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COVID-19 Seroprevalence Report

# **COVID-19 Seroprevalence Report**

**April 10<sup>th</sup>, 2022**

**Report #19: February 2022 Survey**

**The advance of Omicron**

# Summary

February 2022

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

•**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 99.60% (95% CI 99.45, 99.75%) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by February likely due to third vaccine dose administration.

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

- Seroprevalence (natural infection) in February 2022 was 23.68% (95% CI 23.18, 24.18), higher than January 2022 (12.12% (95% CI 11.76, 12.48)). ( $P < 0.0001$ ). There was a gradual increase over the 28 day reporting period from 21.39% (20.31, 22.48) to 23.43% (22.41, 24.45) to 23.68% (22.77, 24.58) to 25.25% (95% CI 24.30, 26.20) consistent with emergence of the Omicron variant.
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (36.27% (95% CI 34.68, 37.86%)) compared to other age groups. However, the seroprevalence rate increased in all age groups compared to January.
- Seroprevalence rates increased in February compared to January in all provinces.
- Racialized groups have a higher seroprevalence rate (33.45% (95% CI 32.16, 34.73)) compared to white donors (21.17% (95% CI 20.62, 21.72%)).
- Among repeat tested donors, new infections in unvaccinated donors have increased from June 1.53% (1.14, 2.00) to 9.12% (95% CI 8.24, 10.07) in January, and more than doubled in February (23.71%, 95% CI 22.10, 25.37).
- Potential breakthrough infections remained low from June to December, but increased from 5.19% (95% CI 4.68, 5.74) in January to 15.56% (95% CI 14.72, 16.42) in February.

January 2022

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

•**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 98.89% (95% CI 98.73, 99.06%) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September, but gradually decreased. A peak in values followed by decline is expected after vaccination. Concentrations increased in all age groups by January likely due to third vaccine dose administration.

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

- Seroprevalence (natural infection) in January 2022 was 12.12% (95% CI 11.76, 12.48), higher than December 2021 at 6.39% (95% CI 6.01, 6.76) ( $P < 0.001$ ). There was a gradual increase over the 31 day reporting period from 7.16% (6.62, 7.71) to 10.09% (9.46, 10.71) to 12.65% (11.84, 13.45) to 16.30% (95% CI 15.51, 17.09) consistent with emergence of the Omicron variant.
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (22.22% (95% CI 20.93, 23.51%)) compared to other age groups. However, the seroprevalence rate increased in all age groups compared to December.
- Seroprevalence rates increased in January compared to December in almost all provinces.
- Racialized groups have a higher seroprevalence rate (18.29% (95% CI 17.27, 19.32)) compared to white donors (10.73% (95% CI 10.34, 11.12%)).
- Among repeat tested donors, new infections in unvaccinated donors have increased from June 1.53% (1.14, 2.00) to 3.91% (3.11, 4.83%) in December and more than doubled in January to 9.012% (95% CI 8.24, 10.07).
- Potential breakthrough infections remained low from June to December, but increased from 0.74% (95% CI 0.48, 1.10) in December to 5.19% (95% CI 4.68, 5.74) in January.

## December 2021

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

### •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 98.58% (95% CI 98.34, 98.82%) (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were high by September, but gradually decreased. A peak in values followed by decline is expected after vaccination. By December, concentrations increased in older age groups likely due to administration of third doses consistent with policies to vaccinate older age groups earlier.

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

- Seroprevalence (natural infection) in December was 6.39% (95% CI 6.01, 6.76), higher than November at 5.08% (95% CI 4.58, 5.50) ( $P < 0.001$ ). There was a gradual increase over the 17 day reporting period from 5.60% (5.03, 6.18) to 6.55% (5.95, 7.15) to 7.51% (6.63, 8.39) consistent with emergence of the Omicron variant.
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (11.37% (95% CI 9.99, 12.75%)) compared to other age groups.
- Seroprevalence rates remained similar to November in most provinces, however, rates increased in December in Alberta (12.94% (95% CI 11.62, 14.27%),  $P < 0.001$ ) and Ontario (5.43% (95% CI 4.94, 5.92%),  $P < 0.001$ ) compared to November.
- Racialized groups have a higher seroprevalence rate (10.40% (95% CI 9.32, 11.48%)) compared to white donors (5.21% (95% CI 4.81, 5.61%)).
- Among repeat tested donors, new infections in unvaccinated donors have increased since June 1.53% (1.14, 2.00) to 3.91% (3.11, 4.83%) in December but vaccine breakthrough infections are low, 0.74% (0.48, 1.10%).

## November 2021

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

- **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 98.52% (95% CI 98.18, 98.86%), slightly higher than October (based on results from the Spike antibody assay) ( $P = 0.039$ ). This was predominantly driven by vaccination.
- Spike antibody concentrations were very high (>2500 U/mL) by July, but gradually decreasing in almost all age groups as the months progress with the greatest decrease in older age groups. A peak in values followed by decline is expected after vaccination. These results are consistent with policies to vaccinate older age groups earlier.

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

- Seroprevalence (natural infection) in November was 5.08% (95% CI 4.58, 5.50), higher than October at 4.26% (95% CI 3.85, 4.68%) ( $P = 0.014$ ).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (9.35% (95% CI 7.62, 11.07%)) compared to other age groups.
- Racialized groups have a higher seroprevalence rate (8.28% (95% CI 6.82, 9.74%)) compared to white donors (4.56% (95% CI 4.05, 5.07%)).
- Among repeat tested donors, new infections in unvaccinated donors have increased since June 1.53% (1.14, 2.00) to 3.19% (2.42, 4.13) in November but vaccine breakthrough infections are low, 0.6% (0.37, 0.93).

October 2021

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

•**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 proportion of blood donors with humoral immunity for SARS-CoV-2 was 98.01% (95% CI 97.65, 98.36%), slightly higher than September (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were very high (>2500 AU/mL) by July, but began to decrease in older individuals by September. In October values are still very high but gradually decreasing in all age groups. A peak in values followed by decline is expected after vaccination. These results are consistent with policies to vaccinate older age groups earlier.
- Similar to past reports, donors living in affluent neighbourhoods had higher seroprevalence rates, 99.25% (95% CI 98.72, 99.79%) compared to those living in the most materially deprived neighbourhoods, 97.13% (95% CI 95.64, 98.61%).
- Of 25,100 donors tested on 2 or more occasions since January 2021, the most common (55.2%) test profile was presumed unvaccinated to vaccinated (N negative S negative on their first tested donation and N negative S positive on their last tested donation). There were 15 presumed breakthrough infections (donors who were N negative S positive on their first tested donation and N positive S positive on their last tested donation).

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

- Seroprevalence (natural infection) in October was 4.26% (95% CI 3.85, 4.68%) similar to September, 2021 at 4.38% (95% CI 3.96, 4.81%).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (7.50% (95% CI 5.98, 9.01%)) compared to other age groups.
- Racialized groups have a higher seroprevalence rate (6.18% (95% CI 4.92, 7.45%)) compared to white donors (3.85% (95% CI 3.40, 4.31%)).

September 2021

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

•**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 proportion of blood donors with humoral immunity for SARS-CoV-2 was 97.03% (95% CI 96.62, 97.44%), slightly higher than August (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Spike antibody concentrations were very high (>2500 AU/mL) by July, but are beginning to decrease in older individuals by September. A peak in values followed by decline is expected after vaccination. These results are consistent with policies to vaccinate older age groups earlier.
- Similar to past reports, donors living in affluent neighbourhoods had higher seroprevalence rates, 97.56% (95% CI 96.83, 98.28%) compared to those living in the most materially deprived neighbourhoods, 94.72% (95% CI 92.93, 96.51%).
- Of 21,727 donors tested on 2 or more occasions since January 2021, the most common (54.0%) test profile was presumed unvaccinated to vaccinated (N negative S negative on their first tested donation and N negative S positive on their last tested donation). There were 12 presumed breakthrough infections (donors who were N negative S positive on their first tested donation and N positive S positive on their last tested donation).

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

- Seroprevalence (natural infection) in September was 4.38% (95% CI 3.96, 4.81%) similar to August, 2021 at 4.43% (95% CI 3.99, 4.86%).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (8.70% (95% CI 7.06, 10.34%)) compared to other age groups. Rates in the 60+ age group increased significantly in September (2.78% (95% CI 2.13, 3.43%)) compared to August (1.61% (95% CI 1.09, 2.12%)) while other age groups did not change.
- Racialized groups have a higher seroprevalence rate (7.61% (95% CI 6.24, 8.97%)) compared to white donors (3.65% (95% CI 3.20, 4.10%)).

## August 2021

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

### •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 proportion of blood donors with humoral immunity for SARS-CoV-2 was 96.09% (95% CI 95.63, 96.54) slightly up from July (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Median spike antibody concentrations increased in July compared to previous months ( $P < 0.001$ ) but increased even further in August ( $P < 0.001$ ).
- Similar to past reports, donors living in affluent neighbourhoods had higher seroprevalence rates, 98.25% (95% CI 97.56, 98.95%) compared to those living in the most materially deprived neighbourhoods, 93.41% (95% CI 91.45, 95.37%).
- Of 17,762 donors tested on 2 or more occasions since January 2021, the most common (52.9%) test profile was presumed unvaccinated to vaccinated (N negative S negative on their first tested donation and N negative S positive on their last tested donation). There were 11 presumed breakthrough infections (donors who were N negative S positive on their first tested donation and N positive S positive on their last tested donation).

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

- Seroprevalence (natural infection) in August was 4.43% (95% CI 3.99, 4.86%) similar to July, 2021 at 4.08% (95% CI 3.65, 4.51%).
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (8.44% (95% CI 6.80, 10.09%)) compared to other age groups. Rates in this age group were highest in Manitoba at 24.95% (95% CI 13.53, 36.37%).
- Racialized groups have a higher seroprevalence rate (11.14% (95% CI 9.14, 13.15%)) compared to white donors (3.30% (95% CI 2.86, 3.74%)). Natural infection rates in racialized donors also increased significantly compared to July. Compared to previous reports, the gap between those in materially deprived vs. affluent neighbourhoods has begun to widen likely due to the 4th wave, 7.85% (95% CI 5.87, 9.83%) vs 3.27% (95% CI 2.52, 4.02%).



## July 2021

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

### •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 proportion of blood donors with humoral immunity for SARS-CoV-2 was 94.69% (95% CI 94.16, 95.22) a significant increase from June (based on results from the Spike antibody assay). This was predominantly driven by vaccination.
- Median Spike antibody concentrations increased in June compared to previous months ( $P < 0.001$ ) but increased more in July ( $P < 0.001$ ).
- The seroprevalence of white donors (95.04% (95% CI 94.44, 95.64%)) was not different from racialized groups (93.82% (95% CI 92.48, 95.15%)), this gap has closed compared to earlier surveys. Similar to past reports, donors living in affluent neighbourhoods had higher seroprevalence rates, 96.72% (95% CI 95.82, 97.61%) compared to those living in the most materially deprived neighbourhoods, 92.94% (95% CI 90.89, 95.00%).
- Of 14, 201 donors tested on 2 or more occasions since January 2021 the most common (51.2%) test profile was N negative S negative on their first tested donation and N negative S positive on their last tested donation, most likely due to vaccination. There were 5 donors who were N negative S positive on their first tested donation and N positive S positive on their last tested donation, potentially breakthrough infections.

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

- Seroprevalence (natural infection) in July was 4.08% (95% CI 3.65, 4.51%), decreased from June, 2021.
- Natural seroprevalence in most provinces except Alberta plateaued, likely due to widescale vaccination and social restrictions.
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (6.71% (95% CI 5.17, 8.25%)) compared to other age groups, however, this number has decreased since June, 2021.
  - Rates in this age group were highest in Alberta at 11.88% (95% CI 6.80, 16.97%) and British Columbia at 9.91% (95% CI 5.44, 14.37%). Since June, 2021 these rates have decreased or stayed very similar in almost every province with the exception of British Columbia where they have increased.
- Racialized groups had a higher seroprevalence rate (7.29% (95% CI 5.95, 8.63%)) compared to white donors (3.33% (95% CI 2.87, 3.78%)). Compared to previous reports, the gap between those in materially deprived vs. affluent neighbourhoods is closing, 4.62% (95% CI 3.03, 6.22%) vs 3.87% (95% CI 3.02, 4.71%). However, those living in more socially deprived settings (had lower social contact) had lower seroprevalence rates compared to those that were least deprived, 3.35% (95% CI 2.39, 4.30%) vs. 5.63% (95% CI 4.47, 6.80%).

June 2021

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

•**Humoral Immunity (Based on results from the Roche S assay):**

- Roche S 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 Roche N and S positive results together likely have been infected and may or may not have been vaccinated.
- The proportion of blood donors with humoral immunity for SARS-CoV-2 was 90.78% (95% CI 90.32, 91.25) a significant increase from May (based on results from the Roche S assay). This was predominantly driven by vaccination.
- The proportion of blood donors with presumed vaccine-induced humoral immunity to SARS-CoV-2 was 86.05% (95% CI 85.50, 86.59%), a significant increase from May (based on results from the Roche S-only assay).
- White donors did not have different seroprevalence rates (Roche S, primarily vaccine-induced) (90.81% (95% CI 90.25, 91.35%)) compared to other racialized groups (91.37% (95% CI 90.27, 92.47%)), this gap has closed compared to previous surveys. However, white donors had higher seroprevalence rates (Roche S-only, presumed vaccine induced) (86.87% (95% CI 86.26, 87.49%)), compared to other racialized groups (83.14% (95% CI 81.72, 84.56%)) with a decreased difference between these two groups compared to May. Similarly, donors living in affluent neighbourhoods had higher seroprevalence rates (Roche S, primarily vaccine-induced), 93.68% (95% CI 92.90, 94.46%) compared to those living in the most materially deprived neighbourhoods, 88.33% (95% CI 86.60, 90.06%).

•**Natural Infections (Based on results from the Roche N assay):**

- Seroprevalence (natural infection) in June was 4.5% (95% CI 4.19, 4.83%), increased from May, 2021.
- Natural infections in most provinces except Alberta plateaued, likely due to widescale vaccination.
- Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate (9.3% (95% CI 8.04, 10.57%)) compared to other age groups.
  - Rates in this age group were highest in Alberta at 17.53% (95% CI 13.23, 21.82%), Saskatchewan at 14.26% (95% CI 6.66, 21.87%), and Manitoba at 15.56% (95% CI 8.46, 22.65%).
- Racialized groups had a higher seroprevalence rate (7.95% (95% CI 6.95, 8.95%)) compared to white donors (3.72% (95% CI 3.38, 4.06%)). Those living in materially deprived vs. affluent neighbourhoods had a higher rate of natural infections, 6.95% (95% CI 5.62, 8.27%) vs 4.26% (95% CI 3.66, 4.87%).

May 2021

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

- The proportion of blood donors with humoral immunity for SARS-CoV-2 was 63.9% (95% CI 63.2, 64.6) a significant increase from April (based on results from the Roche S assay). This was predominantly driven by vaccination.

• **Vaccine-Induced Humoral Immunity (Reactive to Roche S-only):**

- The proportion of blood donors with vaccine-induced humoral immunity to SARS-CoV-2 was 59.8% (95% 59.1, 60.6), a significant increase from April.
- White donors had higher seroprevalence rates (vaccine-induced) (61.8% (95% CI 60.9, 62.7) compared to other racialized groups (48.9% (95% CI 47.1, 50.7%). Similarly, donors living in affluent neighbourhoods also had higher seroprevalence rates 64.8% (95% CI 63.4, 66.2%) compared to those living in the most materially deprived neighbourhoods, 56.6% (95% CI 54.0, 59.1%).

• **Natural Infections (Based on results from the Roche N assay):**

- Seroprevalence (natural infection) in May was 4.0% (95% CI 3.7, 4.3), increased from April, 2021.
- Natural infections in most provinces except Ontario and Alberta plateaued, likely due to widescale vaccination.
- Consistent with previous surveys donors aged 17-24 years old had the highest seroprevalence rate (7.0% (95% CI 5.9, 8.1)) compared to other age groups.
  - Rates in this age group were highest in Alberta 12.7% (95% CI 9.0, 16.4) and Manitoba 11.3% (95% CI 5.2, 17.4).
- Racialized groups had a higher seroprevalence rate (7.4% (95% CI 6.5, 8.3)) compared to white donors (3.3% (95% CI 2.9, 3.6)). Those living in materially deprived vs. affluent neighbourhoods had a higher rate of natural infections 5.7% (95% CI 4.5, 6.8) vs 3.1% (95% CI 2.6, 3.6).

## April 2021

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

- The proportion of blood donors with humoral immunity to SARS-CoV-2 was 26.9% (95% CI 26.2, 27.6) a significant increase from March (based on results from the Roche S assay). This was predominantly driven by vaccination.

### • Vaccine-Induced Humoral Immunity (Reactive to Roche S-only):

- The proportion of blood donors with vaccine-induced humoral immunity to SARS-CoV-2 was 23.6% (95% CI 23.0, 24.3), a significant increase from March.
- Vaccine inequity emerged in April 2021.
- White donors had higher seroprevalence rates (vaccine-induced) (25.0% (95% CI 24.3, 25.8) compared to other racialized groups (17.9% (95% CI 16.5, 19.3%). Similarly, donors living in affluent neighbourhoods also had higher seroprevalence rates 26.9% (95% CI 25.6, 28.2%) compared to those living in the most materially deprived neighbourhoods, 20.9% (95% CI 18.8, 23.0%).

### • Natural Infections (Based on results from the Roche N assay):

- Seroprevalence (natural infection) in April was 3.2% (95% CI 3.0, 3.5), similar to March 2021.
- Natural infections in most provinces except Ontario decreased or plateaued, likely due to widescale vaccination.
- Consistent with previous surveys donors aged 17-24 years old had the highest seroprevalence rate (5.4% (95% CI 4.4, 6.3)) compared to other age groups.
- Rates in this age group were significantly higher in Alberta 8.9% (95% CI 5.7, 12.0) and Manitoba 15.0% (95% CI 7.9, 22.0) compared to the full sample.
- Racialized groups had a higher seroprevalence rate (5.3% (95% CI 4.4, 6.1)) compared to white donors (2.8 (95% CI 2.5, 3.1)). Those living in materially deprived vs. affluent neighbourhoods had a higher rate of natural infections 4.6% (95% CI 3.5, 5.7) vs 2.7% (95% CI 2.2, 3.2).

## March 2021

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

- Serological testing using the Roche nucleocapsid (N) and the Roche spike (S) total antibody assays allows us to monitor trends in natural infection transmission and vaccine-induced seropositivity.
- Overall, as of March 2021 adjusted seroprevalence by the Roche S assay (proxy for humoral immunity, vaccine or natural infection immunity) was 9.9% (95% CI 9.4, 10.3). The fraction of the population naturally exposed as opposed to developing immunity post-vaccination varied across Canada.
- Adjusted seroprevalence by the Roche S assay alone (N negative, proxy for vaccine-induced immunity) was 6.8% (95% CI 6.4, 7.16) a significant increase from January.
- Using self-reported vaccine history the Roche S assay alone had a sensitivity of 96.1% to identify vaccination (after 2 weeks)
- Despite broader access to COVID-19 vaccines, seroprevalence by the Roche N assay (proxy for natural infections) continued to increase from January (2.2% (95% CI 2.1, 2.4) to March (3.3% (95% CI 3.0, 3.5))
- Consistent with previous surveys, donors aged 17-24 years old demonstrated the highest seroprevalence rate (natural infection immunity) 6.37% (5.31, 7.44) compared to other age groups. Rates in this age group were significantly higher in Alberta 14.7% (95% CI 10.8, 18.6) and Manitoba 20.8% (95% CI 12.3, 28.0) than for the full sample.
- The disparities in natural infection immunity seroprevalence rates between racialized groups and white donors and those living in materially deprived vs. affluent neighbourhoods narrowed for the first time since November 2020 when disparities began to widen.

