulating Omicron subvariants that have not been associated with increased disease severity. This includes evidence of reduced risk of COVID-19 disease complications in pregnant women during the Omicron variant era when compared to the Delta period (16, 17).

There is evidence of high levels of protection against SARS-CoV-2 infection in pregnant women after COVID-19 vaccination (18-21) and also evidence from studies in England and the USA that 2 doses of mRNA COVID-19 vaccination during pregnancy might help prevent COVID-19 hospitalisations in young infants under 6 months of age (22) with increased protection observed after a booster dose (23).

COVID-19 vaccines used in the UK programme do not contain live SARS-CoV-2 virus and therefore cannot infect a pregnant woman or her unborn child with the virus. Whilst as is commonly the case in trials of medicinal products, pregnant women were excluded from the original COVID-19 vaccine trials, there is a large body of experience and evidence of the safe and effective use of mRNA vaccines (such as the Pfizer-BioNTech or Moderna) in pregnant women. No safety concerns relating to COVID-19 vaccination of pregnant women have been found in published studies to date (24-30) including a large matched case–control study nested in a retrospective cohort covering all births in England between 16 April 2021 - 31 March 2022 that concluded COVID-19 vaccines were safe to use in pregnancy (31).

Data published in this report should be considered provisional and data are not directly comparable between each report as data is updated through the complete period under consideration. This section of the report summarises the coverage for women who had received an Autumn 2023 COVID-19 vaccine dose. In addition, an analysis of COVID-19 associated rates of hospitalisation and deaths in pregnant women in England and in their infants, during a period of Omicron predominance, is summarised.

Methods to estimate vaccine coverage

Please see earlier reports for methods to generate data on women who gave birth in England between September 2022 and June 2023.

Data on COVID-19 vaccination status together with details of each vaccine administered is recorded in a central data set called the Immunisation Information System (IIS, previously

NIMS)[1]. In addition, NHS Digital manages the Hospital Episode Statistics (HES) data sets, containing information about hospital activity in England and the Maternity Services Dataset (MSDS) in England that records information for all maternities in England.

Records of women giving birth ('delivery records') in the months between 1 September 2023 and 31 May 2024 were identified in MSDS. De-duplication of delivery records resulted in a data set of women who had given birth in this period, identified by her NHS Number. Gestational age at birth and the date of birth of the baby were used to generate pregnancy start date.

Each woman who gave birth in the period covered by this report was linked to her record(s) in the IIS using the NHS Number, establishing her Autumn 2023 vaccine status (including any prior to becoming pregnant or after she gave birth), using the IIS vaccine records extracted on 12 November 2024. For a woman to be identified as having had the autumn dose, a COVID-19 vaccine dose was recorded in IIS on or after 1 September 2023 to 31 January 2024 at 20 or more days after any previous dose if they received an earlier dose of COVID-19 vaccine.

For each vaccine dose in the 2023 autumn dose period the woman was known to have received, the following information was ascertained:

Dose administered pre-pregnancy	Dose administered before the pregnancy start date
Dose administered in pregnancy	Dose administered after the pregnancy start date and before the date she gave birth
Dose administered post-pregnancy	Dose administered on or after the date she gave birth, based on IIS records extracted on 8 November 2024
Unvaccinated in pregnancy	No vaccine records exist for the woman after the pregnancy start date and before the date she gave birth, administered between 1 September 2023 to 31 May 2024 based on linkage using the NHS number

The ethnicity, quintile of multiple deprivation and age information is taken from the IIS record. The latest MSDS data available for publication was for May 2024, and all MSDS data since April 2024 is considered provisional.

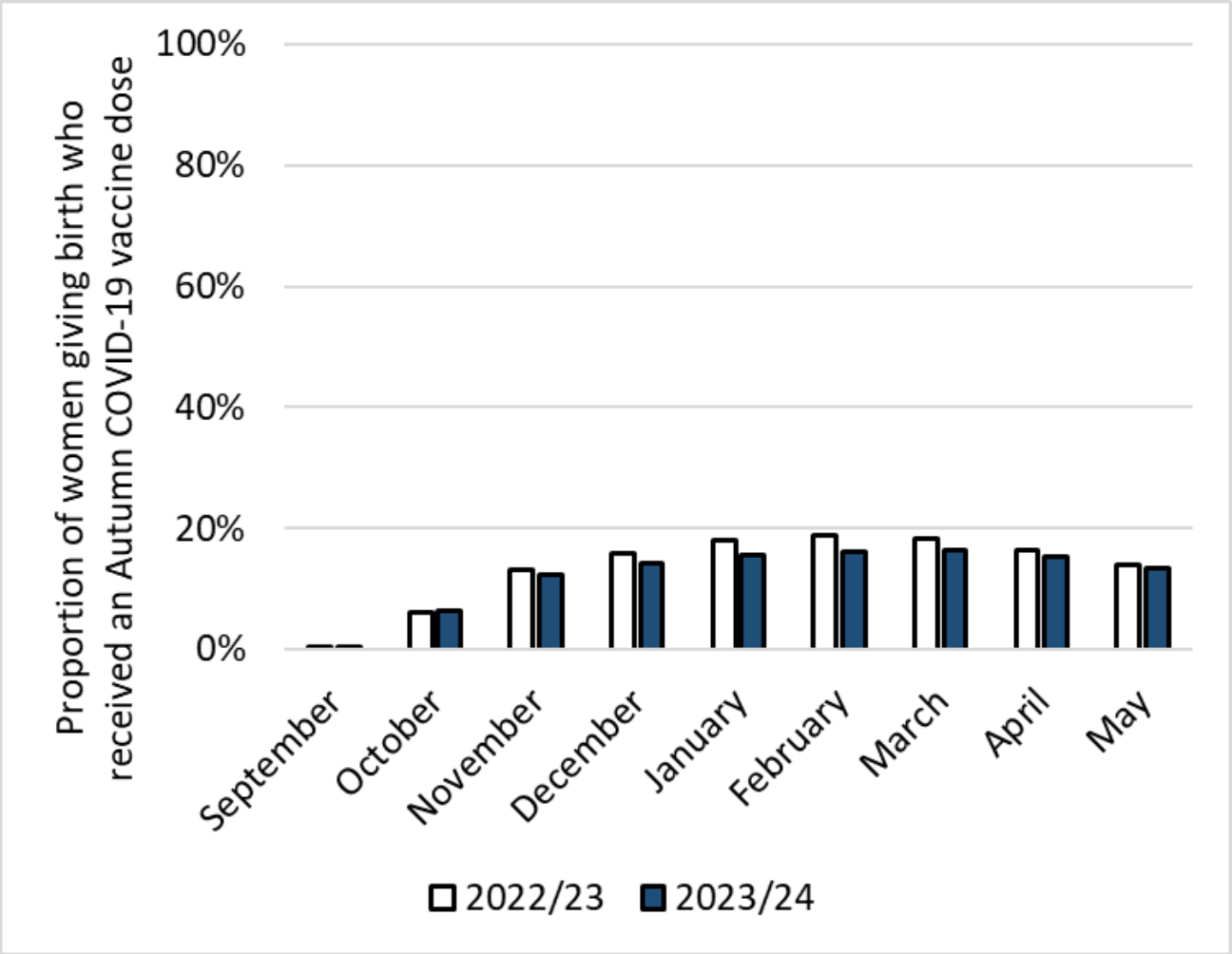
Gestational age at time of vaccination was generated using the gestational age at birth recorded in MSDS and the pregnancy start date. Maternal trimester was defined as; first trimester at 0-90 days, second trimester 91-188 days, third trimester 189+ days. Records for those who had given birth aged 15 to 54 years inclusive are presented.

