Seroprevalence of SARS-CoV-2-specific antibodies among Australian blood donors: Round 3 update

Prepared by the Australian COVID-19 Serosurveillance Network

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Overview

Why are we doing the surveys?

- Routine surveillance based on reporting diagnosed cases provides an incomplete picture of SARS-CoV-2 infection in population because of under-detection and under-reporting of cases.
- The Australian COVID-19 Serosurveillance Network is conducting regular serological surveys among Australian blood donors (aged 18 years and over) to provide estimates of the proportion of the population with SARS-CoV-2 antibodies (also known as SARS-CoV-2 seroprevalence).

How are we doing the surveys?

- The surveys are being conducted every 13 weeks (approximately) using residual blood donations, with three serosurvey rounds completed to date in 2022. This report presents results from Round 3, based on blood donations received between 23 August and 2 September 2022, alongside results from Rounds 1 and 2, which were presented in more detail in earlier reports (see Round 1 and Round 2).
- For Round 3, 5,005 de-identified specimens received from all Australian states and territories were tested for the presence of antibodies to SARS-CoV-2. The COVID-19 vaccines used in Australia generate antibodies to the spike protein of SARS-CoV-2, but not to its nucleocapsid protein. The presence of spike antibodies therefore indicates exposure to vaccination and/or natural infection, while presence of nucleocapsid antibodies specifically indicates past infection with SARS-CoV-2.

What did we find?

- The overall prevalence of spike antibodies was 99.6%, with little variation across jurisdictions or age groups, exceeding the already very high prevalence found in Rounds 1 and 2.
- The prevalence of nucleocapsid antibodies increased from 46% in Round 2 to 65% in Round 3, with consistence increases in all states and territories, and age groups.
- Overall, the highest prevalence of nucleocapsid antibodies was in the 18–29 year old age group, at 80%, and decreased with age.

What do our findings mean?

- These results suggest that by September, at least two thirds of the population had been infected with SARS-CoV-2, with at least 20% infected within the 3 months since the previous survey round.
- The true cumulative prevalence of SARS-CoV-2 infection in the population is likely to be higher than that indicated by seroprevalence. Available local data show that the sensitivity of the Roche assay to detect nucleocapsid antibodies arising in vaccinated people as a result of an Omicron infection is 84%, suggesting that 15–20% of infections may be missed by these seroprevalence estimates.

What is next?

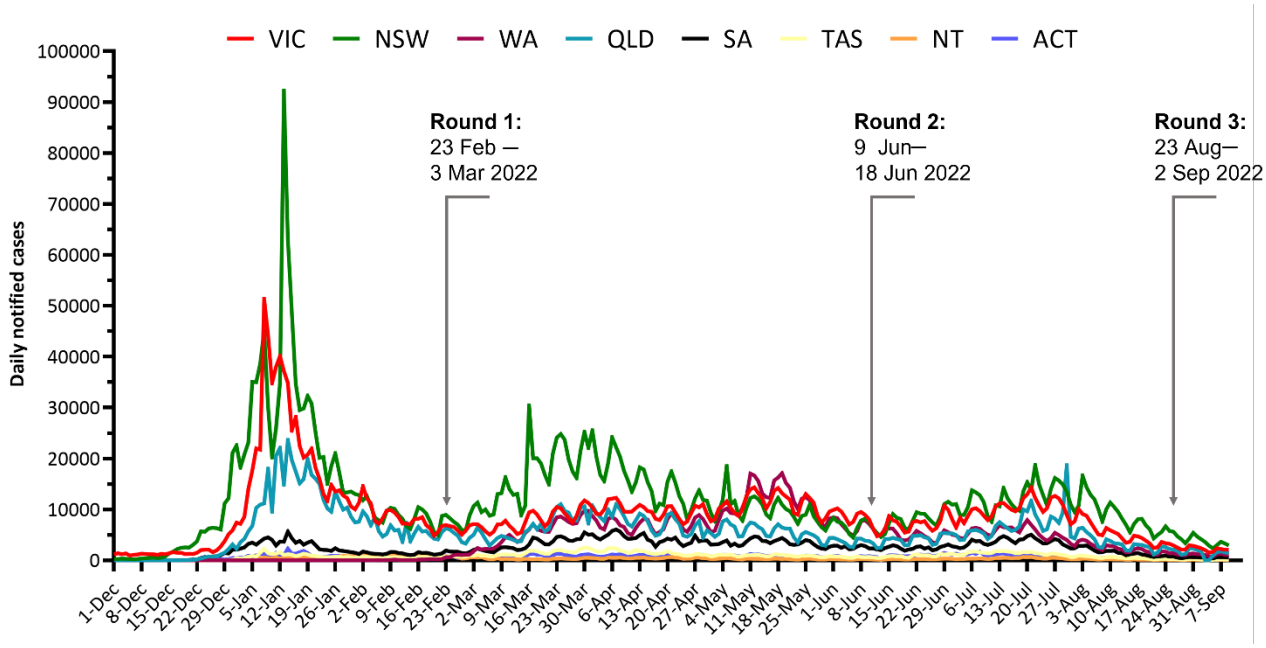
- The next serosurvey round will commence in December 2022.

