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## **We update data weekly by Saturday evening.**

Follow @covid\_19\_canada and @MoriartyLab on Twitter to hear when these are up.

## **--QUESTIONS?**

## **--DATA YOU'D LIKE TO SEE?**

## **--THOUGHTS ABOUT HOW TO MAKE THESE DATA MORE USEFUL FOR DECISION-MAKING IN YOUR LIFE?**

## **--QUESTIONS ABOUT VACCINES, MASKING, VENTILATION AND HOW TO PROTECT YOURSELF AND LOVED ONES FROM COVID?**

COVID-19 Resources Canada hosts free, bilingual drop-in kitchen table-style Zoom conversations with volunteer scientists and others wanting to learn more and make good decisions. You can drop in anytime, as long as you're respectful to others and are not joining to disrupt or spread misinformation.

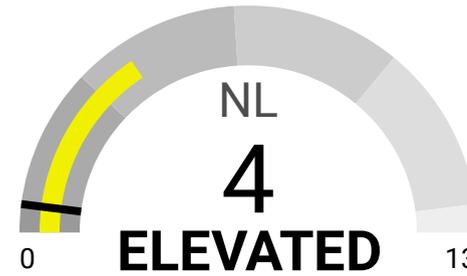
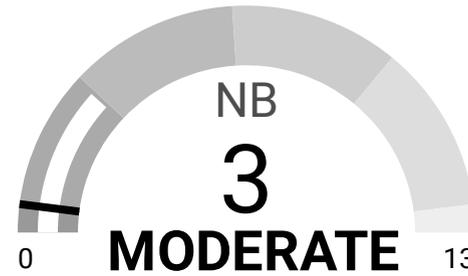
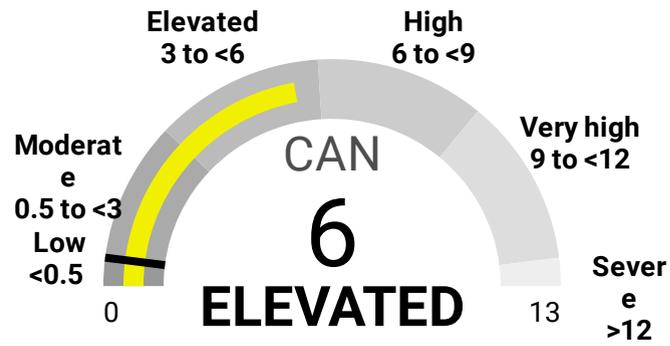
You can also request special sessions for your family, workplace, community organization or any group of 20 or more people. We can provide these sessions in a wide range of languages spoken in Canada.

Here's the sign-up link: <https://covid19resources.ca/public/discussions/>

We can't respond to individual questions sent by email or on Twitter, so these meetings are the best place to get the information you need. You can be anonymous and post questions in the meeting chat if you're uncomfortable joining the conversation via audio or video.

**JOURNALISTS:** For interview requests contact [amanda@afcommunications.ca](mailto:amanda@afcommunications.ca)

# CANADIAN COVID-19 HAZARD INDEX: October 7, 2022



The Hazard Index is calculated from 3 equally weighted categories: 1) Current infections and spread; 2) Healthcare system impact; 3) Mortality. Within each category there is one sub-category for trends over the most recent week (Trends) and one sub-category for current parameter values relative to a specified baseline (Current values). Trends and current values are weighted equally when determining the final score for a category. All Hazard Index input [data and sources are available here](#). Past hazard index scores are available in the Table below. Hazard index scores are grouped into 6 ranges: LOW (<0.5, blue), MODERATE (0.5 to <3, white), ELEVATED (3 to <6, yellow), HIGH (6 to <9, light orange), VERY HIGH (9 to <12, dark orange), SEVERE (>12, red).

Past hazard index scores: SCROLL DOWN

Date	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Oct 7, 2022	6	7	8	7	3	4	7	4	5	6	4	7
Sep 30, 2022	6	7	6	8	4	3	7	5	5	4	4	7
Sep 23, 2022	6	7	6	7	4	3	7	7	6	13	4	4
Sep 16, 2022	8	7	7	9	5	6	5	10	6	4	3	6

**NOTE:** On Sep 20/22 we revised the hazard index inputs and scale so that it now corresponds directly to expected toxic drug-corrected excess mortality. A score of <0.5 (LOW) means that COVID is not expected to cause substantial excess mortality. A score of 0.5-3 means that COVID is expected to cause 0-3% excess mortality (or a little more than 3X more deaths than flu in an average year). A score of >3-6 means that COVID is expected to cause 3-6% excess mortality etc. For reference, average drug death-adjusted excess mortality for the COVID epidemic in Canada until Omicron (Dec 2/21) is currently ~7%.

COVIDdataMasterTableau

[Hazard index DASHBOARD current FRANCAIS](#) [Hazard index DASHBOARD current](#)

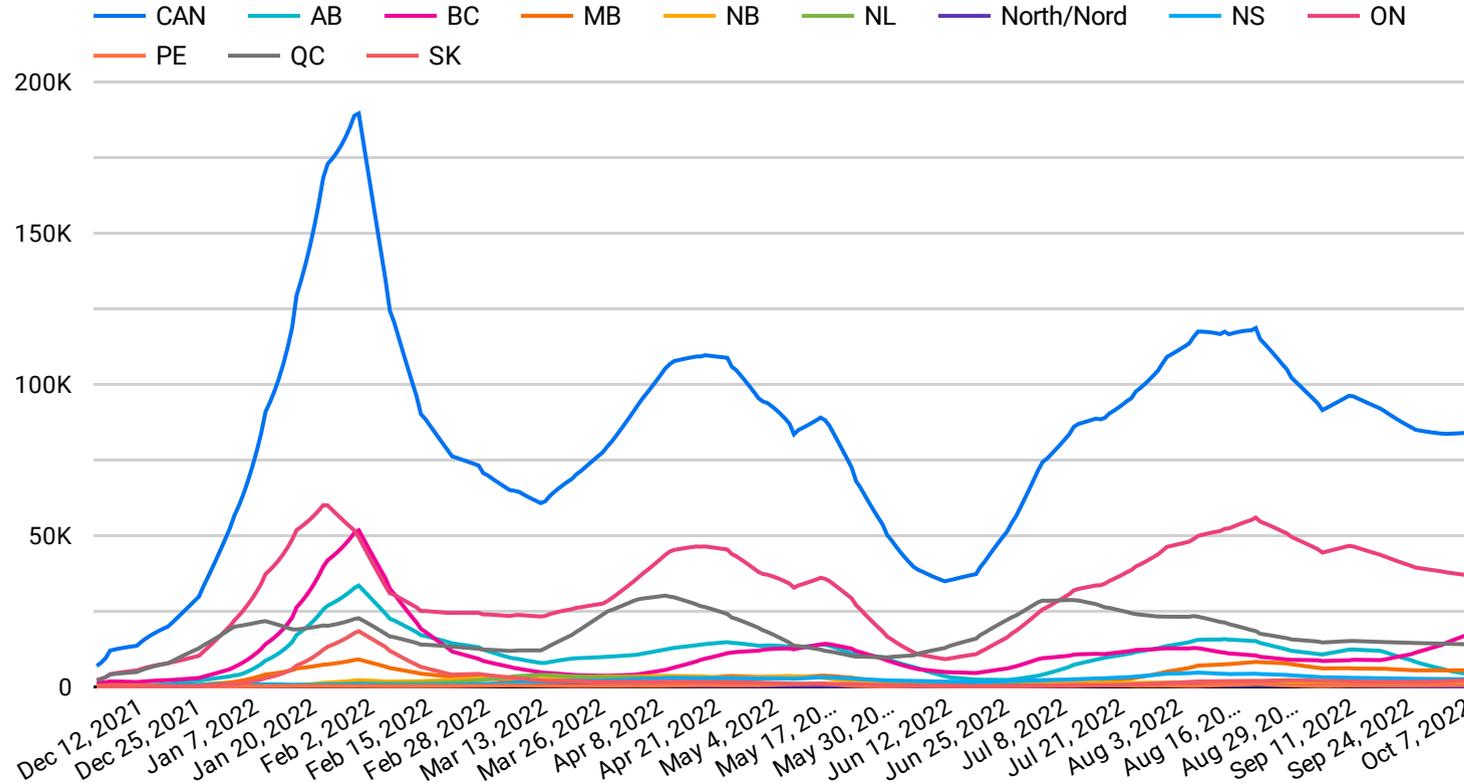
Vendredi, le 7 octobre 2022	CAN	AB	BC	MB	NB	NL NORTH/N	NS	ON	PE	QC	SK	Sources	
	Sévère	Sévère	Sévère	Sévère	Haut Très élevé	Sévère Très élevé	Sévère Très élevé	Sévère	Sévère Très élevé	Sévère	Sévère		
<b>Score moyen de l'indice par rapport à la ligne de base du 5 novembre 2021 au QC (risque "modéré")</b>	5.52	7.49	8.15	6.94	2.92	3.89	7.15	4.27	5.29	6.03	3.85	7.30	
Valeur inférieure de l'intervalle de confiance à 95 %	7.38	10.50	10.99	10.38	3.79	6.80	10.27	6.96	7.38	9.44	5.47	10.65	
Valeur supérieure de l'intervalle de confiance à 95 %	3.65	4.48	5.31	3.50	2.05	0.97	4.04	1.59	3.20	2.62	2.24	3.94	
<b>CATÉGORIES PONDÉRÉES</b>													
<b>1. Protection vaccinale</b>													
<b>1a. Tendances (variation hebdomadaire)</b>													
	CAN	AB	BC	MB	NB	NL NORTH/N	NS	ON	PE	QC	SK		
% de personnes ayant reçu 2 doses de vaccin ou plus NON protégées contre l'infection (Tableau scientifique de l'Ontario)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://covid19-sciencetable.c">https://covid19-sciencetable.c</a>
% de personnes ayant reçu 2 doses de vaccin ou plus NON protégées contre l'hospitalisation (Tableau scientifique de l'Ontario)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://covid19-sciencetable.c">https://covid19-sciencetable.c</a>
% de personnes ayant reçu 2 doses de vaccin ou plus NON protégées contre l'admission aux soins intensifs (Tableau scientifique de l'Ontario)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://covid19-sciencetable.c">https://covid19-sciencetable.c</a>
Rapport de cotes de l'hospitalisation (2 doses de vaccin ou plus vs non vaccinés ; ASPC ; changement mensuel)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://health-infobase.canad">https://health-infobase.canad</a>
Rapport de cotes de décès (2 doses de vaccin ou plus vs non vaccinés ; ASPC ; changement mensuel)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://health-infobase.canad">https://health-infobase.canad</a>
Rapport de cotes de l'hospitalisation (3 doses de vaccin ou plus vs non vaccinés ; ASPC ; changement mensuel)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://health-infobase.canad">https://health-infobase.canad</a>
Rapport de cotes de décès (3 doses de vaccin ou plus vs non vaccinés ; ASPC ; changement mensuel)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	<a href="https://health-infobase.canad">https://health-infobase.canad</a>
<b>MOYENNE</b>	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	
<b>1b. Valeurs actuelles :</b>													
<b>Différence par rapport aux</b>													

# How many FIRST TIME COVID infections happen each day?

ESTIMATES CHANGE AS SOURCE DATA ARE UPDATED. THE MOST RECENT 2 WEEKS OF ESTIMATES ARE BASED ON WEEKLY RATES OF CHANGE IN SOURCE DATA AND ARE PROVISIONAL. To download data, click on the three vertical dots at the top right, then choose Export. To select only your region, click on the chart icon to the left of the 3 vertical dots.

## Estimated new daily FIRST TIME infections

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



These estimates likely reflect the number of people infected with Omicron at least once (i.e. for the first time). Over time, they match quite well to [seroprevalence estimates from Canadian Blood Services](#) (see comparison [here](#)). They are lower than infection numbers estimated from waste water and self-reporting. However, they more accurately [predict severe outcomes](#) (hospitalizations, ICU admissions, deaths) than waste water and self-reporting estimates, which include reinfections. Waste water-independent methods for are also useful for estimating daily infections in provinces and non-urban areas without waste water data.

The timing of waves estimated by this method are affected by reporting delays for cases, deaths and test positivity rates. When this happens, waves shift right. The most recent 2 weeks of data are estimated from weekly rates of change for some parameters. Estimates change as Quebec (QC) death reporting is completed and corrected, especially for the most recent 6 weeks. All estimates are based on weekly case and test positivity rate data from PHAC and weekly QC deaths from INSPQ.

Although test positivity rates are still reported, NWT and Nunavut have stopped reporting cases and deaths to PHAC. Saskatchewan now reports only every 4 weeks. When data for these regions are unavailable, we use average per capita values for Manitoba and Alberta. Saskatchewan data are back-filled when they become available.

Estimate error rates are higher for the most recent 6 weeks as QC death reporting is completed and dates of death are adjusted.

### Total estimated FIRST TIME infections since Dec 2/21

CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
25.9M	3.3M	3.5M	1M	518K	320K	87K	651K	10M	115K	5.5M	770K

### Method for estimating actual infection numbers (SIR model)

New daily infections in Quebec (QC) are estimated from reported deaths and the expected [QC Omicron population infection fatality rate \(popIFR\)](#) using an [SIR model](#) trends. Deaths reported in QC are used for these calculations because historically QC has reported most/all of its COVID deaths in a timely fashion. COVID death under-detection/under-reporting in other Canadian regions is common, as is seen in most countries. You can information about this at our [Royal Society of Canada report on COVID mortality in Canada](#).

Actual infections in QC are estimated using [deaths reported by date of death by INSPQ](#) and the [QC Omicron popIFR](#) 14 days earlier. Comparing infection numbers estimated by this method to QC infections reported by PHAC for the same day gives daily infection under-detection rates for QC (IUDR). New daily infections for other Canadian regions are then estimated by comparing test positivity rates (TPR) and per capita test rates (PCTR) [reported by PHAC](#) for QC on the same day, and adjusting by the QC IUDR on that day. Using Ontario as an example: Estimated actual infections (ON) = ((ON TPR/QC TPR)/(ON PCTR/QC PCTR))\*(QC IUDR). Test and case reporting to PHAC is often delayed by up to 2 weeks. INSPQ reports QC deaths by actual date of death. Deaths reported 2 weeks later by INSPQ are used to estimate under-detection of PHAC-reported cases 2 weeks earlier, but these infections may have occurred 20 or more days earlier than reported dates of death. Total infection numbers estimated by this method are "anchored" (adjusted) to the [most recent seroprevalence data](#) for each province, and the estimated maximum % of the population susceptible to infection on that date, based on rates of 2, 3 and 4 dose vaccination and reported dose- and time-dependent vaccine protection vs infection from [UKHSA](#).