Vaccine coverage in 2023/24

[1] IIS Data controllers are NHSEI and NHSD.

Please see COVID-19 vaccine quarterly surveillance reports (September 2021 to July 2024) for previously published data.[2]

Figure 1. Autumn COVID-19 vaccine dose coverage in pregnancy in women who gave birth between September 2022 and May 2023 and Autumn 2023 dose coverage in pregnancy in women who gave birth between September 2023 and May 2024



Autumn 2023 COVID-19 vaccine coverage for 388,918 women aged between 15 and 54 years who gave birth between September 2023 and May 2024 found similarly low levels of coverage to those who were pregnant during the Autumn 2023 COVID-19 vaccine programme (Figure 1). Of 388,195 people that gave birth who could be linked to IIS vaccination records (virtually 100%), overall, only 12.2% (47,397) received a dose of COVID-19 vaccine during pregnancy. Coverage by month peaked at 16.5% in those giving birth in March 2024.

There were 110,647 (28.5%) women who had not received any doses of COVID-19 vaccine before their pregnancy and this proportion was slightly higher at 31.8% (108,539 women) when considering only those who did not receive the COVID-19 vaccine during their current

[2] Note the data in this report for Autumn 2023 vaccine coverage has been generated using Maternity Services Dataset records to identify women who gave birth in England. This is more complete and records more detail than maternity records in the Hospital Episode Statistics.

pregnancy. Of the COVID-19 vaccine administered, 11.7% was during the first trimester, 50.6% the second and 37.7% during the third trimester of pregnancy. There were 2831 women who received an Autumn 2023 COVID-19 vaccine dose only after they gave birth.

The distribution of those vaccinated during pregnancy was looked at by maternal age, index of multiple deprivation by quintile and by ethnicity, as recorded in IIS supplemented by MSDS data. Vaccine coverage in pregnancy increased with increasing maternal age from 3.5% in those aged less than 20 years at the time they gave birth to 19.3% in those aged 40 years or over when they gave birth (Table 3).

Table 3. Vaccine coverage by age of mother for women giving birth between September 2023 and May 2024

Maternal age group at time of birth	Total not receiving a COVID-19 dose during pregnancy	Total vaccinated during this pregnancy	% vaccinated during pregnancy
Under 20 years	8680	312	3.5%
20 to 24 years	42861	1843	4.1%
25 to 29 years	93022	7460	7.4%
30 to 34 years	115690	19564	14.5%
35 to 39 years	65047	14519	18.2%
40 years and older	15498	3699	19.3%

Coverage of COVID-19 vaccine in pregnancy also differed by IMD of mother where this could be determined in 376,953 (97.1%) of women who gave birth in this period. In line with earlier reports, the highest coverage was in the most affluent (21.1%) and lowest in those living in the most deprived areas (4.4%) (Table 4).