Update on SARS-CoV-2 situation since the previous report

Key developments since the previous report include the following:

- There were 2.6 million new cases of COVID-19 reported in the total Australian population between June and September 2022,[1] with BA.4 and BA.5 being the dominant subvariants.
- All jurisdictions experienced a small winter surge in cases in late July, driven by the BA.4 and BA.5 subvariants, decreasing steadily by September 2022 to the lowest 7-day average since January 2022.
- Estimates of cumulative case numbers based on routine case notifications are likely to underestimate the extent of infections in the community because of asymptomatic cases, testing capacity and community behaviour. Also, positive rapid antigen test (RAT) results are not always reported.
- At 23 September 2022, national 2-dose vaccine coverage was 95–96%; uptake of the third (booster) dose had increased from 67% to 72% since the Round 2 report; and uptake of the fourth dose increased to 41% following expansion of eligibility to adults aged 30 years and older on 11 July 2022.[2]

Figure 1. Count of daily SARS-CoV-2 case notifications by jurisdiction and timing of serosurvey rounds



Source: https://www.covid19data.com.au/

Characteristics of the study population

Round 3 results were available for 5,005 specimens: 1,105 in Victoria, 1,185 in New South Wales (NSW), 960 in Queensland, 996 in Western Australia (WA), 206 in South Australia (SA), 202 in Tasmania, 186 in the Northern Territory (NT) and 165 in the Australian Capital Territory (ACT). The median age of donors included in Round 3 was 47 years (IQR 33–58; range 18–84), and 55.9% were male.

More information on the survey population for each round is available here.

Spike antibody seroprevalence

Overall, spike antibody seroprevalence was very high across jurisdictions in Round 3 (99.6%; 99.3–99.7), ranging from 99.0% (96.1–99.8) in Tasmania to 100% (97.8–100.0) in the ACT (refer to Figure 2A).

Prevalence of spike antibodies was very high across all age groups nationally (refer to Figure 2B), and in Victoria, NSW, Queensland and WA (refer to Figure 2C). Seroprevalence was similar for males and females (male 99.6% [99.3–99.8] versus female 99.6% [99.2–99.8]). (Refer to supplementary file here.)

The majority (>96%) of donors had high antibody titres (i.e. >250 U/ml), with little variation by jurisdiction (refer to Figure 3A) and age group (refer to Figure 3B).

These findings are consistent with observations from Round 1 and Round 2.

Nucleocapsid antibody seroprevalence

Overall, nucleocapsid antibody seroprevalence increased from 46.2% (44.8–47.6) in Round 2 to 65.2% (63.9–66.5) in Round 3 (refer to Figure 4A). Seroprevalence increased in all jurisdictions and was highest in the NT (70.4%; 63.5–76.6), followed by NSW (67.3%; 64.5–69.9), Victoria (67.0%; 64.1–69.7) and Queensland (65.9%; 62.9–68.9). Tasmania had the lowest seroprevalence at 55.5% (48.5–62.2), with WA now having a comparable seroprevalence to other jurisdictions (61.7%; 58.6–64.6) (refer to Figure 4A).

