

COVID-19 Seroprevalence Brief Report

Report #32A: March 1 - March 15, 2023, Survey

(Reported April 27, 2023)

Introduction

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 report weekly seroprevalence and evaluate differences by geographical regions, age groups, racialized groups, and socioeconomic status.

This is a brief bi-weekly report intended to provide updates to inform public health policy and mathematical modelling. Full reports with more detailed results are released monthly.

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.

SARS-COV-2 ANTIBODY TESTING

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

Full details on methods, data management and analysis, and ethical issues can be found in the previous Report, #31: February 2023.

Results

Between March 1 and March 15, 2023, a total of 15,209 unique donors were tested for SARS-CoV-2 antibodies.

Spike antibody results indicate a SARS-CoV-2 humoral response to vaccination or natural infection. The (adjusted) proportion of blood donors with humoral immunity was 100% (95% CI, 100.00, 100.00) (based on results from the Spike antibody assay). A peak in blood concentration followed by decline is expected after vaccination. Spike antibody concentrations are shown since September 2021 (Figure 1) and declines and peaks in antibody concentration are consistent with the roll-out of third and fourth vaccination doses in late 2021/early 2022, in the spring of 2022 and in the fall of 2022. Peaks occurred earlier in older age groups, consistent with the policies to vaccinate older age groups earlier and progressively in younger donors. Anti-Spike concentrations increased since the summer of 2022, however since January 2023 they have started to decline, particularly in older age groups.

The nucleocapsid seroprevalence is indicative of natural infection (Table 1). There was no change over the 15-day reporting period from 77.49% (95% CI, 76.62, 78.37) in the last week of February, to 77.97% (95% CI, 76.89, 79.04) in the first week of March and 78.29% (95% CI, 77.44, 79.13) in the second week of March. Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate compared to other age groups at 89.40% (95% CI 87.62, 91.18) in the week of March 8-15. Racialized groups continue to have higher seroprevalence compared with white donors (83.72% (95% CI, 82.05, 85.40) vs 76.71% (95% CI, 75.73, 77.70) in the week of March 8-15.

Conclusion

Spike antibody concentrations remain high. This may be related to a combination of vaccination and breakthrough natural infections. Despite all donors having vaccine related antibodies, the infection related antibody rate is 78.29% (95% CI, 77.44, 79.13) by mid-March, consistent with the continued prevalence of the Omicron subvariants.

Table 1. Weekly SARS-CoV-2 seroprevalence by sociodemographic variables by natural infection (nucleocapsid) results in February and March 2023 (weighted for population demographics and adjusted for test characteristics (sensitivity and specificity)).