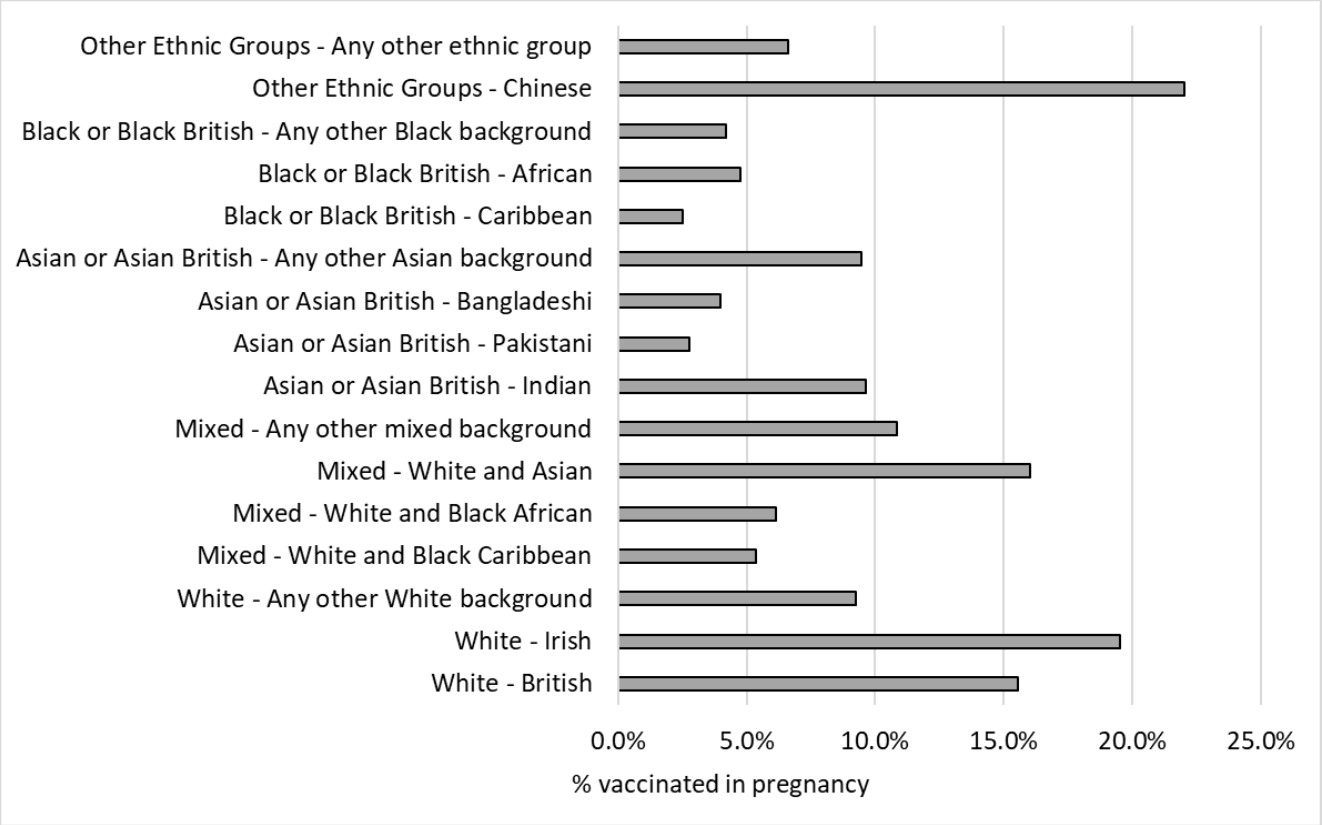
Table 4. Vaccine coverage by quintile of deprivation of the small area in which the woman lived, for women giving birth from September 2023 to May 2024[3]

	Total not receiving a COVID-19 dose during pregnancy	Total vaccinated during this pregnancy	% vaccinated during pregnancy
1 - most deprived	92861	5053	5.2%
2	74082	7600	9.3%
3	62588	9387	13.0%
4	54538	10997	16.8%
5 - most affluent	46819	13006	21.7%

[3] Quintile of deprivation could not be determined in 11,264 (2.9%) of women who gave birth in this period

Coverage differed by ethnicity of mother which was recorded in 96.1% of those giving birth in this period. The highest coverage was recorded in those of Chinese ethnicity (22.0%), followed by those who were white Irish (19.5%) and of mixed Asian and white ethnicity (16.0%) or who were white British (15.3%) (Figure 2).

Figure 2. COVID-19 vaccine coverage in pregnancy by ethnicity, for women giving birth from September 2023 to May 2024



COVID-19 burden in pregnancy and in infants aged under 3 months (Autumn 2022-Spring 2024)

We looked at hospitalisations during a period when Omicron strains were circulating using Secondary Use Services (SUS) data where a COVID-19 related hospitalisation was defined as a positive SARS-CoV-2 test result in SGSS together with a respiratory ICD-10 code in a primary diagnostic field or COVID-19 coded in a primary diagnostic field. Hospital events were categorised as severe when coded as requiring oxygen/ventilation and/ or ICU admission. Infants were identified using MSDS births between August 2022 and February 2024 with SUS/ SGSS records linked and extracted for those aged 0-2 months at the time of hospitalisation (when maternal vaccination vaccine effectiveness is higher). Women with a third trimester (when the highest risk of severe COVID-19 disease has been observed) of pregnancy beginning between October 2022-December 2023 were included to allow full follow-up to the time of birth. Mean length of hospital stay was calculated where 1 day was defined as admission and discharge on the same day.

Rates of COVID-related hospital admission during the third trimesters in 532,567 pregnant individuals, were 120 per 100,000 pregnancies with only 4 severe hospital admissions (0.8 per 100,000) and no ICU admissions or deaths. Whilst admission rates were relatively high compared to healthy adults of a similar age, the length of stay per hospitalisation was comparable and low with a mean of 2 days. This is suggestive of a low threshold for admission during pregnancy.

In 682,835 infants aged 0-2 months and born between August 2022 and February 2024, the rates of COVID-19 related hospitalisation were 479 per 100,000 infants, with admission for severe disease at 17 per 100,000 and admission requiring intensive care at 1 per 100,000 in a total of 8 infants. Mean length of stay (LOS) was only 3 days overall. Whilst mean LOS was longer in those infants admitted with severe disease, such admissions were more likely in babies born prematurely.

The JCVI reviewed all deaths in infants aged 0-2 months (and born between August 2022 and February 2024) with COVID-19 identified through ONS records and/ or data shared from the National Child Mortality Database where the death was linked to a positive SARS-CoV-2 result and considered as possibly, probably, or clearly linked to COVID-19 following clinical review. JCVI members agreed that SARS-CoV2 was only likely to be responsible for or contributing to very few (<5) deaths in these young infants, mainly in those with serious underlying and potentially life-limiting underlying conditions.

