Seroprevalence of SARS-CoV-2-specific antibodies among Australian blood donors: Round 2 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 populations because of under-detection and under-reporting of cases.
- The Australian COVID-19 Serosurveillance Network is conducting a series of regular serological surveys during 2022 among Australian blood donors (aged 18 years and over) to provide estimates of the proportion of the population that have SARS-CoV-2 antibodies (i.e., seroprevalence).

How are we doing the surveys?

- The surveys are being conducted every 13 weeks (approximately) using residual blood donations, with two serosurvey rounds completed to date. Results for blood donations received between 23 February and 3 March 2022 (Round 1) and the survey methods can be found here. This report describes the results for blood donations received between 9 June and 18 June 2022 (Round 2).
- Overall, 5,139 de-identified specimens received from all Australian states and territories were tested for the presence of antibodies to SARS-CoV-2. In the Australian setting, testing for anti-spike antibodies provides an indication of the extent of cumulative exposure in the community to vaccination and/or natural infection. Testing for anti-nucleocapsid protein antibodies is indicative of recent (particularly past 3–6 months) infection with SARS-CoV-2.

What did we find?

- The prevalence of anti-spike antibodies was very high (99%) across all jurisdictions. Seroprevalence was very high across all age groups and within the four jurisdictions for which sample size was large enough to calculate age-specific rates: Victoria, NSW, Queensland, and WA. These findings are consistent with observations from Round 1.
- The prevalence of anti-nucleocapsid antibodies increased from 17% in Round 1 to 46% in Round 2. Antibody prevalence increased in all states and territories, including Western Australia, where seroprevalence increased from less than 0.5% to 38%.
- Overall, the highest positivity was in the 18–29-year-old age group, at 62%. This age-specific pattern was also observed within Victoria, NSW, Queensland and WA.

What does it mean?

- These results suggest that by June, nearly half of the population were infected with SARS-CoV-2, with the majority occurring in the previous three months. The findings highlight the extent of SARS-CoV-2 circulating in the community.
- The true cumulative SARS-CoV-2 infection rate 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 anti-nucleocapsid antibodies in vaccinated persons with breakthrough Omicron infections is 78% (65–89%). This means that approximately 20% of infections may be missed by these seroprevalence estimates.

What is next?

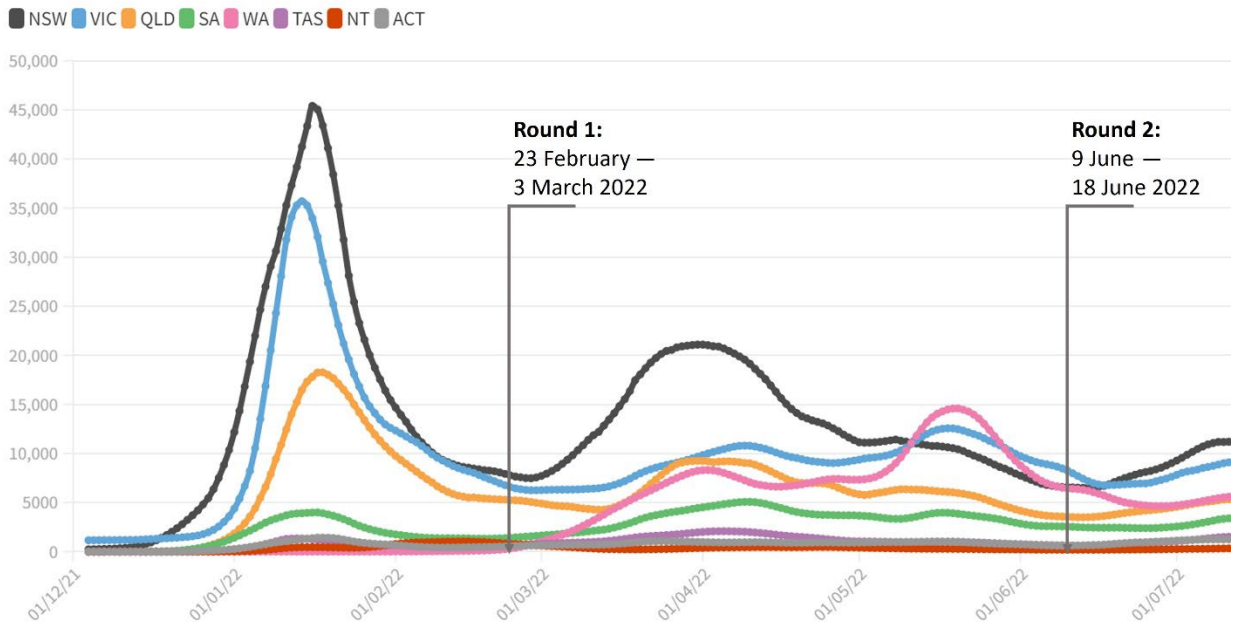
- The next serosurvey round will commence in September 2022. This time point will provide an estimate of SARS-CoV-2 antibody prevalence following winter and the emergence of Omicron subvariants BA.4 and BA.5 and broadening of fourth vaccine dose eligibility to all adults aged over 30 years.

