Supplementary Material

Serial cross-sectional estimation of vaccine and infection-induced SARS-CoV-2 sero-prevalence in children and adults, British Columbia, Canada: March 2020 to August 2022

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Material 1. Public health context for sero-surveys in Lower Mainland, British Columbia (BC), Canada

Testing and surveillance reporting

Publicly-funded access to nucleic acid amplification testing (NAAT) in British Columbia (BC) was initially exposure-based (until March 15, 2020), or targeted (until April 8, 2020) with an expanded but still targeted indication until April 20, 2020 (epi-week 17). Thereafter NAAT testing was broadly available for symptomatic individuals from April 21, 2020 (with revision of qualifying symptoms on December 17, 2020 (epi-week 51)) through to January 18, 2022 (epi-week 3). From epi-week 3 of 2022, access to NAAT testing was limited to symptomatic high-risk individuals (e.g. unvaccinated, immuno-compromised, or those who live/work in certain high risk settings) owing to laboratory capacity during the Omicron wave [1]. Shortly thereafter also, publicly-funded access to rapid antigen tests (RATs) increased for community-dwelling adults through pharmacies and for children through schools. Hospital-based NAAT screening of asymptomatic individuals may have also been undertaken throughout at local discretion (e.g. for infection control purposes).

NAAT (but not RAT) confirmed or epidemiologically-linked cases are reportable under the Public Health Act to the BC Centre for Disease Control (BCCDC), under delegation of the Provincial Health Officer [1]. Through the current study period spanning to August 2022 (epi-week 32), BCCDC surveillance reports captured only the first reported case, and excluded any re-infections [1]. Although not available in BC, in analyses of hybrid (vaccine + infection-induced immunity) in Quebec, Canada, Carazo et al identified re-infections (≥90 days after a prior primary infection) among 4% (9,505/224,007) of community-dwelling cases ≥12 years of age during the Omicron BA.1 dominant period spanning December 26, 2021 (epi-week 52) to March 12, 2022 (epi-week 10) [2], and among 8% (2,991/37,543) of healthcare worker cases during the Omicron BA.2 dominant period spanning March 27 to June 4, 2022 (epi-weeks 13-22) [3]. Of note, healthcare workers had broad access to publicly-funded testing in Quebec during that period, including for other than symptomatic indications,

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

with about 40% of healthcare worker cases (with or without prior primary infection) included in the Carazo et al study having been tested while asymptomatic (i.e. due to close contact, outbreak setting or pre-admission to hospital) or for confirmation of a positive RAT [3].

Population-level public health measures

Population-level, public health measures began in BC in mid-March 2020, and included discouraging non-essential travel, postponing non-urgent scheduled surgeries, restricting visitors in long-term care facilities (LTCFs), encouraging virtual-care physician services where possible and prohibiting all public gatherings of >50 people, with closure of bars and nightclubs and a provincial state of emergency declared on March 18, 2020 (epi-week 12) [4,5]. Mitigation measures were then variously relaxed and reinforced in response to epidemic waves and public health need. This includes "core bubble" social restrictions implemented in November 2020 (epi-week 45) in response to the second wave, limiting interactions only to those within households or 'core bubble' (immediate family or those in same dwelling) OR a maximum of two other safe individuals if living alone [5-7]. In March 2021 (epi-week 13) special "circuit breaker" social restrictions were announced during the third (Alpha/Gamma) wave, suspending dine-in food services, indoor fitness activities and permitting only essential travel [8]. This was followed by a gradual "restart plan": Step 1 beginning in May 2021 (epi-week 21), Step 2 in June 2021 (epi-week 24) and Step 3 in July 2021 (epi-week 26) that included gradual return to gatherings, recreational travel, in-person work, and opening of nightclubs and casinos [9], but with the proposed Step 4 scheduled for September 2021 (epi-week 36) interrupted by the start of the fourth (Delta) wave that peaked in the fall of 2021 [1].

Apart from temporary school closure between March 17 and June 1 (epi-weeks 12-22) of 2020, children were able to attend scheduled classes in person throughout the pandemic, with on-line options also available [5]. Masking within indoor public settings was mandated for all individuals ≥12 years old (except in schools) beginning November 2020 (epi-week 47) at the peak of the second wave [1],

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

continuing through the third wave that peaked in spring 2021 [1,10]. With a brief summer pause beginning in July (epi-week 26) and ending in August (epi-week 34) of 2021 [11], mandatory masking continued and was extended to the school setting for the 2021-22 academic year, including children ≥5 years from October 2021 (epi-week 43), during the fourth wave [1,12,13]. With Omicron (BA.1) ultimately displacing Delta in December 2021 [1], BC experienced its most intense fifth wave, prompting more stringent "holiday season" public health measures beginning epi-week 51 of 2021 that limited indoor and personal gatherings, with 50% capacity limit at venues of >1000 individuals, pausing sports tournaments and seated-only New Year's Eve events [14,15].

All social restrictions were lifted in February 2022 (epi-week 7) along with mask mandates in March 2022 (epi-week 10) [16,17]. Thereafter, BC experienced sixth and seventh waves due to Omicron (predominantly BA.2 and BA.5, respectively) that were associated with lesser peaks based on surveillance case reports [1].

Vaccine availability and roll-out

The first SARS-CoV-2 vaccines available in Canada were spike (S1)-based mRNA vaccines including BNT162b2 (Pfizer-BioNTech) authorized on December 9 (epi-week 50), 2020 and mRNA-1273 (Moderna) on December 23 (epi-week 52), both as two-dose schedules spaced 3-4 weeks apart [18,19]. On February 26 (epi-week 8), 2021, a chimpanzee adenoviral-vectored (ChAdOx1) vaccine (AstraZeneca) was also authorized in Canada as a two-dose schedule spaced 4-12 weeks apart [18,19]. On March 29 (epi-week 13), NACI recommended that ChAdOx1 be restricted to adults ≥55 years of age owing to vaccine safety concerns (thrombosis with thrombocytopenia), lowering to ≥30 years on April 23 (epi-week 16) [18]. On June 1 (epi-week 22), NACI recognized the interchangeability of vaccines, recommending that first-dose recipients of ChAdOx1 or mRNA vaccines could complete the series with either mRNA product [18,19]. The Pfizer-BioNTech and Moderna mRNA vaccines comprised the vast majority (>90%) of doses administered in BC and elsewhere in Canada, with various modifications to

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

authorized schedules, notably extending the interval between doses (beginning epi-week 52, 2020 in BC) to enable as many as possible to benefit from single-dose protection as soon as possible while risk remained elevated and vaccine supply remained scarce [18,19]. During the summer 2021, the dosing interval was again shortened to speed second dose delivery before the autumn. Full details regarding the extended interval applied between doses one and two in BC are provided in the Supplementary Material 1 of reference [19]. Although other manufacturers have also obtained product approval in Canada (e.g. Janssen viral vector vaccine authorized as a one-dose schedule for adults ≥18 years on May 3, 2021 (epi-week 18); Novavax recombinant vaccine authorized as a two-dose schedule for adults ≥18 years on February 17, 2022) (epi-week7); and Medicago virus-like particle vaccine authorized as a two-schedule for adults 18-64 years on February 24, 2022 (epi-week 8) [18, 20], their use has thus far been much lower.

Vaccines (mRNA) were initially targeted to residents and staff of long-term care and assisted living facilities, essential visitors within those settings, and healthcare workers, with age-based prioritization of the oldest community-dwelling adults beginning in mid-March (epi-week 10) 2021. Adolescents ≥12 years old became vaccine eligible in BC May 20 (epi-week 20) 2021 [18,21] and children 5-11 years old on November 29 (epi-week 48) 2021 [18,22] followed by children 6 months to 4 years from August 2, 2022 [18,23]. Booster dose access followed a similar prioritization sequence, inclusive of clinically extremely vulnerable individuals of any age. A single-dose vaccine card for entry into social/recreational settings was introduced for all ≥12 years old in September 2021 (epi-week 37) and a two-dose card in October 2021 (epi-week 43) [24], ultimately repealed in April 2022 (epi-week 14) [25].

Vaccine coverage estimates

Vaccine coverage estimates from the provincial immunization registry for Fraser Health Authority and Vancouver Coastal Health Authority (inclusive of care facility residents), suggest that by

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

the epi-week 2 start of the 4th sero-survey in January 2021, not more than ~1-2% of the Lower Mainland population overall or by any age group (except those ≥80 years (~5%)) had received a first dose; whereas, by the epi-week 22 start of the 5th sero-survey in May/June 2021 this had increased to ~60% (including ≥90% of those ≥70 years, ~80% 60-69 years and 50-59 years, ~60% 18-49 years and ~10% 12-17 years) with <5% overall having yet received a second dose (including <10% of those ≥70 years).

By the epi-week 39 start of the 6th sero-survey in September 2021, ~80% overall were vaccinated (including ~90% of those 18-49 years and ~70% of adolescents 12-17 years) with nearly three-quarters of the Lower Mainland population overall twice vaccinated (including >90% of those ≥70 years). By the epi-week 11 start of the 7th sero-survey in March 2022 about half of children 5-11 years and 85% of adolescents 12-17 years had been vaccinated with about half the Lower Mainland population overall having received a third dose (including ≥80% of those ≥70 years). By the epi-week 31 start of the 8th sero-survey in July/August 2022, <1% of children under 5 years and about half 5-11 years had been vaccinated, with still about half of the Lower Mainland population overall having received a third dose (including ≥85% of those ≥70 years) and nearly 10% having received four doses, including just over half of those ≥70 years.

References for Supplementary Material 1

1. British Columbia Centre for Disease Control. BC COVID-19 Data Trends. [Accessed 28 August 2022]. Available: http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data-trends
2. Carazo S, Skowronski DM, Brisson M, et al. Estimated protection of prior SARS-CoV-2 infection against re-infection with the Omicron variant among messenger RNA-vaccinated and nonvaccinated individuals in Quebe, Canada. JAMA Netw Open. 2022;5(10):e2236670. Doi: 10.1001/jamanetworkopen.2022.36670
3. Carazo S, Skowronski DM, Brisson M, et al. Protection against omicron (B.1.1.529) BA.2 reinfection conferred by primary omicron BA.1 or pre-omicron SARS-CoV-2 infection with and without mRNA vaccination: a test-negative case-control study. Lancet Infec Dis 2022 Sep21;S1473-3099(22)00578-3. Doi: 10.1016/S1473-3099(22)00578-3. Online ahead of print.
4. BC Government News. Joint statement on BC's COVID-19 response and latest updates. Monday March 16, 2020 [Accessed 15 October 2022]. Available: https://news.gov.bc.ca/releases/2020HLTH0086-000499

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

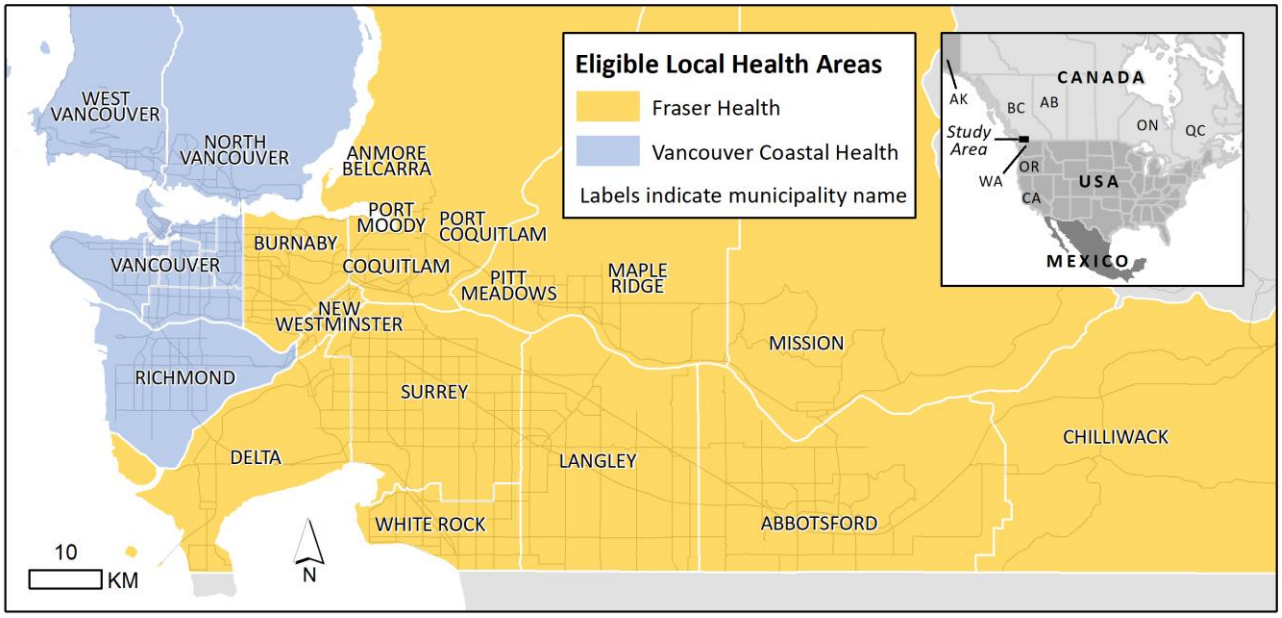
5. CTV News. Scroll through this timeline of the 1st year of COVID-19 in BC. Vancouver News. Thursday January 28, 2021 [Accessed 8 September 2022]. Available at: https://bc.ctvnews.ca/scroll-through-this-timeline-of-the-1st-year-of-covid-19-in-b-c-1.5284929
6. BC Government News. Joint statement on BC's COVID-19 response, latest updates. Saturday November 7, 2020 [Accessed 8 September 2022]. Available: https://news.gov.bc.ca/releases/2020HLTH0059-001922
7. BC Government News. Joint statement on BC's COVID-19 response, latest updates. Thursday November 19, 2020 [Accessed 8 September 2022]. Available: https://news.gov.bc.ca/releases/2020HLTH0061-001949
8. BC Government News. Office of the Premier. Three-week circuit breaker begins now to bend the curve, protect people. Monday March 29, 2021. [Accessed 8 September 2022]. Available: https://news.gov.bc.ca/releases/2021PREM0023-000578
9. BC Government News. Office of the Premier. BC launches restart plan to safely bring people back together. Tuesday May 25, 2021. [Accessed 15 October 2022]. Available: https://news.gov.bc.ca/releases/2021PREM0037-001008
10. BC Government News. Emergency Preparedness. Province extends emergency, introduces mask enforcement measures. Tuesday November 24, 2020. [Accessed 3 July 2022]. Available: https://news.gov.bc.ca/releases/2020EMBC0061-001960
11. BC Government News. Health. Mask mandate to reduce transmission, protect people in public spaces. Tuesday August 24, 2021. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2021HLTH0053-001665
12. BC Government News on Twitter. August 24, 2021. [Accessed 4 July 2022]. Available: https://twitter.com/bcgovnews/status/1430219193564098561?lang=en
13. BC Government News. Health. Indoor mask mandate extended. Friday October 29, 2021. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2021HLTH0190-002077
14. BC Government News. Health. Province introduces new COVID-19 measures for safer holiday season. Friday December 17, 2021. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2021HLTH0230-002414
15. BC Government News. Health. Province strengthens COVID-19 measures for safer holiday season. Tuesday December 21, 2021. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2021HLTH0234-002431
16. BC Government News. Health. British Columbians' COVID-19 efforts allow easing of restrictions. Tuesday February 15, 2022. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2022HLTH0053-000219
17. BC Government News. Health. BC takes next step in balanced plan to lift COVID-19 restrictions. Thursday March 10, 2022. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2022HLTH0081-000324
18. National Advisory Committee on Immunization (NACI): Statements and publications. COVID-19. Ottawa: NACI. [Accessed 8 September 2022]. Available: https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci.html#covid-19
19. Skowronski DM, Febriani Y, Ouakki M, et al. Two-dose SARS-CoV-2 vaccine effectiveness with mixed schedules and extended dosing intervals: test-negative design studies from British Columbia and Quebec, Canada. Clin Infect Dis 2022 Apr 19:ciac290. Doi: 10.1093/cid/ciac290. Online ahead of print [Supplementary Material 1 of this publication provides additional details related to vaccine program modifications and roll-out]
20. Government of Canada. Approved COVID-19 vaccines. Ottawa. [Accessed 11 October 2022]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines.html

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

21. BC Government News. Office of the Premier. B.C. Youth 12+ can register, get vaccinated against COVID-19. Thursday May 20, 2021. [Accessed 18 October 2022]. Available: https://news.gov.bc.ca/releases/2021PREM0037-000986
22. BC Government News. Health. Safe, effective COVID-19 pediatric vaccine available for children aged 5-11. Tuesday November 23 2021. [Accessed 18 October 2022]. Available: https://news.gov.bc.ca/releases/2021HLTH0209-002245
23. BC Government News. Health. B.C. encourages parents to register children under 5 for COVID-19 vaccine. Thursday July 14, 2022. [Accessed 18 October 2022]. Available: https://news.gov.bc.ca/releases/2022HLTH0165-001115
24. BC Government News. Office of the Premier. Vaccine card enhances confidence, increases safety at BC events. Tuesday September 7, 2021. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2021PREM0054-001746
25. BC Government News. Health. BC takes next steps in COVID-19 response. Tuesday April 5, 2022. [Accessed 4 July 2022]. Available: https://news.gov.bc.ca/releases/2022HLTH0112-000501

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Figure 1. Sampling area and eligible municipalities



Abbreviations: AB = Alberta; AK = Alaska; BC = British Columbia; CA = California; ON = Ontario; OR = Oregon; QC = Quebec; USA = United States of America; WA = Washington

The sero-survey protocol utilizes anonymized residual sera collected from individuals of all ages presenting for outpatient blood work in the Lower Mainland (Greater Vancouver Area and Fraser Valley) of BC, Canada, where 60% (~3 million) of the total provincial population (~5 million) resides.[a,b]

Two health authorities (HA) are responsible for health administration and surveillance reporting within the Lower Mainland of BC including Fraser Health Authority (FHA: ~1.9 million) and Vancouver Coastal Health Authority (VCHA: ~1.2 million).[a,b] Eligible local health authorities of the Lower Mainland are displayed with their associated municipality names and with those belonging to FHA shaded yellow and those belonging to VCHA shaded blue.

[a] BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

[b] BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Material 2. Description of Bayesian logistic regression analysis

Two sero-prevalence categories were assessed including "vaccine and/or infection-induced (any)", defined by positivity on any two of the applied SARS-CoV-2 chemi-luminescent immuno-assays per sero-survey (dual-assay positivity), and "infection-induced" also defined by dual-assay positivity but requiring both anti-spike and anti-nucleocapsid detection.

