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

Guidance on the Prioritization of Key Populations for COVID-19 Immunization

PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

Public Health Agency of Canada | Agence de la santé publique du Canada

Canada

INTRODUCTION

The goal of Canada's pandemic response is to minimize serious illness and death while minimizing societal disruption as a result of the COVID-19 pandemic. Safe and effective COVID-19 vaccines will help achieve this goal. Initial supplies of authorized COVID-19 vaccines are not expected to be sufficient to offer vaccination to all Canadians in whom they are authorized for use until the fall of 2021. Therefore, recommendations to prioritize key populations for early immunization are needed in order to meet the pandemic response goal as equitably, ethically and efficiently as possible.

The evidence on COVID-19 and COVID-19 vaccines is rapidly evolving. To date, the National Advisory Committee on Immunization (NACI) has developed the following evidence-informed guidance related to the prioritization of key populations in the context of limited vaccine supply to inform the planning of provincial and territorial publicly funded COVID-19 immunization programs:

1. Preliminary guidance on key populations for early COVID-19 immunization (November 2020 [1]): NACI developed this guidance in the absence of information on the results of vaccine clinical trials, vaccine characteristics, and vaccine supply. NACI conducted a comprehensive systematic assessment of ethics, equity, feasibility and acceptability (EEFA) considerations with the peer-reviewed EEFA Framework [2] in order to develop the recommendations. The guidance was informed by evidence available at the time of NACI deliberations including: the epidemiology of COVID-19, the results of a rapid review of risk factors for severe COVID-19 [3], and stakeholder consultations (including surveys of experts, patient and community advocates [4], and the Canadian public [5-9]). This guidance document provided a framework upon which further prioritization could be based as evidence evolved. This framework is summarized in Figure 1 of the evidence-informed guidance document.
2. Guidance on the prioritization of initial doses of COVID-19 vaccines (December 2020): NACI developed this urgent guidance based on the framework above when preliminary evidence on the results of the Phase 3 clinical trials of the Pfizer-BioNTech and Moderna COVID-19 vaccines became available. These recommendations further sequenced the key populations identified in NACI's preliminary guidance in anticipation of the arrival of initial doses of authorized COVID-19 vaccines.

Since the publication of the above guidance documents, COVID-19 vaccines have been authorized for use in Canada under an interim order. NACI released recommendations on the use of the first authorized COVID-19 vaccine on December 12, 2020, and has updated their guidance as additional vaccines have become authorized for use in Canada, and as evidence on these vaccines has evolved. NACI recommendations on the use of COVID-19 vaccines are available here.

Data on COVID-19 vaccination coverage and doses administered in various key populations in jurisdictions across Canada is available here.

Guidance objective:
The objective of this advisory committee statement is to provide guidance for the equitable, ethical, and efficient allocation of authorized COVID-19 vaccines in the context of staggered arrival of vaccine supply that will necessitate offering vaccines to some populations earlier than

others. This guidance builds on the foundational framework of NACI's preliminary guidance with updates informed by current evidence on COVID-19 and authorized COVID-19 vaccines.

METHODS

Consultations with various stakeholders since the development of the initial guidance on key populations have included: Public Health Ethics Consultative Group, First Nations and Inuit Health Branch (FNIHB), Indigenous Services Canada, NACI liaison and ex-officio organisations, the Canadian Immunization Committee (CIC), the Pan-Canadian Public Health Network's Special Advisory Committee on COVID-19 (SAC), SAC's Technical Advisory Committee, the Sex and Gender Based Analysis Plus (SGBA+) network with the Social Determinants of Health Division at PHAC; and Immigration, Refugees and Citizenship Canada (IRCC). NACI considered the values and preferences of the general Canadian population, expert stakeholders, and specific key populations through the results of surveys [4, 9-11], literature reviews [12, 13], and communication with patient and community advocates via the NACI Chair, NACI Secretariat and the Public Health Agency of Canada.

On January 19, 2021, NACI and the NACI High Consequence Infectious Disease Working Group (HCID WG) reviewed updated evidence on the epidemiology of COVID-19, Canadian data on the intersectionality between various biological and social risk factors for COVID-19, and issues related to the ethics, equity, feasibility and acceptability of immunization in different key populations. Members of NACI and the NACI HCID WG completed surveys on the prioritization of different key populations on January 24, 2021. NACI reviewed results from a rapid review of evidence [3] on risk factors for severe outcomes of COVID-19 that informed NACI's previous guidance, as well as preliminary results (see Appendix A) from an updated rapid review of biological risk factors (in studies from the Organisation for Economic Co-operation and Development (OECD) countries) and social risk factors (in studies from Canada) by the Alberta Research Centre for Health Evidence (ARCHE) on January 19 and 28, 2021. On January 28, 2021, NACI deliberated on the cumulative evidence and proposed recommendations. On February 5, 2021, NACI voted on and approved the revised recommendations.

Further information on NACI's process and procedures is available elsewhere [14].

