



**Canadian
Blood
Services**

BLOOD
PLASMA
STEM CELLS
ORGANS
& TISSUES

COVID-19 Seroprevalence Report

COVID-19 Seroprevalence Report

March 18, 2021

Report #6: January 2021 Survey

Summary

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 a novel coronavirus first identified in Wuhan, Hubei province China in late 2019. It is responsible for a respiratory illness, coronavirus infection disease (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. With less than 500 confirmed cases across Canada, by March 23rd, 2020, strict physical distancing measures were implemented. As a direct result, the first wave of the epidemic peaked by the end of April and plateaued in July and August. A resurgence of infections began in late September 2020 and continued to grow across Canada until December. Yet, these statistics do not convey the true infection rate because some infections will not cause illness, others may not be severe enough for people to seek testing, and testing may be disproportionately directed to outbreaks. Testing for SARS-CoV-2 antibodies is important to understand what proportion of the population have detectable antibodies (the seroprevalence) and to monitor infection over the course of the pandemic. This information will improve mathematical models to predict the course of infection and inform public health policy.

Blood donors are reasonably representative of healthy Canadians between the ages of 17 and about 60. There are people over 60 who donate blood, although there are fewer as age increases. Canadian Blood Services has blood collection sites in all large cities and many smaller urban centres in all provinces except Quebec but people in rural areas may have less opportunity to donate. Blood donations are not collected in the northern territories.

In partnership with the COVID-19 Immunity Task Force, Canadian Blood Services is testing samples left over from donations for SARS-CoV-2 antibodies. **The current report summarizes the seroprevalence estimates from residual blood from donors in January 2021.**

Methods

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. They are deferred from donation for 2 weeks if they have been in contact with someone who was infected, and if they have had the infection deferral is for two 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 and other testing. An extra sample is taken, called the retention sample, in

case extra testing is required. Only about 20% of these retention samples are needed. For seroprevalence testing plasma from the 80% of retention samples not needed for operational testing was 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 (although most samples from August and September have not yet been tested). In January 2021 all samples were tested. **This report includes samples from January 1-27, 2021.**

SARS-CoV-2 antibody testing

All plasma samples were tested using the Abbott Architect SARS-CoV-2 IgG assay (chemiluminescent microparticle immunoassay (CMIA)) which utilizes the nucleocapsid antigen. This assay was assumed to have 92.7% (90.2-94.8%) sensitivity and 99.9% (99.4 – 100%) specificity (1). Testing was conducted at Canadian Blood Services in Ottawa.

Ethical issues

All data were de-identified by the information technology team at Canadian Blood Services by providing a random identification number. Demographic variables 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 routinely tested infectious disease markers and other tests as required. Information about the study was made available on the website in late June, 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 quantiles 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 (2). SARS-CoV-2 seroprevalence was stratified by geography (regions, province, economic regions (maps) and selected metropolitan cities), sex, age groups, self-reported ethnicity and social and material deprivation indices. Temporal trends at two-week intervals were evaluated by geographical region by linear regression. Statistical comparisons between groups were carried out using logistic regression.

Results

Between January 1 and January 27, 2021, a total of 34,921 unique donors were tested for SARS-CoV-2 antibodies. Over half (57%) were from male donors, all age groups were represented however the majority were from donors 40 years and older. Samples tested were represented of donation rates by each province (Table 1).

Table 2 shows the unadjusted and adjusted SARS-CoV-2 seroprevalence rates by sociodemographic variables for all Canadian provinces (except Quebec and territories). Overall seroprevalence was 1.99% (95% CI 1.84, 2.15) a significant increase from December 2020 (1.37% (95% CI 1.18, 1.56) ($P>0.001$)).

We found seroprevalence differed by age groups with the highest rates among donors aged 17-24 years old 3.45% (95% CI 2.87, 4.02%). Compared to December 2020, there was a significant increase in seroprevalence rates among donors 25-39 years old and 40-59 years old (Table A2). Donors that self-identified as white had a significantly lower seroprevalence rate (1.66%; 95% CI 1.49, 1.82) compared to all other racialized groups (3.30%; 95% CI 2.78, 3.83) ($P>0.001$). Donor's living in the most materially deprived neighborhoods were nearly four-times more likely to be positive compared to those living in more affluent neighborhoods (4.04% compared to 1.17%).

Table 3 compares SARS-CoV-2 seroprevalence by province. Manitoba remained the province with the highest adjusted rate (3.92% (95% CI 2.92, 4.93) followed by Alberta 3.41% (95% CI 2.89, 3.94) and the lowest in Prince Edward Island and New Brunswick. Tables A1.1-A1.5 summarize all provincial rates stratified by age and sex.

Figure 1 illustrates temporal trends of SARS-CoV-2 seroprevalence from April 4, 2020 until January 27, 2021 by approximately two-week intervals¹. After a stark increase in seroprevalence at the end of November, rates declined in early December. However, since December rates have been steadily increasing. This increase in seroprevalence is driven by

¹ Data from the CIHR funded "Correlates of Immunity" study, that samples 1500 donors per month from April 2020-March 2021 were included to create this report

higher rates in Alberta and Ontario (Figure 2A stratifies monthly temporal trends by regions; Appendix Figure 2A provides biweekly summaries).

Figure 3 illustrates significant inter-regional variations within each province. For example, in Manitoba in populations with greater than 80 samples tested; seroprevalence rates ranged from 1.2% (95% CI 0, 3.2%) in Interlake to 15.2% (95% CI 7.2, 23.24%). Table A5 lists all regional seroprevalence rates compared to the last two months (November and December 2020). Table 4 summarizes SARS-CoV-2 seroprevalence by cities. The highest seroprevalence was observed in Edmonton 3.74% followed by Calgary 2.87%, Toronto 2.44% and Winnipeg 2.45%.

Given seroprevalence in Ontario is lower than expected. We compared seroprevalence trends in Ontario compared to Toronto (Figure 4). While in December Toronto's seroprevalence was more than two times Ontario's seroprevalence rate (including Toronto), in January we found this differentiation shrunk considerably.

Conclusion

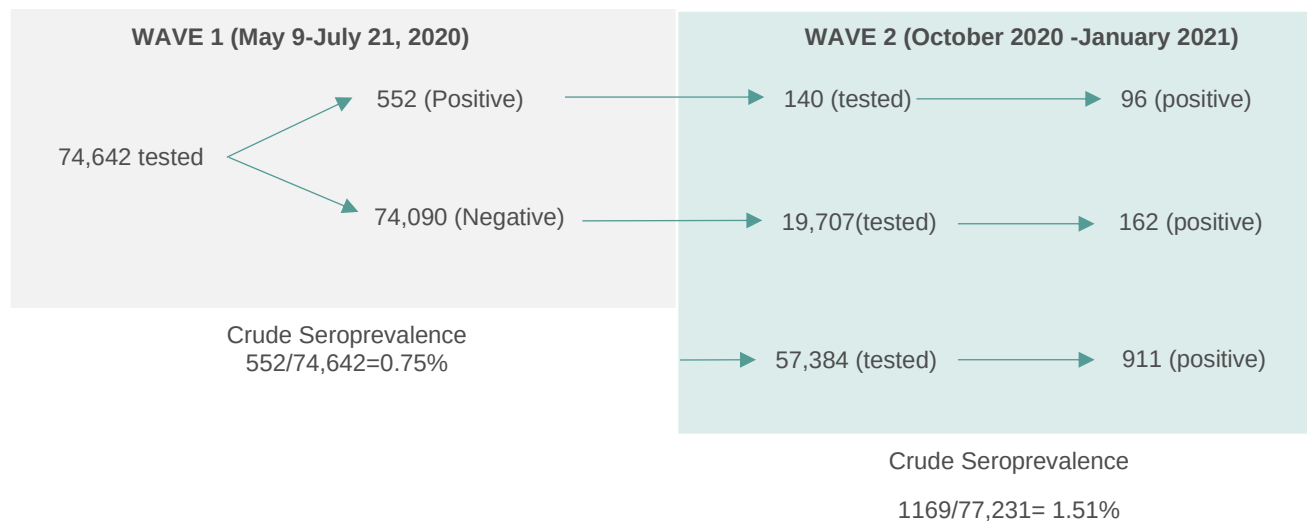
Overall seroprevalence of SARS-CoV-2 remained low in Canadian blood donors between January 1-27, 2020 (2%) but there was significant regional variation. There was also some evidence of a spill over effect from younger adults to older adults as seroprevalence increased significantly among donors 25-59 years old in January compared to December. Racialized groups and donors living in material deprived neighbourhoods remained more likely to have antibodies compared to white donors and the disparities are widening. Overall lower rates than expected may be a result of waning antibody (see points for interpretation). While the donor selection criteria ensure blood donors are healthy, caution should be exercised in extrapolating findings to all healthy Canadians adults because donors self-select to be blood donors, in some areas access to a donation clinic may be limited and because there are fewer elderly donors.

Points for Interpretation

1. Blood donors are a healthy sub-set of the adult Canadian population. Important points to keep in mind with regards 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 unweighted SARS-CoV-2 seroprevalence for the full sample

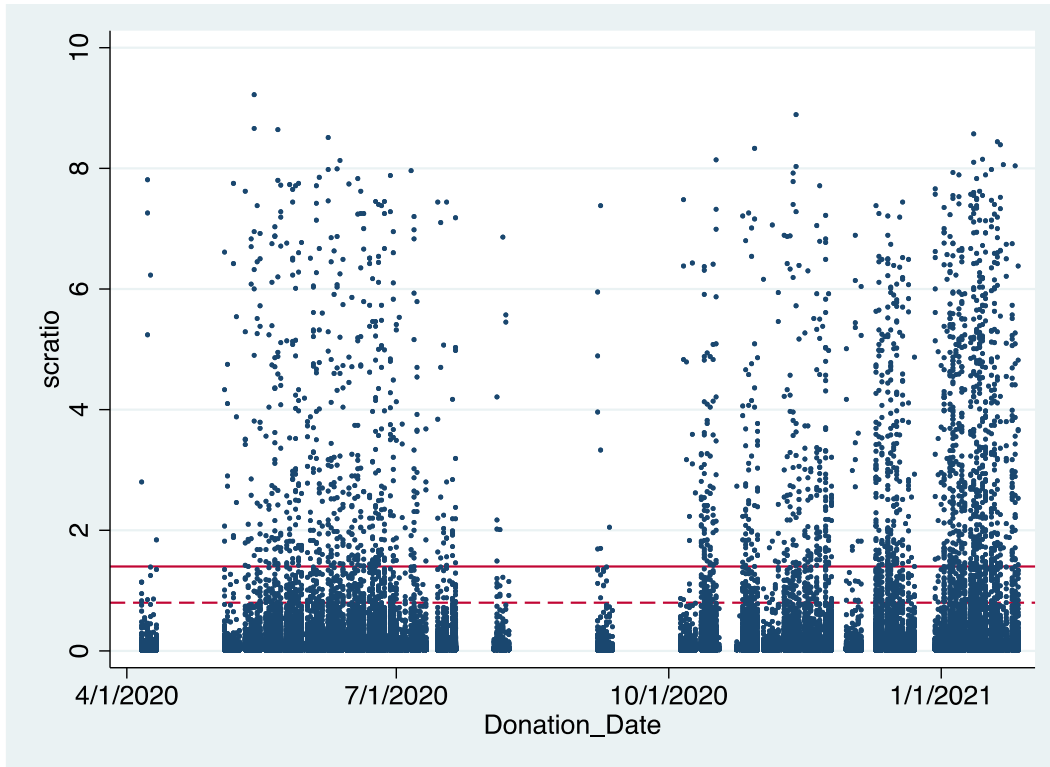
was 2% (95% CI 1.86, 2.16)), and after weighting factors applied it was 2.06% (95% CI 1.90, 2.22), then after the weighted seroprevalence was adjusted for sensitivity and specificity, 1.99% (95% CI 1.84, 2.15).