Primary sero-prevalence estimates are based on Bayesian analysis [1-3]. For this, we adapted the Bayesian hierarchical approach of [2] to multiple sero-surveys and the two sero-prevalence categories, adjusting for population geography (defined by health authority (HA) of residence, either Fraser (FHA) or Vancouver Coastal (VCHA)), sex, and age group. The analysis incorporated a hierarchical structure per sero-survey and sero-prevalence category across HA, sex, and age group. We had previously explored incorporating the increasing sero-prevalence in the population across surveys, however given the time-periods between surveys, changes in vaccination rates, and potential waning we opted for a more flexible approach at the potential cost of some increase in uncertainty. Analysis was implemented in the Stan probabilistic programming language using a Hamiltonian Monte Carlo method to generate samples of the posterior. Eight thousand samples were generated across four chains including 4000 warm-up samples. Sero-prevalence estimates with 95% credible intervals (CrI) for each age, sex, and HA stratum were sampled from the posterior with the post-stratification method [3]. Visual inspection and the R-hat statistic were used to determine convergence and mixing of the chains.

A full description of the methods for each survey and sero-prevalence category is as follows.

First the sero-prevalence rate (π_{ijk}) for each age group (i), sex (j), and HA (k) was constructed using a global intercept term (b), and a hierarchical term (a_{ijk}) through the following equation,

$$\pi_{\mathrm{ijk}} = \mathrm{logit}^{-1}\left(b + a_{\mathrm{ijk}}\right).$$

Where the parameters are transformed to represent a probability using the logistic function, $\mathrm{logit}^{-1}: \mathbb{R} \to (0,1)$,

$$\mathrm{logit}^{-1}(v) = \frac{1}{1 + \exp(-v)}.$$

For the hierarchical term we assume a simple hierarchical structure where each group are drawn from a distribution with mean zero and the same variance,

$$a_{\mathrm{ijk}} \sim \mathrm{normal}(0, \sigma_a),$$

Where the variance is drawn from the standard half-normal hyper-prior,

$$\sigma_a \sim \mathrm{normal}_{+}(0,1).$$

We use an uninformative prior for the global intercept,

$$b \sim \mathrm{logistic}(0,1).$$

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Given an observed number of positive tests (y_{ijk}) out of a given total number of tests for each age, sex, and HA group (n_{ijk}), the positive tests are modeled as being binomially distributed with the corresponding sero-prevalence rate (π_{ijk}),

$$y_{ijk} \sim \text{binomial}(n_{ijk}, \pi_{ijk}).$$

Post-stratification [3] was performed on the resulting posterior sero-prevalence samples (π_{ijk}) by marginalizing across the appropriate cells to adjust and stratify by any combination of age group (i), sex (j), and HA (k). Given the population size for an age group, sex and HA [4,5] (p_{ijk}), the post-stratification sero-prevalence estimate is,

$$\hat{\pi}^{PS} = \frac{\sum_{i=1}^{10}\sum_{j=1}^{2}\sum_{k=1}^{2} p_{ijk} \cdot \pi_{ijk}}{\sum_{i=1}^{10}\sum_{j=1}^{2}\sum_{k=1}^{2} p_{ijk}}.$$

The post-stratification sero-prevalence estimate stratified by any combination of sub-populations can be similarly derived. For example, the post-stratification estimate for age group i is given by,

$$\hat{\pi}_i^{PS} = \frac{\sum_{j=1}^{2}\sum_{k=1}^{2} p_{ijk} \cdot \pi_{ijk}}{\sum_{j=1}^{2}\sum_{k=1}^{2} p_{ijk}}.$$

Median, 2.5th and 97.5th percentiles are estimated by sampling of the posterior.

Exploration of potential effects of assay sensitivity and specificity

In primary analysis we did not incorporate assay sensitivity or specificity but explored their effects on the resulting sero-prevalence estimates, incorporating assumptions elaborated with rationale in **Supplementary Material 3**. For a given sero-prevalence category with a logistic sensitivity θ_1 and a logistic specificity of θ_0, and the disease prevalence rate π_{ijk}, the probability of getting a positive test result is

$$\Pr[x = 1] = \pi_{ijk} \cdot \text{logit}^{-1}(\theta_1) + (1 - \pi_{ijk}) \cdot \left(1 - \text{logit}^{-1}(\theta_0)\right).$$

For a total of n_{ijk} independent tests, the number of positive tests will thus be distributed binomially with the preceding probability of success,

$$y_{ijk} \sim \text{binomial}\left(n_{ijk}, \pi_{ijk} \cdot \text{logit}^{-1}(\theta_1) + (1 - \pi_{ijk}) \cdot \left(1 - \text{logit}^{-1}(\theta_0)\right)\right).$$

The sensitivity and specificity were modeled based upon assumptions and using the positive and negative control samples as per **Supplementary Material 3**, with y^{sens} positive samples out of n^{sens} samples in the positive controls and y^{spec} negative samples out of n^{spec} samples in the negative controls. The positive samples in the positive controls were modeled as a binomially-distributed random variable,

$$y^{sens} \sim \text{binomial}\left(n^{sens}, \text{logit}^{-1}(\theta_1)\right).$$

Similarly, the negative samples in the negative controls are also modeled as a binomially-distributed random variable,

$$y^{spec} \sim \text{binomial}\left(n^{spec}, \text{logit}^{-1}(\theta_0)\right).$$

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

The priors for the logistic sensitivity and specificity were both drawn from a weak normal distribution prior,

$$\theta_i \sim \text{normal}(4,2).$$

This results in a 95-percentile range of 0.5 – 1.0 for both sensitivity and specificity.

References for Supplementary Material 2

1. Stringhini, Silvia, et al. Seroprevalence of anti-SARS-CoV-2 IgG antibodies in Geneva, Switzerland (SEROCoV-POP): a population-based study. The Lancet 2020;396:313-319.
2. Gelman A, Carpenter B. Bayesian analysis of tests with unknown specificity and sensitivity. Journal of the Royal Statistical Society: Series C (Applied Statistics). 2020 Nov;69(5):1269-83.
3. Downes M, Gurrin LC, English DR, Pirkis J, Currier D, Spittal MJ, Carlin JB. Multilevel regression and poststratification: A modeling approach to estimating population quantities from highly selected survey samples. American journal of epidemiology. 2018 Aug 1;187(8):1780-90.
4. BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections
5. BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Material 3. Sensitivity and specificity assumptions and considerations

Five chemiluminescent immunoassays (CLIAs) were used in the current sero-survey including Ortho-S1[a], Abbott-NP[b], Siemens-S1-RBD[c], Roche-NP[d], and Abbott-S1-RBD[e]. At least three CLIAs per sero-survey were applied. Two categories of sero-prevalence were assessed including "vaccine and/or infection-induced (any)", defined by positivity on any two of the assays applied per sero-survey (dual-assay positivity), and "infection-induced" also defined by dual-assay positivity but requiring anti-nucleocapsid (NP) plus anti-spike (S1 or S1-RBD) detection.

The manufacturers of each of these CLIAs reported high sensitivities (>98%) and specificities (>99.5%) but with minimal participant details provided [1,2]. Assay characteristics may vary by population sub-group characteristics such as vaccine status, time since exposure, disease severity, age group etc. but most validation studies to date have not addressed these issues[3-5]. Like other public health agencies more recently, we did not adjust for sensitivity or specificity in primary sero-prevalence analyses [6,7]. In exploratory analyses we incorporated sensitivity and specificity adjustment assuming values (positive and negative controls) foremost informed by empirical field investigation by the BC Centre for Disease Control (BCCDC) Public Health Laboratory (PHL) [8]. These assumptions (positive and negative control values for Bayesian analyses) are summarized in the table immediately below with rationale and references provided in subsequent sections of this Supplement.

Sero-prevalence estimate by sero-survey	Assumed Sensitivity values n/N; % (95%CI) [f]	Assumed Specificity values n/N; % (95%CI) [f]	Relevant assays included in dual-assay interpretation [see detailed rationale in sections below this table]
Vaccine and/or infection-induced dual-assay sero-positivity			
Sero-surveys 1-5	92/92 100% (96.1, 100)	188/189 99.5% (97.1, 100)	(Ortho-S1 + Abbott-NP) OR (Abbott-NP + Siemens-S1-RBD) OR (Ortho-S1 + Siemens-S1-RBD)
Sero-surveys 6-8	92/92 100% (96.1, 100)	187/189 98.9% (96.2, 99.9)	(Ortho-S1/Abbott-S1-RBD + Roche-NP) OR (Roche-NP + Siemens-S1-RBD) OR (Ortho-S1/Abbott-S1-RBD + Siemens-S1-RBD) [g]
Infection-induced (with/without vaccination) dual-assay sero-positivity			
Sero-surveys 1-3 [h]	92/92 100% (96.1, 100)	188/189 99.5% (97.1, 100)	(Ortho-S1 + Abbott-NP) OR (Abbott-NP + Siemens-S1-RBD) OR (Ortho-S1 + Siemens-S1-RBD) [h]
Sero-surveys 4-5	88/92 95.7% (89.2, 98.8)	189/189 100% (98.1, 100)	(Ortho-S1 + Abbott-NP) OR (Abbott-NP + Siemens-S1-RBD) [i]
Sero-surveys 6-7	91/92 98.9% (94.1, 100)	187/189 98.9% (96.2, 99.9)	(Ortho-S1 + Roche-NP) OR (Roche-NP + Siemens-S1-RBD)
Sero-survey 8 [j]	91/92 98.9% (94.1, 100)	187/189 98.9% (96.2, 99.9)	(Abbott-S1-RBD [i] + Roche-NP) OR (Roche-NP + Siemens-S1-RBD)

[a] Ortho assay detects total antibody (IgA, IgG and IgM) to recombinant spike (S1) using the Vitros XT 7600 analyzer (Ortho-Clinical Diagnostics, Rochester, New York).
[b] Abbott assay detects IgG antibody to nucleocapsid (NP) using the ARCHITECT i2000SR analyzer (Abbott Laboratories, Diagnostic Division, Abbott Park, Illinois).
[c] Siemens assay detects total (IgG, IgM) antibodies to the S1 receptor-binding domain (S1-RBD) by the ADVIA Centaur XPT system (Siemens Healthineers, Erlangen, Germany).
[d] Roche assay detects total antibody (IgA, IgG and IgM) to nucleocapsid (NP) using the Roche cobas e601 analyzer (Roche Diagnostics Gmbh, Mannheim, Germany).
[e] Abbott assay detects IgG to the spike receptor binding domain (S1-RBD) using the ARCHITECT i2000SR analyzer (Abbott Laboratories, Diagnostic Division, Abbott Park, Illinois).
[f] Exact confidence interval (CI). One sided 97.5% confidence intervals for cells with zero or 100% counts.
[g] Assumes comparable interpretation of any (vaccine- or infection-induced) dual-assay sero-positivity whether predicated on Ortho-S1/Roche-NP/Siemens-S1-RBD OR Abbott-S1-RBD/Roche-NP/Siemens-S1-RBD.
[h] All dual-assay sero-positivity during the first three sero-surveys before vaccine roll-out assumed to be infection induced.
[i] Disregards supplemental Roche-NP testing undertaken during these sero-surveys.
[j] Assumes comparable interpretation of infection-induced dual-assay sero-positivity whether using Ortho-S1 or Abbott-S1-RBD in combination with Roche-NP.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Rationale and references for assumed sensitivity and specificity values

The BCCDC PHL reported assay characteristics from an internal validation (n=97) and facility-based outbreak field investigation (n=281) [8]. We predicate our sensitivity and specificity assumptions on the larger field investigation. The latter included 92 SARS-CoV-2 cases, laboratory-confirmed by nucleic acid amplification test (NAAT), with sera collected >14 days to two months post-onset between March-May 2020 and 189 negative controls. Three-quarters of cases were female with median (range) of age 76.5 (20-102) years; 71% of test-negative controls were females with median (range) of age 57 (22-102) years. In that field investigation, sensitivity was highest for the Ortho-S1 and Roche-NP assays at 98.9% (95%CI: 94.1, 99.8) (91/92 cases detected) each, followed by the Siemens-S1-RBD at 97.8% (95%CI: 92.4, 99.4) (90/92) and the Abbott-NP assay at 95.7% (95%CI: 89.4, 98.3) (88/92). Specificity was 97.9% (95%CI: 94.7, 99.2) for the Ortho-S1(185/189 controls correctly identified) but 98.4% (95%CI: 95.4, 99.5) for both the Abbott-NP and Roche-NP assays (186/189), and 98.9% (95%CI: 96.2, 99.7) for Siemens-S1-RBD (187/189) [8].

Applying the dual-assay requirements for sero-positivity from the current sero-survey to the BCCDC field investigation, sensitivity was improved for the detection of any vaccine- and/or infection-induced sero-prevalence at 100% (95% CI: 96.1, 100) (92/92) for both the Ortho-S1/Abbott-NP/Siemens-S1-RBD algorithm used in sero-surveys 1-5 and the Ortho-S1/Roche-NP/Siemens-S1-RBD algorithm used in sero-surveys 6-7, with comparable or higher specificities also of 99.5% (95%CI: 97.1, 100) (188/189) and 98.9% (95%CI: 96.2, 99.9) (187/189), respectively, for both algorithms. For infection-induced sero-positivity requiring that at least one of the two positive assays used include anti-NP detection, sensitivities were 95.7% (95%CI: 89.2, 98.8) using Abbott-NP (88/92) and 98.9% (95%CI: 94.1, 100) using Roche-NP (91/92). Specificities were 100% (95%CI: 98.1, 100) (189/189) and 98.9% (95%CI: 96.2, 99.9) (187/189), respectively.

Although the Abbott-S1-RBD was not included in the above BCCDC PHL field investigation, in side-by-side comparison to which the BCCDC PHL contributed with multiple other laboratories [9], Abbott-S1-RBD sensitivity ranged 95.3% to 98.1% (depending on the reference definition) while sensitivity of the Ortho-S1 assay ranged 95.8% to 98.7%, with specificities of 99.5% and 100%, respectively [9]. As per other recent reports [10-14], sensitivity of the Roche-NP assay tended higher than that of Abbott-NP (95.8-98.7% versus 88.5-90.9%, respectively) with more comparable specificities (99.5% and 100%, respectively) [9]. To assess the impact of our having replaced the Ortho-S1 with the Abbott-S1-RBD assay at the 8th (July/August 2022) sero-survey, we compared findings among a random selection of 200 sera from the 7th (March 2022) sero-survey (54% female, median age 47 years, interquartile range 26-69 years) subjected to Abbott-S1-RBD in addition to the Ortho-S1 assay. As shown in the table below, use of the Abbott-S1-RBD individually or in dual-assay interpretation was associated with only slightly lower sensitivity for any vaccine and/or infection-induced sero-prevalence, but this did not affect interpretation of (orthogonal dual-assay) infection-induced sero-positivity.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Comparing 8th sero-survey using Abbott-S1-RBD vs. 7th sero-survey using Ortho-S1 (N=200 randomly selected 7th sero-survey sera)	**n/N % sensitivity (95% CI) [a]**	**n/N % specificity (95% CI) [a]**
Relative to Ortho-S1 findings at 7th sero-survey [N=200]		
Abbott-S1-RBD assay findings	186/188 98.9 (96.2, 99.9)	12/12 100 (75.3, 100)
Relative to 7th sero-survey findings of vaccine and/or infection-induced dual-assay positivity: (Ortho-S1 + Siemens-S1-RBD) OR (Ortho-S1 + Roche-NP) OR (Siemens-S1-RBD + Roche-NP) [N=200]		
8th sero-survey approach of any dual positivity with: (Abbott-S1-RBD + Siemens-S1-RBD) OR (Abbott-S1-RBD[a] + Roche-NP) OR (Siemens-S1-RBD + Roche-NP)	186/187 99.5 (97.1, 100)	13/13 100 (75.3, 100)
Relative to 7th sero-survey findings of infection-induced (orthogonal dual-assay) positivity (inclusive of anti-NP): (Ortho-S1 + Roche-NP) OR (Siemens-S1 + Roche-NP) [N=80[b]]		
8th sero-survey orthogonal approach of any dual positivity with at least one assay anti-NP positive: (Abbott-S1-RBD + Roche-NP) OR (Siemens-S1-RBD + Roche-NP)	67/67 100 (94.6, 100)	13/13 100 (75.3, 100)

We also assessed the impact of having switched from the Ortho-S1 to the Abbott-S1-RBD assay among a separate immunity study cohort of 37 adults (59% female, median age 40 years, interquartile range 33-53 years) who were NAAT-confirmed cases between March and June 2020 [unpublished study led by Skowronski/Sadarangani, reviewed and approved by the University of British Columbia Research Ethics Board]. As shown in the table below sensitivity of each of the assays was higher at 30 days versus 14 days post-onset and lowest at both time points for anti-NP detection whether by Abbott-NP or Roche-NP assays. Consistent with findings above, Abbott-S1-RBD sensitivity was marginally reduced compared to Ortho-S1, notably at 14 days post-onset, but with minimal impact on dual-assay interpretation of any or infection-induced sero-positivity, notably at 30 days post-onset.