Nucleocapsid antibody seroprevalence increased in all age groups in Round 3 compared with Round 2, but the overall patterns were consistent between all three rounds (refer to Figure 4B). Seroprevalence was highest among donors aged 18–29 years at 79.7% (77.0–82.2), declining steadily to 41.6% (36.0–47.4) in donors aged 70–89 years (refer to Figure 4B). These age-specific patterns were also observed n Victoria, NSW, Queensland and WA. Seroprevalence was similar for males and females (64.5% [62.7–66.2] versus 66.2% [64.2–68.2]). (Refer to supplementary file here.)

Overall, the proportion of spike antibody seropositive samples that were negative for nucleocapsid antibodies decreased from 83% in Round 1 and 54% in Round 2 to 35% in Round 3.

Figure 2: Crude SARS-CoV-2 spike antibody seroprevalence among Australian blood donors, by jurisdiction (A), age groups (B), and age groups within Victoria, NSW, Queensland and WA (C)

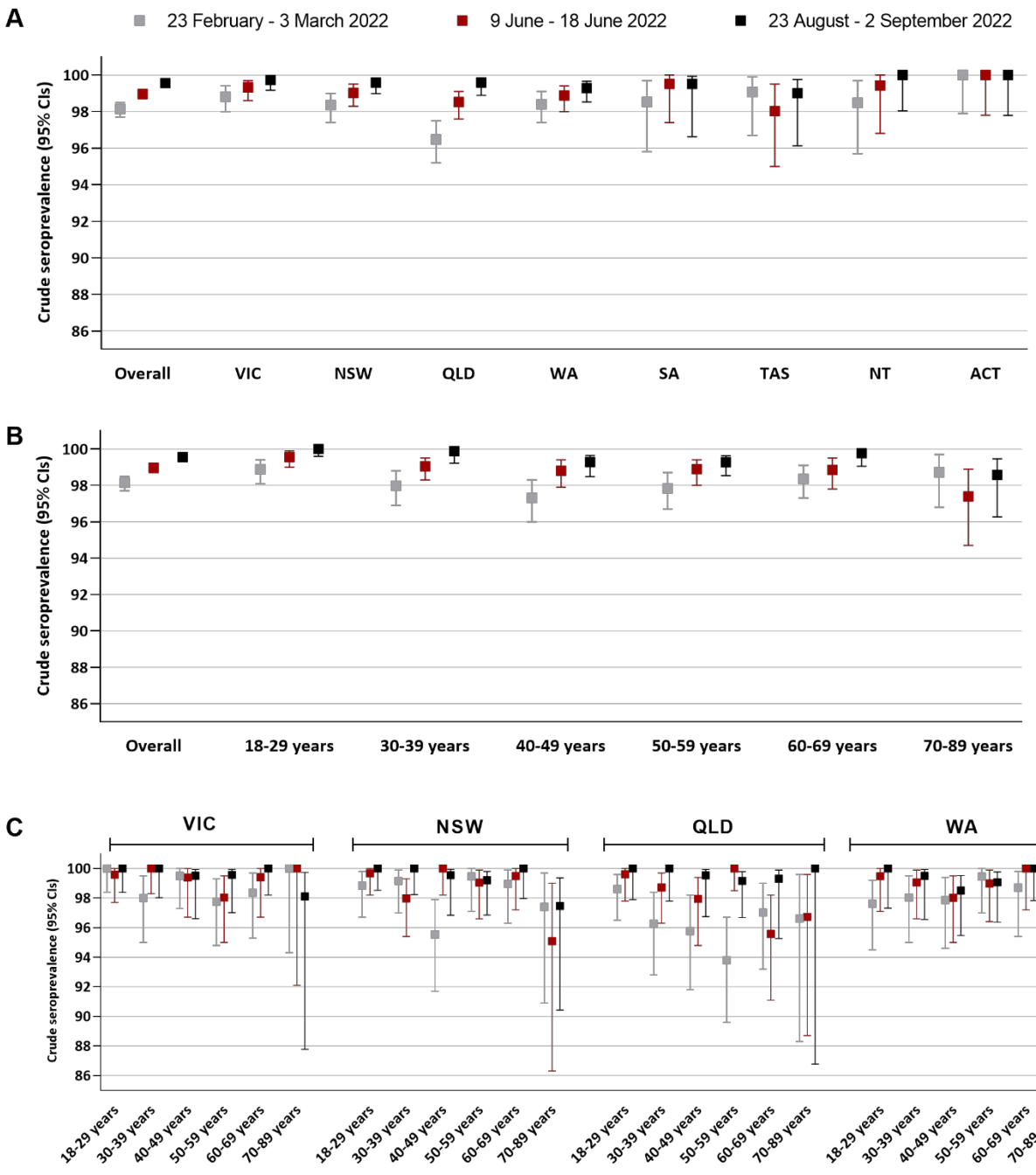


Figure 3: SARS-CoV-2 spike protein antibody concentration levels among Australian blood donors, by jurisdiction (A) and age groups (B)