## January 2021 (Roche)

January 1-27, 2021 (n=33,400 Roche)

- In order to evaluate seroprevalence in the vaccine era, residual blood is now tested using the Roche Elecsys® Anti-SARS-CoV-2 Spike (S) (semi-quantitative) and N (qualitative) assays. All vaccines will produce antibodies to S but not N, and natural infection will usually produce antibodies to S and N.
- In January 2021, seroprevalence estimates were higher by the Roche S assay (2.78% (95% CI 2.58, 2.97%) compared to either nucleocapsid assays. Seroprevalence by the Roche N assay was 2.24% (95% CI 2.08, 2.41) comparable to the Abbott N (1.99% (95% CI 1.84, 2.15)).
- **New:** 511 (1.5%) of donors self-reported vaccination against COVID-19 in the last 3 months in January 2021.

## January 2021

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

- Seroprevalence in January was 1.99% (95% CI 1.84, 2.15)
- Across Canada seroprevalence remained the highest in Manitoba (3.92% (95% CI 2.92, 4.93)) and lowest in PEI (0%)
- Seroprevalence increased significantly in Ontario (1.16% vs 1.82%) and in Alberta (2.12% to 3.41%) from December 2020 until January 2021
- Consistent with previous surveys, donors aged 17-24 years old the highest seroprevalence rate (3.45% (95% CI 2.87, 4.02)).
- Disparities by socioeconomic status and racialized groups widened. Donors living in the most materially deprived neighbourhoods were nearly 4-times more likely to be positive than those living in affluent neighbourhoods (4.04% compared with 1.17%) . Racialized groups of donors were two time more likely to be positive than self identified white donors (3.37% compared to 1.66%)
- Detailed comparison with the previous survey (December 2020) is included.

## December 2020

### December 10-23, 2020 (n=16,961)

- Seroprevalence in December was 1.37% (95% CI 1.18, 1.56)
- Regional variation: Across Canada seroprevalence remained the highest in Manitoba (3.02% (95% CI 1.75, 4.29)) however this was a significant decrease from the last report.
- Donors aged 17-24 years old remained the age group with the highest seroprevalence (2.75% (95% CI 2.01, 3.49))
- Disparities by socioeconomic status widened, donors living in the most materially deprived neighbourhoods were 3-times more likely to be positive than those living in affluent neighbourhoods (2.2% compared with 0.72%)
- **New:** Longitudinal data on repeat donors illustrating waning S/co ratios over time

## November 2020

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

- Seroprevalence in November was 1.51% (95% CI 1.31, 1.71)
- Regional variation: Seroprevalence increased mostly in Western Canada. Highest rates were observed in the Prairies; Manitoba's rate increased to 8.56% (95% CI 6.51, 10.62) and Saskatchewan's rate increased to 4.2% (95% CI 2.3, 5.8). There was a slight decrease in Ontario to 0.77% (95% CI 0.56, 0.97%) and PEI remained at 0.
- Donors aged 17-24 years old had the highest seroprevalence rates 2.97% (95% CI 2.20, 3.37%) while donors 40-59 years old 1.09% (95% CI 0.80, 1.38%) had the lowest rates.
- New: Revised time series (Additional data from the correlates of immunity study from April until Aug 31, 2020 are included in this report)
- Comparison of Wave 1 (May-July) to November 2020

## October 2020

### October 12-31, 2020 (n=16,811)

- Seroprevalence increased significantly in October to 0.88% (95% CI 0.73, 1.04) (p=0.04).
- Regional variation: Manitoba's seroprevalence rate increased to 2.96% (95% CI 1.70, 4.23), the highest in Canada. Ontario remained stable at 0.87% (0.65, 1.08)
- New: Heat maps to illustrate inter-provincial variation (by economic regions)
- Disparities widen: Donors that self-identified as white (0.75%; 95% CI 0.61, 0.92) had significantly lower seroprevalence compared to other racialized groups (1.82%; 95% CI 1.21, 2.62)

## Wave 1

### May 9, 2020- July 21, 2020 (n=74,642)

- Seroprevalence was estimated at 0.70% (95% CI 0.63, 0.77)
- Regional variation: Ontario, 0.88% (95% CI 0.78, 0.99) had the highest seroprevalence, very low seroprevalence in Atlantic provinces.
- Disparities: Donors that self-identified as white (0.66%; 95% CI 0.59, 0.74) had lower seroprevalence compared to racialized groups (1.09%; 95% CI 0.84, 1.34)

## 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). This was followed by a third wave that emerged in many regions across Canada in March 2021, which then subsided in late April. A fourth wave of this epidemic began in early August 2021 and subsided by the end of October. Finally, in mid-December 2021, a fifth wave began. As of February 28, 2022, 3,293,908 cases of COVID-19 had been reported in Canada.

Beginning in January 2021, the dominant variant of concern (VOC) in Canada was Alpha (B.1.1.7). Alpha remained the dominant VOC in the Canadian population until late June 2021 when Delta (B.1.617.2) became dominant. Beginning in mid-December 2021, a new more contagious VOC named Omicron (B.1.1.529) has become the most dominant VOC in the Canadian population. By late December 2021 public health testing facilities were overwhelmed and restrictions on testing were implemented in many jurisdictions. Because many people with symptoms were not being tested, as well as those infected but without symptoms, the reported cases underestimate the infection rate. Surveillance studies that monitor SARS-CoV-2 antibodies are important to understand what proportion of the population have detectable antibodies (the seroprevalence) and to monitor trajectories over the course of the pandemic. This information improves mathematical models to predict the course of infection and informs public health policies.

Antibody concentrations typically peak within a month of vaccination and then gradually decrease. Antibody concentrations can be much higher after a second or third dose of vaccine, or when an infection occurs pre- or post-vaccination. More than 84% of the eligible (5 and older) population had received two doses as of February 28, 2022. Starting in November 2021, some Canadians became eligible for a third dose. By February 28, 2022, over 55% of the eligible population (18 and older) had received a third dose. 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 distinguishing natural and likely vaccine induced humoral immunity. 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, 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 if they have been in contact with someone who was infected or if they have had the infection for 2 weeks after symptoms disappear (3 weeks if hospitalized). Donors also have their temperature checked before they enter the clinic, and their hemoglobin level is 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°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 stored but not tested). In January 2021 a larger sample was tested and in February samples were stored but not tested. As of March, 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.

		2020																													
		March			April			May			June			July			August			September			October			November			December		
Seroprevalence <sup>1</sup>									14,541			51,963			21,594									16,811			17,049			16,963	
Correlates of Immunity Study <sup>2</sup>																															
		2021																													
	January	February		March		April		May		June		July		August		September		October		November		December									
Seroprevalence <sup>1</sup>	34,921					16,873		16,931		17,001		16,884		8,457		9,109		9,363		9,627		9,018						16,811			
Correlates of Immunity Study <sup>2</sup>																															
		2022																													
	January	February		March																											
Seroprevalence <sup>1</sup>			32,505			28,616																									
Orthogonal Testing <sup>2</sup>																															

<sup>1</sup> 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).

<sup>2</sup> 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  $\geq 0.8$  U/mL, the Spike antibody assay was assumed to have sensitivity of 98.8% and specificity of 99.6%. At a concentration of  $\geq 1.0$  U/mL, the Nucleocapsid antibody assay was assumed to have sensitivity of 99.5% and specificity of 99.8%<sup>1</sup>. All testing was conducted at Canadian Blood Services laboratories in Ottawa.

Samples from January to August were tested neat and at a 1:10 dilution for Spike antibody, however, by June many samples were above the maximum detection level when diluted. From September 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<sup>2</sup>. 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, racialized groups, 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<sup>3</sup>. 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.

Donors who donated more than once since testing began with the Roche assay in January 2021 and whose samples were selected for seroprevalence testing (at least two samples tested per donor) were included in a separate dataset for analysis and are referred to as “repeat donors”. At monthly intervals, beginning with June 2021, donations from repeat donors were evaluated for potential incident infections. If a donor was S positive and N negative on their previous donation (presumed vaccinated) before the month being observed and then was S positive N positive on their following donation in the corresponding month (eg. June), this was considered a potential incident breakthrough infection. Percent incidence for each month was calculated by dividing the number of new incident infections (S positive N positive) in that month by the total number of donors who tested S positive N negative on their previous donation prior to the corresponding month. This same approach was used to evaluate incident cases among donors

who were S negative and N negative (presumed unvaccinated) on their previous donation who then were S positive N positive on their following donation in the corresponding month.

## Results

Between February 1 and 28 2022, a total of 28,616 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 99.60% (95% CI 99.45, 99.75%). The adjusted seroprevalence by Nucleocapsid antibody (proxy for natural infection) was 23.68% (95% CI 23.18, 24.18%) (please refer to points of interpretation). There was a gradual increase over the 28-day reporting period from 21.39% (20.31, 22.48) to 23.43% (22.41, 24.45) to 23.68% (22.77, 24.58) to 25.25% (95% CI 24.30, 26.20) consistent with emergence of the Omicron variant.

Figure 1 illustrates temporal trends of SARS-CoV-2 seroprevalence from April 4, 2020, until February 28, 2022, 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 S assay, from early-March 2021 onwards, mirroring wider vaccine roll out. Figure 2 (A-E) stratifies seroprevalence by regions. Most of the humoral immunity was induced by vaccines (compared to natural infections) across the country. The largest increase in seroprevalence using Roche N was seen in February 2022 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 2A compares temporal changes in seroprevalence rates by natural infection (**Nucleocapsid antibody** between January 2022 and February 2022). Overall, the seroprevalence rate for natural infections was higher in February (23.68% (95% CI 23.18, 24.18) compared to January 12.12% (95% CI 11.76, 12.48%) ( $P < 0.0001$ ), and natural infections increased compared to the previous month across all demographics. Donors aged 17-24 years old continued to have the highest seroprevalence rate at 36.27% (95% CI 34.68, 37.86%) compared to other age groups.

Table 2B illustrates increases in seroprevalence by **Spike antibody** (proxy for humoral immunity), in many sociodemographic variables between January and February. In February, nearly all sociodemographic groups had at least 99% seroprevalence.

After vaccination an increase in antibody concentration followed by gradual decline is expected. From September 2021 to February 2022 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 S antibody concentrations by age group from September to February.

From June to October 2021 the percentage of incident breakthrough infections were rare and varied by month with no clear trend (See Table 3). There was a small increase over November and December which increased in January and in February was 15.56% (95% CI 14.72, 16.42). Table 4 shows the percentage of incident cases by month in likely unvaccinated donors. Since June the percentage slowly increased to 3.91% (3.11, 4.83) in December then increasing much further to February 23.71% (95% CI 22.10, 25.37).

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 (ethnicity, age, material deprivation, and social deprivation) from January 2021 to February 2022. Differences in natural infections between white and racialized groups were seen from January 2021 to February 2022 with 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 February by region (Nucleocapsid and Spike), and additional weekly breakdown of Nucleocapsid results are shown in Tables A 2.1 and A 2.2

## Conclusion

As of February 2022, adjusted seroprevalence by the Spike antibody assay (proxy for humoral immunity) was 99.60% (95% CI 99.45, 99.75%). While humoral immunity was largely driven by vaccination, the fraction of the population naturally exposed has increase sharply since December consistent with the arrival of the Omicron variant. Among repeat tested donors, breakthrough infections in unvaccinated donors have increased slowly since June and more substantially in February 2022.

## 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-represented. 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 23.74% (95% CI 23.25, 24.24), and after weighting

factors applied it was 23.71% (95% CI 23.22, 24.21), then after the weighted seroprevalence was adjusted for sensitivity and specificity, 23.68% (95% CI 23.18, 24.18). Using the Spike antibody assay, the unweighted SARS-CoV-2 seroprevalence for the full sample was 98.22% (95% CI 98.07, 98.37), and after weighting factors applied it was 98.42% (95% CI 98.27, 98.56), then after the weighted seroprevalence was adjusted for sensitivity and specificity, 99.6% (95% CI 99.45, 99.75).

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. Most Spike antibody positive results are related to vaccination. However, some Spike antibody positives may be 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 February the most common positive antibody profile was positive on Spike antibody and negative on Nucleocapsid antibody (see below).

### Diagnostic phenotypes in February 2022 (unadjusted)

	Nucleocapsid Antibody	Spike Antibody	Total N (%)
	Negative	Negative	438 (1.5%)
	Negative	Positive	21,385 (74.7%)
	Positive	Negative	70 (0.2%)
	Positive	Positive	6,723 (23.5%)
Total			28,616

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**Table 1.** Comparing SARS-CoV-2 seroprevalence by sociodemographic variables by Nucleocapsid and Spike antibody results in February 2022

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
<b>Sex</b>								
Female	12,659	2,945	22.09	21.42, 22.77	12,659	12,476	99.85	99.66, 100.00
Male	15,957	3,848	25.36	24.63, 26.09	15,957	15,632	99.33	99.11, 99.56
<b>Age</b>								
17-24	2,203	814	36.27	34.68, 37.86	2,203	2,185	100.00	100.00, 100.00
25-39	7,755	2,400	30.99	29.90, 32.08	7,755	7,624	99.54	99.24, 99.85
40-59	10,741	2,610	23.62	22.78, 24.45	10,741	10,542	99.41	99.14, 99.67
60+	7,917	969	11.87	11.15, 12.58	7,917	7,757	99.49	99.21, 99.78
<b>Province</b>								
British Columbia	4,438	1,116	25.52	24.32, 26.73	4,438	4,368	99.68	99.34, 100.00
Alberta	5,560	1,691	31.79	30.38, 33.19	5,560	5,427	98.88	98.43, 99.34
Saskatchewan	1,213	281	22.28	19.81, 24.75	1,213	1,185	98.98	98.10, 99.86
Manitoba	1,479	411	28.05	25.61, 30.50	1,479	1,451	99.13	98.35, 99.91
Ontario	13,633	3,061	22.65	21.96, 23.34	13,633	13,397	99.67	99.47, 99.87
New Brunswick	797	74	9.82	7.76, 11.89	797	794	100.00	100.00, 100.00
Nova Scotia	962	117	12.77	10.69, 14.85	962	956	100.00	99.98, 100.00
Prince Edward Island	140	10	7.21	3.05, 11.36	140	138	99.40	97.30, 100.00
Newfoundland	394	32	8.18	5.87, 10.50	394	392	100.00	99.54, 100.00
<b>Metro area</b>								
Vancouver	2,384	730	30.12	28.43, 31.82	2,384	2,351	99.85	99.43, 100.00
Calgary	2,285	695	31.76	29.33, 34.19	2,285	2,242	99.44	98.75, 100.00
Edmonton	1,753	478	27.97	25.74, 30.20	1,753	1,719	99.30	98.62, 99.98



COVID-19 Seroprevalence Report  
February Survey

Ottawa	1,151	195	17.38	15.31, 19.46	1,151	1,145	100.00	99.99, 100.00
Toronto	4,645	1,221	25.71	24.59, 26.82	4,645	4,594	100.00	99.88, 100.00
Winnipeg	1,029	249	23.96	21.11, 26.81	1,029	1,019	99.90	99.14, 100.00
<b>Ethnicity<sup>1,2</sup></b>								
White	21,522	4,630	21.17	20.62, 21.72	21,522	21,131	99.57	99.40, 99.74
Indigenous	383	96	23.88	19.69, 28.08	383	376	99.16	97.76, 100.00
Asian	1,466	423	29.06	26.81, 31.31	1,466	1,458	100.00	100.00, 100.00
Other racialized groups	3,120	1,118	36.79	35.12, 38.46	3,120	3,073	99.74	99.33, 100.00
<b>Social Deprivation<sup>3</sup></b>								
1 (least deprived)	5,402	1,402	26.19	25.00, 27.38	5,402	5,316	99.86	99.55, 100.00
2	5,482	1,214	21.86	20.77, 22.95	5,482	5,381	99.53	99.19, 99.87
3	5,040	1,158	22.98	21.81, 24.15	5,040	4,944	99.50	99.14, 99.86
4	4,587	1,084	23.70	22.47, 24.94	4,587	4,511	99.66	99.30, 100.00
5 (most deprived)	4,759	1,084	22.24	21.04, 23.44	4,759	4,672	99.55	99.18, 99.92
<b>Material Deprivation<sup>3</sup></b>								
1 (least deprived)	7,647	1,744	22.39	21.44, 23.34	7,647	7,554	100.00	99.94, 100.00
2	6,110	1,337	22.10	21.04, 23.15	6,110	6,004	99.70	99.39, 100.00
3	5,156	1,182	22.83	21.67, 23.99	5,156	5,046	99.26	98.88, 99.65
4	3,977	971	24.48	23.15, 25.81	3,977	3,893	99.31	98.89, 99.74
5 (most deprived)	2,380	708	28.90	27.13, 30.67	2,380	2,327	98.93	98.35, 99.52
<b>Total</b>	<b>28,616</b>	<b>6,793</b>	<b>23.68</b>	<b>23.18, 24.18</b>	<b>28,616</b>	<b>28,108</b>	<b>99.60</b>	<b>99.45, 99.75</b>

<sup>1</sup> Self reported ethnicity was missing for 2125 (7.4%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 24.82% (95% CI 22.95, 26.68); and Spike antibody was 98.82% (95% CI 98.16, 99.47).

<sup>2</sup> Combining all racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 33.45% (95% CI 32.16, 34.73) by the Nucleocapsid antibody assay, and 99.99% (95% CI 99.69, 100.00) by Spike antibody.

<sup>3</sup> Postal Codes were missing for 3,346 (11.7%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 25.83% (95% CI 24.32, 27.34) and Spike antibody was 99.43% (95% CI 98.98, 99.89).