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

Key developments since the previous report (in the period March to June) include the following:

- Cumulative SARS-CoV-2 case notifications increased from 2,868,618 to 6,220,803 nationally, including a rapid rise in WA from 13,805 to 594,656. Of all Omicron cases sequenced since December, 45.0% were BA.1; 53.9% BA.2; and the remaining 1.1% of sequences were BA.3, BA.4 and BA.5.
- All jurisdictions experienced a 'second' surge, which was largely driven by the spread of the BA2 Omicron sub-variants, which constituted 95% of all lineages by mid-April (from 35% in mid-February).
- The extent of the spread is expected to be much higher as estimates based on routine case notifications are known to underestimate the extent of infections in the community (due to asymptomatic cases, testing capacity and community behaviour). Also, positive antigen test (RAT) results are not always reported.
- National 2-dose vaccine coverage has remained relatively stable at 95-96%, but uptake of the third (booster) dose increased from 56% to 67%.
- Changes to public health measures included the re-opening of international borders in April and further relaxation of restrictions, including the abandonment of mask mandates at airports.

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 2 results were available for 5,139 specimens: 1,035 in Victoria, 1,226 in NSW, 1,145 in Queensland, 983 in WA, 210 in SA, 203 in Tasmania, 174 in NT, and 164 in ACT. The median age of donors included in Round 2 was 44 years (IQR 31–57; range 18-82), and 55.9% were male.

More information on the survey populations at each round are available here.

Anti-spike protein seroprevalence

Overall, anti-spike seroprevalence was very high across jurisdictions in Round 2 (99.0%; 98.7-99.2), ranging from 98.0% (95.0–99.5) in Tasmania to 100% (97.8–100.0) in ACT (Figure 2A).

Prevalence of anti-spike antibodies was very high across all age groups nationally (Figure 2B), and within Victoria, NSW, Queensland, and WA (Figure 2C). Seroprevalence was similar for males and females (male 98.7% [98.2–99.1] vs female 99.3% [98.9-99.6]) (See supplementary file which is available here).

The majority (>95%) of donors had high antibody titres (i.e., >250 U/ml), with little variation by jurisdiction (Figure 3A), and age-group (Figure 3B).

These findings are consistent with observations from Round 1.

Anti-nucleocapsid protein seroprevalence

Overall, anti-nucleocapsid seroprevalence increased from 17.0% (16.0–18.0) in Round 1 to 46.2% (44.8–47.6) in Round 2. Seroprevalence increased in all jurisdictions and was highest in NSW (49.8%; 47.0–52.7), Queensland (48.9%; 46.0–51.9) and Victoria (46.5%; 46.5–52.7). WA had the lowest seroprevalence at 37.5% (34.4–40.6) but experienced the greatest increase between rounds (Figure 4A).

Anti-nucleocapsid seroprevalence increased in all age-groups in Round 2 compared with Round 1, but the overall patterns were consistent between the rounds. Seroprevalence was highest among donors aged 18–29 years at 61.7% (58.8–64.5), declining steadily to 25.7% (20.6–31.4) in donors aged 70–89 years (Figure 4B). These age-specific patterns were also observed within Victoria, NSW, Queensland, and WA. Seroprevalence was similar for males and females (44.2% [42.3–46.0] vs 48.8% [46.8–50.9]) (See supplementary file which is available here).

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

Anti-nucleocapsid seroprevalence was compared with cumulative case notifications (aged 18–89 years, as a proportion of the state/territory population of the same age) reported up to 14 days prior to the median date of collection. Seroprevalence was two times higher than cumulative case notifications overall, with substantial variation by jurisdiction. This variation is likely to be largely driven by local procedures regarding reporting of positive at-home rapid antigen test results to the notifiable diseases system.

