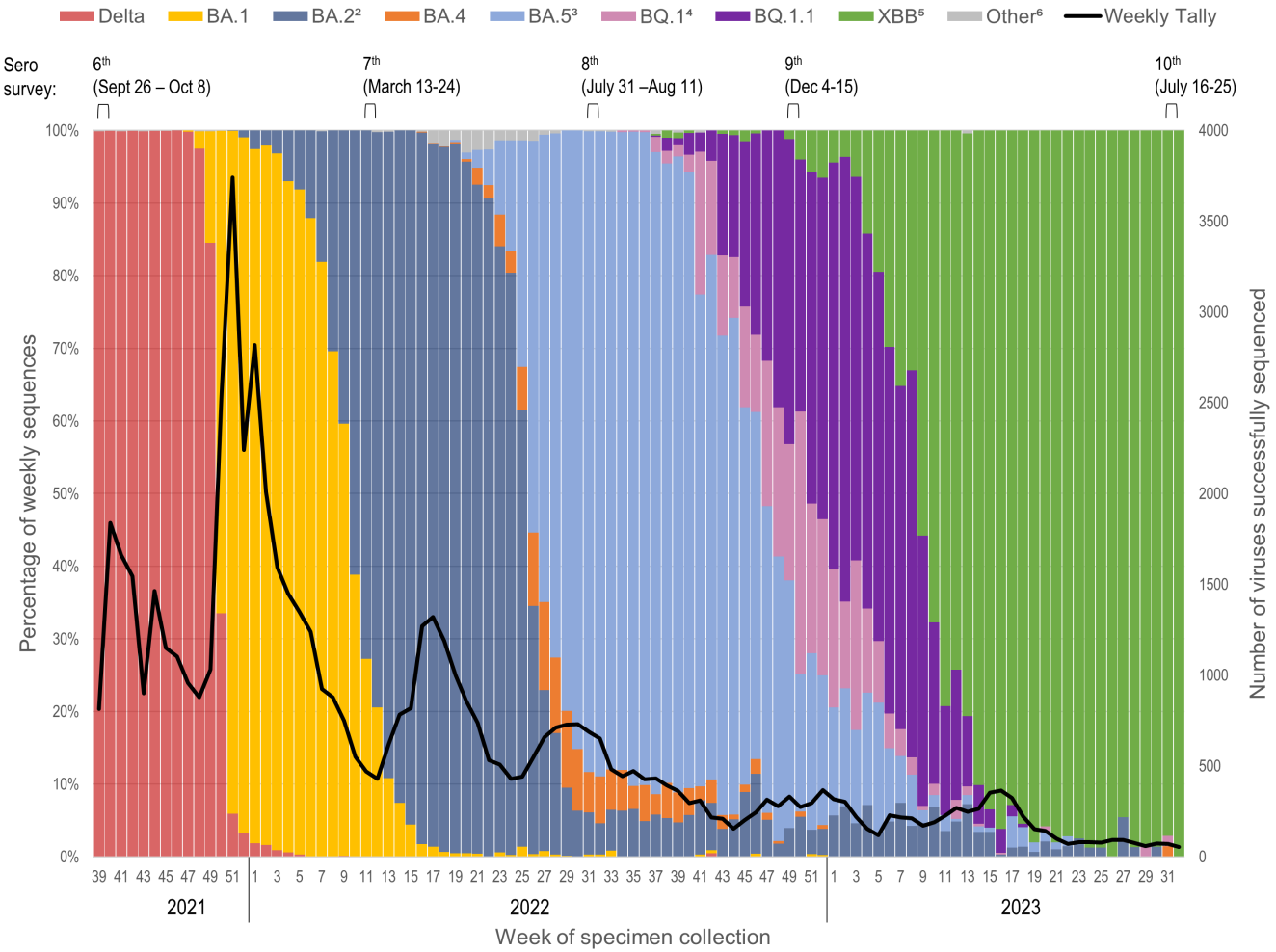
Appendix 1

Risk of hospital admission and death from first-ever SARS-CoV-2 infection by age group during the Delta and Omicron periods in British Columbia, Canada

Appendix 1, as submitted by the authors. Appendix to: Skowronski DM, Kaweski SE, Irvine MA, et al. Risk of hospital admission and death from first-ever SARS-CoV-2 infection by age group during the Delta and Omicron periods in British Columbia, Canada. *CMAJ* 2023. doi: 10.1503/cmaj.2307321.

Supplementary Figure 1 Percent weekly contribution by variants of concern, spanning sixth to tenth serosurveys, Lower Mainland, BC, Canada



Displayed are the percentage contributions of specified variants of concern[1] among viruses successfully genetically characterized provincially in British Columbia (BC), by epi-week and year. Overlaid are the timing of the sixth to tenth serosurveys and number of viruses successfully genetically characterized weekly. The sampling frame for genetic characterization of viruses by whole genome sequencing (WGS) at the BC Centre for Disease Control (BCCDC) Public Health Laboratory (PHL) evolved in response to case load and laboratory capacity over the displayed period. In particular, WGS was applied to a subset only (10% random sample in addition to prioritized cases including all hospitalized, vaccinated or outbreak-associated) from September 1, 2021 (epi-week 35). In October and November, 2021 WGS was additionally applied to all positive specimens from the first week of each month. To assess emerging Omicron BA.1, sequencing of all positive samples was undertaken in December 2021, including retrospectively for specimens collected from November 15, 2021 (epi-week 46). However, BCCDC PHL resumed the above subset sampling by December 15, 2021 (epi-week 50) owing to Omicron-related laboratory constraints. Thereafter, with the switch to targeted high-risk nucleic acid amplification testing (NAAT) beginning January 18, 2022 (epi-week 3), sequencing of all NAAT-reported cases in BC has since been routinely undertaken. Details are provided in main text, references [9,16,17]. Aug = August; Dec = December; Oct = October; Sept = September.

1. All lineages include their descendant strains unless otherwise noted
2. BA.2: includes BA.2.75 and BN.1 (BA.2.75.5.1), excludes XBB variants (separately displayed)
3. BA.5: includes BF.7 (BA.5.2.1.7), excludes BQ.1 or BQ.1.1 (separately displayed)
4. BQ.1: excludes BQ.1.1 (separately displayed)
5. XBB: includes XBB.1.5, XBB.1.16, XBB.1.9, and EG.5
6. Other sequences not clustering within categories displayed here

Supplementary Material 1. Description of Bayesian logistic regression analysis

Primary seroprevalence estimates are predicated on Bayesian analysis of serology data [1-4]. For each serosurvey, we adapted the Bayesian hierarchical approach of [2] to estimate two categories of seroprevalence including "any" (vaccine or infection-induced, or both) or infection-induced, adjusting (or standardizing) for population geography (defined by health authority (HA) of Lower Mainland residence, either Fraser (FHA) or Vancouver Coastal (VCHA)), sex, and age group.

Bayesian analyses incorporated a hierarchical structure per serosurvey and seroprevalence category across HA, sex, and age group. We had previously explored incorporating the increasing population seroprevalence 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 increased 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. Seroprevalence estimates 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.

Estimates are provided with 95% credible intervals (CrI). The 95% CrI reflects the Bayesian estimate of uncertainty and is the 95% probability that a value lies within the interval given the evidence of the observed data and including any prior uncertainties.

A full description of the methods for each survey and seroprevalence 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 is 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,

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

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 [5,6] (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,

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

Similarly, the post-stratification estimate for age group i and sex j is given by,

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

Median, 2.5th and 97.5th percentiles are estimated by sampling of the posterior. Note that in our prior publication [4], we had chosen instead to present the point estimate of the posterior as a mean (expectation). We instead present the point estimate as the median of the posterior samples to address the potential for extreme values, notably in the posterior sample of infections or severe outcome risks.

Infection hospitalization ratios (IHR) and infection fatality ratios (IFR) were calculated using independent draws from the posterior for successive snapshots, where the estimated infection-induced seroprevalence applied to the population census [5] was used to derive the cumulative number of infections and the difference between two snapshots was given as the number of infections within that inter-snapshot period at the age group, sex, and HA cell level. Concretely, for a prevalence sample for an age group (i), sex (j), and HA (k) from the posterior at snapshot t and a prevalence sample at snapshot $t+1$,

$$\pi_{tijk} \sim P_t,$$
$$\pi_{t+1ijk} \sim P_{t+1}.$$

The difference in prevalence is taken to be the proportion of the population who were infected between time point t and time point $t+1$. The number of infections is assumed to be binomially distributed with this proportional difference and with the population size estimate as the number of trials i.e.

$$I_{\Delta tijk} \sim Bin(\pi_{t+1ijk} - \pi_{tijk}, p_{ijk})$$

In order to ensure the difference in prevalence samples represented the proportion of infections in the time period, any negative samples were necessarily excluded. As a sensitivity analysis, this exclusion of negative samples was not performed and as such the number of infections was generated as a product of the seroprevalence difference and population size,

$$(\pi_{t+1ijk} - \pi_{tijk}) \times p_{ijk}$$

In order to derive the IFR and IHR overall and by age-group, the relevant sum of hospitalizations/fatalities was divided by the relevant sum of simulated infections. For an outcome $O_{\Delta tijk}$ for inter-snapshot period Δt, age group i, sex j, and HA k, the relevant infection outcome ratio is

$$\frac{O_{\Delta tijk}}{I_{\Delta tijk}}.$$

For any ratio over a given strata e.g. the ratio by age-group, the relevant strata are summed over. For example, the ratio for for inter-snapshot period Δt and age group i is,

$$\frac{\sum_{j=1}^{2}\sum_{k=1}^{2} O_{\Delta tijk}}{\sum_{j=1}^{2}\sum_{k=1}^{2} I_{\Delta tijk}}.$$

Where outcome for death had unknown sex, these were aggregated over to produce the relevant strata, e.g. the ratio by age-group is,

$$\frac{\sum_{j=1}^{3}\sum_{k=1}^{2} O_{\Delta tijk}}{\sum_{j=1}^{2}\sum_{k=1}^{2} I_{\Delta tijk}}.$$

Where the index j is over male, female and unknown in the numerator. Where sex-stratified ratios are required those outcomes with known sex only are necessarily included.

The random seed of the random number generator is set at the start of the analysis for replicability of the simulated cases. Variation would exist between different seeds due to Monte Carlo error.