3. The sensitivity and specificity of the Abbott assay were obtained from a report from the United Kingdom. The manufacturer indicates higher sensitivity. A study from Denmark indicates sensitivity may be slightly lower.
4. The sensitivity and specificity of the assay 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. The Abbott assay used by Canadian Blood Services detects IgG antibodies to the SARS-CoV-2 nucleocapsid protein. IgG develops during infection but may not be present early in the course of infection. Donors are deferred if they have recent COVID-19 infection, but asymptomatic early stage infections may not be detected. 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).
5. In total, 35,070 samples from January were tested. Of these 148 were a donation from donors who had been tested more than once during the January sampling period. None of these repeated donors were positive. Repeat tested samples were excluded from the present analysis. Analysis is presented for the 34,921 unique donors in this study period.
6. It is common for blood donors to donate multiple times over a year. The following flow diagram highlights donors that were tested multiple times over the sampling period of May 9, 2020 to January 27, 2021. Of the 552 positive donors in wave 1, 140 were re-tested in wave 2 and 96/140 (69%) remained positive. Of the 74,090 negative donors in wave 1, 19,707 were re-tested in wave 2 and 162/19,707 (0.82%) seroconverted. Wave 2 included 57,384 naïve donors (to the seroprevalence study), of whom 911 were positive (1.59%).



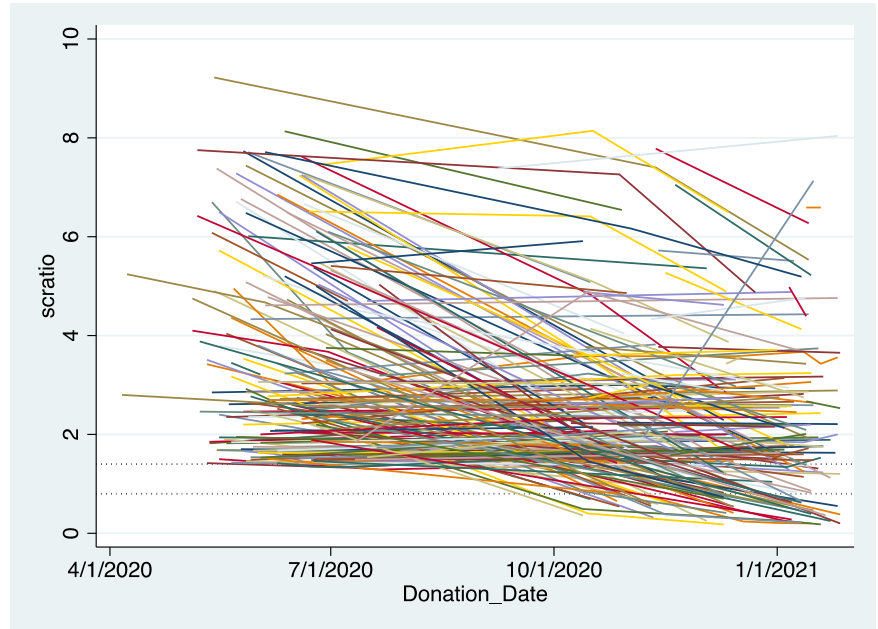
7. There is growing evidence that SARS-CoV-2 antibody levels begin to wane in some individuals by about 100 days post-infection. This is particularly evident using a nucleocapsid-based assay such as the one used in this study.

Multiple approaches are currently being investigated to account for waning antibody levels to adjust seroprevalence. Preliminary work below summarizes waning signals in our donor population.



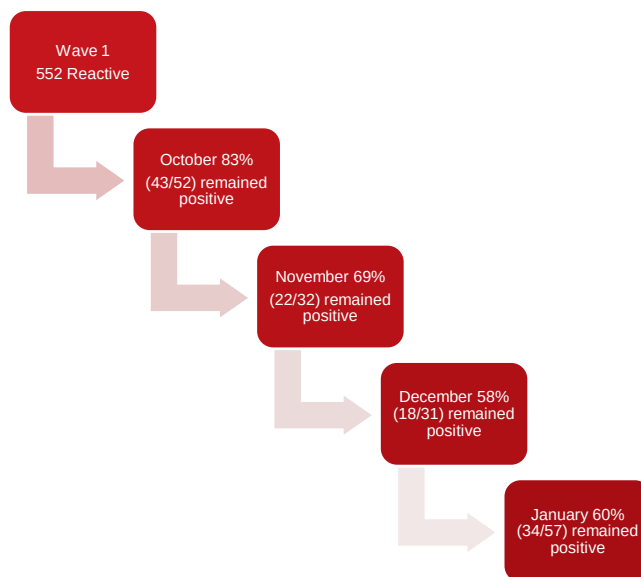
Cross-sectional assessment of sample to cut-off (S/Co) ratios from April 9, 2020 until January 27, 2020, of all retention samples tested with a S/Co ratio greater than 0.1 are illustrated in the figure above. Solid red line indicates manufacturers 1.4 threshold to identify reactive samples. Dotted red line (0.8) represents manufacturers updated “grey zone” classification of reactive samples. The concentration of samples between 0.8-1.4 compared to >1.4 appears to be increasing over time with each wave, suggesting a waning nucleocapsid signal.

We evaluated S/Co kinetics among seropositive donors with repeated samples tested. A total of 201 seropositive donors were identified as having at least 2 (max 9) measurements over a median of 21 weeks (IQR 9, 27), their median age at baseline was 48 years old (IQR 34, 61) and 137 (68%) were male. Baseline S/Co ratio was 2.8 (IQR 2.6, 3.0) and this decreased to 1.95 (IQR 1.41, 2.92) at donors last screening.



We used a generalized mixed effect linear model (random intercept for the individual donor) to estimate the rate of decline to be **-0.06 units/weeks (95% CI -0.07, -0.05)] (p-value <0.0001)**, this model takes into account the variance between donors. We found no association between age, sex, region, ABO blood group, the date of baseline donation with baseline S/co ratios or rate of decline (however sample size remains limited).

The effect of this decline is summarized by the following flow diagram; among donors that tested positive in the first wave, when retested in October, November, December or in January 2021, only 83%, 69%, 58% and 60% remained positive, respectively.



8. Disclaimer: Canadian Blood Services is providing this report of the study results on an "as is" basis and makes no representations or warranties, express or implied, including with regards to the accuracy, reliability or validity of the information or its fitness for a particular purpose. The use of this report and/or any study results is the responsibility of the user. Canadian Blood Services assumes no liability resulting from any such use. This report may not be reproduced without permission from Canadian Blood Services.

References

1. The National SARS-CoV-2 Serologic Assay Evaluation Group. Head-to-head benchmark evaluation of the sensitivity and specificity of five immunoassays for SARS-CoV-2 serology on >1500 samples. Available at: <https://doi.org/10.6084/m9.figshare.12593288.v1>.
2. Lang Z, Reiczigel J. Confidence limits for prevalence of disease adjusted for estimated sensitivity and specificity. Preventive Veterinary Medicine. 2014;113;13-22.

Table 1. January survey of 34,921 Canadian Blood Services donors

	Number Tested	Percentage
Sex		
Female	15,102	43.2
Male	19,819	56.8
Age		
17-24	2,758	7.9
25-39	9,863	28.2
40-59	12,810	36.7
60+	9,490	27.2
Province		
British Columbia	6,418	18.4
Alberta	7,189	20.6
Saskatchewan	1,790	5.1
Manitoba	1,878	5.4
Ontario	14,286	40.9
New Brunswick	1,130	3.2
Nova Scotia	1,413	4.0
Prince Edward Island	318	0.9
Newfoundland	499	1.4
Total	34,921	

Note: 35,070 donations were tested, if multiple donations were from the same donor only the first was counted.

Table 2. SARS-CoV-2 Seroprevalence by Sociodemographic Variables (January 2021 Survey)

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	15,102	286	1.89	1.68, 2.12	1.78	1.57, 1.98
Male	19,819	414	2.09	1.89, 2.30	2.22	1.99, 2.46
Age						
17-24	2,758	94	3.41	2.76, 4.15	3.45	2.87, 4.02
25-39	9,863	246	2.49	2.20, 2.82	2.49	2.14, 2.84
40-59	12,810	230	1.80	1.57, 2.04	1.70	1.46, 1.95
60+	9,490	130	1.37	1.15, 1.62	1.28	1.04, 1.52
Ethnicity^{1,2}						
White	25,983	448	1.72	1.57, 1.89	1.66	1.49, 1.82
Indigenous	415	5	1.20	0.39, 2.79	1.05	0.00, 2.14
Asian	1,387	37	2.67	1.89, 3.66	2.74	1.82, 3.65
Other racialized groups	3,172	115	3.63	3.00, 4.34	3.95	3.23, 4.66
Social Deprivation Index³						
1 (least deprived)	6,450	153	2.37	2.01, 2.77	2.47	2.07, 2.87
2	6,544	141	2.15	1.82, 2.54	2.19	1.81, 2.56
3	6,348	107	1.69	1.38, 2.03	1.69	1.35, 2.02
4	5,651	95	1.68	1.36, 2.05	1.66	1.30, 2.02
5 (most deprived)	6,098	110	1.80	1.48, 2.17	1.70	1.35, 2.05

Con't to next page

Material Deprivation Index ³						
1 (least deprived)	9,278	121	1.30	1.08, 1.56	1.17	0.93, 1.41
2	7,382	126	1.71	1.42, 2.03	1.67	1.36, 1.98
3	6,573	143	2.18	1.84, 2.56	2.17	1.80, 2.54
4	5,128	116	2.26	1.87, 2.71	2.26	1.83, 2.68
5 (most deprived)	2,730	100	3.66	2.99, 4.44	4.04	3.28, 4.80
Total	34,921	700	2.00	1.86, 2.16	1.99	1.84, 2.15

¹ Self-reported ethnicity was missing for 3,964 (11.4%) donors; 95 were positive, adjusted SARS-CoV-2 seroprevalence of those missing ethnicities was 2.50% (95% CI 1.97, 3.02)

² All racialized groups together resulted in adjusted SARS-CoV-2 seroprevalence of 3.37% (95% CI 2.84, 3.91)

³ Postal Codes were missing for 3,830 (10.97%) donors; 94 were positive, adjusted SARS-CoV-2 seroprevalence among missing postal codes was 2.32 (95% CI 1.80, 2.84)

