COVID-19 Seroprevalence Report

September 29, 2023

Report #37: August 2023 Survey

Summary

August 2023 | **August 1 – August 31, 2023 (n = 31,776)**

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in August was 79.03% (95% CI 78.58, 79.49), similar to July (79.94% (95% CI 79.50, 80.39)). There was a week-to-week variation over August from 79.10% (95% CI 78.17, 80.03) to 79.10% (95% CI 78.16, 80.03) to 78.79% (95% CI 77.81, 79.77) to 79.10% (95% CI 78.28, 79.91).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 87.87% (95% CI 86.83, 88.91) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (84.52% (95% CI 83.65, 85.39)) compared to White donors (77.28% (95% CI 76.75, 77.82)).

July 2023

July 1 – July 31, 2023 (n = 31,978)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in July was 79.94% (95% CI 79.50, 80.39), similar to June (80.00% (95% CI 79.55, 80.44 p = 0.87)). There was a week-to-week variation over July from 78.92% (95% CI 77.96, 79.88) to 79.60% (95% CI 78.69, 80.50) to 79.94% (95% CI 79.01, 80.87) to 80.98% (95% CI 80.18, 81.77).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 90.00% (95% CI 89.05, 90.96) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (84.72% (95% CI 83.87, 85.58)) compared to White donors (78.40% (95% CI 77.88, 78.93)).

June 2023

June 1 – June 30, 2023 (n = 31,790)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in June was 80.00% (95% CI 79.55, 80.44), similar to May (79.64% (95% CI 79.19, 80.09 p = 0.27)). There was a week-to-week variation over June from 80.24% (95% CI 79.31, 81.16) to 80.93% (95% CI 80.03, 81.82) to 79.11% (95% CI 78.17, 80.04) to 79.76% (95% CI 78.94, 80.58).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 90.22% (95% CI 89.27, 91.17) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (85.65% (95% CI 84.78, 86.52)) compared to White donors (78.38% (95% CI 77.86, 78.90)).

May 2023

May 1 – May 31, 2023 (n = 31,711)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in May was 79.64% (95% CI 79.19, 80.09), similar to April (79.41% (95% CI 78.96, 79.86) p = 0.48)). There was a week-to-week variation over May from 79.89% (95% CI 78.97, 80.80) to 78.63% (95% CI 77.69, 79.57) to 80.17% (95% CI 79.23, 81.11) to 79.85% (95% CI 79.03, 80.66).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 89.89% (95% CI 88.92, 90.85) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (84.68% (95% CI 83.79, 85.57)) compared to White donors (78.07% (95% CI 77.54, 78.59)).

April 2023

April 1 – April 30, 2023 (n = 31,979)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies, compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in April was 79.41% (95% CI 78.96, 79.86) only slighty higher than in March (78.67% (95% CI 78.21, 79.13) p = 0.02).There was a week-to-week variation over April from 78.88% (95% CI 77.91, 79.84) to 78.72% (95% CI 77.77, 79.67) to 79.86% (95% CI 78.97, 80.75) to 79.97% (95% CI 79.15, 80.78).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 89.42% (95% CI 88.44, 90.41) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (83.95% (95% CI 83.02, 84.88)) compared to White donors (78.21% (95% CI 77.69, 78.73)).

March 2023

March 1 – March 31, 2023 (n = 30,793)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay).
- Spike antibody concentrations tend to be higher among those positive for Nucleocapsid antibodies, compared with those positive for Spike antibodies only.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in March was 78.67% (95% CI 78.21, 79.13), only slightly higher than in February (77.59%, 95% CI 77.13, 78.06), P 0.0013). There was a week-to-week variation over March from 77.96% (95% CI 76.88, 79.03) to 78.41% (95% CI 77.49, 79.32) to 79.41% (95% CI 78.42, 80.40) to 78.71% (95% CI 77.92, 79.50).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 89.17% (95% CI 88.17, 90.18) compared to other age groups.
- Also consistent with previous surveys, Black, Indigenous and Racialized groups have a higher seroprevalence rate (84.33% (95% CI 83.38, 85.27)) compared to White donors (77.17% (95% CI 76.63, 77.71)).

February 2023

February 1 – February 28, 2023 (n = 31,755)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay). This was largely driven by vaccination.
- Spike antibody concentrations were high by September 2021, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February 2022 likely due to third vaccine dose administration. Recently rising values in most age groups may be related to vaccination or infection. February 2023 saw a slight decrease in concentrations among older age groups.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in February was 77.59% (95% CI 77.13, 78.06), higher than in January (76.73%, 95% CI 76.27, 77.20), P < 0.01). There was a week-to-week variation over February from 78.48% (95% CI 77.56, 79.40) to 77.22% (95% CI 76.26, 78.19) to 77.01% (95% CI 76.08, 77.93) to 77.49% (95% CI 76.62, 78.37).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 88.40% (95% CI 87.38, 89.42) compared to other age groups. The seroprevalence rate increased in 17-24 and 40-59 age groups compared to January.
- Black, Indigenous and Racialized groups have a higher seroprevalence rate (83.52% (95% CI 82.60, 84.44)) compared to White donors (75.92% (95% CI 75.38, 76.46)).

January 2023

January 1 – January 31, 2023 (n = 32,062)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay). This was largely driven by vaccination.
- Spike antibody concentrations were high by September 2021, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February 2022 likely due to third vaccine dose administration. Recently rising values in most age groups may be related to vaccination or infection. January 2023 saw a slight decrease in concentrations among older age groups.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in January was 76.72% (95% CI 76.25, 77.19), higher than in December (73.50%, 95% CI 73.01, 73.98), $P < 0.0001$). There was a gradual week-to-week change over January from 76.08% (95% CI 75.14, 77.03) to 75.91% (95% CI 74.97, 76.85) to 76.46% (95% CI 75.59, 77.34) to 78.48% (95% CI 77.54, 79.43).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 86.55% (95% CI 85.46, 87.63) compared to other age groups. The seroprevalence rate increased in all age groups, excluding 17-24 year olds, compared to December.
- Black, Indigenous and Racialized groups have a higher seroprevalence rate (81.95% (95% CI 80.97, 82.94)) compared to White donors (75.44% (95% CI 74.91, 75.98)).

December 2022

December 1 – December 31, 2022 (n = 32,698)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September 2021, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February 2022 likely due to third vaccine dose administration. Recently rising values in most age groups may be related to vaccination or infection.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in December was 73.50% (95% CI 73.01, 73.98), higher than in November was 70.78% (95% CI 70.27, 71.30), $P < 0.0001$). There was a gradual week-to-week increase over December from 71.6% (95% CI 70.52, 72.69) to 73.04% (95% CI 72.19, 73.90) to 73.82% (95% CI 72.88, 74.76) to 75.26% (95% CI 74.27, 76.22).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 86.76% (95% CI 85.70, 87.82) compared to other age groups. However, the seroprevalence rate increased in all age groups compared to November.
- Seroprevalence rates increased in December compared to November in all provinces, however the increase was not statistically significant in Nova Scotia and Prince Edward Island.
- Black, Indigenous and Racialized groups have a higher seroprevalence rate (79.57% (95% CI 78.56, 80.58)) compared to White donors (71.97% (95% CI 71.41, 72.52)).

November 2022

November 1 – November 30, 2022 (n = 31,080)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September 2021, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February 2022 likely due to third vaccine dose administration. Recently rising values in most age groups may be related to vaccination or infection.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in November was 70.78% (95% CI 70.27, 71.30), higher than in October was 67.37% (95% CI 66.84, 67.89), $P < 0.0001$). There was week-to-week fluctuation over November from 69.90% (95% CI 68.74, 71.06) to 70.42% (95% CI 69.50, 71.34) to 71.23% (95% CI 70.26, 72.20) to 70.80% (95% CI 69.77, 71.83).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 84.55% (95% CI 83.39, 85.71) compared to other age groups. However, the seroprevalence rate increased in all age groups compared to October.
- Seroprevalence rates increased in November compared to October in all provinces, however the increase was not statistically significant in Saskatchewan, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland.
- Black, Indigenous and Racialized groups have a higher seroprevalence rate (78.67% (95% CI 77.65, 79.70)) compared to White donors (68.58% (95% CI 67.99, 69.17)).

October 2022

October 1 – October 31, 2022 (n = 31,457)

Humoral Immunity (Based on results from the Spike antibody assay):

- Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. Because people are advised to be vaccinated irrespective of past infection, those with Nucleocapsid and Spike antibody positive results together likely have been infected and may or may not have been vaccinated.
- The (adjusted) proportion of blood donors with humoral immunity for SARS-CoV-2 was 100.00% (95% CI 100.00, 100.00%) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September 2021, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February 2022 likely due to third vaccine dose administration. Recently rising values in most age groups may be related to vaccination or infection.

Natural Infections (Based on results from the Nucleocapsid antibody assay):

- Seroprevalence (natural infection) in October was 67.37% (95% CI 66.84, 67.89), higher than in September (63.22% (95% CI 62.69, 63.76), $P < 0.0001$). There was a modest week to-week change over October from 66.37% (95% CI 65.29, 67.44) to 66.12% (95% CI 65.07, 67.16) to 67.79% (95% CI 66.72, 68.86) to 68.47% (95% CI 67.51, 69.42).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate at 81.73% (95% CI 80.50, 82.96) compared to other age groups. However, the seroprevalence rate increased in all age groups compared to September.
- Seroprevalence rates increased in October compared to September in all provinces, however the increase was not statistically significant in Manitoba, New Brunswick, Prince Edward Island and Newfoundland.
- Black, Indigenous and Racialized groups have a higher seroprevalence rate (75.25% (95% CI 74.14, 76.35)) compared to White donors (65.33% (95% CI 64.73, 65.94)).

September 2022

September 1 - September 30, 2022 (n=31,637)

August 2022

August 1 - August 31 2022 (n=35,165)

July 2022

July 1 - July 31 2022 (n=31,275)

June 2022

June 1 - June 30 2022 (n=32,121)

May 2022

May 1 - May 31 2022 (n=31,764)

April 2022

April 1 - April 30 2022 (n=29,787)

March 2022

March 1 - March 31 2022 (n=26,026)

February 2022

February 1 - February 28 2022 (n=28,616)

January 2022

January 1 - January 31 2022 (n=32,505)

December 2021

December 14 - December 30 2021 (n=16,816)

November 2021

November 13 - November 24 2021 (n=9,018)

October 2021

October 14 - October 23 2021 (n=9,627)

September 2021

September 14 - September 24 2021 (n=9,363)

August 2021

August 15 - August 26 2021 (n=9,109)

July 2021

July 14 - July 23 2021 (n=8,457)

June 2021

June 14 - June 29 2021 (n=16,884)

May 2021

May 22 -June 4 2021 (n=17,001)

April 2021

April 13-April 30 2021 (n=16,931)

March 2021

February 27-March 13, 2021 (n=16,873)

January 2021

January 1-27, 2021 (n=34,921)

November 2020

November 7-25, 2020 (n=17,049)

Introduction

SARS-CoV-2 is responsible for the respiratory illness, coronavirus infection disease 2019 (COVID-19). Some people become extremely ill and can die from complications, while others experience mild symptoms or may not be aware of their infection at all. Early in the pandemic (by late March 2020) strict physical distancing measures were implemented. As a result, the first wave of the epidemic in Canada peaked by the end of April 2020 and plateaued during the summer. A resurgence of cases began in late September 2020, peaking in January 2021 (the second wave) which was followed by additional waves. As of September 26, 2023, 4,728,375 cases of COVID-19 had been reported in Canada.

Beginning in January 2021, Alpha (B.1.1.7) began to establish itself as the primary variant of concern (VOC). In late June 2021, Delta (B.1.617.2) was transitioning to be the primary VOC. In mid-December 2021, a new more contagious VOC, Omicron (B.1.1.529) began to establish itself as a primary VOC followed by subvariants. By August 2023 the XBB1.9 Omicron variants were increasingly detected. Peak timepoints when each VOC became dominant varied between provinces. By late December 2021 public health testing facilities were overwhelmed by a surge in Omicron variant cases. Omicron infections tended to have milder symptoms and in many jurisdictions testing was increasingly focused on high-risk individuals. Because many people with symptoms were not being tested, as well as those infected but without symptoms, the reported cases underestimate the infection rate. Public health restrictions were largely relaxed by 2022. Surveillance studies that monitor SARS-CoV-2 antibodies are important to understand what proportion of the population have detectable antibodies (seroprevalence) and to monitor trajectories over the course of the pandemic. These data improve mathematical models to predict the course of infection and inform public health policies.

Antibody concentrations typically peak within a month of vaccination and then gradually decrease. Antibody concentrations can be much higher after a subsequent dose of vaccine, or when an infection occurs pre- or post-vaccination. Approximately 89% of the people in Canada aged 18 and older had received a primary vaccine series as of June 18, 2023. Monitoring spike (vaccine) antibody concentrations and the proportion of people with Omicron variant infection provides data for mathematical models to estimate the status of humoral immunity.

In partnership with the COVID-19 Immunity Task Force, Canadian Blood Services is testing residual blood for SARS-CoV-2 antibodies from blood donors. This report tracks SARS-CoV-2 seroprevalence. We present seroprevalence rates based on two Roche total Ig- assays that detect Spike (S) and Nucleocapsid (N) antibodies and monitor the concentration of S antibodies. We assess temporal changes and evaluate differences by geographical regions, age groups, Black, Indigenous and Racialized groups, and socioeconomic status.

Methods

Population

Canadian Blood Services has blood collection sites in all large cities and many smaller urban centres in all provinces except Quebec. People in rural areas may have less opportunity to donate and donations are not collected in the northern territories. Blood donors are reasonably representative of healthy Canadians between the ages of 17 and about 60.

Blood donor eligibility

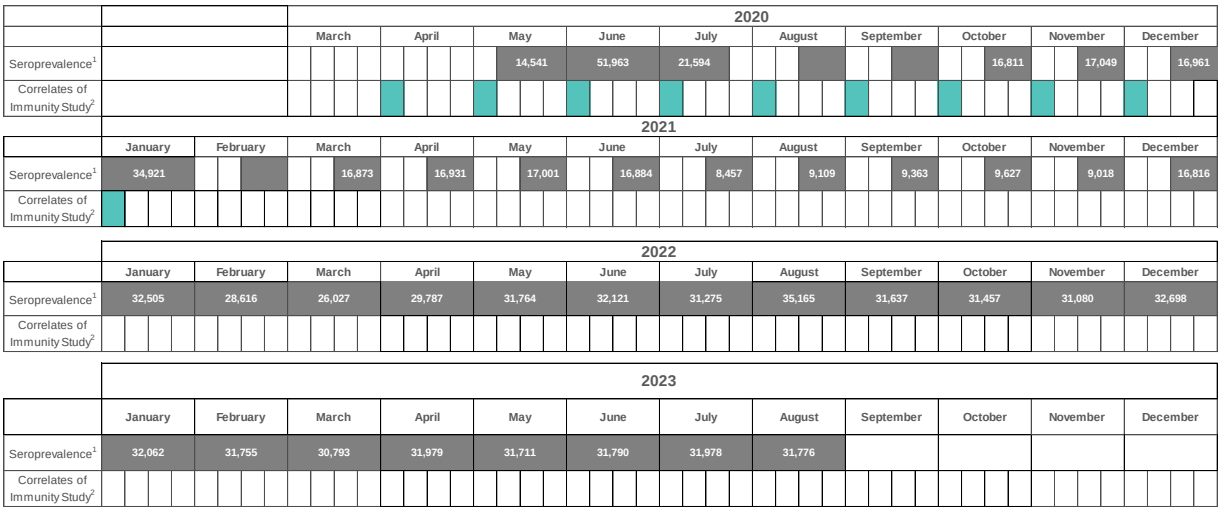
Before each donation, blood donors must answer screening questions to ensure that they are in good health and do not have risk factors for infections that may be transmitted to blood recipients. There is no evidence that SARS-CoV-2 can be transmitted through blood transfusion, but it is important to ensure other donors and staff are safe while in the blood clinic. Donors are asked if they have had COVID-19 or been in contact with someone who has. Donors are deferred for 2 weeks after symptoms disappear (3 weeks if hospitalized) if they have been in contact with someone who was infected or if they have had the infection. Donors also have their temperature and their hemoglobin level checked before they can donate.