References, Supplementary Material 1

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. Skowronski, Danuta M., et al. "Serial cross-sectional estimation of vaccine-and infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada." *CMAJ* 194.47 (2022): E1599-E1609.
5. BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2022. [Accessed 2023 August 24]. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections

Supplementary Table 1 Datasets integrated within the British Columbia COVID-19 Cohort (BCC19C) platform

British Columbia Centre for Disease Control (BCCDC), Provincial Heath Services Authority (PHSA) and Regional Health Authority data sources:	**Data Date Ranges:**
Integrated COVID-19 laboratory dataset (SARS-CoV2 tests from private/public labs) [1]	Jan 2020 onward
Integrated COVID-19 case surveillance data (positive laboratory tests and historical regional health authority case data integrated with vaccination, genomic screening/sequencing, hospitalization, and death data)[2]	Jan 2020 onward
Provincial COVID-19 Monitoring Solution (critical and non-critical care hospital census data) [3]	Jan 2020 onward
Provincial Immunizations Registry (COVID-19 vaccination data) [4]	Dec 2020 onward
Provincial Laboratory Information Solution (laboratory tests from private/public labs) [5]	Jan 2020 onward
Public Health Reporting Data warehouse (Influenza laboratory tests) [6]	Jan 2008 onward
Emergency department visits (hospital-based and community-based ambulatory care)	Mar 2020 onward
Ministry of Health (MoH) Administrative Data Sources:	
Client Roster (CR) (registry of enrollment in the universal public health insurance plan including residential history) [7]	2008/9 onward
Discharge Abstracts Database (DAD) (hospital discharge records) [8]	2008/9 onward
Medical Services Plan (MSP) (physician diagnostic and billing data for services provided through universal public health insurance plan) [9]	2008/9 onward
PharmaNet (Pharma) (prescription drugs dispensed from community pharmacies, includes medications covered by public and private insurance plans) [10]	2008/9 onward
BC Vital Statistics (VS) (deaths registry)[11]	2008/9 onward
National Ambulatory Care Reporting System (NACRS) (hospital-based and community-based ambulatory care) [12]	2011/12 onward
Chronic Disease Registry [13]	2008/9 - 2018/19
811 Calls (respiratory calls only) [14]	2014 onward
Health System Matrix [15]	2018/19 onward
Population Grouper Methodology [S16]	2008/9 onward

Grey shaded rows used in the current study.

References, Supplementary Table 1

1. British Columbia Centre for Disease Control [creator]. Integrated COVID-19 laboratory dataset (SARS-CoV2 tests from private/public labs). Public Health Reporting Data Warehouse, British Columbia Centre for Disease Control [publisher] (2020). 2021.
2. British Columbia Centre for Disease Control [creator]. Integrated COVID-19 case surveillance data. British Columbia Centre for Disease Control [publisher]. (2020). 2021.
3. Provincial Health Services Authority [creator]. Provincial COVID-19 Monitoring Solution. Provincial Health Services Authority [publisher]. (2020). 2021.
4. Provincial Health Services Authority [creator]. COVID-19 vaccination data. Provincial Immunizations Registry, Provincial Public Health Information Systems [publisher]. (2020). 2021.
5. Provincial Health Services Authority [creator]. Provincial Public Health Information Systems [publisher]. (2020). 2021.
6. British Columbia Centre for Disease Control [creator]. Respiratory datamart, Public Health Reporting Data Warehouse, British Columbia Centre for Disease Control [publisher] (2020). 2021.
7. British Columbia Ministry of Health [creator]. Client Roster (Client Registry System/Enterprise Master Patient Index). British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
8. British Columbia Ministry of Health [creator]. Discharge Abstract Database (Hospital Separations). British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
9. British Columbia Ministry of Health [creator]. Medical Services Plan (MSP) Payment Information File. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021.https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
10. British Columbia Ministry of Health [creator]. PharmaNet. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
11. BC Vital Statistics Agency [creator]. Vital Statistics Deaths. BC Vital Statistics Agency [publisher]. Data Extract. BC Vital Statistics Agency (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
12. British Columbia Ministry of Health [creator]. National Ambulatory Care Reporting System. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
13. British Columbia Ministry of Health [creator]. Chronic Disease Registry. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2020. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
14. British Columbia Ministry of Health [creator]. 811 calls. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021.

    https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
15. British Columbia Ministry of Health [creator]. Health System Matrix. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services
16. British Columbia Ministry of Health [creator]. Population Grouper Methodology. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2020). 2021. https://www2.gov.bc.ca/gov/content/health/health-forms/online-services

Supplementary Material 2 COVID-19 vaccine context and coverage

Two messenger RNA (mRNA) formulations of monovalent COVID-19 vaccine, manufactured by Pfizer-BioNTech and Moderna and targeting the spike (S1) surface protein of the original Wuhan-like virus, were first authorized in Canada in December 2020 [1,2]. Although multiple other S1-based vaccines have since been authorized in Canada [2], the vast majority of vaccine doses distributed have been mRNA formulations. Various immunization program adjustments, including extended dosing intervals and mixed schedules, enabled Canada to rapidly achieve high two-dose (primary series) coverage followed by additional booster dose administration [3,4].

The dates of authorization and/or expanded indication of mRNA vaccines in Canada are provided in **Supplementary Table 2** [2]. The date of first mRNA vaccine distribution in British Columbia (BC), Canada by eligible age group and manufacturer is displayed in **Supplementary Table 3**. The timeline of COVID-19 vaccine booster doses (third through fifth) in BC is provided in **Supplementary Table 4** [5,6].

By the sixth serosurvey (start of epi-week 39, September 2021) reported here, one and two doses of SARS-CoV-2 vaccine had been received by about 80% and 75%, respectively, of the Lower Mainland, BC population overall (about 90% and 85%, respectively of age-eligible ≥ 12-year-olds), with the percentage twice vaccinated ranging from about half of 10-19-year-olds to >95% of ≥70-year-olds.

By the seventh serosurvey (start of epi-week 11, March 2022), about 30% and 20% of children 5-9 years (eligible among 5-11-year-olds since November 2021) had been vaccinated once or twice, respectively, with one-, two- and three-dose coverages of about 85%, 80% and 50%, respectively, among the Lower Mainland, BC population overall. Three dose coverage ranged from about 20% of 10-19-year-olds (12+ years eligible since February 2022) to >85% of ≥70-year-olds.

By the eighth serosurvey (start of epi-week 31, July 2022) a negligible proportion of children 6 months to 4 years had received even one dose; whereas, about one-third of children 5-9 years had received one and two doses. First to third dose coverages in the Lower Mainland population overall were stable. Fourth dose coverage was <10% in all age groups, except 70-79-year-olds and ≥80-year-olds, at about 50% and ≥60%, respectively.

By the ninth serosurvey (start of epi-week 49, December 2022), one and two dose coverage among children <5 years was just ~10% and 5%, respectively, and among children 5-9 years was about 35%. Second and third dose coverages overall in the Lower Mainland population were stable at just over 85% and 55%, respectively. Fourth dose coverage was about 30% overall, ranging from about 10% in 10-19-year-olds to >70% among ≥70-year-olds. Of the fourth doses given to ≥70-year-olds, >80% were monovalent vaccine, with about 10% bivalent BA.1 and 5% bivalent BA.4/5 vaccine. Fifth dose

coverage was <10% overall and in all age groups except ≥70-year-olds, with about 40% having received five doses, equally split as bivalent BA.1 or BA.4/5 vaccines.

By the tenth serosurvey (start of epi-week 29, July 2023), first to fourth dose coverages overall in the Lower Mainland population remained stable. Two dose coverage among children <5 years and 5-9 years remained low at about 15% and just over 35%, respectively. Fourth and fifth dose coverages remained about 30% and 10% overall, ranging from about 10% and nil, respectively, in 10-19-year-olds to about 75% and 50%, respectively, among ≥70-year-olds. Of the fifth doses given to ≥70-year-olds, <5% were monovalent vaccine, with about 40% bivalent BA.1 and 60% bivalent BA.4/5 vaccine. Sixth dose coverage was <5% in the Lower Mainland overall, highest among ≥70-year-olds and ≥80-year-olds with about one-quarter and one-third, respectively, having received six doses. Of the sixth doses given to ≥70-year-olds, virtually all (>95%) were the bivalent BA.4/5 vaccine.

References, Supplementary Material 2

1. Skowronski DM, Kaweski SE, Irvine MA, et al. Serial cross-sectional estimation of vaccine- and infection-induced SARS-CoV-2 seroprevalence in British Columbia, Canada. CMAJ. 2022 Dec 5;194(47):E1599-609.
2. Government of Canada. Drug and vaccine authorizations for COVID-19: List of authorized drugs, vaccines and expanded indications. Available at: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/authorization/list-drugs.html (accessed 2023 September 3)
3. Skowronski DM, Febriani Y, Ouakki M, et al. Two-dose severe acute respiratory syndrome coronavirus 2 vaccine effectiveness with mixed schedules and extended dosing intervals: test-negative design studies from British Columbia and Quebec, Canada. Clin Infect Dis 2022;75:1980-92.
4. COVID-19 Vaccination Coverage. Vancouver: British Columbia Centre for Disease Control. Available at: http://www.bccdc.ca/health-professionals/data-reports/covid-19-vaccination-coverage (accessed 2023 September 3).
5. Admin Circulars. 2020-2023. Updates to the Communicable Disease Control Manual. Available at: http://www.bccdc.ca/health-professionals/clinical-resources/communicable-disease-control-manual/admin-circulars (accessed 2023 September 3)
6. Immunization Manual. Part 4: Biological Products (Vaccines & Immune Globulins). COVID-19 vaccines. Vaccine eligibility. Available at: http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Epid/CD%20Manual/Chapter%202%20-%20Imms/Part4/COVID-19-vaccine-eligibility.pdf (accessed 2023 September 3).

Supplementary Table 2 Timeline of Health Canada COVID-19 mRNA vaccine authorization and indication

Manufacturer	Vaccine**	Date of authorization or expanded indication yyyy-mm-dd	Authorization or expanded indication
Pfizer-BioNTech*	Comirnaty	2020-12-09	Primary series ≥ 16 years
		2021-05-05	Primary series 12-15 years
		2021-11-09	First booster dose ≥ 18 years
		2021-11-19	Primary series 5-11 years
		2022-06-01	First booster dose 16-17 years
		2022-08-19	First booster dose 5-11 years
		2022-09-09	Primary series 6 months to 4 years
	Comirnaty Original & Omicron BA.4/BA.5	2022-10-07	Bivalent booster ≥ 12 years
		2022-12-09	Bivalent booster 5-11 years
Moderna*	Spikevax	2020-12-23	Primary series ≥ 18 years
		2021-08-27	Primary series 12-17 years
		2021-11-12	First booster dose ≥ 18 years
		2022-03-17	Primary series 6-11 years
		2022-07-14	Primary series 6 months to 5 years
	Spikevax Bivalent Original/Omicron BA.1	2022-09-01	Bivalent booster ≥ 18 years
		2023-02-17	Bivalent booster ages 6-17 years
	Spikevax Bivalent Original/Omicron BA.4/5	2022-11-03	Bivalent booster ≥ 18 years

Data source: Government of Canada. Drug and vaccine authorizations for COVID-19: List of authorized drugs, vaccines and expanded indications. Available at: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/authorization/list-drugs.html (accessed 2023 March 5).