[a] Exact confidence interval (CI). One sided 97.5% confidence intervals for cells with zero or 100% counts.
[b] Among these 80 participants, 54% female, median age 29 years, interquartile range 12-50 years.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Immunity study: Individual assays and dual-assay approaches used in current sero-survey	Sensitivity relative to NAAT Sera collected 14 days post-onset			Sensitivity relative to NAAT Sera collected 30 days post-onset		
	Assay positive	NAAT positive	% Assay Sensitivity (95% CI) [a]	Assay positive	NAAT positive	% Assay Sensitivity (95% CI) [a]
Ortho-S1 assay	36	36	100 (90.3, 100)	37	37	100 (90.51, 100)
Abbott-NP assay	29	36	80.6 (64.0, 91.8)	32	37	86.49 (71.2, 95.46)
Siemens-S1-RBD assay	26	36	72.2 (54.8, 85.8)	36	37	97.3 (85.8, 99.9)
Infection-induced sero-positivity [as per sero-surveys 1-5]: (Ortho-S1 + Abbott-NP) OR (Abbott-NP + Siemens-S1-RBD)	29	36	80.6 (64.0, 91.8)	32	37	86.49 (71.2, 95.46)
Vaccine and/or infection-induced dual-assay positivity [as per sero-surveys 1-5]: (Ortho-S1 + Abbott-NP) OR (Ortho-S1 + Siemens-S1-RBD) OR (Abbott-NP + Siemens-S1-RBD)	33	36	91.7 (77.53, 98.3)	36	37	97.3 (85.8, 99.9)
Roche-NP assay	28	36	77.8 (60.9, 89.9)	32	37	86.49 (71.2, 95.46)
Infection-induced sero-positivity [as per sero-surveys 6-7]: (Ortho-S1 + Roche-NP) OR (Roche-NP + Siemens-S1-RBD)	28	36	77.8 (60.9, 89.9)	32	37	86.49 (71.2, 95.46)
Vaccine and/or infection-induced dual-assay positivity [as per sero-surveys 6-7]: (Ortho-S1 + Roche-NP) OR (Ortho-S1 + Siemens-S1-RBD) OR (Roche-NP + Siemens-S1-RBD)	33	36	91.7 (77.53, 98.3)	36	37	97.3 (85.8, 99.9)
Abbott-S1-RBD	33	36	91.7 (77.53, 98.3)	36	37	97.3 (85.8, 99.9)
Infection-induced sero-positivity [as per sero-survey 8]: (Abbott-S1-RBD + Roche-NP) OR (Roche-NP + Siemens-S1-RBD)	26	36	72.2 (54.8, 85.8)	32	37	86.49 (71.2, 95.46)
Vaccine and/or infection-induced dual-assay positivity [as per sero-survey 8]: (Abbott-S1-RBD + Roche-NP) OR (Abbott-S1-RBD + Siemens-S1-RBD) OR (Roche-NP + Siemens-S1-RBD)	31	36	86.1 (70.50, 95.3)	36	37	97.3 (85.8, 99.9)

CI = Confidence interval (exact). One sided 97.5% confidence intervals for cells with zero or 100% counts; NAAT = nucleic acid amplification test

Based on the above, our approach using several (at least three) antibody assays per sero-survey while requiring positivity on at least two (dual-assay positivity) for sero-prevalence estimation may have improved upon sensitivity and specificity compared to single assay detection for both sero-prevalence categories. Recognizing other potential variability and uncertainty in assay characteristics by population sub-groups, as well as the potential that negative controls obtained (albeit early March-June 2020) during (rather than prior) to the pandemic in the validation studies we utilize here may have been false-negatives, these exploratory analyses should be interpreted cautiously. Our sensitivity and specificity adjusted estimates presented in **Supplementary Table 11** and **Supplementary Table 12** are for exploratory interest only and still require cautious interpretation.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

References for Supplementary Material 3

1. Health Canada. Authorized medical devices for uses related to COVID-19: List of authorized testing devices. [Accessed 8 September 2022]. Available at: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/medical-devices/authorized/list.html.
2. United States Food and Drug Administration. EUA Authorized Serology Test Performance. [Accessed 8 September 2022]. Available at: https://www.fda.gov/medical-devices/emergency-situations-medical-devices/eua-authorized-serology-test-performance
3. Bailie CR, Tseng Y-Y, Carolan L, Kirk MD, Nicholson S, Fox A, Sullivan SG. Trend in sensitivity of SARS-CoV-2 serology one year after mild and asymptomatic COVID-19: unpacking potential bias in seroprevalence studies. Clin Infect Dis 2022 Jan 13;ciac020. Doi: 10.1093/cid/ciac020. Online ahead of print.
4. Elslande JV, Oyaert M, Ailliet S, et al. Longitudinal follow-up of IgG anti-nucleocapsid antibodies in SARS-VoV-2 infected patients up to eight months after infection. J Clin Virol 2021;136:104765. Doi: 10.1016/j.jcv.2021.104765. Epub 2021 Feb 18.
5. Allen N, Brady M, Carrion MAI, et al. Serological markers of SARS-CoV-2 infection; anti-nucleocapsid antibody positivity may not be the ideal marker of natural infection in vaccinated individuals. J Infect. 2021;83:e9-e10. Doi: 10.1016/j.jinf.2021.08.012. Epub 2021 Aug 9.
6. Victorian Government. Seroprevalence of SARS-CoV-2 specific antibodies among Victorian blood donors. Summary report for the Victorian Government Department of Health. State of Victoria, Australia. 03 May 2022. [Accessed 8 September 2022]. Available: https://www.health.vic.gov.au/research-and-reports/seroprevalence-of-sars-cov-2-specific-antibodies-among-victorian-blood-donors
7. United Kingdom Health Security Agency. COVID-19 vaccine surveillance report. Week 35. 1 September 2022. [Accessed 8 September 2022]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1101870/vaccine-surveillance-report-week-35.pdf
8. Sekirov I, Barakauskas VE, Simons J, et al. SARS-CoV-2 serology: Validation of high-throughput chemiluminescent immunoassay (CLIA) platforms and a field study in British Columbia. J Clin Virol;142:104914. Doi:10.1016/j.jcv.2021.104914. Epub 2021 Jul 16.
9. Stone M, Grebe E, Sulaeman H, et al. Evaluation of commercially-available high-throughput SARS-CoV-2 serologic assays for serosurveillance and related applications. Emerg Infect Dis 2022;28:672-83.
10. Mohanraj D, Bicknell K, Bhole M, Webber C, Taylor L, Whitelegg A. Antibody responses to SARS-CoV-2 infection – comparative determination of seroprevalence in two high-throughput assays versus a sensitive spike protein ELISA. Vaccines (Basel). 2021;9:1310. Doi: 10.3390/vaccines9111310
11. Tan SS, Saw S, Chew KL, et al. Comparative clinical evaluation of the Roche Elecsys and Abbott Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) serology assays for Coronavirus Disease 2019 (COVID-19). Arch Pathol Lab Med 2021;145:32-38.
12. El-Khoury JM, Schulz WL, Durant TJS. Longitudinal assessment of SARS-CoV-2 antinucleocapsid and antispike-1-RBD antibody testing following PCR-detected SARS-CoV-2 infection. J Appl Lab Med 2021;6:1005-1011.
13. Deshpande GR, Kaduskar O, Deshpande K, et al. Longitudinal clinico-serological analysis of anti-nucelocapsid and anti-receptor binding domain of spike protein antibodies against SARS-CoV-2. Int J Infect Dis 2021;112:103-10.
14. Nakagama Y, Komase Y, Kaku N, et al. Detecting waning serological response with commercial immunoassays: 18-month longitudinal follow-up of anti-SARS-CoV-2 nucleocapsid antibodies. Microbiol Spectr 2022 July14;e0098622. Doi: 10.1128/spectrum.00986-22. Online ahead of print.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Material 4. Derivation of surveillance under-ascertainment ratios (SUARs)

Surveillance under-ascertainment ratios (SUARs) with 95% credible intervals (CrIs) were derived by dividing the Bayesian sero-prevalence estimated number of infections by the number of cases reported from the Lower Mainland, British Columbia (BC). Infection-induced sero-prevalence estimates (SP; age-, sex- and health authority (HA)-standardized) were multiplied by the Fraser Health Authority (FHA) and Vancouver Coastal Health Authority (VCHA) population census estimates to derive estimated infections[a] [1-4], and surveillance case tallies are based on those reported from FHA and VCHA to the BC Centre for Disease Control (BCCDC) [5].

Under provincial legislation, all cases confirmed by nucleic acid amplification test (NAAT) were laboratory reportable to local public health authorities and provincially to the BCCDC. Provincial surveillance case reporting additionally included epidemiologically-linked cases identified by local HAs but did not capture cases confirmed by rapid antigen test (RAT) alone [5]. Surveillance case reports reflect tallies of laboratory-confirmed, laboratory probable and epidemiologically-linked cases as of the August 2022 sero-survey [5]. For the current analyses cases from out-of-province were excluded. Cases identified as being facility (long term care, assisted living, independent living) residents were also excluded to reflect community vs. closed-setting (e.g. outbreak) conditions but such exclusions may have been incomplete, particularly for the period between the penultimate and final sero-surveys, owing to variation in surveillance processes. Surveillance case reports were timed by episode date defined hierarchically by onset date, or if unavailable then specimen collection or laboratory result date. Through the current study period spanning to August 2022, official BCCDC surveillance case report tallies included only the first (primary infection) and excluded re-infections [3]. Taking into account a 10-14-day span from the first to last serum collection and comparable lag to antibody development, for each sero-survey we identified as referent the date two weeks earlier than the last serum collection date. We then summed surveillance case reports with episode date to the end of the corresponding complete epidemiological week. By way of example, for the 8th sero-survey spanning serum collection to August 11, 2022 we identified July 28, 2022 as referent date and summed surveillance case reports with episode date to the end of epi-week 30.

[a] Population estimates include long-term care facility (LTCF) and assisted (ALF) or independent living facility (ILF) residents; whereas, sero-survey sampling and surveillance case report tallies excluded these individuals as identified. There may be up to ~50,000 LTCF/ALF/ILF residents in BC [3,4]; recognizing about half the population of elderly adults ≥65 years in BC reside in FHA + VCHA there may be up to 25,000 LTCF/ALF/ILF residents in the Lower Mainland included in population census estimates used to derive estimated infections.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Cumulative SUARs by the 4th to 8th sero-surveys (January 2021, May/June 2021, September/October 2021, March 2022 and July/August 2022) are presented overall based on cumulative sero-prevalence-estimated infection rates and surveillance case reports. The sero-prevalence rate (p_{ijkl}) for each survey period i, age group j, sex k, and geographic region (defined by health authority (HA) of residence) l were drawn from the posterior distribution and combined with the estimated population size (n_{jkl}) to produce the binomially-distributed number of cumulative infections for cell i, j, k, l:

$$I_{ijkl} \sim \text{Bin}(n_{jkl}, p_{ijkl}).$$

Given the number of cumulative reported cases for each cell, the resulting cumulative SUAR can be calculated from the ratio of the expected number of cumulative cases to cumulative reported cases as,

$$\frac{\mathbb{E}[I_{ijkl}]}{C_{ijkl}}.$$

Cumulative SUARs adjusted for age group, sex, and HA were calculated through post-stratification. Cumulative surveillance case reports and derived under-ascertainment ratios at the 4th (January 2021) through 8th (July/August 2022) sero-surveys are provided in **Supplementary Table 10**.

Period-specific sero-prevalence and SUAR estimates

Inter-survey period-specific SUARs were also generated overall between all consecutive sero-surveys and additionally by age group between the 6th (September/October 2021) to 7th (March 2022) sero-surveys and 7th (March 2022) to 8th (July/August 2022) sero-surveys. Period-specific SUAR estimates were derived as below, notably assuming no waning and no previously infected individuals were re-infected during the specified period, in accordance with surveillance case reporting in BC.

First the sero-prevalence estimate (p_{ijkl}) for each age group i, sex j, HA k, and survey period l were drawn from the posterior distribution. The SUAR represents the ratio of the estimated number of infections for each period and cell to the total reported cases for the same period within that cell. We estimate the total infections using a binomial distribution with number of trials being the population census [1,2] for category i, j, k (n_{jkl}) and success probability being the rate of new infections (Δp_{ijkl}). Under the assumption of no waning and no re-infections we may calculate the rate of new infections as

$$\Delta p_{ijkl} = p_{ijkl} - p_{ijkl-1}.$$

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Given that a negative rate of new infections is implausible, all draws from the posterior where Δp_{ijkl} is negative are necessarily excluded. Using the assumed rate of new infections, the simulated number of new infections are drawn from a binomial distribution as

$$\Delta I_{ijkl} \sim \text{Bin}\left(n_{jkl}, \Delta p_{ijkl}\right).$$

Given the reported number of cases between sero-survey $l-1$ and l (ΔC_{ijkl}), the estimate for the period-specific SUAR can be calculated as,

$$\frac{\mathbb{E}[\Delta I_{ijkl}]}{\Delta C_{ijkl}}.$$

Period-specific case reports, new infection rates and SUARs between all consecutive sero-surveys are shown in **Supplementary Table 9** and by age group between the 6th-7th and 7th-8th sero-surveys in **Figure 4** and **Table 3** of the main manuscript.

Exploratory analyses taking into account the potential impact of re-infections

Although not available in BC, in analyses of hybrid (vaccine + infection-induced immunity) in Quebec, Canada, Carazo et al identified re-infections (≥90 days after a prior primary infection) among 4% (9,505/224,007) of community-dwelling cases ≥12 years of age during the Omicron BA.1 dominant period spanning December 26, 2021 (epi-week 52) to March 12, 2022 (epi-week 10) [6], and among 8% (2,991/37,543) of healthcare worker cases during the Omicron BA.2 dominant period spanning March 27 to June 4, 2022 (epi-weeks 13-22) [7]. Of note, during that period healthcare workers had broad access to publicly-funded testing in Quebec, including for other than symptomatic indications, with about 40% of healthcare worker cases (with or without prior primary infection) included in the Carazo et al study having been tested while asymptomatic (i.e. due to close contact, outbreak setting or pre-admission to hospital) or for confirmation of a positive RAT [7].

On the above basis we anticipated the inclusion/exclusion of re-infections not to have meaningfully changed the order of magnitude of our SUAR estimates but assessed this in exploratory analysis whereby we increased the estimated number of period-specific infections by a factor accounting for reinfections. Allowing potentially higher proportion of cases that were reinfections during the BA.4 or BA.5 period than reported by Carazo et al for BA.1 and BA.2 periods [6,7], we assumed reinfection percentages of $\rho = 0.1$ and $\rho = 0.25$ and applied these during the period between the 6th-7th (September/October 2021 to March 2022) and the 7th-8th (March 2022 to July/August 2022) sero-surveys.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

We define the re-infection percentage as the proportion of all infections within a specified period that are re-infections (ρ). The derived rate of new infections including re-infections is therefore,

$$\Delta p^{\rho}_{ijkl} = \frac{1}{1-\rho}(p_{ijkl} - p_{ijkl-1}).$$

Where the re-infection adjustment factor is

$$f^{\rho}_{ijkl} = \frac{1}{1-\rho}.$$

The simulated number of new infections can be similarly defined,

$$\Delta I^{\rho}_{ijkl} \sim \text{Bin}\left(n_{jkl}, \Delta p^{\rho}_{ijkl}\right).$$

These exploratory analyses allowing re-infections are displayed in **Supplementary Table 13**.

References for Supplementary Material 4

1. BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

2. BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections.

3. Canadian Institute for Health Information. 2021. How many long-term care beds are there in Canada? [Accessed August 10, 2022]. Available: https://www.cihi.ca/en/how-many-long-term-care-beds-are-there-in-canada#:~:text=In%20Canada%2C%20there%20are%202%2C076,of%20February%2028%2C%202021

4. Statistics Canada. A profile of nursing and residential care facilities, 2019. [Accessed August 10, 2022]. Available: https://www150.statcan.gc.ca/n1/daily-quotidien/210916/dq210916c-eng.htm

5. British Columbia Centre for Disease Control. BC COVID-19 Data Trends. [Accessed 28 August 2022]. Available: http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data-trends

6. Carazo S, Skowronski DM, Brisson M, et al. Estimated protection of prior SARS-CoV-2 infection against re-infection with the Omicron variant among messenger RNA-vaccinated and nonvaccinated individuals in Quebec, Canada. JAMA Netw Open. 2022;5(10):e2236670. Doi: 10.1001/jamanetworkopen.2022.36670

7. Carazo S, Skowronski DM, Brisson M, et al. Protection against omicron (B.1.1.529) BA.2 reinfection conferred by primary omicron BA.1 or pre-omicron SARS-CoV-2 infection with and without mRNA vaccination: a test-negative case-control study. Lancet Infec Dis 2022 Sep21;S1473-3099(22)00578-3. Doi: 10.1016/S1473-3099(22)00578-3. Online ahead of print.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 1. Sample size, exclusions and dual-assay positivity by sero-survey and testing algorithm

Assays: Ortho-S1 + Abbott-NP + Siemens-S1-RBD [a]															
Age group years	Sero-survey 1: March 2020 [N=1000; 100 per age group] [b]					Sero-survey 2: May 2020 [N=1000; 100 per age group]					Sero-survey 3: September 2020 [N=2000; 200 per age group]				
	Excluded: insufficient sera for specified testing [c]	Included	Ortho-S1, Abbott-NP, Siemens-S1-RBD Tested [a]	Dual assay SP	SP and Abbott-NP positive	Excluded: insufficient sera for specified testing [c]	Included	Ortho-S1, Abbott-NP, Siemens-S1-RBD Tested [a]	Dual assay SP	SP and Abbott-NP positive	Excluded: insufficient sera for specified testing [c]	Included	Ortho-S1, Abbott-NP, Siemens-S1-RBD Tested [a]	Dual assay SP	SP and Abbott-NP positive
All	105	895	10	2	0	110	890	9	4	4	0	2000	28	19	14
0-4	63	38	0	0	0	84	16	0	0	0	0	200	2	2	1
5-9	23	76	0	0	0	11	89	0	0	0	0	200	3	1	1
10-19	11	89	0	0	0	5	95	1	1	1	0	200	3	3	3
20-29	1	99	1	0	0	2	98	0	0	0	0	200	4	3	2
30-39	2	98	0	0	0	0	100	1	1	1	0	200	6	5	4
40-49	0	100	1	1	0	1	99	0	0	0	0	200	1	0	0
50-59	2	98	1	1	0	2	98	4	2	2	0	200	3	3	1
60-69	0	100	1	0	0	0	100	0	0	0	0	200	2	1	1
70-79	0	100	2	0	0	1	99	2	0	0	0	200	3	1	1
80+	3	97	4	0	0	4	96	1	0	0	0	200	1	0	0

Assays: Ortho-S1 + Abbott-NP + Siemens-S1-RBD [a] + supplemental Roche-NP as volume permits																						
Age group years	Sero-survey 4: January 2021 [N=2000; 200 per age group]											Sero-survey 5: May/June 2021 [N=2000; 200 per age group]										
	Excluded: insufficient sera for specified testing [c]	Included	Ortho-S1, Abbott-NP, Siemens-S1-RBD Tested [a]	Dual assay SP	SP and Abbott-NP positive	SP and Roche-NP tested	SP and Abbott-NP negative Roche-NP negative	SP and Abbot-NP negative, Roche-NP positive	SP and Abbott-NP positive Roche-NP negative	SP and Abbott-NP and Roche-NP positive	SP and Abbott-NP or Roche-NP positive	Excluded: insufficient sera for specified testing [c]	Included	Ortho-S1, Abbott-NP, Siemens-S1-RBD Tested [a]	Dual assay SP	SP and Abbott-NP positive	SP and Roche-NP tested	SP and Abbott-NP negative Roche-NP negative	SP and Abbot-NP negative, Roche-NP positive	SP and Abbott-NP positive Roche-NP negative	SP and Abbott-NP and Roche-NP positive	SP and Abbott-NP or Roche-NP positive
All	1	1999	97	87	70	65	9	6	1	49	76	9	1991	1163	1060	156	1039	844	58	2	135	214
0-4	1	199	11	17	16	7	0	1	0	6	17	0	201	24	34	28	27	0	6	0	21	34
5-9	0	200	12	15	15	10	0	0	0	10	15	2	197	36	35	29	27	2	4	0	21	33
10-19	0	200	3	3	3	3	0	0	0	3	3	0	200	45	41	17	38	15	9	0	14	26
20-29	0	200	11	10	6	8	0	3	0	5	9	0	200	101	88	13	87	59	15	0	13	28
30-39	0	200	8	6	4	6	1	1	0	4	5	1	199	122	110	7	109	92	11	0	6	18
40-49	0	200	12	10	8	8	2	0	0	6	8	0	200	149	137	14	137	118	5	1	13	19
50-59	0	200	8	4	3	4	1	0	0	3	3	0	200	158	148	10	148	138	0	0	10	10
60-69	0	200	7	4	3	4	1	0	0	3	3	1	199	180	163	12	162	147	3	0	12	15
70-79	0	200	7	5	4	5	0	1	1	3	5	4	196	177	159	17	159	138	4	0	17	21
80+	0	200	18	13	8	10	4	0	0	6	8	1	199	171	145	9	145	135	1	1	8	10

Age group years	Assays: Ortho-S1 + Roche-NP + Siemens-S1-RBD [d]								Assays: Abbott-S1 + Roche-NP + Siemens-S1-RBD [d]			
	Sero-survey 6: September-October 2021 [N=2000; 200 per age group]				Sero-survey 7: March 2022 [N=2000; 200 per age group]				Sero-survey 8: July/August 2022 [N=2000; 200 per age group]			
	Excluded: insufficient sera for specified testing [c]	Included	Dual assay SP	SP and Roche-NP positive	Excluded: insufficient sera for specified testing [b]	Included	Dual assay SP	SP and Roche-NP positive	Excluded: insufficient sera for specified testing [c]	Included	Dual assay SP	SP and Roche-NP positive
All	10	1990	1502	193	0	2000	1864	850	0	2000	1921	1235
0-4	5	195	34	33	0	200	136	132	0	200	164	157
5-9	0	200	28	26	0	200	178	140	0	200	182	147
10-19	0	200	168	26	0	200	193	117	0	200	194	159
20-29	1	199	175	18	0	200	196	102	0	200	200	147
30-39	0	200	178	23	0	200	197	111	0	200	198	139
40-49	1	199	183	22	0	200	195	90	0	200	196	134
50-59	1	199	184	19	0	200	194	64	0	200	197	121
60-69	0	200	180	6	0	200	196	47	0	200	197	79
70-79	0	200	187	15	0	200	192	22	0	200	195	81
80+	2	198	185	5	0	200	187	25	0	200	198	71

NC = nucleocapsid; S1 = spike 1 protein; S1-RBD = S1 receptor binding domain; SP = sero-positive based on signal above the cut-off threshold on at least two assays

[a] As per specified algorithm for these sero-surveys, Siemens-S1-RBD testing undertaken only if screen positive on Ortho-S1 or Abbott-NP assays

[b] For this sero-survey, sera from 101 children 0-4 years and 99 children 5-9 years were instead provided

[c] At each sero-survey, specimens with insufficient volume to complete the specified algorithm (see Table 1, main manuscript) were excluded only if the requirement for dual positivity could not be resolved otherwise on that basis (e.g. if Ortho-S1 positive, Abbott-NP negative and insufficient serum for Siemens).