Blood samples

Just before a donor gives their blood donation, several small tubes of blood are collected for infectious disease screening. An extra sample is taken, known as the retention sample, in case extra testing is required (80% of these retention samples are not needed for operational testing). For this study retention samples were aliquoted and frozen at -20^{o}C or colder, starting on May 9, 2020.

Periodicity

All retention samples were tested for SARS-CoV-2 antibodies until July 21, 2020 (Wave 1). From August 2020 until December 2020, only samples from approximately the last two weeks of each month were tested (except samples from August and September which were not tested). In January 2021 a larger sample was tested and in February 2021 samples were not tested. As of March 2021, testing of approximately 2 weeks per month resumed. Beginning in July 2021 the sample size was reduced to include about 300 samples per age/region grouping plus extra repeat tested donors. In December 2021 samples from 2 weeks were tested without sorting in order to be able to report more quickly, and as of January 2022 samples from all weeks of the month were tested. Seroprevalence estimates also include an additional 1,500 residual blood tests from the correlates of immunity study from April 2020 to January 2021. These were tested on a battery of assays (orthogonal testing) including the Abbott IgG Assay.



[1] Samples tested with the **Abbott SARS-CoV-2 IgG Assay until January 2021** (residual blood from August 2020, September 2020 and February 2021 are aliquoted but have not been tested). As of January 2021, all samples were tested using the Roche Elecsys ® Anti-SARS-CoV-2 assays (S and N).

[2] Orthogonal Testing (PI: S. Drews (CIHR 2020) sampling 1,500 samples per month until and including January 2021 (Abbott tested); this study is known as the “Correlates of Immunity Study”

SARS-CoV-2 antibody testing

Two assays were used. The Roche Elecsys ® Anti-SARS-CoV-2 spike semi-quantitative immunoassay detects total antibodies (including IgA, IgM and IgG) to the SARS-CoV-2 spike (S) protein (**Spike antibody**). The Elecsys® Anti-SARS-CoV-2 qualitative immunoassay detects total antibodies (including IgA, IgM and IgG) to SARS-CoV-2 using a recombinant protein, nucleocapsid (N) antigen (**Nucleocapsid antibody).** At a concentration of ≥ 0.8 U/mL, the Spike antibody assay was assumed to have sensitivity of 98.8% and specificity of 99.6%. At a concentration of ≥ 1.0 U/mL, the Nucleocapsid antibody assay was assumed to have sensitivity of 99.5% and specificity of 99.8%[1]. All testing was conducted at Canadian Blood Services laboratories in Ottawa.

Samples from January 2021 to August 2021 were tested neat and at a 1:10 dilution for Spike antibody, however, by June 2021 many samples were above the maximum detection level when diluted. From September 2021 onwards samples were tested up to a 1:400 dilution.

Serological testing using the Nucleocapsid, and Spike antibody assay allows trends in natural infection transmission and vaccine-induced seropositivity to be monitored[2]. In this report the dual terms Spike antibody/ humoral immunity (by vaccine or natural infection) and Nucleocapsid antibody/proxy for natural infection will be used interchangeably. This is to ease interpretation for readers, with the caveat that these interpretations do not reflect the complexity of adaptive immunity.

Ethical issues

All data were de-identified by the information technology team at Canadian Blood Services by providing a random identification number. Demographic variables and vaccination history were extracted from the Canadian Blood Services donor database (e.g., donation date, birth year, sex, self-reported ethnicity, Forward Sortation Area of residential postal code) and linked to the test data. In the donor pamphlet “What you must know to donate blood” which donors must read before each donation, and in the pamphlet entitled “What happens to your blood donation?” donors were informed that their blood will be tested for routine infectious disease markers and other tests as required. Information about the study was made available on the website in late June 2020 prior to commencing testing. Donors were not informed of their results because confirmatory/supplemental testing was not carried out. This study was approved by the Canadian Blood Services Research Ethics Board.

Data management and analysis

De-identified demographic data were analysed by the Canadian Blood Services Epidemiology & Surveillance Department. Socioeconomic status was estimated by quintiles of the Pampalon Material and Social Deprivation Indices (MSDI). MSDI was derived from 2016 Statistics Canada census, aggregated from postal codes to the dissemination area (DA) level (the smallest geographic unit available in the Canadian census, consisting of 400–700 persons). Because blood donors tend to live in areas close to a blood clinic there will be higher concentrations of donors in certain areas compared with the general population, and lower concentrations in other areas. To make inference to the general population, weighting factors were applied based on the donor’s residential Forward Sortation Area (FSA), age group and sex. Data were weighted based on Statistics Canada data (catalogue # 98-400-X2016008). For FSAs with few donors, several FSAs were combined, generally to include at least 500 donors. For data with no FSA recorded or if not in a province where blood is collected (0.2% of samples) weighting was based on FSA of the blood centre.

The seroprevalence was calculated as the number of positive samples divided by all samples tested. Ninety-five percent confidence intervals were calculated based on the Exact method. The adjusted seroprevalence and confidence intervals present the weighted data adjusted for sensitivity and specificity of the assay using the Rogan-Gladen equation[3]. SARS-CoV-2 seroprevalence was stratified by geography (regions, province and selected metropolitan cities), sex, age groups, self-reported ethnicity, and social and material deprivation indices.

Temporal trends by monthly intervals were evaluated by demographic variables. Statistical comparisons between groups were carried out using logistic regression.

Results

Between August 1 and August 31, 2023 a total of 31,776 unique donors were tested for SARS-CoV-2 antibodies.

Table 1 compares adjusted seroprevalence rates by different assays (**Nucleocapsid and Spike antibody)** by sociodemographic variables for all Canadian provinces (except Quebec and

territories). Overall adjusted seroprevalence by Spike antibody (a proxy of humoral immunity) was 100.00% (95% CI 100.00, 100.00%). The adjusted seroprevalence by Nucleocapsid antibody (proxy for natural infection) was 79.03% (95% CI 78.58, 79.49) (please refer to points of interpretation). There was week-to-week variability over the 31-day reporting period from 79.10% (95% CI 78.17, 80.03) to 79.10% (95% CI 78.16, 80.03) to 78.79% (95% CI 77.81, 79.77) to 79.10% (95% CI 78.28, 79.91) (Table A2.1).

Figure 1 illustrates temporal trends of SARS-CoV-2 seroprevalence from April 4, 2020, until August 31, 2023, by monthly intervals. The discontinuation of the line in January 2021 represents the transition from the Abbott assay to the Roche assay. The largest increase in seroprevalence was seen in the Roche anti-S assay, from early-March 2021 to July 2021, mirroring wider first and second dose vaccine roll out. Figure 2 stratifies seroprevalence by regions. Much of the humoral immunity was induced by vaccines (compared to natural infections) across the country. The largest increase in seroprevalence using Roche anti-N began in February 2022 and increased consistent with the Omicron variant wave. Appendix Tables A1.1-A1.6 compare seroprevalence rates by sex, age groups and material deprivation in different regions.

Table 2 compares temporal changes in seroprevalence rates by natural infection (**Nucleocapsid antibody** between July 2023 and August 2023. Overall, the seroprevalence rate for natural infections was similar in August (79.03 (95% CI 78.58, 79.49) compared to July (79.94% ((95% CI 79.50, 80.39)). Donors aged 17-24 years old continued to have the highest seroprevalence rate at 87.87% (95% CI 86.83, 88.91) compared to other age groups.

After vaccination an increase in antibody concentration followed by gradual decline is expected. From September 2021 to August 2023 dilution of high concentration spike antibody samples permitted measurement of antibody concentrations as high as 100,000 U/mL. Figure 3 illustrates distributions of log transformed Spike antibody concentrations from September 2021 to August 2023, stratified by donors seropositive for Spike antibodies only and donors seropositive for Spike antibodies and Nucleocapsid antibodies. Donors with both Spike and Nucleocapsid antibodies tended to have higher concentrations of Spike antibodies than those with only Spike antibodies.

Figure 4 shows regional weekly trends since December 2021 for Nucleocapsid by age group. Figures 5A-H illustrate temporal trends of seroprevalence by Nucleocapsid and Spike antibody results by sociodemographic variables (self-reported ethnicity, age, material deprivation, and social deprivation) from January 2021 to August 2023. Differences in natural infections between White and Black, Indigenous and Racialized groups were seen from January 2021 to August 2023 with Black, Indigenous and Racialized groups having higher natural infection rates. Other sociodemographic variables had significant differences at various months corresponding to the vaccine roll out across Canada with evident trends in certain groups having increased Spike and/or Nucleocapsid antibodies compared to others. Tables A 1.1 to A 1.6 show selected demographic results for August by region (Nucleocapsid and Spike), and additional weekly breakdown of Nucleocapsid antibody results are shown in Tables A 2.1 and A 2.2.

Conclusion

As of August 2023 adjusted seroprevalence by the Spike antibody assay (proxy for humoral immunity) was 100.00% (95% CI 100.00, 100.00%). While humoral immunity was largely driven by vaccination in 2021, most people have now also been naturally exposed (with hybrid immunity) since the arrival of the Omicron variant and subsequent subvariants.

Points for Interpretation

1. Blood donors are a healthy sub-set of the adult Canadian population. Important points to keep in mind with regard to representativeness of the sample are:
    - blood donors self-select to donate blood therefore those who choose not to donate blood for whatever reason are not included in the sample.
    - Blood donations are collected from people aged 17 years and older, however there are relatively few donations from elderly donors.
    - Blood donations are collected in larger cities and many smaller urban areas, but people in rural areas may be under-sampled. Canadian Blood Services does not collect blood in the northern territories or the province of Quebec.
2. Data were weighted for age, sex, and location to more closely reflect the Canadian population. For example, the Nucleocapsid antibody assay unweighted SARS-CoV-2 seroprevalence for the full sample was 77.65% (95% CI 77.19, 78.11), and after weighting factors applied it was 78.68% (95% CI 78.22, 79.13), then after the weighted seroprevalence was adjusted for sensitivity and specificity, 79.03% (95% 78.58, 79.49). Using the Spike antibody assay, the unweighted SARS-CoV-2 seroprevalence for the full sample was 99.63% (95% CI 99.56, 99.70), and after weighting factors applied it was 99.68% (95% CI 99.61, 99.74), then after the weighted seroprevalence was adjusted for sensitivity and specificity, 100% (95% CI 100.00, 100.00).
3. The sensitivity and specificity of the Roche assays are very good, but it is still possible that some true positives may be missed, and some positive results may be false. Confirmatory testing has not been performed. The seroprevalence was adjusted for sensitivity and specificity using a well-established mathematical formula.
4. Different seroprevalence rates by the assays reflect different isotypes being measured. The Roche assay identifies IgA, IgG and IgM antibodies. The Abbott assay measured IgG. Detection of Nucleocapsid antibodies is likely a marker of natural infection while Spike antibodies can be induced by either natural infection or by vaccines.
5. Seroprevalence results reflect measurement of humoral immunity. The exact mechanisms of protective immunity against SARS-CoV-2 remains unknown. The protection at particular levels of Spike antibody is unknown. Quantitative results from the Spike antibody assay will be valuable to inform policy regarding booster shots as the science evolves.

6. As of September 2021, the dilution for higher concentration (>250 U/mL) was increased from 1:10 to 1:400. This allows antibody concentration to be measured as high as 100,000 U/mL rather than 2,500 U/mL. It is possible that values between 160 and 320 U/mL may be less accurate because they are at the lower end of sensitivity of the assay.

7. SARS-CoV-2 antibody signals wane over time.

8. Spike antibodies reflect SARS-CoV-2 humoral response. Many Spike antibody positive results are related to vaccination. However, Spike antibody positives are also due to natural infection (with or without N antibodies). Donors with both Spike and Nucleocapsid antibodies are assumed to have had a natural infection; however, they may have also been vaccinated before or after the infection.

   Due to a variety of biological factors, donors may have variable antibody responses to different binding sites on the SARS-CoV-2 virus (e.g., Spike, receptor binding domain of Spike, nucleocapsid protein). In August 2023 the two most common positive antibody profile were positive on Spike antibody/positive on Nucleocapsid antibody (77.49%) followed by positive on Spike antibody/negative on Nucleocapsid antibody (22.02%) (see below).

Diagnostic phenotypes in August 2023 (unadjusted)

	Nucleocapsid Antibody	Spike Antibody	Total N (%)
	Negative	Negative	123 (0.39)
	Negative	Positive	6,978 (22.02)
	Positive	Negative	32 (0.10)
	Positive	Positive	24,557 (77.49)
Total			31,690

Note: samples missing anti-N or anti-S results not included in the above

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2. Whitaker HJ, Elgohari S, Rowe C, Otter AD, Brooks T, Linley E, et al., Impact of COVID-19 vaccination program on seroprevalence in blood donors in England, 2021, Journal of Infection (2021), doi: https://doi.org/10.1016/j.jinf.2021.04.037
3. Lang Z, Reiczigel J. Confidence limits for prevalence of disease adjusted for estimated sensitivity and specificity. Preventive Veterinary Medicine. 2014:113;13-2

Table 1. Comparing SARS-CoV-2 seroprevalence by sociodemographic variables by Nucleocapsid and Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	12,795	10,024	79.06	78.43, 79.69	12,786	12,753	100.00	100.00, 100.00
Male	18,981	14,651	79.00	78.35, 79.65	18,865	18,782	100.00	100.00, 100.00
Age								
17-24	2,101	1,839	87.87	86.83, 88.91	2,101	2,101	100.00	100.00, 100.00
25-39	8,167	6,778	84.30	83.47, 85.12	8,160	8,154	100.00	100.00, 100.00
40-59	11,763	9,289	79.53	78.77, 80.29	11,738	11,690	100.00	100.00, 100.00
60+	9,745	6,769	69.97	69.01, 70.93	9,652	9,590	100.00	100.00, 100.00
Province								
British Columbia	5,367	4,125	78.14	77.05, 79.23	5,366	5,345	100.00	100.00, 100.00
Alberta	5,964	4,811	82.22	81.11, 83.33	5,896	5,871	100.00	100.00, 100.00
Saskatchewan	1,374	1,075	80.02	77.77, 82.27	1,374	1,369	100.00	100.00, 100.00
Manitoba	1,641	1,293	80.39	78.32, 82.47	1,641	1,637	100.00	100.00, 100.00
Ontario	14,977	11,499	78.31	77.67, 78.96	14,938	14,880	100.00	100.00, 100.00
New Brunswick	640	497	79.60	76.94, 82.26	633	631	100.00	100.00, 100.00
Nova Scotia	1,304	972	75.05	72.48, 77.61	1,303	1,302	100.00	100.00, 100.00
Prince Edward Island	153	115	76.13	69.64, 82.61	144	144	100.00	98.41, 100.00
Newfoundland	356	288	83.23	80.25, 86.21	356	356	100.00	100.00, 100.00
Metro area								
Vancouver	2,910	2,334	80.47	79.14, 81.81	2,910	2,902	100.00	100.00, 100.00
Calgary	2,158	1,755	83.17	81.25, 85.09	2,130	2,123	100.00	100.00, 100.00
Edmonton	1,946	1,538	80.04	78.06, 82.02	1,911	1,910	100.00	100.00, 100.00

Ottawa	1,648	1,194	73.68	71.04, 76.32	1,647	1,643	100.00	100.00, 100.00
Toronto	5,362	4,291	80.65	79.72, 81.59	5,362	5,351	100.00	100.00, 100.00
Winnipeg	1,045	815	79.63	76.96, 82.29	1,045	1,044	100.00	100.00, 100.00
Ethnicity[1,2]								
White	24,629	18,730	77.28	76.75, 77.82	24,515	24,425	100.00	100.00, 100.00
Indigenous	442	359	82.13	78.55, 85.71	442	440	100.00	99.76, 100.00
Asian	3,481	2,950	85.41	84.29, 86.54	3,476	3,473	100.00	100.00, 100.00
Other Racialized groups	2,381	1,949	83.57	82.10, 85.04	2,375	2,358	100.00	100.00, 100.00
Social Deprivation[3]								
1 (least deprived)	6,013	4,789	81.20	80.20, 82.20	5,994	5,974	100.00	100.00, 100.00
2	6,018	4,624	78.66	77.61, 79.71	5,991	5,973	100.00	100.00, 100.00
3	5,562	4,266	78.21	77.11, 79.31	5,533	5,507	100.00	100.00, 100.00
4	5,154	3,977	78.24	77.10, 79.37	5,135	5,119	100.00	100.00, 100.00
5 (most deprived)	4,969	3,777	77.01	75.83, 78.19	4,948	4,922	100.00	100.00, 100.00
Material Deprivation[3]								
1 (least deprived)	7,842	6,024	78.01	77.06, 78.96	7,801	7,780	100.00	100.00, 100.00
2	6,723	5,125	77.45	76.42, 78.48	6,691	6,651	100.00	100.00, 100.00
3	5,835	4,503	78.42	77.35, 79.49	5,815	5,795	100.00	100.00, 100.00
4	4,677	3,670	80.62	79.51, 81.74	4,662	4,648	100.00	100.00, 100.00
5 (most deprived)	2,639	2,111	80.84	79.43, 82.25	2,632	2,621	100.00	100.00, 100.00
Total	31,776	24,675	79.03	78.58, 79.49	31,651	31,535	100.00	100.00, 100.00

[1]Self reported ethnicity was missing for 843 (2.6%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 83.62% (95% CI 81.17, 86.07); and Spike antibody was 100.00% (95% CI 100.00, 100,00).