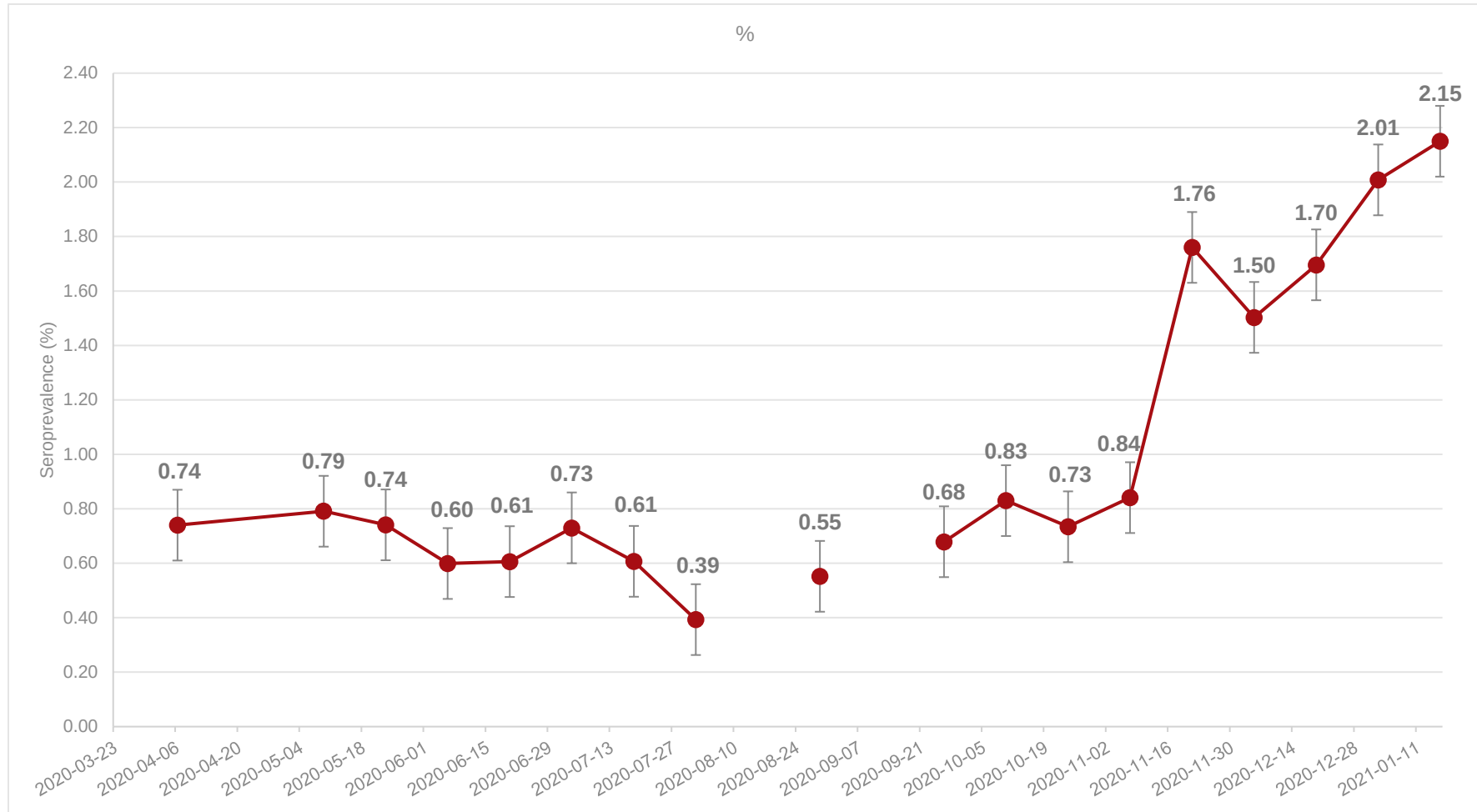
Table 3. SARS-CoV-2 seroprevalence by province (January Survey)

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
British Columbia	6,418	95	1.48	1.20, 1.81	1.48	1.16, 1.81
Alberta	7,189	223	3.10	2.71, 3.53	3.41	2.89, 3.94
Saskatchewan	1,790	40	2.23	1.60, 3.03	2.46	1.59, 3.33
Manitoba	1,878	68	3.62	2.82, 4.57	3.92	2.92, 4.93
Ontario	14,286	257	1.80	1.59, 2.03	1.82	1.61, 2.04
New Brunswick	1,130	5	0.44	0.14, 1.03	0.27	0.00, 0.66
Nova Scotia	1,413	9	0.64	0.29, 1.21	0.56	0.09, 1.03
Prince Edward Island	318	0	0	0.00, 1.15	0	
Newfoundland and Labrador	499	3	0.60	0.12, 1.75	0.42	0.00, 0.97
Total	34,921	700	2.00	1.86, 2.16	1.99	1.84, 2.15

Table 4. SARS-CoV-2 seroprevalence in selected cities (January Survey)

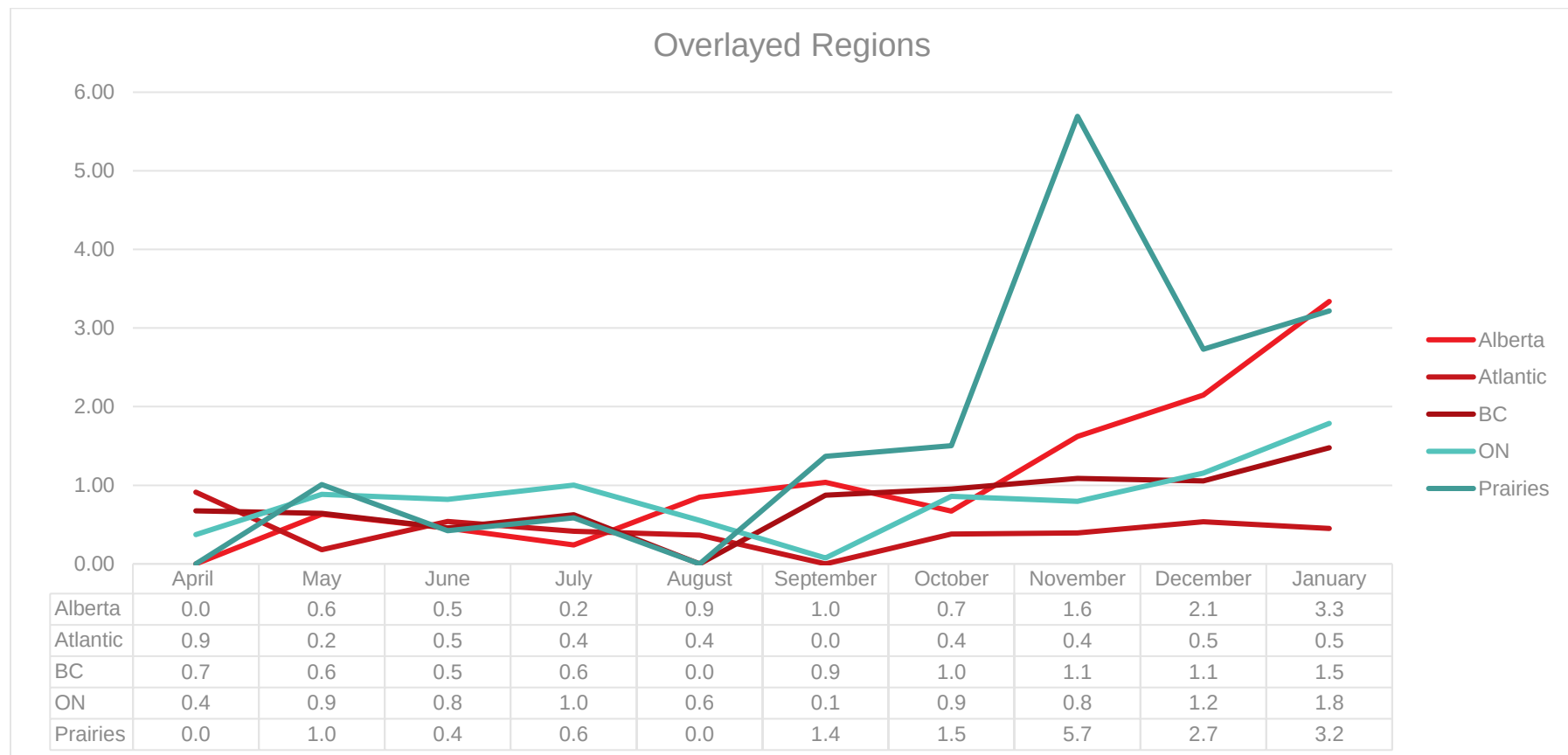
	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Vancouver	3,649	66	1.81	1.40, 2.30	1.83	1.30, 2.30
Calgary	2,596	67	2.58	2.01, 3.27	2.87	2.10, 3.68
Edmonton	2,417	83	3.43	2.74, 4.24	3.74	2.80, 4.68
Ottawa	1,340	10	0.75	0.36, 1.37	0.78	0.30, 1.26
Toronto	4,364	100	2.29	1.87, 2.78	2.44	2.00, 2.89
Winnipeg	1,131	27	2.39	1.58, 3.45	2.46	1.40, 3.51

Figure 1. Overall temporal trends of SARS-CoV-2 seroprevalence by two-week intervals from April 2020-January 2021.



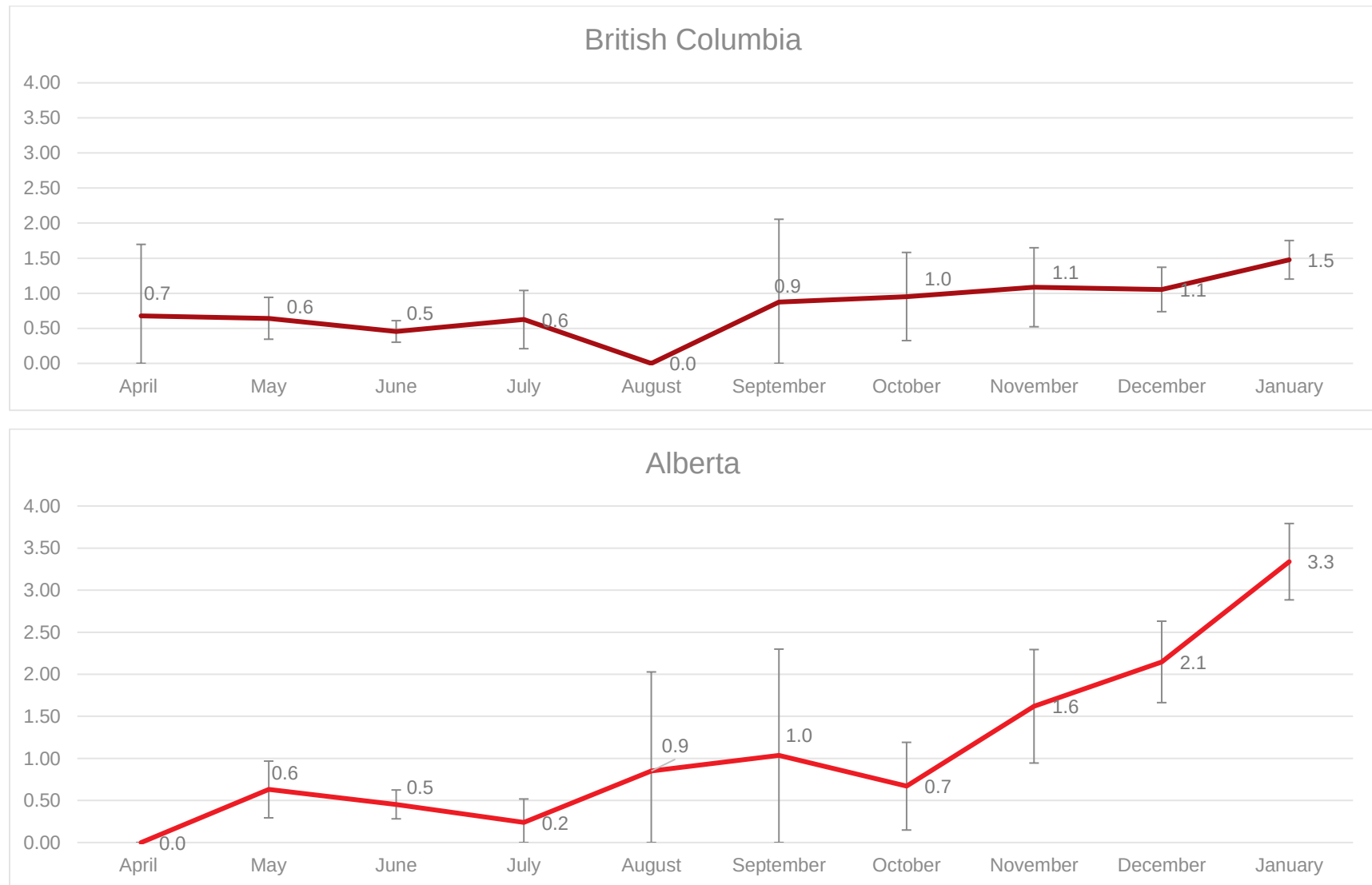
Notes: SARS-CoV-2 seroprevalence rates (95% CI), that have been weighted and adjusted for test characteristics. Data from the CIHR funded study (Correlates of Immunity) from April 9-January 31, 2020 have been included. There is a significant linear temporal trend.

