

COVID-19 Seroprevalence Brief Report

Report #29A: December 1 - December 15, 2022, Survey

(Reported January 17, 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 as the Omicron variant wave progresses. 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, #28: November 2022.

Results

Between December 1 and December 15, 2022, a total of 17,061 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 have been rising since the summer of 2022, particularly in older donors.

The nucleocapsid seroprevalence is indicative of natural infection (Table 1). There was an increase over the 15-day reporting period from 70.83% (95% CI, 69.80, 71.86) in the last week of November, to 72.06% (95% CI, 71.00, 73.12) in the first week of December, to 73.28% (95% CI, 72.40, 74.15) by mid-December. Consistent with previous surveys, donors aged 17-24 years old had the highest seroprevalence rate compared to other age groups (87.71% (95% CI 85.89, 89.54) in the week of December 8-15, 86.75% (95% CI, 84.34, 89.16) from December 1-7). Compared to the last week of November, the seroprevalence rate increased in all provinces except Manitoba, New Brunswick, and Nova Scotia. Racialized groups continue to have higher seroprevalence compared with white donors (80.97% (95% CI, 79.08, 82.87) vs 71.62% (95% CI, 70.63, 72.61) in the week of December 8-15, 78.10% (95% CI, 75.69, 80.52) vs 70.87% (95% CI, 69.69, 72.05) from December 1-7).

Conclusion

Spike antibody concentrations are high and have been rising since the summer of 2022, particularly in older donors. This may be related to a combination of vaccination and breakthrough natural infections. Despite all donors having vaccine related antibodies as of December 2022, the infection related antibody rate is 73.28% (95% CI, 72.40, 74.15) by mid-December, 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 November and December 2022 (weighted for population demographics and adjusted for test characteristics (sensitivity and specificity)).

	November 24-30				December 1 – 7				December 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	3,231	2,267	70.15	68.71, 71.58	3,014	2,174	71.83	70.36, 73.31	4,269	3,106	72.52	71.28, 73.75
Male	4,397	3,106	71.58	70.10, 73.06	4,026	2,835	72.31	70.79, 73.83	5,744	4,137	74.07	72.83, 75.31
Age												
17-24	583	480	82.76	80.22, 85.30	528	458	86.75	84.34, 89.16	861	752	87.71	85.89, 89.54
25-39	1,929	1,463	76.44	74.49, 78.39	1,663	1,330	80.43	78.50, 82.36	2,470	1,962	79.89	78.29, 81.49
40-59	2,887	2,102	72.51	70.81, 74.22	2,643	1,924	73.02	71.25, 74.80	3,707	2,739	74.01	72.53, 75.48
60+	2,229	1,328	59.43	57.38, 61.49	2,206	1,297	58.94	56.83, 61.05	2,975	1,790	59.87	58.04, 61.70
Province												
British Columbia	1,093	772	71.56	68.98, 74.15	1,265	876	70.12	67.57, 72.66	1,554	1,124	72.99	70.77, 75.20
Alberta	1,413	1,038	74.30	71.69, 76.90	1,343	1,067	80.34	78.19, 82.50	1,884	1,458	78.62	76.74, 80.50
Saskatchewan	300	213	70.50	65.24, 75.76	315	234	74.74	69.91, 79.57	366	269	74.45	69.89, 79.01
Manitoba	380	279	75.50	70.81, 80.19	391	299	78.10	73.97, 82.22	388	291	75.32	71.00, 79.63
Ontario	3,881	2,706	70.05	68.64, 71.46	3,310	2,254	69.01	67.41, 70.60	4,959	3,532	72.14	70.88, 73.40
New Brunswick	252	163	65.16	59.13, 71.20	86	66	77.63	68.60, 86.65	146	90	62.17	54.17, 70.16
Nova Scotia	184	124	67.23	59.87, 74.60	214	127	59.25	52.67, 65.83	387	247	64.89	60.11, 69.68
Prince Edward Island	30	16	56.98	32.13, 81.84	40	27	73.08	59.24, 86.92	88	66	77.83	69.06, 86.60
Newfoundland	95	62	66.30	59.00, 73.60	76	59	78.06	68.41, 87.72	241	166	70.23	64.35, 76.10
Metro area												
Vancouver	574	419	73.63	70.22, 77.04	626	469	75.57	72.17, 78.96	789	594	75.78	72.78, 78.78
Calgary	531	400	75.63	71.26, 80.00	469	371	79.56	75.83, 83.29	636	487	77.83	74.52, 81.13