[2]Combining all Racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 84.52% (95% CI 83.65, 85.39) by the Nucleocapsid antibody assay, and 100.00% (95% CI 100.00, 100.00) by Spike antibody.

[3]Postal codes were missing for 4,060 (12.8%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.05% (95% CI 79.81, 82.29) and Spike antibody was 100.00% (95% CI 100.00, 100.00).

Table 2. Changes in SARS-CoV-2 seroprevalence by **Nucleocapsid Antibody assay (proxy for natural infection)** by sociodemographic variables between July and August 2023

	July 2023 (crude)		July 2023 (adjusted)		August 2023 (crude)		August 2023 (adjusted)		
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	P-Value*
Sex									
Female	12,796	10,170	80.34	79.72, 80.96	12,795	10,024	79.06	78.43, 79.69	0.00
Male	19,182	14,918	79.52	78.88, 80.17	18,981	14,651	79.00	78.35, 79.65	0.26
Age									
17-24	1,982	1,782	90.00	89.05, 90.96	2,101	1,839	87.87	86.83, 88.91	0.00
25-39	8,123	6,713	83.90	83.08, 84.73	8,167	6,778	84.30	83.47, 85.12	0.51
40-59	12,083	9,650	80.74	80.00, 81.48	11,763	9,289	79.53	78.77, 80.29	0.03
60+	9,790	6,943	71.10	70.15, 72.04	9,745	6,769	69.97	69.01, 70.93	0.10
Province									
British Columbia	5,672	4,359	78.50	77.42, 79.59	5,367	4,125	78.14	77.05, 79.23	0.64
Alberta	5,659	4,587	82.94	81.85, 84.03	5,964	4,811	82.22	81.11, 83.33	0.36
Saskatchewan	1,375	1,085	80.86	78.64, 83.08	1,374	1,075	80.02	77.77, 82.27	0.60
Manitoba	1,766	1,399	80.13	78.05, 82.21	1,641	1,293	80.39	78.32, 82.47	0.86
Ontario	15,380	12,060	79.85	79.22, 80.48	14,977	11,499	78.31	77.67, 78.96	0.00
New Brunswick	670	499	77.13	74.31, 79.94	640	497	79.60	76.94, 82.26	0.21
Nova Scotia	1,018	750	74.55	71.93, 77.16	1,304	972	75.05	72.48, 77.61	0.79
Prince Edward Island	180	144	81.90	76.01, 87.78	153	115	76.13	69.64, 82.61	0.20
Newfoundland	258	205	83.34	80.36, 86.31	356	288	83.23	80.25, 86.21	0.96
Metro area									
Vancouver	3,091	2,460	80.51	79.15, 81.86	2,910	2,334	80.47	79.14, 81.81	0.97
Calgary	2,142	1,739	82.82	80.90, 84.75	2,158	1,755	83.17	81.25, 85.09	0.80
Edmonton	1,838	1,485	82.53	80.69, 84.36	1,946	1,538	80.04	78.06, 82.02	0.07
Ottawa	1,393	1,043	76.48	73.92, 79.04	1,648	1,194	73.68	71.04, 76.32	0.14

Toronto	5,397	4,362	81.26	80.37, 82.15	5,362	4,291	80.65	79.72, 81.59	0.36
Winnipeg	1,184	936	79.91	77.17, 82.66	1,045	815	79.63	76.96, 82.29	0.88
Ethnicity[1,2]									
White	24,711	19,032	78.40	77.88, 78.93	24,629	18,730	77.28	76.75, 77.82	0.00
Indigenous	468	381	81.92	78.41, 85.44	442	359	82.13	78.55, 85.71	0.94
Asian	3,565	2,997	84.99	83.85, 86.12	3,481	2,950	85.41	84.29, 86.54	0.60
Other Racialized groups	2,411	2,006	84.84	83.43, 86.25	2,381	1,949	83.57	82.10, 85.04	0.22
Social Deprivation[3]									
1 (least deprived)	6,375	5,029	80.23	79.25, 81.21	6,013	4,789	81.20	80.20, 82.20	0.17
2	5,969	4,693	79.84	78.80, 80.87	6,018	4,624	78.66	77.61, 79.71	0.12
3	5,396	4,175	79.38	78.29, 80.47	5,562	4,266	78.21	77.11, 79.31	0.14
4	5,058	3,958	80.13	79.01, 81.24	5,154	3,977	78.24	77.10, 79.37	0.02
5 (most deprived)	5,216	4,041	79.07	77.94, 80.20	4,969	3,777	77.01	75.83, 78.19	0.01
Material Deprivation[3]									
1 (least deprived)	8,114	6,367	79.79	78.88, 80.69	7,842	6,024	78.01	77.06, 78.96	0.01
2	6,928	5,367	78.81	77.83, 79.80	6,723	5,125	77.45	76.42, 78.48	0.06
3	5,837	4,545	79.66	78.61, 80.70	5,835	4,503	78.42	77.35, 79.49	0.11
4	4,440	3,481	80.54	79.40, 81.69	4,677	3,670	80.62	79.51, 81.74	0.92
5 (most deprived)	2,695	2,136	80.75	79.32, 82.18	2,639	2,111	80.84	79.43, 82.25	0.93
Total	31,978	25,088	79.94	79.50, 80.39	31,776	24,675	79.03	78.58, 79.49	0.00

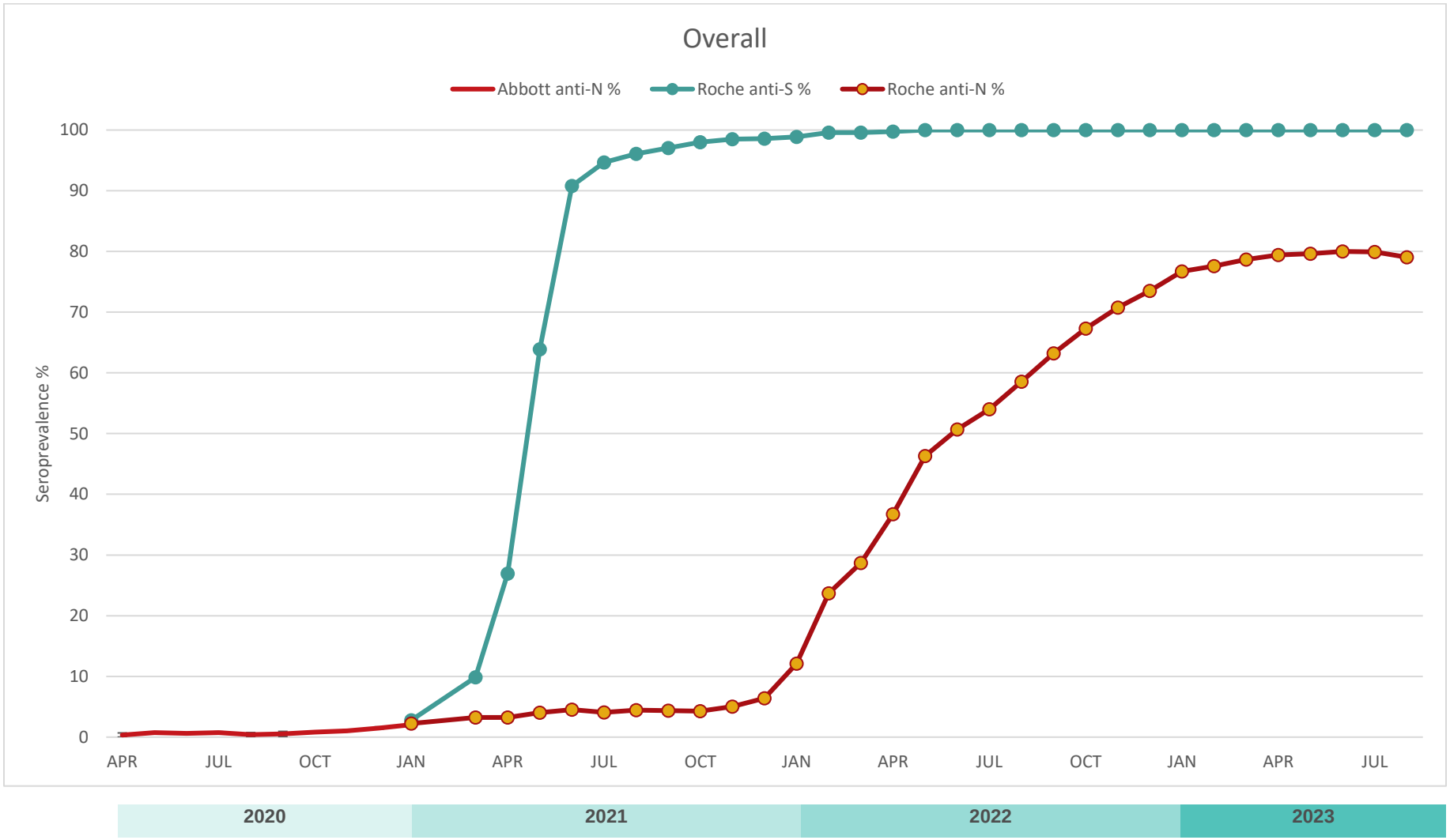
*P-value reflects the difference between July and August results.

[1] In July, self reported ethnicity was missing for 823 (2.6%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 84.20% (95% CI 81.74, 86.67). In August, self reported ethnicity was missing for 843 (2.6%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 83.62% (95% CI 81.17, 86.07).

[2] In July, combining all Racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 84.72% (95% CI 83.87, 85.58) by the Nucleocapsid antibody assay. In August, combining all Racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 84.52% (95% CI 83.65, 85.39) by the Nucleocapsid antibody assay.

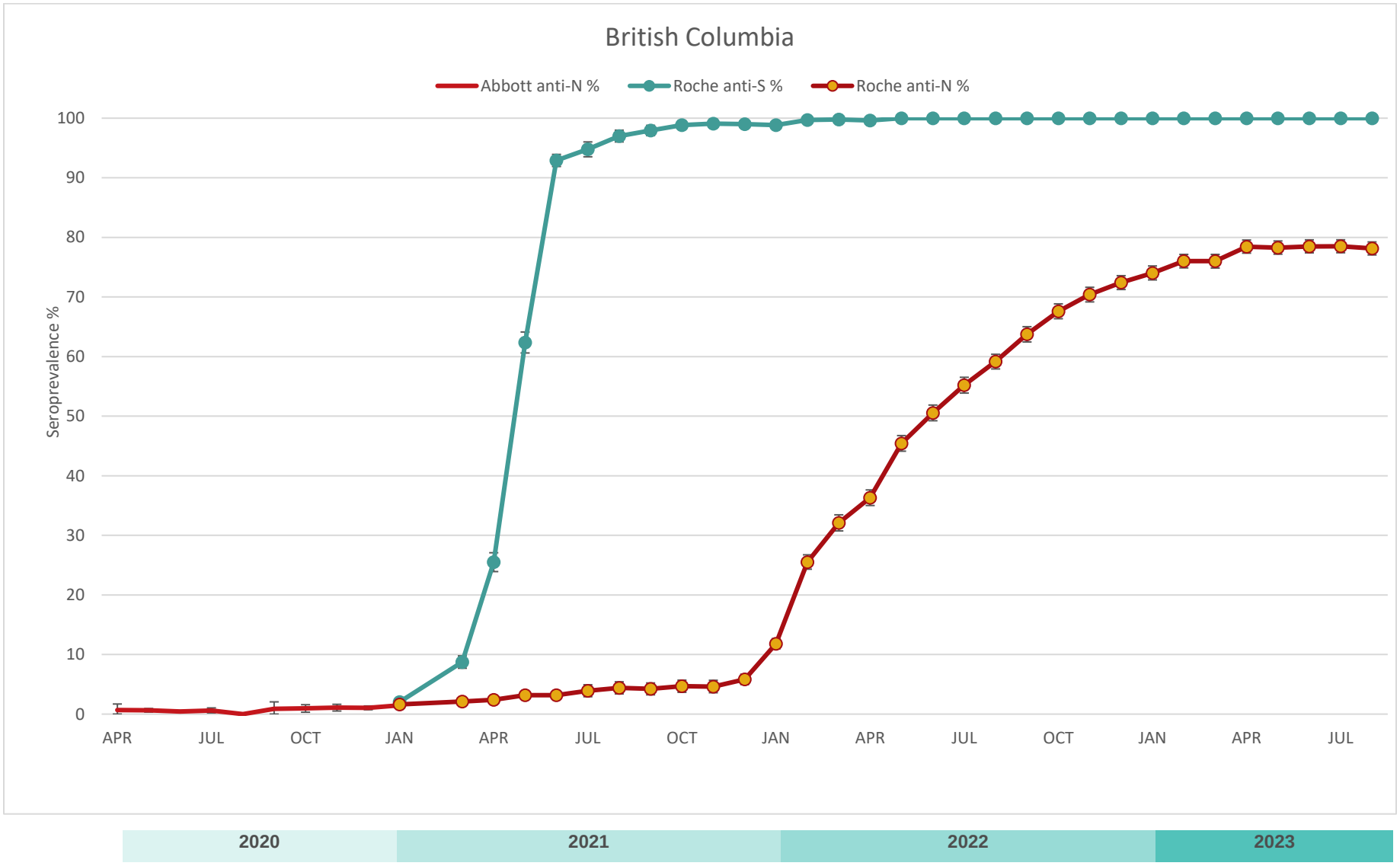
[3] In July, postal codes were missing for 3,964 (12.4%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.34% (95% CI 80.09, 82.59). In August, postal codes were missing for 4,060 (12.8%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.05% (95% CI 79.81, 82.29).