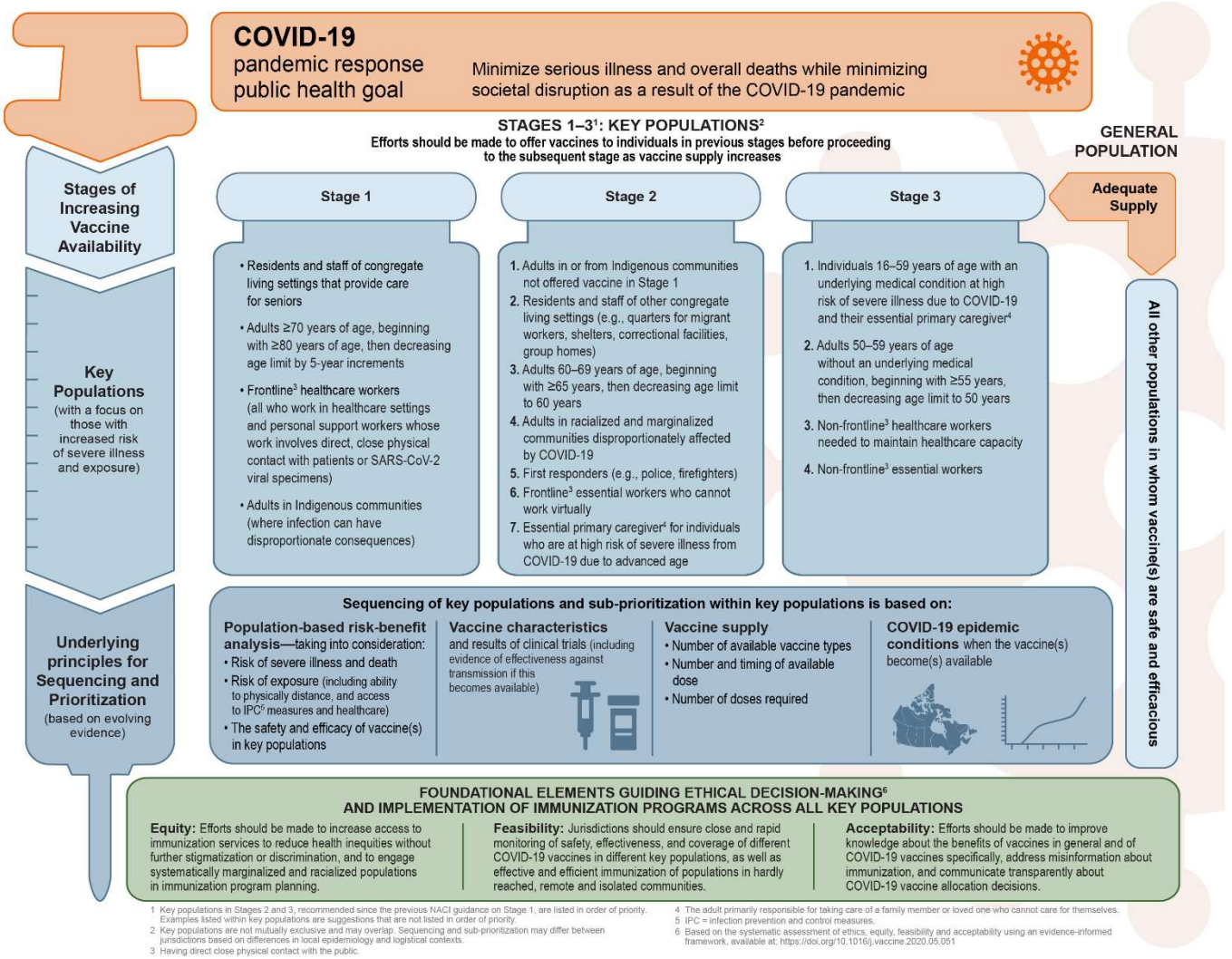
RECOMMENDATIONS

Figure 1 summarizes NACI's recommendations for the equitable, ethical, and efficient allocation of authorized COVID-19 vaccines in the context of staggered arrival of vaccine supply. This figure updates the foundational framework from NACI's Preliminary guidance on key populations for early COVID-19 immunization with current evidence on COVID-19 and COVID-19 vaccines.

NACI developed these evidence-informed recommendations to inform the planning of provincial and territorial publicly funded COVID-19 immunization programs with evidence available at the time of deliberations. NACI recognizes that logistical/operational and epidemiological contexts vary between provinces and territories across Canada, and this may affect the sequencing of, and sub-prioritization within, key populations identified in each stage. NACI encourages jurisdictions to align with these recommendations as much as possible to ensure the equitable, ethical, efficient and consistent allocation of COVID-19 vaccines in Canada, while considering their local contexts.

NACI also acknowledges that the epidemiology of COVID-19 (including the emergence of SARS-CoV-2 virus variants of concern) and the evidence on COVID-19 vaccines are rapidly evolving and will continue to monitor the evidence and update recommendations as needed.

Figure 1. Summary of NACI recommendations on the prioritization of key populations for COVID-19 immunization



Stages of increasing vaccine availability

Key populations are sequenced in three stages corresponding to increasing vaccine availability in each quarter of 2021. By the end of the third quarter of 2021, it is anticipated that sufficient vaccine supply will be available to offer vaccines to the general Canadian population. NACI recommends that efforts should be made to offer authorized COVID-19 vaccines to individuals in the key populations identified in each stage before proceeding to the subsequent stage as vaccine supply increases.