*Full authorization granted both manufacturers September 16, 2021

** Not listed above is Pfizer-BioNTech's Comirnaty Original/Omicron BA.1 authorized 2022-10-21 as a bivalent booster for those ≥ 12 years (authorized but not used in Canada)

Supplementary Table 3 Date of first mRNA vaccine distribution in British Columbia (BC), Canada by eligible age group and manufacturer

Age	≥ 18 years	≥ 16 years	≥ 12 years	5-11 years	6 months to 4 years
Date	Dec 14, 2020[1]	Jan 8, 2021[1]	May 20, 2021[2]	Nov 29, 2021[3]	August 2, 2022[4]
Vaccine manufacturer (earliest available by age indication)	Pfizer-BioNTech	Pfizer-BioNTech	Pfizer-BioNTech	Pfizer-BioNTech	Moderna

[1] As COVID-19 vaccination occurred in phases, with the highest risk based on age or underlying condition targeted earliest during the initial phases of vaccine roll-out, younger cohorts of the general population (i.e., those not considered at increased risk of severe illness) became eligible for vaccination at later dates than those specified.

[2] BC Government News. Office of the Premier. B.C. Youth 12+ can register, get vaccinated against COVID-19. Thursday May 20, 2021. [Accessed 2023 March 8]. Available: https://news.gov.bc.ca/releases/2021PREM0037-000986

[3] BC Government News. Health. Safe, effective COVID-19 pediatric vaccine available for children aged 5-11. Tuesday November 23 2021. [Accessed 2023 March 8]. Available: https://news.gov.bc.ca/releases/2021HLTH0209-002245

[4] BC Government News. Health. B.C. encourages parents to register children under 5 for COVID-19 vaccine. Thursday July 14, 2022. [Accessed 2023 May 18]. Available: https://news.gov.bc.ca/releases/2022HLTH0165-001115

Supplementary Table 4 Timeline of COVID-19 vaccine booster doses in British Columbia (BC), Canada

Date first eligible	Included populations
First booster dose (third dose in series for general population)[1]	
Oct 6, 2021	• Residents of long-term care (LTC) and assisted living (AL) facilities, alternate level of care clients awaiting placement in LTC
Oct 28, 2021	• Residents of independent living facilities, those receiving long term home support • Individuals ≥ 70 years • Indigenous people ≥ 12 years [changed to ≥ 18 years on Nov 1, 2021] • Individuals ≥ 12 years in rural and remote communities [changed to ≥ 18 years on Nov 1, 2021] • Healthcare workers who received dose 2 at an interval of <42 days from dose 1 • Individuals who are vulnerable or in congregate settings in outbreaks at the direction of the local Medical Health Officer
Nov 24, 2021	• Healthcare workers 18-69 years who received their 2nd dose on or before Mar 15, 2021 • Individuals 18-69 years who received AstraZeneca product for both doses of the primary series
Dec 9, 2021	• Individuals 65-69 years
Dec 23, 2021	• Individuals 63-69 years
Dec 29, 2021	• Individuals 60-69 years
Dec 31, 2021	• Individuals 18-69 years
Feb 3, 2022	• Individuals 12-17 years
Aug 26, 2022	• Individuals 5-11 years
Second booster dose (fourth dose in series for general population)[2]	
Apr 4, 2022	• LTC residents and alternate level of care clients awaiting placement in LTC • Individuals ≥ 70 years • Indigenous people ≥ 55 years
July 8, 2022	• Individuals ≥ 18 years who wish to receive; however, advised preferable to delay until the fall
Fall 2022 Bivalent booster dose[3]	
Sept 8, 2022	• Fall booster dose for individuals ≥5 years with spacing of at least 6 months between primary series or previous booster dose (minimum 3 months). • For those ≥12 years, recommended regardless of the number of doses previously received. • Strongly recommended for all those ≥65 years and ≥5 years at higher risk of severe COVID-19
Oct 2022 through Dec 2022	• Individuals≥ 65 years, Indigenous people ≥ 18 years and clinically extremely vulnerable people ≥12 years who may have received monovalent booster dose before September 2022, were invited to receive their fall booster dose by Dec 31, 2022 (even if a 4-month spacing since last dose)
Spring 2023 Bivalent booster dose	
Mar 17, 2023	• A spring booster should be offered to individuals ≥ 80 years, Indigenous peoples ≥ 70 years, LTC residents and alternate level of care clients awaiting placement in LTC and those ≥ 18 years who are moderately to severely immunosuppressed • A spring booster may be offered to individuals with no prior history of SARS-CoV-2 infection who are 60-79 years and Indigenous peoples 50-69 years. • Recommended at least 6 months from the last COVID-19 vaccine dose (minimum 5 months) regardless of the number of doses previously received
Mar 27, 2023	• A spring booster should be offered to those ≥ 50 years with underlying health conditions • A spring booster may be offered to individuals with no prior history of SARS-CoV-2 infection who are 18-49 years with underlying health conditions • Recommended at least 6 months from the last COVID-19 vaccine dose (minimum 5 months) regardless of the number of doses previously received

Data source: Admin Circulars. 2020-2023. Updates to the Communicable Disease Control Manual. Available at: http://www.bccdc.ca/health-professionals/clinical-resources/communicable-disease-control-manual/admin-circulars (accessed 2023 September 3) and Immunization Manual. Part 4: Biological Products (Vaccines & Immune Globulins). COVID-19 vaccines. Vaccine eligibility. Available at: http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Epid/CD%20Manual/Chapter%202%20-%20Imms/Part4/COVID-19-vaccine-eligibility.pdf (accessed 2023 September 3)

[1] Primary series for moderately or severely immunosuppressed consists of three doses. First booster would be their fourth dose.
[2] Primary series for moderately or severely immunosuppressed consists of three doses. First booster would be their fourth dose.
[3] A bivalent COVID-19 mRNA vaccine recommended for the fall booster dose; however, monovalent product could be provided upon client request.

Supplementary Table 5 Crude and Bayesian adjusted SARS-CoV-2 cumulative seroprevalence, by age group and health authority or sex, Lower Mainland, British Columbia, Canada, December 4 – 15, 2022 (ninth) serosurvey

		Cumulative seroprevalence estimates										
Age group (years):		**0-4**	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**≥80**	**Overall**
Fraser Health Authority												
Vaccine- or infection-induced[1]	Crude, n/N (%)	153/170 (90.0)	158/165 (95.8)	144/145 (99.3)	153/154 (99.4)	135/136 (99.3)	142/144 (98.6)	120/121 (99.2)	119/121 (98.4)	94/96 (97.9)	117/122 (95.9)	1335/1374 (97.2)
	Bayesian adjusted[2] % (95% CrI)	92.0 (87.3, 95.6)	96.8 (93.6, 98.6)	99.0 (97.2, 99.8)	99.1 (97.4, 99.8)	99.0 (97.2, 99.8)	98.6 (96.47, 99.6)	98.9 (96.9, 99.8)	98.6 (96.3, 99.6)	98.4 (95.7, 99.6)	96.6 (92.7, 98.7)	98.2 (97.45, 98.7)
Infection-induced[3]	Crude, n/N (%)	143/170 (84.1)	146/165 (88.48)	121/145 (83.45)	133/154 (86.4)	112/136 (82.4)	110/144 (76.4)	83/121 (68.6)	71/121 (58.7)	49/96 (51.0)	56/122 (45.9)	1024/1374 (74.53)
	Bayesian adjusted[2] % (95% CrI)	83.0 (77.52, 87.9)	86.9 (81.6, 91.2)	82.2 (75.7, 87.6)	85.1 (79.3, 89.8)	81.53 (74.9, 87.0)	75.9 (69.3, 81.9)	69.3 (61.6, 76.6)	60.8 (52.47, 68.9)	53.4 (43.8, 63.0)	48.2 (40.1, 56.6)	74.0 (71.6, 76.3)
Vancouver Coastal Health Authority												
Vaccine- or infection-induced[1]	Crude, n/N (%)	30/30 (100)	34/35 (97.1)	54/55 (98.2)	46/46 (100)	64/64 (100)	56/56 (100)	79/79 (100)	77/79 (97.47)	104/104 (100)	78/78 (100)	622/626 (99.4)
	Bayesian adjusted[2] % (95% CrI)	99.0 (95.7, 99.8)	98.3 (93.7, 99.7)	98.52 (95.2, 99.7)	99.0 (96.53, 99.8)	99.1 (96.8, 99.9)	99.1 (96.6, 99.9)	99.2 (97.1, 99.9)	98.1 (94.4, 99.48)	99.2 (97.47, 99.9)	99.2 (96.9, 99.9)	98.7 (97.8, 99.3)
Infection-induced[3]	Crude, n/N (%)	29/30 (96.7)	28/35 (80.0)	47/55 (85.45)	40/46 (87.0)	50/64 (78.1)	44/56 (78.6)	55/79 (69.6)	46/79 (58.2)	57/104 (54.8)	32/78 (41.0)	428/626 (68.4)
	Bayesian adjusted[2] % (95% CrI)	87.3 (77.0, 94.3)	78.2 (65.0, 87.6)	82.6 (73.1, 89.8)	83.1 (73.1, 90.7)	77.0 (67.0, 85.3)	77.8 (67.4, 86.6)	70.0 (60.2, 78.7)	60.8 (51.0, 70.2)	57.4 (48.1, 66.47)	46.2 (35.2, 56.9)	72.9 (69.6, 76.2)
Females[4]												
Vaccine- or infection-induced[1]	Crude, n/N (%)	92/100 (92.0)	97/100 (97.0)	99/100 (99.0)	99/100 (99.0)	100/100 (100)	98/100 (98.0)	99/100 (99.0)	100/100 (100)	100/100 (100)	95/100 (95.0)	979/1000 (97.9)
	Bayesian adjusted[5] % (95% CrI)	94.54 (89.9, 97.47)	97.8 (94.7, 99.3)	98.9 (96.6, 99.8)	98.9 (96.7, 99.8)	99.2 (97.49, 99.9)	98.4 (95.8, 99.6)	98.8 (96.4, 99.7)	99.3 (97.47, 99.9)	99.2 (97.4, 99.9)	96.6 (92.50, 98.7)	98.45 (97.7, 99.0)
Infection-induced[3]	Crude, n/N (%)	88/100 (88.0)	87/100 (87.0)	86/100 (86.0)	85/100 (85.0)	84/100 (84.0)	70/100 (70.0)	67/100 (67.0)	62/100 (62.0)	50/100 (50.0)	37/100 (37.0)	716/1000 (71.6)
	Bayesian adjusted[5] % (95% CrI)	85.8 (78.55, 91.2)	84.0 (76.4, 89.9)	84.0 (76.6, 89.8)	83.2 (75.1, 89.6)	82.3 (74.8, 88.2)	71.7 (63.3, 79.03	68.2 (59.9, 75.8)	63.8 (54.2, 72.6)	52.1 (41.8, 62.4)	42.2 (33.0, 51.51)	72.7 (69.9, 75.4)
Males[4]												
Vaccine- or infection-induced[1]	Crude, n/N (%)	91/100 (91.0)	95/100 (95.0)	99/100 (99.0)	100/100 (100)	99/100 (99.0)	100/100 (100)	100/100 (100)	96/100 (96.0)	98/100 (98.0)	100/100 (100)	978/1000 (97.8)
	Bayesian adjusted[5] % (95% CrI)	94.1 (89.3, 97.1)	96.7 (92.8, 98.7)	98.8 (96.4, 99.7)	99.2 (97.3, 99.9)	98.9 (96.7, 99.7)	99.3 (97.4, 99.9)	99.2 (97.52, 99.9)	97.4 (93.7, 99.0)	98.2 (95.0, 99.48)	99.3 (97.4, 99.9)	98.4 (97.6, 9.0)
Infection-induced[3]	Crude, n/N (%)	84/100 (84.0)	87/100 (87.0)	82/100 (82.0)	88/100 (88.0)	78/100 (78.0)	84/100 (84.0)	71/100 (71.0)	55/100 (55.0)	56/100 (56.0)	51/100 (51.0)	736/1000 (73.6)
	Bayesian adjusted[5] % (95% CrI)	83.3 (76.1, 88.9)	84.4 (76.8, 90.1)	80.8 (72.9, 87.2)	85.3 (78.1, 90.9)	77.2 (68.4, 84.3)	81.9 (73.9, 88.4)	71.0 (62.50, 78.9)	57.7 (48.2, 66.4)	58.4 (49.3, 66.8)	54.47 (45.3, 63.4)	80.8 (78.3, 83.1)