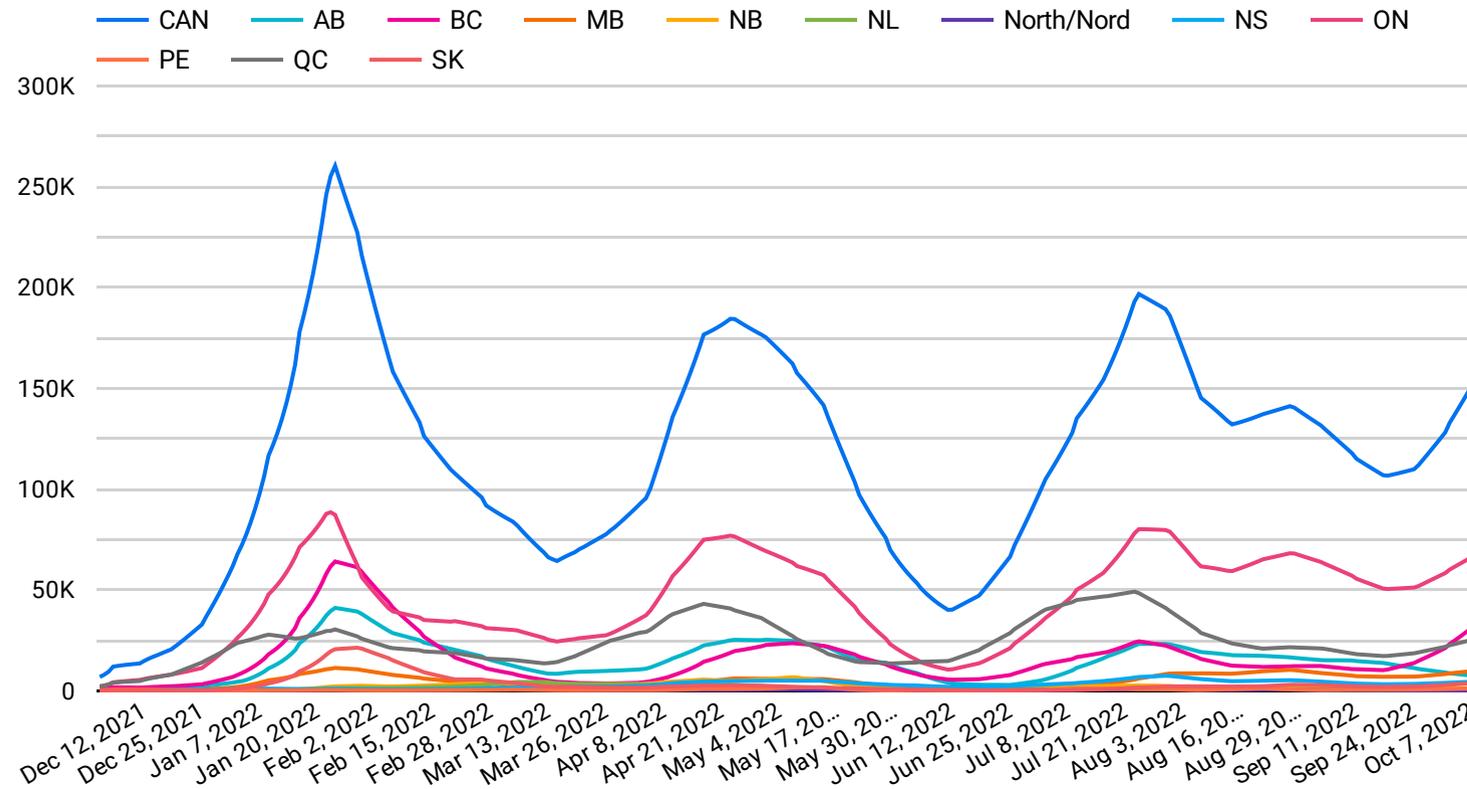
The popIFR tells us how many deaths are expected if 100% of the population is infected. It is based on the age structure of the population, age-specific vaccination rates (PHAC: Public Health Agency of Canada) on any given date, Omicron infection fatality rates, and protection against death from at least 2 vaccine doses, calculated [as described HERE](#), as well as an adjustment factor that reflects the percentage of total expected Omicron deaths in QC that have been reported to date (which is largely a function of the % of the population older than 40 who have been infected at least once). We calculate IFRs each week based on these data and new weekly reported deaths in QC to estimate actual infections as accurately as possible, and use the midpoint popIFR of a 3 week rolling window to estimate infections from deaths reported in QC 2 weeks later. You can find current QC popIFRs [HERE](#). PopIFRs for other provinces are calculated in a similar fashion. PopIFRs for each province are also adjusted based on differences in 2018-2020 average life expectancy at birth in each province compared to QC, as a proxy for the general health of the population (which contributes to susceptibility to death from COVID-19). PopIFRs for other provinces relative to the QC popIFR have remained similar through Omicron, because they change largely in tandem to similar timing of vaccination campaigns and mortality waves. This allows us to calculate expected numbers of deaths in each region on any given date by multiplying by the ratio of each province's popIFR to the QC popIFR at the beginning of Omicron (Dec 2/21), then multiplying this ratio by the QC popIFR on the date of interest. Most provinces have conducted less efficient/slower rollout of 1st, 2nd and additional vaccine doses than QC. Therefore, some provincial popIFRs may fall more slowly over time than the popIFR for QC. Thus, expected deaths on any given date in some provinces may be higher than calculated using this method. As can be seen by comparing excess all-cause mortality in QC and ON from Dec/21-Jan/22, [\(p17 of report HERE\)](#) expected deaths calculated by this method almost perfectly recapitulate excess mortality.

# How many TOTAL COVID infections happen each day (including reinfections)?

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## Estimated new daily TOTAL infections

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



### Total estimated infections since Dec 2/21

CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
35.7M	4.6M	4.9M	1.5M	712K	413K	119K	912K	13.9M	164K	7.5M	1M

### ESTIMATING TOTAL ACTUAL INFECTIONS (INCLUDING REINFECTIONS)

On Aug 24, 2022, INSPQ began [publishing results of weekly surveys](#) asking people 18+ in Quebec to self-report whether they have/had COVID in the last 7 days (positive for PCR or RAT). Polling is done for people registered in the CLIC-Sante vaccination portal, and is more likely to reflect self-reported infection rates among vaccinated adults. The method and polling up to May 2022 were developed and conducted by CIRANO (Centre interuniversitaire de recherche en analyse des organisations). CIRANO data from Jan 13 onward are available [HERE](#).

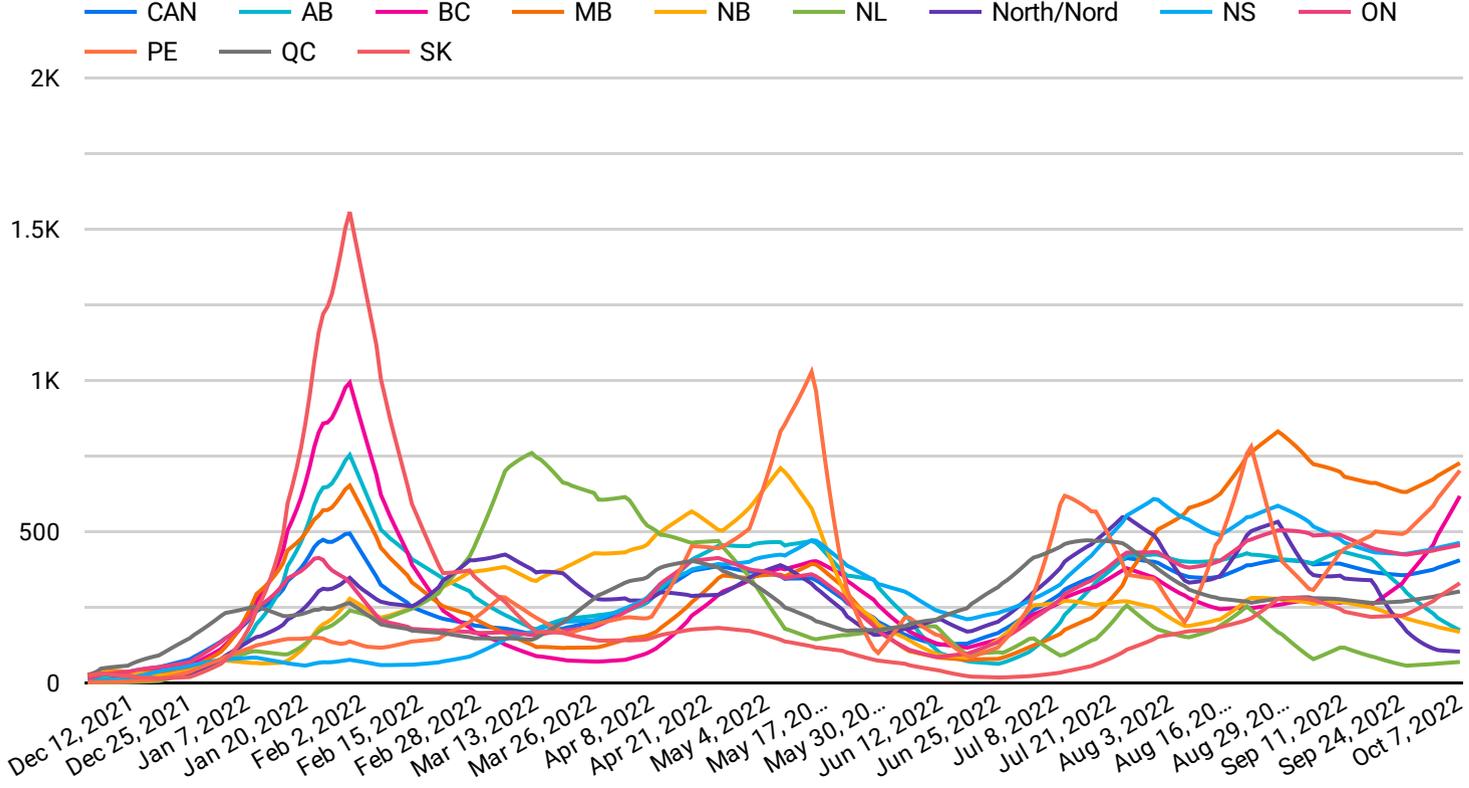
We calculate how much higher CIRANO/INSPQ self-reported infections are than estimated first-time infections, and multiply this by first-time infections to estimate the total number of infections on any given day. Once again, thank Quebec, Quebec researchers from CIRANO and INSPQ for truly fantastic COVID data reporting and ongoing efforts to understand the magnitude of impact of the epidemic.

# How many TOTAL Omicron infections per 100,000 people happen each day?

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## Estimated TOTAL daily infections/100,000

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



Calculating estimated TOTAL daily infections (first time and reinfections) per 100,000 people allows comparison of the relative intensity of surges in different Canadian regions over time, independent of differences in the size of their populations.

Looking at data this way shows that the December-February BA.1 wave was relatively smaller in Atlantic provinces than other Canadian regions, but that per capita infections in Atlantic Canada relative to the rest of the country were often higher thereafter.

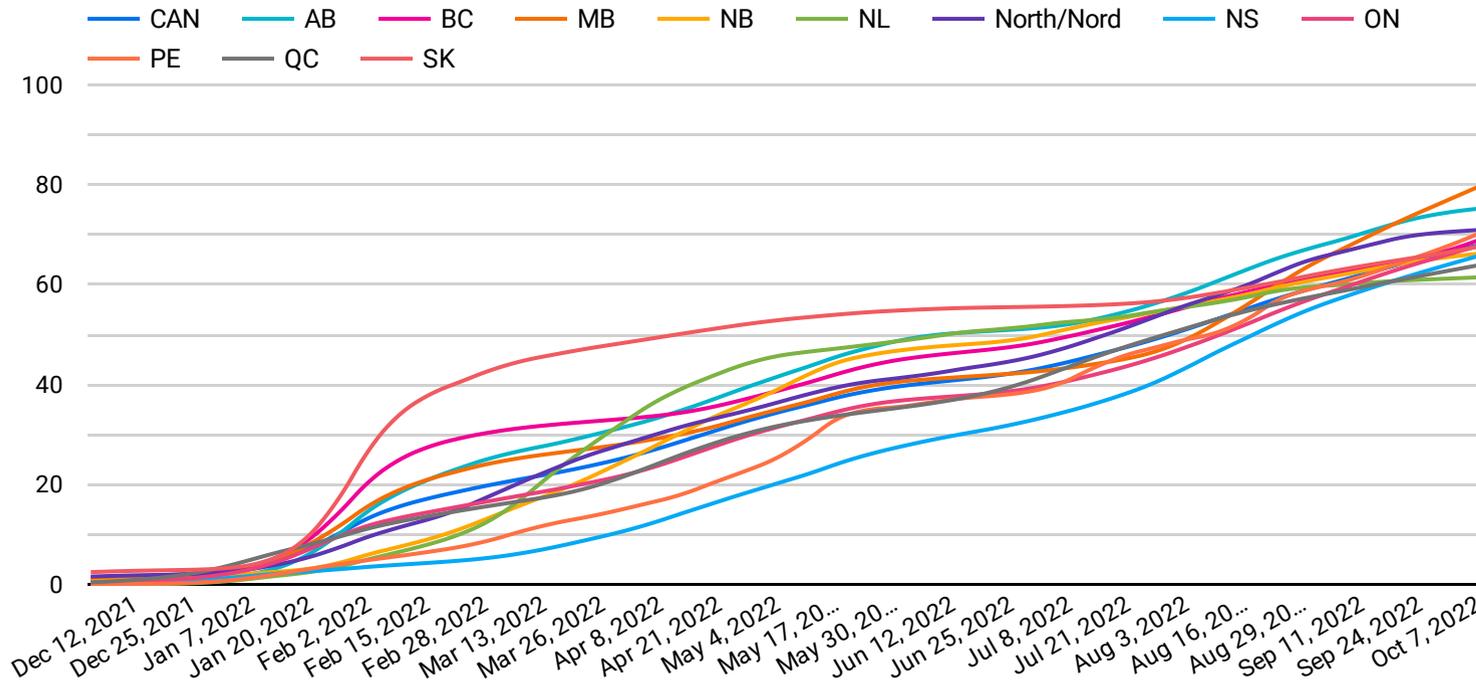
### Total estimated infections/100,000 since Dec 2/21

CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
85K	93K	84K	102K	82K	71K	87K	88K	86K	94K	80K	74K

# What percentage of people have been infected with Omicron to date?

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Estimated cumulative % population infected since Dec 2/21 (error range +/- 9%)



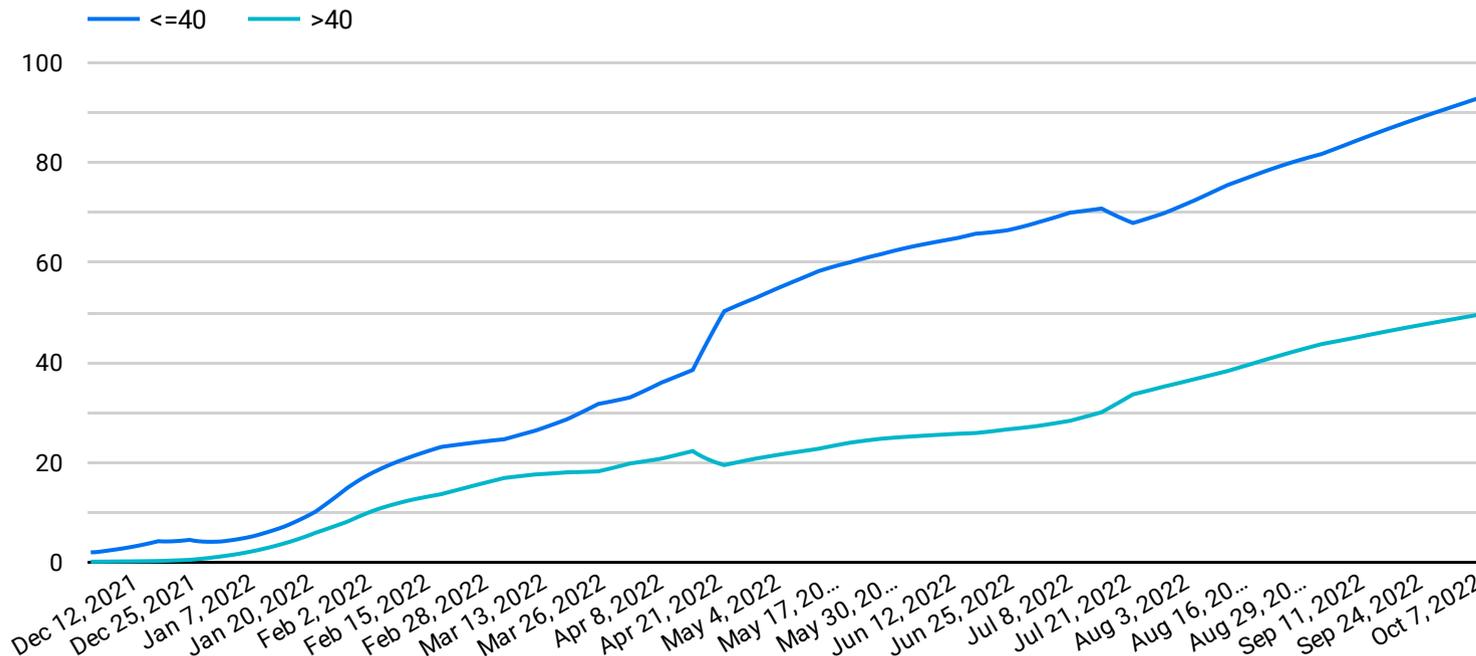
**TOP GRAPH:** Cumulative % population infected at least once since Dec 2/21, calculated from [total estimated new daily infections](#).