**Table 2a.** Changes in SARS-CoV-2 seroprevalence by **Nucleocapsid Antibody assay (proxy for natural infection)** by sociodemographic variables between January and February 2022

January 2022 (crude)		January 2022 (adjusted)		February 2022 (crude)		February 2022 (adjusted)		P-Value*
Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	
<b>Sex</b>								
Female	13,912	1,537	11.31 10.82, 11.79	12,659	2,945	22.09 21.42, 22.77		<0.0001
Male	18,593	2,184	12.98 12.45, 13.51	15,957	3,848	25.36 24.63, 26.09		<0.0001
<b>Age</b>								
17-24	2,412	531	22.22 20.93, 23.51	2,203	814	36.27 34.68, 37.86		<0.0001
25-39	8,856	1,319	15.42 14.62, 16.22	7,755	2,400	30.99 29.90, 32.08		<0.0001
40-59	11,876	1,294	10.91 10.33, 11.49	10,741	2,610	23.62 22.78, 24.45		<0.0001
60+	9,361	577	6.30 5.79, 6.80	7,917	969	11.87 11.15, 12.58		<0.0001
<b>Province</b>								
British Columbia	5,305	587	11.82 10.97, 12.66	4,438	1,116	25.52 24.32, 26.73		<0.0001
Alberta	6,741	1,050	16.78 15.72, 17.84	5,560	1,691	31.79 30.38, 33.19		<0.0001
Saskatchewan	1,553	167	11.53 9.75, 13.30	1,213	281	22.28 19.81, 24.75		<0.0001
Manitoba	2,001	301	16.26 14.36, 18.16	1,479	411	28.05 25.61, 30.50		<0.0001
Ontario	13,085	1,494	12.13 11.62, 12.64	13,633	3,061	22.65 21.96, 23.34		<0.0001
New Brunswick	1,192	28	2.43 1.38, 3.47	797	74	9.82 7.76, 11.89		<0.0001
Nova Scotia	1,712	76	3.80 2.66, 4.95	962	117	12.77 10.69, 14.85		<0.0001
Prince Edward Island	400	6	1.52 0.00, 3.45	140	10	7.21 3.05, 11.36		0.013
Newfoundland	516	12	2.10 0.93, 3.26	394	32	8.18 5.87, 10.50		<0.0001

COVID-19 Seroprevalence Report  
February Survey

<b>Metro area</b>									
Vancouver	3,024	437	14.83	13.65, 16.00	2,384	730	30.12	28.43, 31.82	<0.0001
Calgary	2,501	382	15.97	14.12, 17.82	2,285	695	31.76	29.33, 34.19	<0.0001
Edmonton	2,280	298	13.91	12.22, 15.60	1,753	478	27.97	25.74, 30.20	<0.0001
Ottawa	1,608	126	7.61	6.03, 9.18	1,151	195	17.38	15.31, 19.46	<0.0001
Toronto	3,672	603	16.33	15.42, 17.23	4,645	1,221	25.71	24.59, 26.82	<0.0001
Winnipeg	1,328	140	10.79	8.70, 12.88	1,029	249	23.96	21.11, 26.81	<0.0001
<b>Ethnicity<sup>1,2</sup></b>									
White	24,932	2,539	10.73	10.34, 11.12	21,522	4,630	21.17	20.62, 21.72	<0.0001
Indigenous	440	38	8.80	6.11, 11.50	383	96	23.88	19.69, 28.08	<0.0001
Asian	1,484	180	12.89	11.25, 14.52	1,466	423	29.06	26.81, 31.31	<0.0001
Other racialized groups	3,199	680	22.03	20.64, 23.41	3,120	1,118	36.79	35.12, 38.46	<0.0001
<b>Social Deprivation<sup>3</sup></b>									
1 (least deprived)	6,012	805	14.07	13.18, 14.96	5,402	1,402	26.19	25.00, 27.38	<0.0001
2	6,123	698	11.89	11.06, 12.71	5,482	1,214	21.86	20.77, 22.95	<0.0001
3	5,832	588	10.52	9.73, 11.32	5,040	1,158	22.98	21.81, 24.15	<0.0001
4	5,419	575	11.34	10.49, 12.19	4,587	1,084	23.70	22.47, 24.94	<0.0001
5 (most deprived)	5,414	579	11.46	10.60, 12.31	4,759	1,084	22.24	21.04, 23.44	<0.0001
<b>Material Deprivation<sup>3</sup></b>									
1 (least deprived)	8,641	919	11.27	10.58, 11.95	7,647	1,744	22.39	21.44, 23.34	<0.0001
2	7,120	789	11.47	10.71, 12.23	6,110	1,337	22.10	21.04, 23.15	<0.0001
3	5,795	623	11.26	10.44, 12.08	5,156	1,182	22.83	21.67, 23.99	<0.0001
4	4,622	536	12.35	11.41, 13.28	3,977	971	24.48	23.15, 25.81	<0.0001

COVID-19 Seroprevalence Report  
February Survey

5 (most deprived)	2,622	378	15.18	13.84, 16.51	2,380	708	28.9	27.13, 30.67	<0.0001
<b>Total</b>	<b>32,505</b>	<b>3,721</b>	<b>12.12</b>	<b>11.76, 12.48</b>	<b>28,616</b>	<b>6,793</b>	<b>23.68</b>	<b>23.18, 24.18</b>	<b>&lt; 0.0001</b>

\*P-value reflects the difference between January and February results.

<sup>1</sup> In January, self reported ethnicity was missing for 2450 (7.5%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 11.94% (95% CI 10.63, 13.26). In February, Self reported ethnicity was missing for 2125 (7.4%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 24.82% (95% CI 22.95, 26.68).

<sup>2</sup> In January, combining all racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 18.29% (95% CI 17.27, 19.32) by the Nucleocapsid antibody assay. In February, combining all racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 33.45% (95% CI 32.16, 34.73) by the Nucleocapsid antibody assay.

<sup>3</sup> In January, postal codes were missing for 3,705 (11.4%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 14.00% (95% CI 12.86, 15.14). In February, postal codes were missing for 3,346 (11.7%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 25.83% (95% CI 24.32, 27.34).

**Table 2b.** Changes in SARS-CoV-2 seroprevalence using Spike antibody results (proxy for natural infection or vaccine induced immunity) by sociodemographic variables between January and February 2022

January 2022 (crude)		January 2022 (adjusted)		February 2022 (crude)		February 2022 (adjusted)		P-Value*
Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	
<b>Sex</b>								
Female	13,912	13,638	99.23 99.02, 99.44	12,659	12,476	99.85 99.66, 100.00		<0.0001
Male	18,593	18,111	98.54 98.28, 98.79	15,957	15,632	99.33 99.11, 99.56		<0.0001
<b>Age</b>								
17-24	2,412	2,370	99.46 99.05, 99.87	2,203	2,185	100.00 100.00, 100.00		0.0001
25-39	8,856	8,639	98.65 98.30, 99.00	7,755	7,624	99.54 99.24, 99.85		0.0002
40-59	11,876	11,579	98.66 98.37, 98.95	10,741	10,542	99.41 99.14, 99.67		0.0002
60+	9,361	9,161	99.15 98.85, 99.44	7,917	7,757	99.49 99.21, 99.78		0.0992
<b>Province</b>								
British Columbia	5,305	5,184	98.83 98.43, 99.23	4,438	4,368	99.68 99.34, 100.00		0.0016
Alberta	6,741	6,543	98.03 97.53, 98.52	5,560	5,427	98.88 98.43, 99.34		0.0138
Saskatchewan	1,553	1,517	98.76 97.91, 99.62	1,213	1,185	98.98 98.10, 99.86		0.7262
Manitoba	2,001	1,942	98.00 97.09, 98.90	1,479	1,451	99.13 98.35, 99.91		0.066
Ontario	13,085	12,792	99.08 98.86, 99.31	13,633	13,397	99.67 99.47, 99.87		0.0002
New Brunswick	1,192	1,167	99.13 98.19, 100.00	797	794	100.00 100.00, 100.00		0.001
Nova Scotia	1,712	1,695	100.00 99.40, 100.00	962	956	100.00 99.98, 100.00		0.2009
Prince Edward Island	400	397	99.44 97.48, 100.00	140	138	99.40 97.30, 100.00		0.9038
Newfoundland	516	512	100.00 99.30, 100.00	394	392	100.00 99.54, 100.00		0.5881

COVID-19 Seroprevalence Report  
February Survey

<b>Metro area</b>									
Vancouver	3,024	2,966	99.40	98.96, 99.84	2,384	2,351	99.85	99.43, 100.00	0.1543
Calgary	2,501	2,448	99.20	98.49, 99.91	2,285	2,242	99.44	98.75, 100.00	0.6314
Edmonton	2,280	2,225	98.74	97.98, 99.50	1,753	1,719	99.30	98.62, 99.98	0.2842
Ottawa	1,608	1,599	100.00	99.94, 100.00	1,151	1,145	100.00	99.99, 100.00	0.9633
Toronto	3,672	3,615	99.78	99.49, 100.00	4,645	4,594	100.00	99.88, 100.00	0.0472
Winnipeg	1,328	1,304	99.30	98.38, 100.00	1,029	1,019	99.90	99.14, 100.00	0.1623
<b>Ethnicity<sup>1,2</sup></b>									
White	24,932	24,346	98.83	98.64, 99.02	21,522	21,131	99.57	99.40, 99.74	<0.0001
Indigenous	440	428	98.61	97.10, 100.00	383	376	99.16	97.76, 100.00	0.6025
Asian	1,484	1,471	100.00	99.96, 100.00	1,466	1,458	100.00	100.00, 100.00	0.2349
Other racialized groups	3,199	3,139	99.47	99.03, 99.90	3,120	3,073	99.74	99.33, 100.00	0.3723
<b>Social Deprivation<sup>3</sup></b>									
1 (least deprived)	6,012	5,855	98.65	98.25, 99.06	5,402	5,316	99.86	99.55, 100.00	<0.0001
2	6,123	5,972	98.64	98.23, 99.04	5,482	5,381	99.53	99.19, 99.87	0.0010
3	5,832	5,721	99.30	98.95, 99.65	5,040	4,944	99.50	99.14, 99.86	0.4463
4	5,419	5,304	99.14	98.76, 99.52	4,587	4,511	99.66	99.30, 100.00	0.0557
5 (most deprived)	5,414	5,292	98.99	98.60, 99.39	4,759	4,672	99.55	99.18, 99.92	0.0440
<b>Material Deprivation<sup>3</sup></b>									
1 (least deprived)	8,641	8,509	99.82	99.57, 100.00	7,647	7,554	100.00	99.94, 100.00	0.0331
2	7,120	6,984	99.27	98.94, 99.60	6,110	6,004	99.70	99.39, 100.00	0.0628
3	5,795	5,641	98.57	98.16, 98.99	5,156	5,046	99.26	98.88, 99.65	0.0171
4	4,622	4,491	98.28	97.80, 98.76	3,977	3,893	99.31	98.89, 99.74	0.0018

COVID-19 Seroprevalence Report  
February Survey

5 (most deprived)	2,622	2,519	97.40	96.69, 98.11	2,380	2,327	98.93	98.35, 99.52	0.0013
<b>Total</b>	<b>32,505</b>	<b>31,749</b>	<b>98.89</b>	<b>98.73, 99.06</b>	<b>28,616</b>	<b>28,108</b>	<b>99.60</b>	<b>99.45, 99.75</b>	<b>&lt;0.0001</b>

\*P-value reflects the difference between January and February results.

<sup>1</sup> In January, self reported ethnicity was missing for 2450 (7.5%) donors; Adjusted seroprevalence by the Spike antibody was 97.63% (95% CI 96.88, 98.38). In February, self reported ethnicity was missing for 2125 (7.4%) donors; Adjusted seroprevalence by the Spike antibody was 98.82% (95% CI 98.16, 99.47).

<sup>2</sup> In January, combining all racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 99.71% (95% CI 99.39, 100.00) by Spike antibody. In February, combining all racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 99.99% (95% CI 99.69, 100.00) by Spike antibody.

<sup>3</sup> In January, postal codes were missing for 3,705 (11.4%) of donors; Adjusted seroprevalence by the Spike antibody was 98.53% (95% CI 98.00, 99.06). In February, postal codes were missing for 3,346 (11.7%) of donors; Adjusted seroprevalence by the Spike antibody was 99.43% (95% CI 98.98, 99.89).

**Table 3.** SARS-CoV-2 incidence among anti-S positive donors by month from June 2021 – February 2022.

Month	Total donors tested	Repeat Donors	Previous S positive, N negative	S Positive, N Positive		
				N	%	95% CI
Jun	16884	4452	929	2	0.22	0.03, 0.78
Jul	8457	2853	1054	5	0.47	0.15, 1.10
Aug	9109	5400	2719	8	0.29	0.13, 0.58
Sep	9363	5728	2915	3	0.10	0.02, 0.30
Oct	9627	5898	3313	12	0.36	0.19, 0.63
Nov	9018	5290	3318	20	0.60	0.37, 0.93
Dec	16816	5560	3241	24	0.74	0.48, 1.10
Jan	32505	11296	6973	362	5.19	4.68, 5.74
Feb	28616	10200	7065	1099	15.56	14.72, 16.42

Note: A donation was considered a potential breakthrough incident infection if donors tested S positive and N negative on their previous donation and then tested S positive and N positive on their following donation.

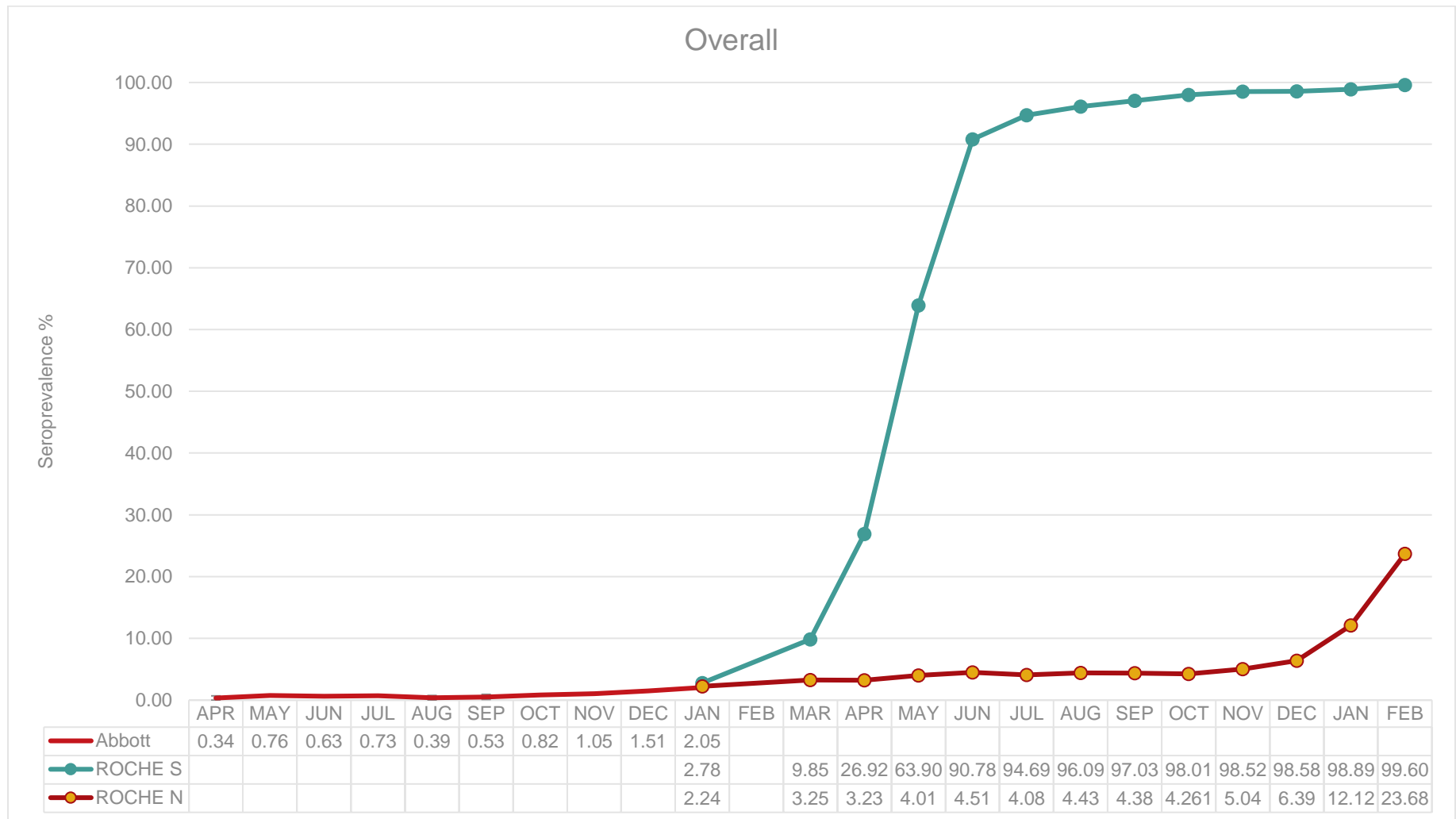


**Table 4.** SARS-CoV-2 incidence among anti-S negative donors by month from June 2021 – February 2022.

Month	Total donors tested	Repeat Donors	Previous S negative, N negative	S Positive, N Positive		
				N	%	95% CI
Jun	16884	4452	3409	52	1.53	1.14, 2.00
Jul	8457	2853	1697	24	1.41	0.91, 2.10
Aug	9109	5400	2487	29	1.17	0.78, 1.67
Sep	9363	5728	2628	53	2.02	1.51, 2.63
Oct	9627	5898	2385	61	2.56	1.96, 3.27
Nov	9018	5290	1754	56	3.19	2.42, 4.13
Dec	16817	5560	2073	81	3.91	3.11, 4.83
Jan	32505	11296	3924	358	9.12	8.24, 10.07
Feb	28616	10200	2666	632	23.71	22.10, 25.37

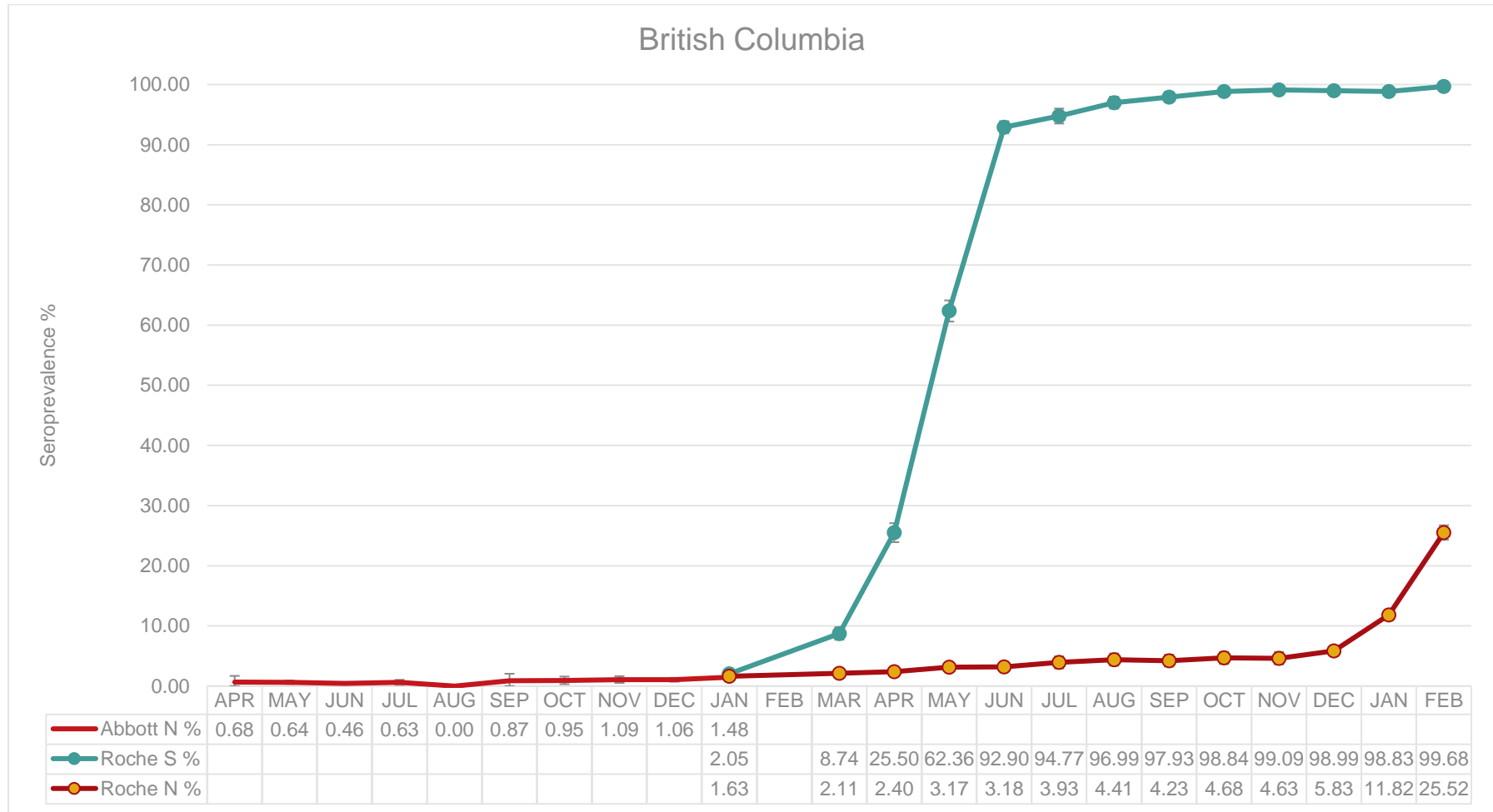
Note: A donation was considered a potential incident infection if donors tested S negative and N negative on their previous donation and then tested S positive and N positive on their following donation.