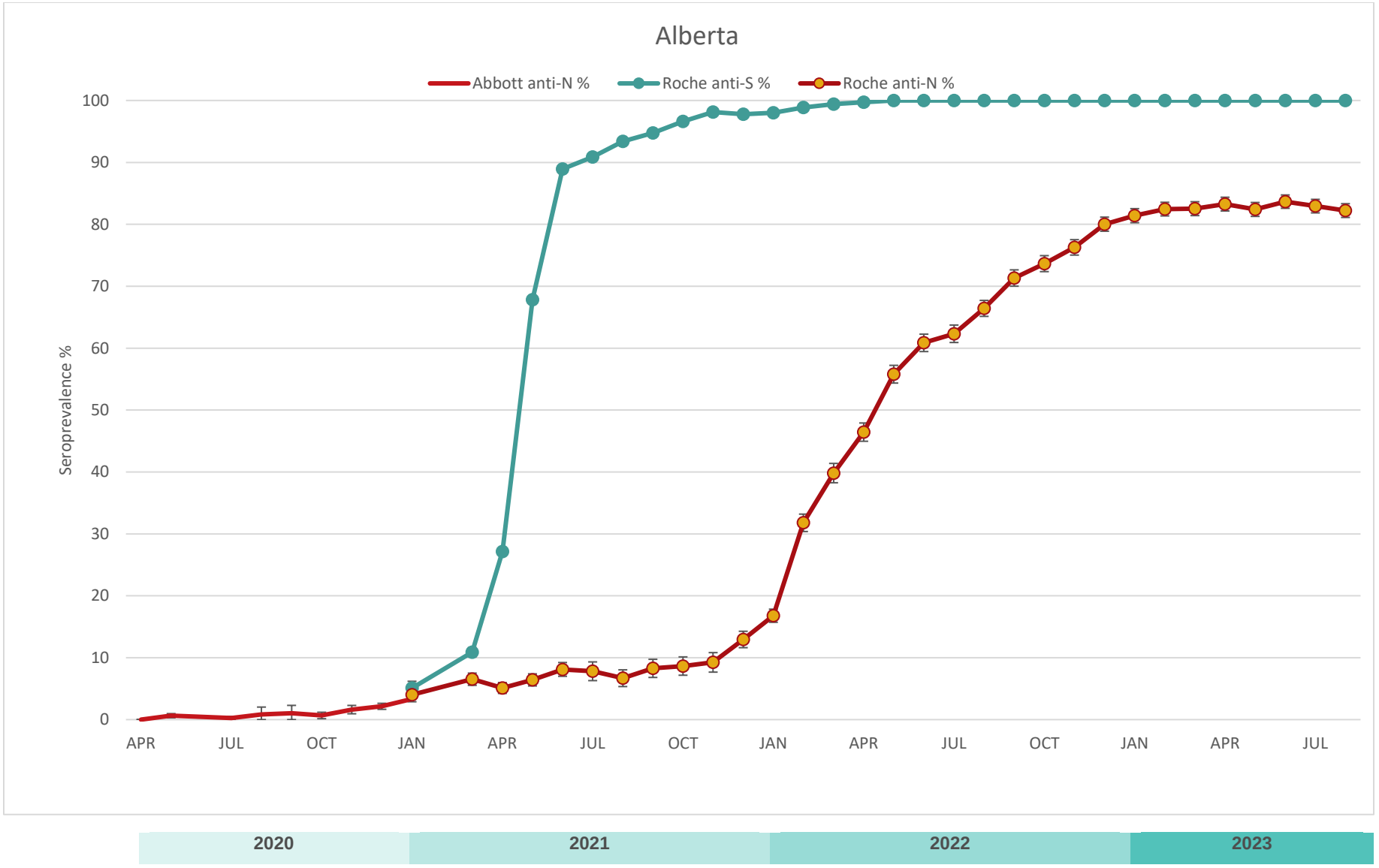
Figure 1. Overall temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from April 2020 - August 2023 (comparing results from Abbott anti-N (until January 2021) followed by seroprevalence estimated by Roche anti-N and Roche anti-S results.

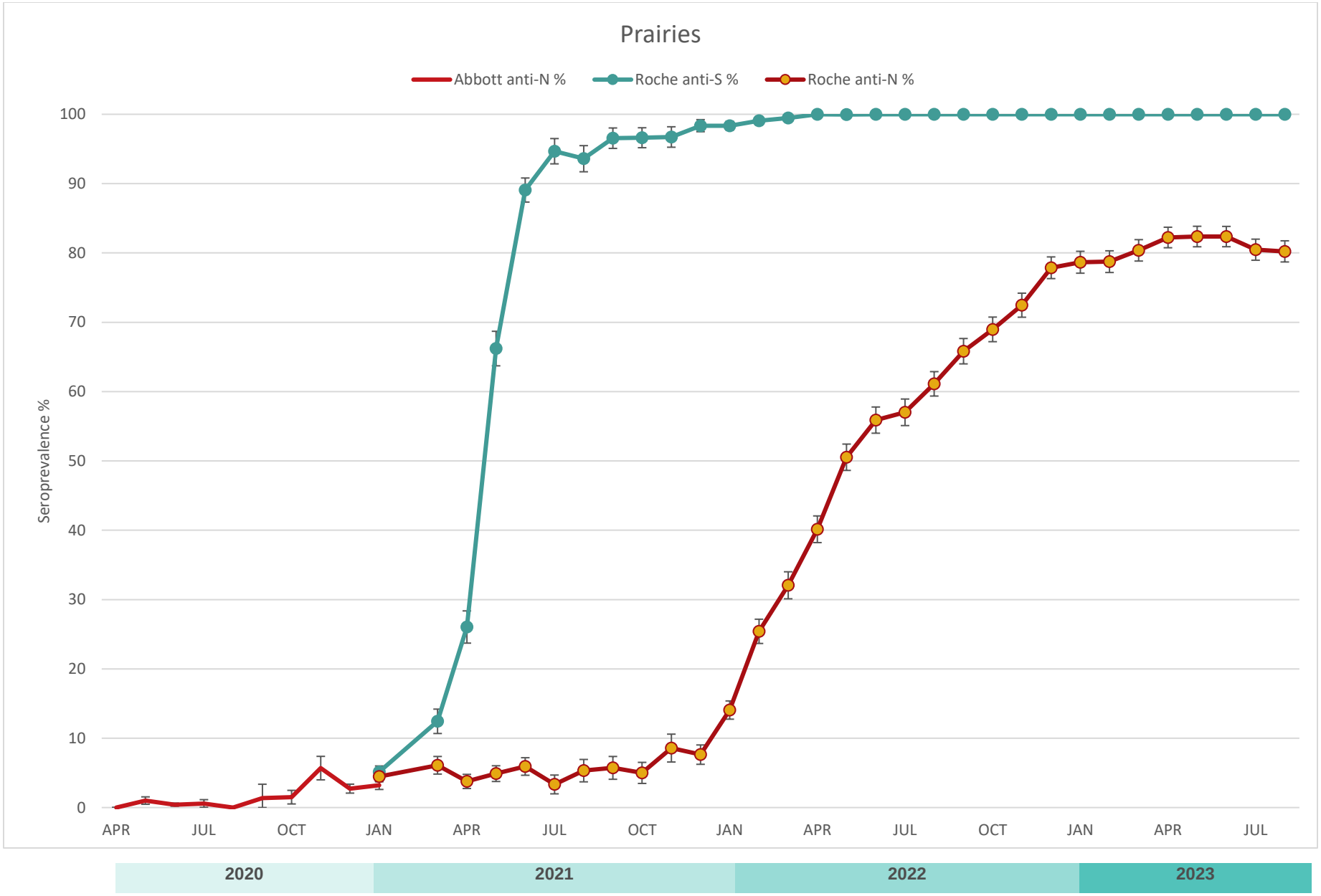


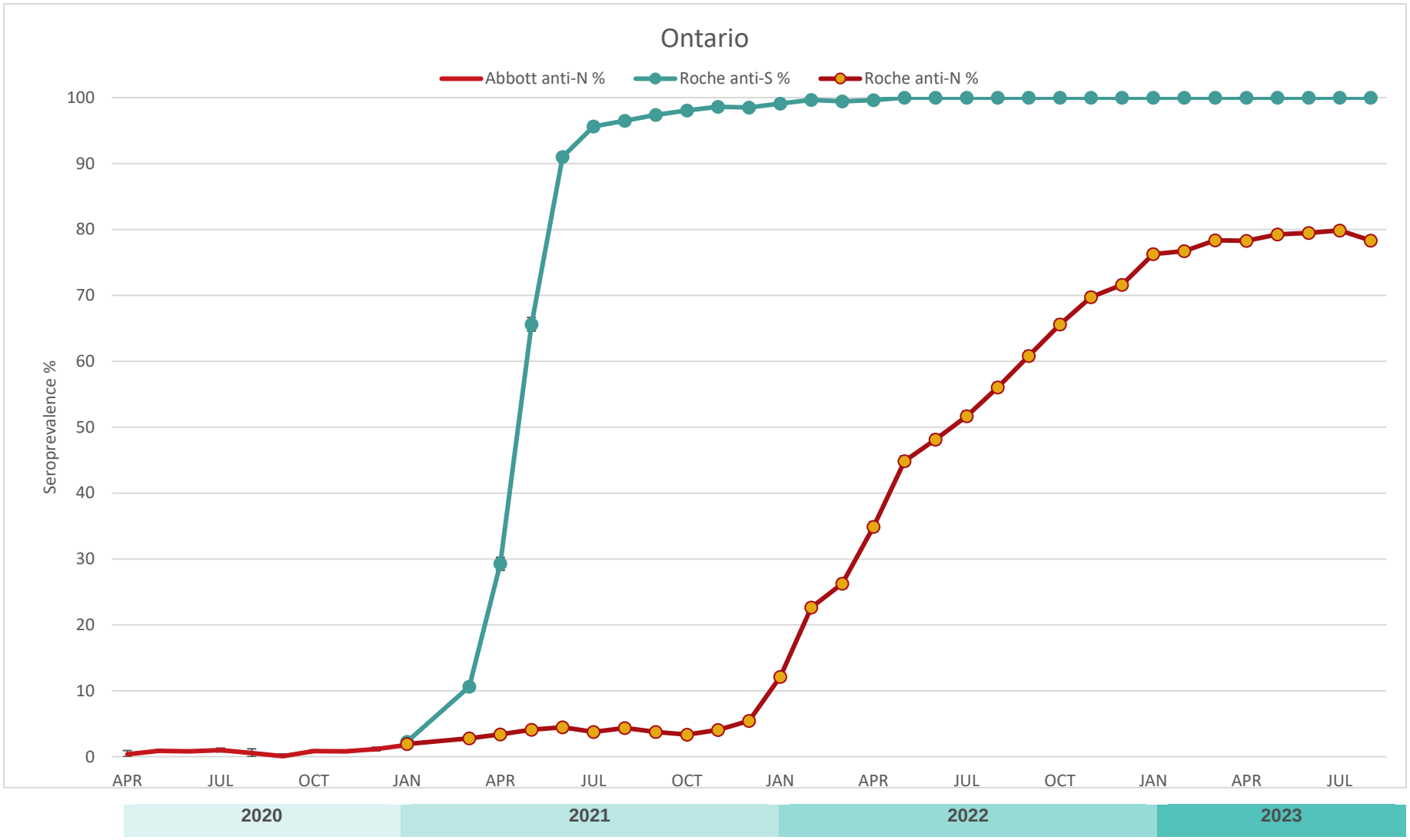
Notes: SARS-CoV-2 seroprevalence rates (95% CI), that have been weighted and adjusted for test characteristics. Data from the CIHR funded study (Correlates of Immunity) from April 9, 2020 - January 31, 2021, have been included.

Figure 2. Regional temporal trends of SARS-CoV-2 seroprevalence monthly from April 2020 – August 2023 (by Abbott anti-N, Roche anti-N and Roche anti-S assays)




Alberta
Abbott anti-N %
Roche anti-S %
Roche anti-N %
Seroprevalence %
100
90
80
70
60
50
40
30
20
10
0
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
2020
2021
2022
2023


Prairies
Abbott anti-N %
Roche anti-S %
Roche anti-N %
Seroprevalence %
100
90
80
70
60
50
40
30
20
10
0
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
2020
2021
2022
2023


Ontario
Abbott anti-N %
Roche anti-S %
Roche anti-N %
Seroprevalence %
100
90
80
70
60
50
40
30
20
10
0
APR
JUL
OCT
JAN
APR
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OCT
JAN
APR
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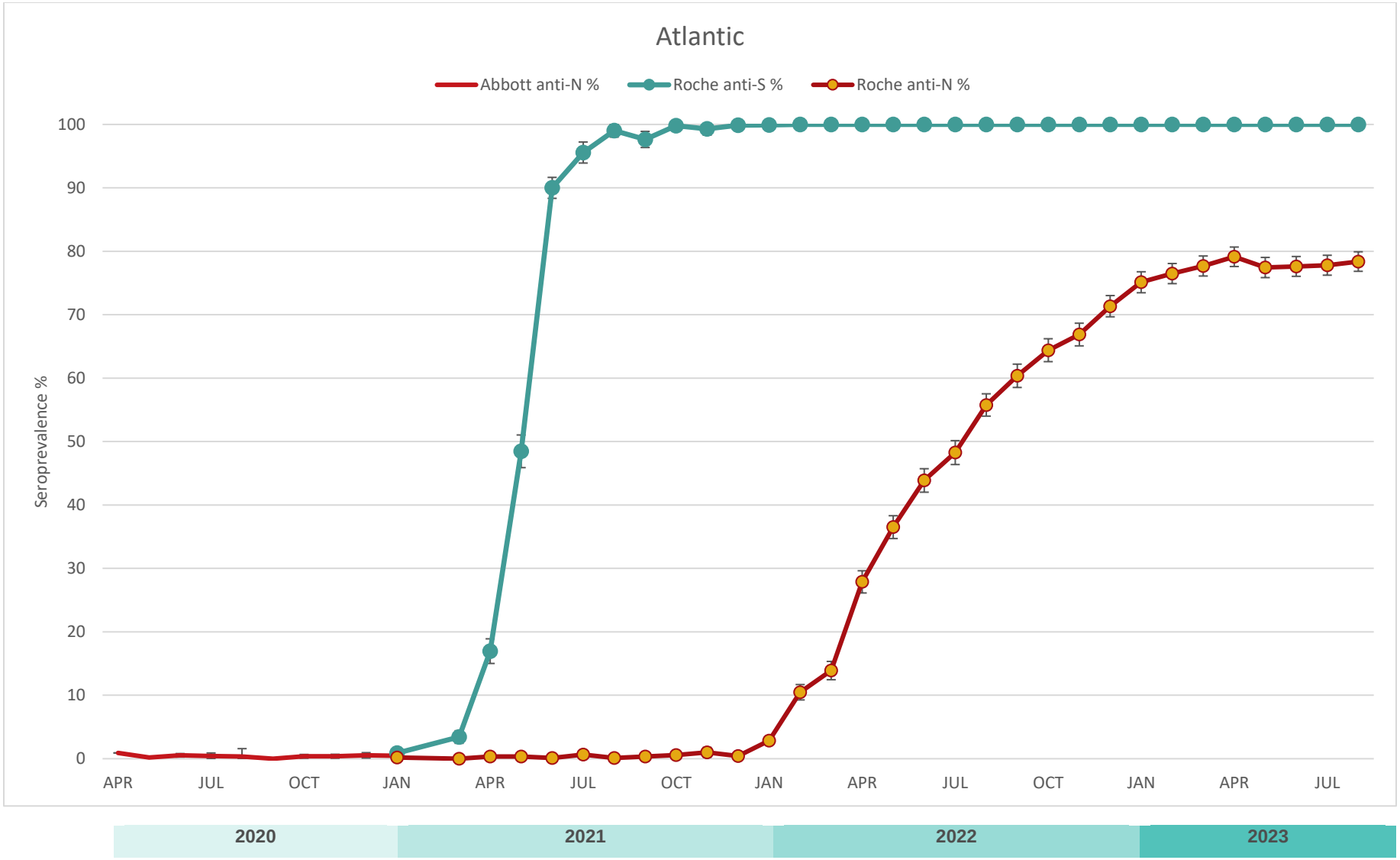
2020
2021
2022
2023



Note: SARS-CoV-2 seroprevalence rates (95% CI), that have been weighted and adjusted for test characteristics. Data from the CIHR funded study (Correlates of Immunity) from April 9, 2020 - January 31, 2021, have been included.

Figure 3. Distributions of log transformed Spike antibody concentration results (U/mL) (circle represents the median and the lighter shaded area represents the IQR) in spike antibody seropositive donations from September 2021 – August 2023 stratified by anti-spike positive only and anti-spike and anti-nucleocapsid positive donors.