Figure 2A. Overall temporal trends of SARS-CoV-2 seroprevalence monthly from April-December 2020.

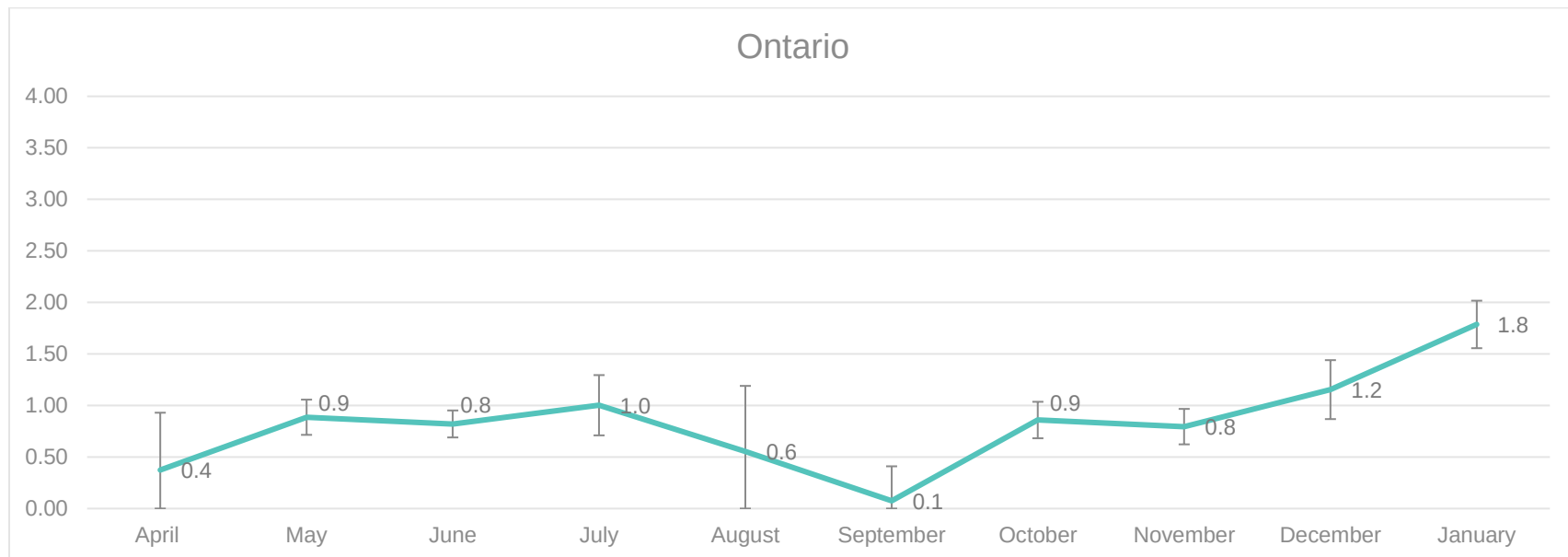
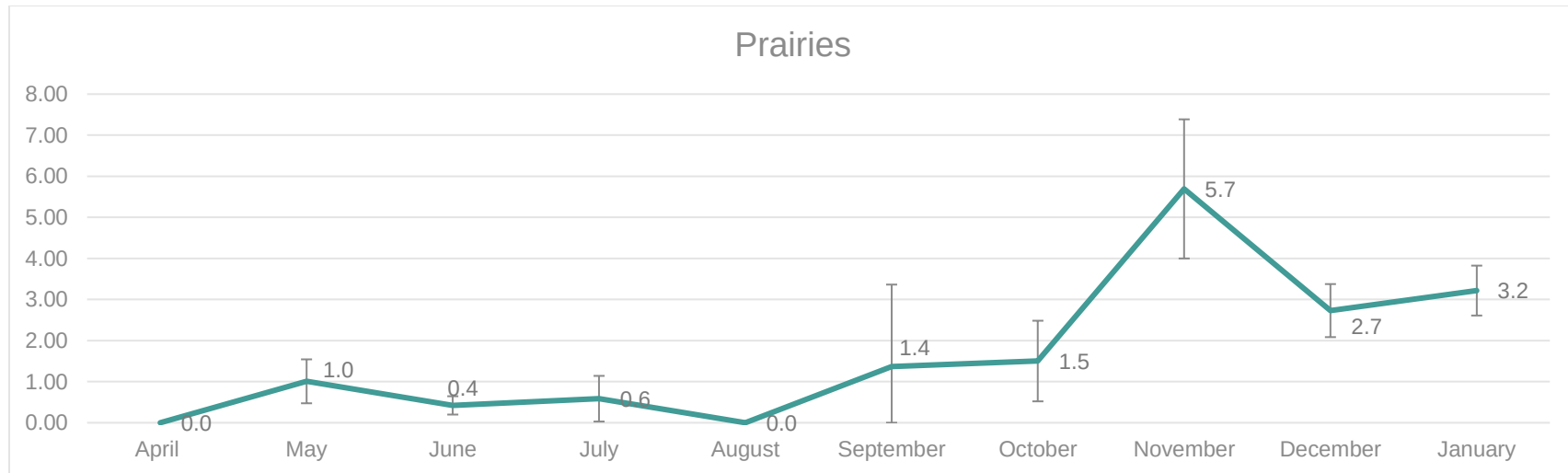


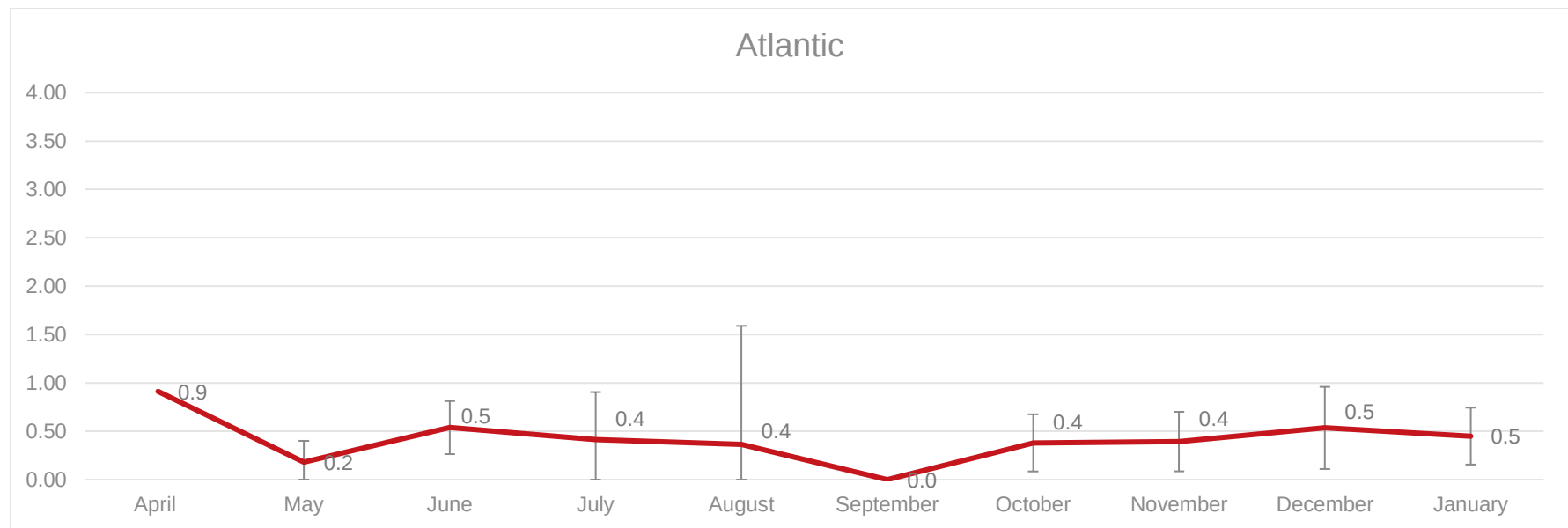
Note: SARS-CoV-2 seroprevalence rates (weighted and adjusted for test characteristics). Data from the CIHR funded study (Correlates of Immunity) from April 9-January 31, 2020 have been included.

Figure 2B. Overall temporal trends of SARS-CoV-2 seroprevalence monthly from April 2020-January 2021.



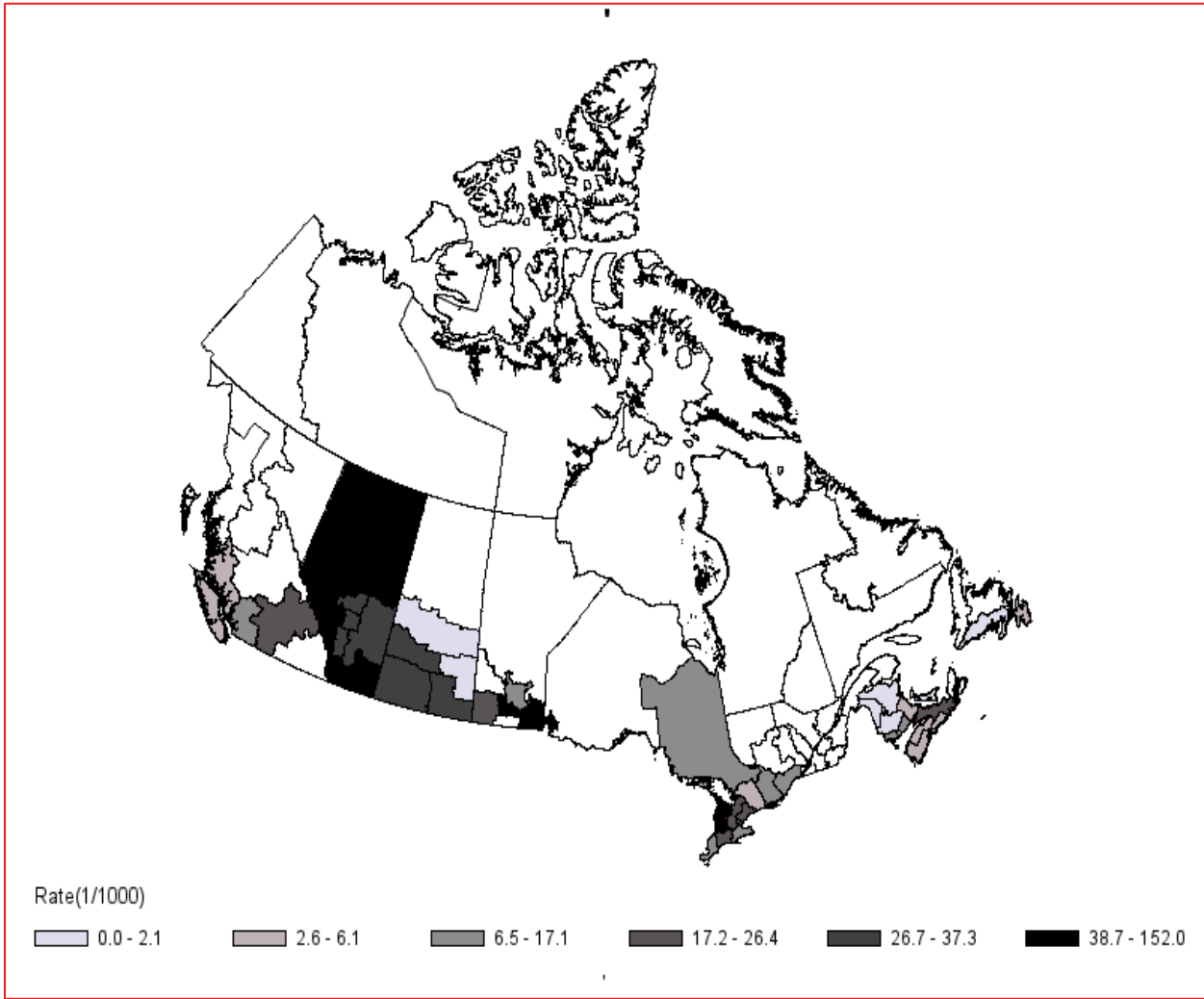
COVID-19 Seroprevalence Report
January Survey