**Figure 1.** Overall temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from April 2020-February 2022 (comparing results from Abbott N (until January 2021) followed by seroprevalence estimated by Roche N and Roche S results.



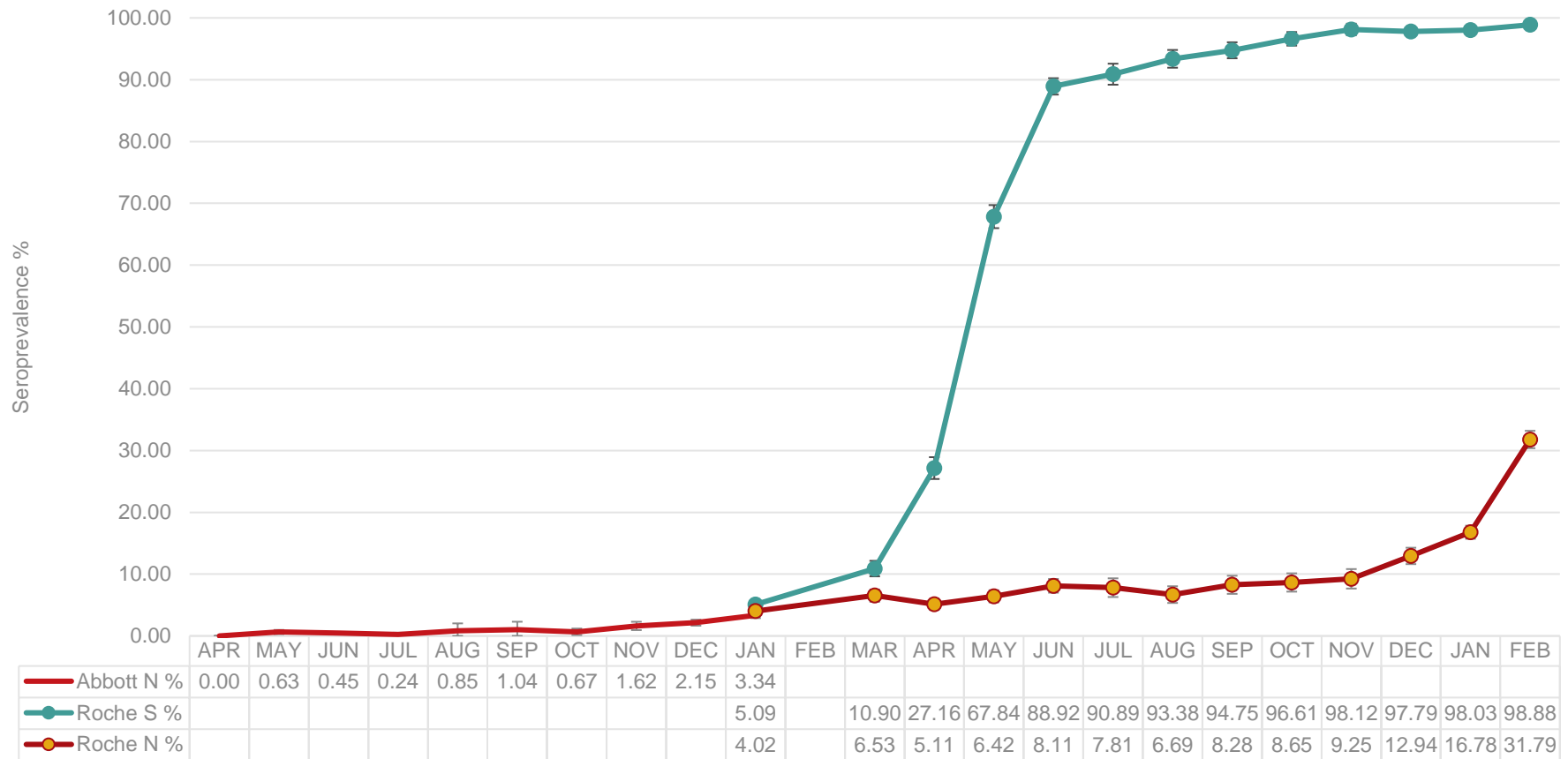
Notes: SARS-CoV-2 seroprevalence rates (95% CI), that have been weighted and adjusted for test characteristics. Data from the CIHR funded study (Correlates of Immunity) from April 9, 2020-January 31, 2021, have been included.

**Figure 2.** Regional temporal trends of SARS-CoV-2 seroprevalence monthly from April 2020-February 2022 (by Abbott N, Roche N and Roche S assays)