Interpretation and Main findings

Despite COVID-19 vaccination in pregnancy being effective with a good safety profile, coverage of the programme remains poor. MSDS data was used to monitor coverage and found very low levels of uptake in women who gave birth between September and May of the Autumn 2024

programme, similar to coverage previously identified using HES birth data. Further breakdown of these data by age, ethnicity and deprivation scores found higher uptake with increasing age and in more affluent populations with differences by ethnic categories.

Over a recent Omicron-dominant period, rates of COVID-19 hospitalisation were low in pregnant women and severe disease was rare. Rates of hospitalisation in infants were higher but severe disease was uncommon and associated with prematurity. This low burden means only a small number of severe COVID-19 cases can be prevented by vaccination and the low coverage means even lower numbers are being prevented. The JCVI committee agreed that it was difficult to attribute hospitalisations to COVID-19 in infants referring to recent data from the US that found 30% of infants hospitalised with COVID-19 had concomitant infections (Havers et al., 2024). It was noted that throughout the pandemic, higher hospitalisation rates had been observed in children in the US, as compared with the UK.

The JCVI has considered all available evidence on disease burden in a population with high levels of combined vaccine and disease-derived immunity against severe disease from currently circulating Omicron strain. JCVI minutes from the October meeting updated recommendations for COVID-19 vaccination that now advise probably those over 75 and those immunosuppressed should continue to be routinely vaccinated. This updated JCVI advice, which does not recommend continued vaccination of pregnant individuals, is in line with the Statement of the Standing Commission on Vaccination (STIKO) at the Robert Koch Institute in Germany summarising the decision on the implementation of the COVID-19 vaccination into the regular recommendations of the STIKO 2023 (32) that states ‘No further boosters are currently recommended for healthy adults aged < 60 years and pregnant Women’. Updated advice issued by the Health Council of the Netherlands on 27 March 2024 highlights that COVID-19 no longer leads to a higher risk of serious illness and complications during pregnancy and that the COVID-19 vaccination should no longer be made available to all pregnant people (33).

Vaccine impact on proportion of population with antibodies to COVID-19

Seroprevalence

The results from testing samples provided by healthy adult blood donors aged 17 years and older, supplied by the NHS Blood and Transplant (NHS BT collection) between weeks 35 2020 and week 43 2024 are summarised. Between week 44 2020 and week 10 2024, approximately 250 samples from each geographic NHS region were tested each week; from week 11 2024 onwards, approximately 55 samples from each geographic region are tested each week.
The COVID-19 vaccination campaign began on 8 December 2020 (week 50) with a phased roll out by age and risk group. Booster doses have been offered from the beginning of September 2021. Further doses are typically offered in spring and autumn campaigns to populations in risk groups. The 2023 autumn booster programme began in September 2023 for adults aged 65 and older, people in clinical risk groups, older adults in care homes, health and social care workers and individuals who live closely with or are carers for clinically vulnerable people; a similar 2024 autumn booster programme began in October 2024. The 2024 spring booster programme began in April 2024 for adults aged 75 years and older, residents of care homes and immunosuppressed individuals aged 6 months and older. We intend to monitor the current Autumn booster programme and its impact on seroprevalence.

Seroprevalence in blood donors aged 17 years and older

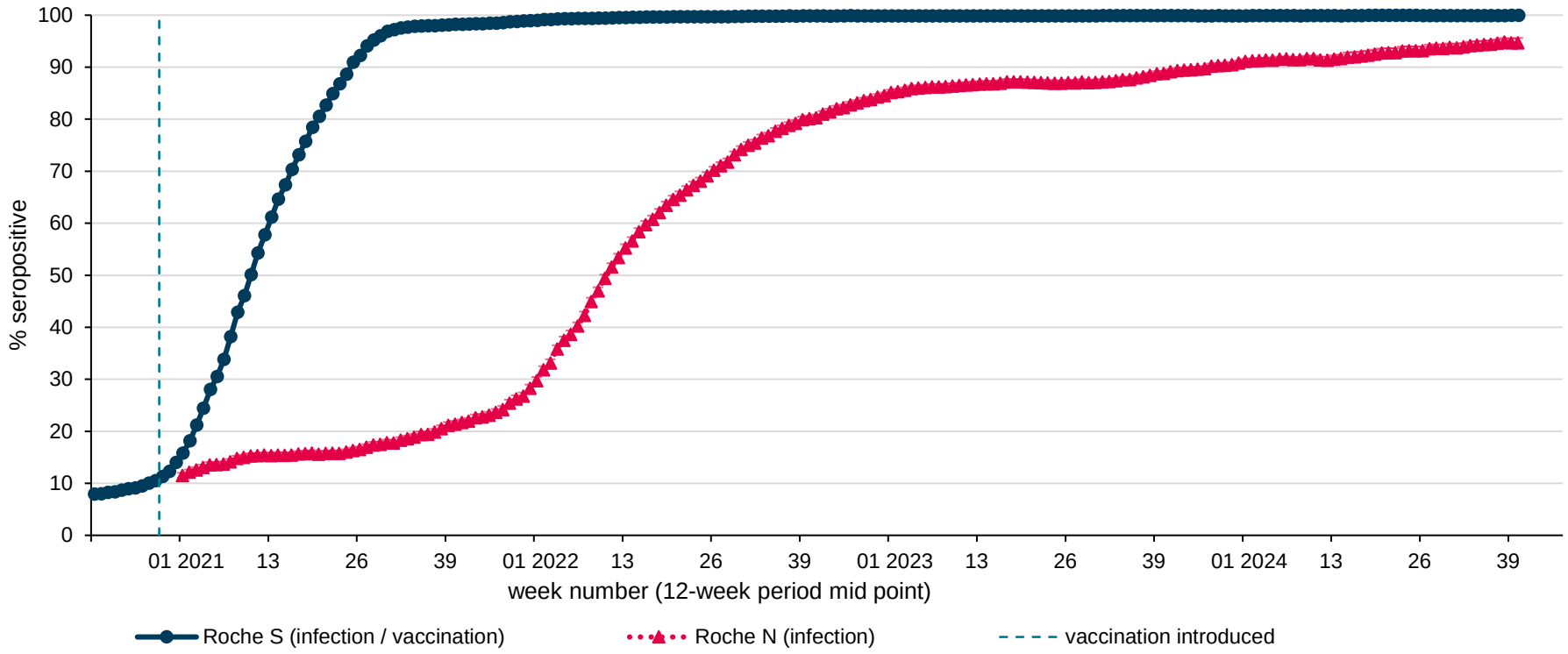
The results presented here are based on testing samples with Roche nucleoprotein (N) and Roche spike (S) antibody assays.
Nucleoprotein (N) assays only detect post-infection antibodies, whereas spike (S) assays will detect both post-infection antibodies and vaccine-induced antibodies. Thus, changes in seropositivity for the Roche N assay reflect the effect of natural infection. Increases in seropositivity as measured by S antibody reflect both infection and vaccination. Antibody responses to both targets reflect infection or vaccination occurring at least 2 to 3 weeks previously given the time taken to generate a COVID-19 antibody response. Currently donors are asked to defer donations for at least 48 hours post vaccination (previously 7 days), and for at least 7 days following resolution of any COVID-19 symptoms (previously 28 days, changes were implemented during January 2022).
This report presents N and S seropositivity estimates on the same set of samples, using a 12-week rolling prevalence for national, age group and regional estimates. Seropositivity estimates are plotted using the mid-point of a 12-weekly rolling period. This means the data will reflect seroprevalence several weeks previously. Seroprevalence estimates reported are based on seropositivity which are unadjusted for the sensitivity and specificity of the Roche assays used.