Underlying principles for sequencing and prioritization of key populations

NACI's recommendations on the sequencing of key populations and sub-prioritization within key populations are based on evidence available on the following:

- Population-based risk-benefit analysis, taking into consideration:
  - Risk of severe illness and death from COVID-19
  - Risk of exposure to SARS-CoV-2 (including ability to physically distance, as well as access to other infection prevention and control measures and healthcare)
  - Safety and efficacy of authorized vaccines in key populations
- Vaccine characteristics and results of clinical trials (recognizing that evidence of effectiveness against transmission of SARS-CoV-2 is evolving)
- Vaccine supply (number of available vaccine types, number and timing of available doses, number of doses required for each key population)
- COVID-19 epidemic conditions when the vaccines become available (recognizing that these may differ across Canadian jurisdictions)

NACI recommends that authorized COVID-19 vaccines be prioritized for individuals in the key populations sequenced in three stages of increasing vaccine supply, and sub-prioritized within each stage as outlined in Figure 1 until adequate supply is available to offer vaccines to the general population. NACI recognizes that sequencing and sub-prioritization within each stage may differ between jurisdictions depending on local COVID-19 epidemiology and logistical contexts. Sub-prioritization within key populations should be based on increased risk of severe illness and death from COVID-19 (e.g., age) and increased risk of exposure to SARS-CoV-2 (e.g., inability to physically distance). The key populations are not mutually exclusive and may overlap.

Foundational elements guiding ethical decision-making (for equitable, feasible, and acceptable recommendations) and implementation of COVID-19 immunization programs across all key populations

The foundational elements that guided ethical decision-making for these recommendations are consistent with those outlined in NACI's EEFA framework. Evidence-informed tools were used to comprehensively assess issues related to ethics, equity, feasibility and acceptability [2] of COVID-19 vaccination in NACI's Preliminary guidance on key populations for early COVID-19 immunization.

NACI endeavoured to make ethical, equitable and evidence-based recommendations. NACI acknowledges that some populations are at increased risk of exposure to the SARS-CoV-2 virus (e.g., due to living or occupational settings), and some populations are at increased risk of severe COVID-19 disease and outcomes (e.g., hospitalization and death) due to various biological (e.g., advanced age, pre-existing medical conditions) and social (e.g., low socioeconomic status, belonging to a racialized population) [3] factors that may intersect. Factors for risk of severe disease and risk of exposure may overlap, further increasing risk. Any combination of these factors, as well as varying access to health care services, has the potential for disproportionate consequences for specific populations characterized by increased rates of infection and disease, severe illness, hospitalizations, and deaths. NACI also acknowledges that evidence regarding risk factors for severe outcomes from COVID-19 continues to emerge. NACI will monitor the evidence and update its recommendations as needed.

Many of the populations at increased risk of severe disease or exposure face challenges accessing immunization. The COVID-19 pandemic has magnified social and biologic inequities

and threatens to exacerbate them with the inequitable allocation of vaccines. [15] Please see the Equity Matrix, updated with evolving evidence and consultations, for a summary of inequities associated with COVID-19, potential reasons for and intersections between these inequities, and suggested interventions to reduce inequities and improve access to vaccines.

NACI also endeavoured to make recommendations that are acceptable to Canadians and feasible to implement, informed by stakeholder consultations and surveys of experts, the general Canadian population, and key populations.

Based on these foundational elements, as well as updated considerations on the spectrum of biological and social inequities and their intersections [15], NACI makes the following recommendations for the implementation of immunization programs across all populations:

- **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.**

  - Examples of interventions to engage communities and address barriers to accessing vaccine, as summarized in the Equity Matrix [15], could help reduce inequities. For example, strategies should be implemented to increase availability and access to COVID-19 vaccines to migrant groups, who fall within the above key populations, but for whom vaccines are not typically provided under provincial or territorial health plans. Migrant groups can include: temporary residents (e.g., temporary foreign workers, international students, asylum seekers etc.) and undocumented migrants (i.e., individuals without status).

- **Jurisdictions should ensure close and rapid monitoring of safety, effectiveness, and coverage of different COVID-19 vaccines in different key populations, as well as effective and efficient immunization of populations in remote, hardly reached, and isolated communities.**

  - For example, implementation plans for immunization programs should consider convenient, reachable locations for all populations, including those with challenges accessing traditional healthcare settings such as those experiencing homelessness, those with disabilities, or those without transportation. Plans to book appointments, for recall and reminder systems, and to monitor safety and effectiveness should consider how to reach individuals without phones or access to technology.

- **Efforts should be made to improve knowledge about the benefits of vaccines in general and of COVID-19 vaccines specifically, address misinformation, and communicate transparently about COVID-19 vaccine allocation decisions.**

  - For example, engaging social influencers, Elders and leaders of cultural and faith-based groups with community-driven efforts for coordinated public health approaches and immunization program planning, and providing culturally sensitive educational materials in appropriate languages, literacy levels and media channels could combat misinformation and mistrust about vaccination in general, and COVID-19 vaccines specifically.

Key Populations prioritized for COVID-19 vaccination

Based on the above principles for sequencing and prioritization of key populations, and the foundational elements guiding ethical decision-making, NACI recommends that the following key populations in Table 1 for whom authorized COVID-19 vaccines are recommended be prioritized

for COVID-19 immunization. Additional details on key populations, as well as the evidence and rationale for the prioritization of these key populations, are summarized in Table 2.