| | February 22-28 | | | | March 1 – 7 | | | | March 8 – 15 | | | |
|----------------------|----------------|-----------------|------------------|--------------|---------------|-----------------|------------------|---------------|---------------|-----------------|------------------|--------------|
| | Crude | | Adjusted | | Crude | | Adjusted | | Crude | | Adjusted | |
| | Number Tested | Number Positive | Percent Positive | 95% CI | Number Tested | Number Positive | Percent Positive | 95% CI | Number Tested | Number Positive | Percent Positive | 95% CI |
| Sex | | | | | | | | | | | | |
| Female | 3,526 | 2,734 | 77.19 | 75.96, 78.43 | 2,227 | 1,736 | 78.57 | 77.07, 80.07 | 3,535 | 2,778 | 79.13 | 77.98, 80.29 |
| Male | 5,479 | 4,185 | 77.80 | 76.56, 79.03 | 3,743 | 2,818 | 77.34 | 75.79, 78.89 | 5,704 | 4,297 | 77.37 | 76.14, 78.61 |
| Age | | | | | | | | | | | | |
| 17-24 | 646 | 566 | 88.01 | 85.97, 90.05 | 387 | 348 | 90.18 | 87.90, 92.47 | 681 | 612 | 89.40 | 87.62, 91.18 |
| 25-39 | 2,260 | 1,902 | 84.66 | 83.12, 86.20 | 1,203 | 980 | 82.68 | 80.69, 84.68 | 2,156 | 1,783 | 83.94 | 82.41, 85.46 |
| 40-59 | 3,544 | 2,790 | 79.21 | 77.81, 80.61 | 2,319 | 1,829 | 79.67 | 77.92, 81.43 | 3,420 | 2,726 | 79.65 | 78.24, 81.05 |
| 60+ | 2,555 | 1,661 | 64.64 | 62.74, 66.53 | 2,061 | 1,397 | 66.67 | 64.37, 68.96 | 2,982 | 1,954 | 66.63 | 64.81, 68.44 |
| Province | | | | | | | | | | | | |
| British Columbia | 1,183 | 878 | 76.02 | 73.62, 78.42 | 1,145 | 841 | 75.50 | 73.00, 77.99 | 1,491 | 1,075 | 73.78 | 71.56, 76.00 |
| Alberta | 1,486 | 1,203 | 81.88 | 79.62, 84.14 | 1,477 | 1,170 | 81.53 | 79.09, 83.97 | 1,701 | 1,369 | 82.27 | 80.13, 84.40 |
| Saskatchewan | 326 | 258 | 80.25 | 75.67, 84.82 | 197 | 157 | 83.47 | 79.29, 87.64 | 298 | 209 | 76.07 | 71.04, 81.10 |
| Manitoba | 383 | 299 | 78.20 | 73.98, 82.42 | 169 | 131 | 83.46 | 78.98, 87.94 | 354 | 264 | 81.34 | 77.59, 85.10 |
| Ontario | 4,743 | 3,607 | 76.65 | 75.49, 77.82 | 2,747 | 2,077 | 76.94 | 75.31, 78.57 | 4,741 | 3,659 | 78.66 | 77.51, 79.82 |
| New Brunswick | 277 | 208 | 76.69 | 70.59, 82.78 | 70 | 46 | 65.15 | 58.37, 71.93 | 117 | 86 | 78.68 | 73.31, 84.05 |
| Nova Scotia | 409 | 311 | 75.53 | 70.83, 80.23 | 54 | 44 | 80.13 | 72.81, 87.45 | 256 | 188 | 75.37 | 71.11, 79.64 |
| Prince Edward Island | 82 | 67 | 85.35 | 77.96, 92.74 | 21 | 19 | 95.08 | 89.21, 100.00 | 12 | 8 | 71.01 | 52.58, 89.43 |
| Newfoundland | 116 | 88 | 78.25 | 71.91, 84.59 | 90 | 69 | 78.31 | 68.73, 87.89 | 269 | 217 | 80.87 | 75.67, 86.07 |
| Metro area | | | | | | | | | | | | |
| Vancouver | 622 | 484 | 79.29 | 76.29, 82.29 | 584 | 438 | 75.99 | 72.45, 79.54 | 841 | 647 | 77.87 | 75.08, 80.67 |
| Calgary | 553 | 445 | 81.30 | 77.22, 85.37 | 474 | 376 | 82.13 | 77.71, 86.56 | 668 | 542 | 82.88 | 79.46, 86.29 |