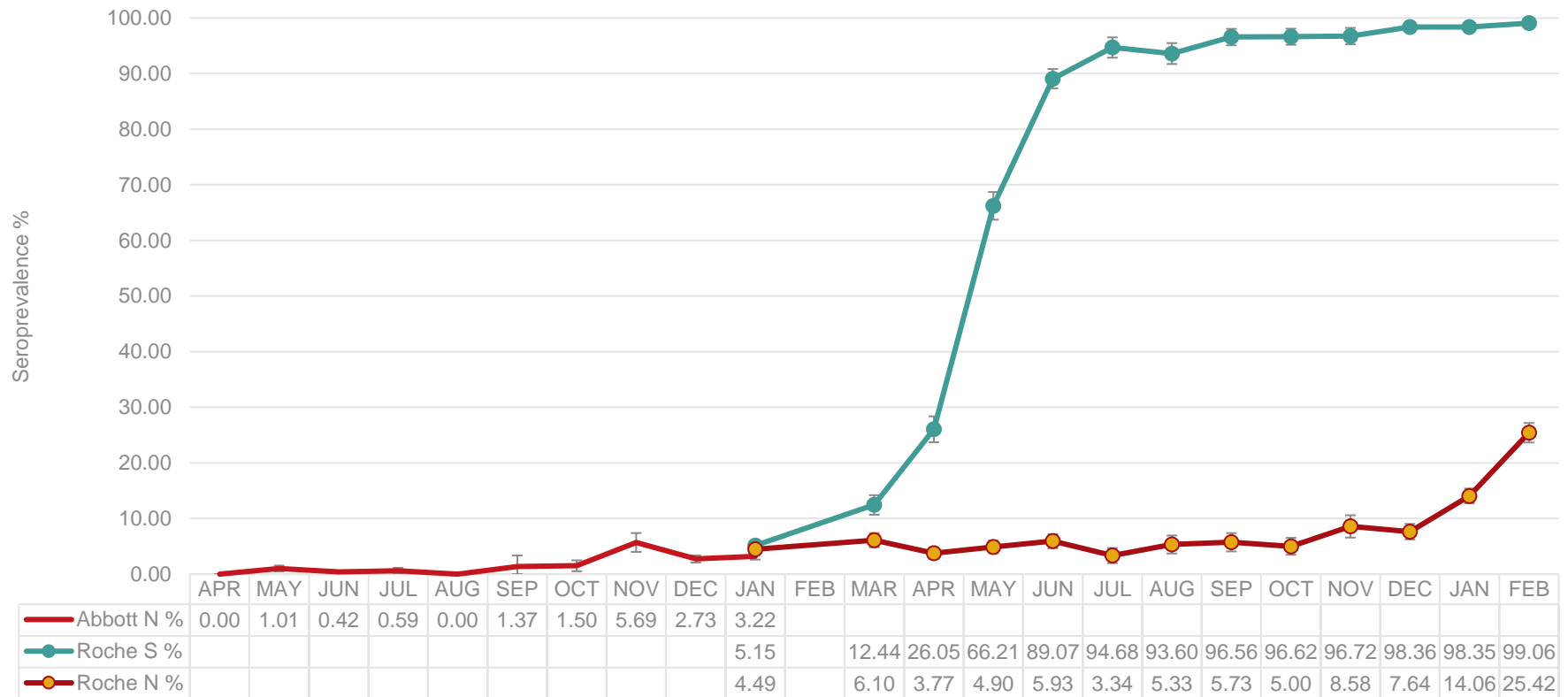


COVID-19 Seroprevalence Report  
February Survey

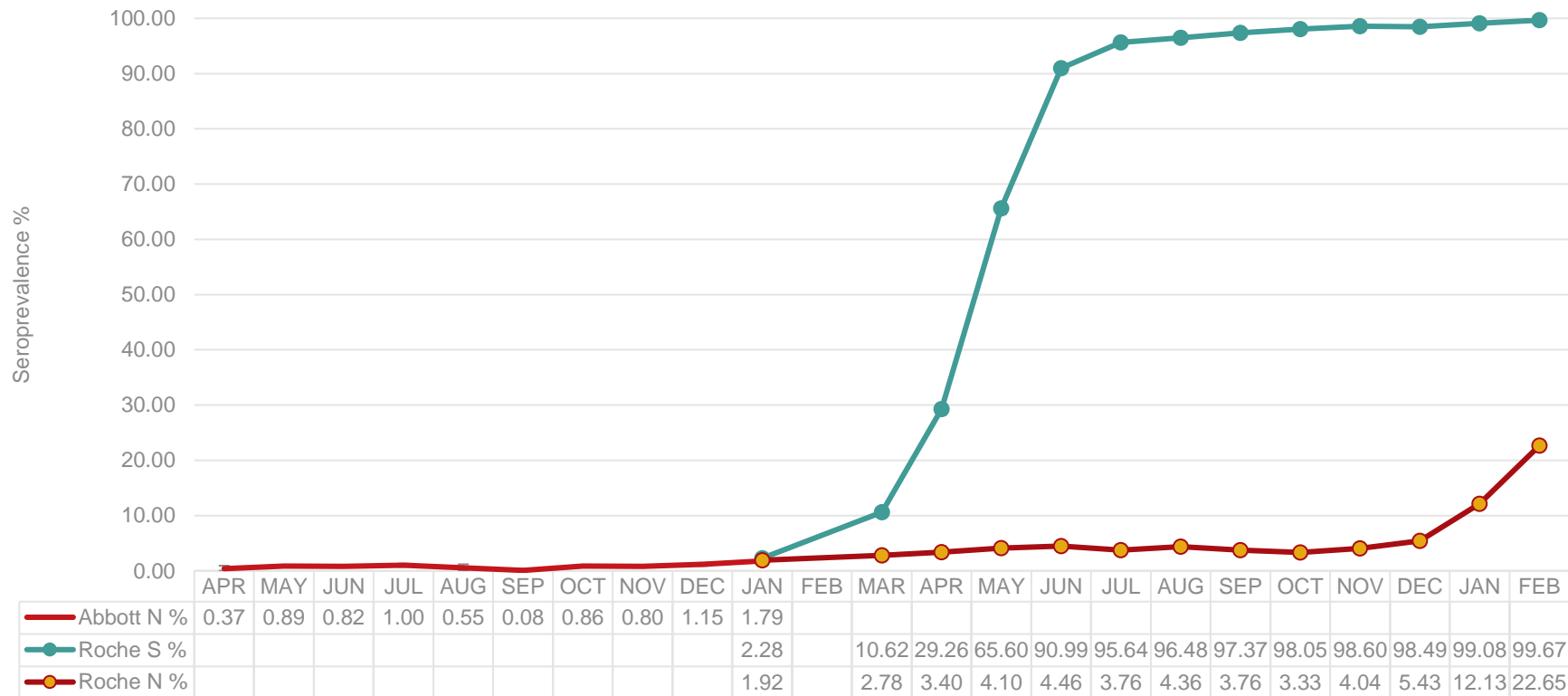
Alberta

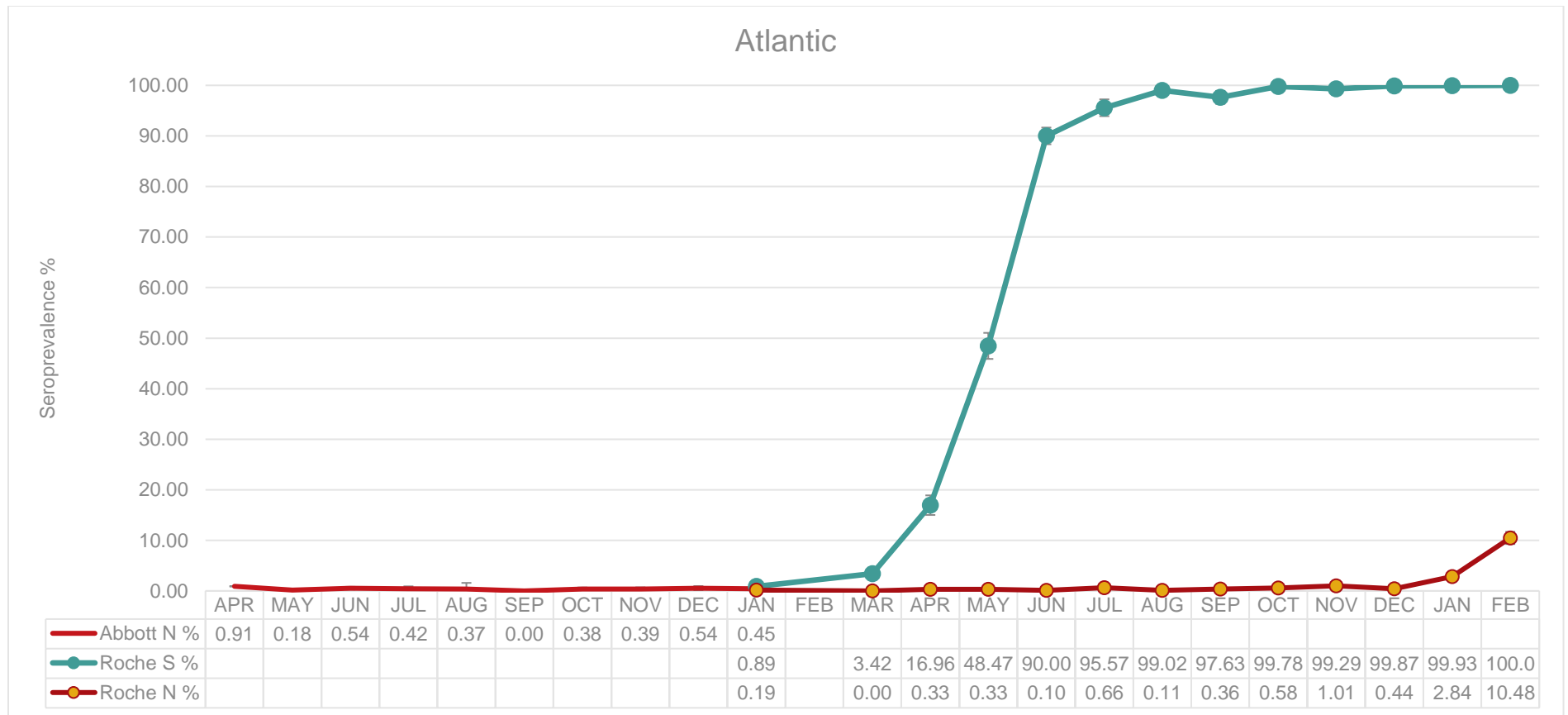


## Prairies



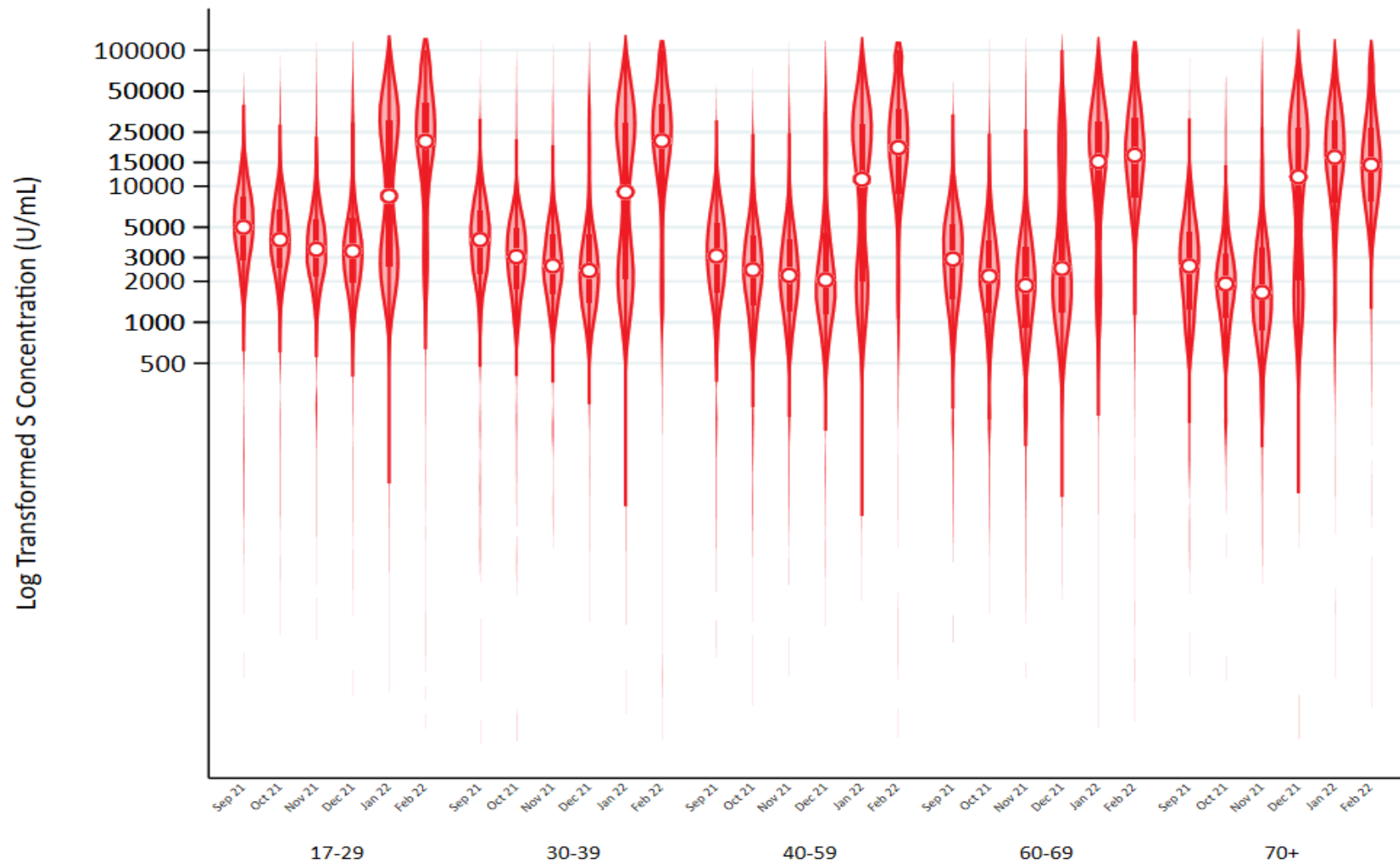
# Ontario



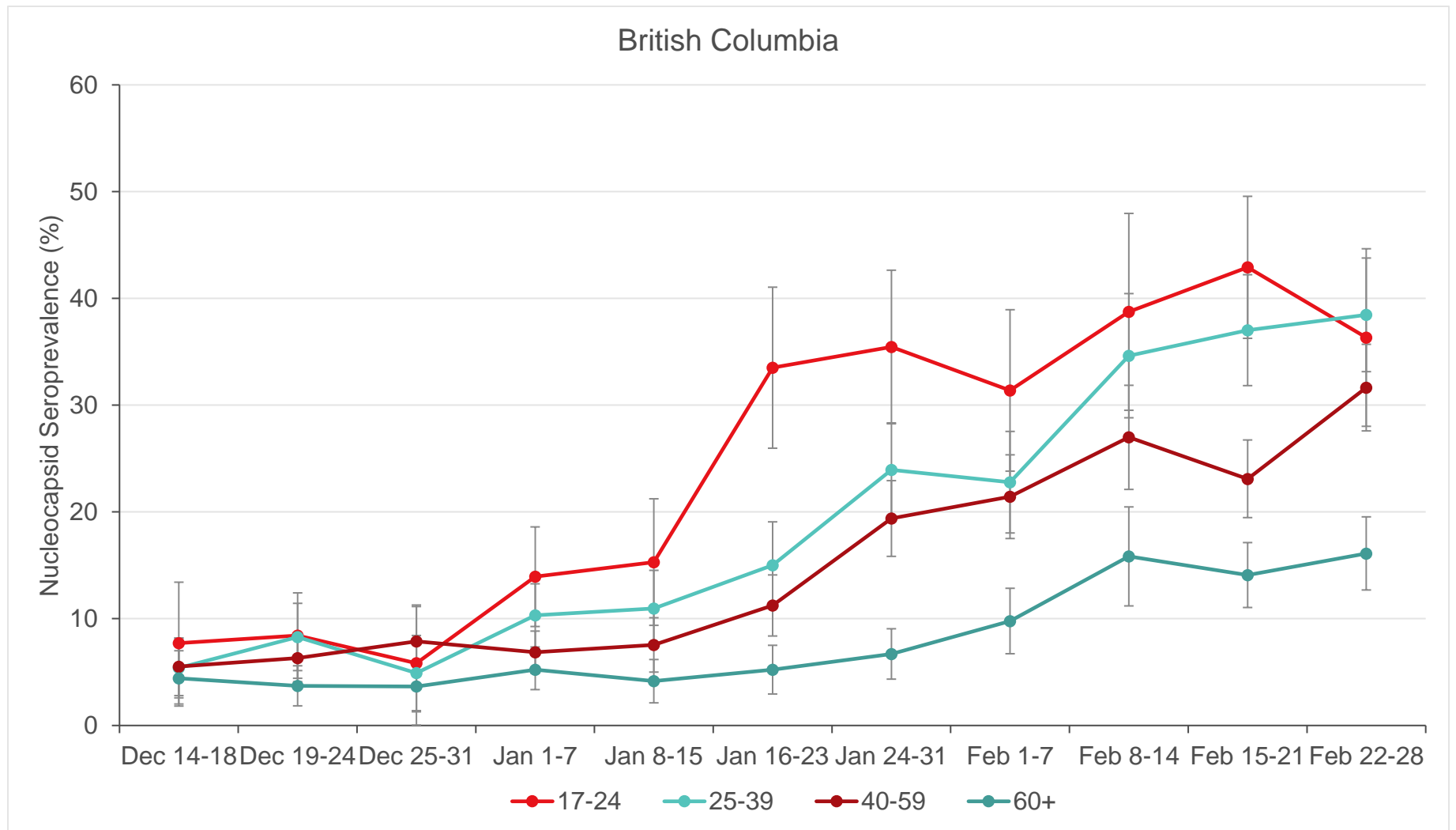


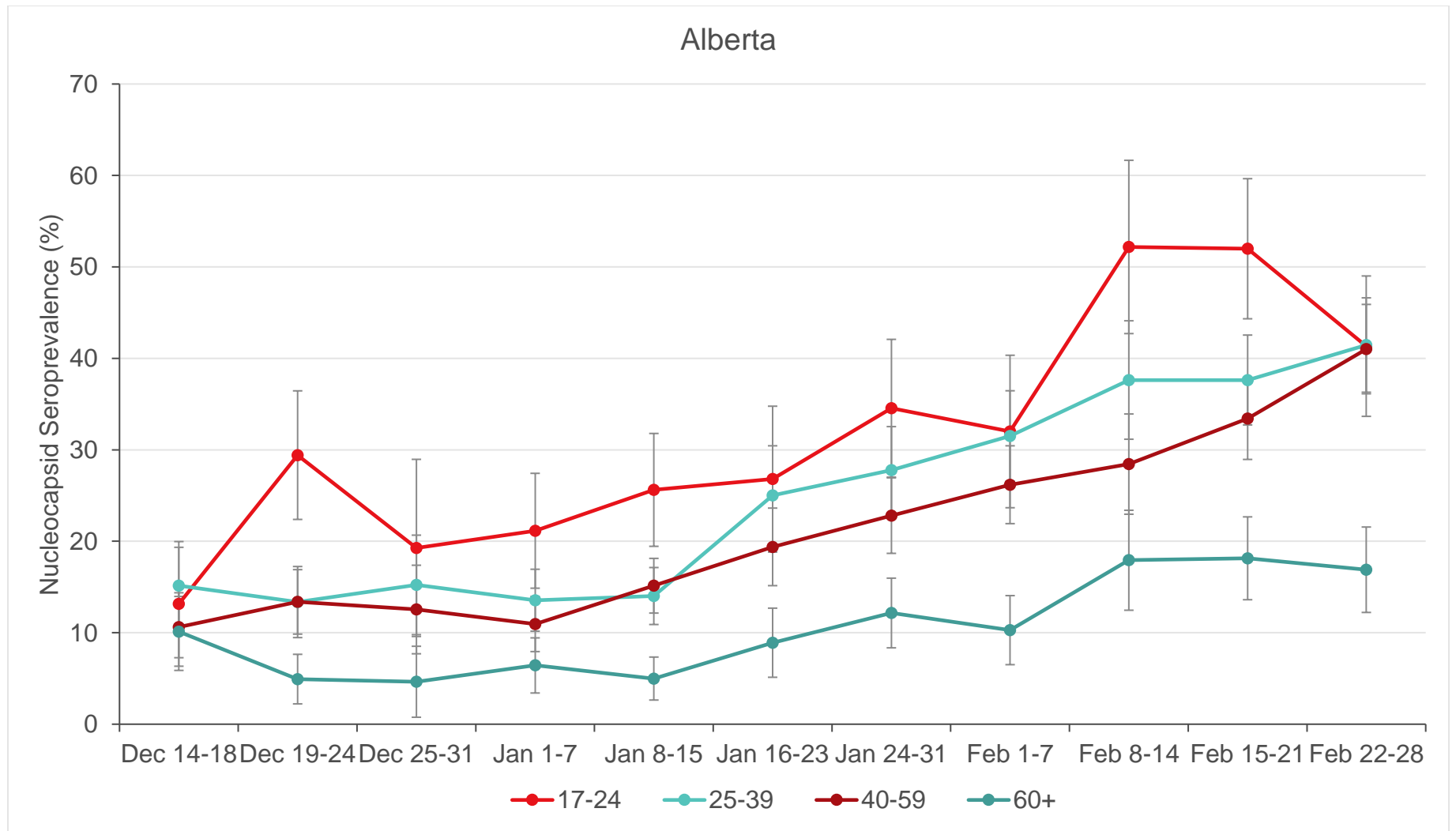
Note: SARS-CoV-2 seroprevalence rates (95% CI), that have been weighted and adjusted for test characteristics. Data from the CIHR funded study (Correlates of Immunity) from April 9, 2020-January 31, 2021, have been included.

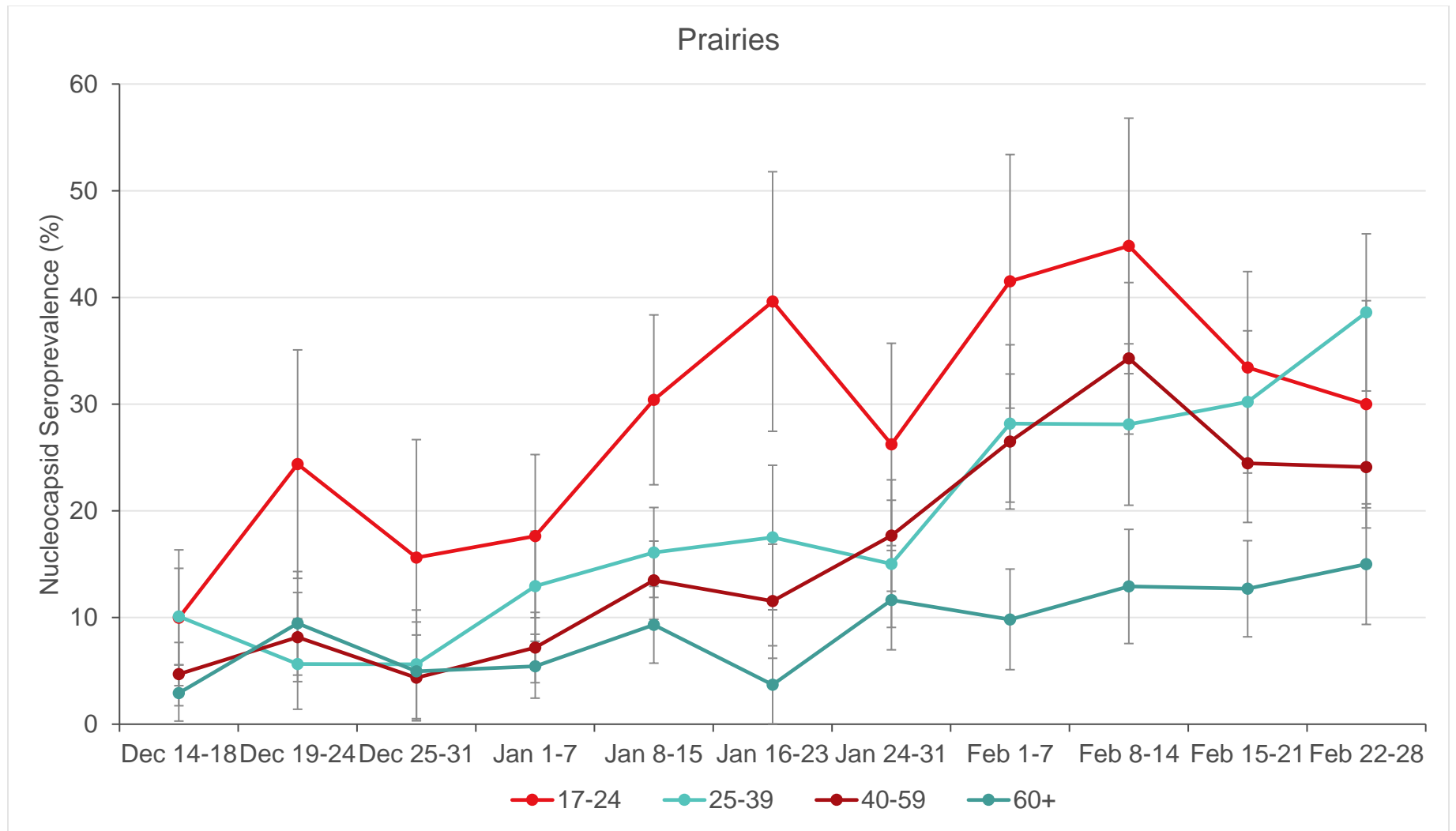
**Figure 3.** Distributions of log transformed Spike antibody concentration results (U/mL) (white circle represents the median and the bar represents the IQR) in spike antibody seropositive donations from September to February 2022 (dilution method was changed in September to measure up to 100,000 U/mL) stratified by age group.

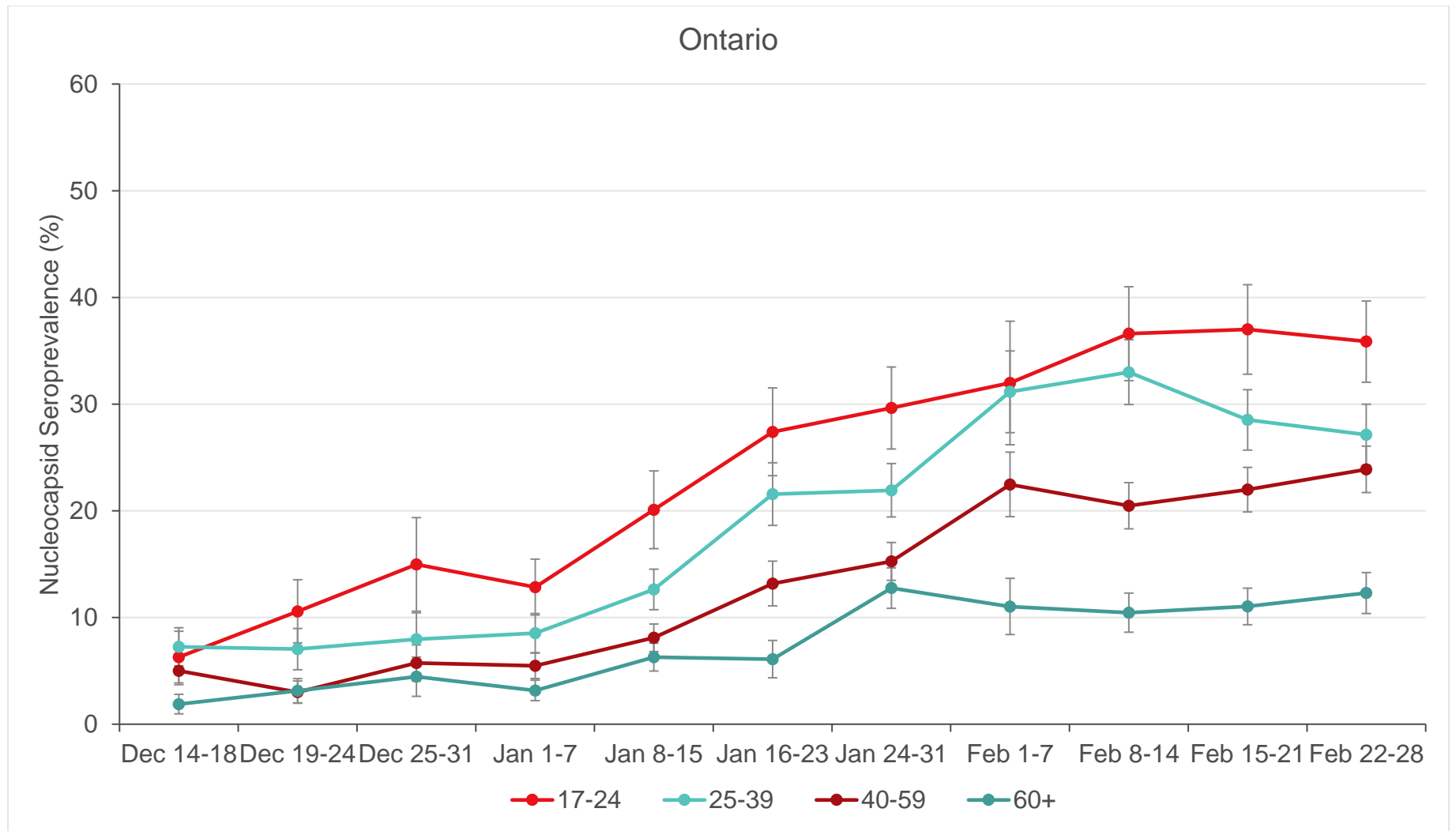


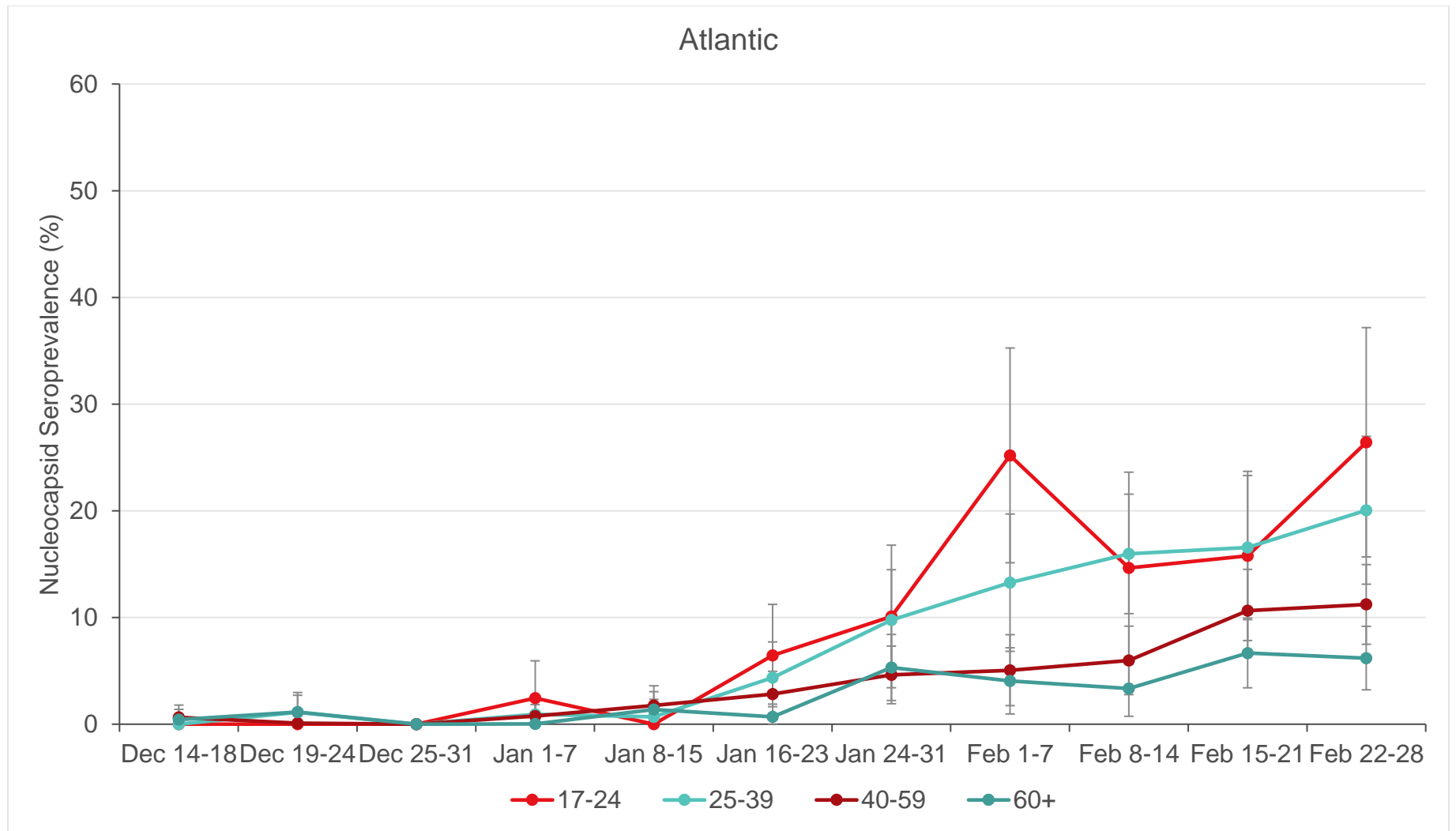


**Figure 4.** Regional temporal trends of SARS-CoV-2 Nucleocapsid (infection) seroprevalence by age group weekly from December 2021-February 2022