CrI = credible interval

[1] Vaccine- or infection-induced estimates defined by anti-spike and/or anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[2] Adjusted for sex as well as age group for overall estimate.
[3] Infection-induced estimates defined by anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[4] Refers to biological sex as specified in available datasets.
[5] Adjusted for health authority as well as age group for overall estimate.

Supplementary Table 6 Crude and Bayesian adjusted SARS-CoV-2 cumulative seroprevalence, by age group and health authority or sex, Lower Mainland, British Columbia, Canada, July 16 – 25, 2023 (tenth) serosurvey

		Cumulative seroprevalence estimates										
Age group (years):		**0-4**	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**≥80**	**Overall**
Fraser Health Authority												
Vaccine- or infection-induced[1]	Crude, n/N (%)	159/167 (95.2)	162/167 (97.0)	151/152 (99.3)	144/145 (99.3)	108/108 (100)	121/122 (99.2)	106/107 (99.1)	128/136 (94.1)	118/119 (99.2)	107/109 (98.2)	1304/1332 (97.9)
	Bayesian adjusted[2] % (95% CrI)	97.1 (93.9, 98.6)	98.0 (95.7, 99.1)	98.9 (97.45, 99.7)	98.8 (97.2, 99.7)	99.0 (97.48, 99.8)	98.8 (97.2, 99.7)	98.7 (97.1, 99.6)	96.6 (92.9, 98.54)	98.8 (97.2, 99.7)	98.47 (96.4, 99.50)	98.3 (97.6, 98.9)
Infection-induced[3]	Crude, n/N (%)	149/167 (89.2)	148/167 (88.6)	136/152 (89.47)	130/145 (89.7)	90/108 (83.3)	107/122 (87.7)	79/107 (73.8)	90/136 (66.2)	70/119 (58.8)	62/109 (56.9)	1061/1332 (79.7)
	Bayesian adjusted[2] % (95% CrI)	87.9 (82.8, 91.9)	87.3 (82.0, 91.6)	88.0 (82.8, 92.1)	87.8 (82.1, 92.3)	82.7 (75.46, 88.45)	86.2 (80.3, 91.0)	74.9 (66.8, 81.7)	68.3 (60.54, 74.9)	61.7 (53.1, 69.7)	59.4 (50.0, 68.1)	79.48 (77.2, 81.7)
Vancouver Coastal Health Authority												
Vaccine- or infection-induced[1]	Crude, n/N (%)	29/33 (87.9)	33/33 (100)	48/48 (100)	55/55 (100)	92/92 (100)	78/78 (100)	92/93 (98.9)	64/64 (100)	80/81 (98.8)	91/91 (100)	662/668 (99.1)
	Bayesian adjusted[2] % (95% CrI)	96.7 (88.8, 98.8)	98.7 (96.46, 99.8)	98.8 (96.7, 99.8)	98.8 (96.8, 99.8)	98.9 (97.4, 99.8)	98.9 (97.2, 99.8)	98.7 (96.8, 99.6)	98.8 (97.0, 99.8)	98.6 (96.6, 99.6)	98.9 (97.4, 99.8)	98.6 (97.8, 99.2)
Infection-induced[3]	Crude, n/N (%)	25/33 (75.8)	30/33 (90.9)	45/48 (93.8)	50/55 (90.9)	77/92 (83.7)	60/78 (76.9)	73/93 (78.49)	45/64 (70.3)	48/81 (59.3)	46/91 (50.6)	499/668 (74.7)
	Bayesian adjusted[2] % (95% CrI)	77.4 (65.0, 86.6)	85.7 (76.1, 92.7)	88.3 (80.0, 94.0)	86.7 (77.8, 92.9)	82.9 (75.4, 88.9)	77.8 (68.9, 85.0)	78.7 (70.54, 85.54)	72.2 (61.7, 81.1)	63.4 (53.3, 72.3)	55.4 (45.9, 64.6)	78.3 (75.2, 81.1)
Females[4]												
Vaccine- or infection-induced[1]	Crude, n/N (%)	95/100 (95.0)	97/100 (97.0)	100/100 (100)	100/100 (100)	100/100 (100)	100/100 (100)	99/100 (99.0)	95/100 (95.0)	100/100 (100)	99/100 (99.0)	985/1000 (98.5)
	Bayesian adjusted[5] % (95% CrI)	97.4 (93.50, 98.9)	98.1 (95.51, 99.2)	99.0 (97.54, 99.8)	98.9 (97.3, 99.8)	99.0 (97.4, 99.8)	99.0 (97.4, 99.8)	98.6 (96.7, 99.6)	97.2 (93.7, 98.8)	99.0 (97.4, 99.8)	98.7 (96.7, 99.6)	98.48 (97.7, 99.1)
Infection-induced[3]	Crude, n/N (%)	87/100 (87.0)	90/100 (90.0)	90/100 (90.0)	91/100 (91.0)	80/100 (80.0)	83/100 (83.0)	74/100 (74.0)	61/100 (61.0)	60/100 (60.0)	48/100 (48.0)	764/1000 (76.4)
	Bayesian adjusted[5] % (95% CrI)	84.3 (76.3, 90.2)	87.52 (80.7, 92.6)	87.7 (81.4, 92.6)	87.8 (80.51, 93.0)	80.0 (72.2, 86.3)	82.49 (75.0, 88.51)	74.8 (66.48, 81.9)	64.8 (56.0, 73.2)	63.1 (53.8, 71.6)	53.8 (44.0, 63.2)	77.3 (74.6, 79.8)
Males[4]												
Vaccine- or infection-induced[1]	Crude, n/N (%)	93/100 (93.0)	98/100 (98.0)	99/100 (99.0)	99/100 (99.0)	100/100 (100)	99/100 (99.0)	99/100 (99.0)	97/100 (97.0)	98/100 (98.0)	99/100 (99.0)	981/1000 (98.1)
	Bayesian adjusted[5] % (95% CrI)	96.52 (90.9, 98.6)	98.4 (96.1, 99.4)	98.7 (96.9, 99.7)	98.7 (96.8, 99.6)	99.0 (97.4, 99.8)	98.7 (96.8, 99.6)	98.8 (97.0, 99.6)	97.9 (95.0, 99.2)	98.45 (96.4, 99.51)	98.7 (96.9, 99.6)	98.4 (97.6, 99.0)
Infection-induced[3]	Crude, n/N (%)	87/100 (87.0)	88/100 (88.0)	91/100 (91.0)	89/100 (89.0)	87/100 (87.0)	84/100 (84.0)	78/100 (78.0)	74/100 (74.0)	58/100 (58.0)	60/100 (60.0)	796/100 (79.6)
	Bayesian adjusted[5] % (95% CrI)	84.6 (77.4, 90.3)	86.2 (79.3, 91.3)	88.4 (82.1, 93.1)	87.0 (80.2, 92.0)	85.51 (78.7, 90.8)	83.50 (76.6, 89.1)	78.2 (70.0, 84.9)	75.0 (66.7, 82.1)	61.6 (52.3, 70.1)	63.3 (53.7, 71.7)	80.8 (78.3, 83.1)

CrI = credible interval

[1] Vaccine- or infection-induced estimates defined by anti-spike and/or anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[2] Adjusted for sex as well as age group for overall estimate.
[3] Infection-induced estimates defined by anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[4] Refers to biological sex as specified in available datasets.
[5] Adjusted for health authority as well as age group for overall estimate.