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-August 31, 2020 have been included. **Y-axis is different for the Prairies.**

Figure 3A. SARS-CoV-2 seroprevalence by economic regions **per 1000 donors** (January 2021 survey)



. Table A5 summarizes SARS-CoV-2 seroprevalence by economic regions.

Figure 3B. SARS-CoV-2 seroprevalence by economic regions **per 1000 donors** (inter-regional variation January survey)

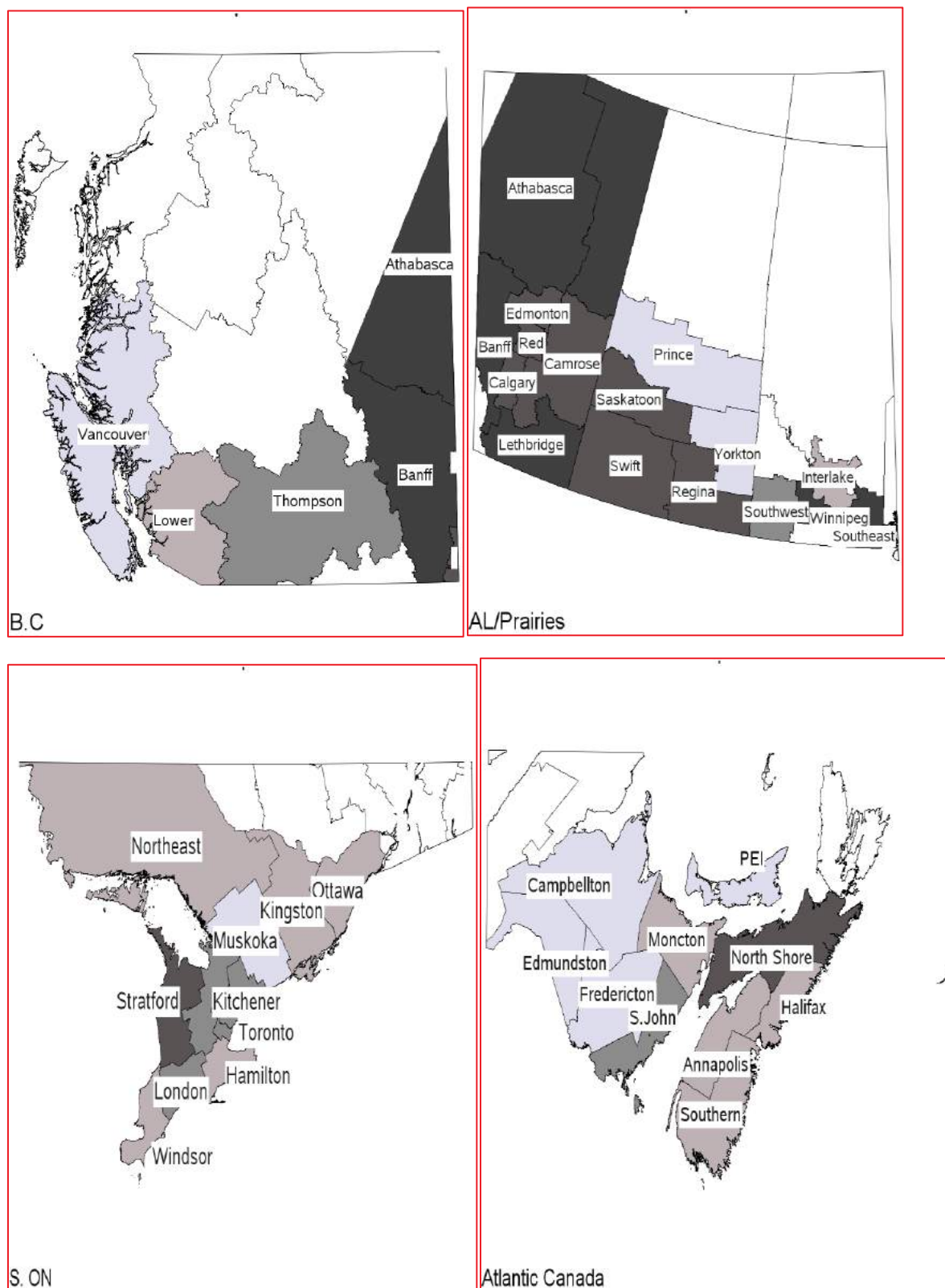
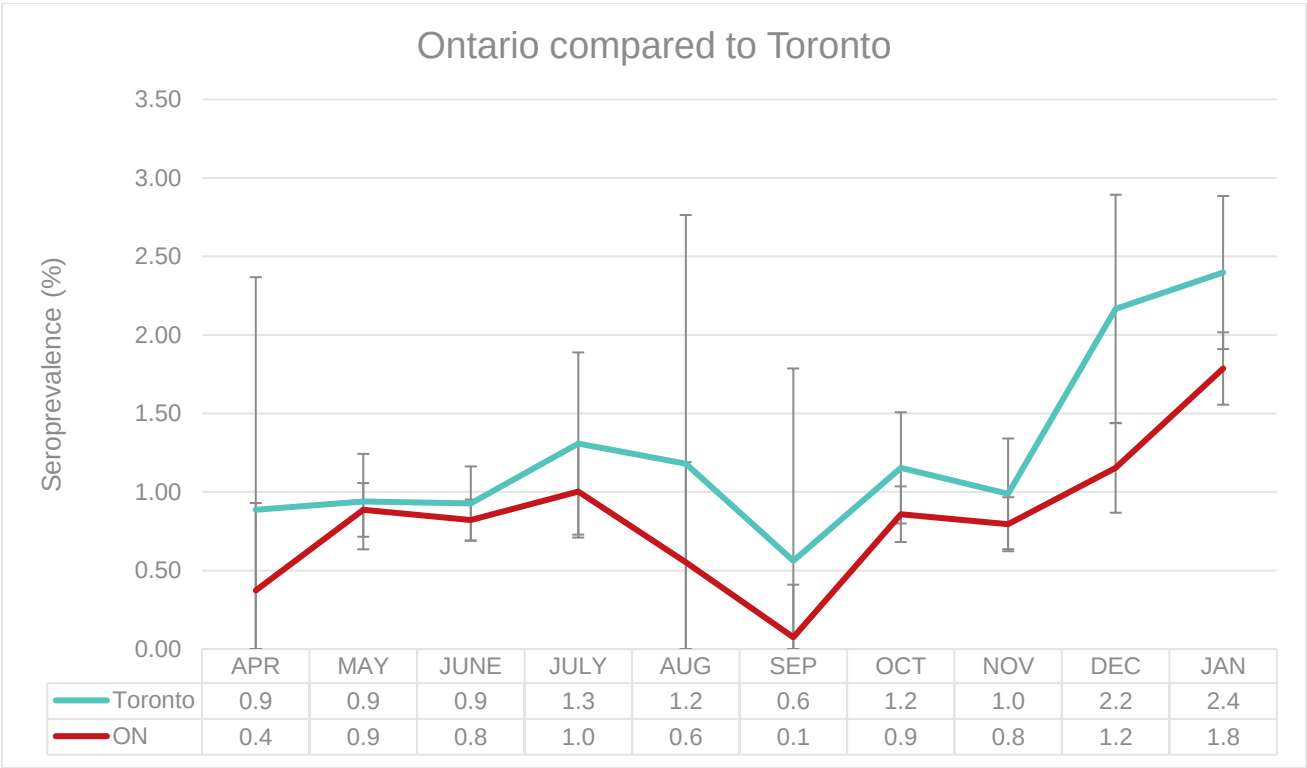


Figure 4. Seroprevalence overall in Ontario compared to Toronto



Appendix – Regional SARS-CoV-2 seroprevalence by sex and age (January 2021)

Table A1.1 British Columbia

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	2,799	41	1.46	1.05, 1.98	1.47	1.02, 1.92
Male	3,619	54	1.49	1.12, 1.94	1.50	1.03, 1.96
Age						
17-24	447	7	1.57	0.63, 3.20	1.57	0.59, 2.55
25-39	1,924	32	1.66	1.14, 2.34	1.69	0.98, 2.39
40-59	2,192	31	1.41	0.96, 2.00	1.34	0.81, 1.87
60+	1,855	25	1.35	0.87, 1.98	1.45	0.87, 2.04
Total	6,418	95	1.48	1.20, 1.81	1.48	1.16, 1.81

Table A1.2 Alberta

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	3,186	103	3.23	2.65, 3.91	3.36	2.62, 4.09
Male	4,003	120	3.00	2.49, 3.57	3.47	2.73, 4.22
Age						
17-24	595	30	5.04	3.43, 7.12	5.50	3.68, 7.32
25-39	2,142	84	3.92	3.14, 4.83	4.13	3.09, 5.18
40-59	2,650	77	2.91	2.30, 3.62	3.03	2.19, 3.86
60+	1,802	32	1.78	1.22, 2.50	1.88	1.05, 2.71
Total	7,189	223	3.10	2.71, 3.53	3.41	2.89, 3.94

Table A1.3 Saskatchewan

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	748	15	2.01	1.13, 3.29	2.02	0.90, 3.14
Male	1,042	25	2.40	1.56, 3.52	2.91	1.57, 4.26
Age						
17-24	149	7	4.70	1.91, 9.44	5.11	1.69, 8.53
25-39	496	19	3.83	2.32, 5.92	3.96	1.84, 6.08
40-59	632	6	0.95	0.35, 2.05	0.96	0.00, 1.96
60+	513	8	1.56	0.68, 3.05	1.56	0.22, 2.90
Total	1,790	40	2.23	1.60, 3.03	2.46	1.59, 3.33