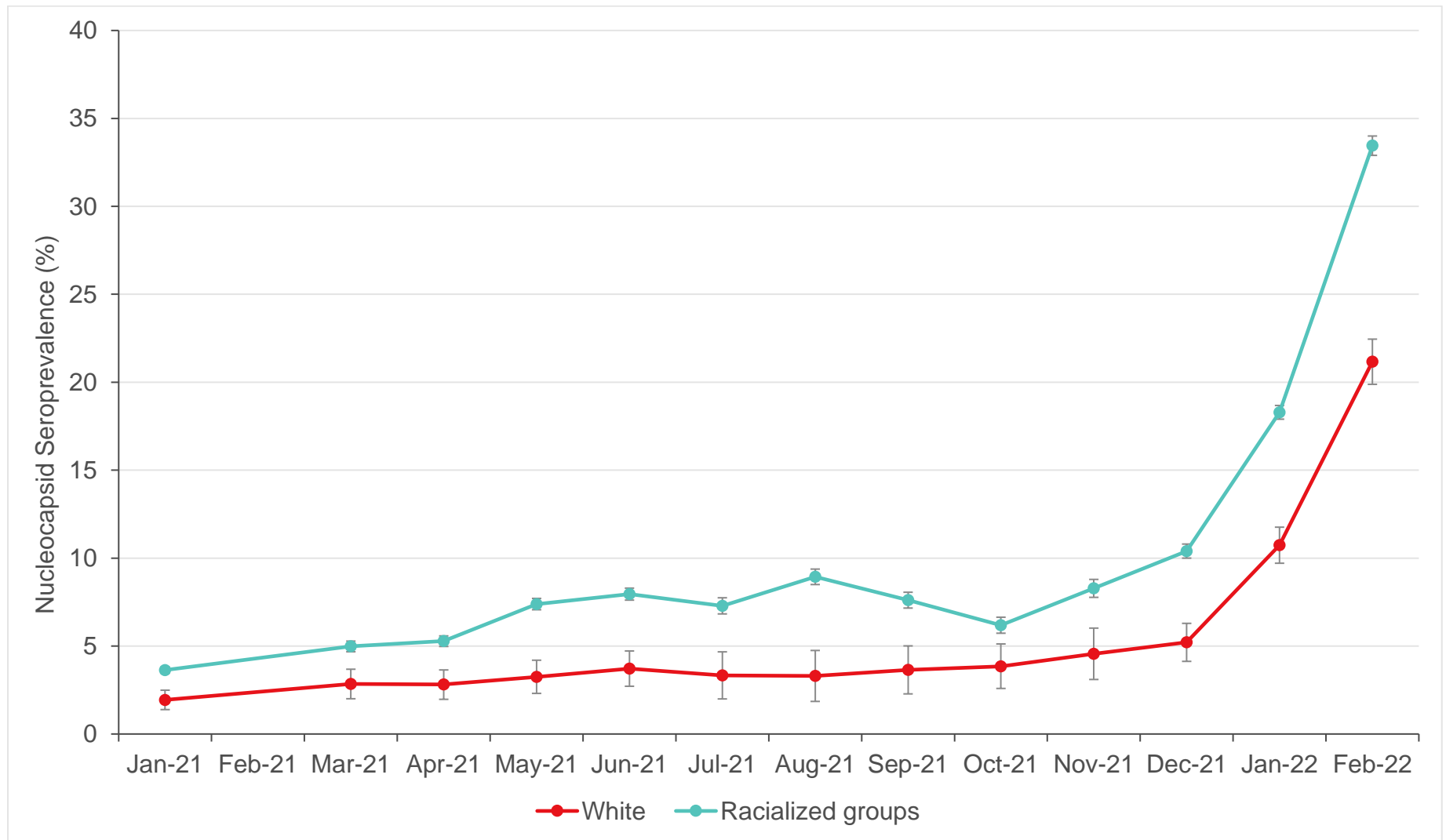




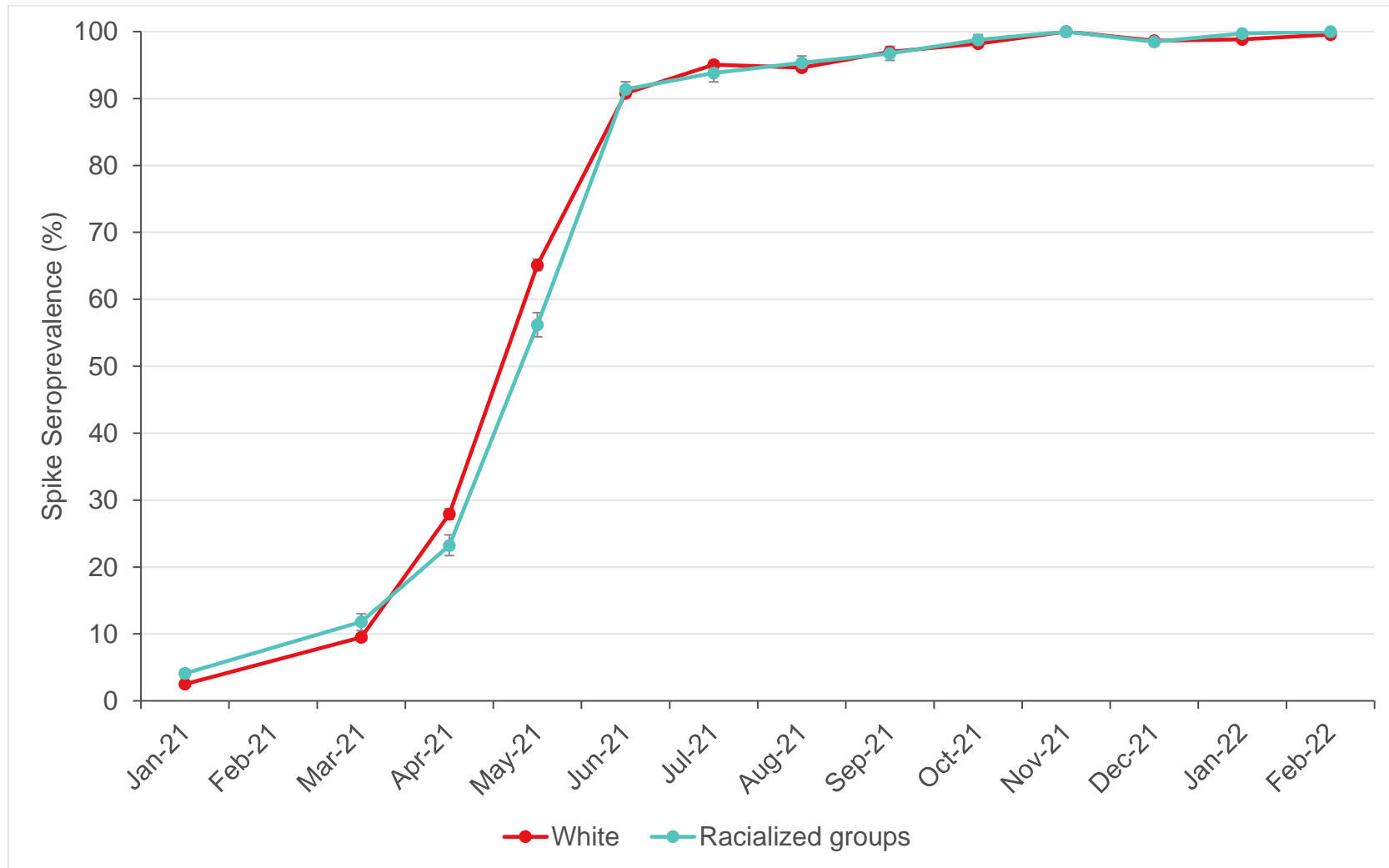




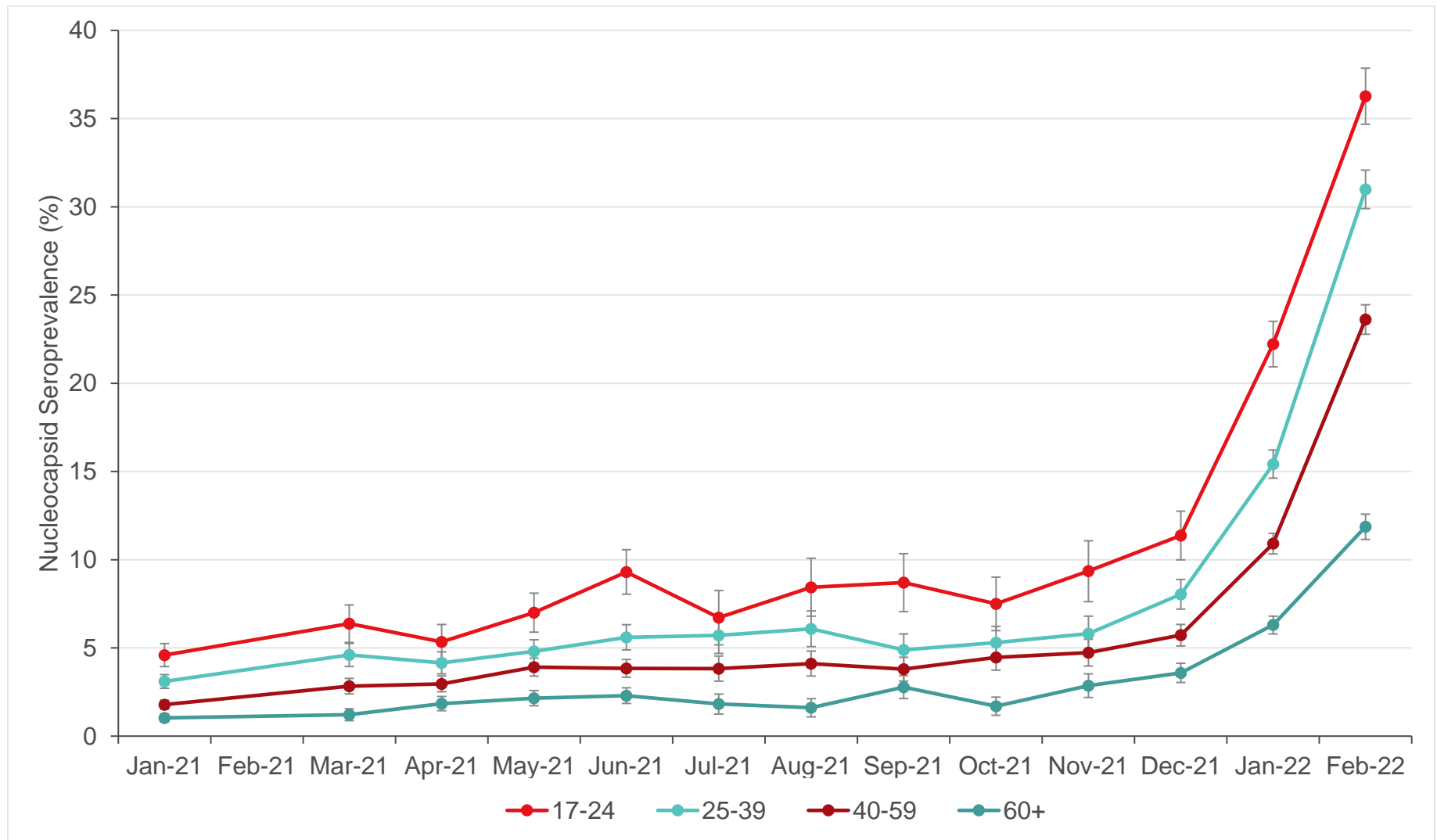
**Figure 5A.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Nucleocapsid antibody results by ethnicity.