[d] For these assays, Roche-NP and Siemens S1-RBD assays applied to all specimens

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 2. Distribution by age group, sex and sero-survey

Age (years) and sex stratum	Sero-survey (N=14,000 specimens collected in total; 13,765 included)								FHA and VCHA population (% only displayed)		
	March 2020	May 2020	Sept 2020	Jan 2021	May/June 2021	Sept/Oct 2021	March 2022	July/Aug 2022	2020 [a]	2021[b]	2022 [b]
Overall included (N)	895	890	2000	1999	1991	1990	2000	2000	NA	NA	NA
Female (n, %) [c]	452 (50)	450 (51)	1000 (50)	1000 (50)	997 (50)	994 (50)	1000 (50)	1000 (50)	51	51	51
0-4 (n, %) [d]	38 (4)	16 (2)	200 (10)	199 (10)	201 (10)	195 (10)	200 (10)	200 (10)	4	4	4
Female (n, %) [c]	19 (50)	11 (69)	100 (50)	99 (50)	101 (50)	98 (50)	100 (50)	100 (50)	48	48	48
5-9 (n, %) [d]	76 (8)	89 (10)	200 (10)	200 (10)	197 (10)	200 (10)	200 (10)	200 (10)	5	5	5
Female (n, %) [c]	38 (50)	44 (49)	100 (50)	100 (50)	97 (49)	100 (50)	100 (50)	100 (50)	48	48	48
10-19 (n, %) [d]	89 (10)	95 (11)	200 (10)	200 (10)	200 (10)	200 (10)	200 (10)	200 (10)	10	10	10
Female (n, %) [c]	49 (55)	46 (48)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	49	49	49
20-29 (n, %) [d]	99 (11)	98 (11)	200 (10)	200 (10)	200 (10)	199 (10)	200 (10)	200 (10)	15	15	15
Female (n, %) [c]	50 (51)	50 (51)	100 (50)	100 (50)	100 (50)	99 (50)	100 (50)	100 (50)	48	49	49
30-39 (n, %) [d]	98 (11)	100 (11)	200 (10)	200 (10)	199 (10)	200 (10)	200 (10)	200 (10)	15	15	16
Female (n, %) [c]	49 (50)	50 (50)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	50	50	49
40-49 (n, %) [d]	100 (11)	99 (11)	200 (10)	200 (10)	200 (10)	199 (10)	200 (10)	200 (10)	13	13	13
Female (n, %) [c]	50 (50)	50 (51)	100 (50)	100 (50)	100 (50)	99 (50)	100 (50)	100 (50)	52	52	51
50-59 (n, %) [d]	98 (11)	98 (11)	200 (10)	200 (10)	200 (10)	199 (10)	200 (10)	200 (10)	14	14	14
Female (n, %) [c]	50 (51)	49 (50)	100 (50)	100 (50)	100 (50)	99 (50)	100 (50)	100 (50)	51	51	52
60-69 (n, %) [d]	100 (11)	100 (11)	200 (10)	200 (10)	199 (10)	200 (10)	200 (10)	200 (10)	12	12	12
Female (n, %) [c]	50 (50)	50 (50)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	100 (50)	52	52	52
70-79 (n, %) [d]	100 (11)	99 (11)	200 (10)	200 (10)	196 (10)	200 (10)	200 (10)	200 (10)	7	8	8
Female (n, %) [c]	50 (50)	50 (51)	100 (50)	100 (50)	99 (51)	100 (50)	100 (50)	100 (50)	53	53	53
80+ (n, %) [d]	97 (11)	96 (11)	200 (10)	200 (10)	199 (10)	198 (10)	200 (10)	200 (10)	4	4	4
Female (n, %) [c]	47 (48)	50 (52)	100 (50)	100 (50)	100 (50)	99 (50)	100 (50)	100 (50)	58	58	58
Median (years)	44	45	39.5	40	39	40	39.5	39.5	40	40	40
Male	45	45	39.5	39.5	39	40	39.5	39.5	38	39	39
Female	43	44	39.5	40	40	39.5	39.5	39.5	41	41	41

Aug = August; FHA = Fraser Health Authority; Jan = January; Oct = October; Sept = September; VCHA = Vancouver Coastal Health Authority

[a] BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

[b] BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

[c] Percentages female are the percentage of included specimens overall and by age group and sero-survey that were collected from females.

[d] Percentages by age group are the percentage of the overall sero-survey tally belonging to that age group

Supplementary Table 3. Percentage distribution by health authority (HA), age group and sero-survey

Surveillance for SARS-CoV-2 and COVID-19 cases is administered across the Lower Mainland of British Columbia by two health authorities: Fraser Health Authority (FHA) and Vancouver Coastal Health Authority (VCHA). Displayed below are the percentages of the Lower Mainland general population (FHA and VCHA overall combined) and sero-survey specimens that came from FHA residents, by age group and sero-survey.

Sero-survey	Percentage of FHA + VCHA general population and sero-survey specimens from within FHA, by age group (years) and sero-survey										
	0-4	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80+**	**Overall**
General population (%)											
2020[a]	67	69	68	58	58	61	60	60	59	57	61
2021[b]	65	68	68	59	57	62	61	60	60	58	61
2022[b]	64	68	68	60	57	62	61	61	60	58	61
Sero-survey participants n/N (%)											
1. March 2020	34/38 (89)	64/76 (84)	59/89 (66)	59/99 (60)	62/98 (63)	64/100 (64)	59/98 (60)	61/100 (61)	61/100 (61)	61/97 (63)	584/895 (65)
2. May 2020	14/16 (88)	66/89 (74)	59/95 (62)	62/98 (63)	45/100 (45)	57/99 (58)	52/98 (53)	60/100 (60)	54/99 (55)	52/96 (54)	521/890 (59)
3. September 2020	172/200 (86)	162/200 (81)	146/200 (73)	111/200 (56)	120/200 (60)	121200 (61)	109/200 (55)	122/200 (61)	117/200 (59)	118/200 (59)	1298/2000 (65)
4. January 2021	171/199 (86)	159/200 (80)	139/200 (70)	120/200 (60)	128/200 (64)	133/200 (67)	124/200 (62)	105/200 (53)	127/200 (64)	109/200 (55)	1315/1999 (66)
5. May/June 2021	179/201 (89)	164/197 (83)	156/200 (78)	132/200 (66)	126/199 (63)	126/200 (63)	126/200 (63)	135/199 (68)	142/196 (72)	130/199 (65)	1416/1991 (71)
6. September/October 2021	167/195 (86)	164/200 (82)	157/200 (79)	131/199 (66)	115/200 (58)	119/199 (60)	123/199 (62)	121/200 (61)	124/200 (62)	129/198 (65)	1350/1990 (68)
7. March 2022	170/200 (85)	161/200 (81)	161/200 (81)	139/200 (70)	110/200 (55)	128/200 (64)	133/200 (67)	119/200 (60)	111/200 (56)	123/200 (62)	1355/2000 (68)
8. July/August 2022	183/200 (92)	161/200 (82)	144/200 (72)	147/200 (74)	163/200 (82)	158/200 (79)	154/200 (77)	119/200 (60)	124/200 (62)	119/200 (60)	1472/2000 (74)

[a] BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates

[b] BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 4. Crude and Bayesian sero-prevalence overall and HA-, age-, sex- stratified: any vaccine and/or infection-induced

Stratum	Estimation method	Sero-prevalence estimates by sero-survey: any dual-assay positivity, indicative of vaccine- and/or infection-induced antibody [a]							
		1. March 2020	2. May 2020	3. Sept 2020	4. January 2021	5. May/June 2021	6. Sept/Oct 2021	7. March 2022	8. July/Aug 2022
OVERALL	Crude tallies n/N	2/895	4/890	19/2000	87/1999	1060/1991	1502/1990	1864/2000	1921/2000
	% (95% CI) [b]	0.2 (0.03, 0.8)	0.45 (0.1, 1.2)	1.0 (0.6, 1.48)	4.4 (3.50, 5.3)	53.2 (51.0, 55.45)	75.48 (73.53, 77.4)	93.2 (92.0, 94.3)	96.1 (95.1, 96.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.07, 0.8)**	**0.6 (0.2, 1.1)**	**1.0 (0.6, 1.52)**	**4.0 (3.2, 5.0)**	**56.2 (54.1, 58.4)**	**82.7 (81.1, 84.2)**	**95.2 (94.3, 96.0)**	**97.0 (96.2, 97.8)**
By health authority (HA)									
Fraser HA (FHA)	Crude tallies n/N	1/584	2/521	13/1298	65/1315	728/1416	976/1350	1251/1355	1407/1472
	% (95% CI) [b]	0.2 (0.00, 1.0)	0.4 (0.1, 1.4)	1.0 (0.53, 1.7)	4.9 (3.8, 6.3)	51.4 (48.8, 54.1)	72.4 (69.9, 74.8)	92.3 (90.8, 93.7)	95.6 (94.4, 96.6)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.8)**	**0.6 (0.2, 1.2)**	**1.0 (0.6, 1.53)**	**4.3 (3.3, 5.3)**	**56.1 (53.46, 58.6)**	**82.1 (80.2, 83.9)**	**94.9 (93.8, 95.9)**	**97.0 (96.2, 97.7)**
Vancouver Coastal HA (VCHA)	Crude tallies n/N	1/311	2/369	6/702	22/684	332/575	526/640	613/645	514/528
	% (95% CI) [b]	0.3 (0.01, 1.8)	0.54 (0.1, 1.9)	0.9 (0.3, 1.9)	3.2 (2.0, 4.8)	57.7 (53.6, 61.8)	86.2 (79.0, 85.1)	95.0 (93.1, 96.6)	97.4 (95.6, 98.54)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1-0.9)**	**0.6 (0.2, 1.2)**	**1.0 (0.6, 1.6)**	**3.7 (2.6, 5.0)**	**56.4 (52.7, 60.0)**	**83.6 (81.2, 85.9)**	**95.7 (94.2, 96.9)**	**97.1 (95.6, 98.3)**
By sex									
Male	Crude tallies n/N	1/443	4/440	9/1000	43/1000	528/994	745/996	931/1000	962/1000
	% (95% CI) [b]	0.2 (0.01, 1.3)	0.9 (0.3, 2.3)	0.9 (0.4, 1.7)	4.3 (3.1, 5.8)	53.1 (50.0, 56.3)	74.8 (72.0, 77.47)	93.1 (91.4, 94.6)	96.2 (94.8, 97.3)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 0.8)**	**0.6 (0.2, 1.3)**	**1.0 (0.6, 1.54)**	**4.2 (3.1, 5.3)**	**55.4 (52.4, 58.47)**	**81.8 (79.6, 83.8)**	**95.0 (93.8, 96.2)**	**96.9 (95.8, 97.8)**
Female	Crude tallies n/N	1/452	0/450	10/1000	44/999	532/997	757/994	933/1000	959/2000
	% (95% CI) [b]	0.2 (0.01, 1.2)	0 (0-0.8)	1.0 (0.48, 1.8)	4.4 (3.2, 5.9)	53.4 (50.2, 56.49)	76.2 (73.4, 78.8)	93.3 (91.6, 94.8)	95.9 (94.48, 97.0)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.06, 0.8)**	**0.53 (0.2, 1.1)**	**1.0 (0.6, 1.6)**	**3.9 (2.9, 5.1)**	**57.0 (53.9, 60.0)**	**83.6 (81.49, 85.6)**	**95.4 (94.1, 96.4)**	**97.1 (96.1, 98.0)**
By age group									
0-4 years	Crude tallies n/N	0/38	0/16	2/200	17/199	34/201	34/195	136/200	164/200
	% (95% CI) [b]	0 (0-9.3)	0 (0-20.6)	1.0 (0.1, 3.6)	8.54 (5.1, 13.3)	16.9 (12.0, 22.8)	17.4 (12.4, 23.50)	68.0 (61.0, 74.4)	82.0 (76.0, 87.1)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.6 (0.1, 1.4)**	**1.0 (0.52, 1.7)**	**6.1 (3.9, 9.0)**	**18.7 (13.3, 25.0)**	**17.6 (12.52, 23.49)**	**71.9 (64.8, 78.4)**	**84.48 (77.6, 89.8)**
5-9 years	Crude tallies n/N	0/76	0/89	1/200	15/200	35/197	28/200	178/200	182/200
	% (95% CI) [b]	0 (0-4.7)	0 (0-4.1)	0.50 (0.01, 2.8)	7.50 (4.3, 12.1)	17.8 (12.7, 23.8)	14.0 (9.51, 19.6)	89.0 (83.8, 93.0)	91.0 (86.2, 94.6)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.53 (0.1, 1.3)**	**1.0 (0.48, 1.6)**	**5.7 (3.7, 8.6)**	**18.4 (13.6, 24.1)**	**14.8 (10.4, 20.2)**	**89.9 (85.51, 93.53)**	**92.8 (89.3, 95.53)**
10-19 years	Crude tallies n/N	0/89	1/95	3/200	3/200	41/200	168/200	193/200	194/200
	% (95% CI) [b]	0 (0-4.1)	1.1 (0.03-5.7)	1.50 (0.3, 4.3)	1.50 (0.3, 4.3)	20.50 (15.1, 26.8)	84.0 (78.2, 88.8)	96.50 (92.9, 98.6)	97.0 (93.6, 98.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.045, 0.9)**	**0.6 (0.2, 1.52)**	**1.1 (0.6, 1.8)**	**3.1 (1.6, 4.8)**	**21.7 (16.4, 27.51)**	**83.8 (78.6, 88.4)**	**96.1 (93.55, 98.2)**	**96.53 (93.9, 98.4)**
20-29 years	Crude tallies n/N	0/99	0/98	3/200	10/200	88/200	175/199	196/200	200/200
	% (95% CI) [b]	0 (0-3.7)	0 (0-3.7)	1.50 (0.3, 4.3)	5.0 (2.4, 9.0)	44.0 (37.0, 51.2)	87.9 (82.6, 92.1)	98.0 (95.0, 99.45)	100 (98.2, 100)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.9)**	**0.54 (0.1, 1.2)**	**1.0 (0.6, 1.8)**	**4.9 (3.0, 7.50)**	**44.2 (37.7, 50.8)**	**87.7 (82.8, 91.9)**	**97.2 (95.0, 98.7)**	**98.8 (97.2, 99.7)**
30-39 years	Crude tallies n/N	0/98	1/100	5/200	6/200	110/199	178/200	197/200	198/200
	% (95% CI) [b]	0 (0-3.7)	1.0 (0.03-5.45)	2.50 (0.8, 5.7)	3.0 (1.1, 6.4)	55.3 (48.1, 62.3)	89.0 (83.8, 93.0)	98.50 (95.7, 99.7)	99.0 (96.4, 99.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.6 (0.2, 1.3)**	**1.1 (0.6, 2.1)**	**3.7 (2.1, 5.55)**	**54.8 (48.2, 61.6)**	**88.6 (84.1, 92.4)**	**97.46 (95.4, 98.9))**	**98.1 (95.7, 99.4)**
40-49 years	Crude tallies n/N	1/100	0/99	0/200	10/200	137/200	183/199	195/200	196/200
	% (95% CI) [b]	1.0 (0.03, 5.45)	0 (0, 3.7)	0 (0-1.8)	5.0 (2.4, 9.0)	68.50 (61.6, 74.9)	92.0 (87.3, 95.3)	97.50 (94.3, 99.2)	98.0 (95.0, 99.45)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.1, 1.1)**	**0.53 (0.1, 1.2)**	**0.9 (0.4, 1.54)**	**4.4 (2.7, 6.6)**	**68.0 (61.8, 73.8)**	**91.3 (87.3, 94.50)**	**96.8 (94.4, 98.50)**	**97.8 (95.53, 99.1)**
50-59 years	Crude tallies n/N	1/98	2/98	3/200	4/200	148/200	184/199	194/200	197/200
	% (95% CI) [b]	1.0 (0.03, 5.6)	2.0 (0.3, 7.2)	1.50 (0.3, 4.3)	2.0 (0.6, 5.0)	74.0 (67.3, 80.0)	92.46 (87.9, 95.7)	97.0 (93.6, 98.9)	98.50 (95.7, 99.7)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.1, 1.1)**	**0.6 (0.2, 1.7)**	**1.0 (0.6, 1.8)**	**3.3 (1.8, 5.2)**	**73.1 (67.1, 78.7)**	**91.7 (87.6, 94.9)**	**96.3 (93.8, 98.2)**	**97.9 (95.7, 99.2)**
60-69 years	Crude tallies n/N	0/100	0/100	1/200	4/200	163/199	180/200	196/200	197/200
	% (95% CI) [b]	0 (0-3.6)	0 (0, 3.6)	0.50 (0.01, 2.8)	2.0 (0.6, 5.0)	81.9 (75.9, 87.0)	90.0 (85.0, 93.8)	98.0 (95.0, 99.45)	98.50 (95.7, 99.7)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 0.9)**	**0.53 (0.1, 1.2)**	**1.0 (0.49, 1.6)**	**3.3 (1.7, 5.2)**	**80.1 (74.3, 85.4)**	**89.6 (85.3, 93.3)**	**97.1 (94.8, 98.7)**	**98.0 (96.1, 99.3)**
70-79 years	Crude tallies n/N	0/100	0/99	1/200	5/200	159/196	187/200	192/200	195/200
	% (95% CI) [b]	0 (0-3.6)	0 (0, 3.7)	0.50 (0.01, 2.8)	2.50 (0.8, 5.7)	81.1 (74.9, 86.4)	93.50 (89.1, 96.49)	96.0 (92.3, 98.3)	97.50 (94.3, 99.2)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.53 (0.1, 1.2)**	**1.0 (0.48, 1.6)**	**3.49 (1.9, 5.4)**	**79.4 (73.53, 84.7)**	**92.9 (89.2, 95.8)**	**95.7 (93.0, 97.8)**	**97.4 (95.2, 98.9)**
80+ years	Crude tallies n/N	0/97	0/96	0/200	13/200	145/199	185/198	187/200	198/200
	% (95% CI) [b]	0 (0-3.7)	0 (0, 3.8)	0 (0-1.8)	6.50 (3.51, 10.9)	72.9 (66.1, 78.9)	93.4 (89.0, 96.46)	93.50 (89.1, 96.49)	99.0 (96.4, 99.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.9)**	**0.53 (0.1, 1.2)**	**0.9 (0.4, 1.53)**	**5.0 (3.1, 7.7)**	**71.9 (65.6, 77.8)**	**92.7 (88.9, 95.8)**	**93.4 (89.6, 96.3)**	**98.2 (96.49, 99.4)**

Green shading signifies primary analysis based on adjusted Bayesian logistic regression analysis. 95% CI = 95% confidence interval; 95% CrI = 95% credible interval; Aug = August; Oct = October; Sept = September

[a] Sero-prevalence based on positivity on any two assays, with or without anti-nucleocapsid protein detection.
[b] 95% CIs around crude sero-prevalence estimates are based on exact method. One-sided 97.5% CIs for cells with zero counts.
[c] HA, sex and age group standardized.