Table 1. Key Populations* prioritized for COVID-19 immunization in the context of staggered vaccine supply

Efforts should be made to offer vaccines to individuals in previous stages before proceeding to the subsequent stage as vaccine supply increases		
STAGE 1	**STAGE 2†**	**STAGE 3†**
• Residents and staff of congregate living settings that provide care for seniors • Adults ≥70 years of age, beginning with ≥80 years, then decreasing age limit by 5-year increments • **Frontline‡** healthcare workers (all who work in healthcare settings and personal support workers whose work involves direct care with patients) • Adults in Indigenous communities (where infection can have disproportionate consequences)	1. Adults in or from Indigenous communities not offered vaccine in Stage 1 2. Residents and staff of other congregate living settings. (e.g., quarters for migrant workers, shelters, correctional facilities, group homes) 3. Adults 60-69 years of age, beginning with ≥65 years, then decreasing age limit to 60 years 4. Adults in racialized and marginalized communities disproportionately affected by COVID-19 5. First responders (e.g., police, firefighters) 6. Frontline‡ essential workers who cannot work virtually 7. Essential primary caregiver§ for individuals who are at high risk of severe illness from COVID-19 due to advanced age	1. Individuals 16-59 years of age with an underlying medical condition at high risk of severe illness due to COVID-19 and their essential primary caregiver§ 2. Adults 50-59 years of age without an underlying medical condition, beginning with ≥55 years, then decreasing age limit to 50 years 3. Non-frontline‡ healthcare workers needed to maintain healthcare capacity 4. Non-frontline‡ essential workers

*Key populations are not mutually exclusive and may overlap. Sequencing and sub-prioritization may differ between jurisdictions based on differences in local epidemiology and logistical contexts.

†Key populations in Stages 2 and 3, recommended since the previous NACI guidance on Stage 1, are listed in order of priority.

‡Frontline, for the purposes of prioritization of COVID-19 immunization, is defined as: “having direct close physical contact with the public”.

§Primary caregiver, for the purposes of prioritization of COVID-19 immunization, is defined as: “The adult primarily responsible for taking care of a family member or loved one who cannot care for themselves.”

In situations where multiple authorized COVID-19 vaccines are available in Canada, it would be reasonable that a vaccine not authorized for use in a prioritized key population, or not expected to offer optimal protection in these populations, be made available to individuals in populations outside of the priority sequence who provide informed consent. Offering a less efficacious vaccine

to key populations prioritized for early immunization may achieve some direct protection in the short-term if they could get access to the vaccine more quickly, but the long-term ramifications of less protection could perpetuate the unfair distribution of benefits and burdens associated with COVID-19 in these groups who are at increased risk of severe disease or exposure. When deciding which vaccine to offer to key populations, it is important to examine the potential for exacerbating inequities in populations who experience intersecting risk factors for severe disease (e.g., poverty, homelessness, underlying medical conditions) and exposure (e.g., multigenerational housing, over-representation in jobs providing essential services such as food and healthcare) such as racialized and marginalized populations who have been disproportionately affected by COVID-19, and that experience systemic barriers to accessing necessary supportive care for COVID-19. The benefits of earlier vaccination should outweigh the risks of vaccinating with a less efficacious vaccine. This will depend on an assessment of the local COVID-19 epidemic conditions and vaccine supply, as well as the risk of severe disease and exposure in a population. Please see NACI's recommendations on the use of COVID-19 vaccines for additional guidance.

Table 2 provides additional details and examples of key populations, as well as a summary of the evidence and rationale for the recommendations on the prioritization sequence.

Table 2. Summary of evidence and rationale for the recommendations on the sequencing and sub-prioritization of key populations in three stages* of increasing COVID-19 vaccine supply

Recommended key population for early COVID-19 immunization	Summary of evidence and rationale for the recommendation
STAGE 1	
Residents and staff of congregate living settings that provide care for seniors i.e., long term care, assisted living, retirement homes, and chronic care hospitals	• Long-term care facilities and retirement residences continue to be the most common outbreak setting in Canada, and account for the greatest proportion of outbreak-related cases and deaths [16]. Forty-four percent of all COVID-19 outbreaks and 69% of COVID-19 related deaths in Canada have been reported within long-term care and retirement facilities [17]. • Residents of these facilities are primarily of advanced age, further increasing their risk of severe outcomes, including hospitalization and death, due to COVID-19 [3]. • Living in a long-term care facility is associated with an increased risk of mortality in Canada [18]. • Canadian respondents to a survey conducted in December 2020 ranked "people living or working in long-term care facilities" as one of the top priority populations for COVID-19 vaccination in the context of limited supply [11].
Adults ≥70 years of age, beginning with those ≥80 years, then decreasing age limit by 5 year increments	• There is a large independent association of severe COVID-19 with increasing age and moderate certainty of evidence for a very large association of hospitalization and mortality particularly in those over 70 years of age. • The highest rates of hospitalization in Canada are observed in those 80 years of age and older [16]. • The proportion of individuals with at least one underlying medical condition associated with an increased risk of severe COVID-19 increases with increasing age [19]. • Older Canadians are significantly more willing than younger Canadians to get a COVID-19 vaccine and have been ranked by Canadians and expert stakeholders as a high priority group for early COVID-19 vaccination in the context of limited supply [4, 9, 11]. • The proportion of some racialized groups who have been disproportionately affected by the COVID-19 pandemic (e.g., Indigenous and South Asian) with at least one underlying medical condition is higher in this age group compared to other groups [19]. Therefore, immunization of individuals in this age group has the potential to reduce or prevent the exacerbation of health inequities related to COVID-19. • From a feasibility perspective, offering vaccination by age is logistically simpler for immunization program roll-out than other strategies.
Frontline† healthcare workers i.e., all who work in healthcare settings and personal support workers whose work involves	• Healthcare workers providing frontline care to patients cannot work virtually and are differentially exposed to SARS-CoV-2. They are essential to protect healthcare capacity, and their absence due to illness compromises healthcare capacity. The healthcare system continues to be strained due to the hospitalization of people with COVID-19, especially where infection rates are high.