Table A1.4 Manitoba

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	881	28	3.18	2.12, 4.56	3.23	1.95, 4.51
Male	997	40	4.01	2.88, 5.42	4.65	3.09, 6.20
Age						
17-24	175	8	4.57	1.99, 8.81	5.30	2.17, 8.43
25-39	496	26	5.24	3.45, 7.59	5.55	3.20, 7.90
40-59	674	18	2.67	1.59, 4.19	2.77	1.30, 4.24
60+	533	16	3.00	1.73, 4.83	3.16	1.43, 4.89
Total	1,878	68	3.62	2.82, 4.57	3.92	2.92, 4.93

Table A1.5 Ontario

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	6,000	95	1.58	1.28, 1.93	1.57	1.29, 1.84
Male	8,286	162	1.96	1.67, 2.28	2.10	1.77, 2.43
Age						
17-24	1,189	42	3.53	2.56, 4.74	3.66	2.84, 4.49
25-39	4,006	82	2.05	1.63, 2.53	2.07	1.61, 2.53
40-59	5,385	92	1.71	1.38, 2.09	1.63	1.29, 1.97
60+	3,706	41	1.11	0.80, 1.50	1.02	0.72, 1.33
Total	14,286	257	1.80	1.59, 2.03	1.82	1.61, 2.04

Table A1.5 Atlantic Provinces

	Unweighted				Adjusted	
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Percent Positive	95% Confidence Interval
Sex						
Female	1,488	4	0.27	0.07, 0.69	0.18	0.00, 0.46
Male	1,872	13	0.69	0.37, 1.18	0.62	0.17, 1.07
Age						
17-24	203		0	0.00, 1.80	0.00	0.00, 0.00
25-39	799	3	0.38	0.08, 1.09	0.24	0.00, 0.72
40-59	1,277	6	0.47	0.17, 1.02	0.42	0.00, 0.87
60+	1,081	8	0.74	0.32, 1.45	0.62	0.08, 1.16
Total	3,360	17	0.51	0.30, 0.81	0.39	0.14, 0.65

Table A2. Comparison of SARS-CoV-2 seroprevalence by socio-demographic variables December 2020 to January 2021)

	WAVE 2: DECEMBER 2020				JANUARY 2021				December 2020 compared to January 2021 (p-value)
	Unadjusted		Adjusted		Unadjusted		Adjusted		
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	
Sex									
Female	8,240	106	1.06	0.84, 1.28	15102	286	1.78	1.57, 1.98	0.0000
Male	10,769	179	1.67	1.39, 1.95	19819	414	2.22	1.99, 2.46	0.0047
Age									
17-24	1,737	45	2.63	1.95, 3.32	2758	94	3.45	2.87, 4.02	0.0865
25-39	5,211	77	1.36	1.00, 1.72	9863	246	2.49	2.14, 2.84	0.0000
40-59	7,319	103	1.17	0.89, 1.45	12810	230	1.70	1.46, 1.95	0.0079
60+	4,742	60	1.02	0.72, 1.31	9490	130	1.28	1.04, 1.52	0.1808
Ethnicity									
White	14,289	192	1.16	0.97, 1.35	25,983	448	1.66	1.49, 1.82	0.0002
Indigenous	233	4	3.34	0.74, 5.94	415	5	1.05	0.00, 2.14	0.0618
Asian	776	11	1.02	0.24, 1.79	1,387	37	2.74	1.82, 3.65	0.0130
Other racialized Groups	1,698	38	2.57	1.78, 3.36	3,172	115	3.95	3.23, 4.66	0.0167
Con't to next page									

Social Deprivation Index									
1 (least deprived)	3,603	61	1.56	1.13, 1.99	6,450	153	2.47	2.07, 2.87	0.0041
2	3,485	48	1.31	0.91, 1.71	6,544	141	2.19	1.81, 2.56	0.0035
3	3,496	57	1.51	1.07, 1.94	6,348	107	1.69	1.35, 2.02	0.5320
4	3,151	47	1.04	0.65, 1.43	5,651	95	1.66	1.30, 2.02	0.0310
5 (most deprived)	3,019	37	1.28	0.84, 1.72	6,098	110	1.70	1.35, 2.05	0.1596
Material Deprivation Index									
1 (least deprived)	5,246	53	0.79	0.52, 1.06	9,278	121	1.17	0.93, 1.41	0.0518
2	4,171	64	1.49	1.09, 1.89	7,382	126	1.67	1.36, 1.98	0.4852
3	3,374	55	1.44	1.02, 1.87	6,573	143	2.17	1.80, 2.54	0.0163
4	2,437	41	1.48	0.98, 1.99	5,128	116	2.26	1.83, 2.68	0.0318
5 (most deprived)	1,526	37	2.3	1.53, 3.07	2,730	100	4.04	3.28, 4.80	0.0033
Total	19,009	285	1.36	1.18, 1.53	34,921	700	1.95	1.80, 2.09	<0.0001

Note: Data from the CIHR funded study (Correlates of Immunity) has been appended to December data.

Table A3. Comparison of SARS-CoV-2 seroprevalence by province (December 2020 to January 2021)

	WAVE 2: DECEMBER 2020				JANUARY 2021				December 2020 compared to January 2021 (p-value)
	Unadjusted		Adjusted		Unadjusted		Adjusted		
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	
British Columbia	3,577	40	1.02	0.65, 1.39	6,418	95	1.48	1.16, 1.81	0.0801
Alberta	4,339	89	2.12	1.55, 2.68	7,189	223	3.41	2.89, 3.94	0.0020
Saskatchewan	1,510	33	2.27	1.13, 3.41	1,790	40	2.46	1.59, 3.33	0.7981
Manitoba	1,325	41	3.1	1.88, 4.31	1,878	68	3.92	2.92, 4.93	0.3204
Ontario	6,319	72	1.16	0.93, 1.40	14,286	257	1.82	1.61, 2.04	0.0001
New Brunswick	482	3	0.78	0.00, 1.61	1,130	5	0.27	0.00, 0.66	0.2130
Nova Scotia	978	6	0.62	0.00, 1.30	1,413	9	0.56	0.09, 1.03	0.8794
Prince Edward Island	208	0			318				
Newfoundland and Labrador	271	1	0.19	0.00, 0.76	499	3	0.42	0.00, 0.97	0.6055
Total	19,009	285	1.36	1.18,1.53	34,921	700	1.95	1.80, 2.09	<0.0001

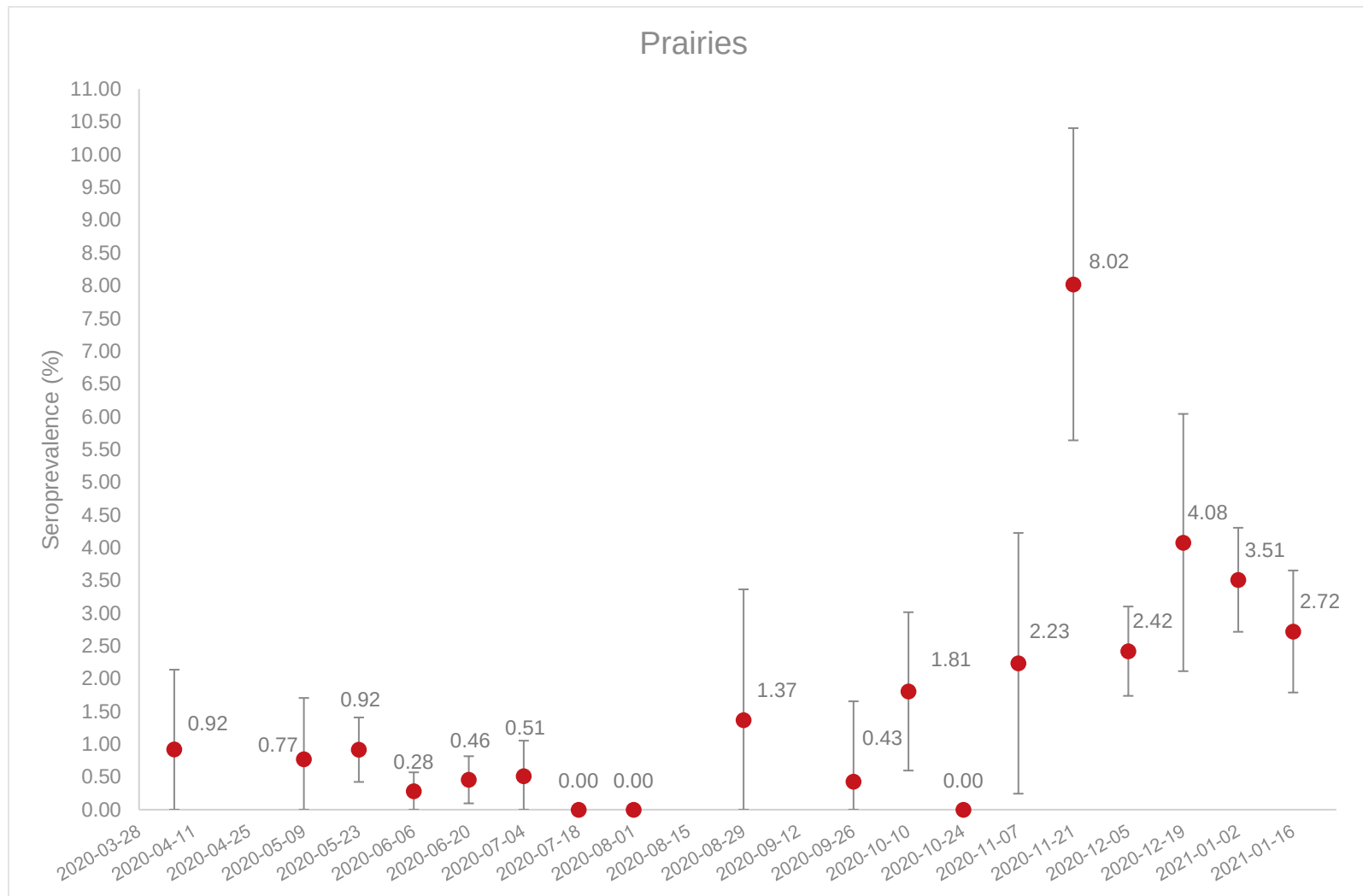
Note: Data from the CIHR funded study (Correlates of Immunity) has been appended to December data.