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

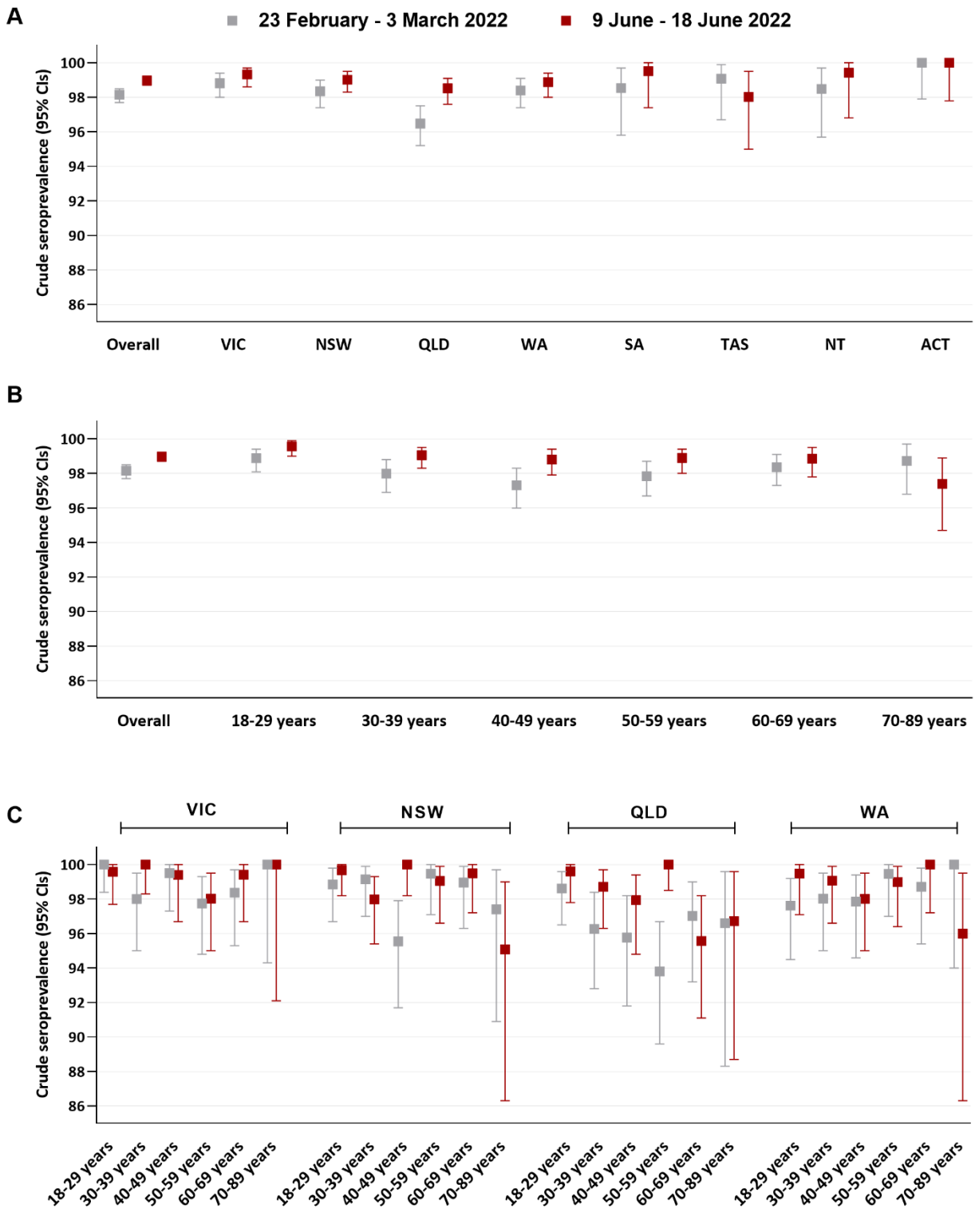


Figure 3: SARS-CoV-2 anti-spike protein antibody concentration levels among Australian blood donors, by jurisdiction (A) and age-groups (B)