Seroprevalence estimates of % blood donors 17+y in Canada infected fby June 20/22: 53.36-66.95% (95% CI range). Seroprevalence data are from Canadian Blood Services [HERE](#).

**BOTTOM GRAPH:** Estimated % of people 40 and younger (<=40) and older than 40 (>40) infected at least once.

This is estimated by calculating the % of total expected Omicron deaths in each age group that have been reported on any given day, then calculating the ratio of each of these ratios, after adjusting for the proportion of the Canadian population contributed by each age group. The estimates obtained by our method are similar to the most recent [age-specific seroprevalence estimates for Canada](#).

Estimated % people 40 and younger and older than 40 infected since Dec 2/21 (error range +/- 9%)

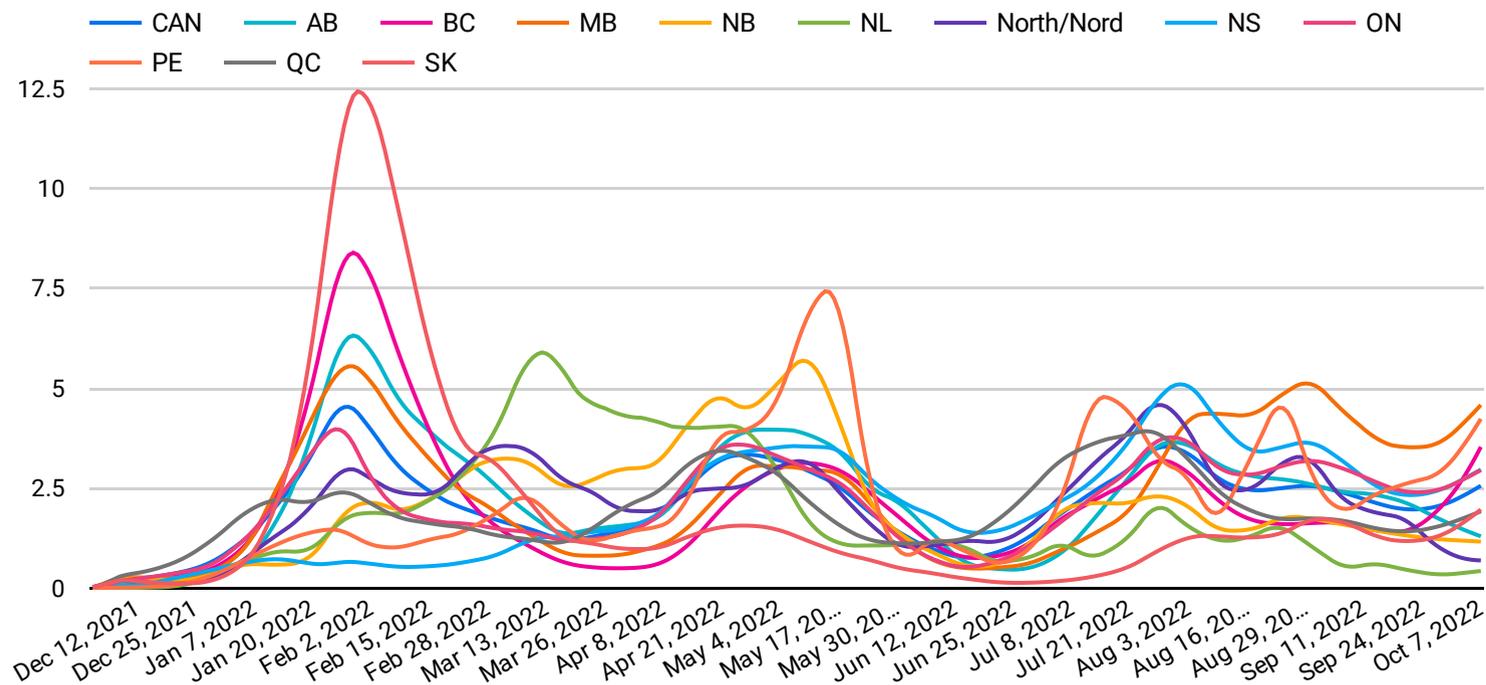


NOTE: Infection estimates are anchored to the latest seroprevalence data from the COVID-19 Immunity Taskforce and Canadian Blood Services/HemaQuebec. Our infection estimates usually decline somewhat as more recent seroprevalence data become available, and can be somewhat higher than actual infections during rapid infection surges. The uncertainty interval is +/-9% (-/+15% for most recent 6 weeks).

# What percentage of the population is infected or experiencing COVID symptoms longer than 4 weeks that limit activities of daily life?

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**Estimated daily infection prevalence (% population infected)**  
(error range +/- 9% overall; 15% last 6 weeks)

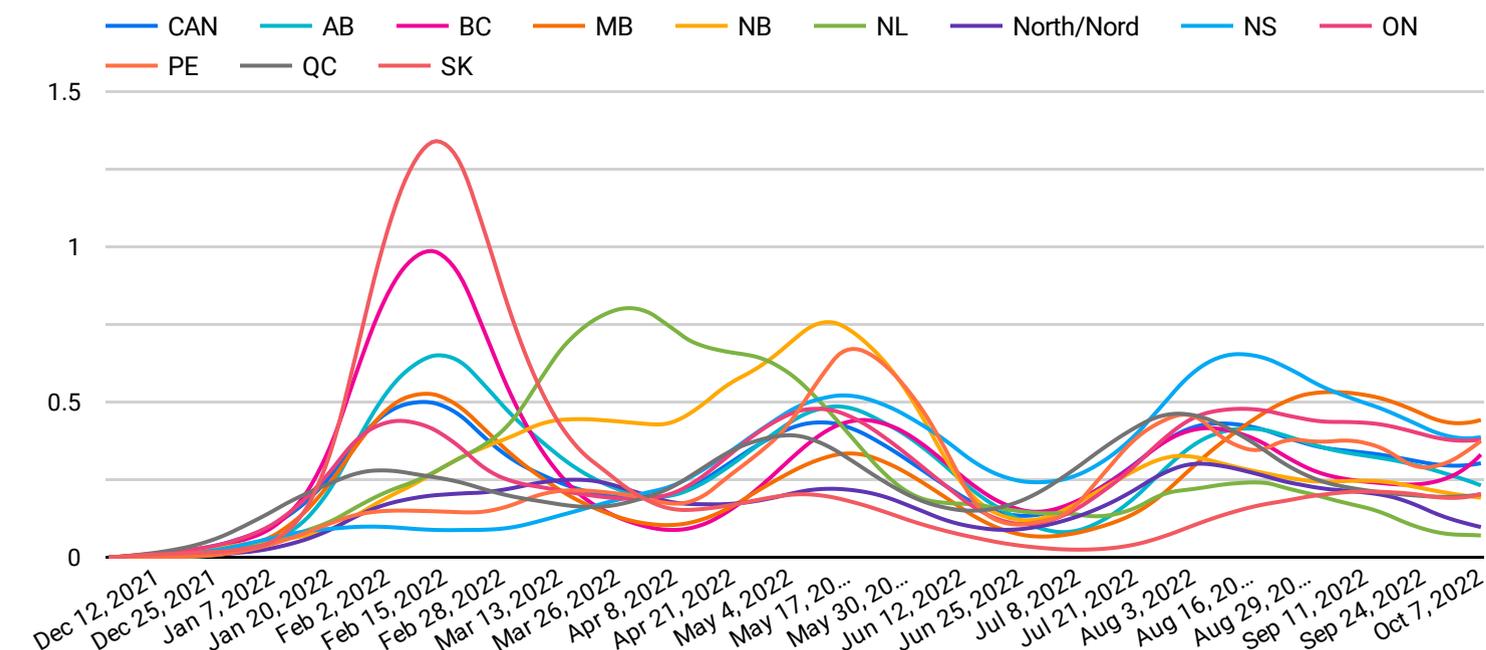


**TOP PANEL:** Estimated percentage of people in each region infected on any given day, assuming the average infection lasts 7 days. These values are calculated from estimated [total daily infections](#).

**BOTTOM PANEL:** Estimated prevalence of cases with symptoms that limit activities of daily life and last at least 4 weeks. These estimates assume that daily life activity-limiting symptoms last EXACTLY 4 weeks, and are likely underestimates. They are calculated from estimated [daily long COVID-infections](#).

Estimates of the combined prevalence of infections and long-lasting activity-limiting symptoms are provided on the following page. These estimates are important for understanding the % of the population that may be unable to work, may be experiencing impaired work performance and/or is experiencing limitations in the ability to conduct activities of daily life.

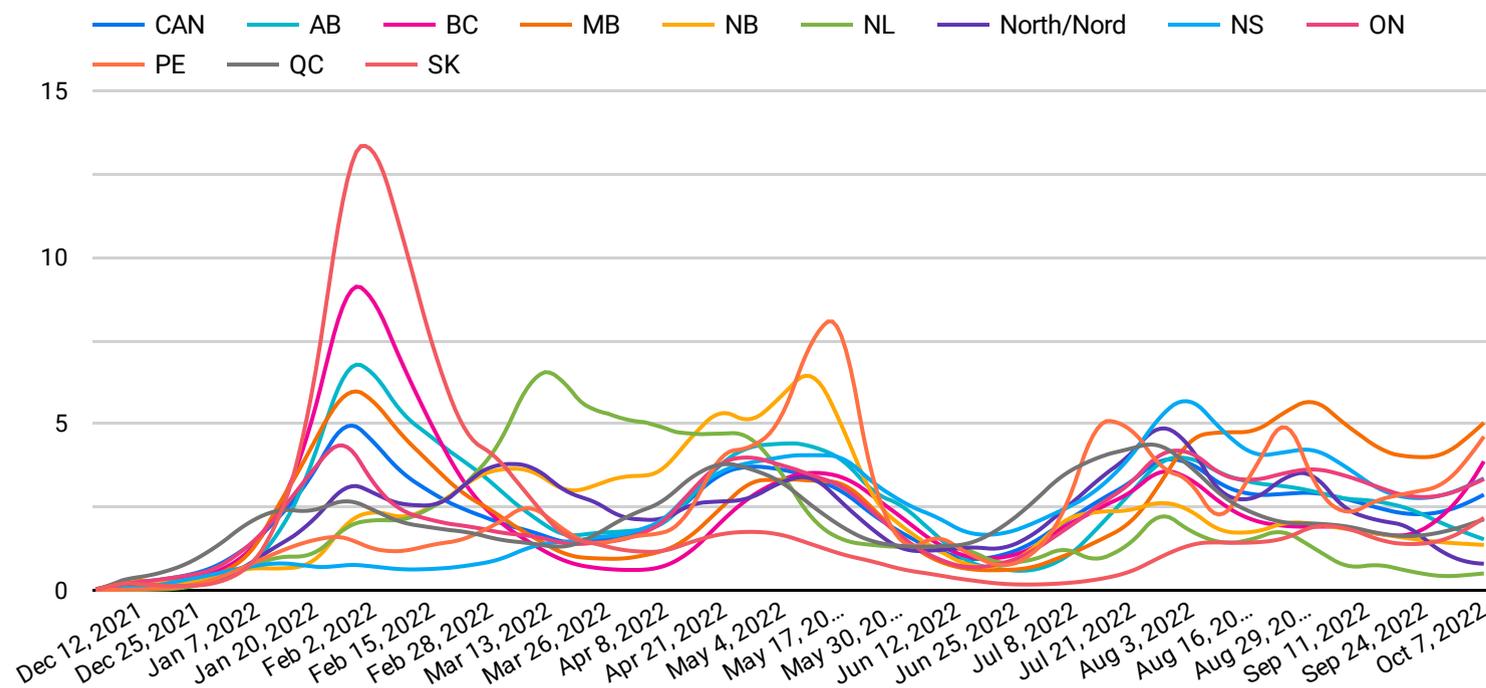
**Estimated % population experiencing symptoms lasting at least 4 weeks that limit daily life activities** (error range +/- 9%; 15% last 6 weeks)



# What percentage of the population is infected or experiencing daily life activity-limiting symptoms on any given day?

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## Estimated daily % of population infected or experiencing activity-limiting long-lasting symptoms (error range +/- 9% overall; 15% last 6 weeks)



The chart at top shows what percentage of the population is infected or experiencing daily life activity-limiting long-lasting symptoms on any given day. It is the combined [prevalence of people infected](#) plus [prevalence of people experiencing long-lasting activity-limiting symptoms](#).

The table at the bottom shows the same data in an alternative format. The GRAND TOTAL at the bottom of the table is the average daily % of the population infected or experiencing activity-limiting long-lasting symptoms since December 2, 2021. It is especially useful for estimating the % of the workforce that may be unable to work at all or at full capacity due to COVID. Since a [greater percentage of younger people have been infected to date](#), and younger people have also likely experienced more reinfections, it is likely that these estimates under-estimate Omicron impacts on the labour force, especially among those repeatedly infected because of the inability to limit exposure due to face-to-face work, and people living in households with others who work in person and/or children. Long-lasting activity-limiting symptoms are more likely among people with fewer than 3 vaccine doses (typically younger), but this may be balanced by an increased frequency of long-lasting activity-limiting symptoms among people with severe disease, who are more likely to be unvaccinated, but who may also be fully vaccinated older adults, especially those with risk factors for increased COVID severity.