| | | | | | | | | | | | | |
|---|--------------|--------------|--------------|---------------------|--------------|--------------|--------------|---------------------|--------------|--------------|--------------|---------------------|
| Edmonton | 500 | 393 | 79.75 | 75.89, 83.61 | 483 | 369 | 77.36 | 72.85, 81.86 | 480 | 380 | 80.50 | 76.38, 84.61 |
| Ottawa | 517 | 371 | 72.25 | 67.77, 76.74 | 351 | 253 | 73.24 | 67.27, 79.22 | 557 | 410 | 75.74 | 71.16, 80.33 |
| Toronto | 1,606 | 1,268 | 78.64 | 76.97, 80.30 | 607 | 480 | 80.66 | 78.08, 83.24 | 1,434 | 1,137 | 79.73 | 78.04, 81.42 |
| Winnipeg | 206 | 161 | 78.49 | 72.61, 84.36 | 74 | 55 | 76.49 | 68.80, 84.18 | 265 | 194 | 79.95 | 75.39, 84.50 |
| Ethnicity¹ | | | | | | | | | | | | |
| White | 7,243 | 5,475 | 75.89 | 74.88, 76.90 | 4,887 | 3,671 | 76.49 | 75.26, 77.71 | 7,343 | 5,526 | 76.71 | 75.73, 77.70 |
| Indigenous | 97 | 76 | 79.83 | 71.62, 88.05 | 82 | 62 | 79.17 | 70.58, 87.77 | 121 | 91 | 78.52 | 70.95, 86.10 |
| Asian | 829 | 680 | 82.80 | 80.35, 85.25 | 476 | 388 | 84.54 | 81.35, 87.73 | 877 | 724 | 83.79 | 81.49, 86.08 |
| Other racialized groups | 681 | 567 | 85.14 | 82.54, 87.74 | 385 | 321 | 86.09 | 82.59, 89.59 | 689 | 572 | 84.41 | 81.84, 86.98 |
| Social Deprivation² | | | | | | | | | | | | |
| 1 (least deprived) | 1,767 | 1,401 | 80.57 | 78.71, 82.43 | 1,194 | 909 | 78.83 | 76.42, 81.25 | 1,722 | 1,341 | 79.44 | 77.54, 81.35 |
| 2 | 1,749 | 1,340 | 76.63 | 74.61, 78.65 | 1,052 | 802 | 77.38 | 74.77, 79.98 | 1,835 | 1,395 | 76.96 | 74.98, 78.93 |
| 3 | 1,629 | 1,230 | 76.58 | 74.49, 78.66 | 1,018 | 768 | 76.88 | 74.16, 79.59 | 1,598 | 1,198 | 76.26 | 74.18, 78.34 |
| 4 | 1,433 | 1,104 | 78.23 | 76.07, 80.38 | 996 | 762 | 77.90 | 75.34, 80.47 | 1,496 | 1,149 | 78.96 | 76.86, 81.06 |
| 5 (most deprived) | 1,440 | 1,070 | 74.01 | 71.73, 76.28 | 950 | 711 | 75.79 | 73.05, 78.52 | 1,427 | 1,076 | 78.26 | 76.13, 80.40 |
| Material Deprivation² | | | | | | | | | | | | |
| 1 (least deprived) | 2,272 | 1,742 | 76.63 | 74.87, 78.39 | 1,514 | 1,138 | 77.01 | 74.84, 79.19 | 2,360 | 1,782 | 77.58 | 75.88, 79.27 |
| 2 | 1,978 | 1,518 | 77.11 | 75.20, 79.02 | 1,206 | 907 | 77.01 | 74.51, 79.52 | 1,953 | 1,452 | 75.06 | 73.10, 77.02 |
| 3 | 1,716 | 1,299 | 76.55 | 74.51, 78.58 | 1,171 | 908 | 79.13 | 76.79, 81.48 | 1,643 | 1,293 | 80.41 | 78.45, 82.37 |
| 4 | 1,291 | 993 | 78.41 | 76.17, 80.66 | 872 | 655 | 76.64 | 73.77, 79.50 | 1,300 | 984 | 77.73 | 75.46, 80.00 |
| 5 (most deprived) | 761 | 593 | 79.33 | 76.57, 82.09 | 447 | 344 | 76.65 | 72.75, 80.54 | 822 | 648 | 81.07 | 78.47, 83.67 |
| Total | 9,005 | 6,919 | 77.49 | 76.62, 78.37 | 5,970 | 4,554 | 77.97 | 76.89, 79.04 | 9,239 | 7,075 | 78.29 | 77.44, 79.13 |

¹ In Week 1, self reported ethnicity was missing for 155 (1.7%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 80.67% (95% CI 74.28, 87.06). In Week 2, self reported ethnicity was missing for 140 (2.3%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 80.51% (95% CI 73.49, 87.54). In Week 3, self reported ethnicity was missing for 209 (2.3%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.89% (95% CI 76.88, 86.91).

² In Week 1, postal codes were missing for 987 (11.0%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 79.08% (95% CI 76.47, 81.70). In Week 2, postal codes were missing for 760 (12.7%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 81.76% (95% CI 78.94, 84.58). In Week 3, postal codes were missing for 1,161 (12.6%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 80.49% (95% CI 78.23, 82.74).