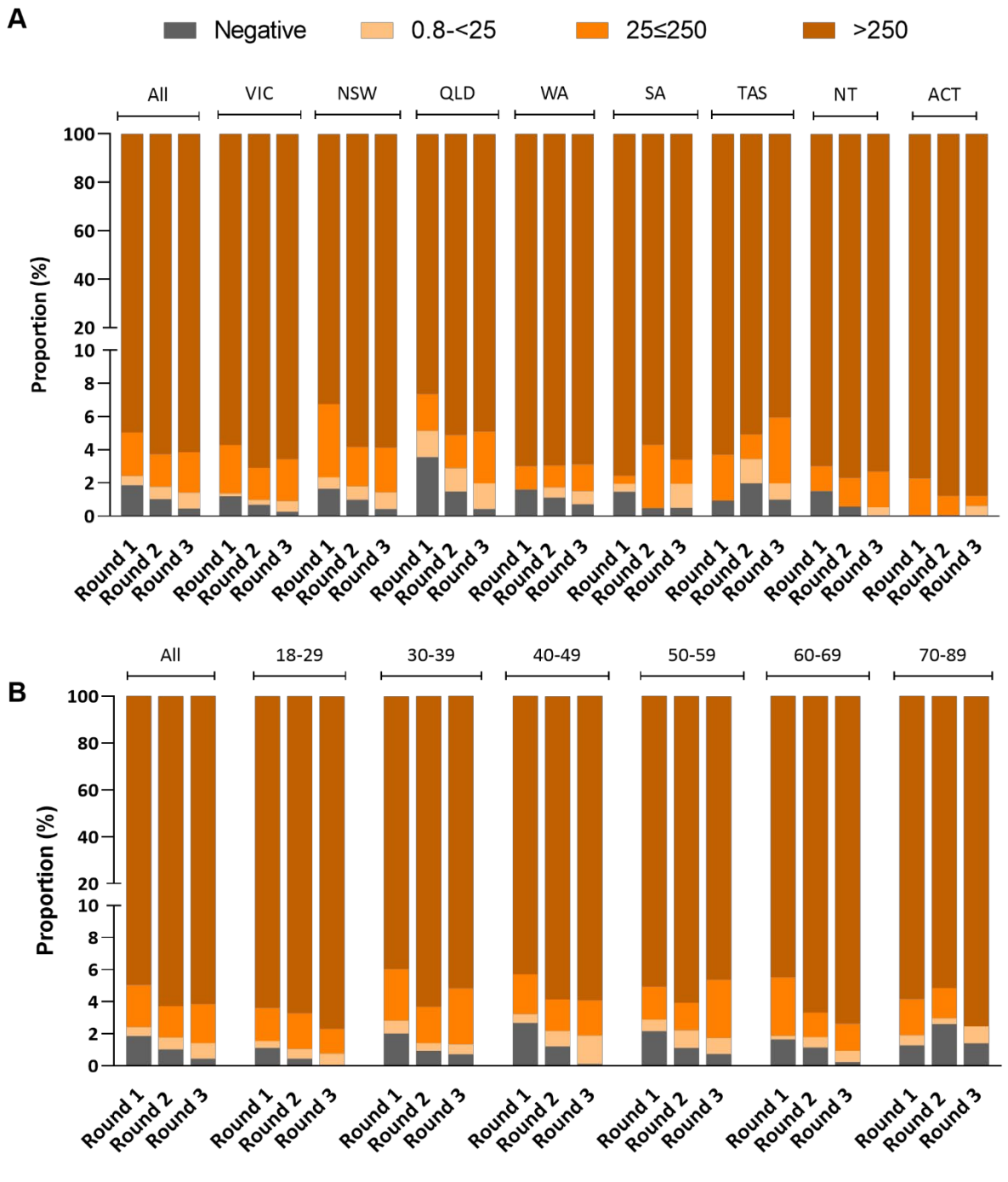