Supplementary Table 5. Crude and Bayesian sero-prevalence overall and HA-, age-, sex- stratified: infection-induced

Stratum	Estimation method	Sero-prevalence estimates by sero-survey: dual-assay positivity inclusive of anti-nucleocapsid detection, infection-induced antibody (with/without vaccination) [a]							
		1. March 2020	2. May 2020	3. Sept 2020	4. January 2021	5. May/June 2021	6. Sept/Oct 2021	7. March 2022	8. July/Aug 2022
OVERALL	Crude tallies n/N	2/895	4/890	19/2000	76/1999	214/1991	193/1990	850/2000	1235/2000
	% (95% CI) [b]	0.2 (0.03, 0.8)	0.45 (0.1, 1.2)	1.0 (0.6, 1.48)	3.8 (3.0, 4.7)	10.8 (9.4, 12.2)	9.7 (8.4, 11.1)	42.50 (40.3, 44.7)	61.8 (59.6, 63.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.07, 0.8)**	**0.6 (0.2, 1.1)**	**1.0 (0.6, 1.52)**	**3.48 (2.7, 4.4)**	**10.1 (8.8, 11.6)**	**9.4 (8.1, 10.8)**	**42.48 (40.2, 44.9)**	**61.1 (58.8, 63.4)**
By health authority (HA)									
Fraser HA (FHA)	Crude tallies n/N	1/584	2/521	13/1298	62/1315	184/1416	156/1350	625/1355	974/1472
	% (95% CI) [b]	0.2 (0.00, 1.0)	0.4 (0.1, 1.4)	1.0 (0.53, 1.7)	4.7 (3.6, 6.0)	13.0 (11.3, 14.9)	11.6 (9.9, 13.4)	46.1 (43.4, 48.8)	66.2 (63.7, 68.6)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.8)**	**0.6 (0.2, 1.2)**	**1.0 (0.6, 1.53)**	**3.8 (2.9, 4.9)**	**11.3 (9.7, 13.0)**	**10.3 (8.7, 12.0)**	**44.7 (42.0, 47.6)**	**65.3 (62.8, 67.7)**
Vancouver Coastal HA (VCHA)	Crude tallies n/N	1/311	2/369	6/702	14/684	30/575	37/640	225/645	261/528
	% (95% CI) [b]	0.3 (0.01, 1.8)	0.54 (0.1, 1.9)	0.9 (0.3, 1.9)	2.1 (1.1, 3.4)	5.2 (3.6, 7.4)	5.8 (4.1, 7.9)	34.9 (31.2, 38.7)	49.4 (45.1, 53.8)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1-0.9)**	**0.6 (0.2, 1.2)**	**1.0 (0.6, 1.6)**	**3.0 (2.0, 4.2)**	**8.3 (6.3, 10.51)**	**7.9 (6.0, 9.8)**	**39.0 (35.1, 42.8)**	**54.6 (50.0, 59.1)**
By sex									
Male	Crude tallies n/N	1/443	4/440	9/1000	40/1000	109/994	103/996	419/100	634/1000
	% (95% CI) [b]	0.2 (0.01, 1.3)	0.9 (0.3, 2.3)	0.9 (0.4, 1.7)	4.0 (2.9, 5.4)	11.0 (9.1, 13.1)	10.3 (8.52, 12.4)	41.9 (38.8, 45.0)	63.4 (60.3, 66.4)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 0.8)**	**0.6 (0.2, 1.3)**	**1.0 (0.6, 1.54)**	**3.7 (2.7, 4.8)**	**10.2 (8.6, 12.1)**	**10.0 (8.2, 11.8)**	**42.53 (39.4, 45.6)**	**63.1 (59.9, 66.2)**
Female	Crude tallies n/N	1/452	0/450	10/1000	36/999	105/997	90/994	431/100	601/1000
	% (95% CI) [b]	0.2 (0.01, 1.2)	0 (0-0.8)	1.0 (0.48, 1.8)	3.6 (2.54, 5.0)	10.53 (8.7, 12.6)	9.1 (7.3, 11.0)	43.1 (40.0, 46.2)	60.1 (57.0, 63.2)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.06, 0.8)**	**0.53 (0.2, 1.1)**	**1.0 (0.6, 1.6)**	**3.3 (2.4, 4.3)**	**10.0 (8.3, 11.7)**	**8.8 (7.1, 10.51)**	**42.4 (39.3, 45.6)**	**59.2 (56.0, 62.4)**
By age group									
0-4 years	Crude tallies n/N	0/38	0/16	2/200	17/199	34/201	33/195	132/200	157/200
	% (95% CI) [b]	0 (0-9.3)	0 (0-20.6)	1.0 (0.1, 3.6)	8.54 (5.1, 13.3)	16.9 (12.0, 22.8)	16.9 (11.9, 22.9)	66.0 (59.0, 72.53)	78.50 (72.2, 84.0)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.6 (0.1, 1.4)**	**1.0 (0.52, 1.7)**	**5.9 (3.6, 8.8)**	**13.4 (9.9, 17.46)**	**13.3 (9.8, 17.4)**	**62.9 (55.8, 69.46)**	**72.6 (65.6, 79.2)**
5-9 years	Crude tallies n/N	0/76	0/89	1/200	15/200	33/197	26/200	140/200	147/200
	% (95% CI) [b]	0 (0-4.7)	0 (0-4.1)	0.50 (0.01, 2.8)	7.50 (4.3, 12.1)	17.8 (12.7, 23.8)	13.0 (8.7, 18.47)	70.0 (63.1, 76.3)	73.50 (66.8, 79.48)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.53 (0.1, 1.3)**	**1.0 (0.48, 1.6)**	**5.52 (3.47, 8.4)**	**13.7 (10.1, 17.8)**	**11.3 (8.1, 15.0)**	**65.9 (59.3, 72.2)**	**70.46 (64.6, 76.3)**
10-19 years	Crude tallies n/N	0/89	1/95	3/200	3/200	26/200	26/200	117/200	159/200
	% (95% CI) [b]	0 (0-4.1)	1.1 (0.03-5.7)	1.50 (0.3, 4.3)	1.50 (0.3, 4.3)	13.0 (8.7, 18.47)	13.0 (8.7, 18.47)	58.50 (51.3, 65.4)	79.50 (73.2, 84.9)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.045, 0.9)**	**0.6 (0.2, 1.52)**	**1.1 (0.6, 1.8)**	**2.7 (1.4, 4.4)**	**11.8 (8.6, 15.6)**	**11.3 (8.1, 15.0)**	**56.0 (49.54, 62.4)**	**76.0 (70.46, 81.4)**
20-29 years	Crude tallies n/N	0/99	0/98	3/200	9/200	28/200	18/199	102/200	147/200
	% (95% CI) [b]	0 (0-3.7)	0 (0-3.7)	1.50 (0.3, 4.3)	4.50 (2.1, 8.4)	14.0 (9.51, 19.6)	9.1 (5.45, 13.9)	51.0 (43.9, 58.1)	73.50 (66.8, 79.48)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.9)**	**0.54 (0.1, 1.2)**	**1.0 (0.6, 1.8)**	**4.3 (2.47, 6.7)**	**11.9 (8.6, 15.54)**	**8.9 (6.1, 12.2)**	**49.7 (43.0, 56.6)**	**69.51 (63.3, 75.4)**
30-39 years	Crude tallies n/N	0/98	1/100	5/200	5/200	18/199	23/200	111/200	139/200
	% (95% CI) [b]	0 (0-3.7)	1.0 (0.03-5.45)	2.50 (0.8, 5.7)	2.50 (0.8, 5.7)	9.1 (5.45, 13.9)	11.50 (7.4, 16.8)	55.50 (48.3, 62.51)	69.50 (62.6, 75.8)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.6 (0.2, 1.3)**	**1.1 (0.6, 2.1)**	**3.1 (1.6, 4.9)**	**9.51 (6.6, 12.9)**	**10.50 (7.4, 14.2)**	**54.4 (48.2, 60.8)**	**64.6 (57.6, 71.2)**
40-49 years	Crude tallies n/N	1/100	0/99	0/200	8/200	19/200	22/199	90/200	134/200
	% (95% CI) [b]	1.0 (0.03, 5.45)	0 (0-3.7)	0 (0-1.8)	4.0 (1.7, 7.7)	9.50 (5.8, 1.4)	11.1 (7.1, 16.3)	45.0 (38.0, 52.2)	67.0 (60.0, 73.47)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.1, 1.1)**	**0.53 (0.1, 1.2)**	**0.9 (0.4, 1.54)**	**3.7 (2.2, 5.8)**	**9.7 (6.9, 12.9)**	**10.1 (7.1, 13.7)**	**44.51 (38.1, 51.3)**	**64.1 (57.6, 70.51)**
50-59 years	Crude tallies n/N	1/98	2/98	3/200	3/200	10/200	19/199	64/200	121/200
	% (95% CI) [b]	1.0 (0.03, 5.6)	2.0 (0.3-7.2)	1.50 (0.3, 4.3)	1.50 (0.3, 4.3)	5.0 (2.4, 9.0)	9.6 (5.9, 14.51)	32.0 (25.6, 39.0)	60.50 (53.4, 67.3)
	Bayesian adjusted [c] % (95% CrI)	**0.4 (0.1, 1.1)**	**0.6 (0.2, 1.7)**	**1.0 (0.6, 1.8)**	**2.8 (1.4, 4.55)**	**7.6 (4.8, 10.7)**	**9.2 (6.4, 12.51)**	**32.7 (26.7, 39.0)**	**59.6 (53.0, 66.3)**
60-69 years	Crude tallies n/N	0/100	0/100	1/200	3/200	15/199	6/200	47/200	79/200
	% (95% CI) [b]	0 (0-3.6)	0 (0-3.6)	0.50 (0.01, 2.8)	1.50 (0.3, 4.3)	7.54 (4.3, 12.1)	3.0 (1.1, 6.4)	23.50 (17.8, 30.0)	39.50 (32.7, 46.6)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 0.9)**	**0.53 (0.1, 1.2)**	**1.0 (0.49, 1.6)**	**2.8 (1.4, 4.6)**	**8.7 (5.9, 11.9)**	**5.8 (3.4, 8.7)**	**24.9 (19.55, 30.6)**	**42.3 (36.0, 48.6)**
70-79 years	Crude tallies n/N	0/100	0/99	1/200	5/200	21/196	15/200	22/200	81/200
	% (95% CI) [b]	0 (0-3.6)	0 (0-3.7)	0.50 (0.01, 2.8)	2.50 (0.8, 5.7)	10.7 (6.8, 15.9)	7.50 (4.3, 12.1)	11.0 (7.0, 16.2)	40.50 (33.6, 47.7)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.046, 0.9)**	**0.53 (0.1, 1.2)**	**1.0 (0.48, 1.6)**	**3.1 (1.7, 4.8)**	**10.2 (7.3, 13.46)**	**8.2 (5.50, 11.34)**	**14.3 (9.8, 19.3)**	**43.1 (36.55, 49.7)**
80+ years	Crude tallies n/N	0/97	0/96	0/200	8/200	10/199	5/198	25/200	71/200
	% (95% CI) [b]	0 (0-3.7)	0 (0-3.8)	0 (0-1.8)	4.0 (1.7, 7.7)	5.0 (2.4, 9.1)	2.53 (0.8, 5.8)	12.50 (8.3, 17.9)	35.50 (28.9, 42.6)
	Bayesian adjusted [c] % (95% CrI)	**0.3 (0.1, 0.9)**	**0.53 (0.1, 1.2)**	**0.9 (0.4, 1.53)**	**3.7 (2.1, 5.9)**	**7.6 (4.8, 10.7)**	**5.6 (3.2, 8.6)**	**15.4 (11.1, 20.4)**	**37.9 (31.7, 44.3)**

Green shading signifies primary analysis based on adjusted Bayesian logistic regression analysis. 95% CI = 95% confidence interval; 95% CrI = 95% credible interval; Aug = August; Oct = October; Sept = September

[a] Sero-prevalence based on positivity on any two assays, of which from the January 2021 sero-survey, at least one must include anti-nucleocapsid detection. Specimens sero-positive on any two assays in prior sero-surveys (1-3) considered infection-induced regardless of assay type.
[b] 95% CIs around crude sero-prevalence estimates are based on exact method. One-sided 97.5% CIs for cells with zero counts.
[c] HA, sex and age group standardized.

Supplementary Table 6. Crude and Bayesian sero-prevalence stratified for both age and sex: any vaccine and/or infection-induced