direct, close physical contact with patients or SARS-CoV-2 viral specimens, including: ➢ staff who work or study in healthcare settings (e.g., students in healthcare disciplines, contract workers, volunteers) and other healthcare personnel (e.g., those working in home care agencies, labs, and community settings)	• Immunizing healthcare workers and other workers functioning in a healthcare capacity (e.g., personal support workers) minimizes the disproportionate burden of those taking on additional risks to protect the public, thereby upholding the ethical principle of reciprocity. • Among workers in a healthcare setting, those whose work puts them at increased risk due to direct contact with patients (e.g., physical contact with patients, sustained time in patients' rooms), and particularly those who are in direct contact with COVID-19 patients, should be prioritized during the initial vaccine availability. • Racialized groups and recent immigrants who have been disproportionately affected by COVID-19 are over-represented in jobs in the healthcare setting [20]. Therefore, immunization of these workers has the potential to reduce or prevent the exacerbation of health inequities related to COVID-19. • Healthcare workers have been ranked by Canadians and expert stakeholders as a high priority group for early COVID-19 vaccination in the context of limited supply [4, 9-11]. • A rapid review of Canadian studies revealed lower rates of hospitalization, intensive care unit (ICU) admission, and mortality among healthcare workers compared to non-healthcare workers. (This may be related to increased access to and training in the use of personal protective equipment among some healthcare workers, increased testing among healthcare workers, or other covariates not controlled for, such as age [18]).
Adults in Indigenous communities (where infection can have disproportionate consequences) (includes First Nations, Métis, and Inuit communities such as those living in remote or isolated areas where access to health care may be limited)	• Indigenous communities have been disproportionately impacted by past pandemics (e.g., 2009 H1N1 influenza pandemic). Remote or isolated communities may not have ready access to sufficient health care infrastructure. Therefore, their risk for severe outcomes, including death, and societal disruption is proportionally greater than in other communities. • The proportion of Canadians who identify as Indigenous and have at least one underlying medical condition associated with severe COVID-19 is higher compared to other Canadians for every age category above 20 years of age [19]. • The risk of transmission is high in settings where physical distancing and other infection prevention and control measures are challenging and individuals may not be able to exercise sufficient personal actions to adequately protect themselves from infection. • Immunization of individuals in this population has the potential to reduce or prevent the exacerbation of intersecting biological and social health inequities [15].
STAGE 2	
1. Adults in or from Indigenous communities not offered vaccine in Stage 1	• Earlier in the COVID-19 pandemic, case rates and mortality rates of COVID-19 in Indigenous communities in Canada were low compared to the general population due to the success of interventions grounded in their own traditions and self-determination [21]. However, attack rates and mortality rates in First Nations communities are now higher when compared to the overall Canadian population (when adjusted for population structure differences) [22]. • The risk of severe COVID-19 appears higher in First Nations living off reserve compared to those living on reserve. A rapid review of evidence in Canada found an association between increased hospitalization and mortality in First Nations living off-reserve vs. on-reserve (though the magnitude of association was uncertain and covariates such as age were not accounted for) [18].

	• The proportion of Canadians who identify as Indigenous and have at least one underlying medical condition associated with an increased risk of severe COVID-19 is higher compared to other Canadians for every age category above 20 years of age [19]. • Racialized and marginalized populations, such as Indigenous Peoples, have been disproportionately affected by COVID-19 due to a number of intersecting equity factors. NACI recognizes that these populations may face challenges accessing immunization services, and special efforts to reach these populations will be needed throughout all stages of vaccine roll-out. NACI encourages the implementation of strategies identified in the Equity Matrix [15], to reduce inequities and increase access to vaccines across all key populations. For example, engaging Elders with community-driven efforts for coordinated public health approaches and immunization program planning, and providing culturally sensitive educational materials in appropriate languages, literacy levels and media channels could reduce inequities and combat misinformation and mistrust.
2. Residents and staff of other congregate living settings For example: ➢ quarters for migrant workers ➢ shelters (homeless, women's and children's, newcomers) ➢ correctional facilities ➢ group homes (for those with disabilities, addictions, mental illness)	• In Canada, a high number of COVID-19 outbreaks and associated cases, including deaths, have occurred in congregate living settings (e.g., correctional facilities, shelters, quarters for migrant workers, group homes) [23]. • The risk of infection with SARS-CoV-2 is high in congregate settings where physical distancing and other infection prevention and control measures are challenging. Overcrowding and poor ventilation in these settings further increase the risk of exposure. • The risk of transmission of infection between settings such as shelters and correctional facilities and the community is increased due to movement of staff, residents, and visitors [24]. • Individuals in these settings may not be able to exercise sufficient personal actions to adequately protect themselves from infection. • Residents in congregate living facilities have a number of intersecting factors (such as underlying medical conditions, low socio-economic status and racialization [15]) contributing to health inequities and associated with an increased risk of severe outcomes of COVID-19 disease. For example, it has been estimated that 28% of those experiencing homelessness are members of racialized groups, and Canadians who identify as Indigenous are eight times more likely to experience homelessness. It is estimated that 45% of those experiencing homelessness are living with a disability or mental illness [25]. Individuals who identify as Aboriginal or Black are also overrepresented in correctional facilities in Canada [26]. Therefore, immunization of individuals in these settings has the potential to reduce or prevent the exacerbation of health inequities related to COVID-19. • Many residents in these settings have inequitable access to health care. Offering vaccines in these settings may increase access to and uptake of vaccines in residents and workers. Other strategies to increase availability and access to COVID-19 vaccines in these populations are needed [15]. For example, strategies to increase availability and access to vaccines in migrant groups (e.g., temporary foreign workers) for whom vaccines are not typically provided under provincial or territorial health plans should be implemented. • When ranking the relative importance of different groups to be vaccinated when supply is limited, Canadian survey respondents rank people living or working in high-risk settings as #5 [11].

