

# An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI)

Interim guidance on planning considerations for a  
fall 2022 COVID-19 vaccine booster program in  
Canada

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# Preamble

The National Advisory Committee on Immunization (NACI) is an External Advisory Body that provides the Public Health Agency of Canada (PHAC) with independent, ongoing and timely medical, scientific, and public health advice in response to questions from PHAC relating to immunization.

In addition to burden of disease and vaccine characteristics, PHAC has expanded the mandate of NACI to include the systematic consideration of programmatic factors in developing evidence based recommendations to facilitate timely decision-making for publicly funded vaccine programs at provincial and territorial levels.

The additional factors to be systematically considered by NACI include: economics, ethics, equity, feasibility, and acceptability. Not all NACI statements will require in-depth analyses of all programmatic factors. While systematic consideration of programmatic factors will be conducted using evidence-informed tools to identify distinct issues that could impact decision-making for recommendation development, only distinct issues identified as being specific to the vaccine or vaccine-preventable disease will be included.

This statement contains NACI's independent advice and recommendations, which are based upon the best current available scientific knowledge. This document is being disseminated for information purposes. People administering the vaccine should also be aware of the contents of the relevant product monograph. Recommendations for use and other information set out herein may differ from that set out in the product monographs of the Canadian manufacturers of the vaccines. Manufacturer(s) have sought approval of the vaccines and provided evidence as to its safety and efficacy only when it is used in accordance with the product monographs. NACI members and liaison members conduct themselves within the context of PHAC's Policy on Conflict of Interest, including yearly declaration of potential conflict of interest.

# Background

On April 5, 2022, NACI published [initial guidance on a second booster dose of COVID-19 vaccines in Canada](#). The Statement mentioned the potential need for subsequent boosters in broader populations based on the evolution of the COVID-19 pandemic. On April 12, 2022, NACI also published [updated guidance on a first booster dose of COVID-19 vaccines in Canada](#). Since that time:

- The epidemiology of COVID-19 continues to change and there is still considerable uncertainty with regard to the likelihood, timing, and severity of any potential future COVID-19 wave. It is possible that, consistent with other respiratory viruses, incidence of COVID-19 may increase in the later fall and winter seasons and that new variants of concern (VOC) may emerge.
- The current Omicron COVID-19 wave is declining nationally in Canada, with decreasing rates of hospitalizations and deaths. Nationally, the predominant Omicron sub-lineages continue to change, with BA.2 and BA.2.3 declining while the proportions of BA.2.12.1, BA.4, and BA.5 continue to grow <sup>(1)</sup>.
- As of May 22, 2022, 86% of the population aged 5 years and older was vaccinated with a primary series. While the proportion of Canadians vaccinated with a primary series is high, the proportion who have received at least one additional dose has plateaued at a lower level, especially in the younger age groups. Vaccine coverage (particularly for the additional doses) increases with increasing age.
- Hybrid immunity (i.e., protection due to vaccination and infection) has increased as many Canadians have now been infected with SARS-CoV-2. A national seroprevalence study of Canadian Blood Services donors (17 years of age and older) suggests that about 37% of individuals have infection-acquired antibodies <sup>(2)</sup>. Preliminary unpublished data show that about 50% of Canadian children aged less than 5 years have been infected with SARS-CoV-2, a seroprevalence rate similar or higher than older age groups <sup>(3)</sup>. When considering history of prior infection and/or vaccination, important differences by age group are observed. In general, while older adults are more likely to have been vaccinated, they are the least likely to have evidence of both vaccination and infection (i.e., hybrid immunity) among individuals 5 years of age and older <sup>(2, 4)</sup>.
- Although the Omicron variant is associated with less severe illness compared to previous strains, it is partially evasive of immunity conferred by ancestral COVID-19 vaccines or by a previous infection with a SARS-CoV-2 variant prior to Omicron.
- Preliminary evidence suggests infection- and/or vaccine-acquired immunity wanes over time, which supports administration of subsequent vaccine doses (especially in populations at high risk of severe disease and/or at high risk of poor immune responses to vaccination) to improve protection in case of increasing COVID-19 indicators (e.g., case incidence, test positivity, outbreaks, wastewater signals).
- Some international jurisdictions have released interim guidance on forthcoming COVID-19 vaccination programs.