Age and sex	Estimation method	Sero-prevalence by sero-survey: any dual-assay positivity, indicative of vaccine- and/or infection-induced antibody [a]							
		1. March 2020	2. May 2020	3. Sept 2020	4. January 2021	5. May/June 2021	6. Sept/Oct 2021	7. March 2022	8. July/Aug 2022
0-4 years	Male crude tallies n/N; % (95% CI) [b]	0/19; 0 (0-17.7)	0/5; 0 (0-52.2)	1/100; 1.0 (0.02, 5.45)	9/100; 9.0 (4.2, 16.4)	18/100; 18.0 (11.0, 27.0)	16/97; 16.49 (9.7, 25.4)	65/100; 65.0 (54.8, 74.3)	80/100; 80.0 (70.8, 87.3)
	Female crude tallies n/N; % (95% CI) [b]	0/19; 0 (0-17.7)	0/11; 0 (0-28.49)	2/100; 2.0 (0.2, 7.0)	8/99; 8.1 (3.6, 15.3)	16/101; 15.8 (9.3, 24.45)	17/98; 17.4 (10.4, 26.3)	71/100; 71.0 (61.1, 79.6)	84/100; 84.0 (75.3, 90.6)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.6 (0.1, 1.7)**	**0.9 (0.4, 1.6)**	**6.3 (3.48, 10.48)**	**18.4 (11.47, 27.2)**	**16.4 (9.8, 24.2)**	**68.6 (58.0, 77.8)**	**83.2 (72.1, 90.6)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.4 (0.03, 1.0)**	**0.6 (0.1, 1.6)**	**1.1 (0.50, 2.05)**	**5.9 (3.2, 9.6)**	**19.1 (11.4, 28.3)**	**18.9 (11.8, 27.3)**	**75.47 (66.6, 83.0)**	**85.8 (77.1, 92.3)**
5-9 years	Male crude tallies n/N; % (95% CI) [b]	0/38; 0 (0-9.3)	0/45; 0 (0-7.9)	1/100; 1.0 (0.02, 5.45)	5/100; 5.0 (1.6, 11.3)	19/100; 19.0 (11.8, 28.1)	14/100; 14.0 (7.9, 22.4)	85/100; 85.0 (76.47, 91.4)	96/100; 96.0 (90.1, 98.9)
	Female crude tallies n/N; % (95% CI) [b]	0/38; 0 (0-9.3)	0/44; 0 (0-8.0)	0/100; 0 (0-3.6)	10/100; 10.0 (4.9, 17.6)	16/97; 16.49 (9.7, 25.4)	14/100; 14.0 (7.9, 22.4)	91/100; 91.0 (83.6, 95.8)	86/100; 86.0 (77.6, 92.1)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.4)**	**1.0 (0.4, 1.8)**	**4.4 (2.2, 7.6)**	**19.1 (15.6, 26.6)**	**14.53 (8.6, 21.9)**	**88.1 (81.1, 93.4)**	**96.4 (92.6, 98.8)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**7.2 (3.8, 12.0)**	**17.8 (11.2, 25.9)**	**15.2 (9.2, 22.8)**	**91.9 (86.3, 95.9)**	**88.9 (82.6, 93.8)**
10-19 years	Male crude tallies n/N; % (95% CI) [b]	0/40; 0 (0-8.8)	1/49; 2.0 (0.05, 10.9)	2/100; 2.0 (0.2, 7.0)	1/100; 1.0 (0.02, 5.45)	20/100; 20.0 (12.7, 29.2)	85/100; 85.0 (76.47, 91.4)	97/100; 97.0 (91.48, 99.4)	94/100; 94.0 (87.4, 97.8)
	Female crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	0/46; 0 (0-7.7)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	21/100; 21.0 (13.49, 30.3)	83/100; 83.0 (74.2, 89.8)	96/100; 96.0 (90.1, 98.9)	100/100; 100 (96.4, 100)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.7 (0.2, 2.0)**	**1.1 (0.52, 2.3)**	**2.9 (1.2, 5.3)**	**21.3 (14.1, 29.4)**	**84.6 (77.1, 91.0)**	**96.4 (92.7, 98.8)**	**94.3 (89.48, 97.8)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**1.0 (0.45, 1.9)**	**3.2 (1.4, 5.9)**	**22.1 (14.7, 30.4)**	**83.1 (75.1, 89.7)**	**95.8 (91.9, 98.4)**	**98.8 (96.6, 99.8)**
20-29 years	Male crude tallies n/N; % (95% CI) [b]	0/39; 0 (0-9.0)	0/48; 0 (0-7.4)	1/100; 1.0 (0.02, 5.45)	7/100; 7.0 (2.9, 13.9)	43/100; 43.0 (33.1, 53.3)	91/100; 91.0 (83.6, 95.8)	98/100; 98.0 (93.0, 99.8)	100/100; 100 (96.4, 100)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	2/100; 2.0 (0.2, 7.0)	3/100; 3.0 (0.6, 8.52)	45/100; 45.0 (35.0, 55.3)	84/99; 84.9 (76.2, 91.3)	98/100; 98.0 (93.0, 99.8)	100/100; 100 (96.4, 100)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.54 (0.09, 1.4)**	**1.0 (0.46, 1.9)**	**6.0 (3.1, 10.1)**	**43.3 (34.0, 52.4)**	**90.7 (84.6, 95.4)**	**97.1 (93.8, 99.1)**	**98.8 (96.48, 99.8)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**1.1 (0.51, 2.0)**	**3.7 (1.7, 6.52)**	**45.2 (35.3, 55.1)**	**84.4 (76.7, 91.0)**	**97.2 (93.9, 99.2)**	**98.8 (96.54, 99.8)**
30-39 years	Male crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	1/50; 2.0 (0.05, 10.7)	3/100; 3.0 (0.6, 8.52)	2/100; 2.0 (0.2, 7.0)	58/99; 58.6 (48.2, 68.4)	86/100; 86.0 (77.6, 92.1)	99/100; 99.0 (94.6, 100)	99/100; 99.0 (94.6, 100)
	Female crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	0/50; 0 (0-7.1)	2/100; 2.0 (0.2, 7.0)	4/100; 4.0 (1.1, 9.9)	52/100; 52.0 (41.8, 62.1)	92/100; 92.0 (84.8, 96.48)	98/100; 98.0 (93.0, 99.8)	99/100; 99.0 (94.6, 100)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.6 (0.1, 1.7)**	**1.2 (0.6, 2.4)**	**3.3 (1.4, 5.8)**	**58.3 (48.9, 67.54)**	**85.9 (78.7, 91.8)**	**97.7 (94.9, 99.4)**	**97.9 (94.0, 99.6)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 0.9)**	**0.52 (0.1, 1.3)**	**1.1 (0.52, 2.0)**	**4.0 (2.0, 7.0)**	**51.3 (41.9, 60.7)**	**91.3 (85.1, 95.9)**	**97.2 (93.9, 99.1)**	**98.3 (95.2, 99.7)**
40-49 years	Male crude tallies n/N; % (95% CI) [b]	1/50; 2.0 (0.05, 10.7)	0/49; 0 (0-7.3)	0/100; 0 (0-3.6)	6/100; 6.0 (2.2, 12.6)	68/100; 68.0 (57.9, 77.0)	90/100; 90.0 (82.4, 95.1)	98/100; 98.0 (93.0, 99.8)	98/100; 98.0 (93.0, 99.8)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	4/100; 4.0 (1.1, 9.9)	69/100; 69.0 (59.0, 77.9)	93/99; 93.9 (87.3, 97.7)	97/100; 97.0 (91.48, 99.4)	98/100; 98.0 (93.0, 99.8)
	Male Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 1.50)**	**0.53 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**4.9 (2.54, 8.3)**	**67.9 (58.7, 76.2)**	**89.3 (83.1, 94.2)**	**97.1 (93.7, 99.1)**	**97.53 (94.2, 99.4)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**4.0 (1.9, 6.9)**	**68.2 (59.3, 76.6)**	**93.2 (87.54, 97.0)**	**96.48 (92.9, 98.8)**	**97.8 (94.7, 99.4)**
50-59 years	Male crude tallies n/N; % (95% CI) [b]	0/48; 0 (0-7.4)	2/49; 4.1 (0.50, 14.0)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	70/100; 70.0 (60.0, 78.8)	94/100; 94.0 (87.4, 97.8)	95/100; 95.0 (88.7, 98.4)	100/100; 100 (96.4, 100)
	Female crude tallies n/N; % (95% CI) [b]	1/50; 2.0 (0.05, 10.7)	0/49; 0 (0-7.3)	2/100; 2.0 (0.2, 7.0)	2/100; 2.0 (0.2, 7.0)	78/100; 78.0 (68.6, 85.7)	90/99; 90.9 (83.4, 95.8)	99/100; 99.0 (94.6, 100)	97/100; 97.0 (91.48, 99.4)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.8 (0.2, 2.47)**	**1.0 (0.46, 1.8)**	**3.4 (1.4, 6.0)**	**69.48 (60.7, 77.47)**	**93.2 (88.0, 97.9)**	**94.9 (90.6, 97.9)**	**98.8 (96.7, 99.8)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 1.50)**	**0.53 (0.09, 1.4)**	**1.1 (0.51, 2.1)**	**3.3 (1.4, 5.8)**	**76.6 (68.2, 84.0)**	**90.3 (83.9, 95.1)**	**97.6 (94.7, 99.4)**	**97.0 (93.2, 99.1)**
60-69 years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	2/100; 2.0 (0.2, 7.0)	81/99; 81.8 (72.8, 88.9)	88/100; 88.0 (80.0, 93.6)	98/100; 98.0 (93.0, 99.8)	98/100; 98.0 (93.0, 99.8)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	82/100; 82.0 (73.1, 89.0)	92/100; 92.0 (84.8, 96.48)	98/100; 98.0 (93.0, 99.8)	99/100; 99.0 (94.6, 100)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.3)**	**0.9 (0.4, 1.7)**	**3.3 (1.4, 5.8)**	**80.1 (71.3, 87.1)**	**87.7 (80.45, 93.1)**	**97.1 (93.9, 99.1)**	**97.8 (95.1, 99.4)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.52 (1.0, 1.3)**	**1.0 (0.4, 1.8)**	**3.3 (1.3, 6.0)**	**80.0 (72.3, 87.0)**	**91.45 (85.8, 95.9)**	**97.2 (93.9, 99.1)**	**98.3 (95.6, 99.7)**
70-79 years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/49; 0 (0-7.3)	0/100; 0 (0-3.6)	3/100; 3.0 (0.6, 8.52)	79/97; 81.4 (72.3, 88.6)	89/100; 89.0 (81.2, 94.4)	98/100; 98.0 (93.0, 99.8)	97/100; 97.0 (91.48, 99.4)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	80/99; 80.8 (71.7, 88.0)	98/100; 98.0 (93.0, 99.8)	94/100; 94.0 (87.4, 97.8)	98/100; 98.0 (93.0, 99.8)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.1, 1.30**	**0.9 (0.3, 1.7)**	**3.7 (1.7, 6.4)**	**80.1 (71.7, 87.3)**	**88.6 (82.0, 93.8)**	**97.1 (94.0, 99.1)**	**97.1 (93.50, 99.1)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 0.9)**	**0.53 (0.09, 1.3)**	**1.0 (0.4, 1.8)**	**3.3 (1.4, 5.9)**	**78.8 (70.0, 86.3)**	**96.8 (92.7, 99.1)**	**94.4 (89.9, 97.54)**	**97.6 (94.4, 99.4)**
80+ years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/46; 0 (0-7.7)	0/100; 0 (0-3.6)	6/100; 6.0 (2.2, 12.6)	72/99; 72.7 (62.9, 81.2)	92/99; 92.9 (86.0, 97.1)	96/100; 96.0 (90.1, 98.9)	100/100; 100 (96.4, 100)
	Female crude tallies n/N; % (95% CI) [b]	0/47; 0 (0-7.6)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	7/100; 7.0 (2.9, 13.9)	73/100; 73.0 (63.2, 81.4)	93/99; 93.9 (87.3, 97.7)	91/100; 91.0 (83.6, 95.8)	98/100; 98.0 (93.0, 99.8)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.1, 1.3)**	**0.9 (0.4, 1.6)**	**4.8 (2.4, 8.2)**	**72.4 (63.45, 80.3)**	**91.9 (86.0, 96.3)**	**95.8 (91.8, 98.50)**	**98.8 (96.7, 99.8)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.52 (0.1, 1.3)**	**0.9 (0.4, 1.7)**	**5.2 (2.8, 9.0)**	**71.49 (62.2, 79.9)**	**93.3 (88.1, 97.1)**	**91.6 (85.6, 96.0)**	**97.8 (95.0, 99.4)**

Green shading signifies primary analysis based on adjusted Bayesian logistic regression analysis.
95% CI = 95% confidence interval; 95% CrI = 95% credible interval; Aug = August; Oct = October; Sept = September

[a] Sero-prevalence based on positivity on any two assays, with or without anti-nucleocapsid protein detection.
[b] 95% CIs around crude sero-prevalence estimates are based on exact method. One-sided 97.5% CIs for cells with zero counts.
[c] HA, sex and age group standardized

Supplementary Table 7. Crude and Bayesian sero-prevalence stratified for both age and sex: infection-induced

Age and sex	Estimation method	Sero-prevalence by sero-survey: dual-assay positivity inclusive of anti-nucleocapsid, indicative of infection-induced antibody (with/without vaccination) [a]							
		1. March 2020	2. May 2020	3. Sept 2020	4. January 2021	5. May/June 2021	6. Sept/Oct 2021	7. March 2022	8. July/Aug 2022
0-4 years	Male crude tallies n/N; % (95% CI) [b]	0/19; 0 (0-17.7)	0/5; 0 (0-52.2)	1/100; 1.0 (0.02, 5.45)	9/100; 9.0 (4.2, 16.4)	18/100; 18.0 (11.0, 27.0)	16/97; 16.49 (9.7, 25.4)	62/100; 62.0 (51.8, 71.52)	78/100; 78.0 (68.6, 85.7)
	Female crude tallies n/N; % (95% CI) [b]	0/19; 0 (0-17.7)	0/11; 0 (0-28.49)	2/100; 2.0 (0.2, 7.0)	8/99; 8.1 (3.6, 15.3)	16/101; 15.8 (9.3, 24.45)	17/98; 17.4 (10.4, 26.3)	70/100; 70.0 (60.0, 78.8)	79/100; 79.0 (69.7, 86.51)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.6 (0.1, 1.7)**	**0.9 (0.4, 1.6)**	**6.1 (3.2, 13.4)**	**13.9 (9.3, 19.50)**	**13.0 (8.45, 18.8)**	**58.7 (48.7, 68.6)**	**72.1 (62.2, 81.3)**
	Female Bayesian adjusted [c] % (95% CrI)	**00.4 (0.03, 1.0)**	**0.6 (0.1, 1.6)**	**1.1 (0.50, 2.05)**	**5.7 (3.0, 9.6)**	**12.9 (8.4, 18.6)**	**13.52 (8.8, 19.4)**	**67.3 (57.51, 76.0)**	**73.2 (64.0, 81.7)**
5-9 years	Male crude tallies n/N; % (95% CI) [b]	0/38; 0 (0-9.3)	0/45; 0 (0-7.9)	1/100; 1.0 (0.02, 5.45)	5/100; 5.0 (1.6, 11.3)	18/100; 18.0 (11.0, 27.0)	13/100; 13.0 (7.1, 21.2)	71/100; 71.0 (61.1, 79.6)	77/100; 77.0 (67.51, 84.8)
	Female crude tallies n/N; % (95% CI) [b]	0/38; 0 (0-9.3)	0/44; 0 (0-8.0)	0/100; 0 (0-3.6)	10/100; 10.0 (4.9, 17.6)	15/97; 15.46 (8.9. 24.2)	13/100; 13.0 (7.1, 21.2)	69/100; 69.0 (59.0, 77.9)	70/100; 70.0 (90.0, 78.8)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.4)**	**1.0 (0.4, 1.8)**	**4.1 (2.0, 7.4)**	**14.46 (9.7, 20.47)**	**11.3 (7.2, 16.4)**	**66.49 (57.53, 75.3)**	**73.7 (65.3, 51.2)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**7.1 (3.8, 11.7)**	**12.8 (8.4, 18.4)**	**11.3 (6.9, 16.6)**	**65.3 (55.8, 74.1)**	**67.0 (58.2, 75.2)**
10-19 years	Male crude tallies n/N; % (95% CI) [b]	0/40; 0 (0-8.8)	1/49; 2.0 (0.05, 10.9)	2/100; 2.0 (0.2, 7.0)	1/100; 1.0 (0.02, 5.45)	12/100; 12.0 (6.4, 20.0)	14/100; 14.0 (7.9, 22.4)	51/100; 51.0 (40.8, 61.1)	78/100; 78.0 (68.6, 85.7)
	Female crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	0/46; 0 (0-7.7)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	14/100; 14.0 (7.9, 22.4)	12/100; 12.0 (6.4, 20.0)	66/100; 66.0 (55.9, 75.2)	81/100; 81.0 (71.9, 88.2)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.7 (0.2, 2.0)**	**1.1 (0.52, 2.3)**	**2.54 (1.0, 4.9)**	**11.3 (7.0, 16.7)**	**11.8 (7.2, 17.46)**	**49.2 (39.7, 58.4)**	**75.3 (67.4, 82.6)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**1.0 (0.45, 1.9)**	**2.9 (1.1, 5.4)**	**12.4 (7.9, 17.8)**	**10.7 (6.47, 15.8)**	**63.1 (53.53, 72.4)**	**76.8 (65.6, 84.3)**
20-29 years	Male crude tallies n/N; % (95% CI) [b]	0/39; 0 (0-9.0)	0/48; 0 (0-7.4)	1/100; 1.0 (0.02, 5.45)	6/100; 6.0 (2.2, 12.6)	12/100; 12.0 (6.4, 20.0)	8/100; 8.0 (3.52, 15.2)	49/100; 49.0 (38.9, 59.2)	76/100; 76.0 (66.4, 84.0)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	2/100; 2.0 (0.2, 7.0)	3/100; 3.0 (0.6, 8.52)	16/100; 16.0 (9.4, 24.7)	10/99; 10.1 (5.0, 17.8)	53/100; 53.0 (42.8, 63.1)	71/100; 71.0 (61.1, 79.6)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.54 (0.09, 1.4)**	**1.0 (0.46, 1.9)**	**5.1 (2.4, 9.2)**	**10.9 (7.0, 15.8)**	**8.4 (4.8, 12.9)**	**48.3 (39.2, 57.49)**	**72.3 (63.7, 80.3)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.54 (0.09, 1.4)**	**1.1 (0.51, 2.0)**	**3.3 (1.4, 6.1)**	**12.9 (8.4, 18.8)**	**9.49 (5.6, 14.51)**	**51.2 (41.4, 60.8)**	**66.6 (57.4, 75.1)**
30-39 years	Male crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	1/50; 2.0 (0.05, 10.7)	3/100; 3.0 (0.6, 8.52)	2/100; 2.0 (0.2, 7.0)	11/99; 11.1 (5.7, 19.0)	12/100; 12.0 (6.4, 20.0)	57/100; 57.0 (46.7, 66.9)	66/100; 66.0 (55.9, 75.2)
	Female crude tallies n/N; % (95% CI) [b]	0/49; 0 (0-7.3)	0/50; 0 (0-7.1)	2/100; 2.0 (0.2, 7.0)	3/100; 3.0 (0.6, 8.52)	7/100; 7.0 (2.9, 13.9)	11/100; 11.0 (5.6, 18.8)	54/100; 54.0 (43.7, 64.0)	73/100; 73.0 (63.2, 81.4)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.6 (0.1, 1.7)**	**1.2 (0.6, 2.4)**	**2.9 (1.2, 5.3)**	**10.7 (6.6, 16.0)**	**11.1 (6.8, 16.4)**	**55.7 (46.7, 64.3)**	**61.8 (52.2, 71.2)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 0.9)**	**0.52 (0.1, 1.3)**	**1.1 (0.52, 2.0)**	**3.3 (1.4, 5.9)**	**8.3 (4.7, 12.8)**	**9.9 (6.0, 14.8)**	**53.1 (44.0, 62.4)**	**67.3 (57.8, 76.4)**
40-49 years	Male crude tallies n/N; % (95% CI) [b]	1/50; 2.0 (0.05, 10.7)	0/49; 0 (0-7.3)	0/100; 0 (0-3.6)	6/100; 6.0 (2.2, 12.6)	11/100; 11.0 (5.6, 18.8)	16/100; 16.0 (9.4, 24.7)	49/100; 49.0 (38.9, 59.2)	73/100; 73.0 (63.2, 81.4)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	2/100; 2.0 (0.2, 7.0)	8/100; 8.0 (3.52, 15.2)	6/99; 6.1 (2.3, 12.7)	41/10; 41.0 (31.3, 51.3)	61/100; 61.0 (50.7, 70.6)
	Male Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 1.50)**	**0.53 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**4.6 (2.2, 8.1)**	**10.4 (6.3, 15.3)**	**13.0 (8.2, 19.0)**	**47.9 (38.7, 57.7)**	**69.8 (60.8, 78.4)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.4)**	**0.9 (0.4, 1.6)**	**2.9 (1.1, 5.4)**	**9.0 (5.4, 13.4)**	**7.51 (4.1, 11.9)**	**41.3 (32.6, 50.3)**	**58.9 (49.7, 68.1)**
50-59 years	Male crude tallies n/N; % (95% CI) [b]	0/48; 0 (0-7.4)	2/49; 4.1 (0.50, 14.0)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	5/100; 5.0 (1.6, 11.3)	11/100; 11.0 (5.6, 18.8)	32/100; 32.0 (23.0, 42.1)	61/100; 61.0 (50.7, 70.6)
	Female crude tallies n/N; % (95% CI) [b]	1/50; 2.0 (0.05, 10.7)	0/49; 0 (0-7.3)	2/100; 2.0 (0.2, 7.0)	1/100; 1.0 (0.02, 5.45)	5/100; 5.0 (1.6, 11.3)	8/99; 8.1 (3.6, 15.3)	32/100; 32.0 (23.0, 42.1)	60/100; 60.0 (49.7, 69.7)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.8 (0.2, 2.47)**	**1.0 (0.46, 1.8)**	**2.9 (1.2, 5.50)**	**7.47 (4.1, 11.50)**	**10.1 (6.0, 15.3)**	**32.4 (24.0, 41.6)**	**61.1 (52.1, 69.6)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.4 (0.06, 1.50)**	**0.53 (0.09, 1.4)**	**1.1 (0.51, 2.1)**	**2.6 (1.0, 4.9)**	**7.7 (4.1, 12.0)**	**8.3 (4.7, 12.8)**	**33.0 (24.8, 42.1)**	**58.1 (48.6, 67.7)**
60-69 years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	2/100; 2.0 (0.2, 7.0)	7/99; 7.1 (2.9, 14.0)	3/100; 3.0 (0.6, 8.52)	23/100; 23.0 (15.2, 32.49)	42/100; 42.0 (32.2, 52.3)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	1/100; 1.0 (0.02, 5.45)	1/100; 1.0 (0.02, 5.45)	8/100; 8.0 (3.52, 15.2)	3/100; 3.0 (0.6, 8.52)	24/100; 24.0 (16.0, 33.6)	37/100; 37.0 (27.6, 47.2)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.09, 1.3)**	**0.9 (0.4, 1.7)**	**2.9 (1.1, 5.6)**	**8.47 (4.7, 12.9)**	**5.8 (2.7, 9.7)**	**24.6 (17.2, 33.0)**	**44.47 (35.49, 53.55)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.52 (1.0, 1.3)**	**1.0 (0.4, 1.8)**	**2.6 (0.9, 5.0)**	**8.9 (5.2, 13.4)**	**5.9 (2.8, 9.6)**	**25.2 (17.9, 33.6)**	**40.3 (31.8, 49.4)**
70-79 years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/49; 0 (0-7.3)	0/100; 0 (0-3.6)	3/100; 3.0 (0.6, 8.52)	11/97; 11.3 (5.8, 19.4)	7/100; 7.0 (2.9, 13.9)	11/100; 11.0 (5.6, 18.8)	42/100; 42.0 (32.2, 52.3)
	Female crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/50; 0 (0-7.1)	1/100; 1.0 (0.02, 5.45)	2/100; 2.0 (0.2, 7.0)	10/99; 10.1 (5.0, 17.8)	8/100; 8.0 (3.52, 15.2)	11/100; 11.0 (5.6, 18.8)	39/100; 39.0 (29.4, 49.3)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.1, 1.30**	**0.9 (0.3, 1.7)**	**3.4 (1.4, 6.4)**	**10.51 (6.6, 15.47)**	**8.0 (4.4, 12.6)**	**14.1 (8.4, 20.7)**	**44.51 (35.7, 53.3)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 0.9)**	**0.53 (0.09, 1.3)**	**1.0 (0.4, 1.8)**	**2.9 (1.2, 5.2)**	**9.8 (6.1, 14.53)**	**8.4 (4.8, 13.1)**	**14.4 (8.49, 21.54)**	**41.9 (32.8, 51.0)**
80+ years	Male crude tallies n/N; % (95% CI) [b]	0/50; 0 (0-7.1)	0/46; 0 (0-7.7)	0/100; 0 (0-3.6)	4/100; 4.0 (1.1, 9.9)	4/99; 4.0 (1.1, 10.0)	3/99; 3.1 (0.6, 8.6)	14/100; 14.0 (7.9, 22.4)	41/100; 41.0 (31.3, 51.3)
	Female crude tallies n/N; % (95% CI) [b]	0/47; 0 (0-7.6)	0/50; 0 (0-7.1)	0/100; 0 (0-3.6)	4/100; 4.0 (1.1, 9.9)	6/100; 6.0 (2.2, 12.6)	2/99; 2.0 (0.3, 7.1)	11/100; 11.0 (5.6, 18.8)	30/100; 30.0 (21.2, 40.0)
	Male Bayesian adjusted [c] % (95% CrI)	**0.3 (0.03, 1.0)**	**0.53 (0.1, 1.3)**	**0.9 (0.4, 1.6)**	**3.7 (1.7, 6.7)**	**7.0 (3.7, 11.0)**	**5.9 (2.9, 9.7)**	**16.6 (10.1, 24.1)**	**43.4 (34.6, 52.4)**
	Female Bayesian adjusted [c] % (95% CrI)	**0.3 (0.04, 1.0)**	**0.52 (0.1, 1.3)**	**0.9 (0.4, 1.7)**	**3.7 (1.6, 6.7)**	**8.0 (4.4, 12.1)**	**5.4 (2.4, 9.2)**	**14.48 (8.7, 21.4)**	**33.9 (25.8, 42.51)**