3. Adults 60-69 year of age, beginning with ≥65 years, then decreasing age limit to 60 years	• There is a large independent association of severe COVID-19 with increasing age and moderate certainty of evidence for a large association of hospitalization and mortality in those over the age of 60 years compared to those 45 years of age and younger [3]. • There is a low or moderate certainty of evidence for an important association with increased hospitalization, mechanical ventilation, severe disease and mortality in persons with COVID-19 aged 60-69 years compared to those <60 years. In persons with COVID-19 who have two or more pre-existing conditions, there was low or moderate certainty of evidence for an important association with increased hospitalization, mechanical ventilation, and mortality (for those 60-79) compared to those with less than two pre-existing conditions [18]. • The proportion of individuals with at least one underlying medical condition associated with an increased risk of severe COVID-19 increases with increasing age [19]. • Older Canadians are significantly more willing than younger Canadians to get a COVID-19 vaccine [9, 10, 27] and have been ranked by Canadians and expert stakeholders as a high priority group for early COVID-19 vaccination in the context of limited supply [4, 9, 11]. • From a feasibility perspective, offering vaccination by age is logistically simpler for immunization program roll-out than other strategies.
4. Adults in racialized and marginalized communities disproportionately affected by COVID-19	• Racialized and marginalized populations have been disproportionately affected by COVID-19 within Canada and around the world due to a number of intersecting equity factors, including systemic barriers to accessing healthcare. • Poverty, homelessness, and belonging to Black or South Asian ethno-racial groups have been independently associated with hospitalization or mortality from COVID-19 in OECD countries [3]. • Available data in Canada reveal that ethno-culturally diverse neighbourhoods experience disproportionately higher rates of COVID-19 infections, deaths, and hospitalizations [28]. For example, neighbourhoods with the highest proportion of visible minorities (≥25%) had a mortality rate twice as high as those with the lowest proportion of visible minorities (<1%) [29]. In Ontario, rates of hospitalization and ICU admission were 4 times higher for ethnically diverse populations compared to the least ethnically diverse populations, and mortality rates were twice as high [28]. In Ottawa, while the total proportion of racialized groups make up 29% of the general population, they account for 63% of COVID-19 cases. The Black community in Ottawa makes up 7% of the general population, but accounts for 37% of COVID-19 cases [30]. • Those who tested positive for COVID-19 in Ontario more frequently lived in marginalized, lower income, ethnically diverse neighbourhoods with higher concentrations of immigrants and visible minorities [28, 31]. In Toronto, 48% of COVID-19 cases lived in low income households and 57% of these cases were hospitalized [32]. • The risk of transmission is high in settings such as multi-generational housing where physical distancing and other infection prevention and control measures are challenging and individuals may not be able to exercise sufficient personal actions to adequately protect themselves from infection. • NACI recognizes that these populations may face challenges accessing immunization services, and special efforts to reach these populations will be needed throughout all stages of vaccine roll-out. NACI encourages

	the implementation of strategies identified in the Equity Matrix [15] to reduce inequities and increase access to vaccines across all key populations. For example, strategies to reach those with challenges related to transportation, technology, time, or language should be implemented. • NACI recognizes that the feasibility of offering vaccines to this population may present challenges, and that there may be overlap with other key populations identified.
5. **First responders** For example: ➢ Police ➢ Firefighters ➢ Military ➢ Coast guard	• A first responder is among the first to arrive and provide assistance at the scene of an emergency [33] and is therefore at an increased risk of exposure to SARS-CoV-2. • Immunizing first responders minimizes the disproportionate burden of those taking on additional risks to protect the public. • Absenteeism due to illness or perceived risk of illness from COVID-19 among first responders may compromise emergency response.
6. Frontline† essential workers who cannot work virtually For example: ➢ teachers and school/childcare staff not working virtually ➢ food production/manufacturing workers ➢ grocery store staff ➢ transportation workers ➢ border services ➢ postal services ➢ those involved in the pandemic response ➢ rotational workers	• Many essential services cannot be provided virtually, potentially leading to an increased risk of exposure to SARS-CoV-2. • Immunizing essential workers minimizes the disproportionate burden of those taking on additional risks to maintain services essential for the functioning of society. • Absenteeism due to illness or perceived risk of illness from COVID-19 among workers most essential to the functioning of society may compromise critical infrastructure. • A number of outbreaks in Canada associated with a high number of cases including deaths have been reported in agricultural production/farming, meat processing/packaging facilities, and food and drink services [23]. • Racialized populations and recent immigrants are over-represented in many jobs providing frontline essential services (e.g., food manufacturing, grocery store, childcare, transportation) [20], and have been disproportionately affected by COVID-19 [29]. Therefore, immunization of these workers has the potential to reduce or prevent the exacerbation of health inequities related to COVID-19. • The proportion of COVID-19 cases associated with international travel has decreased since the Government of Canada restricted discretionary international travel [16]. However, essential workers required to travel within Canada and internationally and who are exempt from quarantine protocols (e.g., truck drivers transporting goods) [34] may acquire SARS-CoV-2, including variants of concern, and transmit the infection within Canada. While evidence regarding the effectiveness of currently authorized COVID-19 vaccines against transmission of infection is uncertain, strategies to offer vaccine to essential workers required to travel outside of Canada may be warranted. • When ranking the relative importance of different groups to be vaccinated when supply is limited, Canadian survey respondents prioritize protecting people maintaining essential services as #5 (tied with people living or working in high-risk settings) [11]. Frontline workers have similar or lower intentions to get vaccinated compared to non-frontline workers [9, 11].