National prevalence

Overall population weighted (by age group, sex and NHS region) antibody prevalence among blood donors aged 17 years and older in England was 94.7% (93.6% - 95.6%) using the N assay and 100.0% (99.8% - 100.0%) using the S assay for the period 4 September to 25 October 2024 (week 36 to week 43 2024). 2,861 out of 3,021 were N positive and 2,980 out of 2,981 samples were S positive. This compares with 93.6% (92.8% - 94.4%) N seropositivity and 99.9% (99.8% - 100.0%) S seropositivity for the period of 12 June to 30 August 2024 (week 24 to week 35 2024).

Seropositivity (weighted by region, age group and sex) varies over time. Figure 3 shows the overall 12-weekly rolling proportion seropositive over time for the N and S assays. Seropositivity estimates are plotted weekly using the mid-point of a rolling 12-weekly period. The high N seropositivity in 2024 implies that the majority of recent COVID-19 cases have experienced prior infection.

Figure 3. Overall 12-weekly rolling SARS-CoV-2 antibody seroprevalence (% seropositive) in blood donors



Regional prevalence of infection over time

Seropositivity (weighted by age group and sex) using the Roche N assay which detects infection only, has previously varied by region (Figure 4).

Figure 4: 12-weekly rolling SARS-CoV-2 antibody seroprevalence (% seropositive) in blood donors by region, using Roche N test; error bars show 95% confidence intervals.