Supplementary Table 7 Crude tallies and cumulative SARS-CoV-2 seroprevalence estimates (crude), non-orthogonal, by age group, Lower Mainland, British Columbia, Canada, sixth to tenth serosurveys

	Crude tallies and cumulative seroprevalence estimates (crude), n/N, %										
Age group (years):	**0-4**	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**≥80**	**Overall**
Sixth serosurvey (September 26 – October 8, 2021)											
Vaccine- or infection-induced[1]	39/195 (20.0)	28/200 (14.0)	168/200 (84.0)	179/199 (90.0)	180/200 (90.0)	183/199 (92.0)	185/199 (93.0)	182/200 (91.0)	190/200 (95.0)	193/198 (97.47)	1527/1990 (76.7)
Infection-induced[2]	33/195 (16.9)	26/200 (13.0)	26/200 (13.0)	18/199 (9.1)	23/200 (11.50)	22/199 (11.1)	19/199 (9.6)	6/200 (3.0)	15/200 (7.50)	5/198 (2.53)	193/1990 (9.7)
Seventh serosurvey (March 13 – 24, 2022)											
Vaccine- or infection-induced[1]	141/200 (70.50)	181/200 (90.50)	193/200 (96.50)	196/200 (98.0)	197/200 (98.50)	196/200 (98.0)	195/200 (97.50)	197/200 (98.50)	195/200 (97.50)	188/200 (94.0)	1879/2000 (94.0)
Infection-induced[2]	133/200 (66.50)	140/200 (70.0)	117/200 (58.50)	102/200 (51.0)	111/200 (55.50)	90/200 (45.0)	64/200 (32.0)	47/200 (23.50)	22/200 (11.0)	25/200 (12.50)	851/2000 (42.6)
Eighth serosurvey (July 31 – August 11, 2022)											
Vaccine- or infection-induced[1]	166/200 (83.0)	183/200 (91.50)	198/200 (99.0)	200/200 (100)	198/200 (99.0)	198/200 (99.0)	199/200 (99.50)	199/200 (99.50)	195/200 (97.50)	198/200 (99.0)	1934/2000 (96.7)
Infection-induced[2]	159/200 (79.50)	148/200 (74.0)	163/200 (81.50)	147/200 (73.50)	139/200 (69.50)	135/200 (67.50)	122/200 (61.0)	81/200 (40.50)	81/200 (40.50)	71/200 (35.50)	1246/2000 (62.3)
Ninth serosurvey (December 4 – 15, 2022)											
Vaccine- or infection-induced[1]	183/200 (91.50)	192/200 (96.0)	198/200 (99.0)	199/200 (99.50)	199/200 (99.50)	198/200 (99.0)	199/200 (99.50)	196/200 (98.0)	198/200 (99.0)	195/200 (97.50)	1957/2000 (97.9)
Infection-induced[2]	172/200 (86.0)	174/200 (87.0)	168/200 (84.0)	173/200 (86.50)	162/200 (81.0)	154/200 (77.0)	138/200 (69.0)	117/200 (58.50)	106/200 (53.0)	88/200 (44.0)	1452/2000 (72.6)
Tenth serosurvey (July 16 – 25, 2023)											
Vaccine- or infection-induced[1]	188/200 (94.0)	195/200 (97.50)	199/200 (99.50)	199/200 (99.50)	200/200 (100)	199/200 (99.50)	198/200 (99.0)	192/200 (96.0)	198/200 (99.0)	198/200 (99.0)	1966/2000 (98.3)
Infection-induced[2]	174/200 (87.0)	178/200 (89.0)	181/200 (90.50)	180/200 (90.0)	167/200 (83.50)	167/200 (83.50)	152/200 (76.0)	135/200 (67.50)	118/200 (59.0)	108/200 (54.0)	1560/2000 (78.0)

[1] Vaccine- or infection-induced estimates defined by anti-spike and/or anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[2] Infection-induced estimates defined by anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.

Supplementary Table 8 Crude and Bayesian adjusted SARS-CoV-2 cumulative seroprevalence estimates, by primary and *exploratory age groups*, Lower Mainland, British Columbia, Canada, sixth to tenth serosurveys

Age group (years):		Cumulative seroprevalence estimates						
		0-4 year (Primary Analysis)	**1-4 (Exploratory Model 1)**	**5-9 years (Exploratory Model 1)**	**60-69 (Primary Analysis)**	**60-64 (Exploratory Model 2)**	**65-69 (Exploratory Model 2)**	**70-79 (Exploratory Model 2)**
Sixth serosurvey (September 26 – October 8, 2021)								
Vaccine- or infection-induced[1]	Crude, n/N (%)	39/195 (20.0)	37/185 (20.0)	28/200 (14.0)	182/200 (91.0)	90/100 (90.0)	92/100 (92.0)	190/200 (95.0)
	Bayesian adjusted[2], % (95% CrI)	19.2 (14.1, 25.2)	19.4 (14.2, 25.8)	14.48 (10.2, 19.8)	90.8 (86.7, 94.1)	89.3 (82.9, 94.3)	91.1 (85.3, 95.6)	94.52 (91.1, 96.9)
Infection-induced[3]	Crude, n/N (%)	33/195 (16.9)	33/185 (17.8)	26/200 (13.0)	6/200 (3.0)	2/100 (2.0)	4/100 (4.0)	15/200 (7.50)
	Bayesian adjusted[2], % (95% CrI)	13.2 (9.8, 17.47)	13.8 (10.3, 18.3)	11.2 (8.2, 15.1)	5.8 (3.4, 8.7)	6.3 (3.4, 9.7)	6.9 (3.9, 10.6)	8.1 (5.52, 11.3)
Seventh serosurvey (March 13 – 24, 2022)								
Vaccine- or infection-induced[1]	Crude, n/N (%)	141/200 (70.50)	137/194 (70.6)	181/200 (90.50)	197/200 (98.50)	99/100 (99.0)	98/100 (98.0)	195/200 (97.50)
	Bayesian adjusted[2], % (95% CrI)	74.8 (67.9, 80.6)	74.9 (67.8, 80.9)	91.48 (87.1, 94.6)	97.7 (95.6, 99.0)	97.50 (94.6, 99.1)	96.9 (93.8, 98.8)	97.1 (94.6, 98.6)
Infection-induced[3]	Crude, n/N (%)	133/200 (66.50)	129/194 (66.49)	140/200 (70.0)	47/200 (23.50)	23/100 (23.0)	24/100 (24.0)	22/200 (11.0)
	Bayesian adjusted[2], % (95% CrI)	63.3 (56.49, 69.9)	63.1 (56.1, 69.9)	66.0 (59.45, 72.4)	24.9 (19.6, 30.7)	26.0 (18.9, 34.0)	25.7 (18.7, 33.8)	14.0 (9.8, 19.0)
Eighth serosurvey (July 31 – August 11, 2022)								
Vaccine- or infection-induced[1]	Crude, n/N (%)	166/200 (83.0)	161/193 (83.4)	183/200 (91.50)	199/200 (99.50)	100/100 (100)	99/100 (99.0)	195/200 (97.50)
	Bayesian adjusted[2], % (95% CrI)	86.3 (80.1, 90.9)	86.6 (80.3, 91.2)	93.4 (89.9, 95.9)	99.0 (97.4, 99.7)	99.0 (96.8, 99.8)	98.6 (96.1, 99.6)	97.8 (95.6, 99.1)
Infection-induced[3]	Crude, n/N (%)	159/200 (79.50)	154/193 (79.8)	148/200 (74.0)	81/200 (40.50)	39/100 (39.0)	42/100 (42.0)	81/200 (40.50)
	Bayesian adjusted[2], % (95% CrI)	74.45 (67.52, 80.7)	74.45 (67.3, 80.8)	71.2 (65.53, 76.9)	43.2 (36.9, 49.9)	43.48 (34.8, 52.3)	46.1 (37.3, 54.9)	42.8 (36.49, 49.4)
Ninth serosurvey (December 4 – 15, 2022)								
Vaccine- or infection-induced[1]	Crude, n/N (%)	183/200 (91.50)	178/194 (91.8)	192/200 (96.0)	196/200 (98.0)	97/100 (97.0)	99/100 (99.0)	198/200 (99.0)
	Bayesian adjusted[2], % (95% CrI)	94.2 (90.9, 96.6)	94.49 (91.2, 96.9)	97.2 (94.9, 98.6)	98.3 (96.3, 99.3)	97.9 (95.1, 99.2)	98.7 (96.7, 99.6)	98.7 (97.0, 99.52)
Infection-induced[3]	Crude, n/N (%)	172/200 (86.0)	167/194 (86.1)	174/200 (87.0)	117/200 (58.50)	55/100 (55.0)	62/100 (62.0)	106/200 (53.0)
	Bayesian adjusted[2], % (95% CrI)	84.4 (79.4, 88.6)	84.3 (79.0, 88.7)	84.0 (78.8, 88.6)	60.8 (54.2, 67.2)	67.3 (59.3, 74.0)	64.4 (55.8, 72.53)	54.45 (47.47, 61.0)
Tenth serosurvey (July 16 – 25, 2023)								
Vaccine- or infection-induced[1]	Crude, n/N (%)	188/200 (94.0)	182/194 (93.8)	195/200 (97.50)	192/200 (96.0)	95/100 (95.0)	97/100 (97.0)	198/200 (99.0)
	Bayesian adjusted[2], % (95% CrI)	96.8 (93.2, 98.48)	96.6 (93.2, 98.4)	98.1 (96.3, 99.1)	97.47 (95.1, 98.7)	97.51 (94.2, 98.8)	97.9 (95.1, 99.0)	98.6 (97.4, 99.46)
Infection-induced[3]	Crude, n/N (%)	174/200 (87.0)	169/194 (87.1)	178/200 (89.0)	135/200 (67.50)	68/100 (68.0)	67/100 (67.0)	118/200 (59.0)
	Bayesian adjusted[2], % (95% CrI)	84.4 (79.2, 88.6)	84.3 (79.0, 88.7)	86.7 (82.1, 91.50)	69.7 (63.7, 75.3)	71.9 (64.0, 78.8)	70.3 (62.4, 77.4)	62.3 (55.6, 68.49)

CrI = credible interval

Exploratory analyses are predicated on full but separate models using the age sub-strata displayed – this may account for exploratory sub-strata estimates falling outside primary age group estimates in some instances. Note that exploratory estimates for 5-9-year-olds and 70-79-year-olds are displayed here for flanking age group comparison and are extracted from the corresponding exploratory models wherein <1-year-olds are excluded or 60-69-year-olds are sub-stratified as 60-64 and 65-69 years.

[1] Vaccine- or infection-induced estimates defined by anti-spike and/or anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.
[2] Adjusted for sex, health authority as well as age group for overall estimate.
[3] Infection-induced estimates defined by anti-nucleocapsid positivity. See main manuscript Table 1 for assay details.