NACI continues to strongly recommend a primary series with an authorized mRNA vaccine in all authorized age groups. NACI also strongly recommends a booster dose for all adults, and for adolescents who are considered to be at high risk for severe disease. Immunization of those who are eligible for vaccination but have not yet received their recommended doses (primary or booster) remains a top priority in Canada. As with previous COVID-19 booster programs, a fall booster dose in advance of a potential future wave of COVID-19 will be most important for older

adults and other populations at increased risk of severe COVID-19 disease, regardless of the number of booster doses previously received. Evidence to date suggests that while protection against symptomatic disease wanes over time, protection against severe disease is better maintained.

NACI continues to monitor the rapidly evolving scientific data while recognizing that the trajectory of the COVID-19 pandemic remains unclear. Updated recommendations will be made as needed.

NACI's recommendations remain aligned with the goals of the Canadian COVID-19 Pandemic Response that were updated on [February 14, 2022](#):

- To minimize serious illness and death while minimizing societal disruption as a result of the COVID-19 pandemic
- To transition away from the crisis phase towards a more sustainable approach to long term management of COVID-19

## Methods

NACI's recommendations on booster doses are based on the decision-making framework outlined in the published statement entitled [Interim guidance on booster COVID-19 vaccine doses in Canada](#). This framework has been updated with evolving evidence (e.g., including consideration of population level cumulative immunity and vaccine coverage) as outlined in [Table 1](#). Recommendations are based on evidence of the *need for* (e.g., increased risk of severe illness from COVID-19 and/or increased risk of decreased protection, and waning protection due to increased time since last dose or infection) and *benefit of* (e.g., safety and effectiveness) booster doses in the Canadian context.

NACI also reviewed its original framework entitled [Guidance on the prioritizing of key populations for COVID-19 immunization](#) with a primary series when making these recommendations. NACI's original prioritization framework was based on evidence of increased risk of severe illness and death from COVID-19 as well as increased risk of exposure to SARS-CoV-2 in the context of constrained vaccine supply. With the evolution of the pandemic, COVID-19 vaccination, and evidence since this original framework, NACI's current recommendations for an additional booster dose focus on key populations at increased risk of severe illness and death from COVID-19.

On May 24, 2022, and June 7, 2022, NACI reviewed data on the current epidemiology of COVID-19, the level and duration of protection conferred by vaccine-induced immunity, SARS-CoV-2 infection-induced immunity and hybrid immunity (i.e., induced by vaccination and infection); as well as considered future multivalent COVID-19 vaccines.

NACI approved the following recommendations on June 22, 2022.

For further information on NACI's recommendations on the use of COVID-19 vaccines, please refer to National Advisory Committee on Immunization (NACI): [Statements and publications](#) and the [COVID-19 vaccine chapter](#) in the [Canadian Immunization Guide](#) (CIG)

Further information on [NACI's process and procedures](#) is available elsewhere <sup>(5, 6)</sup>.

**Table 1. Underlying factors\* for consideration to determine the need for and benefit of a booster dose of COVID-19 vaccine in various populations**

Underlying factors* for consideration	Evidence reviewed to determine the need for and benefit of a booster dose of COVID-19 vaccine
Risk-benefit analysis	<ul style="list-style-type: none"> <li>• Risk of severe illness and death</li> <li>• Risk of exposure (including access to Infection Prevention and Control [IPC] measures and healthcare)</li> <li>• Risk of transmission to vulnerable populations</li> <li>• Risk of societal disruption</li> <li>• Prevention of Multisystem Inflammatory Syndrome in Children (MIS-C) and post-COVID-19 condition (long COVID)</li> </ul>
COVID-19 epidemic conditions	<ul style="list-style-type: none"> <li>• Circulation of SARS-CoV-2, VOCs</li> <li>• Breakthrough cases, outbreaks</li> <li>• Case rates and implications for healthcare capacity</li> </ul>
Population level cumulative immunity and vaccine coverage	<ul style="list-style-type: none"> <li>• Previous vaccination (coverage, type, number of/interval between doses, time since last dose)</li> <li>• Previous SARS-CoV-2 infection</li> </ul>
Vaccine types available and forecasted	<ul style="list-style-type: none"> <li>• Number and type of available vaccines</li> <li>• Forecasted vaccines (e.g., multivalent vaccines)</li> </ul>
Vaccine characteristics in different groups against wild-type and VOCs	<ul style="list-style-type: none"> <li>• Duration of protection</li> <li>• Immunogenicity</li> <li>• Efficacy/effectiveness</li> <li>• Safety and reactogenicity of booster doses</li> </ul>