## Estimated daily % of population infected or experiencing activity-limiting long-lasting symptoms (error range +/- 9% overall; 15% last 6 weeks)

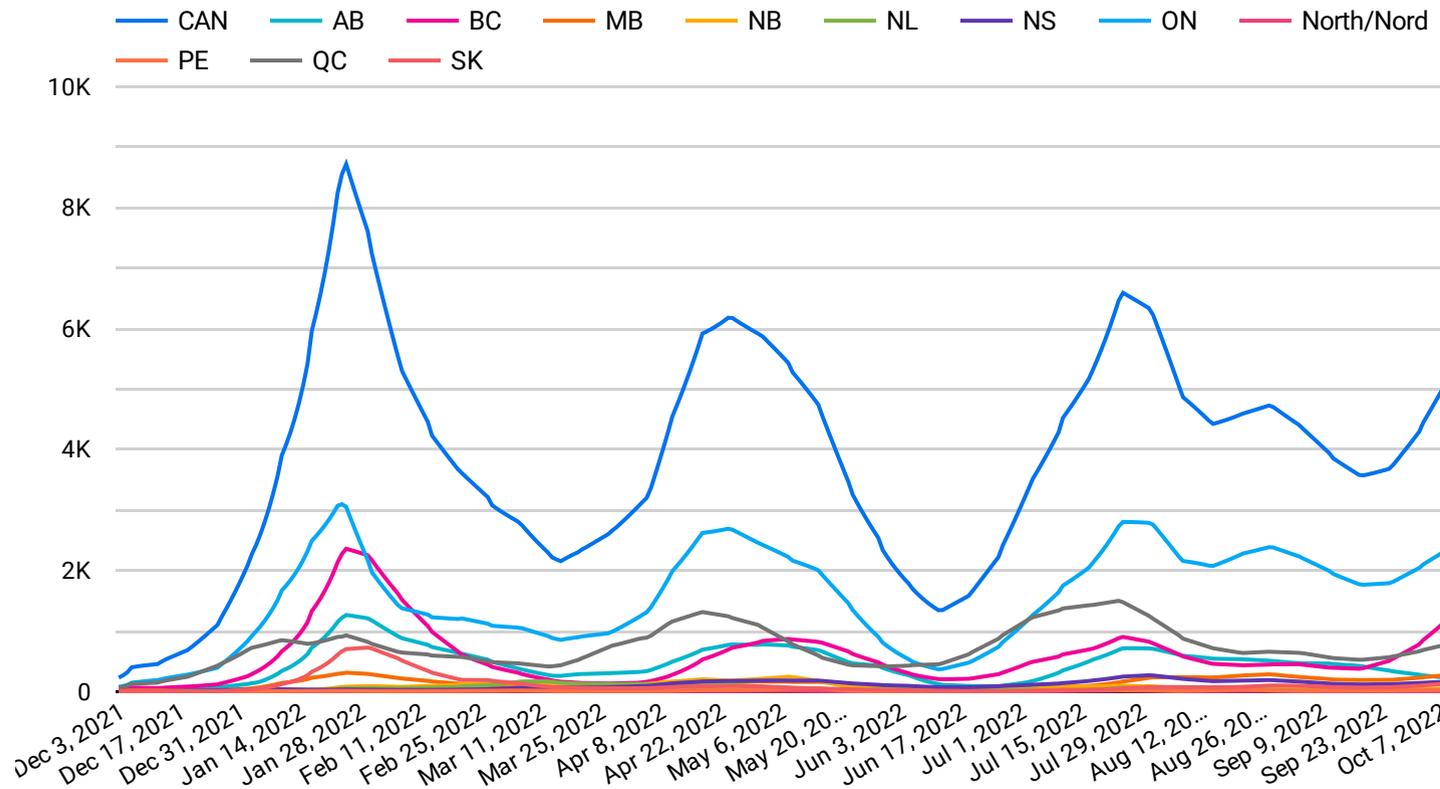
date ▾	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Oct 7, 2022	2.9	1.5	3.9	5.0	1.4	0.5	0.8	3.4	3.3	4.6	2.1	2.2
Oct 6, 2022	2.8	1.6	3.6	4.9	1.4	0.5	0.8	3.3	3.3	4.4	2.1	2.1
Oct 5, 2022	2.7	1.6	3.4	4.8	1.4	0.5	0.8	3.2	3.2	4.2	2.0	2.0
Oct 4, 2022	2.7	1.7	3.2	4.7	1.4	0.5	0.8	3.2	3.1	4.1	2.0	1.9
Oct 3, 2022	2.6	1.7	3.0	4.5	1.4	0.5	0.9	3.1	3.1	3.9	1.9	1.8
Oct 2, 2022	2.5	1.8	2.8	4.4	1.4	0.4	0.9	3.0	3.0	3.7	1.9	1.7
Oct 1, 2022	2.5	1.8	2.7	4.3	1.4	0.4	0.9	3.0	3.0	3.6	1.9	1.7
Sep 30, 2022	2.4	1.9	2.5	4.2	1.4	0.4	1.0	2.9	2.9	3.4	1.8	1.6
Sep 29, 2022	2.4	1.9	2.4	4.2	1.4	0.4	1.1	2.9	2.9	3.3	1.8	1.6
Sep 28, 2022	2.4	2.0	2.3	4.1	1.4	0.4	1.1	2.9	2.9	3.2	1.8	1.5
<b>Grand total</b>	<b>2.4</b>	<b>2.6</b>	<b>2.4</b>	<b>2.6</b>	<b>2.3</b>	<b>2.1</b>	<b>2.3</b>	<b>2.3</b>	<b>2.4</b>	<b>2.5</b>	<b>2.2</b>	<b>2.2</b>

# How many people have (had) COVID symptoms lasting longer than 4 weeks THAT LIMIT ACTIVITIES OF DAILY LIFE?

ESTIMATES CHANGE AS SOURCE DATA ARE UPDATED. THE MOST RECENT 2 WEEKS OF ESTIMATES ARE BASED ON WEEKLY RATES OF CHANGE IN SOURCE DATA AND ARE PROVISIONAL. To download data, click on the three vertical dots at the top right, then choose Export. To select only your region, click on the chart icon to the left of the 3 vertical dots.

## Estimated new daily infections resulting in symptoms lasting >4 weeks that limit activities of daily life

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



### Total estimated infections since Dec 2/21 resulting in long COVID symptoms >4 weeks duration that limit activities of daily life (error range +/-9%)

CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
1.2M	141K	181K	41K	26K	16K	2K	33K	485K	5K	229K	35K

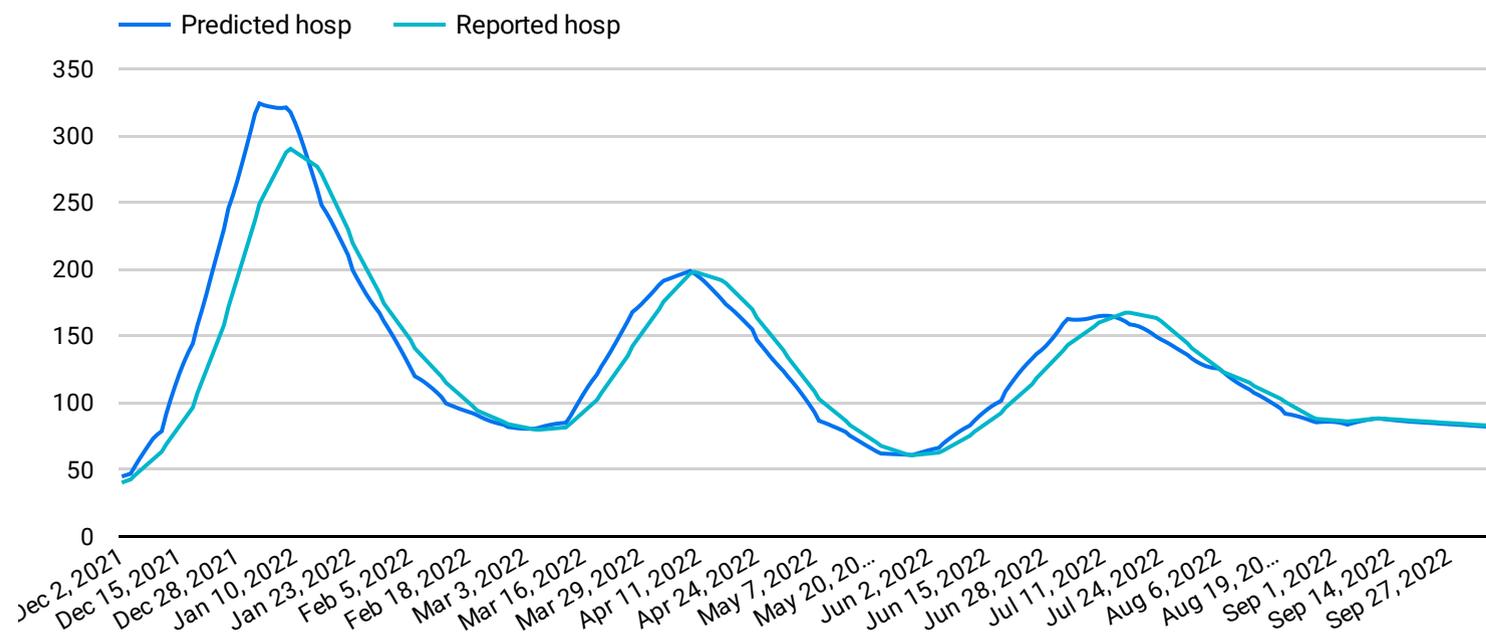
Data from the UK Office of National Statistics (ONS) monthly survey of self-reported COVID symptoms lasting longer than 4 weeks indicate that [adults infected with Omicron](#) are as likely to develop longer-lasting symptoms as people infected with earlier variants. [People with 3 vaccine doses](#) were less likely to develop longer-lasting symptoms from Omicron infection than those with 2 doses, consistent with a previous ONS report that double vaccination reduces the likelihood of long COVID symptoms from pre-Omicron variants [compared to unvaccinated people](#). Triple-vaccinated people infected with [BA.2](#) were more likely to report long-lasting symptoms than those infected with BA.1. ONS data suggest a larger effect of vaccination in protecting against long-lasting COVID symptoms than a large [U.S. Veterans' Affairs](#) study of an older population.

Due to the complexity of the variables that might affect long COVID incidence in Canada, including differences in timing since vaccine doses compared to other countries and rapid rollout of 3rd doses during the BA.1 wave, we have crudely estimated numbers of infections in Canada with symptoms lasting longer than 4 weeks that also limit the ability to conduct activities of daily life (referred to here as LC for long COVID) using an average of the % frequency of long-lasting activity-limiting symptoms among double- and triple-vaccinated people infected with BA.1 and BA.2 in UK ONS data ([3.4% of total infections](#)). This estimate does not account for infections in unvaccinated people. However, [estimated total infections](#) in Canada include children, and long COVID in children appears at worst to be as frequent as in adults.

Incidence of LC is likely affected by both vaccination and age. The median age of the Canadian population is 3% older than the UK, but Canada has administered 3% more vaccine doses/person, so a baseline rate of 3.4% for the Canadian population is reasonable. We adjusted the % of infected people in each province expected to develop LC using popIFRs relative to the Canadian popIFR, because popIFRs reflect population age structure and vaccination rates. The % infections expected to develop LC for each province were: CAN 3.4, AB 3.2, BC 3.7, MB 2.3, NB 4.1, NL 4.1, NS 4.6, ON 3.7, PEI 3.4, QC 2.6, SK 3.8, North 1.8.

These estimates are based on TOTAL estimated daily infections (first-time plus reinfections), since ONS data do not distinguish between people with first or reinfections.

## Predicted and reported new daily COVID hospitalizations in Quebec



To estimate numbers of new daily hospitalizations and ICU admissions expected from [estimated new daily infections](#), we calculate the ratio of total new daily hospitalizations and ICU admissions to new daily deaths during the Omicron waves in Quebec, and multiply these ratios by expected new daily deaths. Hospitalization:death ratios were calculated for new hospital admissions compared to deaths 10 days later. ICU:death ratios were calculated for new ICU admissions compared to deaths 7 days later. Reported hospitalizations and ICU admissions slightly lag predicted (expected) new hospitalizations and ICU admissions because the Predicted values show the numbers expected to occur 7-10 days later.

**Top graph:** compares predicted and reported new daily hospitalizations in Quebec estimated by this method.

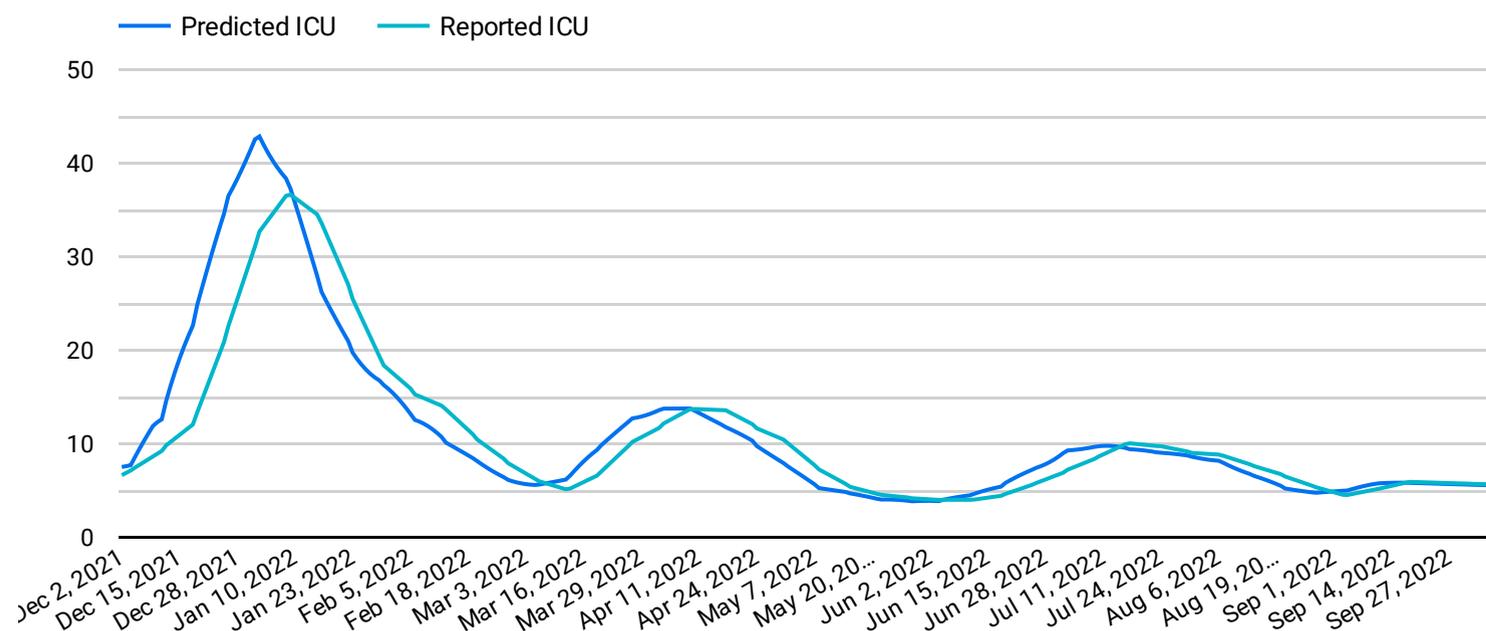
**Bottom graph:** comparison of predicted and reported new daily ICU admissions in Quebec.

**Notes:**

1. Estimated new daily hospital admissions do NOT include new daily ICU admissions, which are assumed to have been admitted to non-ICU care first.

2. Ratios for the most recent 2-3 months of data are still provisional due to delayed reporting and ongoing corrections to dates of death and hospital/ICU admissions in data provided by INSPQ.