Supplementary Table 9 Bayesian estimated period-specific change in SARS-CoV-2 infection-induced seroprevalence and number of infections by age group, *with* censoring of negative estimates, Lower Mainland, British Columbia (BC), Canada

	Period-specific estimates (95% CrI)[1]										
Age group (years):	**0-4**	**5-9**	**10-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**≥80**	**Overall**
Lower Mainland population census[2]	142 000	152 149	321 892	478 800	525 414	435 537	439 590	393 225	255 419	138 469	3 282 495
Sixth to seventh intersurvey period (Sept. 26, 2021-Mar. 12, 2022; epi-weeks 39-10; mixed Delta and Omicron BA.1 predominance)											
Δ infection-induced SP[3] %	50.0 (42.1, 57.7)	54.7 (47.6, 61.7)	44.7 (36.51, 52.2)	40.9 (33.3, 48.1)	43.9 (36.2, 50.9)	34.49 (27.1, 41.6)	23.47 (16.7, 30.4)	19.1 (13.2, 25.4)	7.2 (2.9, 13.2)	9.9 (5.0, 15.7)	33.3 (30.7, 36.1)
Δ infections[4], N	70 966 (59 727, 81 900)	83 262 (72 534, 93 927)	143 784 (117 423, 167 921)	195 826 (159 468, 229 961)	230 872 (190 057, 267 333)	150 158 (117 761, 181 186)	103 144 (73 191, 133 428)	74 930 (51 508, 99 604)	15 829 (4 932, 30 090)	13 351 (6 521, 21 561)	1 081 182 (995 446, 1 166 650)
Seventh to eighth intersurvey period (Mar. 13, 2022-July 30, 2022; epi-weeks 11-30; Omicron BA.2 and BA.5 predominance)											
Δ infection-induced SP[3] %	14.7 (6.7, 23.8)	9.2 (2.47, 20.50)	23.7 (15.8, 32.4)	22.1 (14.3, 31.2)	14.4 (6.7, 24.2)	20.7 (12.4, 29.3)	28.4 (20.0, 37.7)	19.2 (11.2, 27.6)	28.9 (20.7, 36.8)	24.1 (16.4, 33.1)	21.4 (18.45, 24.6)
Δ infections[4], N	17 831 (7 354, 29 941)	10 047 (1 686, 21 218)	72 000 (46 055, 98 320)	97 382 (59 492, 137 765)	60 872 (24 910, 105 303)	87 998 (50 233, 126 251)	121 051 (84 193, 159 010)	72 202 (40 621, 105 472)	73 773 (52 851, 93 849)	31 834 (21 223, 42 933)	647 283 (551 465, 747 541)
Eighth to ninth intersurvey period (July 31, 2022-Dec. 3, 2022; epi-weeks 31-48; Omicron BA.5 and BQ.1/BQ.1.1 predominance)											
Δ infection-induced SP[3] %	12.4 (5.3, 24.45)	13.7 (7.3, 21.1)	9.52 (3.0, 22.2)	15.3 (8.49, 23.9)	15.6 (8.2, 24.4)	15.45 (7.3, 26.4)	11.8 (4.7, 21.1)	18.7 (9.9, 27.9)	14.0 (6.2, 22.8)	14.2 (5.9, 25.54)	14.6 (11.8, 17.8)
Δ infections[4], N	14 605 (5 127, 25 616)	19 763 (9 677, 31 037)	19 154 (4 257, 39 096)	69 214 (34 571, 106 781)	77 526 (36 648, 119 874)	55 046 (23 470, 89 400)	43 772 (13 552, 79 717)	69 830 (35 259, 105 038)	31 440 (11 692, 54 572)	14 730 (5 250, 25 955)	416 818 (329 502, 510 549)
Ninth to tenth intersurvey period (Dec. 4, 2022-July 15, 2023; epi-weeks 49-28; Omicron BQ.1.1 and XBB predominance)											
Δ infection-induced SP[3] %	6.45 (1.4, 15.0)	6.9 (1.49, 19.2)	8.0 (2.8, 15.1)	6.7 (1.53, 14.3)	8.4 (2.3, 17.9)	11.4 (4.6, 22.3)	11.4 (4.3, 22.3)	14.7 (6.7, 26.1)	11.0 (3.6, 21.1)	14.2 (5.9, 25.49)	10.2 (7.8, 13.0)
Δ infections[4], N	5 474 (855, 12 150)	6 168 (881, 14 485)	20 123 (5 095, 38 839)	21 327 (3 195, 48 036)	27 375 (5 193, 58 224)	34 322 (12 489, 60 412)	35 978 (10 615, 66 611)	41 866 (16 715, 71 303)	21 117 (4 685, 43 338)	15 817 (5 279, 27 517)	234 630 (167 142, 308 557)

CrI = credible interval around Bayesian estimates; Δ = absolute difference or change; SP = seroprevalence

[1] Seroprevalence participants excluded long term care or assisted living facility residents. For this purpose, negative likelihoods of acquiring a first-ever infection are censored.
[2] Population census estimates for the Lower Mainland of BC, comprised of Vancouver Coastal Health Authority (VCHA) and Fraser Health Authority (FHA). BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2022. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections (accessed 2023 August 24).
[3] Period-specific change (absolute difference (Δ)) in Bayesian estimates of cumulative SARS-CoV-2 infection-induced seroprevalence between specified serosurveys, interpreted as the risk of acquiring a first-ever SARS-COV-2 infection during the specified period. Negative risk estimates are censored as implausible.
[4] Period-specific change (absolute difference (Δ)) in the number of SARS-CoV-2 infections between specified serosurveys (after censoring negative risk estimates), interpreted as the number of first-ever SARS-CoV-2 infections acquired during the specified period.

Supplementary Table 10 *Sensitivity analyses*: Bayesian estimated period-specific hospitalization and fatality risks per first-ever SARS-CoV-2 infection, by primary and *exploratory age groups*, Lower Mainland, BC

Age group (years):	Period-specific estimates[1]						
	0-4 year (Primary Analysis)	**1-4 (Exploratory Model 1)**	**5-9 years (Exploratory Model 1)**	**60-69 (Primary Analysis)**	**60-64 (Exploratory Model 2)**	**65-69 (Exploratory Model 2)**	**70-79 (Exploratory Model 2)**
Lower Mainland population[2]	142 000	113 663	152 149	393 225	211 015	182 210	255 419
Sixth to seventh intersurvey period (Sept. 26, 2021-Mar. 12, 2022; epi-weeks 39-10; mixed Delta and Omicron BA.1 predominance)							
Δ infection-induced SP[3], % (95% CrI)	50.0 (42.1, 57.7)	49.2 (41.1, 56.7)	54.7 (47.4, 61.9)	19.1 (13.2, 25.4)	20.0 (12.3, 28.4)	19.3 (11.6, 28.3)	7.0 (2.8, 13.2)
Δ infections[4], N (95% CrI)	70 966 (59 727, 81 900)	55 928 (46 686, 64 513)	83 181 (72 040, 94 207)	74 930 (51 508, 99 604)	41 588 (25 120, 58 804)	34 174 (20 254, 49 871)	15 566 (4 999, 29 536)
Number of hospitalizations	89	36	22	461	215	246	517
Number of fatalities	0	0	0	82	39	43	153
IHR, % (95% CrI)	0.13 (0.11, 0.15)	0.064 (0.056, 0.077)	0.026 (0.023, 0.031)	0.62 (0.46, 0.90)	0.52 (0.37, 0.86)	0.72 (0.49, 1.22)	3.32 (1.75, 10.34)
IFR, % (95% CrI)	0	0	0	0.11 (0.08, 0.16)	0.09 (0.07, 0.16)	0.13 (0.09, 0.21)	0.98 (0.52, 3.06)
Seventh to eighth intersurvey period (Mar. 13, 2022-July 30, 2022; epi-weeks 11-30; Omicron BA.2 and BA.5 predominance)							
Δ infection-induced SP[3], % (95% CrI)	14.7 (6.7, 23.8)	14.8 (6.7, 23.8)	9.2 (2.4, 20.3)	19.2 (11.2, 27.6)	21.0 (11.2, 33.6)	22.4 (12.3, 33.49)	28.7 (20.6, 36.7)
Δ infections[4], N (95% CrI)	17 831 (7 354, 29 941)	14 412 (5 741, 24 201)	9 894 (1 696, 21 494)	72 202 (40 621, 105 472)	38 005 (17 551, 61 176)	37 700 (18 994, 57 373)	37 700 (18 994, 57 373)
Number of hospitalizations	73	26	10	183	77	106	310
Number of fatalities	2	2	0	34	16	18	51
IHR, % (95% CrI)	0.41 (0.24, 0.99)	0.18 (0.11, 0.45)	0.10 (0.05, 0.59)	0.25 (0.17, 0.45)	0.20 (0.13, 0.44)	0.28 (0.19, 0.56)	0.42 (0.33, 0.59)
IFR, % (95% CrI)	0.011 (0.007, 0.027)	0.014 (0.008, 0.035)	0	0.05 (0.03, 0.08)	0.04 (0.03, 0.09)	0.05 (0.03, 0.10)	0.07 (0.05, 0.10)
Eighth to ninth intersurvey period (July 31, 2022-Dec. 3, 2022; epi-weeks 31-48; Omicron BA.5 and BQ.1/BQ.1.1 predominance)							
Δ infection-induced SP[3], % (95% CrI)	12.4 (5.3, 24.45)	12.7 (5.3, 24.8)	13.7 (7.2, 21.1)	18.7 (9.9, 27.9)	35.4 (22.1, 50.8)	20.47 (10.0, 32.3)	13.7 (6.2, 23.0)
Δ infections[4], N (95% CrI)	14 605 (5 127, 25 616)	11 810 (4 121, 21 039)	19 871 (9 470, 31 182)	69 830 (35 259, 105 038)	57 946 (36 422, 78 642)	33 932 (14 559, 55 602)	33 932 (11 440, 53 705)
Number of hospitalizations	43	15	2	112	42	70	228
Number of fatalities	0	0	0	18	5	13	35
IHR, % (95% CrI)	0.29 (0.17, 0.84)	0.13 (0.07, 0.36)	0.010 (0.006, 0.021)	0.16 (0.11, 0.32)	0.07 (0.05, 0.12)	0.21 (0.13, 0.48)	0.75 (0.43, 1.99)
IFR, % (95% CrI)	0	0	0	0.03 (0.02, 0.05)	0.01 (0.01, 0.01)	0.04 (0.02, 0.09)	0.12 (0.07, 0.31)

Δ = absolute difference or change; BC = British Columbia; CrI = Credible interval around Bayesian estimates; IFR = Infection fatality ratio, interpreted as risk (%) of dying due to a first-ever SARS-CoV-2 infection acquired during the specified period; IHR = Infection hospitalization ratio, interpreted as risk (%) of hospitalization due to a first-ever SARS-CoV-2 infection acquired during the specified period; SP = seroprevalence

Note that IHR and IFR estimates represent percentage of first-ever SARS-CoV-2 infections.