Table A4. Comparison of SARS-CoV-2 seroprevalence in selected cities (December 2020 to January 2021)

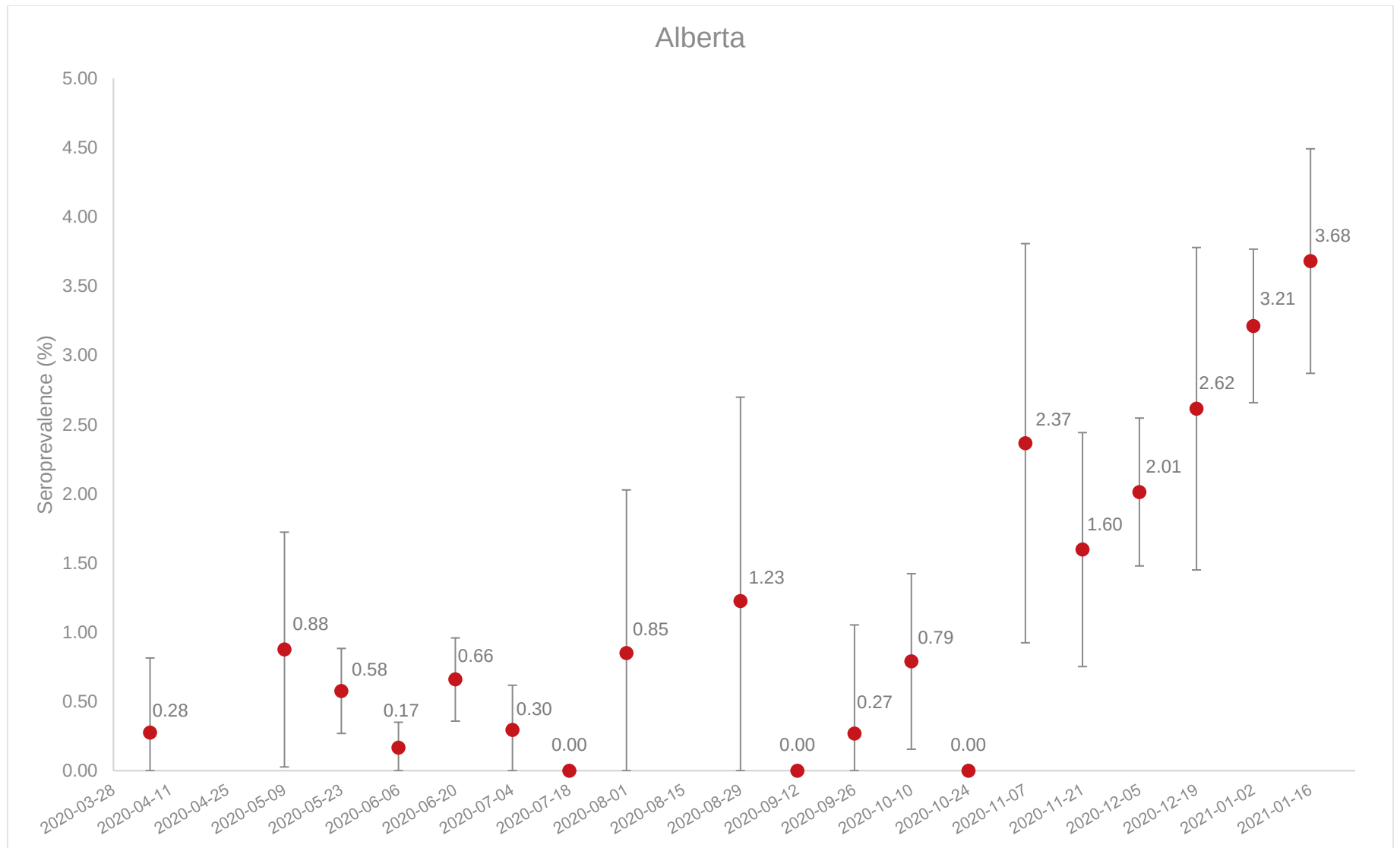
	WAVE 2: DECEMBER 2020				JANUARY 2021				December 2020 compared to January 2021 (p-value)
	Unadjusted		Adjusted		Unadjusted		Adjusted		
	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	Number Tested	Number Positive	Percent Positive	95% Confidence Interval	
Vancouver	2,020	26	1.22	0.68, 1.76	3,649	66	1.83	1.35, 2.30	0.1167
Calgary	1,561	22	1.28	0.53, 2.04	2,596	67	2.87	2.07, 3.68	0.0113
Edmonton	1,460	38	2.74	1.63, 3.84	2,417	83	3.74	2.81, 4.68	0.1932
Ottawa	728	5	0.54	0.04, 1.04	1,340	10	0.78	0.30, 1.26	0.5059
Toronto	1,773	33	2.22	1.61, 2.82	4,364	100	2.44	2.00, 2.89	0.5554
Winnipeg	852	16	1.77	0.60, 2.94	1,131	27	2.46	1.42, 3.51	0.4057

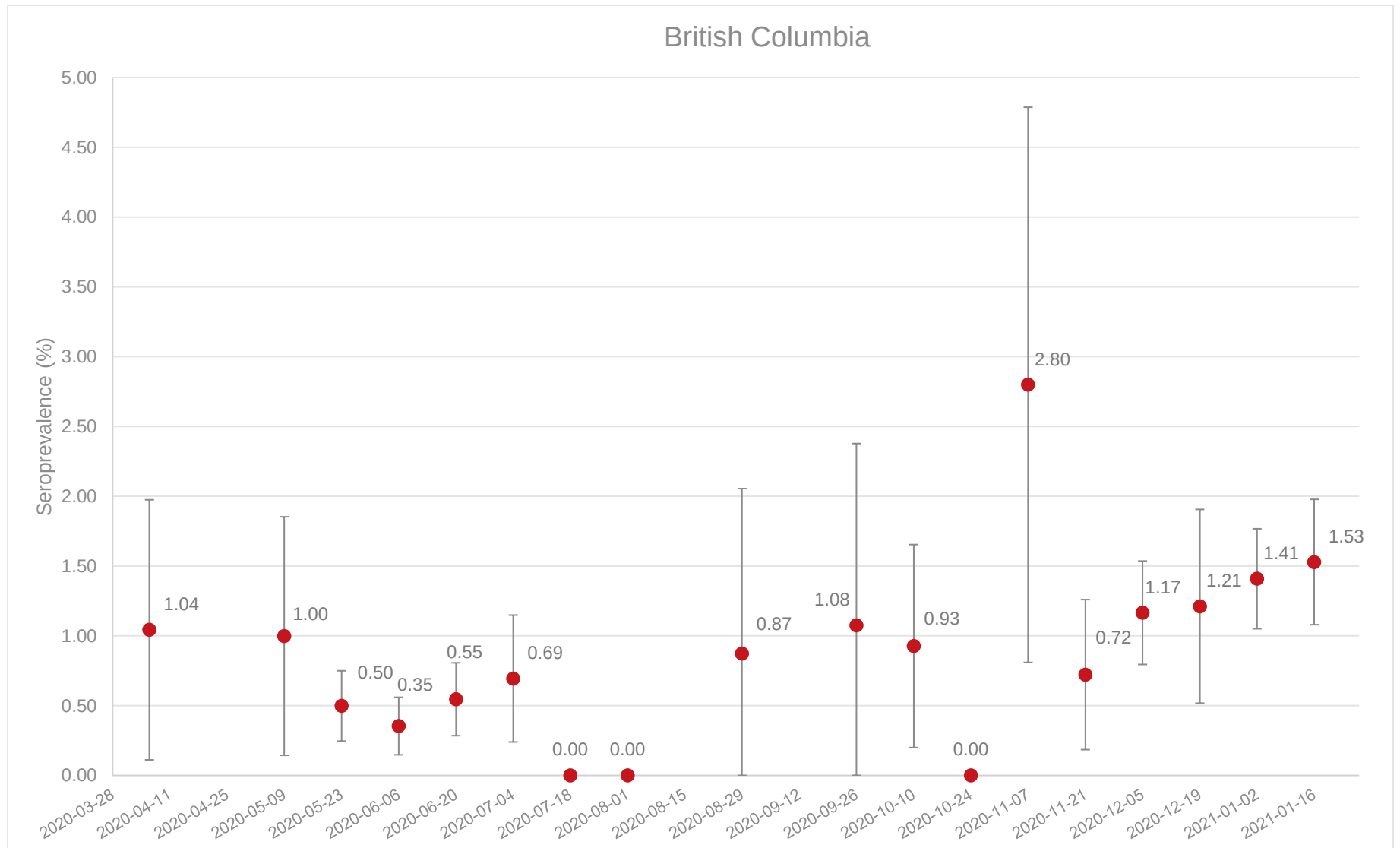
Note: Data from the CIHR funded study (Correlates of Immunity) has been appended to December data.

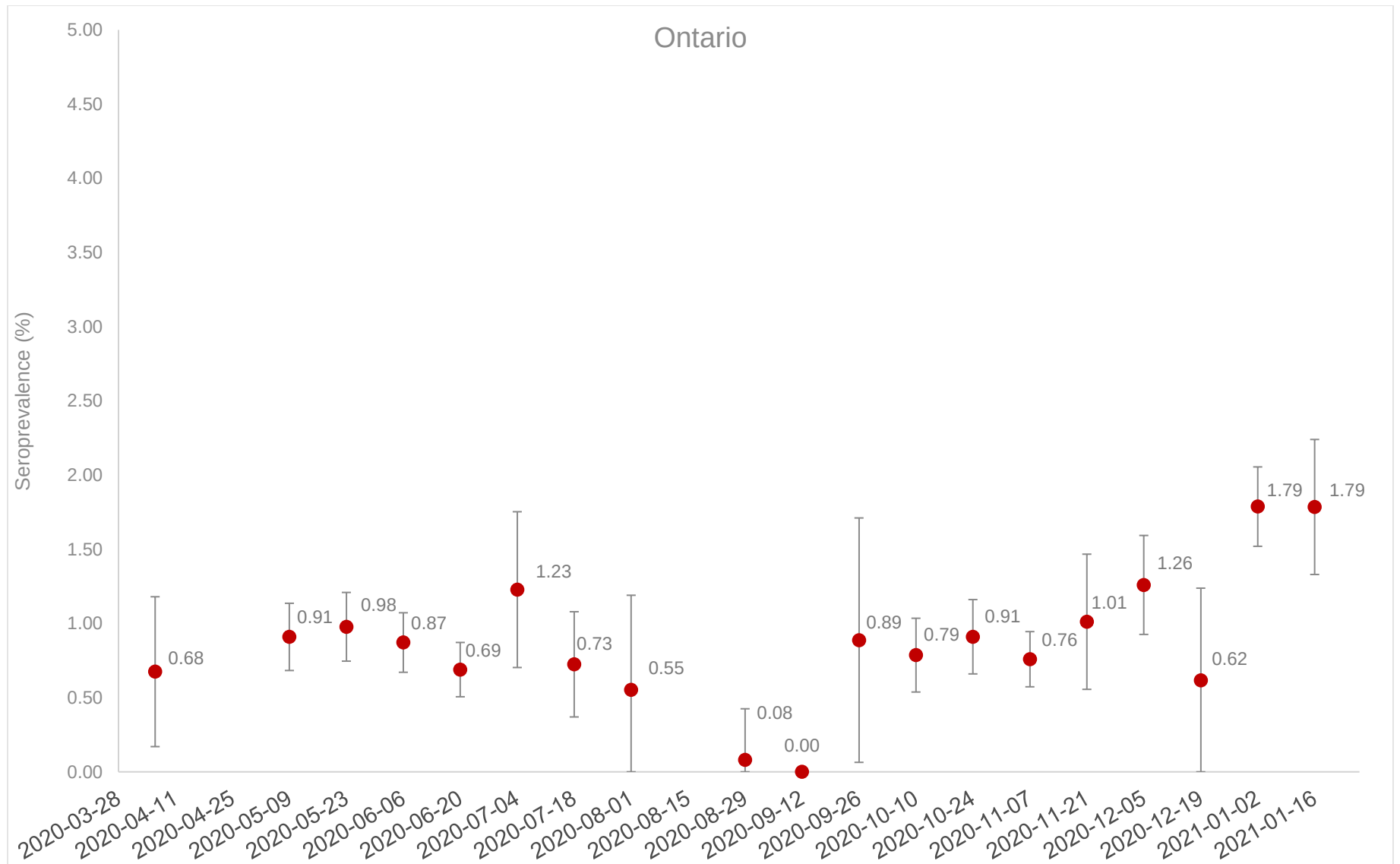
Figure A-1A. Temporal trends of SARS-CoV-2 seroprevalence bi-weekly from April 2020-January 2021 (by region)