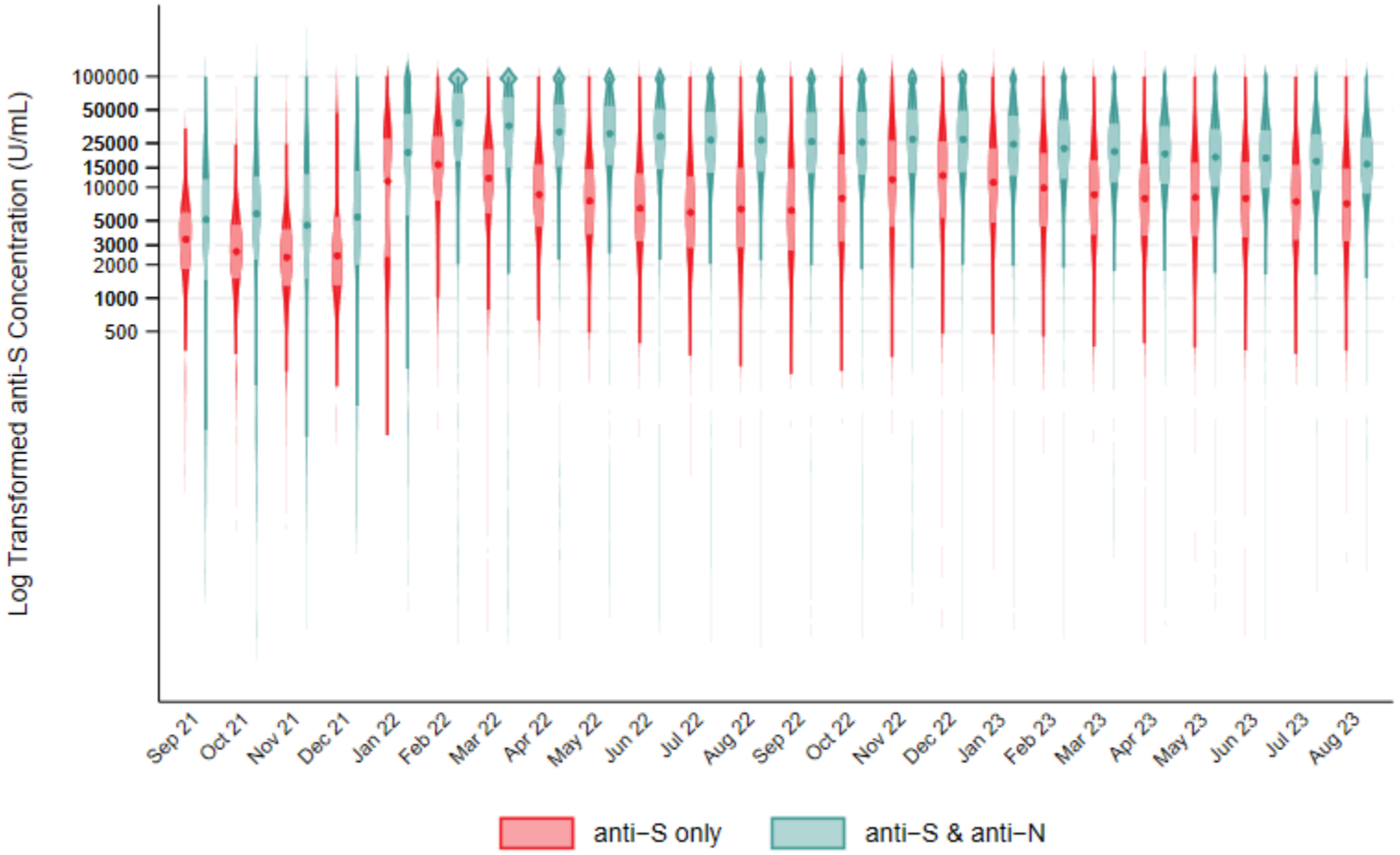
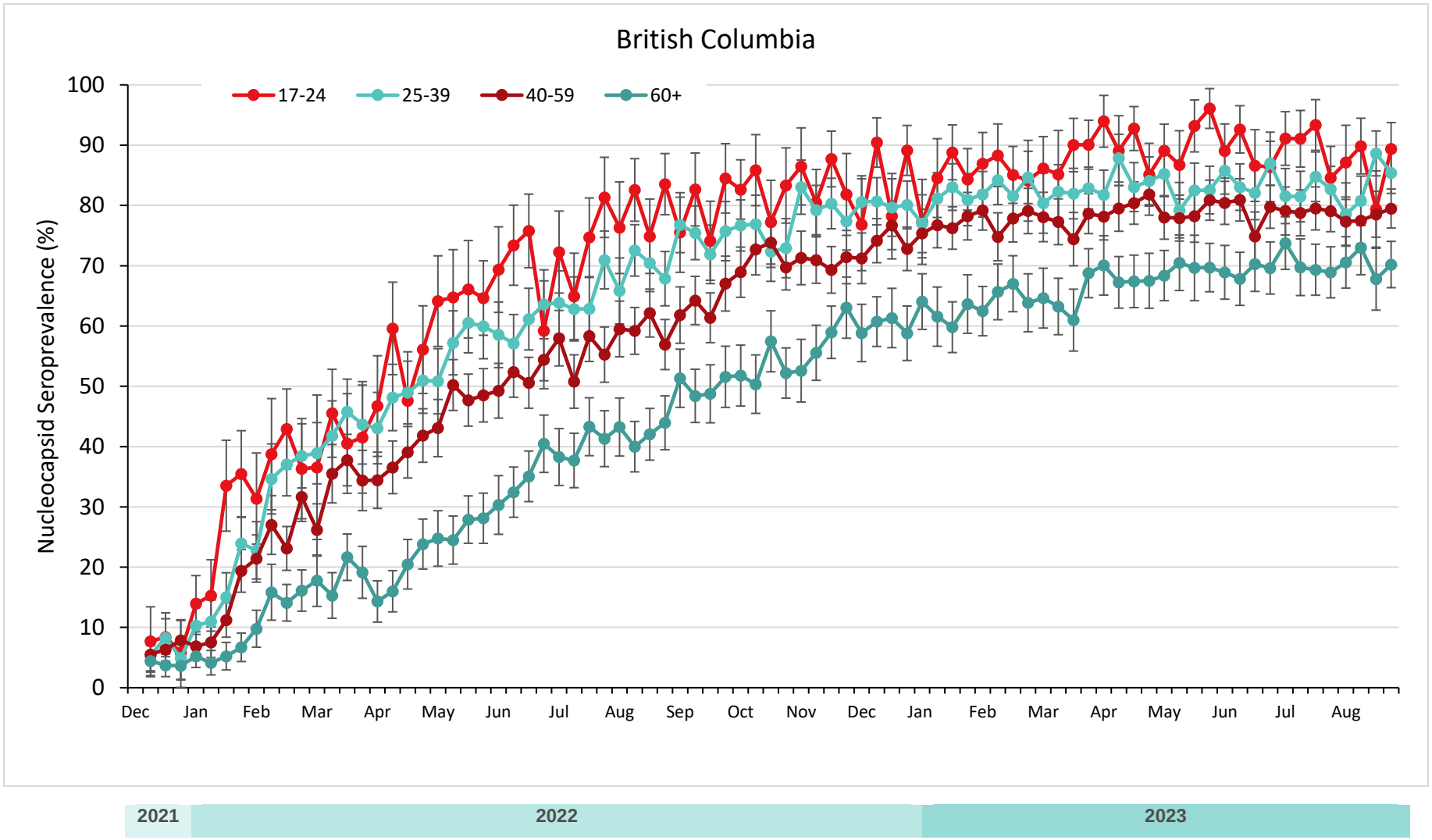
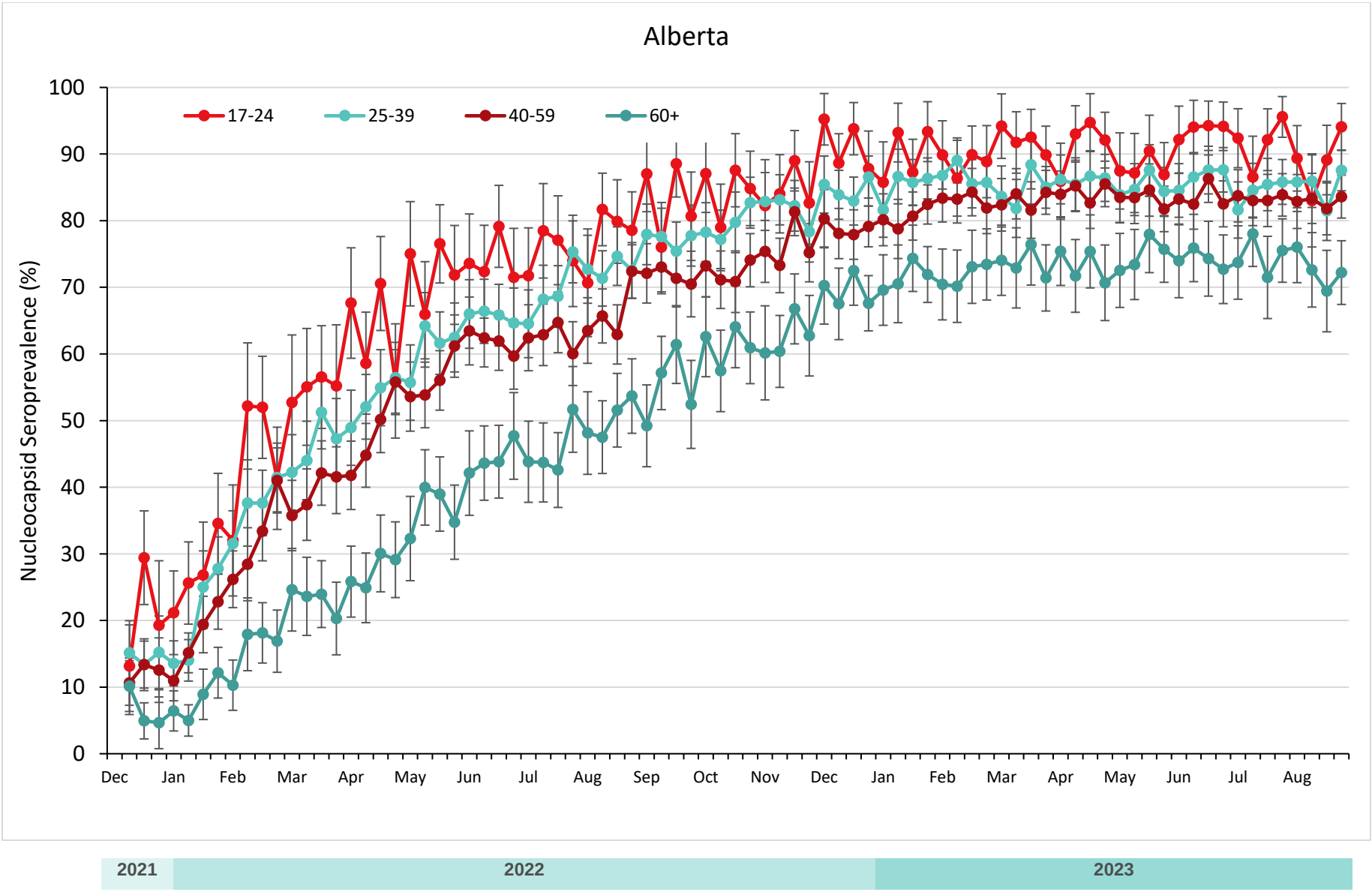
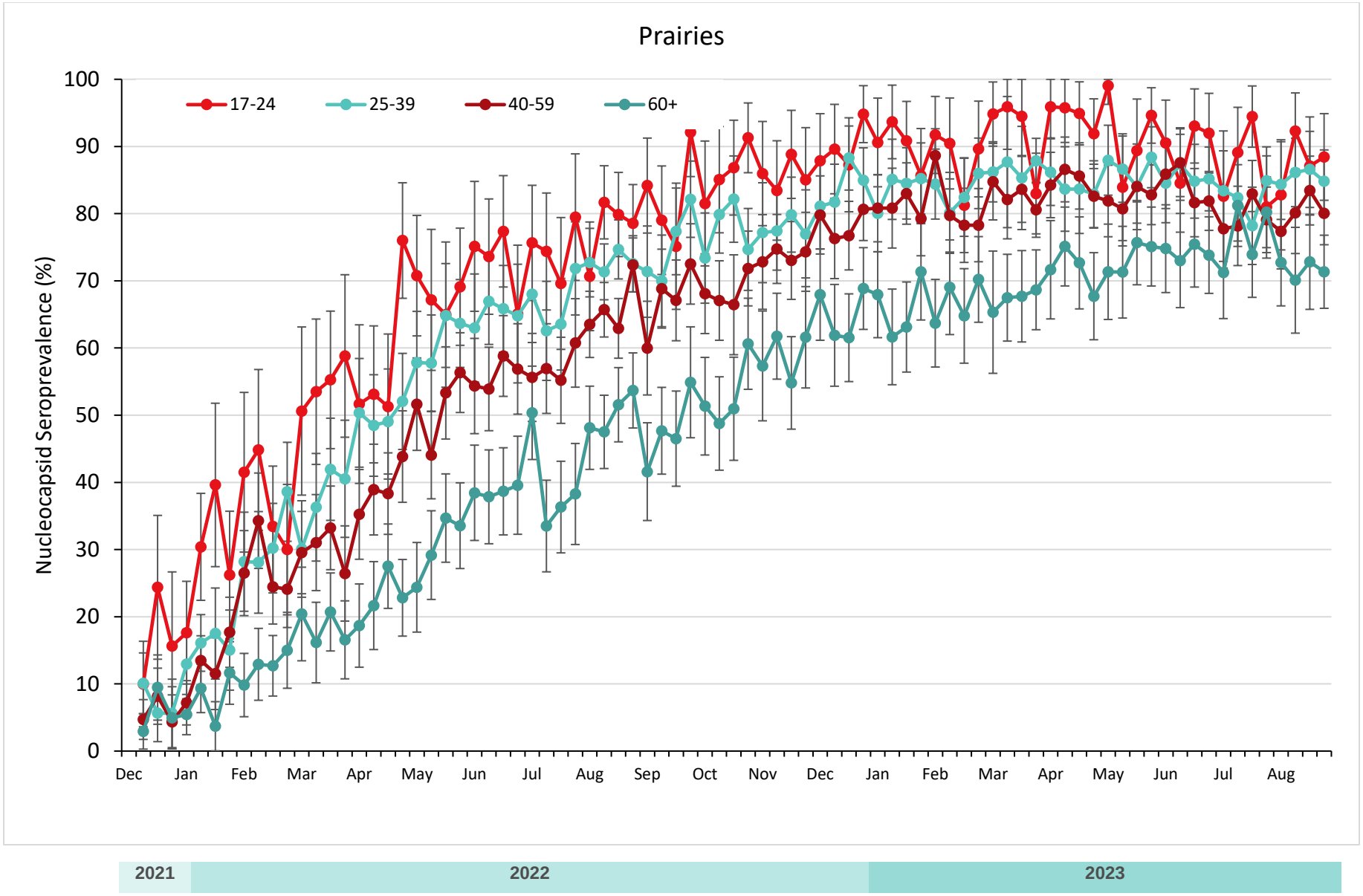
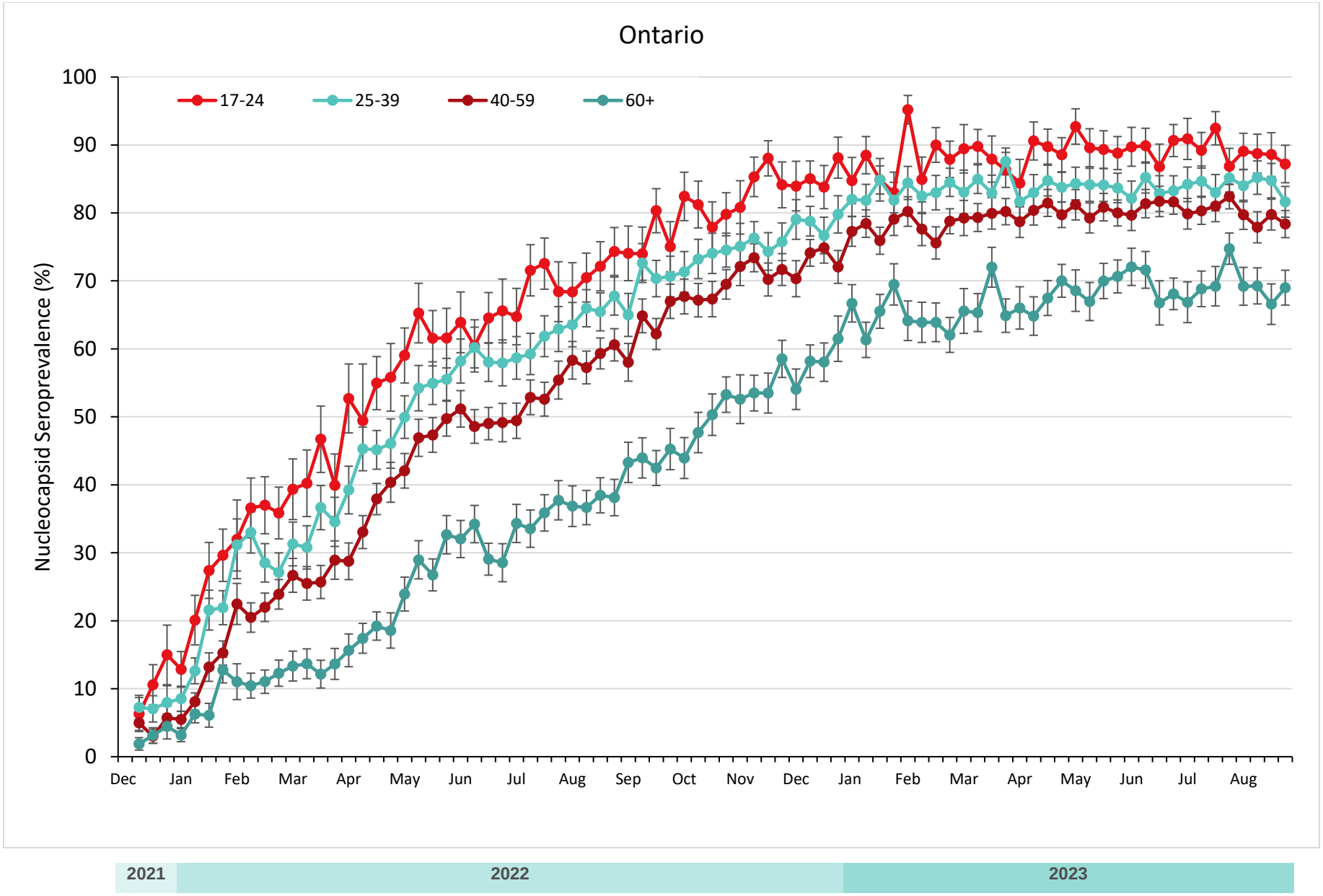