## Predicted and reported new daily COVID ICU admissions in Quebec

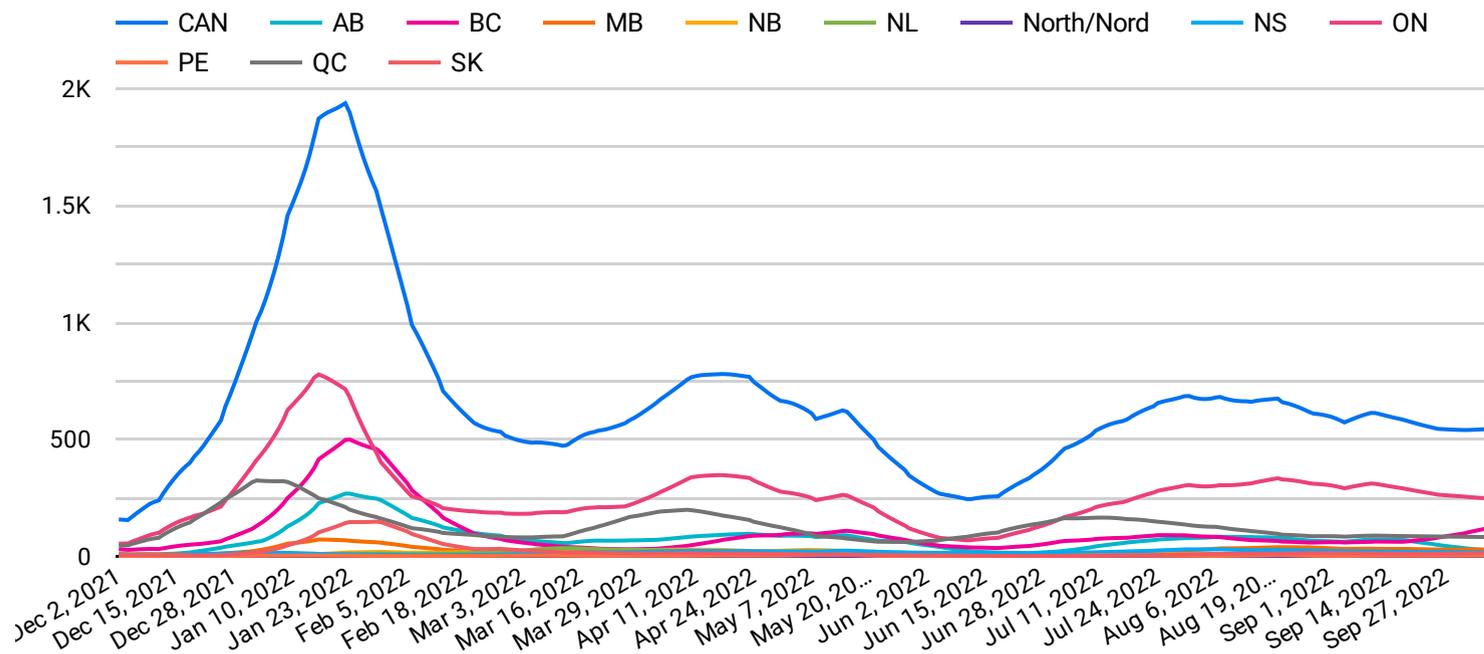


# Estimated new daily Omicron hospitalizations and ICU admissions (all regions)

ESTIMATES CHANGE AS SOURCE DATA ARE UPDATED. THE MOST RECENT 2 WEEKS OF ESTIMATES ARE BASED ON WEEKLY RATES OF CHANGE IN SOURCE DATA AND ARE PROVISIONAL. To download data, click on the three vertical dots at the top right, then choose Export. To select only your region, click on the chart icon to the left of the 3 vertical dots.

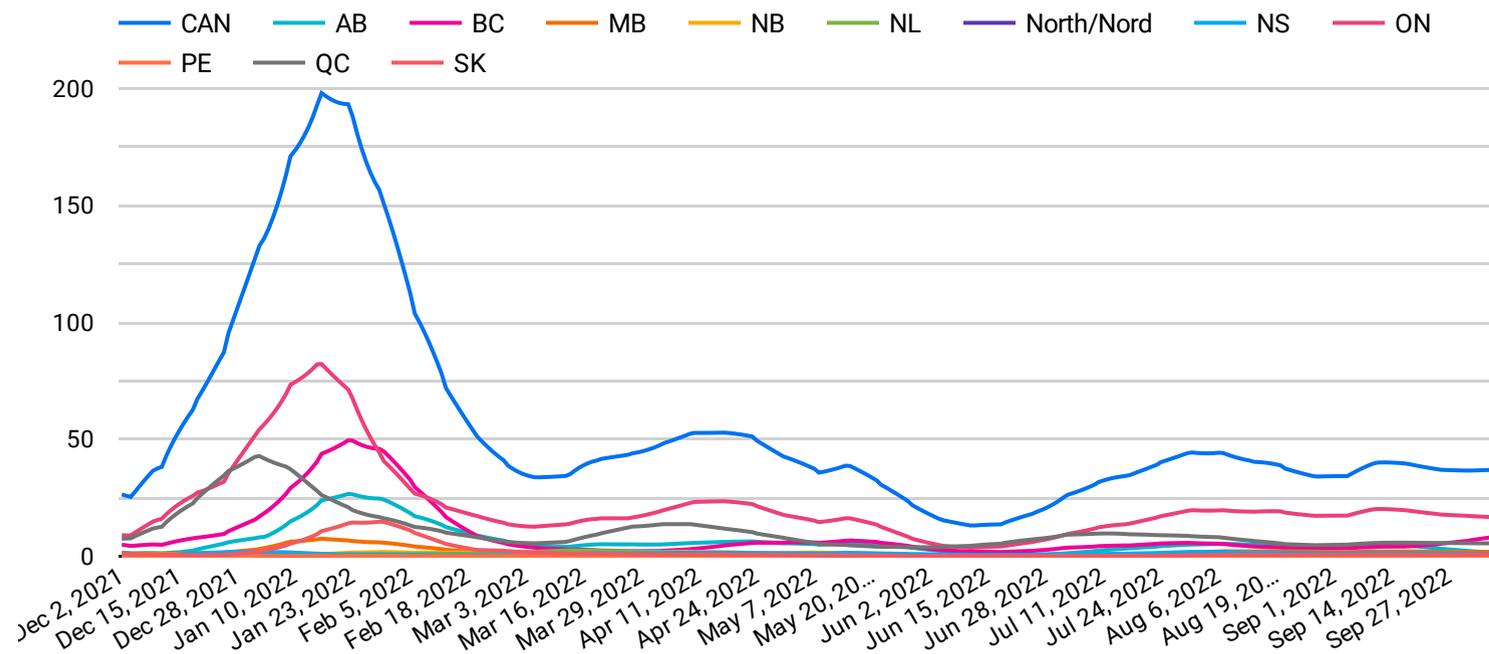
## Estimated (predicted) new daily COVID hospitalizations:

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



## Estimated (predicted) new daily COVID ICU admissions:

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



Estimated (predicted) new daily hospitalizations (top graph) and ICU admissions (bottom graph) expected from [estimated new daily infections](#), using [method described for Quebec](#). The number of [new daily deaths](#) expected from [new daily infections](#) is calculated from the [QC popIFR](#) on any given day and the [ratio of the popIFR for each province relative to QC](#). The ratios of reported hospitalizations:deaths and ICU admissions:deaths in QC for that day are used to estimate expected new daily hospitalizations and ICU admissions in other regions.

Note that not all provinces report new daily hospitalizations and ICU admissions the same as Quebec. Some provinces do not report hospitalization or ICU admission of people who are not deemed to have been admitted for COVID, or ICU admission of people who are no longer positive for COVID. Some provinces include new ICU admissions in total new daily hospitalizations, and others don't. Quebec reports all new COVID positive hospitalizations and ICU admissions, and does not exclude patients admitted to ICU who no longer test positive. Quebec also regularly corrects publicly available hospitalization and ICU admission data to reflect actual date of admission. Many provinces do not do this, which can mask early surges in new hospital and/or ICU admissions when there are reporting delays.

Finally, there has been concern about incidental hospital admissions resulting from people testing positive who are not in hospital because of COVID inflating reported COVID hospitalizations. To date, this does not appear to be a large issue in the reported hospitalization and ICU admission from QC. We think this because the ratio of all reported hospitalizations to all reported deaths in QC during the Omicron period is still currently LOWER than the ratio of hospitalizations to deaths for the QC Delta wave (9.51).

# Estimated Omicron hospitalization costs and effects on hospital capacity

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## Estimated new daily and cumulative Omicron hospitalization costs

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)

date ▾	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Oct 7, 2022	\$13.8M	\$619K	\$3M	\$721K	\$127K	\$36K	6K	\$435K	\$6.2M	88K	2M	345K
Oct 6, 2022	\$13.7M	\$654K	\$3M	\$721K	\$130K	\$36K	7K	\$437K	\$6.3M	87K	2M	339K
Oct 5, 2022	\$13.7M	\$690K	\$3M	\$721K	\$134K	\$36K	7K	\$439K	\$6.3M	85K	2M	333K
Oct 4, 2022	\$13.7M	\$729K	\$3M	\$720K	\$138K	\$36K	7K	\$441K	\$6.3M	84K	2M	326K
Oct 3, 2022	\$13.7M	\$769K	\$3M	\$720K	\$142K	\$35K	7K	\$443K	\$6.4M	83K	2M	320K
Oct 2, 2022	\$13.6M	\$812K	\$3M	\$720K	\$147K	\$35K	7K	\$445K	\$6.4M	81K	2M	313K
Oct 1, 2022	\$13.6M	\$881K	\$2M	\$720K	\$153K	\$35K	8K	\$448K	\$6.4M	79K	2M	305K
Sep 30, 2022	\$13.6M	\$930K	\$2M	\$720K	\$158K	\$35K	8K	\$450K	\$6.5M	78K	2M	300K
Sep 29, 2022	\$13.7M	\$982K	\$2M	\$720K	\$163K	\$35K	9K	\$452K	\$6.5M	77K	2M	294K
Sep 28, 2022	\$13.7M	\$1M	\$2M	\$720K	\$167K	\$35K	9K	\$454K	\$6.5M	76K	2M	289K
<b>Grand total</b>	<b>\$5.3B</b>	<b>\$617M</b>	<b>\$843M</b>	<b>\$180M</b>	<b>\$108M</b>	<b>\$72M</b>	<b>10M</b>	<b>\$127M</b>	<b>\$2.1B</b>	<b>18M</b>	<b>1B</b>	<b>178M</b>

## Estimated % over pre-pandemic hospital capacity (new daily and average Omicron to date)

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)

date ▾	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Oct 7, 2022	6.1	2.1	8.8	5.9	1.8	0.8	1.1	5.1	8.0	6.0	5.4	3.6
Oct 6, 2022	6.1	2.2	8.5	5.9	1.8	0.8	1.2	5.1	8.0	5.9	5.4	3.6
Oct 5, 2022	6.1	2.3	8.3	5.9	1.9	0.8	1.2	5.2	8.1	5.9	5.5	3.5
Oct 4, 2022	6.1	2.5	8.0	5.9	1.9	0.8	1.2	5.2	8.1	5.8	5.5	3.4
Oct 3, 2022	6.1	2.6	7.7	5.9	2.0	0.8	1.2	5.2	8.2	5.7	5.5	3.4
Oct 2, 2022	6.1	2.8	7.4	5.9	2.0	0.8	1.3	5.2	8.2	5.6	5.5	3.3
Oct 1, 2022	6.1	3.0	7.0	5.9	2.1	0.8	1.3	5.3	8.3	5.4	5.5	3.2
Sep 30, 2022	6.1	3.2	6.8	5.9	2.2	0.8	1.4	5.3	8.3	5.3	5.5	3.1
Sep 29, 2022	6.1	3.3	6.6	5.9	2.3	0.8	1.5	5.3	8.4	5.3	5.5	3.1
Sep 28, 2022	6.1	3.5	6.4	5.9	2.3	0.7	1.7	5.3	8.4	5.2	5.6	3.0
<b>Grand total</b>	<b>7.6</b>	<b>6.6</b>	<b>7.6</b>	<b>4.7</b>	<b>4.8</b>	<b>5.0</b>	<b>5.4</b>	<b>4.8</b>	<b>8.7</b>	<b>4.1</b>	<b>8.8</b>	<b>5.9</b>

**Top table:** Estimated new daily Omicron hospitalization costs. Grand total since Dec 2/21 is shown at bottom (Grand total).

**Method:** Estimated hospitalization and ICU costs for each [estimated new daily hospital and ICU admission](#) were calculated using average Canadian COVID hospitalization and ICU admission costs reported by the [Canadian Institute of Health Information](#) (CIHI). CIHI estimates that the cost of an average COVID hospitalization is 3X the cost for a heart attack, and about the same as a kidney transplant. We reduced CIHI-estimated hospitalization costs used in our estimates by 27%, to account for shorter average duration of hospitalizations for Omicron compared to pre-Omicron variants reported by the [U.S. Centers for Disease Control](#). We will adjust with Canadian data when these become available from CIHI.

**Bottom table:** Estimated % over pre-pandemic hospital bed capacity due to Omicron infections. Average % over-capacity since Dec 2/21 is shown at bottom (Grand total).

**Method:** We calculated the number of hospital beds in each province at 85% pre-pandemic (2019) maximum capacity from [CIHI-reported hospital bed in operation data](#). 85% is the safe operating capacity for Canadian hospitals. We assumed the average duration of each new Omicron hospitalization was 5.5 days. Formula: % overcapacity = ((sum new daily hospitalizations and ICU admissions) \* 5.5 days) / ((0.85 \* (number of operating hospital beds in 2019))).

Importantly, estimated % hospital overcapacity due to COVID infections does NOT include loss of operating hospital beds due to sick leave of hospital staff with COVID during waves, retirement or permanent departure of staff from hospitals due to COVID work conditions, or extended absence due to long COVID and/or burnout.

# Total reported and expected Omicron deaths, ICU admissions, hospitalizations to date, by age

To download data, right-click on the chart or click on the three vertical dots at the top right, then choose Export.

## Reported deaths, ICU admissions, hospitalizations since Dec 2/21, by age

Age	Deaths <sup>▲</sup>	Deaths: % epidemic to date	ICU admissions	ICU admissions: % epidemic to date	Hospitalizations	Hospitalizations: % epidemic to date
<=19	50	76	537	69	6,564	77
20-39	186	39	975	36	11,223	50
40-59	1,092	39	2,905	35	14,522	39
60-79	5,747	39	6,194	41	41,339	55
80+	9,991	35	1,864	51	38,617	63
All ages	17,033	37	14,085	44	121,427	57

Collated numbers of deaths, ICU admissions and hospitalizations reported since Dec 2/21. Not all regions report severe outcomes, report total severe outcomes, or report severe outcomes by age. We collate this information for Canada weekly from multiple sources, indicated below. The totals are somewhat higher than the totals reported weekly by PHAC because of delays in reporting to PHAC.

For reference, the bottom tables show the expected (predicted) numbers of hospitalizations, ICU admissions and deaths that should have been reported by now if every province reported as completely as QC.