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-January 31, 2020 have been included. **Y-axis is different between regions.**







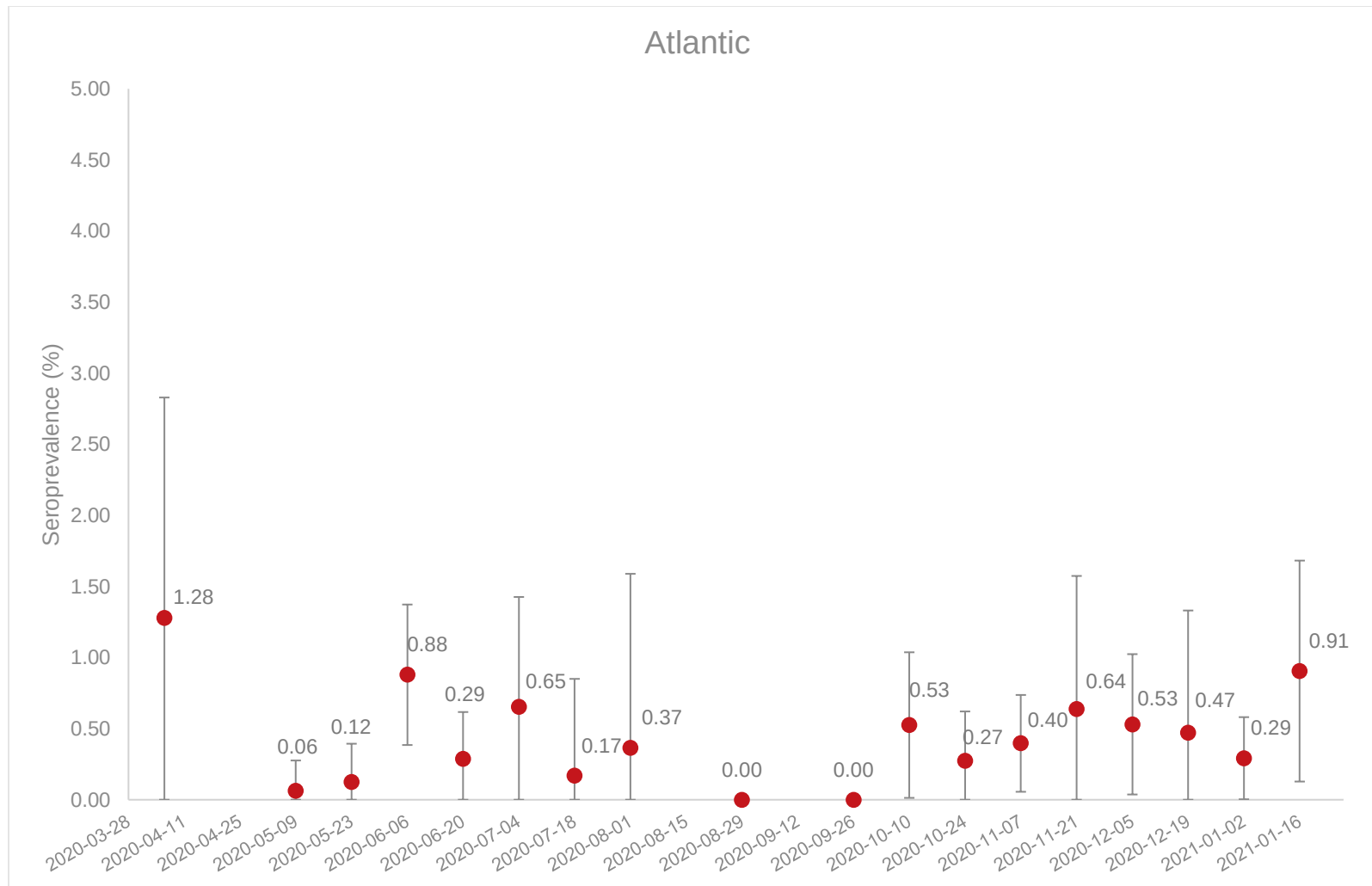


Table A5. Comparing seroprevalence (from highest to lowest) by economic region per 1000 donors from November 2020 to January 2021

		November 2020				December 2020				January 2021				Change*
Economic Region	ID	Total	+	Rate	(95% CI)	Total	+	Rate	(95% CI)	Total	+	Rate	(95% CI)	
British Columbia/Yukon														
Cariboo	5950	. .				5				15	1	5.17	0.00, 17.05	+
Thompson--Okanagan	5930	115	4	3.58	1.68, 5.48	529	7	1.15	0.13, 2.16	913	17	1.93	0.98, 2.89	+
Lower Mainland--Southwest	5920	659	9	1.46	0.92, 2.01	1873	24	1.22	0.66, 1.79	3,628	62	1.71	1.25, 2.17	+
Vancouver Island and Coast	5910	94	0	.	.	699	3	0.27	0.00, 0.75	1,530	9	0.61	0.17, 1.05	+
Kootenay	5940	2	0	.	.	9				20				NC
Yukon	6010	1	0	.	.	0				2	0	NC		
Alberta														
Athabasca--Grande Prairie--Peace River	4870	7	0	.	.	112	1	0.86	0.00, 3.17	126	7	5.65	0.68, 10.62	+
Banff--Jasper--Rocky Mountain House	4840	70	0	.	.	96	1	0.72	0.00, 3.01	46	2	5.63	0.00, 13.91	+
Lethbridge--Medicine Hat	4810	6	0	.	.	89	7	7.95	0.75, 15.14	444	19	4.63	2.20, 7.06	-
Wood Buffalo--Cold Lake	4880	3	0	.	.	13				162	5	3.87	0.21, 7.53	+
Edmonton	4860	518	11	2.28	1.30, 3.25	1,326	33	2.56	1.42, 3.69	2,300	79	3.74	2.78, 4.70	+
Camrose—Drumheller	4820	14	0	.	.	195	10	6.08	1.69, 10.48	255	9	3.43	0.72, 6.14	-
Calgary	4830	488	10	1.96	1.02, 2.90	1,519	23	1.37	0.57, 2.16	2,747	72	2.89	2.11, 3.68	+
Red Deer	4850	85	0	.	.	361	7	2.31	0.26, 4.35	577	13	2.72	1.07, 4.36	+

COVID-19 Seroprevalence Report

Saskatchewan														
Swift Current--Moose Jaw	4720	81	11	14.3	8.92, 19.75	13				92	4	3.71	0.00, 8.38	+
Saskatoon—Biggar	4730	84	0			587	14	2.59	0.66, 4.52	771	22	3.27	1.75, 4.78	+
Regina--Moose Mountain	4710	105	0			541	6	1.15	0.00, 2.53	567	13	2.67	1.05, 4.29	+
Yorkton—Melville	4740	3	0			26				96	0			NC
Prince Albert	4750	3	0			107	3	2.53	0.00, 6.88	190	0			-
	4760									1				
Manitoba														
North Central / Centre nord*	4640	63	15	27.5	19.24, 35.76	23	3	12.65	0.00, 30.01	88	11	15.20	7.17, 23.24	+
Southeast / Sud-est	4610	10	0			67	3	5	0.00, 11.92	253	20	8.23	4.41, 12.06	+
Winnipeg	4650	277	10	4.85	3.01, 6.70	150	10	7.13	1.69, 12.56	1,082	25	2.39	1.34, 3.45	-
Southwest / Sud-ouest	4630	1	0			85	2	2.51	0.00, 7.08	172	3	1.73	0.00, 3.99	-
Interlake	4660	8	0			55	1	1.48	0.00, 5.85	141	2	1.15	0.00, 3.22	-
South Central / Centre sud	4620	2	0			150	10	7.13	1.69, 12.56	15	0			-
Parklands	4670	1	0			2				9				NC
North / Nord	4680	2	0			4				4				NC
Ontario														
Stratford--Bruce Peninsula	3580	430	0			53				322	19	6.34	3.85, 8.84	+
London	3560	876	13	1.52	0.49, 2.55	455	4	0.86	0.11, 1.61	1,078	29	2.65	1.74, 3.56	+
Toronto	3530	3,301	28	0.85	0.45, 1.26	1,354	30	2.71	1.97, 3.46	4,346	92	2.30	1.87, 2.73	-
Kitchener--Waterloo--Barrie	3540	1,784	13	0.73	0.22, 1.24	893	7	0.72	0.22, 1.22	2,050	44	2.28	1.66, 2.89	+
Windsor--Sarnia	3570	844	8	0.97	0.13, 1.80	249	2	0.58	0.00, 1.45	986	18	1.62	0.86, 2.38	+
Hamilton--Niagara Peninsula	3550	1,367	9	0.68	0.11, 1.24	815	6	0.68	0.18, 1.19	1,690	20	1.03	0.56, 1.51	+
Northeast / Nord-est	3590	330	1	0.26	0.00, 1.03	140				539	5	0.86	0.11, 1.62	+

COVID-19 Seroprevalence Report

Ottawa	3510	1,158	6	0.56	0.00, 1.13	689	5	0.57	0.05, 1.08	1,570	12	0.78	0.34, 1.22	+
Kingston--Pembroke	3515	603	1	0.05	0.00, 0.44	401	2	0.31	0.00, 0.84	454	4	0.66	0.00, 1.41	+
Muskoka--Kawarthas	3520	376	3	0.55	0.00, 1.53	401	2	0.31	0.00, 0.84	548	2	0.26	0.00, 0.73	-
Northwest / Nord-ouest	3595	4	0							4	0			NC
Nova Scotia														
North Shore	1220	269	1	0.22	0.00, 1.09	107	1	1.58	0.00, 4.56	59	1	2.37	0.00, 6.56	+
Annapolis Valley	1230	113	0			26	1	6.66	0.00, 18.28	249	2	0.62	0.00, 1.80	-
Southern / Sud	1240	9	0			70	2	2.35	0.00, 6.74	300	2	0.50	0.00, 1.49	-
Halifax	1250	444	2	0.3	0.00, 1.05	457	1	0.08	0.00, 0.58	764	4	0.44	0.00, 1.03	+
Cape Breton	1210	7	0			141				4	0			NC
New Brunswick														
Saint John--St. Stephen	1330	182	2	0.83	0.00, 2.94	127	2	1.98	0.00, 4.33	186	2	0.72	0.00, 2.20	-
Moncton--Richibucto	1320	269	0			162	1	0.9	0.00, 2.35	361	2	0.44	0.00, 1.27	-
Campbellton--Miramichi	1310	91	2	2.17	0.00, 6.85	5				221	1	0.21	0.00, 1.03	+
Fredericton--Oromocto	1340	309	1	0.26	0.00, 3.62	18				218	0			NC
Edmundston--Woodstock	1350	115	1	0.89	0.00, 3.62	76				118	0			NC
Newfoundland														
Avalon Peninsula	1010	376	2	0.42	0.00, 1.28	124	1	0.49	0.00, 1.61	364	3	0.61	0.00, 1.38	+
South Coast--Burin Peninsula	1020	2	0			6				109	0			NC
West Coast--Northern Peninsula--Labrador	1030	8	0			1				2	0			NC
Notre Dame--Central Bonavista Bay	1040	11	1	8.08	0.00, 26.57	74				5	0			NC
PEI														
Prince Edward Island / Île-du-Prince-Édouard	1110	190	0			165				316				NC

Notes: January data is illustrated in Figure 2; Not all tested samples are summarized in this table *Change: + Increase; – Decrease; NC, No Change (current month compared to previous month)