\* based on evolving evidence

## Recommendations

NACI continues to strongly recommend that individuals in the authorized age groups should be immunized with a primary series of an authorized mRNA vaccine. NACI also continues to recommend a first and a second booster in some populations. NACI reiterates its recommendation on concurrent administration of COVID-19 vaccines with other vaccines. For further information on previous guidance, please refer to the [COVID-19 vaccine chapter](#) in the [Canadian Immunization Guide](#) (CIG).

The likelihood, timing, and severity of a future wave of COVID-19 is uncertain; however, the later fall and winter months are expected to be associated with a resurgence of SARS-CoV-2 community transmission due to indoor and seasonal gatherings. Later fall and winter is also a time when the incidence rates of other respiratory diseases are elevated, which leads to increased pressure on health systems. NACI will continue to monitor the evidence (including SARS-CoV-2 epidemiology and available vaccine options) in the coming months to provide recommendations on the type and timing of vaccines for subsequent booster doses, as well as any updates to the

following interim recommendations which are provided to assist with operational planning. At this time:

In addition to offering a primary series with a COVID-19 vaccine to individuals in all authorized age groups and booster dose(s) in eligible populations previously recommended by NACI, jurisdictions should plan for the following in advance of a possible future wave of COVID-19 in Canada:

1. NACI recommends that **individuals who are at increased risk of severe illness from COVID-19 should be offered** a fall COVID-19 vaccine booster dose\* regardless of the number of booster doses previously received, including:
  - Older adults (≥65 years of age)
  - Residents of long-term care facilities or congregate living settings for seniors
  - Individuals 12 years of age and older with an underlying medical condition that places them at high risk of severe COVID-19\*\*
  - Adults in or from First Nations, Métis, or Inuit communities, where infection can have disproportionate consequences\*\*\*
  - Adults in racialized communities and/or marginalized communities (e.g. people living with disabilities) disproportionately affected by COVID-19
  - Residents of other congregate living settings (e.g., quarters for migrant workers, shelters, correctional facilities, group homes) who are 12 years of age and older

*(Strong NACI Recommendation)*

2. NACI recommends that **all other individuals 12 to 64 years of age may be offered** a fall COVID-19 booster dose\* regardless of the number of booster doses previously received.

*(Discretionary NACI Recommendation)*

3. NACI recommends that COVID-19 booster doses may be offered at an interval of 6 months since previous COVID-19 vaccine dose or SARS-CoV-2 infection. However, a shorter interval of at least 3 months may be warranted in the context of heightened epidemiologic risk, as well as operational considerations for the efficient deployment of the program.

*(Discretionary NACI Recommendation)*

*\* NACI will provide recommendations on the type of COVID-19 vaccine to be offered for this booster dose as evidence on multivalent vaccines becomes available.*

*\*\*Individuals with an underlying medical condition that places them at high risk of severe COVID-19 may include: those with cardiac or pulmonary disorders, diabetes mellitus and other metabolic diseases, cancer, immune compromising conditions (due to underlying disease, therapy, or both, such as solid organ transplant or hematopoietic stem cell transplant recipients), renal disease, anemia or hemoglobinopathy, neurologic or neurodevelopmental conditions, Class 3 obesity (BMI of 40 and over), those who are pregnant. A range of factors can impact the relative risk of severe COVID-19 and response to COVID-19 vaccines, and clinical and public health judgement should be applied.*



\*\*\* *Autonomous decisions should be made by Indigenous Peoples with the support of healthcare and public health partners in accordance with the [United Nations Declaration on the Rights of Indigenous Peoples](#).*