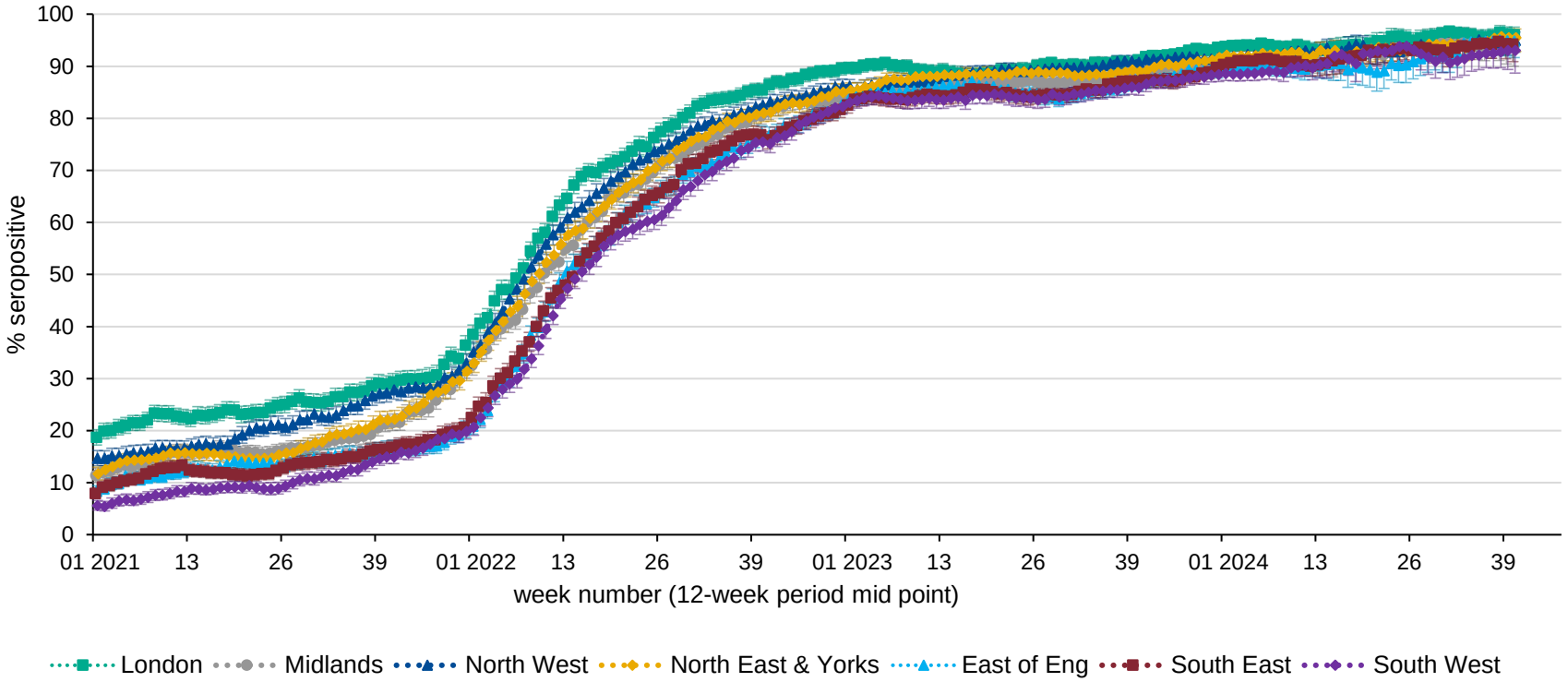


Table 5. Roche N seropositivity (95% CI) estimates by NHS region

NHS region	Weeks 24 to 35 2024	Weeks 36 to 43 2024
East of England	91.9% (88.9% - 94.2%)	94.8% (91.7% - 96.9%)
London	95.8% (93.8% - 97.1%)	96.1% (93.7% - 97.6%)
Midlands	93.5% (91.2% - 95.1%)	94.0% (90.0% - 96.5%)
North East and Yorkshire	94.2% (91.9% - 95.9%)	95.5% (92.8% - 97.2%)
North West	93.9% (91.6% - 95.5%)	95.0% (92.7% - 96.6%)
South East	93.5% (91.2% - 95.2%)	94.2% (90.9% - 96.4%)
South West	91.7% (88.5% - 94.2%)	93.0% (88.7% - 95.8%)

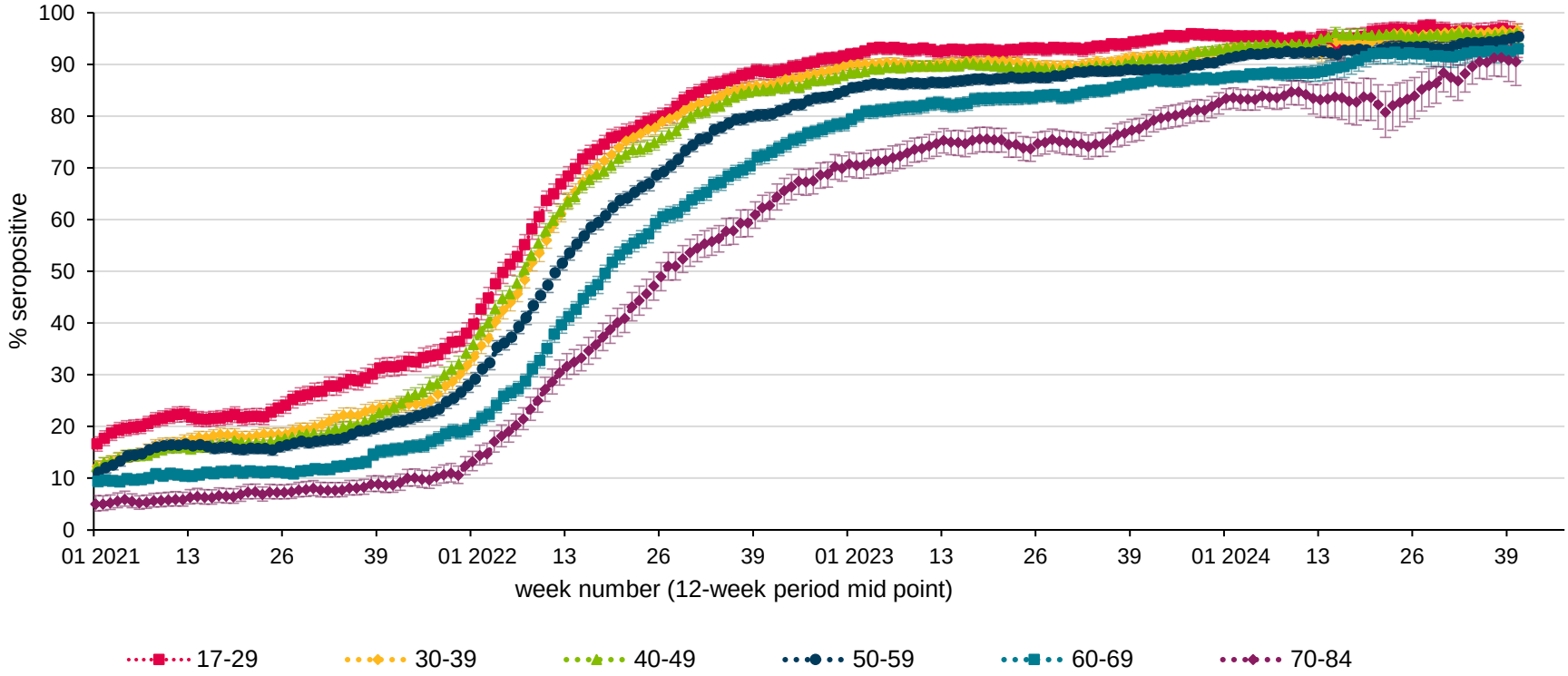
N seropositivity has increased compared to the previous 12-week period (Table 5). Estimates have changed by 0.5 to 2.9% between the two periods.

The difference in seropositivity by region has narrowed over time. Historically the highest seropositivity was observed in London. During the period weeks 36 to 43 2024 there was no clear difference in N seropositivity between regions; the difference between the highest and the lowest regional estimates was 3.1%.

Prevalence by age group

Seropositivity estimates by age group using the Roche N assay are presented below.