**Figure 5B.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Spike antibody results by ethnicity.

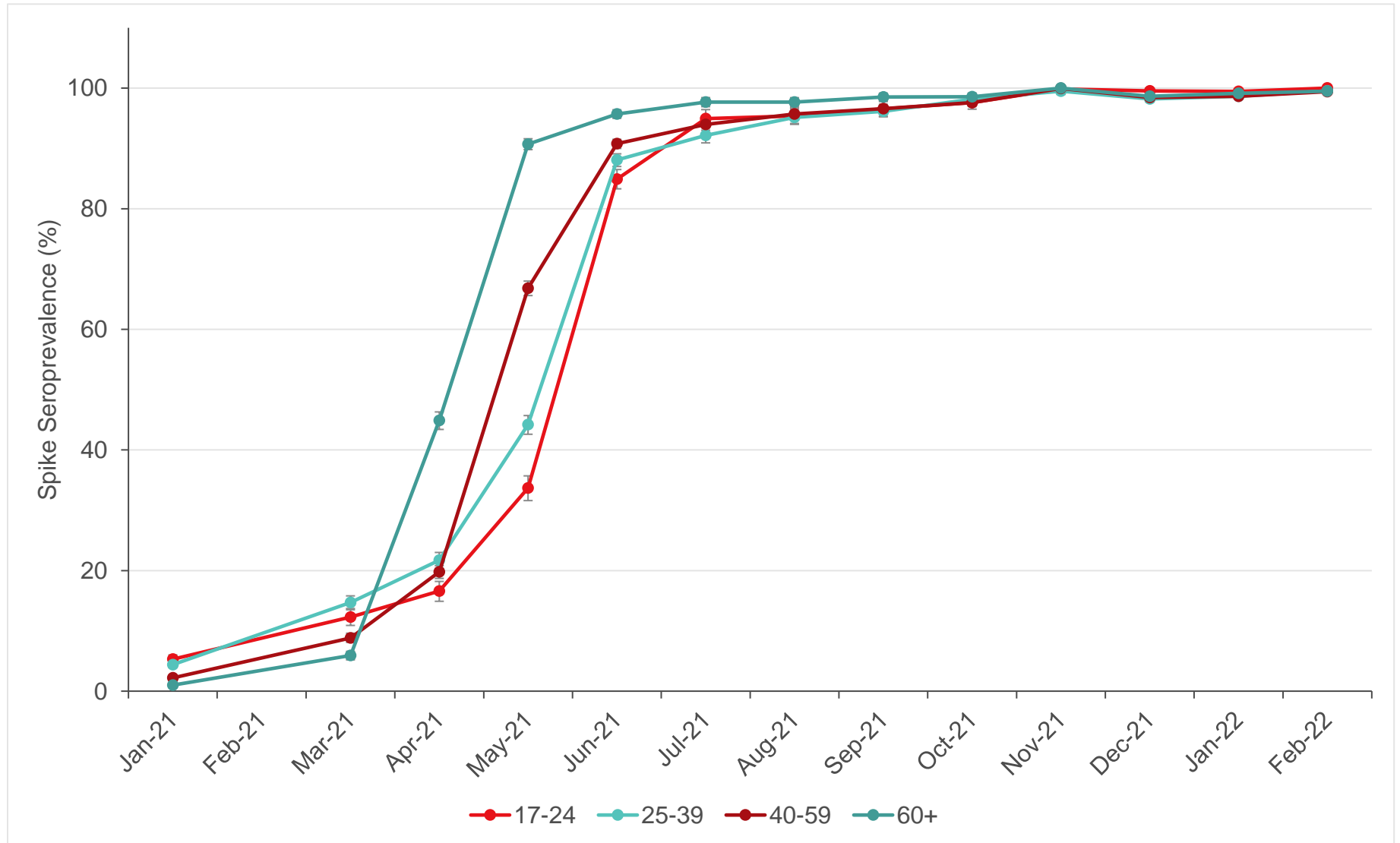


**Figure 5C.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Nucleocapsid antibody results by age group.

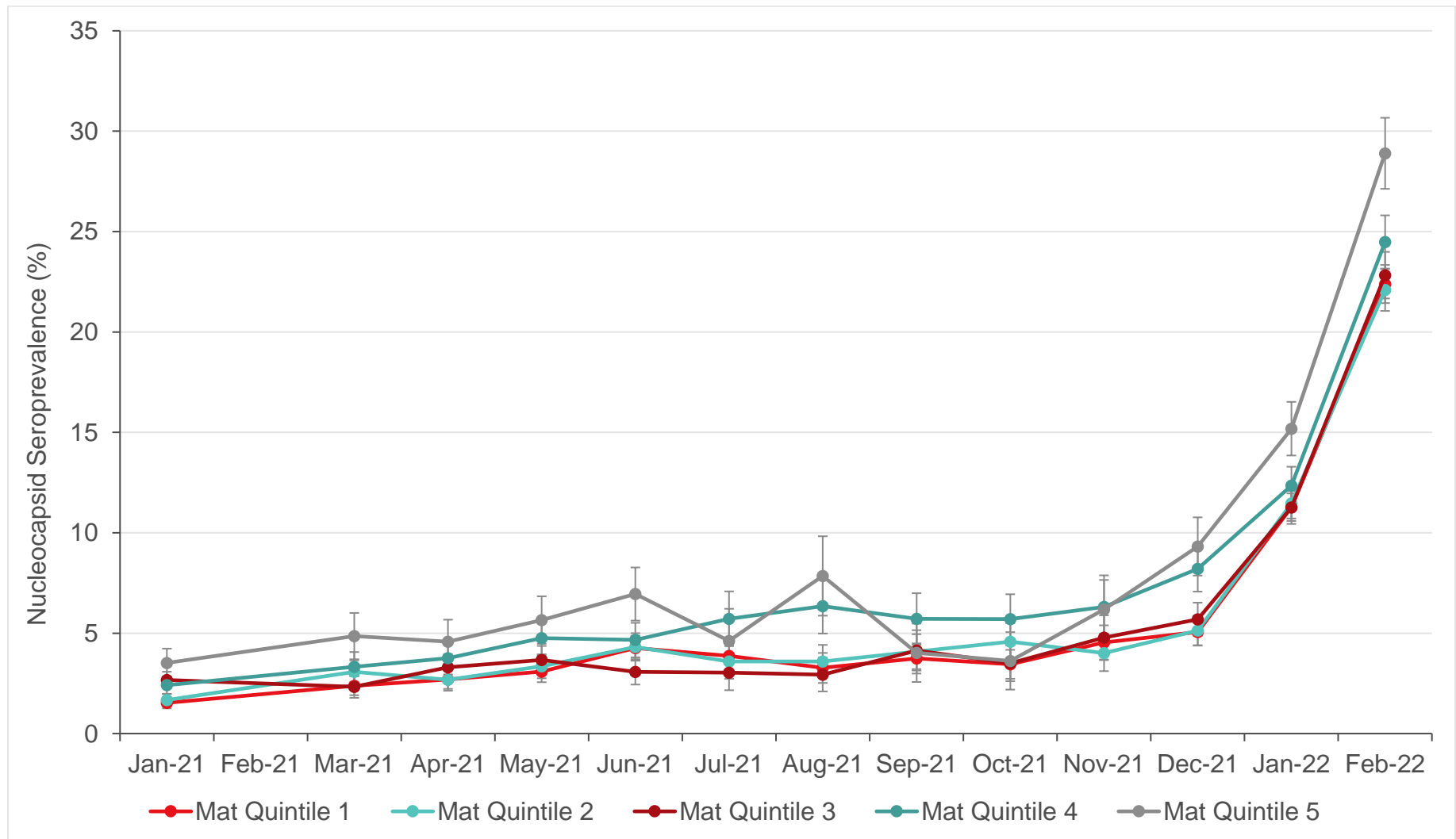




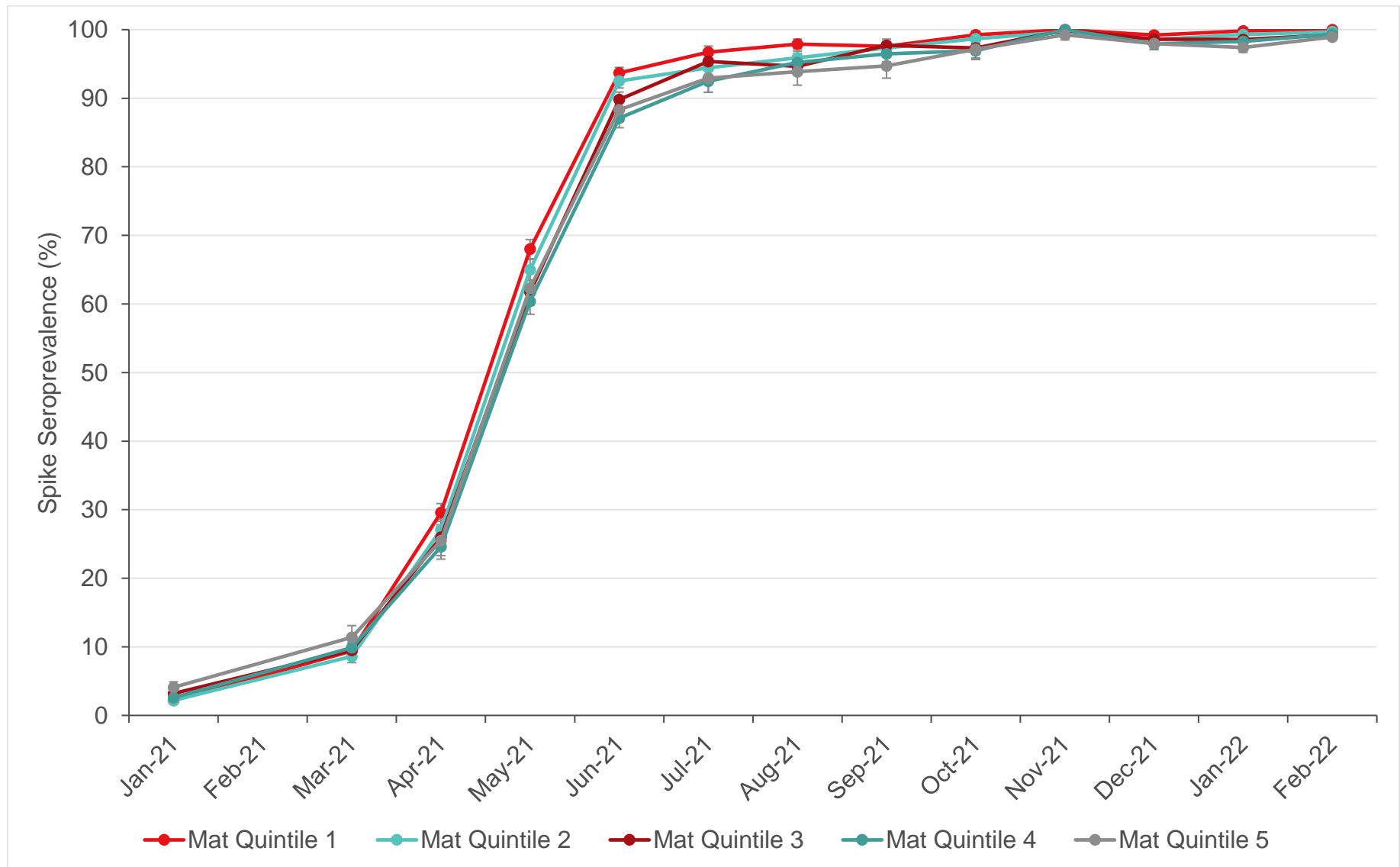
**Figure 5D.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Spike antibody results by age group.



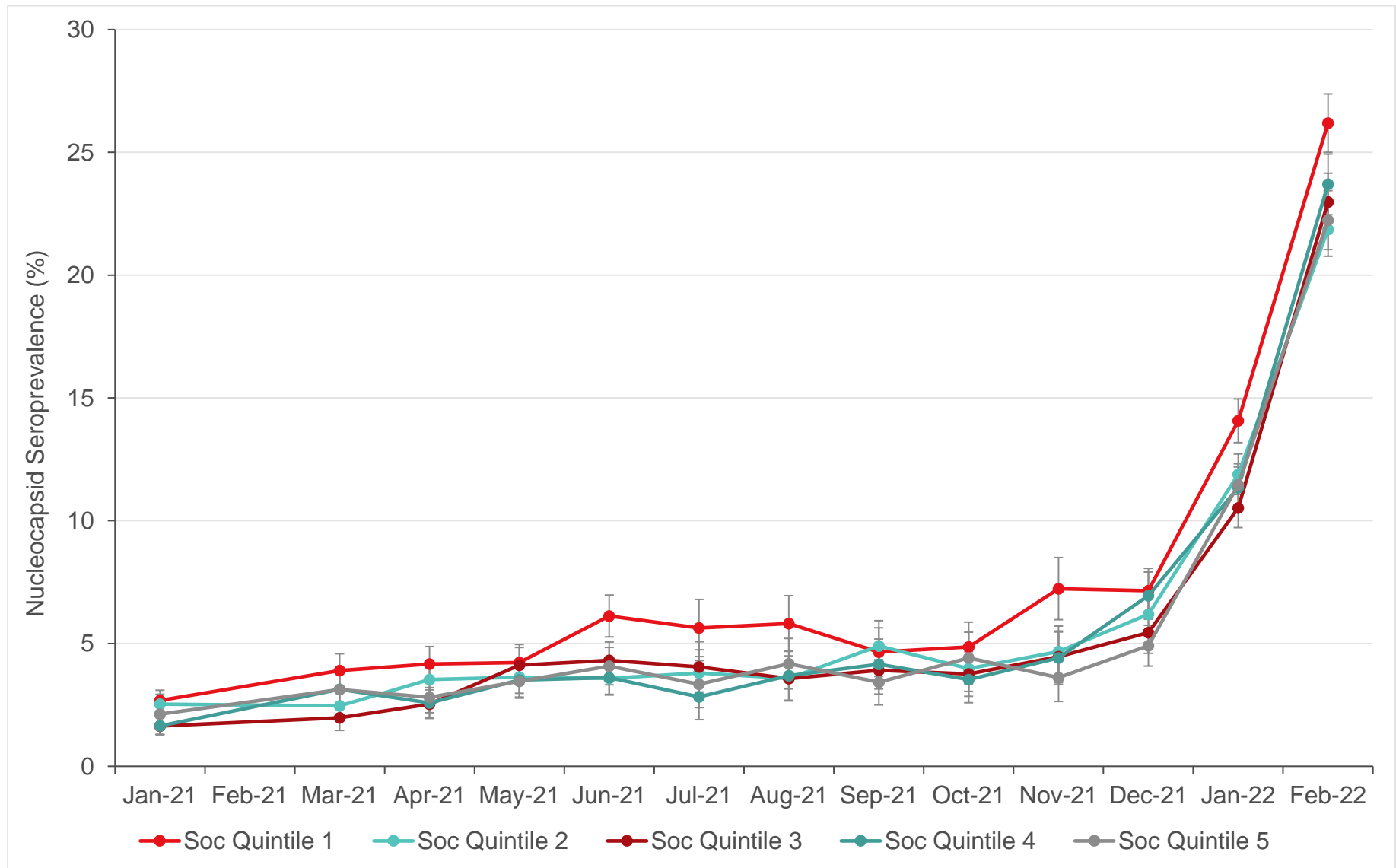
**Figure 5E.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Nucleocapsid antibody results by material deprivation level (1 = least deprived and 5 = most deprived).



**Figure 5F.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Spike antibody results by material deprivation level (1 = least deprived and 5 = most deprived).



**Figure 5G.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Nucleocapsid antibody results by social deprivation level (1 = least deprived and 5 = most deprived).



**Figure 5H.** Temporal trends of SARS-CoV-2 seroprevalence by monthly intervals from January 2021-February 2022 estimated by Spike antibody results by social deprivation level (1 = least deprived and 5 = most deprived).

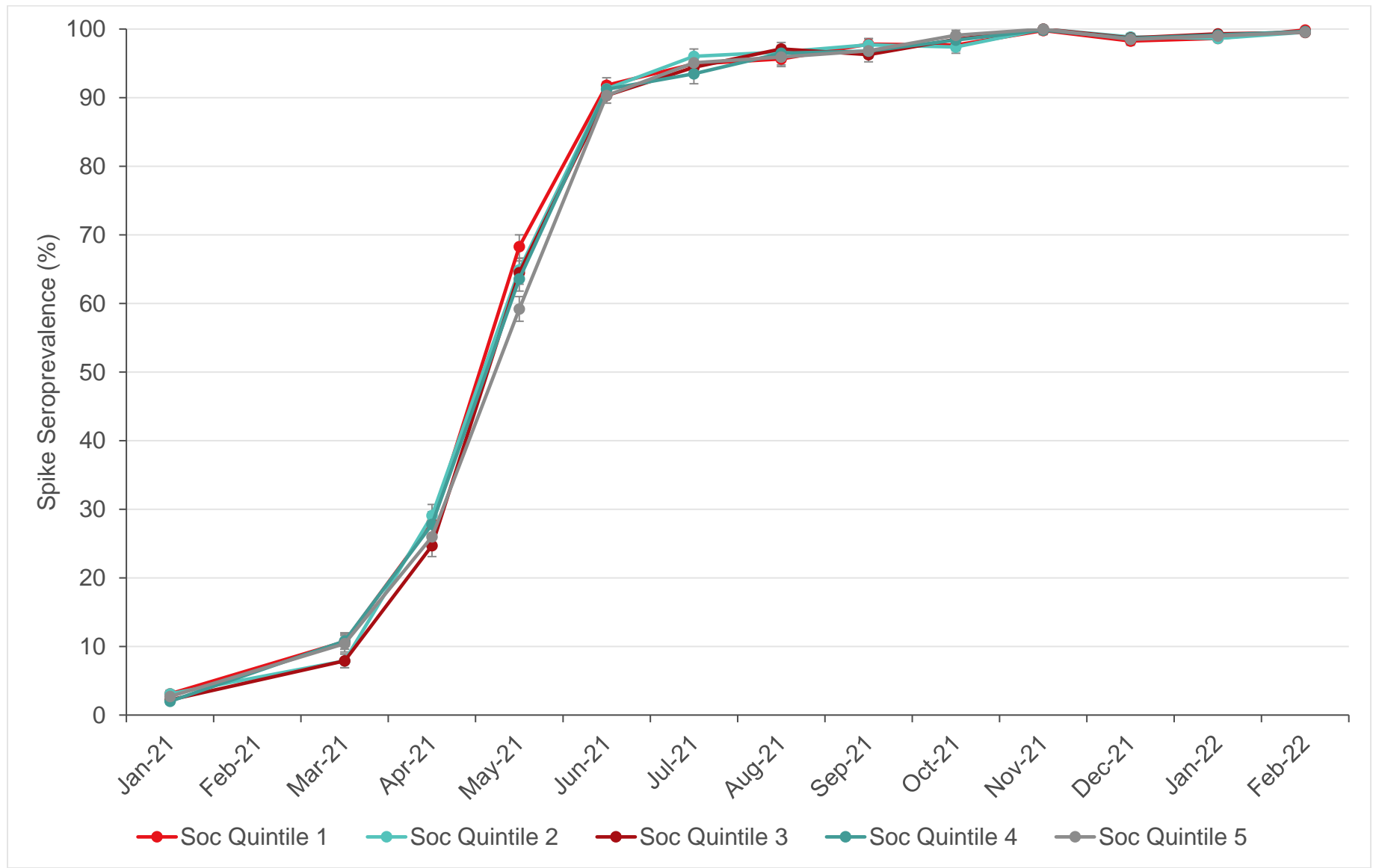


Table A1.1 British Columbia SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike results in February 2022

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
<b>Sex</b>								
Female	2,010	485	24.18	22.53, 25.83	2,010	1,984	99.88	99.44, 100.00
Male	2,428	631	26.94	25.18, 28.70	2,428	2,384	99.47	98.95, 99.99
<b>Age</b>								
17-24	298	113	37.94	34.00, 41.88	298	296	100.00	99.50, 100.00
25-39	1,236	414	33.50	30.82, 36.19	1,236	1,222	99.91	99.26, 100.00
40-59	1,571	409	26.11	24.04, 28.18	1,571	1,543	99.50	98.89, 100.00
60+	1,333	180	13.90	12.16, 15.64	1,333	1,307	99.23	98.53, 99.93
<b>Material Deprivation<sup>1</sup></b>								
1 (least)	1,168	299	25.24	22.92, 27.57	1,168	1,157	100.00	99.65, 100.00
2	1,059	256	24.99	22.54, 27.43	1,059	1,039	99.58	98.86, 100.00
3	777	179	23.50	20.67, 26.33	777	762	99.29	98.38, 100.00
4	615	173	28.04	24.67, 31.40	615	601	98.98	97.88, 100.00
5 (most)	338	100	30.33	25.82, 34.84	338	335	99.69	98.49, 100.00
<b>Total</b>	<b>4,438</b>	<b>1,116</b>	<b>25.52</b>	<b>24.32, 26.73</b>	<b>4,438</b>	<b>4,368</b>	<b>99.68</b>	<b>99.34, 100.00</b>

<sup>1</sup>Postal codes were missing for 481 (10.8%) of donors which could not be included in the quintiles of Material Deprivation; 109/481 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 23.87% (95% CI 20.25, 27.48); and 474/481 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.83% (95% CI 98.84, 100.00).

Table A1.2 Alberta SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in February 2022

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
<b>Sex</b>								
Female	2,499	755	30.10	28.14, 32.06	2,499	2,448	99.17	98.56, 99.77
Male	3,061	936	33.48	31.46, 35.50	3,061	2,979	98.60	97.91, 99.28
<b>Age</b>								
17-24	432	190	44.32	40.12, 48.51	432	428	100.00	99.18, 100.00
25-39	1,567	574	37.27	34.59, 39.94	1,567	1,535	99.05	98.24, 99.85
40-59	2,102	688	32.57	30.17, 34.97	2,102	2,051	98.56	97.74, 99.38
60+	1,459	239	16.26	13.91, 18.60	1,459	1,413	98.29	97.22, 99.36
<b>Material Deprivation<sup>1</sup></b>								
1 (least)	2,158	638	29.87	27.58, 32.16	2,158	2,121	99.70	99.09, 100.00
2	1,067	303	30.63	27.44, 33.83	1,067	1,043	99.32	98.37, 100.00
3	775	245	32.75	29.00, 36.51	775	752	98.06	96.66, 99.46
4	491	168	37.21	32.65, 41.76	491	471	97.29	95.45, 99.12
5 (most)	220	90	40.60	33.40, 47.81	220	214	98.08	95.52, 100.00
<b>Total</b>	<b>5,560</b>	<b>1,691</b>	<b>31.79</b>	<b>30.38, 33.19</b>	<b>5,560</b>	<b>5,427</b>	<b>98.88</b>	<b>98.43, 99.34</b>

<sup>1</sup>Postal codes were missing for 849 (15.3%) of donors which could not be included in the quintiles of Material Deprivation; 247/849 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 30.84% (95% CI 27.34, 34.34); 826/849 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 98.48% (95% CI 97.24, 99.71).

Table A1.3 Saskatchewan SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in February 2022

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
<b>Sex</b>								
Female	539	117	20.75	17.36, 24.13	539	528	99.09	97.88, 100.00
Male	674	164	23.86	20.26, 27.47	674	657	98.87	97.60, 100.00
<b>Age</b>								
17-24	115	35	27.13	19.79, 34.47	115	113	99.89	98.01, 100.00
25-39	335	90	26.84	21.73, 31.94	335	330	99.71	98.30, 100.00
40-59	427	111	25.30	20.79, 29.81	427	415	98.51	96.83, 100.00
60+	336	45	12.12	8.43, 15.81	336	327	98.42	96.56, 100.00
<b>Material Deprivation<sup>1</sup></b>								
1 (least)	365	73	19.99	15.63, 24.35	365	360	99.91	98.68, 100.00
2	282	70	24.30	18.97, 29.63	282	276	99.02	97.20, 100.00
3	201	54	25.35	19.05, 31.65	201	196	98.97	96.82, 100.00
4	119	23	17.75	10.60, 24.90	119	115	98.39	95.29, 100.00
5 (most)	54	14	23.32	11.42, 35.23	54	50	93.70	86.28, 100.00
<b>Total</b>	<b>1,213</b>	<b>281</b>	<b>22.28</b>	<b>19.81, 24.75</b>	<b>1,213</b>	<b>1,185</b>	<b>98.98</b>	<b>98.10, 99.86</b>

<sup>1</sup>Postal codes were missing for 192 (15.8%) of donors which could not be included in the quintiles of Material Deprivation 47/192 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 22.99% (95% CI 16.76, 29.22); 188/192 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.06% (95% CI 96.92, 100.00).



Table A1.4 Manitoba SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in February 2022

Nucleocapsid Antibody Results					Spike Antibody Results			
(proxy for natural infection)					(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	655	179	26.63	23.27, 29.99	655	641	98.91	97.77, 100.00
Male	824	232	29.54	25.99, 33.09	824	810	99.36	98.31, 100.00
Age								
17-24	160	70	43.98	36.66, 51.30	160	155	98.12	95.56, 100.00
25-39	380	135	35.73	30.55, 40.91	380	375	99.78	98.50, 100.00
40-59	544	153	28.29	24.06, 32.52	544	535	99.60	98.42, 100.00
60+	395	53	12.87	9.39, 16.35	395	386	98.46	96.76, 100.00
Material Deprivation <sup>1</sup>								
1 (least)	319	67	20.83	16.05, 25.62	319	314	99.51	97.98, 100.00
2	298	72	24.61	19.35, 29.86	298	293	99.43	97.81, 100.00
3	310	87	28.65	23.30, 33.99	310	303	98.63	96.75, 100.00
4	220	62	27.63	21.18, 34.08	220	216	99.08	97.00, 100.00
5 (most)	140	56	41.30	32.62, 49.99	140	137	99.05	96.49, 100.00
Total	1.479	411	28.05	25.61, 30.50	1.479	1.451	99.13	98.35, 99.91

<sup>1</sup>Postal codes were missing for 192 (13.0%) of donors which could not be included in the quintiles of Material Deprivation; 67/192 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 34.58% (95% CI 27.63, 41.53); 188/192 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.00% (95% CI 96.85, 100.00).