### Data sources:

<https://health-infobase.canada.ca/covid-19/>

<https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310077501>

<https://www.inspq.qc.ca/covid-19/donnees/age-sexe>

<https://www.publichealthontario.ca/en/data-and-analysis/infectious-disease/covid-19-data-surveillance/covid-19-data-tool?tab=ageSex>

<http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data#Situationreport>

<https://www.alberta.ca/stats/covid-19-alberta-statistics.htm#severe-outcomes>

<https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/cases-and-risk-of-covid-19-in-saskatchewan>

<https://www.gov.mb.ca/health/publichealth/surveillance/covid-19/index.html>

<https://www2.gnb.ca/content/gnb/en/corporate/promo/covid-19/COVIDWATCH.html>

## Total expected hospitalizations since Dec 2/21 (error range +/- 9%)

CAN ▾	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
205.4K	23.8K	32.1K	6.9K	4.2K	2.8K	371	5.0K	82.2K	723	40.6K	6.7K

## Total expected ICU admissions since Dec 2/21 (error range +/- 9%)

CAN ▾	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
17.2K	2.0K	2.8K	573	324	217	29	358	6.8K	53	3.5K	623

## Total expected deaths since Dec 2/21 (error range +/- 9%)

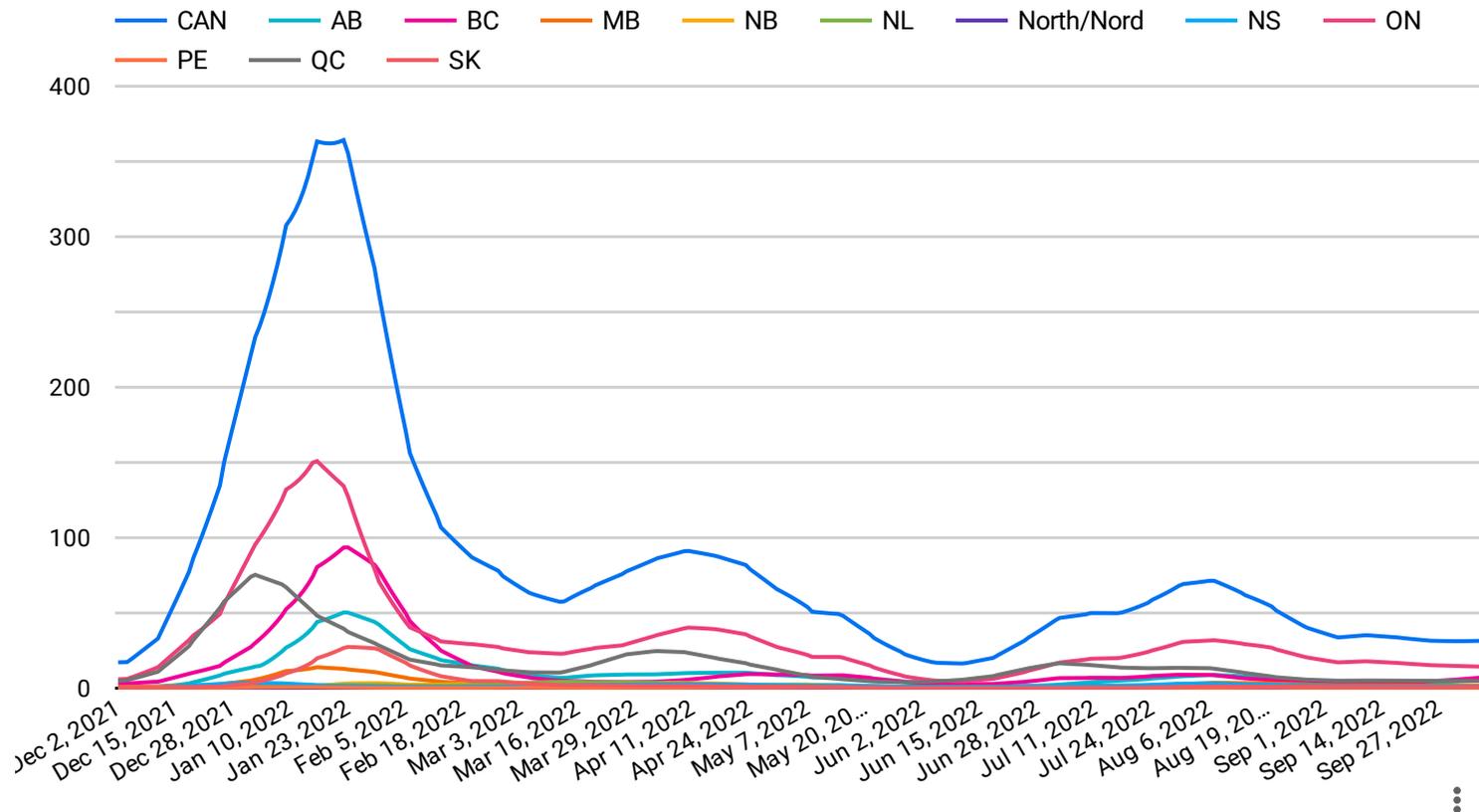
CAN ▾	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
26.7K	3.1K	4.5K	868.3	501	356	45	519	10.4K	78	5.4K	1K

# Estimated actual and reported Omicron mortality: Infections to Jul 2/22

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## Expected deaths resulting from estimated new daily infections

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)



Total Omicron deaths to date	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Estimated actual	26,443	3,054	4,595	855	512	353	49	488	10,031	73	5,330	1,103
Excess all-cause deaths from Dec 2/21	17,182	2,810	4,222	0	53	95	0	0	5,605	0	3,257	1,140
Reported	16,580	1,842	1,991	826	372	227	42	409	5,002	52	5,210	608
Estimated unreported	9,863	1,212	2,604	29	139	126	7	79	5,029	21	120	495
Estimated actual/100,000	69	69	88	62	65	68	39	49	68	44	62	93

**All-cause mortality reporting is incomplete for all regions after Jan/21. Excess mortality estimates for this period in all regions will still increase substantially. Regions that have not yet reported all-cause mortality to Canadian Vital Statistics for dates from Dec 2 onward are indicated as zeros. Regularly updated analyses of excess all-cause mortality in Canada during the COVID epidemic are available [HERE](#).**

**Top graph:** Estimated new daily deaths are calculated from [estimated new daily infections](#) and the [population IFRs \(popIFRs\) for each region](#). These popIFRs change over time as the Quebec popIFR changes, but the ratio of each region's unique popIFR relative to the QC popIFR stays stable over time, due to the similar timing of vaccination campaigns in all Canadian regions. We can use these ratios and the QC popIFR to calculate expected number of deaths in each region from estimated new daily infections. PopIFRs for QC are [found here](#). The ratios for each region's popIFR to the QC popIFR on Dec 2/21 are based on population age-structure, age-specific vaccination rates, and the overall health of the population (estimated from [2018-2020 average life expectancy compared to QC](#)). It is crucial to note that at the start of Omicron QC a higher percentage of the oldest age groups were vaccinated in QC than in other regions. We will adjust popIFR ratios in late Sep/21 once 2022 age group population estimates are available from StatsCan. Currently, these ratios are: CAN 1.30, AB 1.22, BC 1.42, MB 0.90, NB 1.58, NL 1.61, NS 1.77, ON 1.43, PEI 1.32, SK 1.48, NUT, NWT, YK (North) 0.70.

**Bottom table:** Total expected Omicron deaths to date, estimated as described above, compared to total COVID deaths reported by each region [to PHAC](#) since Dec 2/21. Estimated unreported deaths are calculated by subtracting reported deaths from estimated total deaths.

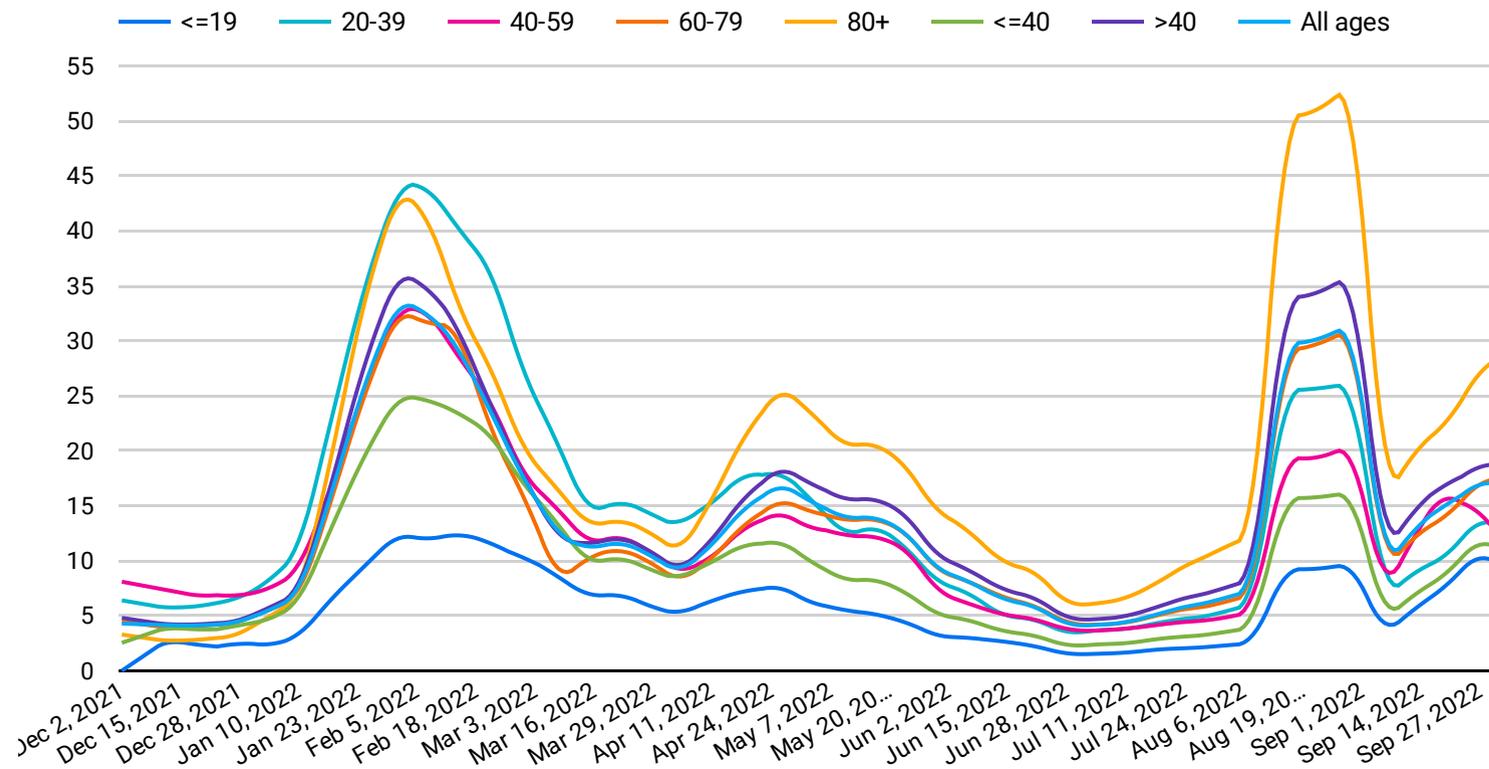
COVID deaths can be undetected due to restricted testing and contact tracing, failure to conduct post-mortem testing on people with suspected COVID, delayed reporting, as well as frank under-reporting of known deaths (e.g. not reporting deaths deemed "with" not "from" COVID). Our estimated total infections [match seroprevalence estimates](#) quite well. It is likely that estimated unreported deaths are also quite accurate. The estimated % undetected/unreported deaths shown here is similar to COVID death under-detection rates estimated previously by [comparing reported COVID deaths to excess all-cause mortality](#).

Historically, all excess mortality in Quebec has been accounted for by reported COVID-19 deaths. Outside QC, COVID death under-reporting leaves large gaps of unexplained excess mortality. This drives misinformation claims that unexplained excess mortality is due to vaccines themselves. It is crucial that provinces report COVID deaths fully. Failing to fully report all known COVID deaths also hampers efforts to understand mortality indirectly caused by the pandemic. Currently, QC is the only province with sufficiently accurate COVID death reporting to permit meaningful investigation of changes in mortality patterns during COVID in Canada.

# New weekly reported COVID hospital admissions, by age group

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## New weekly reported COVID hospitalizations by age group, compared to expected weekly flu hospitalizations for same age group (3 week rolling averages)



**Top graph:** New reported weekly COVID hospitalizations in Canada by age group, compared to expected weekly hospitalizations from influenza in the same age group. New weekly COVID hospitalizations are calculated from numbers collated from the [PHAC weekly COVID epidemiology report](#), from provincial reporting sites, and from the [PHAC COVID dataset](#) posted monthly by Statistics Canada.

To make it easier to visualize all age groups on one graph, and to compare Omicron severe outcomes to a pre-pandemic baseline, we have expressed new weekly severe COVID outcomes by age group relative to expected new weekly severe outcomes for influenza by age group, based on [6 year average annual per capita influenza hospitalizations by age group reported by PHAC](#), and ratios of deaths to hospitalizations in each age group for the 2018-2019 influenza season. Even though influenza is seasonal (fall and winter of each year), to simplify comparisons we have divided total annual severe outcomes for influenza by 52 weeks, and have used this weekly average for comparisons to severe COVID outcomes.

**Bottom table:** Actual new weekly reported COVID hospitalizations in Canada, by age group. Grand totals at the bottom of the table show the average new weekly COVID hospitalizations for each age group since the the start of the Omicron period.

## New weekly reported COVID hospitalizations by age group (3 week rolling averages)

Date ▾	<=19	20-39	40-59	60-79	80+	<=40	>40	All ages
Sep 30, 2022	416	368	585	2,004	2,061	784	4,384	5,168
Sep 29, 2022	423	369	607	1,993	2,040	793	4,375	5,168
Sep 28, 2022	426	369	627	1,976	2,013	795	4,358	5,153
Sep 27, 2022	426	366	645	1,952	1,982	791	4,330	5,122
Sep 26, 2022	421	360	660	1,921	1,946	781	4,294	5,075
Sep 25, 2022	412	353	673	1,882	1,904	765	4,248	5,013
Sep 24, 2022	399	342	683	1,837	1,857	742	4,193	4,935
Sep 23, 2022	383	330	691	1,784	1,805	712	4,129	4,841
Sep 22, 2022	365	317	703	1,736	1,759	682	4,084	4,765
<b>Grand total</b>	<b>237</b>	<b>414</b>	<b>561</b>	<b>1,488</b>	<b>1,371</b>	<b>651</b>	<b>3,413</b>	<b>4,064</b>

**NOTE: Canada's reported COVID hospitalizations are ~1.5-2X lower than expected based on COVID hospitalizations reported by Quebec. This under-reporting has been especially prominent after the BA.1 wave (Dec/Jan). The hospitalization numbers shown here are adjusted for the current global rate of estimated hospitalization under-reporting for Canada compared to QC.**

# How do COVID HOSPITAL ADMISSIONS in Canada this week compare to the average for the epidemic to date, and to expected weekly hospitalization numbers for other common illnesses?

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## Weekly hospital admissions

Cause of hospitalization	COVID-19: This week	COVID-19: avg epidemic to date	Influenza	Transportation accidents	Accidental falls	Cancer	Circulatory system diseases (e.g. heart disease, strokes)
All ages	5,168	2,371	303	330	3,022	3,749	7,412
<=19y	416	99	42	27	123	8	7
20-39y	368	260	27	106	248	101	10
40-59y	585	430	45	80	286	843	1,033
60-79y	2,004	872	115	87	1,174	2,242	4,206
80+y	2,061	710	73	30	1,190	555	2,156
<40y	784	360	69	133	371	109	17
>=40y	4,649	2,012	234	197	2,651	3,640	7,395

### Where do these numbers come from?

We take 2018-2019 age-specific hospitalization rates for different illnesses/conditions [reported by PHAC](#). We then calculate how many weekly hospitalizations we'd expect for each age group and cause using the July 1, 2022 Canadian population estimates for each age group [reported by Statistics Canada](#). Expected influenza hospitalizations are calculated as described [HERE](#). Reported hospitalizations by age group are collated weekly from multiple official sources, [as described HERE](#).