Edmonton	459	330	73.18	68.52, 77.84	453	351	79.05	75.24, 82.85	534	400	76.42	72.76, 80.08
Ottawa	424	271	65.84	60.10, 71.57	537	357	67.57	63.56, 71.57	291	200	70.65	65.30, 76.00
Toronto	1,137	796	69.22	67.10, 71.33	815	581	71.52	68.38, 74.67	1,550	1,148	74.36	72.16, 76.56
Winnipeg	277	205	76.64	70.82, 82.46	229	173	77.10	71.59, 82.61	252	184	72.78	67.26, 78.29
Ethnicity¹												
White	6,138	4,207	68.68	67.50, 69.85	5,791	4,049	70.87	69.69, 72.05	8,211	5,813	71.62	70.63, 72.61
Indigenous	114	85	73.93	65.76, 82.10	87	65	74.13	64.99, 83.28	121	89	73.09	65.15, 81.03
Asian	713	554	78.52	75.63, 81.42	586	464	79.99	76.69, 83.28	850	685	81.91	79.32, 84.50
Other racialized groups	557	441	80.31	77.02, 83.60	471	356	76.56	72.73, 80.39	677	541	81.19	78.25, 84.12
Social Deprivation²												
1 (least deprived)	1,466	1,041	71.10	68.71, 73.50	1,395	1,002	72.93	70.55, 75.31	1,946	1,444	75.42	73.49, 77.36
2	1,431	999	69.40	67.00, 71.79	1,357	945	70.64	68.20, 73.08	1,909	1,348	71.61	69.56, 73.67
3	1,399	994	72.25	69.89, 74.61	1,215	850	70.91	68.32, 73.50	1,719	1,247	73.24	71.11, 75.37
4	1,240	866	70.36	67.85, 72.87	1,070	750	70.41	67.66, 73.16	1,539	1,099	72.25	69.99, 74.51
5 (most deprived)	1,186	808	68.03	65.39, 70.67	1,151	827	72.77	70.19, 75.36	1,602	1,125	70.79	68.55, 73.02
Material Deprivation²												
1 (least deprived)	1,989	1,370	68.01	65.94, 70.08	1,922	1,371	72.16	70.13, 74.19	2,530	1,830	73.03	71.28, 74.79
2	1,721	1,208	70.68	68.47, 72.88	1,420	985	70.24	67.84, 72.64	2,155	1,532	72.33	70.41, 74.25
3	1,329	924	69.89	67.40, 72.38	1,239	867	71.35	68.81, 73.90	1,862	1,338	72.77	70.72, 74.81
4	1,052	748	71.77	69.09, 74.45	1,011	727	72.43	69.65, 75.21	1,306	935	71.99	69.54, 74.45
5 (most deprived)	631	458	74.18	70.90, 77.46	596	424	71.74	68.10, 75.39	862	628	73.94	71.02, 76.86
Total	7,628	5,373	70.83	69.80, 71.86	7,040	5,009	72.06	71.00, 73.12	10,013	7,243	73.28	72.40, 74.15

¹ In Week 1, self reported ethnicity was missing for 106 (1.4%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 82.18% (95% CI 74.71, 89.65). In Week 2, self reported ethnicity was missing for 105 (1.5%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 71.27% (95% CI 62.69, 79.84). In Week 3, self reported ethnicity was missing for 154 (1.5%) donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 76.12% (95% CI 69.46, 82.79).

² In Week 1, postal codes were missing for 906 (11.9%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 75.08% (95% CI 72.18, 77.97). In Week 2, postal codes were missing for 852 (12.1%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 75.72% (95% CI 72.81, 78.64). In Week 3, postal codes were missing for 1,298 (13.0%) of donors; Adjusted seroprevalence by the Nucleocapsid antibody assay was 76.78% (95% CI 74.48, 79.07).