Green shading signifies primary analysis based on adjusted Bayesian logistic regression analysis.
95% CI = 95% confidence interval; 95% CrI = 95% credible interval; Aug = August; Oct = October; Sept = September

[a] Sero-prevalence based on positivity on any two assays, of which from the January 2021 sero-survey, at least one positive assay must include anti-nucleocapsid protein detection (i.e. anti-spike and anti-nucleocapsid detection).
[b] 95% CIs around crude sero-prevalence estimates are based on exact method. One-sided 97.5% CIs for cells with zero counts.
[c] HA, sex and age group standardized

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 8. Crude tallies and SARS-CoV-2 positivity by individual screening assay, age and sero-survey

Sero-survey and screening assay		Crude positivity [n/N % (95% confidence interval (CI)) by age group (years), sero-survey and individual screening assay										
		0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+	All ages
March 2020	Ortho-S1	0/38 (0, 9.3)	0/77 (0, 4.7)	0/89 (0, 4.1)	0/99 (0, 3.7)	0/98 (0, 3.7)	1/100 1.0 (0.02, 5.45)	2/99 2.0 (2.50, 7.1)	1/100 1.0 (0.02, 5.45)	1/100 1.0 (0.02, 5.45)	2/97 2.1 (0.25, 7.3)	6/897 0.7 (0.3, 1.45)
	Siemens-S1-RBD (subset only)[a]	0/0	0/0	0/0	0/1 (0, 97.50)	0/0	1/1 100 (2.50, 100)	1/1 100 (2.50, 100)	0/1 (0, 97.50)	0/2 (0, 84.2)	0/4 (0, 60.2)	2/10 20.0 (2.52, 55.6)
	Abbott-NP	0/38 (0, 9.3)	0/76 (0, 4.7)	0/89 (0, 4.1)	1/99 (1.0) (0.03, 5.50)	0/98 (0, 3.7)	0/100 (0, 3.6)	0/99 (0, 3.7)	0/100 (0, 3.6)	1/100 1.0 (0.02, 5.45)	2/97 2.1 (0.25, 7.3)	4/896 0.45 (0.1, 1.1)
May 2020	Ortho-S1	0/16 (0, 20.6)	0/89 (0, 4.1)	1/96 1.0 (0.03, 5.7)	0/98 (0, 3.7)	1/100 1.0 (0.02, 5.45)	0/99 (0, 3.7)	3/98 3.1 (0.64, 8.7)	0/100 (0, 3.6)	1/100 1.0 (0.02, 5.45)	0/98 (0, 3.7)	6/894 0.7 (0.3, 1.46)
	Siemens-S1-RBD (subset only) [a]	0/0	0/0	1/1 100 (2.50, 100)	0/0	1/1 100 (2.50, 100)	0/0	2/4 50.0 (6.8, 93.2)	0/0	0/2 (0, 84.2)	0/1 (0, 97.50)	4/9 44.4 (13.7, 78.8)
	Abbott-NP	0/16 (0, 20.6)	0/89 (0, 4.1)	1/95 (1.1) (0.03, 5.7)	0/98 (0, 3.7)	1/100 1.0 (0.02, 5.45)	0/99 (0, 3.7)	3/98 3.1 (0.64, 8.7)	0/100 (0, 3.6)	1/99 1.0 (0.03, 5.45)	1/96 (1.0) (0.03-5.7)	7/890 0.8 (0.3, 1.6)
Sept 2020	Ortho-S1	2/200 1.0 (0.12, 3.6)	2/200 1.0 (0.1, 3.6)	3/200 1.50 (0.31, 4.3)	3/200 1.50 (0.31, 4.3)	5/200 2.50 (0.82, 5.7)	1/200 0.50 (0.01, 2.8)	3/200 1.50 (0.31, 4.3)	2/200 1.0 (0.12, 3.6)	0/200 (0, 1.8)	0/200 (0, 1.8)	21/2000 1.1 (0.7, 1.6)
	Siemens-S1-RBD (subset only) [a]	2/2 100 (15.8, 100)	1/3 33.3 (0.8, 90.6)	3/3 100 (29.2, 100)	3/4 75.0 (19.4, 99.4)	5/6 83.3 (35.9, 99.6)	0/1 (0, 97.50)	3/3 100 (29.2, 100)	1/2 50.0 (1.3, 98.7)	1/3 33.3 (0.8, 90.6)	0/1 (0, 97.50)	19/28 67.9 (47.7, 84.1)
	Abbott-NP	1/200 0.50 (0.01, 2.8)	2/200 1.0 (0.12, 3.6)	3/200 1.50 (0.31, 4.3)	3/200 1.50 (0.31, 4.3)	5/200 2.50 (0.82, 5.7)	0/200 (0, 1.8)	1/200 0.50 (0.01, 2.8)	1/200 0.50 (0.01, 2.8)	3/200 1.50 (0.31, 4.3)	1/200 0.50 (0.01, 2.8)	20/2000 1.0 (0.6, 1.54)
Jan 2021	Ortho-S1	18/200 9.0 (5.4, 13.85)	16/200 8.0 (4.6, 12.7)	3/200 1.50 (0.3, 4.3)	10/200 5.0 (2.4, 9.0)	8/200 4.0 (1.7, 7.7)	10/200 5.0 (2.4, 9.0)	6/200 3.0 (1.1, 6.4)	4/200 2.0 (0.6, 5.0)	5/200 2.50 (0.8, 5.7)	16/200 8.0 (4.6, 12.7)	96/2000 4.8 (3.9, 5.8)
	Siemens-S1-RBD (subset only) [a]	11/11 100 (71.51, 100)	11/12 91.7 (61.52, 99.8)	3/3 100 (29.2, 100)	9/11 81.8 (48.2, 97.7)	6/8 75.0 (34.9, 96.8)	9/12 75.0 (42.8, 94.51)	4/8 50.0 (15.7, 84.3)	4/7 57.1 (18.4, 90.1)	5/7 71.4 (29.0, 96.3)	13/18 72.2 (46.52, 90.3)	75/97 77.3 (67.7, 85.2)
	Abbott-NP	16/200 8.0 (4.6, 12.7)	15/200 7.50 (4.3, 12.1)	3/200 1.50 (0.3, 4.3)	8/200 4.0 (1.7, 7.7)	4/200 2.0 (0.6, 5.0)	11/200 6.0 (3.1, 10.3)	5/200 2.50 (0.8, 5.7)	6/200 3.0 (1.1, 6.4)	6/200 3.0 (1.1, 6.4)	10/200 5.0 (2.4, 9.0)	84/2000 4.2 (3.4, 5.2)
	Roche-NP (subset only) [b]	7/7 100 (59.0, 100)	10/10 100 (69.1, 100)	3/3 100 (29.2, 100)	8/9 88.9 (51.8, 99.7)	5/6 83.3 (35.9, 99.6)	6/10 60.0 (26.2, 87.8)	3/6 50.0 (11.8, 88.2)	3/7 42.9 (9.9, 81.6)	4/5 80.0 (28.4, 99.49)	6/11 54.6 (23.4, 83.3)	55/74 74.3 (62.8, 83.8)
	Abbott-NP or Roche-NP	17/200 8.50 (5.0, 13.3)	15/200 7.50 (4.3, 12.1)	3/200 1.50 (0.3, 4.3)	11/200 5.50 (2.8, 9.6)	5/200 2.50 (0.8, 5.7)	11/200 6.0 (3.1, 10.3)	5/200 2.50 (0.8, 5.7)	6/200 (3.0) (1.1, 6.4)	7/200 3.50 (1.4, 7.1)	10/200 5.0 (2.4, 9.0)	90/2000 4.50 (3.6, 5.50)
May/ June 2021	Ortho-S1	34/201 16.9 (12.0, 22.8)	37/198 18.7 (13.51, 24.8)	45/200 22.50 (16.9, 28.9)	101/200 50.50 (43.4, 57.6)	123/200 61.50 (54.4, 68.3)	149/200 74.50 (67.9, 80.4)	156/200 78.0 (71.6, 83.54)	181/200 90.50 (85.6, 94.2)	181/200 90.50 (85.6, 94.2)	171/200 85.50 (79.8, 90.1)	1178/1999 58.9 (56.7, 61.1)
	Siemens-S1-RBD (subset) [a]	24/24 100 (85.8, 100)	34/36 94.4 (81.3, 99.3)	41/45 91.1 (78.8, 97.52)	88/101 87.1 (79.0, 93.0)	109/122 89.3 (82.47, 94.2)	137/149 92.0 (86.4, 95.8)	148/158 93.7 (88.7, 96.9)	163/180 90.6 (85.3, 94.4)	158/177 89.3 (83.8, 93.4)	144/171 84.2 (77.9, 89.3)	1046/1163 89.9 (88.1, 91.6)
	Abbott-NP	28/201 13.9 (9.46, 19.50)	30/198 15.2 (10.46, 20.9)	17/200 8.50 (5.0, 13.3)	13/200 6.50 (3.51, 10.9)	7/200 3.50 (1.4, 7.1)	14/200 7.0 (3.9, 11.47)	12/200 6.0 (3.1, 10.3)	12/200 6.0 (3.1, 10.3)	17/200 8.50 (5.0, 13.3)	10/200 5.0 (2.4, 9.0)	160/1999 8.0 (6.9, 9.3)
	Roche-NP (subset only) [b]	27/27 100 (87.2, 100)	25/29 86.2 (68.3, 96.1)	23/42 54.8 (38.7, 70.1)	28/100 28.0 (19.48, 37.9)	17/122 13.9 (8.3, 21.4)	18/149 12.1 (7.3, 18.4)	10/158 6.3 (3.1, 11.3)	15/180 8.3 (4.7, 13.4)	21/181 11.6 (7.3, 17.2)	9/172 5.2 (2.4, 9.7)	193/1160 16.6 (14.54, 18.9)
	Abbott-NP or Roche-NP	34/201 16.9 (12.0, 22.8)	34/198 17.2 (12.2, 23.2)	26/200 13.0 (8.7, 18.47)	28/200 14.0 (9.51, 19.6)	18/200 9.0 (5.4, 13.9)	19/200 9.50 (5.8, 14.4)	12/200 6.0 (3.1, 10.3)	15/200 7.50 (4.3, 12.1)	21/200 10.50 (6.6, 15.6)	11/200 5.50 (2.8, 9.6)	218/1999 10.9 (9.6, 12.4)
Sept/ Oct 2021	Ortho-S1	39/194 20.1 (14.7, 26.4)	28/199 14.1 (9.6, 19.7)	168/200 84.0 (78.2, 88.8)	179/199 90.0 (84.9, 93.8)	180/200 90.0 (85.0, 93.8)	184/200 92.0 (87.3, 95.4)	185/199 93.0 (88.48, 96.1)	182/200 91.0 (86.2, 94.6)	190/200 95.0 (91.0, 97.6)	193/198 97.47 (94.2, 99.2)	1528/1989 76.8 (74.9, 78.7)
	Siemens-S1-RBD	33/195 16.9 (11.9, 22.9)	29/200 14.50 (9.9, 20.1)	168/200 84.0 (78.2, 88.8)	174/199 87.4 (82.0, 91.7)	178/200 89.0 (83.8, 93.0)	183/199 92.0 (87.3, 95.3)	184/199 92.46 (87.9, 95.7)	180/200 90.0 (85.0, 93.8)	187/200 93.50 (89.1, 96.49)	185/198 93.4 (89.0, 96.46)	1501/1990 75.4 (73.47, 77.3)
	Roche-NP	33/195 16.9 (11.9, 22.9)	26/200 13 (8.7, 18.47)	26/200 13.0 (8.7, 18.47)	18/199 9.1 (5.45, 13.9)	23/200 11.50 (7.4, 16.8)	22/200 11.0 (7.0, 16.2)	19/199 9.6 (5.9, 14.51)	6/200 3.0 (1.1, 6.4)	15/200 7.50 (4.3, 12.1)	5/198 2.53 (0.8, 5.8)	193/1991 9.7 (8.4, 11.1)
March 2022	Ortho-S1	140/200 70.0 (63.1, 76.3)	181/200 90.50 (85.6, 94.2)	193/200 96.50 (92.9, 98.6)	196/200 98.0 (95.0, 99.45)	197/200 98.50 (95.7, 99.7)	196/200 98.0 (95.0, 99.45)	195/200 97.50 (94.3, 99.2)	197/200 98.50 (95.7, 99.7)	195/200 97.50 (94.3, 99.2)	188/200 94.0 (89.8, 96.9)	1878/2000 93.9 (92.8, 94.9)
	Siemens-S1-RBD	134/200 67.0 (60.0, 73.47)	168/200 84.0 (78.2, 88.8)	190/199 95.48 (91.6. 97.9)	193/200 96.50 (92.9, 98.6)	195/200 97.50 (94.3, 99.2)	193/200 96.50 (92.9, 98.6)	192/200 96.0 (92.3, 98.3)	196/200 98.0 (95.0, 99.45)	190/200 95.0 (91.0, 97.6)	187/200 93.50 (89.1, 96.49)	1838/1999 92.0 (90.7, 93.1)
	Roche-NP	133/200 66.50 (59.50, 73.0)	140/200 70.0 (63.1, 76.3)	117/200 58.50 (51.3, 65.4)	102/200 51.0 (43.9, 58.1)	111/200 55.50 (48.3, 62.51)	90/200 45.0 (38.0, 52.2)	64/200 32.0 (25.6, 39.0)	47/200 23.50 (17.8, 30.0)	22/200 11.0 (7.0, 16.2)	25/200 12.50 (8.3, 17.9)	851/2000 42.6 (40.4, 44.8)
July/ Aug 2022	Abbott-S1	158/200 79.0 (72.7, 84.4)	177/200 88.50 (83.3, 92.6)	186/200 93 (88.53, 96.1)	199/200 99.50 (97.3, 100)	198/200 99.0 (96.4, 99.9)	193/200 96.50 (92.9, 98.6)	197/200 98.50 (95.7, 99.7)	195/200 97.50 (94.3, 99.2)	195/200 97.50 (94.3, 99.2)	198/200 99.0 (96.4, 99.9)	1896/2000 94.8 (93.7, 95.7)
	Siemens-S1-RBD	183/200 91.50 (86.7, 94.9)	187/200 93.50 (89.1, 96.49)	194/200 97.0 (93.6, 98.9)	200/200 100 (98.2-100)	198/200 99.0 (96.4, 99.9)	195/200 97.50 (94.3, 99.2)	197/200 98.50 (95.7, 99.7)	198/200 99.0 (96.4, 99.9)	200/200 100 (98.2-100)	200/200 100 (98.2-100)	1952/2000 97.60 (96.8, 98.2)
	Roche-NP	159/200 79.50 (73.2, 84.9)	148/200 74.0 (67.3, 79.9)	163/200 81.50 (75.4, 86.6)	147/200 73.50 (66.8, 79.48)	139/200 69.50 (62.6, 75.8)	135/200 67.50 (60.53, 73.9)	122/200 61.0 (53.9, 67.8)	81/200 40.50 (33.6, 47.7)	81/200 40.50 (33.6, 47.7)	71/200 35.50 (28.9, 42.6)	1246/2000 62.3 (60.1, 64.4)

All 95% CIs are based on exact method. One-sided 97.5% CIs for cells with zero counts. NC = nucleocapsid; S1 = spike 1; S1-RBD = S1 receptor binding domain.