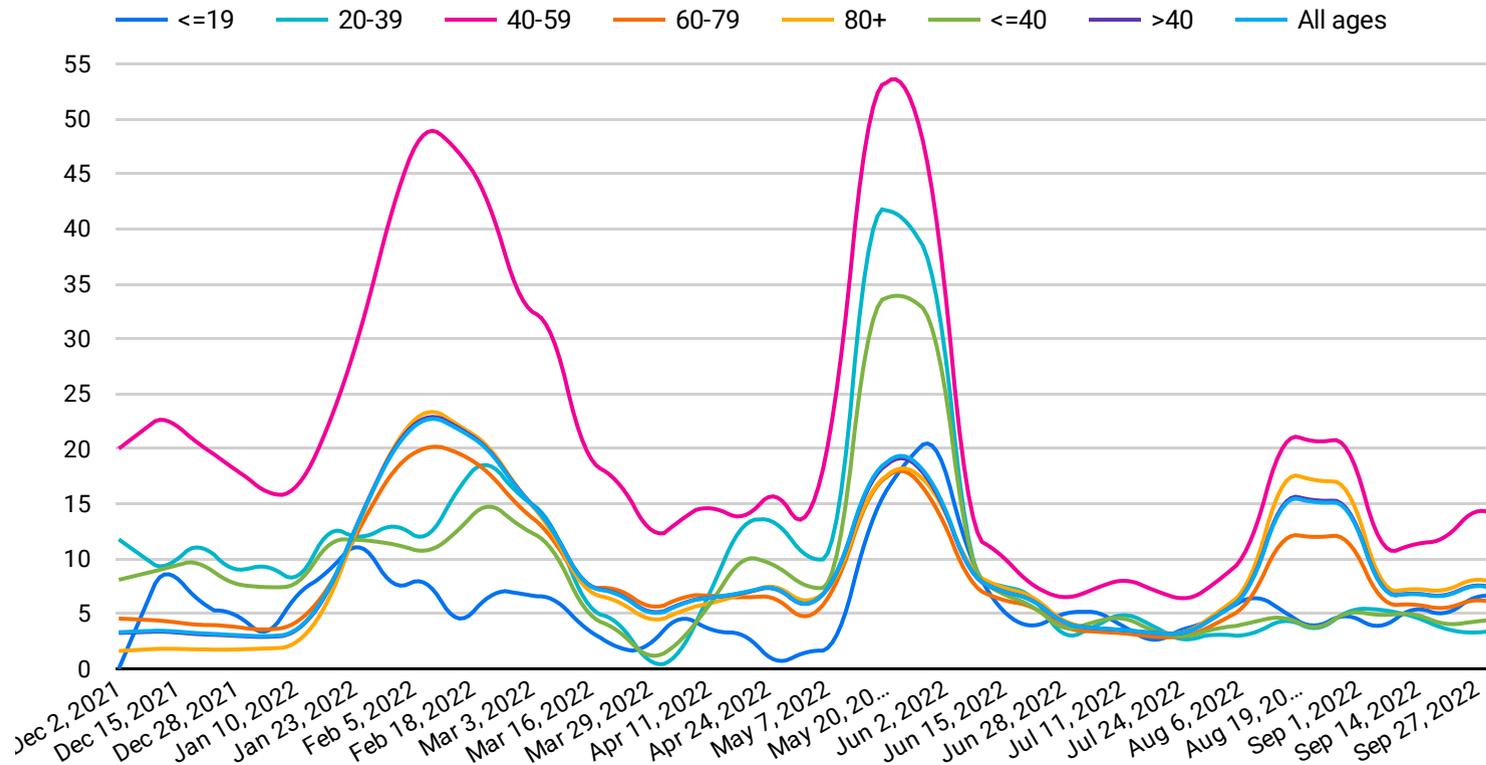
**These numbers are adjusted for the estimated COVID hospitalization [under-reporting rate for Canada](#)** (varies as reporting progresses, but typically ~1.5-1.8-fold under-reporting for Canada compared to Quebec).

**Why do we think this adjustment is needed?** Because reporting to PHAC by many provinces is quite delayed and incomplete compared to Quebec, and hospitalization numbers reported by some provinces on their official pages can be considerably lower than numbers reported in the the PHAC case dataset published monthly by Statistics Canada. Quebec's reported COVID deaths during the Omicron phase of COVID for months where death reporting is reasonably complete [closely match excess all-cause mortality](#) for the same period, unlike Canada as a whole, where excess mortality data show that Omicron deaths have been substantially under-reported. The ratio of reported Omicron hospitalizations to reported Omicron deaths in Quebec is also lower than the hospitalization:death ratio for Quebec pre-Omicron, suggesting that most of Quebec's reported hospitalizations during Omicron are likely not incidental. Finally, we can compare [reported per capita hospitalizations and deaths in Canada during the Omicron era to those reported by the United Kingdom and France](#), which are two high income countries with strong COVID data reporting where access to medical care, age-specific vaccination rates and population age structure are similar to Canada. The percentage of the UK and French populations infected during Omicron is also similar to the percent of the Canadian population infected during this period. Finally, [both the UK and France had higher rates of 3rd dose vaccination at the start of Omicron than Canada](#), again suggesting that these countries should have reported fewer severe outcomes than Canada during the Omicron era. Given what appear to be substantially higher rates of infection pre-Omicron in the UK and France and higher rates of 3rd vaccine dose uptake in these countries at the outset of Omicron, one would expect that the severe outcomes reported by the UK and France during Omicron would have been LESS than severe outcomes reported in Canada, which presumably had a significantly larger susceptible population unprotected by vaccines or previous infection. However, Canada has reported 1.6 times fewer per capita hospitalizations and deaths than France and the UK during Omicron, similar to Canada's estimated hospitalization and death under-reporting rates compared to Quebec. Therefore, the comparisons shown here for Canada are adjusted to reflect estimated hospitalization under-reporting rates for the country compared to Quebec.

# New weekly reported COVID deaths, by age group

To download data, click on the three vertical dots at the top right, then choose Export. To select only your region, click on the chart icon to the left of the 3 vertical dots.

## New weekly reported COVID deaths by age group, compared to expected weekly flu deaths for same age group (3 week rolling averages)



**Top graph:** New reported weekly COVID deaths in Canada by age group, compared to expected weekly deaths from influenza in the same age group. New weekly COVID hospitalizations are calculated from numbers collated from the [PHAC weekly COVID epidemiology report](#), from provincial reporting sites, and from the [PHAC COVID dataset](#) posted monthly by Statistics Canada.

To make it easier to visualize all age groups on one graph, and to compare Omicron severe outcomes to a pre-pandemic baseline, we have expressed new weekly severe COVID outcomes by age group relative to expected new weekly severe outcomes for influenza by age group, based on 6 year [average annual per capita influenza hospitalizations by age group reported by PHAC, and ratios of deaths to hospitalizations in each age group for the 2018-2019 influenza season](#). Even though influenza is seasonal (fall and winter of each year), to simplify comparisons we have divided total annual severe outcomes for influenza by 52 weeks, and have used this weekly average for comparisons to severe COVID outcomes.

**Bottom table:** Actual new weekly reported COVID deaths in Canada, by age group. Grand totals at the bottom of the table show the average new weekly COVID deaths for each age group since the start of the Omicron period.

## New weekly reported COVID deaths by age group (3 week rolling averages)

Date ▾	<=19	20-39	40-59	60-79	80+	<=40	>40	All ages
Sep 30, 2022	2.0	2.3	27	151	312	4.4	490	494
Sep 29, 2022	2.0	2.3	27	153	317	4.3	497	501
Sep 28, 2022	2.0	2.3	27	154	319	4.3	501	505
Sep 27, 2022	2.0	2.2	27	154	320	4.3	501	506
Sep 26, 2022	2.0	2.2	27	153	318	4.2	499	503
Sep 25, 2022	1.9	2.2	27	152	315	4.1	493	497
Sep 24, 2022	1.8	2.3	26	149	309	4.1	484	488
<b>Grand total</b>	<b>1.8</b>	<b>6.9</b>	<b>40</b>	<b>209</b>	<b>359</b>	<b>8.8</b>	<b>436</b>	<b>438</b>

**NOTE: Canada's reported COVID deaths are currently ~1.5-2X lower than expected based on COVID deaths reported by Quebec. This under-reporting has been especially prominent after the BA.1 wave (Dec/Jan). The numbers shown here for Canada are adjusted for the current global death under-detection/reporting for Canada compared to QC.**

# How do COVID DEATHS in Canada this week compare to the average for the epidemic to date, and to expected weekly deaths for other common illnesses?

To download data, click on the three vertical dots at the top right, then choose Export.

## Weekly deaths

Cause of death	COVID-19: This week	COVID-19: avg epidemic to date	Influenza	Transportation accidents	Accidental falls	Cancer	Circulatory system diseases (e.g. heart disease, strokes)
All ages	494	526	67	43	114	1,617	1,734
<=19y	2	1	0	4	0	3	1
20-39y	2	5	1	13	1	15	9
40-59y	27	32	2	11	3	157	86
60-79y	151	169	25	12	25	886	544
80+y	312	319	40	4	85	557	1,094
<40y	4	6	1	17	1	18	10
>=40y	490	520	66	26	113	1,599	1,723

### Where do these numbers come from?

We take age-specific mortality rates for different illnesses/conditions reported by [Statistics Canada, as described HERE](#). We then calculate how many weekly deaths we'd expect for each age group and cause using the July 1, 2022 Canadian population estimates for each age group [reported by Statistics Canada](#). Expected influenza deaths are calculated as described [HERE](#). Reported deaths by age group are collated weekly from multiple official sources, [as described HERE](#).

**These numbers are adjusted for the estimated COVID death [under-reporting rate for Canada](#)** (varies as reporting progresses, but typically ~1.5-1.8-fold under-reporting for Canada compared to Quebec).

**Why do we think this adjustment is needed?** Because reporting to PHAC by many provinces is quite delayed and incomplete compared to Quebec, and hospitalization numbers reported by some provinces on their official pages can be considerably lower than numbers reported in the the PHAC case dataset published monthly by Statistics Canada. Quebec's reported COVID deaths during the Omicron phase of COVID for months where death reporting is reasonably complete [closely match excess all-cause mortality](#) for the same period, unlike Canada as a whole, where excess mortality data show that Omicron deaths have been substantially under-reported. The ratio of reported Omicron hospitalizations to reported Omicron deaths in Quebec is also lower than the hospitalization:death ratio for Quebec pre-Omicron, suggesting that most of Quebec's reported hospitalizations during Omicron are likely not incidental. Finally, we can compare [reported per capita hospitalizations and deaths in Canada during the Omicron era to those reported by the United Kingdom and France](#), which are two high income countries with strong COVID data reporting where access to medical care, age-specific vaccination rates and population age structure are similar to Canada. The percentage of the UK and French populations infected during Omicron is also similar to the percent of the Canadian population infected during this period. Finally, [both the UK and France had higher rates of 3rd dose vaccination at the start of Omicron than Canada](#), again suggesting that these countries should have reported fewer severe outcomes than Canada during the Omicron era. Given what appear to be substantially higher rates of infection pre-Omicron in the UK and France and higher rates of 3rd vaccine dose uptake in these countries at the outset of Omicron, one would expect that the severe outcomes reported by the UK and France during Omicron would have been LESS than severe outcomes reported in Canada, which presumably had a significantly larger susceptible population unprotected by vaccines or previous infection. However, Canada has reported 1.6 times fewer per capita hospitalizations and deaths than France and the UK during Omicron, similar to Canada's estimated hospitalization and death under-reporting rates compared to Quebec. Therefore, the comparisons shown here for Canada are adjusted to reflect estimated hospitalization under-reporting rates for the country compared to Quebec.

# Estimated Omicron mortality to date compared to top 10 causes of mortality in Canada

ESTIMATES CHANGE AS SOURCE DATA ARE UPDATED. THE MOST RECENT 2 WEEKS OF ESTIMATES ARE BASED ON WEEKLY RATES OF CHANGE IN SOURCE DATA AND ARE PROVISIONAL. To download data, click on the three vertical dots at the top right, then choose Export. To select only your region, click on the chart icon to the left of the 3 vertical dots.

## Estimated Omicron deaths compared to expected daily and total influenza deaths during same period

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)

date ▾	CAN	AB	BC	MB	NB	NL	North/Nord	NS	ON	PE	QC	SK
Oct 7, 2022	3.4	1.3	5.6	5.0	1.5	0.7	0.5	4.2	4.0	5.1	2.3	2.8
Oct 6, 2022	3.4	1.4	5.5	5.0	1.6	0.7	0.5	4.2	4.0	5.0	2.3	2.7
Oct 5, 2022	3.4	1.5	5.3	5.0	1.6	0.7	0.5	4.2	4.0	4.9	2.3	2.7
Oct 4, 2022	3.4	1.6	5.1	5.0	1.7	0.6	0.5	4.2	4.0	4.9	2.3	2.6
Oct 3, 2022	3.4	1.7	4.9	5.0	1.7	0.6	0.5	4.2	4.0	4.8	2.3	2.6
Oct 2, 2022	3.4	1.7	4.7	5.0	1.8	0.6	0.5	4.3	4.1	4.7	2.3	2.5
Oct 1, 2022	3.4	1.9	4.5	5.0	1.9	0.6	0.6	4.3	4.1	4.6	2.3	2.5
Sep 30, 2022	3.4	2.0	4.4	5.0	1.9	0.6	0.6	4.3	4.1	4.5	2.3	2.4
Sep 29, 2022	3.4	2.1	4.2	5.0	2.0	0.6	0.7	4.3	4.1	4.4	2.3	2.4
Sep 28, 2022	3.4	2.2	4.1	5.0	2.0	0.6	0.7	4.4	4.2	4.4	2.3	2.3
<b>Grand total</b>	<b>9.4</b>	<b>9.3</b>	<b>11.5</b>	<b>8.4</b>	<b>8.5</b>	<b>9.2</b>	<b>4.8</b>	<b>7.0</b>	<b>9.3</b>	<b>6.4</b>	<b>8.4</b>	<b>11.7</b>

**Top table:** Estimated number of Omicron deaths for every expected influenza death. The average number of estimated daily Omicron deaths compared to expected average daily influenza deaths since Dec 2/21 is shown at bottom (Grand total).

**HOW TO READ THE TABLE:** e.g. Canada. There were 2 times more COVID deaths from estimated new daily COVID infections at the start of Omicron than expected daily influenza deaths (use slider to scroll down to bottom of table). At the height of the BA.1 wave (Jan 19), there were more than 20 times more COVID deaths from estimated daily infections than expected daily flu deaths. Over the entire Omicron period to date, there have been ~11 times more COVID deaths than expected influenza deaths in Canada (see Grand total at bottom).

Expected daily influenza deaths are calculated by dividing average [annual flu deaths reported by Health Canada](#) by 365 days. We ignore influenza seasonality for the purpose of these calculations. Expected flu deaths for each region are adjusted for the size of its population.

## Estimated Omicron deaths compared to expected daily and total deaths due to the top 10 causes of mortality in Canada during the same period

15 day rolling averages (error range +/- 9% overall; +/- 15% most recent 6 weeks)

date ▾	Kidney disease	Suicide	Alzheimer's	Pneumonia	Diabetes	Chronic Lower Respiratory Diseases	Cerebrovascular Disease	Accidents, including Drug Deaths	Heart Disease	Cancer
Oct 7, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 6, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 5, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 4, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 3, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 2, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Oct 1, 2022	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Sep 30, 2...	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
Sep 29, 2...	3.1	2.8	1.8	1.6	1.6	0.9	0.8	0.8	0.2	0.1
<b>Grand total</b>	<b>8.5</b>	<b>7.8</b>	<b>4.9</b>	<b>4.5</b>	<b>4.5</b>	<b>2.4</b>	<b>2.3</b>	<b>2.3</b>	<b>0.6</b>	<b>0.4</b>

**Bottom table:** Estimated number of Omicron deaths for every expected death from the top 10 causes of mortality in Canada. The average number of estimated daily Omicron deaths compared to expected average daily deaths from other causes since Dec 2/21 is shown at bottom (Grand total).

This table shows national estimates only. It is calculated and can be read as described for the top table. Data source for annual Canadian deaths due to top 10 causes of mortality in Canada: [Statistics Canada 2019 causes of death](#).

For example, to date Omicron has likely caused 10 times more deaths in Canada than kidney disease, and nearly the same number of deaths as heart disease.

**COVID-19 was the #3 cause of death in Canada in 2020. Cause of death data for Canada are not yet available for 2021, but based on COVID deaths reported in that year, COVID-19 was clearly also the #3 cause of death in Canada in 2021. Based on our current estimates (bottom table), it is likely COVID-19 will also be the #3 cause of death in Canada in 2022.**

# Estimated individual Omicron risks by age and vaccine dose

To download data, right-click on the chart or click on the three vertical dots at the top right, then choose Export.