Exploratory analyses are predicated on full but separate models using the age sub-strata displayed – this may account for exploratory sub-strata estimates falling outside primary age group estimates in some instances. Note that exploratory estimates for 5-9-year-olds and 70-79-year-olds are displayed here for flanking age group comparison and are extracted from the corresponding exploratory models wherein <1-year-olds are excluded or 60-69-year-olds are sub-stratified as 60-64 and 65-69 years.

Note that where rounding would otherwise suggest credible intervals equal to point estimates, additional decimal points are displayed.

[1] Seroprevalence participants excluded long term care or assisted living facility residents but neither could be reliably identified among hospitalizations or fatalities, and were retained.

[2] Population census estimates for the Lower Mainland of BC, comprised of Vancouver Coastal Health Authority (VCHA) and Fraser Health Authority (FHA). BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2022. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections (accessed 2023 August 24).

[3] Period-specific change (absolute difference (Δ)) in Bayesian estimates of cumulative SARS-CoV-2 infection-induced seroprevalence between specified serosurveys, interpreted as the risk of acquiring a first-ever SARS-COV-2 infection during the specified period. Negative risk estimates are censored as implausible.

[4] Period-specific change (absolute difference (Δ)) in the number of SARS-CoV-2 infections between specified serosurveys (after censoring negative risk estimates), interpreted as the number of first-ever SARS-CoV-2 infections acquired during the specified period.

Supplementary Table 11 Bayesian estimated period-specific *hospitalization* risks per first-ever SARS-CoV-2 infection, by *sex*, overall and by age group, Lower Mainland, British Columbia (BC), Canada

Age group (years):	Period-specific estimates[1]						
	<50	**50-59**	**60-69**	**70-79**	**≥80**	**≥50**	**All ages (<5 to ≥80)**
Sixth to seventh intersurvey period (Sept. 26, 2021-Mar. 12, 2022; epi-weeks 39-10; mixed Delta and Omicron BA.1 predominance)							
Number of hospitalizations among females[2]	192	109	165	185	271	730	922
Number of hospitalizations among males[2]	251	206	296	332	358	1192	1443
Female IHR, % (95% CrI)	0.043 (0.039, 0.049)	0.20 (0.14, 0.31)	0.42 (0.28, 0.75)	2.24 (0.97, 16.56)	3.81 (2.02, 13.08)	0.66 (0.51, 0.91)	0.17 (0.15, 0.19)
Male IHR, % (95% CrI)	0.06 (0.05, 0.07)	0.44 (0.30, 0.77)	0.83 (0.56, 1.48)	4.49 (2.02, 26.30)	5.89 (3.28, 16.80)	1.23 (0.95, 1.73)	0.27 (0.25, 0.31)
Seventh to eighth intersurvey period (Mar. 13, 2022-July 30, 2022; epi-weeks 11-30; Omicron BA.2 and BA.5 predominance)							
Number of hospitalizations among females[2]	76	39	69	127	303	538	614
Number of hospitalizations among males[2]	91	34	114	183	388	719	810
Female IHR, % (95% CrI)	0.05 (0.04, 0.08)	0.07 (0.04, 0.12)	0.21 (0.12, 0.68)	0.34 (0.25, 0.58)	1.88 (1.25, 3.58)	0.37 (0.28, 0.51)	0.20 (0.16, 0.26)
Male IHR, % (95% CrI)	0.05 (0.04, 0.06)	0.06 (0.04, 0.10)	0.29 (0.19, 0.63)	0.50 (0.37, 0.80)	2.48 (1.76, 4.3)	0.47 (0.38, 0.63)	0.23 (0.20, 0.29)
Eighth to ninth intersurvey period (July 31, 2022-Dec. 3, 2022; epi-weeks 31-48; Omicron BA.5 and BQ.1/BQ.1.1 predominance)							
Number of hospitalizations among females[2]	50	17	44	81	197	339	389
Number of hospitalizations among males[2]	56	29	68	147	320	564	620
Female IHR, % (95% CrI)	0.04 (0.03, 0.06)	0.08 (0.04, 0.60)	0.10 (0.06, 0.22)	0.57 (0.25, 3.96)	2.38 (1.18, 13.48)	0.37 (0.26, 0.67)	0.17 (0.13, 0.23)
Male IHR, % (95% CrI)	0.05 (0.03, 0.08)	0.13 (0.06, 0.80)	0.28 (0.14, 1.80)	0.86 (0.47, 3.72)	4.91 (2.30, 33.80)	0.81 (0.51, 1.59)	0.33 (0.23, 0.47)

CrI = Credible interval around Bayesian estimates; IHR = Infection hospitalization ratio, interpreted as risk (%) of hospitalization due to a first-ever SARS-CoV-2 infection acquired during the specified period.

Note that IHR and IFR estimates represent percentage of first-ever SARS-CoV-2 infections.

Because of fewer COVID-19 hospitalizations, we did not stratify IHR estimates by sex for separate age groups below 50 years.

Where rounding would otherwise suggest credible intervals equal to point estimates, additional decimal points are displayed.

[1] Seroprevalence participants excluded long-term care or assisted living facility residents but neither could be reliably identified among hospitalizations, and were retained.
[2] Refers to biological sex as specified in available datasets.

Supplementary Table 12 Bayesian estimated period-specific *fatality* risks per first-ever SARS-CoV-2 infection, by *sex*, overall and by age group, Lower Mainland, British Columbia (BC), Canada

	Period-specific estimates[1]						
Age group (years):	**<50**	**50-59**	**60-69**	**70-79**	**≥80**	**≥50**	**All ages (<5 to ≥80)**
Sixth to seventh intersurvey period (Sept. 26, 2021-Mar. 12, 2022; epi-weeks 39-10; mixed Delta and Omicron BA.1 predominance)							
Number of fatalities among females[2]	7	11	22	41	216	290	297
Number of fatalities among males[2]	12	29	60	111	224	424	436
Female IFR, % (95% CrI)	0.0016 (0.0014, 0.0018)	0.02 (0.01, 0.03)	0.06 (0.04, 0.10)	0.50 (0.22, 3.67)	3.04 (1.61, 10.42)	0.26 (0.20, 0.36)	0.05 (0.05, 0.06
Male IFR, % (95% CrI)	0.0028 (0.0025, 0.0032)	0.06 (0.04, 0.11)	0.17 (0.11, 0.30)	1.50 (0.68, 8.79)	3.69 (2.05, 10.51)	0.44 (0.34, 0.62)	0.08 (0.07, 0.09)
Seventh to eighth intersurvey period (Mar. 13, 2022-July 30, 2022; epi-weeks 11-30; Omicron BA.2 and BA.5 predominance)							
Number of fatalities among females[2]	0	6	18	22	98	144	144
Number of fatalities among males[2]	5	2	16	29	108	155	160
Female IFR, % (95% CrI)	-	0.010 (0.007, 0.018)	0.05 (0.03, 1.18)	0.06 (0.04, 0.10)	0.61 (0.40, 1.16)	0.10 (0.08, 0.14)	0.05 (0.04, 0.06)
Male IFR, % (95% CrI)	0.003 (0.023, 0.004)	0.003 (0.002, 0.006)	0.04 (0.03, 0.09)	0.08 (0.06, 0.13)	0.69 (0.49, 1.21)	0.10 (0.08, 0.14)	0.05 (0.04, 0.06)
Eighth to ninth intersurvey period (July 31, 2022-Dec. 3, 2022; epi-weeks 31-48; Omicron BA.5 and BQ.1/BQ.1.1 predominance)							
Number of fatalities among females[2]	2	3	10	10	89	112	114
Number of fatalities among males[2]	0	6	7	25	95	133	133
Female IFR, % (95% CrI)	0.0015 (0.0011, 0.0022)	0.014 (0.006, 0.106)	0.02 (0.01, 0.05)	0.07 (0.03, 0.49)	1.07 (0.53, 6.09)	0.12 (0.08, 0.22)	0.05 (0.04, 0.07)
Male IFR, % (95% CrI)	-	0.03 (0.01, 0.16)	0.03 (0.01, 0.18)	0.15 (0.08, 0.63)	1.46 (0.68, 10.04)	0.19 (0.12, 0.38)	0.07 (0.05, 0.10)

CrI = Credible interval around Bayesian estimates; IFR = Infection fatality ratio, interpreted as risk (%) of dying due to a first-ever SARS-CoV-2 infection acquired during the specified period.

Note that IHR and IFR estimates represent percentage of first-ever SARS-CoV-2 infections.

Because of fewer COVID-19 fatalities, we did not stratify IFR estimates by sex for separate age groups below 50 years.

Where rounding would otherwise suggest credible intervals equal to point estimates, additional decimal points are displayed.

[1] Seroprevalence participants excluded long-term care or assisted living facility residents but neither could be reliably identified among fatalities, and were retained.
[2] Refers to biological sex as specified in available datasets.

Supplementary Table 13 Bayesian estimated period-specific first-ever SARS-CoV-2 *infection risk* and tallies by *sex*, overall and by age group, Lower Mainland, British Columbia (BC), Canada