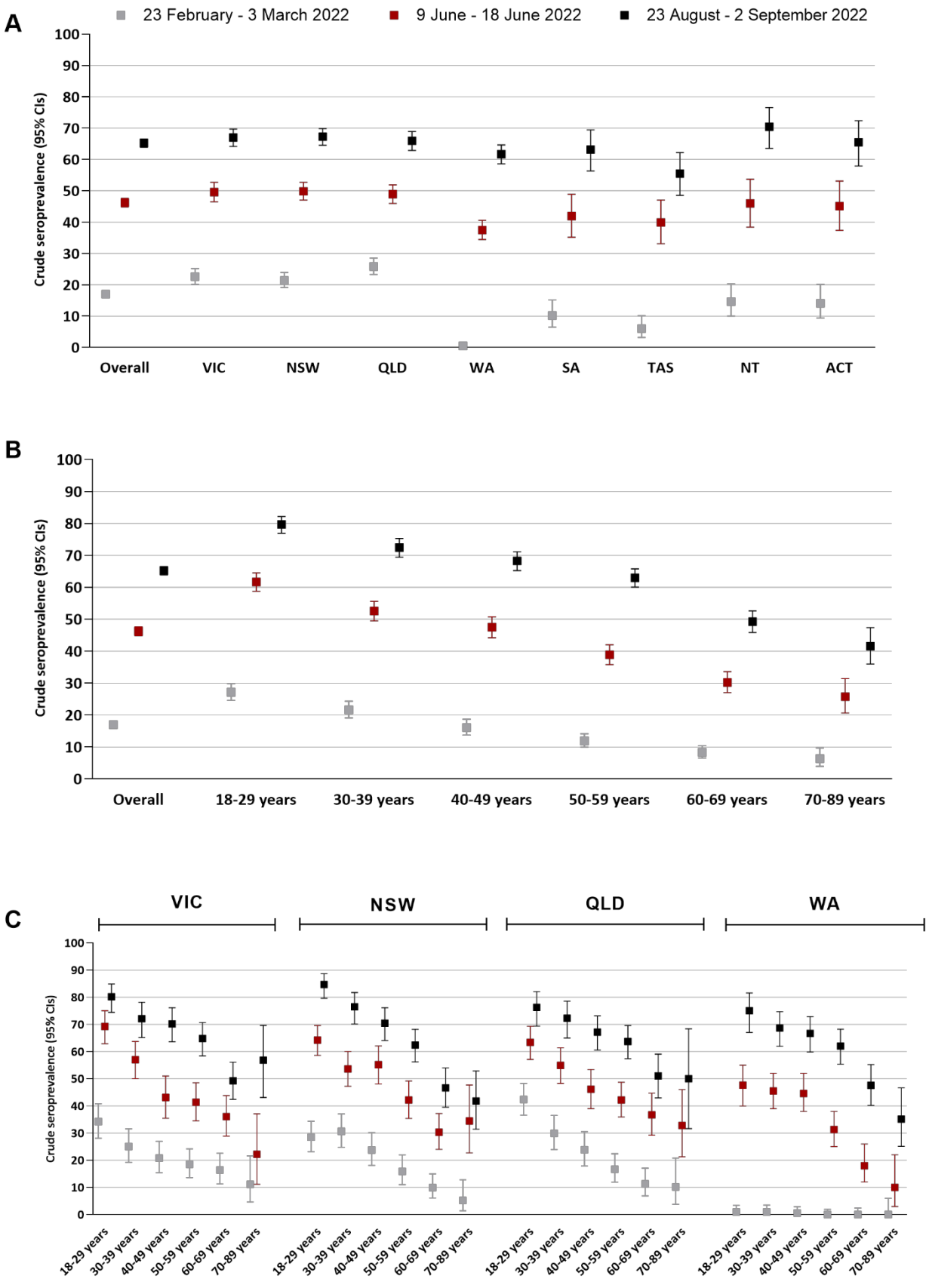