[a] Only specimens that were positive on Ortho-S1 or Abbott-NP screening assays and with sufficient residual sera were tested by Siemens-S1-RBD for these sero-surveys.
[b] Only specimens that were positive on Ortho-S1 or Abbott-NP screening assays and with sufficient residual sera were tested by Roche-NP for these sero-surveys.

Supplementary Table 9. Period-specific sero-prevalence and SUAR estimates, overall, between all consecutive sero-surveys

	Span of sero-survey snapshots defining period-specific SUAR analyses						
Period between sero-surveys:	**1-2** [a,b] March – May, 2020	**2-3** [a,b] May – September, 2020	**3-4** [a,b] September, 2020 – January, 2021	**4-5** [b,c] January-May/June, 2021	**5-6** [b,c] May/June–September/October, 2021	**6-7** [b,c] September/October, 2021 – March, 2022	**7-8** [b,d] March – July/August, 2022
Period-specific epi-week span	10-20	21-38	39-2	3-21	22-38	39-10	11-30
Period-specific case reports [e]	1,784	5,331	43,181	66,597	19,301	88,944	14,085
Period-specific sero-prevalence (%) (95% CrI) [f,g,h]	0.2 (-0.4 – 0.9)	0.46 (-0.2 – 1.1)	3.0 (2.0, 4.1)	6.6 (5.0, 8.3)	-0.7 (-2.6, 1.2)	33.1 (30.47, 35.8)	18.6 (15.4, 21.9)
Period-specific SUAR [a-h,i] (95% CrI)	**17.1 (1.9, 48.4)**	**5.2 (1.47, 9.6)**	**3.0 (2.2, 4.0)**	**3.8 (3.0, 4.7)**	**7.8 (4.2, 12.1)**	**12.1 (11.0, 13.2)**	**91.9 (75.2, 110.2)**

95% CrI = 95% credible interval; SUAR = surveillance under-ascertainment ratio.

See **Supplementary Material 4** for methodological details related to SUAR estimation.

[a] 2020 population estimate (Fraser Health Authority (FHA) and Vancouver Coastal Health Authority (VCHA), combined): 3,173,160 based on: BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

[b] Population census estimates include long-term care facility (LTCF) and assisted (ALF) or independent living facility (ILF) residents; whereas, sero-survey sampling and surveillance case report tallies mostly excluded these individuals as identified. An estimated 25,000 Lower Mainland adults ≥65 years may reside in these settings.

[c] 2021 population estimate (Vancouver Coastal and Fraser Health Authorities, combined): 3,203,743 based on: BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections.

[d] 2022 population estimate (Vancouver Coastal and Fraser Health Authorities, combined): 3,249,077 based on: BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections.

[e] Surveillance case reports based upon episode date hierarchically defined by onset date or if not available then specimen collection date or if not available then test result date. Excludes out of province cases. Cases identified as LTCF, ALF or ILF residents were also excluded but this may have been incomplete, especially for the last period, owing to variation in surveillance processes.

[f] Infection-induced sero-prevalence based on dual-assay positivity, of which from January 2021 at least one positive assay must include anti-nucleocapsid protein detection (i.e. anti-spike and anti-nucleocapsid detection). Period-specific sero-prevalence estimates represent the new infection rate between specified sero-surveys.

[g] Assuming no previously infected are re-infected during the specified analysis period

[h] Bayesian estimates age, sex and HA standardized.

[i] Period-specific SUAR estimates exclude samples from the posterior where the difference in sero-prevalence between sero-surveys is less than zero.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 10. Cumulative SUARs, overall, 4th-8th sero-surveys

Cumulative surveillance under-ascertainment ratios (SUARs)	Sero-surveys				
	4. January 2021	**5. May/June 2021**	**6. Sept/Oct 2021**	**7. March 2022**	**8. July/Aug 2022**
Epi-week span, calendar date (inclusive)	To end epi-week 2 (January 16)	To end epi-week 21 (May 29)	To end epi-week 38 (September 25)	To end epi-week 10 (March 12)	To end epi-week 30 (July 30)
Cumulative case reports to end of epi-week span [a]	50,336	116,933	136,234	225,178	239,263
Cumulative SUAR [b,c,d,e] (95% CrI)	**1.6 (0.9, 2.3)**	**2.4 (1.9, 2.9)**	**1.9 (1.4, 2.3)**	**5.3 (4.8, 5.7)**	**7.9 (7.50, 8.3)**

95% CrI = 95% credible interval; SUAR = surveillance under-ascertainment ratio

See **Supplementary Material 4** for methodological details related to SUAR estimation.

[a] Surveillance case reports from Fraser Health Authority (FHA) and Vancouver Coastal Health Authority (VCHA) combined based upon episode date hierarchically defined by onset date or if not available then specimen collection date or if not available then test result date. Excludes out of province cases. Cases identified as long-term care facility (LTCF), assisted (ALF) or independent living facility (ILF) residents were also excluded but this may have been incomplete, especially for the last period owing to variation in surveillance processes.

[b] Based upon infection-induced sero-prevalence defined by dual-assay positivity, of which at least one positive assay must include anti-nucleocapsid protein detection (i.e. anti-spke and anti-nucleocapsid dtection).

[c] Age, sex and HA standardized

[d] Based upon population census estimates for FHA and VCHA combined. BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections..

[e] Population census estimates include LTCF/ALF/ILF residents; whereas, sero-survey sampling and surveillance case report tallies mostly excluded these individuals. An estimated 25,000 Lower Mainland adults ≥65 years may reside in these settings (see **Supplementary Material 4**).

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 11. Exploratory analysis: Bayesian sero-prevalence estimates, by age group, adjusted for sensitivity and specificity

Age group (years)	Serological category	Bayesian adjusted [a] sero-prevalence estimates by sero-survey: Dual-assay positivity [b] % (95% CrI)							
		1. March 2020	2. May 2020	3. September 2020	4. January 2021	5. May/June 2021	8. September/October 2021	7. March 2022	8. July/August 2022
0-4 years	Vaccine and/or infection-induced [c]				5.6 (3.1, 8.6)	18.2 (12.7, 24.6)	16.6 (11.3, 22.4)	71.8 (64.8, 78.3)	84.4 (76.9, 90.0)
	Infection-induced [d]	0.2 (0.01, 0.8)	0.3 (0.01, 1.1)	0.53 (0.03, 1.3)	5.9 (3.4, 9.1)	13.7 (10.1, 18.1)	12.53 (8.8, 16.9)	63.4 (56.2, 70.54)	73.4 (66.2, 80.4)
5-9 years	Vaccine and/or infection-induced [c]				5.2 (2.8, 8.2)	18.1 (13.1, 23.6)	13.8 (9.1, 19.2)	90.4 (85.51, 94.49)	93.1 (89.47, 96.0)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01,1.0)	0.51 (0.03, 1.2)	5.47 (3.1, 8.6)	14.0 (10.2, 18.6)	10.46 (6.9, 14.4)	66.6 (59.9, 73.3)	71.1 (65.1, 77.0)
10-19 years	Vaccine and/or infection-induced [c]				2.48 (0.8, 4.3)	21.3 (15.7, 27.2)	90.4 (83.3, 96.9)	96.7 (93.9, 98.9)	96.7 (94.1, 98.7)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 1.2)	0.6 (0.03, 1.46)	2.48 (0.9, 4.4)	12.1 (8.7, 16.1)	10.4 (6.9, 14.6)	56.2 (49.1, 63.3)	76.8 (70.7, 82.8)
20-29 years	Vaccine and/or infection-induced [c]				4.3 (2.0, 7.0)	44.2 (37.4, 51.0)	93.9 (87.6, 98.8)	97.6 (95.2, 99.3)	99.0 (97.4, 99.8)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 0.9)	0.6 (0.03, 1.4)	4.1 (2.2, 6.7)	12.1 (8.6, 16.2)	8.0 (5.0, 11.49)	49.9 (43.1, 56.9)	70.2 (63.5, 76.8)
30-39 years	Vaccine and/or infection-induced [c]				3.0 (1.1, 5.0)	54.9 (48.0, 61.7)	94.8 (88.7, 99.3)	97.9 (95.7, 99.46)	98.4 (96.0, 99.7)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 1.1)	0.6 (0.03, 1.6)	2.8 (1.2, 4.9)	9.7 (6.6, 13.1)	9.7 (6.2, 13.6)	54.7 (47.7, 61.4)	65.1 (57.8, 72.2)
40-49 years	Vaccine and/or infection-induced [c]				3.8 (1.7, 6.2)	68.4 (61.7, 74.6)	96.6 (91.6, 99.6)	97.3 (94.7, 99.3)	98.0 (95.7, 99.53)
	Infection-induced [d]	0.2 (0.01, 0.8)	0.3 (0.01, 1.0)	0.49 (0.03, 1.2)	3.5 (1.7, 5.8)	9.8 (6.8, 13.4)	9.3 (5.8, 13.2)	44.51 (37.8, 51.4)	64.6 (57.9, 71.48)
50-59 years	Vaccine and/or infection-induced [c]				2.7 (0.9, 4.6)	73.50 (67.1, 79.4)	97.0 (92.2, 99.8)	96.8 (94.1, 98.9)	98.1 (95.8, 99.54)
	Infection-induced [d]	0.2 (0.01, 0.9)	0.4 (0.01, 1.2)	0.6 (0.03, 1.4)	2.6 (1.0, 4.53)	7.7 (4.6, 11.1)	8.3 (5.0, 11.9)	32.4 (25.9, 39.1)	60.0 (52.9, 67.0)
60-69 years	Vaccine and/or infection-induced [c]				2.6 (1.0, 4.6)	80.6 (74.9, 86.2)	95.9 (90.3, 99.6)	97.6 (95.3, 99.4)	98.4 (96.52, 99.6)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 1.0)	0.51 (0.03, 1.2)	2.51 (1.0, 4.3)	8.8 (5.7, 12.1)	5.0 (2.48, 8.1)	24.3 (18.50, 30.4)	42.1 (35.4, 49.1)
70-79 years	Vaccine and/or infection-induced [c]				2.8 (1.0, 4.8)	79.9 (73.7, 85.7)	97.2 (92.9, 99.8)	96.2 (93.1, 98.8)	97.8 (95.47, 99.4)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 1.0)	0.52 (0.03, 1.2)	2.9 (1.2, 4.9)	10.3 (7.2, 13.8)	7.3 (4.3, 10.6)	13.47 (8.7, 18.6)	43.0 (36.3, 49.7)
80+ years	Vaccine and/or infection-induced [c]				4.3 (2.0, 7.1)	72.2 (65.8, 78.4)	97.7 (93.4, 99.8)	94.0 (90.0, 97.3)	98.52 (96.6, 99.7)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 1.0)	0.49 (0.03, 1.2)	3.47 (1.6, 5.8)	7.7 (4.6, 10.9)	4.9 (2.4, 7.9)	14.6 (9.7, 20.0)	37.8 (31.3, 44.7)
All ages	Vaccine and/or infection-induced [c]				3.4 (2.0, 4.6)	56.4 (54.0, 59.0)	87.8 (84.1, 90.4)	95.7 (94.49, 97.1)	97.3 (96.4, 98.2)
	Infection-induced [d]	0.2 (0.01, 0.7)	0.3 (0.01, 0.9)	0.54 (0.04, 1.2)	3.3 (2.1, 4.3)	10.3 (8.6, 11.9)	8.5 (6.7, 10.3)	42.4 (39.8 - 45.3)	61.5 (58.7, 64.6)

95% CrI = 95% credible interval. Sensitivity and specificity considerations are addressed in **Supplementary Material 2** and **Supplementary Material 3**.

[a] Bayesian estimates age, sex and HA standardized and adjusted for sensitivity and specificity.
[b] Sero-positivity defined by signal above the cut-off threshold on at least two chemi-luminescent immunoassays.
[c] Dual assay positivity includes anti-spike and/or anti-nucleocapsid antibody detection. Spike target may be the S1 or S1 receptor binding domain.
[d] For snapshots 1-3 in 2020, all dual-assay sero-positivity considered infection-induced, regardless of assay type. Thereafter for snapshots 4-8, infection-induced sero-prevalence estimates required dual-assay positivity that included both anti-nucleocapsid and anti-spike antibody detection. Spike target may be the S1 or S1 receptor-binding domain. Those with evidence of infection-induced antibody (anti-nucleocapsid detection) may or may not have been vaccinated.

Supplementary Table 12. Exploratory analysis: Period-specific sero-prevalence and SUAR estimates, overall, adjusted for sensitivity and specificity

	Span of sero-survey snapshots defining period-specific SUAR analyses						
Period between sero-surveys:	**1-2** [a,b] March – May, 2020	**2-3** [a,b] May – September, 2020	**3-4** [a,b] September, 2020 – January, 2021	**4-5** [b,c] January- May, 2021	**5-6** [b,c] May/June– September, 2021	**6-7** [b,c] September/October, 2021 – March, 2022	**7-8** [b,d] March – July/August, 2022
Period-specific epi-week span	10-20	21-38	39-2	3-21	22-38	39-10	11-30
Period-specific sero-prevalence (%) [e, f,g] (95% CrI)	0.1 (-0.47, 0.8)	0.2 (-0.6, 1.0)	2.9 (1.3, 4.2)	7.0 (5.0, 9.0)	-1.8 (-4.2, 0.7)	33.9 (30.8, 37.4)	19.1 (15.3, 23.1)
Period-specific SUAR [a-g,h] (95% CrI)	11.6 (0.4, 37.7)	3.6 (0.2, 8.7)	2.9 (1.7 - 4.0)	4.0 (3.0, 5.1)	7.3 (3.4, 12.2)	12.4 (11.2, 13.7)	94.3 (75.2, 114.48)

95% CrI = 95% credible interval; SP = sero-prevalence; SUAR = surveillance under-ascertainment ratio

Sensitivity and specificity considerations addressed in **Supplementary Material 2**. See **Supplementary Material 3** for methodological details related to SUAR estimation.

[a] 2020 population estimate (Fraser Health Authority (FHA) and Vancouver Coastal Health Authority (VCHA), combined): 3,173,160 based on: BC STATS. Population estimates. Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

[b] Population census estimates include long-term care facility (LTCF) and assisted (ALF) or independent living facility (ILF) residents; whereas, sero-survey sampling and surveillance case report tallies excluded these individuals as identified. An estimated 25,000 Lower Mainland adults ≥65 years may reside in these settings.

[c] 2021 population estimate (Vancouver Coastal and Fraser Health Authorities, combined): 3,203,743 based on: BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections.

[d] 2022 population estimate (Vancouver Coastal and Fraser Health Authorities, combined): 3,249,077 based on: BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2021. [Accessed 8 September 2022]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections.

[e] Infection-induced sero-prevalence based on dual-assay positivity, of which from January 2021 at least one positive assay must include anti-nucleocapsid protein detection (i.e. anti-spike plus anti-nucleocapsid detection). Period-specific sero-prevalence estimates represent the new infection rate between specified sero-surveys.

[f] Assuming no previously infected are re-infected during the specified analysis period

[g] Bayesian estimates age, sex and HA standardized and adjusted for sensitivity and specificity.

[h] Period-specific SUAR estimates exclude samples from the posterior where the difference in sero-prevalence between sero-surveys is less than zero.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.

Supplementary Table 13. Exploratory analysis: Period-specific SUAR estimates, by age group, exploring impact of reinfections between 6th-7th and 7th-8th sero-surveys

Period-specific SUAR [a,b] (95% CrI)	Age group (years)										
	0-4	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80+**	**All ages**
Between 6th and 7th sero-surveys (September/October, 2021 – March, 2022)											
Assuming no reinfections (primary)[c]	13.4 (11.3, 15.50)	15.49 (13.3, 17.6)	19.3 (15.8, 22.6)	13.2 (10.7, 15.7)	13.2 (11.0, 15.3)	10.8 (8.4, 13.4)	10.8 (7.7, 14.1)	10.7 (7.3, 14.4)	5.1 (1.9, 9.2)	3.4 (1.7, 5.3)	12.1 (11.0, 13.2)
Assuming 10% of all infections are reinfections [d]	14.9 (12.52, 17.2)	17.2 (14.8, 19.6)	21.46 (17.6, 25.2)	14.6 (11.9, 17.4)	14.6 (12.2, 17.0)	12.0 (9.4, 14.9)	12.0 (8.50, 15.7)	11.9 (8.1, 16.0)	5.7 (2.1, 10.2)	3.8 (1.9, 5.9)	13.4 (12.3, 14.6)
Assuming 25% of all infections are reinfections [d]	17.8 (15.0, 20.6)	20.6 (17.8, 23.4)	25.7 (21.0, 30.2)	17.6 (14.3, 20.9)	17.6 (14.6, 20.46)	14.4 (11.3, 17.9)	14.45 (10.2, 18.8)	14.3 (9.8, 19.1)	6.8 (2.47, 12.3)	4.51 (2.3, 7.1)	16.1 (14.7, 17.54)
Between 7th and 8th sero-surveys (March – July/August, 2022)											
Assuming no re-infections (primary) [c]	23.9 (10.6, 39.7)	115.8 (25.2, 261.7)	313.1 (192.6, 434.1)	101.2 (60.8, 146.9)	39.6 (17.0, 68.8)	78.4 (44.6, 113.6)	95.4 (63.54, 128.3)	44.7 (25.1, 64.9)	33.1 (23.6, 42.1)	8.6 (5.8, 11.8)	91.9 (75.2, 110.2)
Assuming 10% of all infections are reinfections [d]	26.6 (11.7, 44.2)	128.7 (28.45, 291.4)	347.9 (213.8, 482.4)	112.4 (67.9, 163.3)	44.0 (18.9, 76.3)	87.1 (49.3, 126.3)	106.0 (70.7, 142.4)	49.7 (27.9, 72.0)	36.8 (26.3, 46.9)	9.6 (6.4, 13.1)	102.1 (83.6, 122.3)
Assuming 25% of all infections are reinfections [d]	31.9 (14.2, 52.8)	154.4 (34.3, 350.7)	417.4 (256.51, 579.0)	134.9 (81.2, 196.1)	52.8 (22.6, 91.8)	104.49 (59.2, 151.50)	127.2 (84.8, 171.0)	59.6 (33.4, 86.6)	44.2 (31.50, 56.3)	11.46 (7.7, 15.7)	122.6 (100.3, 146.8)

[a] Period-specific SUAR estimates exclude samples from the posterior where the difference in sero-prevalence between sero-surveys is less than zero.
[b] Bayesian estimates age, sex and HA standardized.
[c] All assumptions, methods and findings otherwise as per main manuscript **Figure 4** and **Table 3.**
[d] Reinfection percentage defined as the proportion of all infections within the specified period that are reinfections. See **Supplementary Material 4** for methods.

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA. Serial cross-sectional estimation of vaccineand infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ 2022. doi: 10.1503/cmaj.221335.