## 1 of every XX people exposed develop SYMPTOMATIC INFECTION

Age ^	<2 doses	2 doses only (>6 months)*	3 doses only (>4 months)	4 doses (<3 months)
0-4	1	2		
05-11	1	2		
12-17	1	1	2	
18-29	1	1	2	3
30-39	1	1	2	3
40-49	1	1	2	3
50-59	1	1	2	3
60-69	1	1	2	3
70-79	1	1	2	3
80+	1	1	2	3

## 1 of every XX people infected is HOSPITALIZED for COVID

Age ^	<2 doses	2 doses only (>6 months)*	3 doses only (>4 months)	4 doses (<3 months)
0-4	457	1,063		
05-11	703	1,634	2,928	
12-17	302	702	1,258	
18-29	256	596	1,068	1,972
30-39	169	393	703	1,299
40-49	123	287	514	949
50-59	84	196	350	647
60-69	42	97	173	320
70-79	15	35	63	117
80+	5	12	22	40

## 1 of every XX people infected is ADMITTED TO ICU WITH COVID

Age ^	<2 doses	2 doses only (>6 months)*	3 doses only (>4 months)	4 doses (<3 months)
0-4	6,609	13,768		
05-11	10,157	21,160	53,458	
12-17	4,364	9,092	22,968	
18-29	4,872	10,149	25,641	81,195
30-39	3,209	6,685	16,887	53,477
40-49	796	1,658	4,189	13,266
50-59	543	1,131	2,856	9,045
60-69	373	777	1,962	6,213
70-79	136	283	715	2,264
80+	149	311	786	2,489

## 1 of every XX people infected DIES OF COVID

Age ^	<2 doses	2 doses only (>6 months)*	3 doses only (>4 months)	4 doses (<3 months)
0-4	13,333	25,641		
05-11	20,408	39,246	170,068	
12-17	11,905	22,894	99,206	
18-29	3,891	7,483	32,425	35,373
30-39	1,479	2,845	12,327	13,448
40-49	614	1,181	5,116	5,581
50-59	429	825	3,573	3,898
60-69	41	78	339	370
70-79	34	66	287	313
80+	7	14	61	66

### HOW TO READ THESE TABLES

These tables show how many people are exposed or infected to result in a specific outcome. **Examples:** **HOSPITALIZATION:** 1 of every 457 unvaccinated children 0-4 years old are hospitalized if infected with Omicron, but 1 of every 1,063 children in this age group infected with Omicron will be hospitalized if they have 2 vaccine doses. **ICU ADMISSION:** Unvaccinated children younger than 4 have about the same risk of ICU admission from Omicron as people 50-69 years old who have received a 4th vaccine dose in the last 3 months. **DEATH:** Someone in their 40s with only 2 vaccine doses is more than 4 times more likely to die of COVID than a 40-49 year old with 3 vaccine doses.

For comparison, the table below shows estimated average annual risk of being diagnosed, hospitalized, admitted to ICU or dying from influenza. This is the estimated average for Canada for 2013-2019. It is important to recognize that only a small percentage of the Canadian population is diagnosed with influenza each year (~1%, depending on the year, possibly 10% due to under-diagnosis of mild cases). THESE ESTIMATES DO NOT COMPARE THE VIRULENCE OF SARS2 AND INFLUENZA VIRUSES. They compared expected outcomes if 100% and 10% of the Canadian population is infected with SARS2 and influenza, respectively.

### METHODS

Vaccine protection rates by dose from UKHSA were multiplied by age-specific Omicron infection fatality and hospitalization rates for unvaccinated people as described. Unvaccinated age-specific Omicron hospitalization and ICU admission rates were calculated from pre-Delta rates (Herrera-Espinoza 2022), adjusted for Delta (Bast 2021), then Omicron (Nyberg 2022), as described for [infection fatality rates](#), except that ICU admission rates for Omicron compared to Delta were calculated using the all ages reduction for death from Delta to Omicron (0.2) from Nyberg 2022. For children 0-4 years old, non-Omicron-adjusted Delta death, hospitalization and ICU admission rates were used for calculations, based on similarity to Delta rates reported by Nyberg 2022.

Age-specific influenza hospitalization, ICU admission and mortality rates are estimated from averages of reported values for the [2013-2019 Canadian flu seasons](#). Deaths from influenza in Canada may be 2-3 times higher in people over 65 (1 in 3000-4000 people die) than reported, based on 10 year average mortality rates for flu and pneumonia combined reported by Statistics Canada.

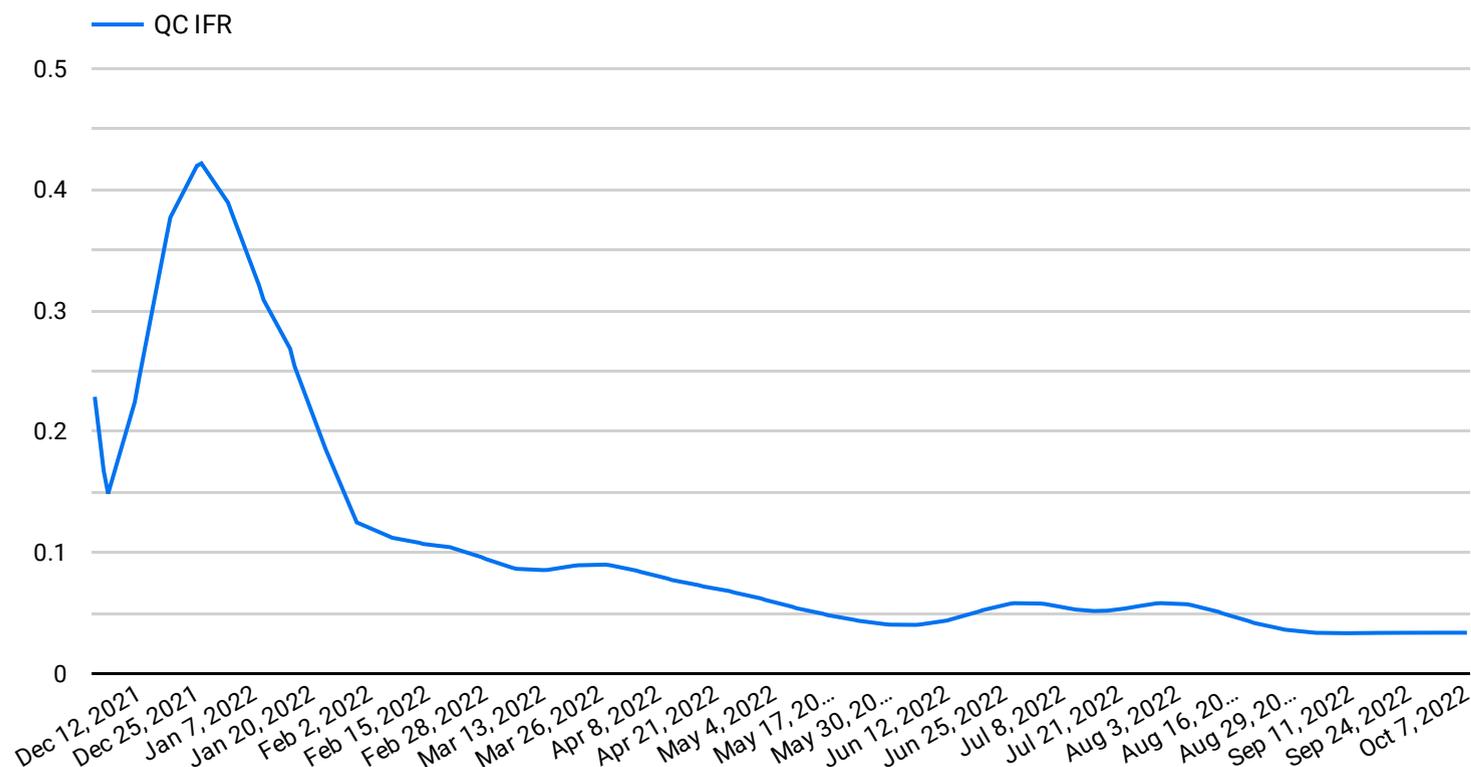
### INFLUENZA: 1 of every XX people is ....

Age ^	Diagnosed *	Hospitalized **	Admitted to ICU**	Dies**
0-4	102	1,500	8,300	167,000
05-19	102	6,800	29,000	150,000
20-44	102	8,100	53,000	190,000
45-64	102	3,300	14,000	77,000
65+	102	700	7,700	8,100

\*\*based on avg 2013-2019 flu seasons in Canada

\*flu is 10X under-detected in Canada, but COVID is also currently 10X-underdetected

## Quebec Omicron-specific population infection fatality rate (popIFR, %) over time



The Quebec population infection fatality rate (popIFR) is the calculated from the [total expected future COVID deaths in QC](#) if 100% of the population is infected on any given day. It is expressed as a % of the total QC population.

These calculations are based on **Omicron-specific, age-specific infection fatality rates**, changing population age structure, age-specific vaccination rates, vaccine protection against death, and the estimated proportion of the QC population most susceptible to death infected with Omicron by any given date. The QC popIFR changes over time as people die of COVID, are vaccinated, as vaccine protection against death changes, as the population ages, and as progressively more of the population susceptible to death is infected.

Starting in May 2022, PHAC moved to monthly reporting of some data required for these calculations (vaccination rates by dose, odds ratios for vaccine protection against death). When there are gaps in data reporting, we calculate average weekly change in the intervening period to avoid artefacts due to reporting delays. When data are not yet available for the most recent week, we use the most recent popIFR for [estimating actual new daily infections](#) from reported deaths in QC.

The QC popIFR used for calculations and shown here is mid-aligned 3 week moving average. We use a 3 week window to "smooth" the effect of rapid changes in vaccination rates and shifts in infections from younger to older populations during waves.

### Detailed explanation of QC popIFR explanation calculations

First, we take the [July 1 2021 population in each age group in QC](#) from StatsCan, and for each week we calculate the population in each age group based on its weekly rate of change from 2020-2021. We'll update these estimates when July 1 2022 population estimates become available. Age groups used are the groups for which vaccination data are reported (0-4, 5-11, 12-17, 18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80+). Then, for each week we enter the number of people with at least 2 vaccine doses in each age group two weeks before the date of interest (data from PHAC) to calculate the number of people in each age group who were at least fully vaccinated by that date.

Next we calculate vaccine protection for people with at least 2 doses, using odds ratios (ORs) of death and hospitalization in people with at least 2 doses compared to unvaccinated people, published by PHAC in the [Daily COVID-19 Epidemiology Update](#). Note that ORs for people with 2 or more doses include people who have 1 or more additional doses, so provides an estimate of vaccine protection in the vaccinated population generally. We use the OR for vaccine protection against hospitalization as a proxy for protection against infection for the purpose of these calculations, since Canada does not publish data on the OR for protection against infection. We multiply the death and hospitalization ORs together to estimate vaccine protection against death among people with at least 2 doses, then use this for each week of interest to calculate the number of vaccinated people in each age group who would be expected to die if 100% of the population was infected that week.

Expected deaths in each age group are calculated from age-specific Omicron IFRs. Age-specific Omicron IFRs for analyses were calculated from age-specific unvaccinated pre-Delta IFRs ([COVID-19 Forecasting Team 2022](#)), adjusted for the Delta:pre-Delta unvaccinated death hazard ratio for Ontario ([Fisman and Tuite 2021](#)), and then adjusted for age-specific Omicron:Delta death hazard ratios from [Nyberg 2022](#). Age-specific unvaccinated Omicron IFRs (%) used for calculations were: 0-5y (0.0075), 5-11y (0.0049), 12-17y (0.0084), 18-29y (0.0257), 30-39y (0.0676), 40-49y (0.1629), 50-59y (0.2332), 60-69y (2.455), 70-79y (2.9014), 80+y (13.6807).

Next, for each week, we estimate the proportion of the population most vulnerable to death (e.g. older and/or unvaccinated) infected in that week using the ratio of QC hospitalizations reported 7 days later to deaths reported 14 days later. We divide the population IFR calculated from variables described above by this ratio.

Finally, we also adjust the overall popIFR for QC to reflect the proportion of the total deaths expected if 100% of the population was infected that have been reported in QC to date. This ratio is largely a reflection of the proportion of the population most vulnerable to death infected to date.

These calculations sound complicated, but the QC popIFRs calculated by this method closely predict [seroprevalence estimates of the % of the QC population infected to date](#), and the [% of the Canadian population younger and older than 40 infected to date](#) (from both our estimates and seroprevalence data). They also closely predict [cumulative excess mortality in QC and ON from Dec/21-Jan/22](#) (the periods when total all-cause mortality reporting is more complete), so we're fairly confident the method is working well. We provide access to the spreadsheet with the [underlying data and calculations at the page HERE](#) if you'd like to look more closely at how the calculations work.

## WHERE TO FIND METHODS DESCRIPTIONS IN THIS REPORT

You're welcome to download our master spreadsheet containing all data and calculations that go into this report. It has a LOT of tabs though, and some are no longer updated/used, so here's where to quickly find what interests you. The underlying formulas will show you the sheets and cells that each calculation links to.

### Hazard index input data and formulas

1. see tab [Hazard Index DASHBOARD current](#) in master spreadsheet

### Calculation of first-time infection numbers

1. See the [First time infections page of this report](#) AND the [TPRv2 tab](#) of the master spreadsheet.
2. The formulas in the Estimated Actual Infections columns of that sheet include a term for adjustment to the most recent estimates of seroprevalence and maximum percentages of the population susceptible to infection (based on vaccine dose). You can find those adjustment terms on the tab [Total Infections Deaths](#).
3. The TPRv2 tab also links out to QC popIFR calculations, which are found at tab [Pop IFR calcs QC PHAC OR](#) of the master spreadsheet.

### Calculation of total infection numbers

1. You can find the description of how we do this on the [Total infections page](#) of this report.
2. If you go to the tab of the master spreadsheet called [TOTAL daily infections](#), you can track back to the sheet and cells containing the self-reported:estimated first time infections ratios for QC used for this calculation.

### Calculation of % population infected

1. Calculations for the entire population are found in the [% pop infected columns of the TPR v2](#) master spreadsheet tab
2. Calculations for % of population younger and older than 40 and links to sheet with underlying data for calculations are on master spreadsheet tab [Percent expected deaths AGE](#). The method for estimating the % of the population younger and older than 40 is also described on the % infected page of this report.

### LongCOVID calculations

1. These are described on the [LongCOVID page](#) of this report.
2. You can also go to the tab [Est new daily long COVID ActLim](#) of the master spreadsheet to find underlying formulas.

### Prevalence calculations

1. These are described on the [Prevalence](#) and [Combined Prevalence](#) pages of this report.
2. You can find the underlying calculations via the [Percent pop currently infected plus LC ActLim tab](#) of the master spreadsheet.

### Hospitalization and ICU admission calculations

1. These are described on the [Hospitalizations, ICU QC](#) and [Hospitalizations, ICU all regions](#) and [Hospitalization costs, burden](#) pages of this report.
2. You can find the underlying calculations via the following tabs of the [master spreadsheet](#): 1) Est new daily hosp; 2) Est new daily ICU; 3) Est new daily hosp costs; 4) Est new daily hosp overcapacity.

### Death calculations

1. These are described on the Deaths and Top 10 causes of death pages of this report.
2. You can find underlying calculations via the following tabs [of the master spreadsheet](#): 1) Est new daily deaths; 2) Est new daily deaths vs flu; 3) Est new daily deaths vs Top 10.