Figure 4. Crude SARS-CoV-2 nucleocapsid antibody seroprevalence among Australian blood donors, by jurisdiction (A), age group (B) and age groups within Victoria, NSW, Queensland and WA (C)



Interpretation and data considerations

- Spike antibody prevalence remains high (>99%) overall, with little variation by jurisdiction, age group or sex. These estimates are modestly higher than what would be expected in the general population based on 2-dose vaccine coverage rates[3] and likely reflect a combination of vaccine- and infection-induced antibody responses.
- The prevalence of nucleocapsid antibodies has increased from 46% in Round 2 to 65% in Round 3, suggesting that at least two thirds of the Australian adult population have been infected to date and with at least 20% having contracted an infection since June 2022.
- Seroprevalence of nucleocapsid antibodies was similar across all jurisdictions.
- Nucleocapsid antibody seroprevalence gives an estimate of cumulative infections in the population, but these antibodies do not necessarily confer immunity. Furthermore, current evidence suggests that circulating subvariants BA.4 and BA.5 have substantial immune escape, and re-infections are common.[4] It is not possible to distinguish first infections from repeat infections in this study.
- The results highlight the extent to which SARS-CoV-2 has been circulating in the Australian community and emphasise the importance of following public health advice on vaccination and other risk-mitigating measures such as mask wearing.
- Both spike and nucleocapsid antibody seroprevalence estimates are crude and unadjusted for test sensitivity and specificity or differences in sample characteristics. In the UK and USA, crude seroprevalence estimates (i.e. without adjustment for sensitivity and specificity of the assay) have been useful in tracking the spread of SARS-CoV-2 infections over time using the Roche assay.[5-7]
- Evidence suggests that nucleocapsid antibodies are produced at lower levels and wane faster in people who acquire infection following vaccination than those who have not been vaccinated, reducing the sensitivity of nucleocapsid antibody assays in detecting previous infection.[8, 9] As vaccine coverage in Australia is high, measures of nucleocapsid antibodies will underestimate SARS-CoV-2 seroprevalence in the population. Available local data show that the sensitivity of the Roche assay to detect nucleocapsid antibodies in vaccinated individuals with breakthrough Omicron infections is 84% (76–90%), suggesting that 15–20% of infections may be missed by these seroprevalence estimates.
- The next round of the blood donor serosurvey will commence in December 2022. This time point will provide an estimate of SARS-CoV-2 antibody prevalence following the end of mandatory isolation requirements for people diagnosed with SARS-CoV-2 infection on 14 October 2022.

Related materials

You can find more information on serological surveillance here.

Results of Round 1 and further details on methods are available here.

Results of Round 2 are available here.

Additional information on the survey populations for each round and results in table format are available here.

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