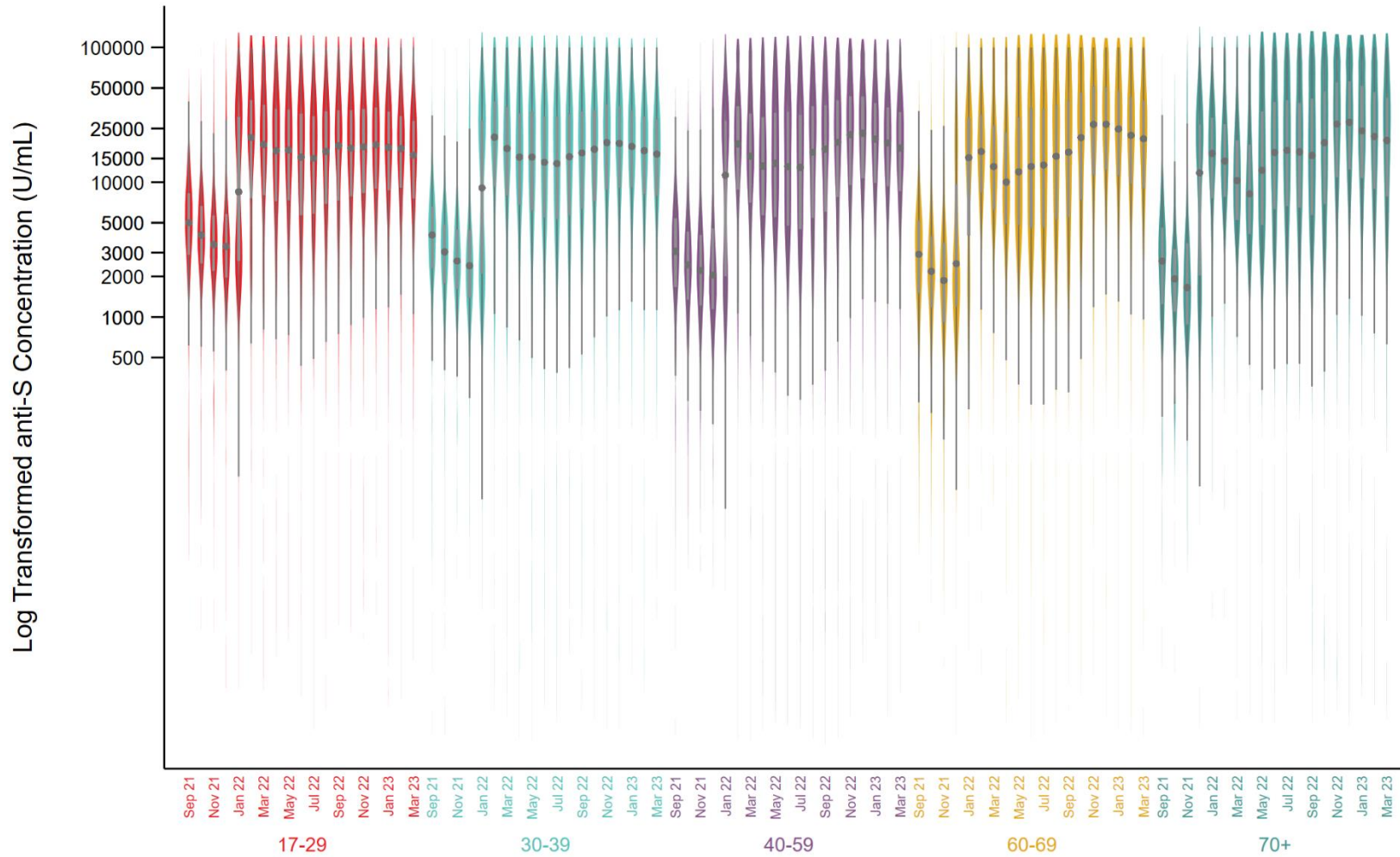


Figure 1. Spike antibody concentration (U/mL) by month and age group from September 1, 2021, to March 15, 2023.