- If adults (≥18 years) or high risk adolescents (12-17 years) have not yet received a first booster dose by the fall of 2022, NACI continues to strongly recommend that a first booster dose be offered.
- For all currently vaccine eligible individuals (i.e., aged 5 years and older), concurrent administration of other vaccines (e.g., seasonal inactivated influenza vaccine) and any dose of a COVID-19 vaccine is acceptable and may increase program efficiency.
- Although Omicron is the variant predominantly circulating in Canada at the time of writing, the timing of a potential new variant or wave of COVID-19, and its characteristics (e.g., transmission, virulence, vaccine escape) cannot be reliably predicted. Given the uncertainties, the planning of a forthcoming COVID-19 booster program should include sufficient resilience and flexibility (e.g., emerging epidemiological trends may alter the timing of an upcoming booster program, triggering an earlier or later roll-out than currently anticipated). Timely, close and ongoing monitoring and assessment of national and international data will be required to ensure adaptability of response.
- There may be variability in how each province, territory and community assesses risk and responds to the needs of their respective jurisdictions. Underlying factors to consider are listed in [Table 1](#).

## Summary of evidence

### **Evolving epidemiology and vaccine coverage**

- Cases of COVID-19, including associated hospitalizations and deaths, are currently declining in Canada. However, the likelihood, timing, and severity of a future wave of COVID-19 is uncertain. It is possible that consistent with other respiratory viruses, incidence of COVID-19 will increase in the later fall and winter seasons thus posing a risk for individuals/communities and increasing pressure on health systems.
- Data from Canadian Blood Services (donors aged 17 years and older) suggest that about 37% of Canadians were infected with SARS-CoV-2 by the end of April 2022 with variation by jurisdiction and higher infection rates among children, young adults, racialized communities and those residing in lower-income neighborhoods <sup>(7)</sup>. Preliminary unpublished data suggest that seroprevalence in individuals less than 17 years of age is higher compared to older age groups <sup>(3, 8)</sup>.
- The evolution of seroprevalence rates over time suggests that the majority of infected individuals were infected by the Omicron variant.
- Regardless of vaccination status, age remains the greatest risk factor for severe outcomes of COVID-19.
- As of May 22, 2022, 86% of the population aged 5 years and older had been vaccinated with a primary series, 59% of the population aged 18 years and older had received an additional dose or booster, and 40% of the population aged 80 years and older had received two additional doses <sup>(9)</sup>. While the proportion of Canadians vaccinated with a primary series was high, the proportion who had received at least one booster had



plateaued at a relatively lower level. Vaccine coverage (especially for additional doses) increased with increasing age.

### Hybrid immunity

- Available evidence shows that hybrid immunity is more robust than immunity due to infection or vaccination alone. The duration of protection from hybrid immunity has not yet been fully characterized, and it is unclear whether hybrid immunity will continue to provide strong protection against some Omicron sub-lineages (e.g. BA.4, BA.5) or potential new variants <sup>(2, 10-16)</sup>.
- Hybrid immunity resulting from three or more exposures to the virus antigen (i.e.,  $\geq 1$  exposure[s] from vaccination and  $\geq 1$  exposure[s] from SARS-CoV-2 infection before or after vaccination) may provide superior protection (as measured by neutralization capacity) against VOCs, including Omicron, compared with primary vaccination only, or previous SARS-CoV-2 infection without vaccination <sup>(16)</sup>.
- Preliminary unpublished data from Quebec healthcare workers (mostly aged 60 years and younger) indicate that protection against Omicron BA.2 conferred by prior infection (with or without vaccination) is higher following prior infection with Omicron BA.1 compared to prior infection with pre-Omicron strains <sup>(12)</sup>. The protection against Omicron BA.2 conferred by a prior SARS-CoV-2 infection was increased by vaccination with 1 and 2 doses but did not seem to increase with a third dose. At about 4 months (132 days) of follow up, protection against Omicron BA.2 reinfection was 72% in individuals with prior BA.1 infection without vaccination and 96-97% among those with Omicron BA.1 infection and vaccination with 2 or 3 doses.
- Emerging Canadian evidence suggests that the proportion of the Canadian population that are infected and/or vaccinated varies by age. A large proportion of elderly adults are protected by vaccination but not by hybrid immunity. On the other hand, a large proportion of infants and young adults have been infected but not vaccinated. About 50% of children aged less than 5 years have been infected but not vaccinated as no vaccine has been authorized in this age group to date; this proportion may vary by jurisdiction. Adolescents and young adults have the highest proportion of individuals that have been both vaccinated and infected with SARS-CoV-2. However data have yet to be published and should be considered preliminary at this time <sup>(3)</sup>.
- It is expected that individuals who have been infected with SARS-CoV-2 may optimize their benefit from future vaccine doses by timing them according to the time since infection, using similar immunological principles to those informing intervals between vaccine doses. Emerging evidence indicates that a longer interval between SARS-CoV-2 infection and vaccination is associated with improved immune responses to COVID-19 vaccines.