Figure 5. Population weighted 12-weekly rolling SARS-CoV-2 antibody seroprevalence (% seropositive) in blood donors from the Roche N assay by age group



Based on testing samples using the N assay (Figure 5) as a marker of infection, the lowest seropositivity continues to be observed in those aged 70 to 84, however the gap in seropositivity between age groups has narrowed over the last year.

Table 6. Roche N seropositivity (95% CI) estimates by age group

Age group	Weeks 24 to 35 2024	Weeks 36 to 43 2024
17 to 29	97.4% (95.2% - 98.6%)	95.7% (91.4% - 97.9%)
30 to 39	95.8% (94.1% - 97.0%)	96.5% (94.5% - 97.8%)
40 to 49	95.6% (94.1% - 96.8%)	96.0% (94.2% - 97.3%)
50 to 59	93.1% (91.5% - 94.3%)	95.3% (93.6% - 96.6%)
60 to 69	91.6% (89.6% - 93.2%)	93.0% (90.7% - 94.7%)
70 to 84	85.9% (81.8% - 89.2%)	90.5% (85.9% - 93.7%)

N seropositivity has decreased slightly among those aged 17 to 29, increased slightly among those 30 to 69, and increased by 4.6% among those 70 to 84 (Table 6) compared to the previous 12-week period.

S seropositivity in blood donors has plateaued and is over 99% across all age groups. Historical seropositivity estimates for S antibody in blood donors are likely to have risen more steeply than would be expected in the general population, reflecting the fact that donors are more likely to be vaccinated. Seropositivity estimates for N antibody will underestimate the proportion of the population previously infected due to (i) waning of the N antibody response over time and (ii) observations from UK Health Security Agency (UKHSA) surveillance data that N antibody levels are lower in individuals who acquire infection following vaccination. These lower N antibody responses in individuals with breakthrough infections (post-vaccination) compared to primary infection likely reflect the shorter and milder infections in these patients. Patients with breakthrough infections continue to have significant increases in S antibody levels consistent with boosting of their antibody levels.

Vaccination has made an important contribution to the overall S seropositivity increases observed since the roll out of the vaccination programme. The impact of the booster vaccination programmes can be assessed by monitoring S antibody levels across the population over time.

Roche S levels by age group and month

The Roche S assay that the UK Health Security Agency (UKHSA) uses for serological surveillance is fully quantitative, meaning that it measures the level of antibodies in a blood sample; an antibody level above 0.8 au/ml (approximately 1 IU/ml using the WHO standard) is deemed positive. The UKHSA surveillance since Autumn 2021 has found that over 99% of the population of blood donors test positive for S-antibodies, which may have resulted from either COVID-19 infection or vaccination. With such high seropositivity, it is important to look at population antibody levels in order to assess the impact of the vaccination booster programmes.

Figure 6 shows categorised S levels by age group. From spring 2023 the proportion of donors aged 50 to 69 years with very high antibody levels of 25,000+ AU/ml clearly decreased, subsequently increasing through October and November 2023. This trend is similar for donors aged 70-84, but with small increases in May-June. These trends are most prominent in older donors; and follow the autumn 2022 and autumn 2023 COVID-19 vaccine booster offers. The small increases during spring in donors aged 70-84 are in line with the spring 2023 COVID-19 vaccine booster offer. The autumn 2024 vaccination campaign began in October 2024, one month later than previous years, and we observe no clear increase in S antibody levels in October 2024 (samples to 25 October). The profile of antibody levels is similar across donors aged 17 to 49, and is lower overall than in those aged above 60.

Figure 7 shows monthly categorised S levels over the past two years by N antibody status. N-antibody positive individuals are those likely to have experienced past infection. Antibody levels will be influenced by vaccination history, time since infection, variant and severity of infection, as well as individual factors such as underlying health conditions, age and genetics. N-antibody negative individuals are those who have either: never experienced infection, or who experienced infection in the past but made little N antibody response, or whose N antibody levels have waned into the negative range over time. In both panels of Figure 6, increased S-antibody levels can be seen around the time of the autumn 2022 and autumn 2023 vaccination campaigns, during the months of October to January. S antibody levels were also high during February 2024. Comparing the left and right panels, the overall higher profile of antibody levels in those who are N antibody positive is evident; vaccination post infection, breakthrough infection following vaccination and re-infection are all expected to boost existing S antibody levels.

Whilst it is thought that there is no threshold antibody level that offers complete protection against infection, higher antibody levels are likely to be associated with lower probability of infection.

Figure 6: Categorised Roche S antibody levels by age group and month, November 2022 to October 2024.