		Period-specific estimates (95% CrI)[1]						
Age group (years):		**<50**	**50-59**	**60-69**	**70-79**	**≥80**	**≥50**	**All ages (<5 to ≥80)**
Females[2]								
Lower Mainland population[3]		1 016 322	227 108	203 404	135 378	80 499	646 389	1 662 711
Sixth to seventh intersurvey period[4]	Δ infection-induced SP[5] %	43.7 (39.0, 48.4)	24.52 (15.3, 34.2)	19.2 (10.8, 28.7)	6.9 (1.3, 15.46)	9.0 (3.2, 17.1)	17.8 (12.8, 23.0)	33.8 (30.2, 37.6)
	Δ infections[6], N	444 190 (396 262, 491 740)	55 669 (34 732, 77 521)	39 096 (21 967, 58 268)	8 243 (1 117, 19 050)	7 108 (2 072, 13 389)	111 194 (79 980, 142 425)	555 189 (496 373, 613 388)
Seventh to eighth intersurvey period[7]	Δ infection-induced SP[5] %	17.2 (12.0, 23.1)	28.1 (16.3, 42.8)	17.2 (5.9, 29.9)	27.6 (16.3, 38.1)	21.7 (11.6, 35.3)	23.8 (17.53, 30.7)	20.0 (15.8, 24.4)
	Δ infections[6], N	153 238 (99 875, 209 337)	59 845 (33 788, 89 209)	33 250 (10 156, 58 006)	37 349 (22 015, 51 579)	16 096 (8 459, 24 294)	146 894 (105 140, 190 899)	299 664 (232 765, 371 500)
Eighth to ninth intersurvey period[8]	Δ infection-induced SP[5] %	15.6 (10.4, 22.0)	11.2 (1.9, 25.0)	22.8 (9.9, 35.3)	12.3 (2.48, 26.8)	15.8 (3.3, 38.2)	16.1 (9.8, 23.7)	15.8 (11.6, 20.8)
	Δ infections[6], N	137 730 (89 058, 188 605)	21 956 (2 842, 48 160)	45 970 (19 613, 71 651)	14 304 (2 048, 32 537)	8 294 (1 462, 16 678)	90 820 (50 665, 132 453)	229 102 (165 659, 296 563)
Males[2]								
Lower Mainland population[3]		1 039 470	212 482	189 821	120 041	57 970	580 314	1 619 784
Sixth to seventh intersurvey period[4]	Δ infection-induced SP[5] %	41.3 (36.4, 46.2)	22.2 (12.7, 32.1)	18.9 (10.9, 28.2)	7.3 (1.7, 16.7)	10.6 (4.1, 19.2)	17.3 (12.3, 22.46)	32.9 (29.3, 36.8)
	Δ infections[6], N	429 046 (378 501, 480 061)	47 219 (26 807, 68 174)	35 586 (20 047, 52 472)	7 396 (1 262, 16 442)	6 077 (2 131, 10 923)	96 744 (68 835, 124 824)	526 287 (469 193, 583 947)
Seventh to eighth intersurvey period[7]	Δ infection-induced SP[5] %	20.7 (15.4, 26.6)	28.7 (16.7, 40.6)	21.3 (10.2, 34.1)	30.3 (19.0, 41.50)	27.2 (16.0, 38.53)	26.4 (20.1, 33.0)	22.9 (18.7, 27.3)
	Δ infections[6], N	194 297 (140 604, 249 439)	61 009 (35 126, 86 220)	39 516 (18 241, 61 244)	36 388 (22 827, 49 696)	15 636 (8 955, 22 054)	152 116 (114 034, 189 749)	346 838 (280 530, 413 430)
Eighth to ninth intersurvey period[8]	Δ infection-induced SP[5] %	13.3 (8.50, 18.7)	12.3 (2.9, 28.1)	13.7 (3.1, 26.6)	15.1 (4.1, 27.7)	12.46 (2.3, 25.7)	13.51 (7.9, 20.7)	13.4 (9.53, 17.7)
	Δ infections[6], N	118 441 (72 849, 169 691)	21 711 (3 642, 46 393)	23 996 (3 788, 48 140)	17 024 (3 952, 31 535)	6 515 (947, 13 934)	69 486 (35 401, 109 695)	188 266 (130 733, 251 729)

Δ = absolute difference or change; CrI = credible interval around Bayesian estimates; SP = seroprevalence

[1] Seroprevalence participants excluded long term care or assisted living facility residents.

[2] Refers to biological sex as specified in available datasets

[3] Population census estimates for the Lower Mainland of BC, comprised of Vancouver Coastal Health Authority (VCHA) and Fraser Health Authority (FHA). BC STATS. Population projections. (P.E.O.P.L.E) Victoria, BC: BC Ministry of Citizens' Services, 2022. Available at: https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-projections (accessed 2023 August 24).

[4] September 2021 to March 2022; epi-weeks 39-10; Delta and Omicron BA.1 predominance

[5] Period-specific change (absolute difference (Δ)) in Bayesian estimates of cumulative SARS-CoV-2 infection-induced seroprevalence between specified serosurveys, interpreted as the risk of acquiring a first-ever SARS-COV-2 infection during the specified period. Negative risk estimates are censored.

[6] Period-specific change (absolute difference (Δ)) in the number of SARS-CoV-2 infections between specified serosurveys (after censoring negative risk estimates), interpreted as the number of first-ever SARS-CoV-2 infections acquired during the specified period.

[7] March 2022 to July 2022; epi-weeks 11-30; Omicron BA.2 and BA.5 predominance

[8] July 2022 to December 2022; epi-weeks 31-48; Omicron BA.5 and BQ.1/BQ.1.1 predominance

Supplementary Table 14 *Sensitivity analyses*: absolute difference in Bayesian point estimates of period-specific *hospitalization* risk per first-ever SARS-CoV-2 infection *with/without censoring or exclusions*, compared to primary analysis with specified censoring and exclusions

Intersurvey period	Age group (years)										
	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	≥80	Overall
Hospitalization without excluding prior COVID-19-associated hospitalizations and/or NAAT positive SARS-CoV-2 tests ≥90 days before hospital admission date, N[1]											
Sixth to seventh	97	24	27	40	110	214	371	540	596	695	2714
Seventh to eighth	77	12	10	23	28	32	80	202	336	729	1529
Eighth to ninth	46	2	19	11	20	24	56	133	242	553	1106
Primary IHR point estimates (%) With censoring of negative infection risks; with exclusion of prior COVID-19-associated hospitalizations and/or NAAT positive SARS-CoV-2 tests ≥90 days before hospital admission date											
Sixth to seventh	0.13	0.03	0.02	0.02	0.04	0.12	0.31	0.62	3.27	4.71	0.22
Seventh to eighth	0.41	0.10	0.01	0.02	0.04	0.03	0.06	0.25	0.42	2.17	0.22
Eighth to ninth	0.29	0.01	0.06	0.01	0.03	0.03	0.11	0.16	0.73	3.51	0.24
Sensitivity IHR, Approach 1, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] *Without censoring* of negative infection risks; with exclusion of prior COVID-19-associated hospitalizations and/or NAAT positive SARS-CoV-2 tests ≥90 days before hospital admission date											
Sixth to seventh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00
Seventh to eighth	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Eighth to ninth	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.43	0.01
Sensitivity IHR, Approach 2, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] With censoring of negative infection risks; *without exclusion* of prior COVID-19-associated hospitalizations and/or NAAT positive SARS-CoV-2 tests ≥90 days before hospital admission date											
Sixth to seventh	0.01	0.00	0.00	0.00	0.01	0.02	0.05	0.11	0.50	0.49	0.03
Seventh to eighth	0.02	0.02	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.12	0.02
Eighth to ninth	0.02	0.00	0.04	0.00	0.00	0.01	0.02	0.03	0.04	0.24	0.02
Sensitivity IHR, Approach 3, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] *Without censoring* of negative infection risks; *without exclusion* of prior COVID-19-associated hospitalizations and/or NAAT positive SARS-CoV-2 tests ≥90 days before hospital admission date											
Sixth to seventh	0.01	0.00	0.00	0.00	0.01	0.02	0.05	0.11	0.60	0.50	0.03
Seventh to eighth	0.07	0.02	0.00	0.00	0.01	0.00	0.01	0.03	0.04	0.13	0.02
Eighth to ninth	0.03	0.00	0.04	0.00	0.00	0.01	0.03	0.03	0.06	0.71	0.04

NAAT = nucleic acid amplification test; IHR = Infection hospitalization ratio, interpreted as risk (%) of hospitalization due to a first-ever SARS-CoV-2 infection acquired during the specified period.

[1] See main manuscript Table 3 for the tally of hospitalizations with exclusion of prior COVID-19-associated hospitalizations and/or NAAT positive tests ≥90 days before hospital admission date.
[2] Positive absolute differences indicate point estimates of IHR that are higher by the indicated amount in sensitivity analysis than in primary analysis.

Supplementary Table 15 *Sensitivity analyses*: absolute difference in Bayesian point estimates of period-specific *fatality* risk per first-ever SARS-CoV-2 infection *with/without censoring or exclusions*, compared to primary analysis with censoring and exclusions

Intersurvey period	Age group (years)										
	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	≥80	Overall
Fatalities due to COVID-19 without excluding those with NAAT positive SARS-CoV-2 tests ≥90 days before date of death, N[1]											
Sixth to seventh	0	0	0	1	7	13	43	83	156	456	759
Seventh to eighth	2	0	0	1	1	1	12	37	54	215	323
Eighth to ninth	0	0	0	0	0	2	9	22	40	197	270
Primary IFR point estimates (%) With censoring of negative infection risks/likelihoods; with exclusion of those with prior NAAT positive SARS-CoV-2 tests ≥90 days before date of death											
Sixth to seventh	-	-	-	0.001	0.003	0.01	0.04	0.11	0.97	3.32	0.07
Seventh to eighth	0.01	-	-	0.001	0.002	0.001	0.01	0.05	0.07	0.65	0.05
Eighth to ninth	-	-	-	-	-	0.004	0.02	0.03	0.11	1.27	0.06
Sensitivity IFR, Approach 1, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] *Without censoring* of negative infection risks; with exclusion of those with prior NAAT positive SARS-CoV-2 tests ≥90 days before date of death											
Sixth to seventh	-	-	-	0.000	0.000	0.000	0.00	0.00	0.03	0.00	0.00
Seventh to eighth	0.001	-	-	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00
Eighth to ninth	-	-	-	-	-	0.000	0.00	0.00	0.00	0.16	0.00
Sensitivity IFR, Approach 2, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] With censoring of negative infection risks; *without exclusion* of those with prior NAAT positive SARS-CoV-2 tests ≥90 days before date of death											
Sixth to seventh	-	-	-	0.000	0.000	0.000	0.00	0.00	0.02	0.10	0.00
Seventh to eighth	0.000	-	-	0.000	0.000	0.000	0.00	0.00	0.00	0.03	0.00
Eighth to ninth	-	-	-	-	-	0.000	0.00	0.01	0.02	0.07	0.00
Sensitivity IFR, Approach 3, absolute difference (Δ) in point estimates compared to primary analysis (%)[2] *Without censoring* of negative infection risks; *without exclusion* of those with prior NAAT positive SARS-CoV-2 tests ≥90 days before date of death											
Sixth to seventh	-	-	-	0.000	0.000	0.000	0.00	0.00	0.04	0.10	0.00
Seventh to eighth	0.001	-	-	0.000	0.000	0.000	0.00	0.00	0.00	0.03	0.00
Eighth to ninth	-	-	-	-	-	0.000	0.00	0.01	0.02	0.23	0.01

NAAT = nucleic acid amplification test; IFR = Infection fatality ratio, interpreted as risk (%) of dying due to a first-ever SARS-CoV-2 infection acquired during the specified period.

[1] See main manuscript Table 3 for the tally of deaths with exclusion of those with prior NAAT positive tests ≥90 days before date of death.

[2] Positive absolute differences indicate point estimates of IFR that are higher by the indicated amount in sensitivity analysis than in primary analysis.