Figure 4. Regional temporal trends of SARS-CoV-2 Nucleocapsid (infection) seroprevalence by age group weekly from December 2021 – August 2023




Alberta
17-24
25-39
40-59
60+
Nucleocapsid Seroprevalence (%)
100
90
80
70
60
50
40
30
20
10
0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2021
2022
2023


Prairies
17-24
25-39
40-59
60+
Nucleocapsid Seroprevalence (%)
100
90
80
70
60
50
40
30
20
10
0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2021
2022
2023


Ontario
17-24
25-39
40-59
60+
Nucleocapsid Seroprevalence (%)
100
90
80
70
60
50
40
30
20
10
0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2021
2022
2023

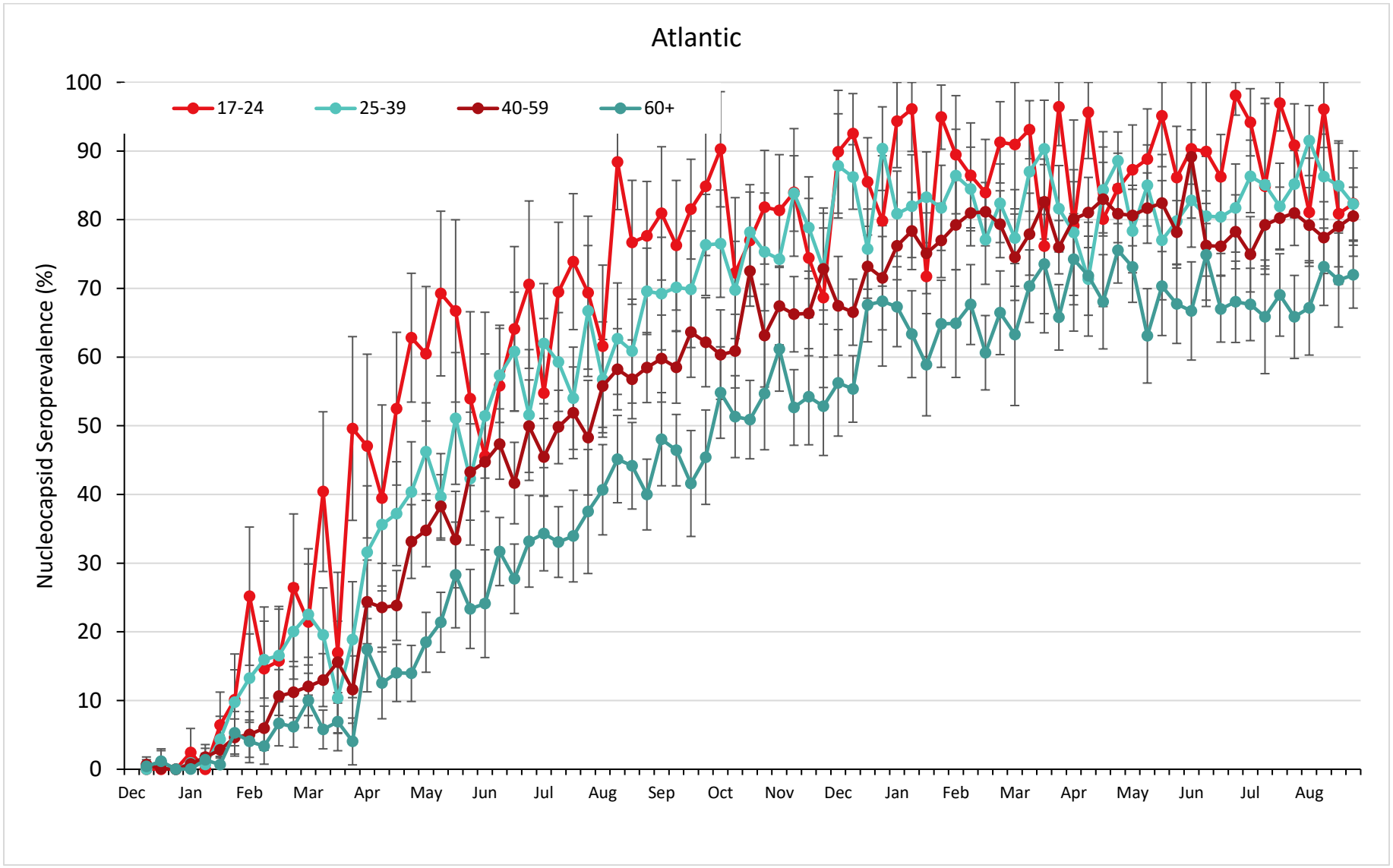

Atlantic
17-24
25-39
40-59
60+
Nucleocapsid Seroprevalence (%)
100
90
80
70
60
50
40
30
20
10
0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2021
2022
2023

Figure 5A. Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021 – August 2023 estimated by Nucleocapsid antibody results by ethnicity.

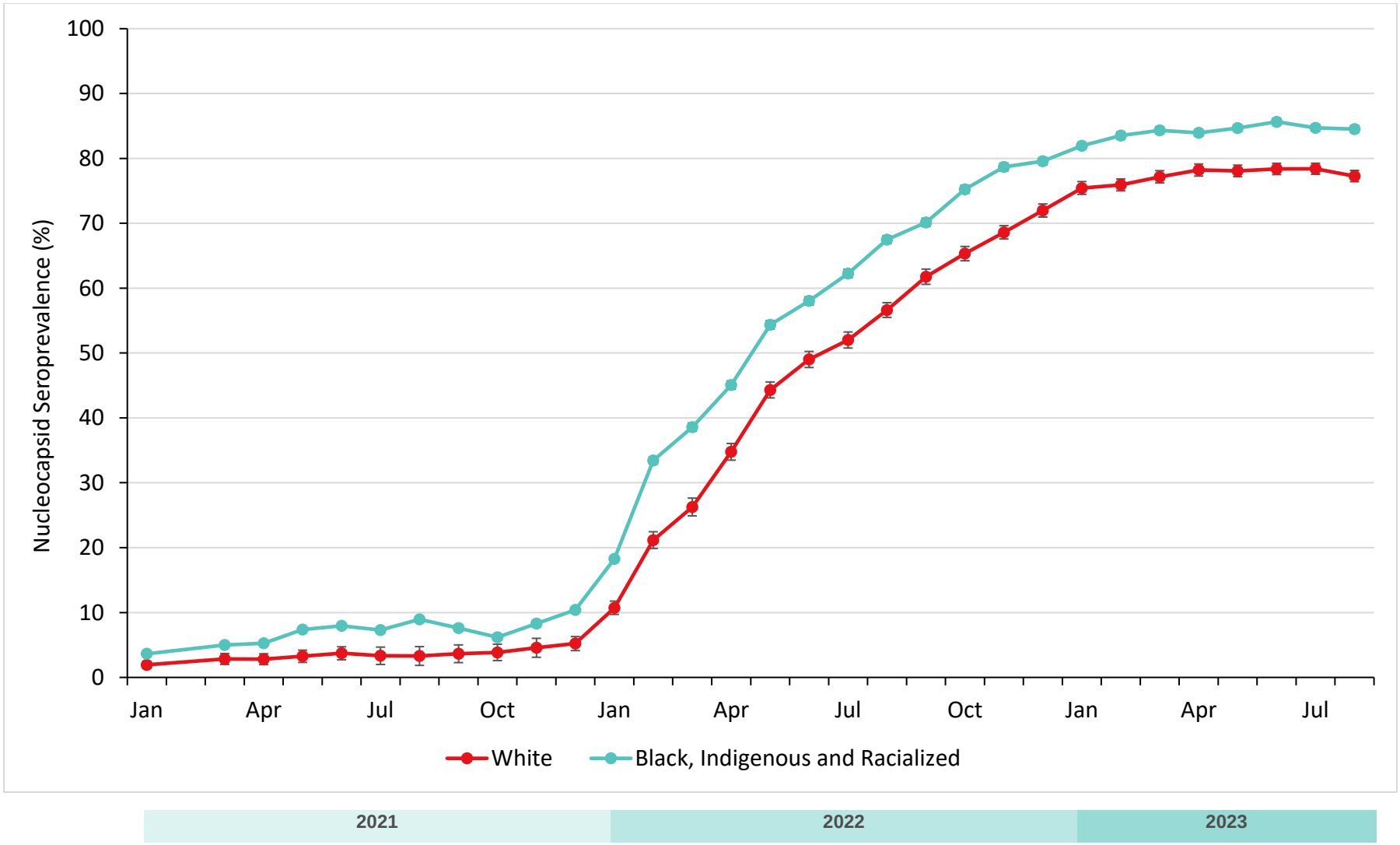


Figure 5B. Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021 - August 2023 estimated by Nucleocapsid antibody results by age group.

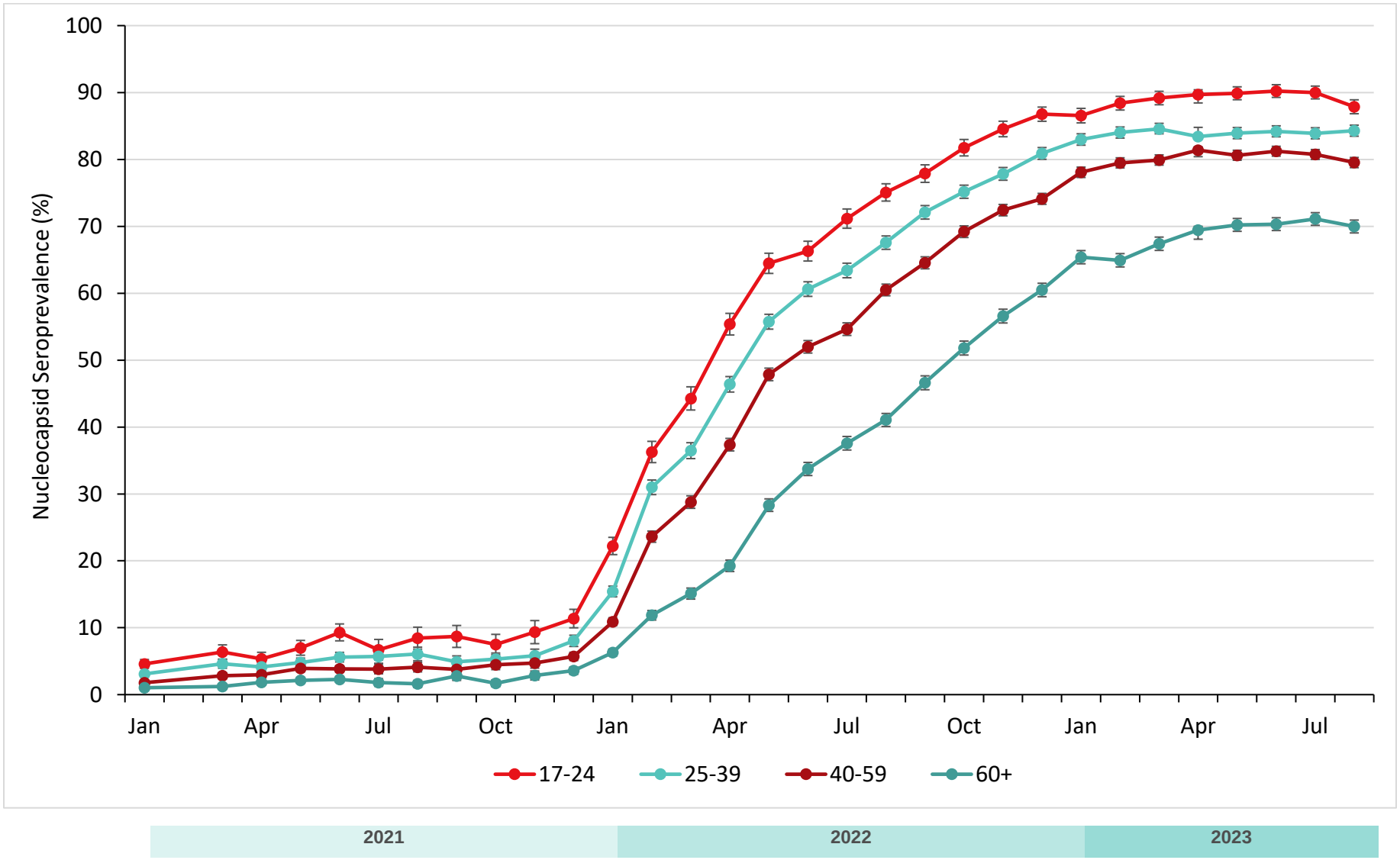


Figure 5C. Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021 - August 2023 estimated by Nucleocapsid antibody results by material deprivation level (1 = least deprived and 5 = most deprived).