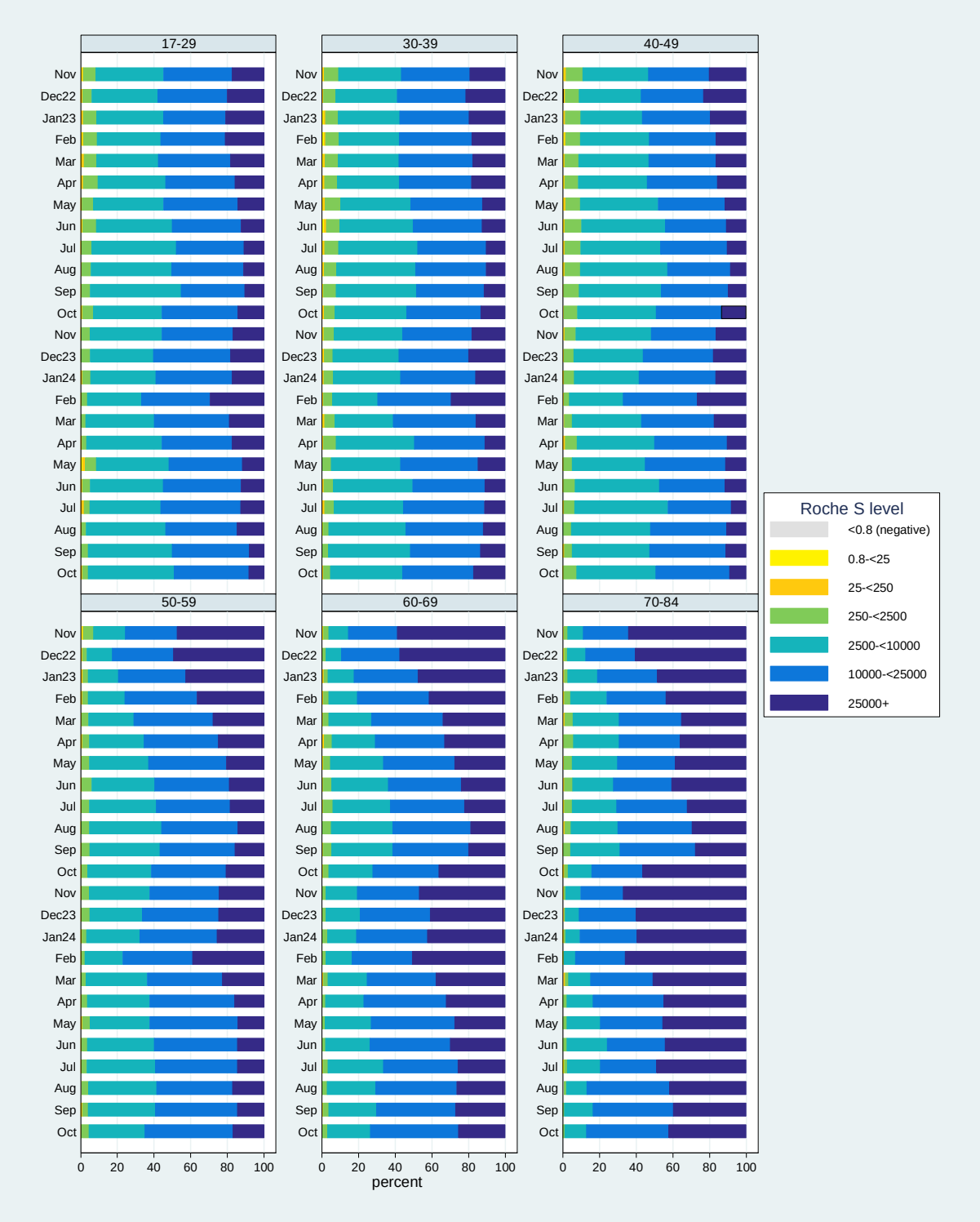
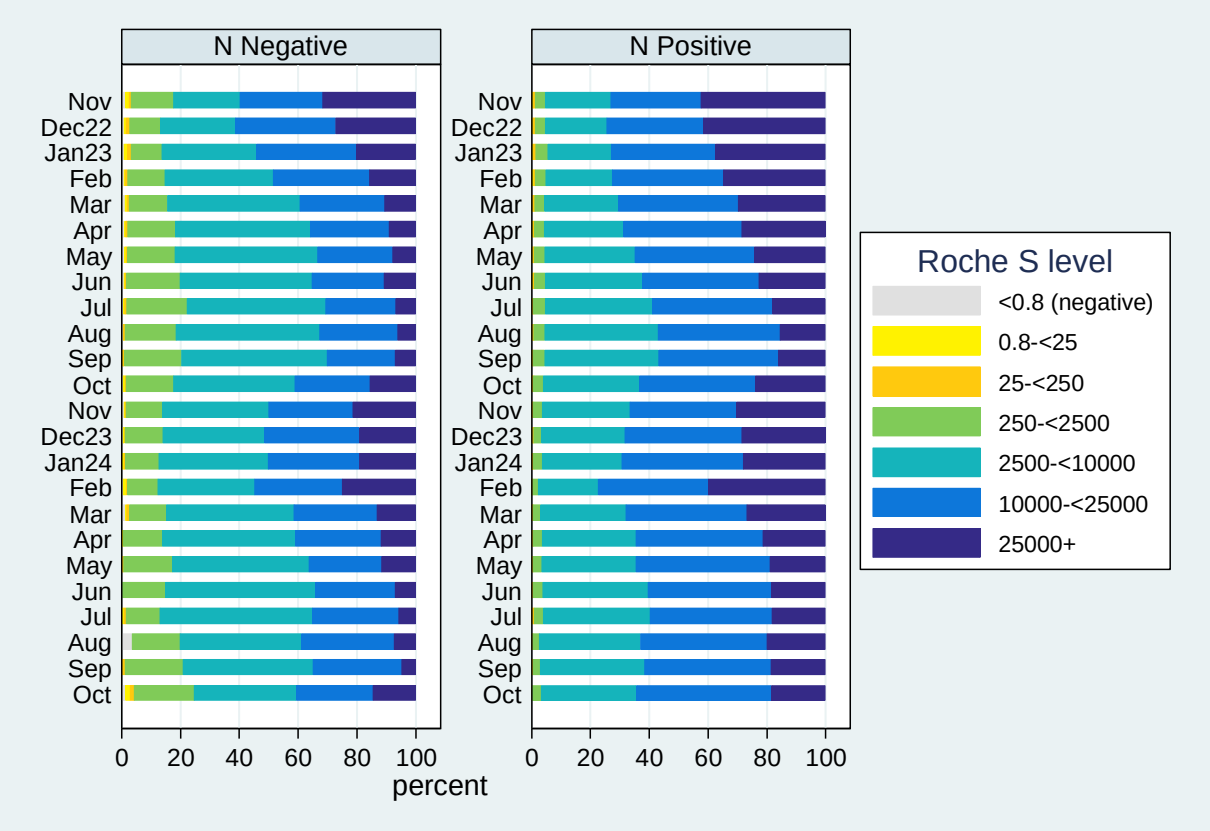


Figure 7: Categorised Roche S antibody levels by N antibody status and month, November 2022 to October 2024.



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