### Vaccine effectiveness (VE) and duration of protection following a first or second booster dose

- Current data suggest that COVID-19 vaccines offer higher protection against hospitalization and severe disease than against infection, and they offer reduced protection against Omicron compared to ancestral strain and previous VOCs. VE against severe disease with Omicron infection is approximately 90% shortly after a first booster dose and remains above 75% in most studies, up to 20 weeks from the first booster <sup>(17-20)</sup>. VE against Omicron infection and/or symptomatic disease from a first booster of mRNA

vaccine is approximately 60% shortly after the dose and decreases over time since vaccination in most studies <sup>(17-24)</sup>.

- Evidence on second booster VE is limited and has mainly been assessed as a relative benefit compared to the first booster <sup>(25-29)</sup>. Preliminary data indicates that a second booster dose provides additional protection compared to a first booster, including against severe disease. The duration of protection is currently unknown <sup>(28)</sup>.
- Longer intervals between doses have been shown to result in a stronger and more durable immune response <sup>(30, 31)</sup> and somewhat better VE than shorter intervals <sup>(30, 32, 33)</sup>. A longer interval between doses provides the opportunity for antibody levels to wane, which may result in a more robust immune memory response after the next dose, as it allows time for the immune response to mature in both breadth and strength.
- The absolute benefit of a booster will depend on the residual protection from previous vaccine doses/infection and on the level of circulating disease in the community.

### **Safety**

- Overall, from both Canadian and International safety surveillance data, mRNA COVID-19 vaccine reactogenicity for first and second booster doses is comparable to the reactogenicity of the primary series <sup>(25, 34-42)</sup>. Booster doses were well tolerated and no new safety signal was identified. However, second booster doses have generally been administered in specific populations (e.g., LTC residents, older adults) or in small groups, therefore evidence of their safety is currently limited. The risk of myocarditis and/or pericarditis following the first booster dose was lower compared to dose 2 of the primary series, which is consistent with lower risk due to extended intervals between doses <sup>(39, 40, 43)</sup>. The risk of myocarditis and/or pericarditis associated with additional doses is currently unknown.
- Evidence monitoring is ongoing on the safety of additional doses of mRNA COVID-19 vaccines.

### **Ethics, equity, feasibility, and acceptability (EEFA)**

- In the face of uncertainty about how the pandemic will evolve, NACI based its recommendations on an evidence-informed framework and recommends booster doses to those at greatest risk of serious harms to avoid preventable morbidity and mortality.
- Planning vaccination ahead of a future wave of COVID-19 could facilitate access to vaccines, reduce inequities, and decrease the burden on healthcare systems.
- Intentions to accept COVID-19 booster doses have decreased between late 2021 and early 2022 in Canada, especially among younger age groups. It is possible that acceptability will increase if cases of COVID-19 increase or if new vaccines (e.g., bivalent or multivalent products targeting VOCs) are offered <sup>(44)</sup>.
- Public health and health care providers have considerable experience with efficient, rapid, large scale vaccination campaigns which can be used as the foundation for rapid implementation of booster doses for populations such as residents of LTC homes and seniors living in other congregate settings who have been disproportionately affected by the COVID-19 pandemic.
- NACI continues to recommend the following elements to guide ethical decision-making, as outlined in [NACI's guidance on the Prioritization of Key Populations for COVID-19 Immunization](#):

- Efforts should be made to increase access to immunization services to reduce health inequities without further stigmatization or discrimination, and to engage systemically marginalized populations and racialized populations in immunization program planning.
- Jurisdictions should ensure close and rapid monitoring of safety, coverage and effectiveness of the vaccines in different key populations, as well as effective and efficient immunization of populations in hard to reach, remote and isolated communities.
- Efforts should be made to improve knowledge about the benefits of vaccines in general, including COVID-19 vaccines as each becomes available, address misinformation, and communicate transparently about COVID-19 vaccine allocation decisions.
- NACI continues to emphasize the importance of completing a primary series of vaccines.