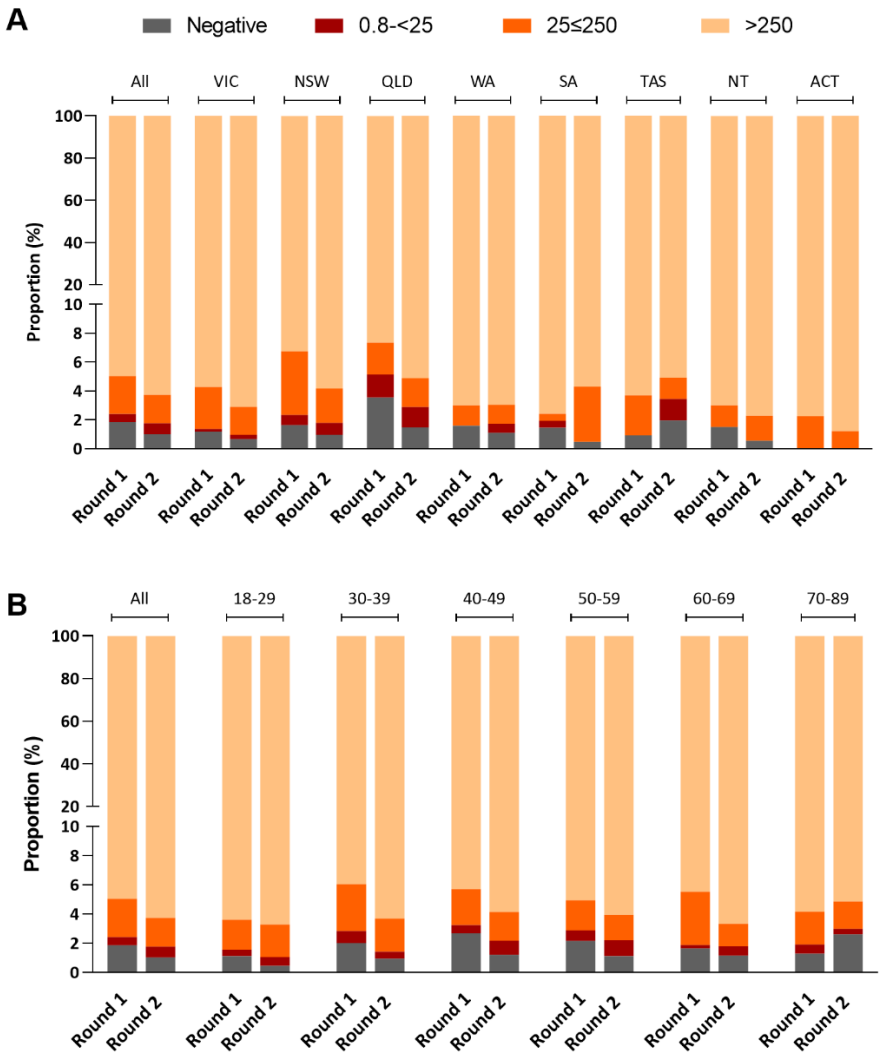
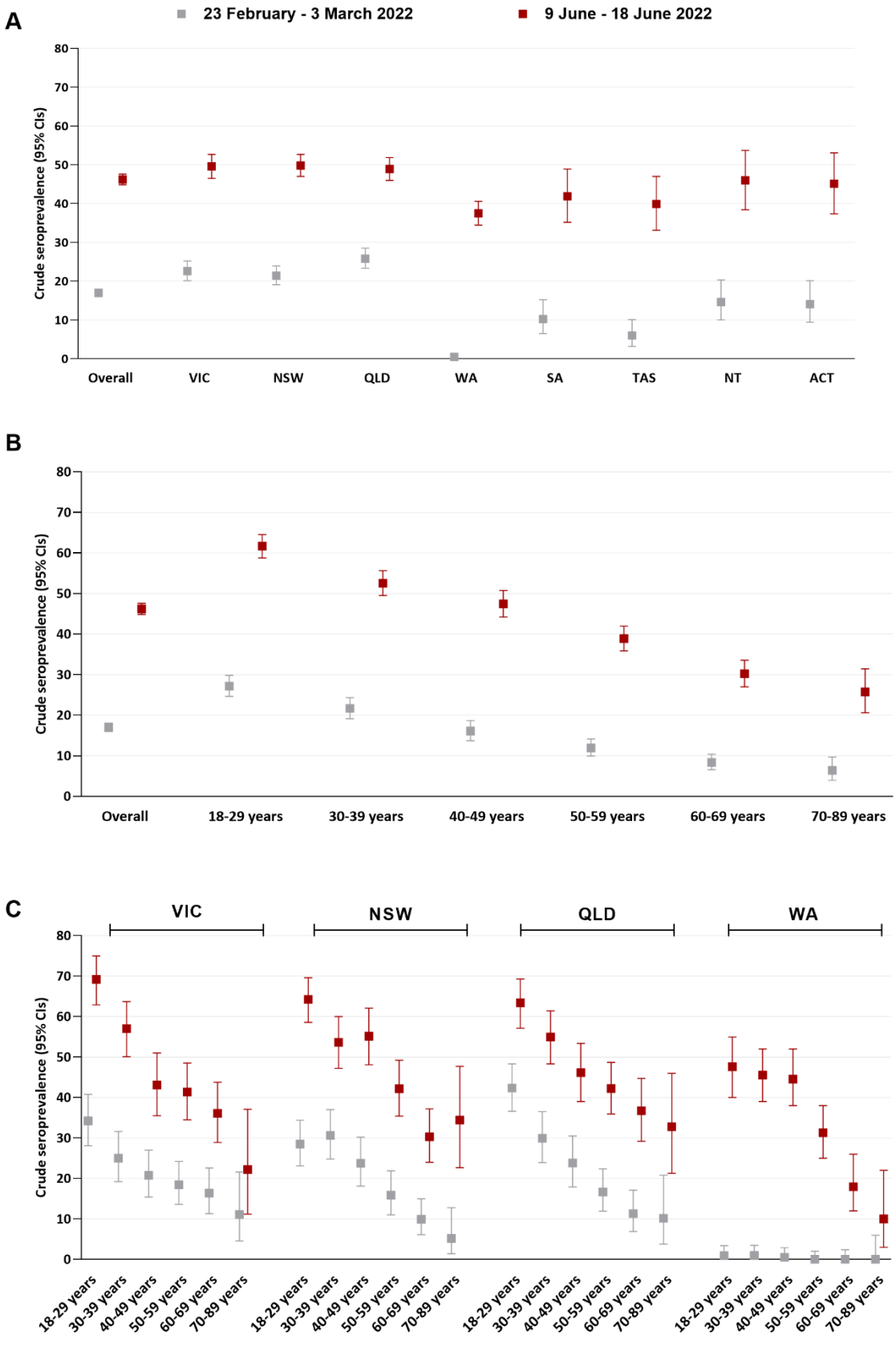