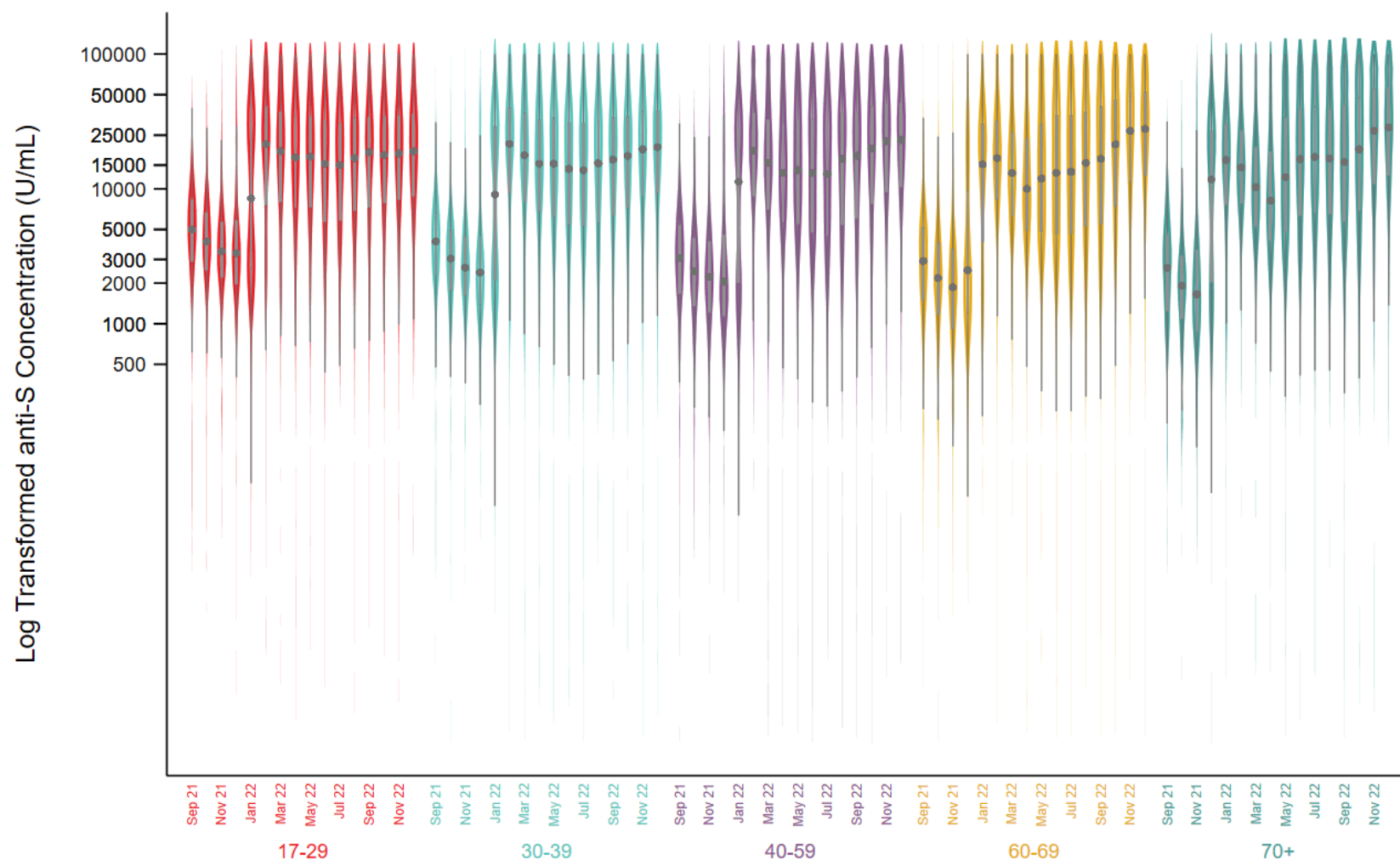


Figure 1. Spike antibody concentration (U/mL) by month and age group from September 1, 2021, to December 15, 2022.