### Other considerations

- Manufacturers are working on new COVID-19 vaccines, including multivalent vaccines and vaccines specifically targeting VOCs, although their exact characteristics and timing of availability in Canada are not yet known. Preliminary data suggests that the Moderna (50mcg) Omicron-containing bivalent booster candidate (mRNA-1273.214) demonstrates superior antibody response against Omicron, and non-inferior antibody responses against the ancestral strain, compared to the original mRNA-1273 (50 mcg) vaccine <sup>(45)</sup>. The mRNA-1273.214 (50mcg) booster dose was generally well-tolerated and its safety and reactogenicity profile was similar to the mRNA-1273 (50 mcg) dose when administered as a second booster dose.
- Maximizing the benefit of protection of a booster dose may be affected by the interval between doses. Longer time between doses may result in a better response after any subsequent dose, as this allows time for the immune response to mature in breadth and strength. A longer interval may, however, also increase the chance of a period with waning (lower) protection while awaiting a next dose.
- As protection against infection and severe disease is highest soon after vaccine administration, vaccination at a time of low disease incidence may have limited benefit, particularly if there is an extended period of time before the next wave of COVID-19.

## RESEARCH PRIORITIES

1. Continuous monitoring of data on the safety, immunogenicity, efficacy, and effectiveness of the COVID-19 vaccines, including booster doses, through clinical trials and studies in real-world settings, including the degree and duration of protection conferred by each booster dose against circulating variants. The research should also consider the clinical implications of previous SARS-CoV-2 infection; repeated immunization; and outcomes after any infection such as MIS-C, post-COVID-19 condition (long COVID), or infection-induced myocarditis or pericarditis in adult, adolescent, and pediatric populations.
2. Further evaluations of the optimal interval between booster dose administration, as well as further evaluations of the optimal interval between previous SARS-CoV-2 infection and vaccine dose administration.

3. Vigilant monitoring and reporting of adverse events of special interest, including myocarditis and pericarditis, in order to accurately inform potential risks associated with a future booster. Global collaboration should be prioritized to enable data sharing so decision makers around the world can weigh benefits and risks of additional booster doses of COVID-19 vaccine.
4. Continuous monitoring of COVID-19 epidemiology and VE in special populations at high risk of severe outcomes or long-term consequences of COVID-19 disease.
5. Further evaluation on the optimal timing and trigger for the initiation of potential future booster dose recommendations, as well as evaluation of potential risks associated with providing booster doses earlier than necessary.
6. Continuous monitoring of vaccine uptake in the Canadian population, particularly in the context of subsequent booster doses and including consideration of measures that may reduce the risk of disparities in vaccine confidence and uptake.

**Table 2. Strength of NACI Recommendations**

<b>Strength of NACI Recommendation</b> <i>based on factors not isolated to strength of evidence</i> (e.g., public health need)	<b>STRONG</b>	<b>DISCRETIONARY</b>
<b>Wording</b>	<i>“should/should not be offered”</i>	<i>“may/may not be offered”</i>
<b>Rationale</b>	Known/anticipated advantages outweigh known/anticipated disadvantages (“should”), OR Known/Anticipated disadvantages outweigh known/anticipated advantages (“should not”)	Known/anticipated advantages are closely balanced with known/anticipated disadvantages, OR uncertainty in the evidence of advantages and disadvantages exists
<b>Implication</b>	A strong recommendation applies to most populations/individuals and should be followed unless a clear and compelling rationale for an alternative approach is present.	A discretionary recommendation may be considered for some populations/individuals in some circumstances. Alternative approaches may be reasonable.

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