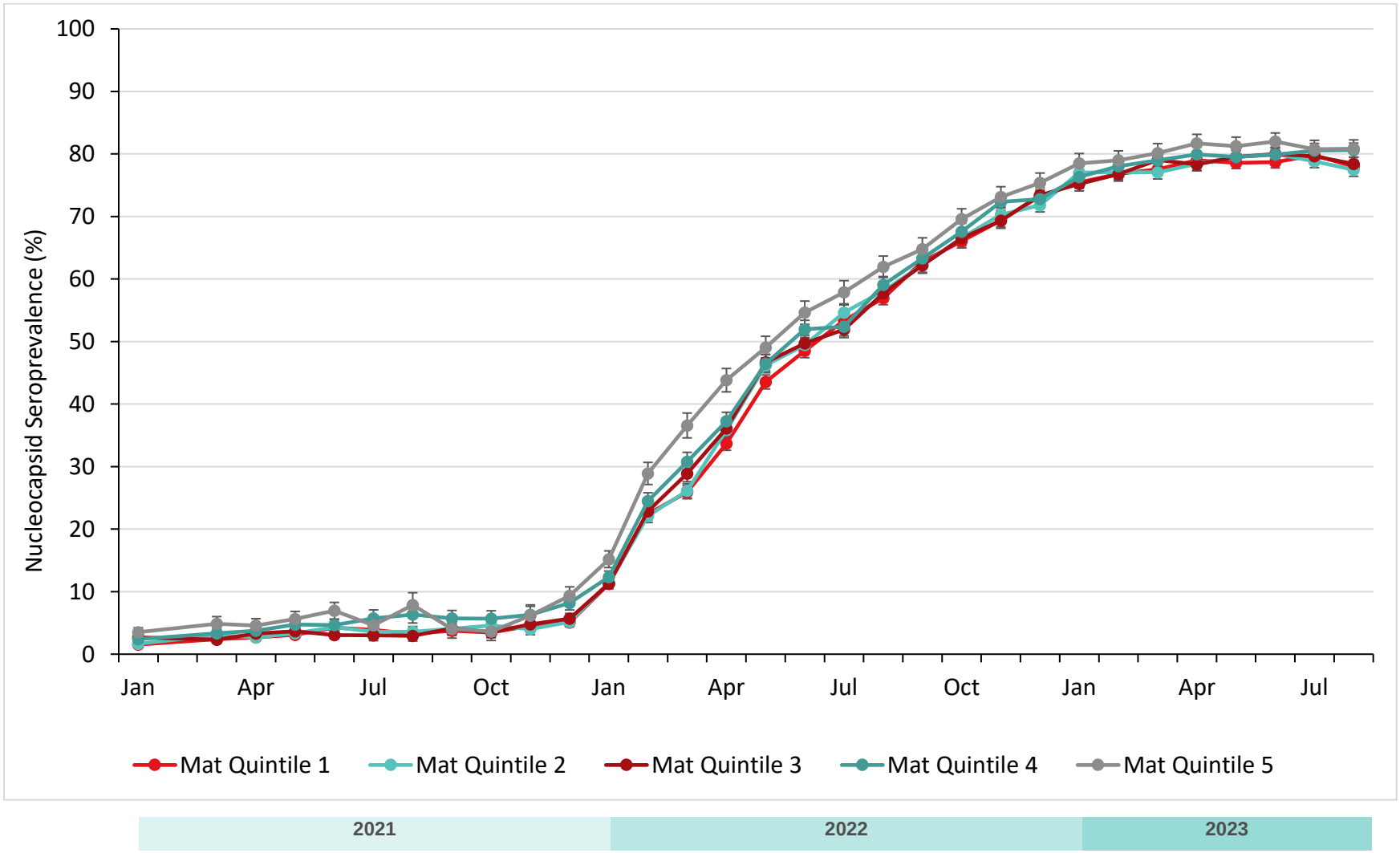


Figure 5D. Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021 – August 2023 estimated by Nucleocapsid antibody results by social deprivation level (1 = least deprived and 5 = most deprived).

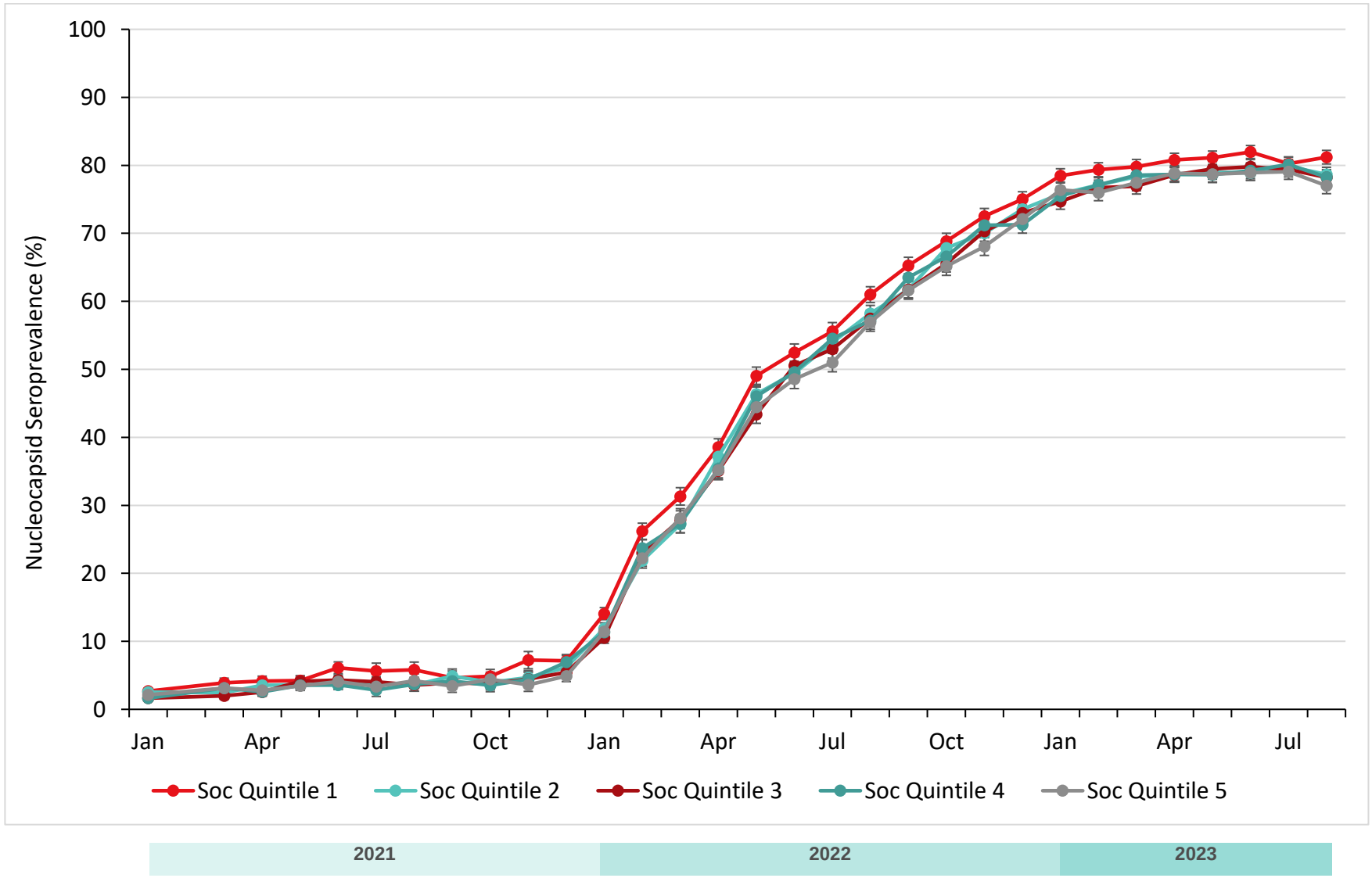


Table A1.1 British Columbia SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	2,221	1,719	78.41	76.90, 79.93	2,221	2,213	100.00	100.00, 100.00
Male	3,146	2,406	77.85	76.28, 79.43	3,145	3,132	100.00	100.00, 100.00
Age								
17-24	311	270	86.64	83.98, 89.30	311	311	100.00	100.00, 100.00
25-39	1,436	1,181	83.57	81.55, 85.59	1,436	1,435	100.00	100.00, 100.00
40-59	1,827	1,424	78.33	76.48, 80.19	1,827	1,817	100.00	100.00, 100.00
60+	1,793	1,250	70.46	68.28, 72.64	1,792	1,782	100.00	100.00, 100.00
Material Deprivation[1]								
1 (least)	1,321	1,009	77.47	75.27, 79.66	1,321	1,320	100.00	100.00, 100.00
2	1,276	969	77.79	75.52, 80.06	1,276	1,267	100.00	99.94, 100.00
3	976	735	76.01	73.34, 78.69	975	971	100.00	100.00, 100.00
4	767	613	81.37	78.67, 84.07	767	764	100.00	100.00, 100.00
5 (most)	367	298	81.59	77.81, 85.38	367	365	100.00	99.10, 100.00
Total	5,367	4,125	78.14	77.05, 79.23	5,366	5,345	100.00	100.00, 100.00

[1]Postal codes were missing for 660 (12.3%) of donors which could not be included in the quintiles of Material Deprivation. 501/660 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 77.33% (95% CI 74.09, 80.57); 658/660 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 100% (95% CI 99.97, 100.00).

Table A1.2 Alberta SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	2,383	1,959	82.97	81.43, 84.51	2,378	2,370	100.00	100.00, 100.00
Male	3,581	2,852	81.47	79.87, 83.06	3,518	3,501	100.00	100.00, 100.00
Age								
17-24	413	370	89.57	87.07, 92.06	413	413	100.00	100.00, 100.00
25-39	1,605	1,355	85.47	83.60, 87.35	1,600	1,599	100.00	100.00, 100.00
40-59	2,175	1,795	82.96	81.11, 84.81	2,163	2,156	100.00	100.00, 100.00
60+	1,771	1,291	72.63	69.92, 75.33	1,720	1,703	99.92	99.23, 100.00
Material Deprivation[1]								
1 (least)	2,153	1,723	81.93	80.02, 83.84	2,121	2,112	100.00	100.00, 100.00
2	1,222	966	81.69	79.23, 84.15	1,205	1,195	100.00	99.48, 100.00
3	812	649	80.55	77.55, 83.55	808	805	100.00	99.87, 100.00
4	533	422	79.37	75.62, 83.13	529	528	100.00	99.87, 100.00
5 (most)	219	191	88.02	83.22, 92.83	215	214	99.95	98.33, 100.00
Total	5,964	4,811	82.22	81.11, 83.33	5,896	5,871	100.00	100.00, 100.00

[1]Postal codes were missing for 1,025 (17.2%) of donors which could not be included in the quintiles of Material Deprivation. 860/1,025 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 85.16% (95% CI 82.66, 87.66); 1,017/1,018 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 100% (95% CI 100.00, 100.00).

Table A1.3 Saskatchewan SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	537	422	80.00	76.84, 83.16	537	534	100.00	99.37, 100.00
Male	837	653	80.04	76.83, 83.25	837	835	100.00	100.00, 100.00
Age								
17-24	97	86	88.48	83.43, 93.53	97	97	100.00	98.35, 100.00
25-39	339	282	83.91	79.88, 87.94	339	339	100.00	99.80, 100.00
40-59	510	402	79.08	75.08, 83.09	510	508	100.00	99.59, 100.00
60+	428	305	73.50	68.80, 78.20	428	425	99.86	98.64, 100.00
Material Deprivation[1]								
1 (least)	416	307	75.50	70.87, 80.12	416	414	100.00	98.93, 100.00
2	311	252	83.24	78.80, 87.68	311	311	100.00	99.55, 100.00
3	206	161	79.79	74.05, 85.52	206	203	99.20	97.21, 100.00
4	137	111	82.81	76.38, 89.24	137	137	99.82	97.86, 100.00
5 (most)	63	52	79.71	69.59, 89.82	63	63	98.26	94.15, 100.00
Total	1,374	1,075	80.02	77.77, 82.27	1,374	1,369	100.00	100.00, 100.00

[1]Postal codes were missing for 241 (17.5%) of donors which could not be included in the quintiles of Material Deprivation 192/241 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 81.39% (95% CI 76.31, 86.47); 241/241 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 100.00% (95% CI 99.21, 100.00).

Table A1.4 Manitoba SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	719	572	80.34	77.44, 83.24	719	717	100.00	100.00, 100.00
Male	922	721	80.45	77.49, 83.41	922	920	100.00	100.00, 100.00
Age								
17-24	141	122	87.21	82.45, 91.97	141	141	100.00	98.87, 100.00
25-39	352	303	86.85	83.31, 90.38	352	352	100.00	99.94, 100.00
40-59	625	504	81.09	77.55, 84.62	625	622	100.00	99.48, 100.00
60+	523	364	70.28	65.75, 74.80	523	522	100.00	99.79, 100.00
Material Deprivation[1]								
1 (least)	366	280	77.65	73.00, 82.31	366	366	100.00	99.74, 100.00
2	294	233	81.02	76.15, 85.88	294	294	100.00	99.41, 100.00
3	351	275	78.95	74.30, 83.60	351	350	100.00	99.24, 100.00
4	242	189	80.40	75.03, 85.77	242	242	100.00	99.07, 100.00
5 (most)	145	118	84.08	77.80, 90.35	145	144	99.21	96.86, 100.00
Total	1,641	1,293	80.39	78.32, 82.47	1,641	1,637	100.00	100.00, 100.00

[1]Postal codes were missing for 243 (14.8%) of donors which could not be included in the quintiles of Material Deprivation; 198/243 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 83.29% (95% CI 78.31, 88.27); 241/243 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.73% (95% CI 98.14, 100.00).

Table A1.5 Ontario SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	5,926	4,567	77.94	77.03, 78.84	5,924	5,913	100.00	100.00, 100.00
Male	9,051	6,932	78.72	77.79, 79.65	9,014	8,967	100.00	100.00, 100.00
Age								
17-24	1,009	881	88.35	86.92, 89.78	1,009	1,009	100.00	100.00, 100.00
25-39	3,965	3,274	83.69	82.49, 84.90	3,963	3,959	100.00	100.00, 100.00
40-59	5,598	4,357	78.90	77.81, 79.98	5,587	5,561	100.00	100.00, 100.00
60+	4,405	2,987	68.60	67.23, 69.96	4,379	4,351	100.00	100.00, 100.00
Material Deprivation[1]								
1 (least)	3,242	2,433	76.07	74.61, 77.53	3,235	3,226	100.00	100.00, 100.00
2	3,145	2,345	75.50	73.98, 77.03	3,136	3,116	100.00	100.00, 100.00
3	2,989	2,307	79.06	77.61, 80.52	2,976	2,967	100.00	100.00, 100.00
4	2,451	1,920	80.91	79.42, 82.41	2,444	2,435	100.00	100.00, 100.00
5 (most)	1,434	1,144	80.53	78.66, 82.39	1,432	1,426	100.00	100.00, 100.00
Total	14,977	11,499	78.31	77.67, 78.96	14,938	14,880	100.00	100.00, 100.00

[1]Postal codes were missing for 1,716 (11.5%) of donors which could not be included in the quintiles of Material Deprivation.1,350/1,716 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 79.93% (95% CI 78.06, 81.79); 1,710/1,715 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 100.00% (95% CI 100.00, 100.00).

Table A1.6 Atlantic Region SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in August 2023

	Nucleocapsid Antibody Results (proxy for natural infection)				Spike Antibody Results (proxy for humoral immunity by either natural infection or vaccination)			
	Crude		Adjusted		Crude		Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval
Sex								
Female	1,009	785	79.31	77.20, 81.41	1,007	1,006	100.00	100.00, 100.00
Male	1,444	1,087	77.39	75.14, 79.65	1,429	1,427	100.00	100.00, 100.00
Age								
17-24	130	110	84.03	79.87, 88.20	130	130	100.00	99.70, 100.00
25-39	470	383	85.65	82.72, 88.57	470	470	100.00	100.00, 100.00
40-59	1,028	807	79.17	76.63, 81.71	1,026	1,026	100.00	100.00, 100.00
60+	825	572	71.20	68.26, 74.14	810	807	100.00	99.99, 100.00
Material Deprivation[1]								
1 (least)	344	272	82.78	79.06, 86.49	342	342	100.00	100.00, 100.00
2	475	360	75.45	71.76, 79.13	469	468	100.00	100.00, 100.00
3	501	376	75.81	72.20, 79.42	499	499	100.00	100.00, 100.00
4	547	415	78.89	75.64, 82.13	543	542	100.00	99.79, 100.00
5 (most)	411	308	77.96	74.30, 81.62	410	409	100.00	100.00, 100.00
Total	2,453	1,872	78.38	76.84, 79.92	2,436	2,433	100.00	100.00, 100.00

[1]Postal codes were missing for 175 (7.1%) of donors which could not be included in the quintiles of Material Deprivation; 141/175 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 84.17% (95% CI 78.90, 89.45); 173/173 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 100.00% (95% CI 98.76, 100.00).