Figure 4. Crude SARS-CoV-2 anti-nucleocapsid protein seroprevalence among Australian blood donors, by jurisdiction (A), age group (B) and age-groups within Victoria, NSW, Queensland, and WA (C)



Interpretations

- Anti-spike antibody seroprevalence 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 vaccine coverage rates[1]. This likely reflects a combination of vaccine- and infection-induced antibody responses, with blood donors likely to be more highly vaccinated than the general population[2, 3,4-6].
- The anti-nucleocapsid seroprevalence estimates are almost three times higher in Round 2 (46%) than in Round 1 (17%) and suggest that nearly half of adults in Australia may have contracted SARS-CoV-2 infection, with the majority having acquired infection since February.
- Seroprevalence was very low in WA in Round 1 but is now comparable to other jurisdictions following the first instance of sustained community transmission in the state.
- Anti-nucleocapsid seroprevalence gives an estimate of infection rates in the community, but these antibodies do not necessarily confer immunity. Current evidence suggests that emerging subvariants BA.4 and BA.5 have substantial immune escape, and re-infections are common[7].
- Overall, anti-nucleocapsid seroprevalence was approximately 2 times higher than cumulative case notifications. In comparing seroprevalence with total cumulative COVID-19 case notifications, it is important to note that serosurveillance cannot differentiate between multiple and single prior infections and that rapid antigen test results are not comprehensively reported.
- The results highlight the extent of SARS-CoV-2 circulating in the community and emphasise the importance of following public health advice on vaccination and other risk mitigating measures such as mask wearing.
- Both anti-spike and anti-nucleocapsid 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 changes in infection rates over time using the Roche assay[8-10].
- Evidence suggests that anti-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 anti-nucleocapsid assays in detecting previous infection[11, 12]. As vaccine coverage in Australia is high, measures of anti-nucleocapsid antibodies will underestimate the cumulative SARS-CoV-2 attack rate in the population. Available local data shows that the sensitivity of the Roche assay to detect anti-nucleocapsid antibodies in vaccinated persons with breakthrough Omicron infections is 78%. This means that these seroprevalence estimates may miss approximately 20% of infections.
- The next round of the blood donor serosurvey will commence in September 2022. This time point will provide an estimate of SARS-CoV-2 antibody prevalence following winter and the emergence of Omicron subvariants BA.4 and BA.5, as well as the broadening of fourth vaccine dose eligibility to all adults aged over 30 years.

Related materials

You can find more information on serological surveillance here

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

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

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