	• Designations of essential services in the context of the COVID-19 pandemic vary across jurisdictions within Canada. Guidance on essential services and functions in Canada during the COVID-19 pandemic, including lists published by provinces and territories, is available.
7. **Essential primary caregiver‡ for individuals** who are at high risk of severe illness from COVID-19 due to advanced age	• Adults who assume the primary responsibility of taking care of a family member or loved one who cannot care for themselves acts in the capacity of an unpaid healthcare or personal support worker. If primary caregivers become sick, the healthcare of the individual they care for may be compromised. • It may be more logistically feasible to offer vaccine to these caregivers when they accompany the individual who they care for to the immunization appointment.
STAGE 3	
Individuals 16-59 years of age with an underlying medical condition at high risk of severe illness due to COVID-19 and their essential primary caregiver‡	• Evidence on various underlying medical conditions as independent risk factors for severe COVID-19 is rapidly evolving. Various lists of these high risk medical conditions exist and will be updated as evidence evolves [35]. The spectrum of underlying medical conditions is broad, and the degree of severity within different medical conditions varies. • A rapid review of evidence found a large association of hospitalization or mortality among individuals with COVID-19 and certain high risk medical conditions, however the certainty of evidence was low. The same rapid review of evidence found a large independent association of severe COVID-19 with increasing age with a moderate certainty of evidence [3]. An update of this rapid review found a large association of increased hospitalization and mortality with two or more comorbidities (moderate certainty of evidence), but no association of increased hospitalization and mortality with only one comorbidity [18]. This rapid review will be updated with evolving evidence on the association between pre-existing medical conditions and severe outcomes from COVID-19. NACI will continue to monitor the evidence. • The proportion of individuals with at least one underlying medical condition associated with an increased risk of severe COVID-19 increases with increasing age [19]. Therefore, the greatest proportion of individuals with at least one comorbidity will be included in the older age groups captured in earlier stages. • People with medical conditions have been ranked by Canadians and expert stakeholders as a high priority group for early COVID-19 vaccination in the context of limited supply [4, 9, 11].
Adults 50-59 years of age without an underlying medical condition, beginning with ≥55 years, then decreasing age limit to 50 years	• Studies treating age on a continuum or across small increments have consistently found that risks for hospitalization and mortality increased with increasing age (e.g., approximately 2–6% and 5–10% relative increase in risk per year) [3]. An updated rapid review of evidence found a moderate certainty of evidence for a large association with increased hospitalization, and a very large association with mortality for those with COVID-19 aged 60-69 years compared to those 50-59 years. The estimated magnitude of association appears to account for the existence of pre-existing medical conditions [18]. • Older adults (from 55 years of age) and seniors have consistently been found in Canadian surveys to be significantly more willing to get vaccinated than younger age groups [11]. • From a feasibility perspective, offering vaccination by age is logistically simpler for immunization program roll-out than other strategies.

Non-frontline† healthcare workers needed to maintain healthcare capacity	• Non-frontline† healthcare workers are essential to maintain healthcare capacity, even if their risk of exposure is reduced due to limited direct close physical contact with patients or specimens. They are essential to protect healthcare capacity, and their absence due to illness or perceived risk of illness from COVID-19 compromises the healthcare system. The healthcare system continues to be strained, especially where infection rates are high. Treatment of non-COVID-19-related conditions and important elective procedures are being delayed or postponed due to overburdened healthcare systems. • Immunizing healthcare workers and other workers functioning in a healthcare capacity minimizes the disproportionate burden of those taking on additional risks to protect the public, thereby upholding the ethical principle of reciprocity. • Healthcare workers have been ranked by Canadians and expert stakeholders as a high priority group for early COVID-19 vaccination in the context of limited supply [4, 9-11].
Non-frontline† essential workers	• Absenteeism due to illness or perceived risk of illness from COVID-19 among workers most essential to the functioning of society may compromise critical infrastructure. • Immunizing this population minimizes the disproportionate burden of those taking on additional risks to maintain services essential for the functioning of society. • When ranking the relative importance of different groups to be vaccinated when supply is limited, Canadians prioritize protecting people maintaining essential services as #5 (tied with people living or working in high-risk settings) [11]. • Designations of essential services in the context of the COVID-19 pandemic vary across jurisdictions within Canada. Guidance on essential services and functions in Canada during the COVID-19 pandemic, including lists published by provinces and territories, is available.

*Key populations in Stages 2 and 3, recommended since the previous NACI guidance on Stage 1, are listed in order of priority. Examples listed within key populations are suggestions that are not listed in order of priority. Key populations are not mutually exclusive and may overlap.
†Frontline, for the purposes of prioritization of COVID-19 immunization, is defined as: “having direct close physical contact with the public”.
‡Primary caregiver, for the purposes of prioritization of COVID-19 immunization, is defined as: “The adult primarily responsible for taking care of a family member or loved one who cannot care for themselves.”