Table A2.1. Weekly SARS-CoV-2 seroprevalence by sociodemographic variables by Nucleocapsid results in August 2023

	August 1-7			August 8-14			August 15-21			August 22-31		
	Crude	Adjusted		Crude	Adjusted		Crude	Adjusted		Crude	Adjusted	
	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI
Sex												
Female	2,939(2,289)	78.29	76.96, 79.62	3,010(2,359)	79.34	78.04, 80.63	2,857(2,249)	79.34	77.99, 80.69	3,989(3,127)	79.24	78.11, 80.36
Male	4,593(3,577)	79.93	78.63, 81.24	4,395(3,385)	78.84	77.49, 80.19	4,147(3,176)	78.20	76.77, 79.63	5,846(4,513)	78.94	77.78, 80.11
Age												
17-24	528(460)	87.60	85.53, 89.67	478(425)	89.01	86.94, 91.07	477(412)	86.22	83.85, 88.60	618(542)	88.37	86.50, 90.25
25-39	1,892(1,572)	84.11	82.39, 85.84	1,914(1,601)	84.59	82.90, 86.28	1,766(1,469)	85.00	83.26, 86.75	2,595(2,136)	83.74	82.27, 85.21
40-59	2,757(2,181)	79.50	77.93, 81.08	2,688(2,096)	78.75	77.14, 80.35	2,682(2,131)	80.10	78.51, 81.69	3,636(2,881)	79.71	78.35, 81.07
60+	2,355(1,653)	70.42	68.47, 72.37	2,325(1,622)	70.78	68.86, 72.71	2,079(1,413)	68.08	65.94, 70.23	2,986(2,081)	70.23	68.51, 71.95
Province												
British Columbia	1,168(873)	76.06	73.64, 78.47	1,314(1,009)	78.65	76.46, 80.84	1,202(931)	78.22	75.89, 80.55	1,683(1,312)	79.13	77.22, 81.03
Alberta	1,376(1,116)	83.13	80.86, 85.40	1,355(1,096)	81.54	79.18, 83.91	1,316(1,039)	80.09	77.65, 82.53	1,917(1,560)	83.53	81.63, 85.42
Saskatchewan	357(286)	81.20	76.96, 85.44	235(179)	79.22	73.71, 84.73	323(255)	79.72	75.05, 84.40	459(355)	79.68	75.70, 83.65
Manitoba	338(249)	74.60	69.53, 79.66	396(320)	83.09	79.18, 87.00	341(280)	84.10	79.90, 88.30	566(444)	79.55	75.94, 83.15
Ontario	3,819(2,981)	79.22	77.94, 80.49	3,497(2,670)	78.21	76.88, 79.54	3,275(2,502)	78.16	76.76, 79.57	4,386(3,346)	77.74	76.54, 78.95
New Brunswick	157(118)	78.66	73.36, 83.96	202(156)	78.65	73.88, 83.42	64(57)	88.04	81.39, 94.70	217(166)	78.50	73.65, 83.36
Nova Scotia	182(136)	75.39	68.51, 82.27	317(240)	76.79	71.63, 81.95	397(297)	75.81	71.18, 80.43	408(299)	72.94	68.33, 77.55
Prince Edward Island	34(26)	77.09	64.57, 89.61	35(28)	79.70	66.39, 93.01	63(49)	80.25	70.56, 89.94	21(12)	56.70	36.28, 77.12
Newfoundland	101(81)	80.76	75.01, 86.51	54(46)	86.75	79.24, 94.25	23(15)	68.54	53.37, 83.70	178(146)	85.46	81.52, 89.39
Metro area												
Vancouver	587(462)	78.74	75.65, 81.83	714(572)	81.06	78.40, 83.72	624(503)	80.74	77.88, 83.60	985(797)	80.89	78.62, 83.16
Calgary	530(422)	82.65	78.66, 86.63	450(378)	84.32	80.27, 88.38	478(383)	81.57	77.33, 85.81	700(572)	83.87	80.58, 87.16
Edmonton	399(320)	80.08	75.72, 84.43	439(348)	80.64	76.43, 84.84	427(328)	76.75	72.31, 81.18	681(542)	81.71	78.49, 84.93
Ottawa	352(267)	77.33	71.94, 82.72	486(358)	74.80	69.94, 79.66	488(343)	71.18	66.27, 76.10	322(226)	71.79	65.60, 77.99

Toronto	1,455(1,171)	80.82	79.01, 82.62	1,125(902)	81.21	79.22, 83.19	1,065(858)	81.21	79.12, 83.30	1,717(1,360)	79.80	78.12, 81.48
Winnipeg	200(143)	72.90	66.10, 79.69	250(197)	81.07	75.87, 86.28	242(201)	85.55	80.73, 90.37	353(274)	78.13	73.39, 82.87
Ethnicity[1]												
White	5,721(4,350)	76.93	75.81, 78.05	5,690(4,327)	77.58	76.47, 78.68	5,490(4,184)	77.41	76.26, 78.56	7,728(5,869)	77.24	76.28, 78.19
Indigenous	109(87)	84.52	77.31, 91.74	107(85)	80.22	72.97, 87.47	94(73)	77.81	69.73, 85.88	132(114)	85.53	79.36, 91.71
Asian	923(785)	85.24	83.04, 87.45	827(695)	84.87	82.53, 87.20	715(603)	85.36	82.83, 87.88	1,016(867)	86.04	84.01, 88.07
Other Racialized groups	579(478)	84.52	81.65, 87.40	560(455)	82.44	79.32, 85.56	526(420)	81.95	78.62, 85.29	716(596)	84.76	82.18, 87.34
Social Deprivation[2]												
1 (least deprived)	1,402(1,123)	79.72	77.59, 81.84	1,303(1,019)	80.76	78.61, 82.90	1,372(1,078)	80.37	78.23, 82.50	1,936(1,569)	83.14	81.46, 84.82
2	1,406(1,085)	78.69	76.52, 80.87	1,394(1,068)	78.20	76.02, 80.39	1,360(1,053)	78.94	76.71, 81.16	1,858(1,418)	78.79	76.91, 80.67
3	1,341(1,031)	78.34	76.09, 80.59	1,293(1,009)	79.68	77.47, 81.89	1,216(920)	77.07	74.63, 79.52	1,712(1,306)	77.77	75.78, 79.75
4	1,214(941)	79.70	77.42, 81.98	1,245(954)	77.24	74.92, 79.56	1,122(864)	77.83	75.33, 80.32	1,573(1,218)	78.19	76.17, 80.22
5 (most deprived)	1,185(895)	76.47	74.04, 78.90	1,200(912)	77.31	74.92, 79.69	1,055(800)	76.53	73.93, 79.13	1,529(1,170)	77.51	75.40, 79.61
Material Deprivation[2]												
1 (least deprived)	1,907(1,478)	78.80	76.89, 80.70	1,797(1,394)	78.60	76.64, 80.56	1,717(1,293)	76.24	74.12, 78.36	2,421(1,859)	78.17	76.47, 79.87
2	1,528(1,139)	74.95	72.72, 77.18	1,612(1,237)	78.03	75.97, 80.09	1,503(1,131)	76.63	74.39, 78.87	2,080(1,618)	79.40	77.61, 81.19
3	1,464(1,140)	79.41	77.29, 81.52	1,312(983)	77.29	74.97, 79.60	1,346(1,036)	78.53	76.27, 80.78	1,713(1,344)	78.36	76.42, 80.30
4	1,107(883)	81.10	78.83, 83.37	1,028(793)	78.83	76.42, 81.23	1,026(823)	81.63	79.29, 83.96	1,516(1,171)	80.87	78.92, 82.82
5 (most deprived)	542(435)	80.36	77.22, 83.50	686(555)	81.99	79.30, 84.68	533(432)	80.93	77.74, 84.12	878(689)	80.17	77.71, 82.63
Total	7,532(5,866)	79.10	78.17, 80.03	7,405(5,744)	79.10	78.16, 80.03	7,004(5,425)	78.79	77.81, 79.77	9,835(7,640)	79.10	78.28, 79.91

[1]In Week 1, self reported ethnicity was missing for 200 (2.7%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 86.76% (95% CI 82.31, 91.22).
In Week 2, self reported ethnicity was missing for 221 (3.0%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 83.42% (95% CI 78.57, 88.26).
In Week 3, self reported ethnicity was missing for 179 (2.6%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.41% (95% CI 75.87, 86.95).
In Week 4, self reported ethnicity was missing for 243 (2.5%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 82.60% (95% CI 77.77, 87.42).

[2]In Week 1, postal codes were missing for 984 (13.1%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 82.31% (95% CI 79.88, 84.73).
In Week 2, postal codes were missing for 970 (13.1%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 82.12% (95% CI 79.64, 84.61).
In Week 3, postal codes were missing for 879 (12.5%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 82.40% (95% CI 79.80, 84.99).
In Week 4, postal codes were missing for 1,227 (12.5%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 78.12% (95% CI 75.71, 80.53).

Table A2.2. Weekly SARS-CoV-2 seroprevalence by province and age group by Nucleocapsid results in August 2023

	August 1-7			August 8-14			August 15-21			August 22-31		
	Adjusted			Adjusted			Adjusted			Adjusted		
	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI	N Tested (N Positive)	Percent Positive	95% CI
British Columbia												
17-24	56(48)	87.15	81.00, 93.30	81(73)	89.85	85.23, 94.47	77(62)	79.41	73.08, 85.73	97(87)	89.39	85.03, 93.75
25-39	274(211)	78.56	73.39, 83.74	378(301)	80.77	76.68, 84.86	330(284)	88.63	84.91, 92.35	454(385)	85.41	82.00, 88.82
40-59	396(308)	77.32	73.25, 81.40	429(325)	77.49	73.61, 81.38	438(340)	78.54	74.73, 82.35	564(451)	79.49	76.25, 82.73
60+	442(306)	70.55	66.28, 74.81	426(310)	72.99	68.51, 77.47	357(245)	67.77	62.63, 72.90	568(389)	70.20	66.36, 74.04
Total	1,168(873)	76.06	73.64, 78.47	1,314(1,009)	78.65	76.46, 80.84	1,202(931)	78.22	75.89, 80.55	1,683(1,312)	79.13	77.22, 81.03
Alberta												
17-24	104(91)	89.36	84.45, 94.27	77(67)	83.04	76.05, 90.03	100(89)	89.10	83.89, 94.32	132(123)	94.07	90.54, 97.59
25-39	380(323)	85.79	81.95, 89.64	357(305)	85.93	81.99, 89.87	337(271)	81.47	77.03, 85.90	531(456)	87.55	84.49, 90.61
40-59	472(385)	82.88	78.83, 86.93	510(423)	83.34	79.58, 87.11	502(410)	81.78	77.88, 85.67	691(577)	83.61	80.39, 86.84
60+	420(317)	76.04	70.70, 81.38	411(301)	72.62	67.03, 78.21	377(269)	69.44	63.32, 75.55	563(404)	72.21	67.43, 76.99
Total	1,376(1,116)	83.13	80.86, 85.40	1,355(1,096)	81.54	79.18, 83.91	1,316(1,039)	80.09	77.65, 82.53	1,917(1,560)	83.53	81.63, 85.42
Saskatchewan												
17-24	25(22)	87.35	77.79, 96.91	23(19)	82.27	69.35, 95.20	23(20)	86.79	75.42, 98.16	26(25)	96.27	90.18, 100.00
25-39	82(74)	90.91	84.41, 97.41	69(59)	86.98	78.77, 95.20	77(63)	82.45	73.78, 91.11	111(86)	77.80	69.81, 85.79
40-59	132(101)	76.88	68.88, 84.89	80(61)	76.08	65.36, 86.80	124(100)	80.48	72.58, 88.38	174(140)	81.19	74.54, 87.84
60+	118(89)	75.12	66.49, 83.76	63(40)	70.57	57.80, 83.34	99(72)	73.07	63.26, 82.88	148(104)	73.68	65.65, 81.70
Total	357(286)	81.20	76.96, 85.44	235(179)	79.22	73.71, 84.73	323(255)	79.72	75.05, 84.40	459(355)	79.68	75.70, 83.65
Manitoba												
17-24	26(20)	76.62	62.55, 90.69	40(39)	98.47	94.77, 100.00	36(31)	87.32	77.79, 96.84	39(32)	82.58	72.53, 92.62
25-39	50(37)	74.06	61.84, 86.28	112(95)	85.64	79.18, 92.10	67(61)	91.21	84.30, 98.13	123(110)	90.61	85.46, 95.76
40-59	144(111)	77.77	70.05, 85.50	140(115)	82.46	75.19, 89.74	141(120)	86.13	79.53, 92.73	200(158)	79.00	72.49, 85.50
60+	118(81)	70.05	60.47, 79.63	104(71)	69.79	59.79, 79.79	97(68)	72.56	62.35, 82.78	204(144)	69.55	62.18, 76.92
Total	338(249)	74.60	69.53, 79.66	396(320)	83.09	79.18, 87.00	341(280)	84.1	79.90, 88.30	566(444)	79.55	75.94, 83.15
Ontario												
17-24	283(250)	89.07	86.41, 91.72	234(205)	88.72	85.86, 91.59	212(186)	88.59	85.36, 91.81	280(240)	87.20	84.44, 89.96
25-39	1,022(854)	84.00	81.64, 86.36	887(748)	85.20	82.74, 87.65	835(691)	84.75	82.22, 87.28	1,221(981)	81.64	79.38, 83.90

40-59	1,410(1,116)	79.72	77.58, 81.86	1,268(970)	77.89	75.60, 80.18	1,249(983)	79.75	77.49, 82.02	1,671(1,288)	78.36	76.36, 80.35
60+	1,104(761)	69.21	66.42, 71.99	1,108(747)	69.27	66.61, 71.92	979(642)	66.58	63.60, 69.56	1,214(837)	69.01	66.44, 71.57
Total	3,819(2,981)	79.22	77.94, 80.49	3,497(2,670)	78.21	76.88, 79.54	3,275(2,502)	78.16	76.76, 79.57	4,386(3,346)	77.74	76.54, 78.95
Atlantic Canada												
17-24	34(29)	81.09	73.22, 88.96	23(22)	96.07	90.51, 100.00	29(24)	80.87	70.61, 91.14	44(35)	82.34	74.68, 90.00
25-39	84(73)	91.52	86.42, 96.62	111(93)	86.27	80.08, 92.46	120(99)	84.92	78.37, 91.47	155(118)	82.28	77.03, 87.53
40-59	203(160)	79.21	73.74, 84.67	261(202)	77.39	72.17, 82.62	228(178)	79.03	73.14, 84.93	336(267)	80.51	76.29, 84.73
60+	153(99)	67.16	60.29, 74.03	213(153)	73.15	67.52, 78.78	170(117)	71.21	64.37, 78.06	289(203)	72.00	67.13, 76.87
Total	474(361)	78.37	75.08, 81.65	608(470)	78.96	75.84, 82.08	547(418)	78.04	74.49, 81.58	824(623)	78.20	75.59, 80.80
Total	7,532(5,866)	79.10	78.17, 80.03	7,405(5,744)	79.10	78.16, 80.03	7,004(5,425)	78.79	77.81, 79.77	9,835(7,640)	79.10	78.28, 79.91