Table A1.5 Ontario SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in February 2022

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
<b>Sex</b>								
Female	5,951	1,319	21.15	20.21, 22.09	5,951	5,874	99.98	99.73, 100.00
Male	7,682	1,742	24.26	23.24, 25.28	7,682	7,523	99.33	99.01, 99.65
<b>Age</b>								
17-24	1,082	379	35.67	33.46, 37.88	1,082	1,077	100.00	100.00, 100.00
25-39	3,810	1,117	29.82	28.26, 31.37	3,810	3,739	99.39	98.94, 99.85
40-59	5,144	1,158	22.24	21.08, 23.40	5,144	5,048	99.40	99.02, 99.77
60+	3,597	407	11.31	10.32, 12.30	3,597	3,533	99.81	99.44, 100.00
<b>Material Deprivation<sup>1</sup></b>								
1 (least)	3,262	615	19.24	17.94, 20.54	3,262	3,227	100.00	99.95, 100.00
2	2,927	589	20.28	18.82, 21.73	2,927	2,879	99.74	99.30, 100.00
3	2,625	578	22.38	20.78, 23.98	2,625	2,569	99.41	98.90, 99.92
4	2,062	491	23.90	22.08, 25.72	2,062	2,021	99.49	98.93, 100.00
5 (most)	1,328	421	31.14	28.72, 33.55	1,328	1,295	98.68	97.86, 99.50
<b>Total</b>	<b>13,633</b>	<b>3,061</b>	<b>22.65</b>	<b>21.96, 23.34</b>	<b>13,633</b>	<b>13,397</b>	<b>99.67</b>	<b>99.47, 99.87</b>

<sup>1</sup>Postal codes were missing for 1,429 (10.5%) of donors which could not be included in the quintiles of Material Deprivation; 367/1,429 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 26.18% (95% CI 23.92, 28.44); 1,406/1,429 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.62% (95% CI 98.98, 100.00).

Table A1.6 Atlantic Provinces SARS-CoV-2 seroprevalence, Nucleocapsid vs. Spike antibody results in February 2022

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
<b>Sex</b>								
Female	1,005	90	8.47	6.95, 10.00	1,005	1,001	100	100.00, 100.00
Male	1,288	143	12.64	10.76, 14.52	1,288	1,279	100	99.90, 100.00
<b>Age</b>								
17-24	116	27	20.44	15.65, 25.23	116	116	100	99.53, 100.00
25-39	427	70	16.63	13.39, 19.88	427	423	99.92	98.94, 100.00
40-59	953	91	8.8	6.93, 10.67	953	950	100	100.00, 100.00
60+	797	45	5.23	3.69, 6.77	797	791	100	99.89, 100.00
<b>Material Deprivation<sup>1</sup></b>								
1 (least)	375	52	15.18	11.67, 18.69	375	375	100.00	100.00, 100.00
2	477	47	9.92	7.30, 12.53	477	474	100.00	99.79, 100.00
3	468	39	8.34	5.92, 10.75	468	464	99.95	98.98, 100.00
4	470	54	11.48	8.68, 14.27	470	469	100.00	100.00, 100.00
5 (most)	300	27	9.29	6.27, 12.30	300	296	99.67	98.40, 100.00
<b>Total</b>	<b>2,293</b>	<b>233</b>	<b>10.48</b>	<b>9.27, 11.69</b>	<b>2,293</b>	<b>2,280</b>	<b>100.00</b>	<b>100.00, 100.00</b>

<sup>1</sup>Postal codes were missing for 203 (8.9%) of donors which could not be included in the quintiles of Material Deprivation; 14/203 were positive by the Nucleocapsid antibody, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 7.75% (95% CI 4.15, 11.35); 202/203 were positive by the Spike antibody, adjusted SARS-CoV-2 seroprevalence was 99.95% (95% CI 98.48, 100.00).

**Table A2.1.** Weekly SARS-CoV-2 seroprevalence by sociodemographic variables by Nucleocapsid results in February 2022.

	February 1-7			February 8-14			February 15-21			February 22-28		
	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
<b>Sex</b>												
Female	2460 (490)	19.31	17.83, 20.79	2887 (663)	21.70	20.33, 23.08	3755 (870)	21.70	20.47, 22.93	3625 (928)	24.44	23.15, 25.73
Male	3319 (746)	23.47	21.89, 25.05	3637 (844)	25.32	23.81, 26.83	5003 (1222)	25.69	24.37, 27.01	4435 (1108)	26.15	24.76, 27.55
<b>Age</b>												
17-24	401 (131)	32.07	28.49, 35.66	484 (183)	38.01	34.64, 41.37	675 (272)	38.49	35.58, 41.40	657 (233)	35.68	32.78, 38.58
25-39	1637 (461)	27.89	25.59, 30.20	1787 (556)	31.78	29.56, 33.99	2278 (712)	31.11	29.07, 33.14	2134 (687)	32.22	30.12, 34.33
40-59	2171 (487)	21.87	20.02, 23.71	2443 (554)	21.96	20.26, 23.65	3226 (782)	23.10	21.57, 24.63	3061 (820)	26.37	24.76, 27.98
60+	1570 (157)	9.71	8.19, 11.23	1810 (214)	11.37	9.92, 12.82	2579 (326)	12.18	10.90, 13.46	2208 (296)	13.04	11.64, 14.44
<b>Province</b>												
British Columbia	1101 (212)	19.48	17.26, 21.69	806 (221)	27.59	24.71, 30.48	1345 (342)	25.84	23.67, 28.01	1253 (356)	28.70	26.33, 31.07
Alberta	1540 (374)	24.87	22.34, 27.40	1053 (302)	31.69	28.41, 34.98	1686 (537)	33.69	31.06, 36.31	1526 (518)	35.97	33.19, 38.74
Saskatchewan	297 (58)	18.84	14.12, 23.55	224 (59)	26.25	20.15, 32.34	384 (80)	19.55	15.43, 23.67	314 (85)	26.02	20.94, 31.09
Manitoba	317 (89)	28.88	23.62, 34.14	361 (103)	28.80	23.88, 33.72	416 (116)	27.80	23.26, 32.34	387 (104)	27.01	22.26, 31.76
Ontario	2046 (461)	22.93	21.13, 24.74	3538 (778)	22.61	21.27, 23.94	4292 (951)	21.96	20.72, 23.20	3891 (889)	23.20	21.92, 24.48
New Brunswick	156 (10)	6.48	2.65, 10.31	260 (26)	11.84	7.89, 15.78	214 (23)	11.12	6.93, 15.32	174 (15)	8.08	4.07, 12.10
Nova Scotia	260 (25)	9.70	6.20, 13.20	50 (2)	3.10	0.00, 8.04	307 (32)	11.53	7.98, 15.07	355 (59)	17.36	13.51, 21.21
Prince Edward Island	47 (5)	11.58	2.91, 20.25	46 (5)	9.58	1.53, 17.63	25 (1)	2.37	0.00, 10.07	33 (1)	1.05	0.00, 4.80
Newfoundland	15 (2)	19.59	2.44, 36.73	186 (11)	6.31	3.38, 9.24	89 (10)	10.22	4.85, 15.59	127 (9)	7.24	2.94, 11.55
<b>Metro area</b>												

COVID-19 Seroprevalence Report

Vancouver	608 (153)	24.77	21.67, 27.88	486 (154)	31.58	27.83, 35.33	681 (204)	29.05	25.98, 32.12	627 (222)	34.49	31.11, 37.87
Calgary	597 (151)	26.10	21.42, 30.78	475 (139)	32.06	26.52, 37.60	738 (225)	32.02	27.75, 36.30	593 (196)	34.31	29.33, 39.29
Edmonton	523 (108)	20.55	16.87, 24.23	312 (83)	29.02	23.65, 34.40	498 (155)	32.48	27.97, 36.99	500 (144)	29.68	25.33, 34.04
Ottawa	84 (13)	16.99	9.32, 24.66	175 (34)	19.67	14.05, 25.29	606 (97)	16.56	13.77, 19.35	290 (51)	17.93	13.72, 22.13
Toronto	812 (216)	26.38	23.63, 29.13	1485 (409)	26.53	24.53, 28.52	1097 (286)	25.16	22.91, 27.42	1272 (312)	24.71	22.67, 26.75
Winnipeg	245 (66)	27.57	21.59, 33.55	207 (44)	20.15	14.13, 26.16	284 (74)	25.67	20.18, 31.15	295 (66)	21.94	16.78, 27.09
<b>Ethnicity<sup>1</sup></b>												
White	4364 (837)	19.10	17.90, 20.30	4818 (991)	20.46	19.32, 21.60	6631 (1444)	21.29	20.28, 22.29	6141 (1419)	22.77	21.71, 23.83
Indigenous	85 (18)	17.80	9.78, 25.81	75 (16)	21.80	13.06, 30.53	119 (33)	26.48	18.41, 34.55	108 (30)	27.71	19.40, 36.02
Asian	292 (69)	25.04	19.99, 30.09	347 (110)	31.39	26.80, 35.98	448 (128)	28.34	24.34, 32.33	389 (120)	30.38	26.00, 34.75
Other racialized groups	609 (219)	36.46	32.61, 40.31	767 (260)	36.29	32.98, 39.59	939 (334)	36.24	33.18, 39.30	842 (314)	37.80	34.62, 40.98
<b>Social Deprivation<sup>2</sup></b>												
1 (least deprived)	1022 (241)	24.45	21.76, 27.13	1283 (323)	26.59	24.18, 29.00	1632 (434)	26.37	24.20, 28.54	1557 (424)	26.98	24.73, 29.22
2	1037 (181)	17.03	14.70, 19.37	1245 (267)	20.97	18.74, 23.19	1701 (398)	22.97	20.96, 24.98	1591 (379)	23.92	21.85, 25.99
3	1019 (229)	22.14	19.55, 24.74	1139 (253)	22.11	19.72, 24.51	1584 (324)	20.50	18.48, 22.53	1393 (369)	26.80	24.48, 29.12
4	936 (214)	22.96	20.20, 25.72	1052 (252)	24.20	21.65, 26.76	1366 (324)	23.73	21.46, 26.00	1316 (306)	23.47	21.18, 25.76
5 (most deprived)	1018 (195)	18.70	16.21, 21.19	1058 (220)	20.37	17.98, 22.77	1480 (362)	23.88	21.65, 26.12	1302 (322)	24.39	22.06, 26.73
<b>Material Deprivation<sup>2</sup></b>												
1 (least deprived)	1591 (329)	20.68	18.60, 22.75	1741 (397)	22.90	20.91, 24.88	2236 (511)	22.04	20.31, 23.77	2253 (534)	23.26	21.49, 25.02
2	1187 (247)	20.84	18.47, 23.21	1349 (260)	20.07	17.92, 22.22	2015 (465)	23.24	21.36, 25.13	1670 (382)	23.06	21.03, 25.09
3	1029 (215)	20.83	18.30, 23.37	1153 (260)	23.22	20.81, 25.63	1585 (370)	22.82	20.70, 24.94	1474 (347)	23.36	21.19, 25.54
4	784 (158)	20.06	17.23, 22.90	937 (233)	24.54	21.87, 27.20	1195 (274)	23.44	21.01, 25.87	1122 (320)	28.63	26.04, 31.23
5 (most deprived)	441 (111)	24.69	20.73, 28.65	597 (165)	25.59	22.29, 28.89	732 (222)	29.80	26.52, 33.08	640 (217)	33.98	30.43, 37.54
<b>Total</b>	5779 (1236)	21.39	20.31, 22.48	6524 (1507)	23.43	22.41, 24.45	8758 (2092)	23.68	22.77, 24.58	8060 (2036)	25.25	24.30, 26.20

<sup>1</sup> In Week 1, self reported ethnicity was missing for 429 (7.4%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 20.71% (95% CI 16.72, 24.69). In Week 2, self reported ethnicity was missing for 517 (7.9%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 25.27% (95% CI 21.52, 29.02). In Week 3, self reported ethnicity was missing for 621 (7.1%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 24.76% (95% CI 21.35, 28.18). In Week 4, self reported ethnicity was missing for 580 (7.2%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 27.62% (95% CI 23.96, 31.28).

<sup>2</sup> In Week 1, postal codes were missing for 747 (12.9%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 23.90% (95% CI 20.73, 27.06). In Week 2, postal codes were missing for 747 (11.5%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 27.60% (95% CI 24.39, 30.81). In Week 3, postal codes were missing for 995 (11.4%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 25.18% (95% CI 22.42, 27.94). In Week 4, postal codes were missing for 901 (11.2%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 26.21% (95% CI 23.33, 29.08).

**Table A2.2.** Weekly SARS-CoV-2 seroprevalence by province and age group by Nucleocapsid results in February 2022

	February 1-7			February 8-14			February 15-21			February 22-28		
	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
<b>British Columbia</b>												
17-24	72 (23)	31.38	23.82, 38.94	55 (21)	38.74	29.52, 47.96	109 (47)	42.91	36.26, 49.56	66 (23)	36.34	28.02, 44.65
25-39	312 (71)	22.78	18.03, 27.54	261 (89)	34.63	28.82, 40.45	347 (128)	37.03	31.83, 42.22	334 (129)	38.46	33.14, 43.78
40-59	385 (84)	21.43	17.51, 25.35	292 (80)	26.99	22.11, 31.86	459 (108)	23.10	19.47, 26.74	459 (144)	31.65	27.59, 35.70
60+	332 (34)	9.78	6.72, 12.85	198 (31)	15.83	11.20, 20.47	430 (59)	14.09	11.05, 17.13	394 (60)	16.11	12.69, 19.54
Total	1101 (212)	19.48	17.26, 21.69	806 (221)	27.59	24.71, 30.48	1345 (342)	25.84	23.67, 28.01	1253 (356)	28.70	26.33, 31.07
<b>Alberta</b>												
17-24	98 (32)	32.00	23.67, 40.34	86 (41)	52.18	42.71, 61.66	133 (68)	51.99	44.33, 59.65	120 (50)	41.33	33.66, 49.01
25-39	435 (138)	31.52	26.59, 36.46	275 (98)	37.63	31.16, 44.11	471 (174)	37.63	32.72, 42.55	429 (174)	41.46	36.30, 46.62
40-59	600 (159)	26.18	21.93, 30.44	384 (112)	28.44	22.96, 33.92	627 (210)	33.41	28.95, 37.87	561 (225)	41.01	36.13, 45.90
60+	407 (45)	10.28	6.51, 14.06	308 (51)	17.93	12.46, 23.39	455 (85)	18.14	13.61, 22.67	416 (69)	16.89	12.22, 21.56
Total	1540 (374)	24.87	22.34, 27.40	1053 (302)	31.69	28.41, 34.98	1686 (537)	33.69	31.06, 36.31	1526 (518)	35.97	33.19, 38.74
<b>Saskatchewan</b>												
17-24	22 (7)	26.71	10.26, 43.17	20 (7)	33.39	14.91, 51.87	42 (11)	22.81	11.48, 34.13	31 (10)	29.31	14.83, 43.79
25-39	74 (16)	21.56	11.47, 31.64	71 (20)	28.00	16.88, 39.12	94 (24)	25.40	16.03, 34.77	97 (30)	31.10	21.25, 40.94
40-59	110 (26)	22.76	14.29, 31.22	67 (25)	36.94	24.17, 49.72	136 (32)	23.09	15.40, 30.78	115 (28)	23.62	15.22, 32.03
60+	91 (9)	9.17	2.76, 15.59	66 (7)	11.09	2.95, 19.23	112 (13)	9.46	3.84, 15.07	71 (17)	21.16	11.29, 31.02
Total	297 (58)	18.84	14.12, 23.55	224 (59)	26.25	20.15, 32.34	384 (80)	19.55	15.43, 23.67	314 (85)	26.02	20.94, 31.09
<b>Manitoba</b>												

# COVID-19 Seroprevalence Report

17-24	33 (17)	52.26	36.42, 68.10	37 (19)	51.77	36.51, 67.03	46 (20)	44.04	30.64, 57.45	44 (14)	30.53	17.46, 43.60
25-39	90 (29)	33.55	23.14, 43.96	83 (24)	28.16	17.84, 38.48	113 (39)	34.23	24.89, 43.56	94 (43)	46.29	35.55, 57.04
40-59	115 (34)	30.30	20.94, 39.67	141 (47)	33.05	24.52, 41.58	142 (37)	25.79	17.84, 33.74	146 (35)	24.48	16.71, 32.25
60+	79 (9)	10.50	3.56, 17.44	100 (13)	14.02	6.99, 21.05	115 (20)	15.93	8.94, 22.91	103 (12)	10.40	4.00, 16.81
Total	317 (89)	28.88	23.62, 34.14	361 (103)	28.80	23.88, 33.72	416 (116)	27.80	23.26, 32.34	387 (104)	27.01	22.26, 31.76
<b>Ontario</b>												
17-24	140 (42)	31.98	26.19, 37.77	267 (91)	36.60	32.20, 41.00	314 (121)	37.00	32.80, 41.19	365 (128)	35.86	32.05, 39.66
25-39	631 (195)	31.15	27.32, 34.98	993 (308)	32.99	29.96, 36.03	1145 (331)	28.52	25.69, 31.35	1058 (286)	27.13	24.27, 29.99
40-59	774 (173)	22.47	19.45, 25.50	1334 (276)	20.48	18.31, 22.64	1591 (365)	21.98	19.89, 24.07	1488 (352)	23.88	21.71, 26.06
60+	501 (51)	11.03	8.40, 13.67	944 (103)	10.46	8.62, 12.29	1242 (134)	11.04	9.32, 12.75	980 (123)	12.29	10.37, 14.21
Total	2046 (461)	22.93	21.13, 24.74	3538 (778)	22.61	21.27, 23.94	4292 (951)	21.96	20.72, 23.20	3891 (889)	23.20	21.92, 24.48
<b>Atlantic Canada</b>												
17-24	36 (10)	25.19	15.13, 35.26	19 (4)	14.64	5.65, 23.62	31 (5)	15.77	7.84, 23.70	31 (8)	26.42	15.68, 37.17
25-39	95 (12)	13.27	6.83, 19.70	104 (17)	15.96	10.36, 21.56	108 (16)	16.56	9.80, 23.31	122 (25)	20.05	13.12, 26.98
40-59	187 (11)	5.06	1.74, 8.39	225 (14)	5.98	2.77, 9.19	271 (30)	10.63	6.75, 14.51	292 (36)	11.22	7.49, 14.96
60+	160 (9)	4.06	0.96, 7.16	194 (9)	3.34	0.74, 5.94	225 (15)	6.67	3.41, 9.94	244 (15)	6.19	3.22, 9.17
Total	478 (42)	9.27	6.75, 11.80	542 (44)	8.59	6.40, 10.79	635 (66)	10.94	8.56, 13.31	689 (84)	12.35	9.95, 14.75
<b>Overall Total</b>	5779 (1236)	21.39	20.31, 22.48	6524 (1507)	23.43	22.41, 24.45	8758 (2092)	23.68	22.77, 24.58	8060 (2036)	25.25	24.30, 26.20