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APPENDIX A: Factors contributing to severe COVID-19 – Preliminary results of an updated rapid review of risk factors

The Alberta Research Centre for Health Evidence is conducting an update of their rapid review [3] examining the magnitude of association between factors that may contribute to health inequity (summarized by the acronym "P2ROGRESS And Other Factors" in NACI's Equity Matrix [15]) and severe outcomes of COVID-19. The full methodological details for the updated review are available in the registered protocol: PROSPERO (CRD42021230185). The original rapid review, published as a pre-print in September 2020, [3] was limited to studies published to June 15, 2020, conducted in Organisation for Economic Co-operation and Development (OECD) countries, and adjusting their analysis for age and sex at a minimum. The review found that there was low or moderate certainty evidence for associations of a large magnitude (≥2-fold) with increased hospitalization in people having confirmed COVID-19 for the following risk factors: obesity class III (body mass index [BMI] ≥40 kg/m^2), heart failure, diabetes, chronic kidney disease, dementia, age (particularly >70 vs. ≥45 years), male sex, Black race/ethnicity (vs. non-Hispanic white), homelessness, and low income (<25th vs. >50th percentile). It also found moderate certainty evidence that age over 70 versus 45 or younger may be associated with large increases in mortality. Studies treating age on a continuum or across small increments consistently found that risks for hospitalization and mortality increased with increasing age (e.g., approximately 2-6% and 5-10% relative increase in risk per year). These findings informed and are summarized in NACI's previous guidance. The review update is ongoing, but has completed results for the following risk factors: age (60 to 69 years vs. <60 years); pre-existing conditions (1 or ≥2 vs. no pre-existing conditions); social factors (Canadian data); and occupational exposure (e.g., essential workers). This review update is informing NACI's current guidance.

A research librarian conducted the literature search update. MEDLINE and Epistemonikos COVID-19 in L.OVE Platform were searched on December 2, 2020. The database search was supplemented by handsearching Canadian websites on January 6-7, 2021, including: Statistics Canada, Public Health Agency of Canada, Public Health Ontario ICES, Government of Canada's First Nations and Inuit Health Branch. Studies were eligible if they were Canadian epidemiologic reports or prospective and retrospective cohort studies (from OECD countries) published in English or French since 1 January 2020, including preprints accepted for publication in a peer-reviewed journal, or government reports. Only higher quality studies were included, i.e., those that had a total sample size of >1000 participants to ensure sufficient adjustment for multiple variables. For social risk factors, only Canadian reports were included because these were considered by NACI as most relevant. Populations included any of the following: a general/community sample, people with confirmed COVID-19, people hospitalized with COVID-19, or people with severe COVID-19 (e.g., in ICU or mechanically ventilated). Outcomes of interest included hospitalization and length of stay, ICU admission and length of stay, mechanical ventilation, severe disease (as defined by study authors), and mortality.
No meta-analysis was conducted due to large heterogeneity in comparisons and measures of association. For each risk factor and outcome, findings were assessed across studies in terms of the estimated magnitude of association (i.e., "little to no difference" [e.g., odds ratio (OR) <2.0], "large" [OR 2.0 to 3.9], "very large" [OR ≥4.0]), and the review team's certainty in the magnitude of association based on the number, size and consistency between studies, the precision of the estimates, and the relevance of the setting and risk factors (e.g., type of healthcare system, uncertainty about risk factor clearly matching review criteria). Varying

certainty in the associations is referred to using the terms "very uncertain" (very low certainty), "may be associated" (low certainty), "probably associated" (moderate certainty), and “is associated” (high certainty).

There were 43 studies included that reported data relevant to those aged 60-69 compared to those under 60 years; 22 studies that reported on pre-existing conditions (as a categorical outcome or on a comorbidity index); 4 studies on occupational exposure; and 9 Canadian reports relevant to social and other risk factors (none meeting the review criteria for multivariable adjustment). Risk factors found to have large or very large associations with any outcome in populations with COVID-19 are presented in Table 3.

There was low or moderate certainty evidence for a large association with increased hospitalization, mechanical ventilation, severe disease, and mortality in persons with COVID-19 aged 60-69 years compared to those under 60 years. For those hospitalized with COVID, there was high certainty in a large association with increased mortality for those 60-69 versus under 60 years. In persons with COVID-19 who have two or more pre-existing conditions, there was low or moderate certainty of evidence for a large association with increased hospitalization, ICU admission, mechanical ventilation, and mortality compared to those without pre-existing conditions. Findings were similar for associations with severe disease and mortality in those hospitalized with COVID-19. There was evidence for little to no association between having a single pre-existing condition (versus none) and hospitalization (moderate certainty) or mortality (low certainty) among patients with COVID-19; findings were similar for those hospitalized with COVID-19 in terms of severe disease and mortality. This rapid review will be updated with evolving evidence on the association between pre-existing medical conditions and severe outcomes from COVID-19. NACI will continue to monitor the evidence.

For healthcare workers with COVID-19, there may be association with a large reduction in hospitalization and ICU admission (low certainty) compared to the general population or non-healthcare workers. However, the relationship between patient facing versus non-patient facing healthcare workers and these outcomes is very uncertain. Results from two Canadian studies without adjusted analysis were similar to findings from other studies suggesting a reduction in hospitalization and ICU admission, and suggested a reduction in mortality. This finding could be related to increased testing among asymptomatic healthcare workers, or increased access to, and training in the use of personal protective equipment.

Table 3: Risk factors identified by an updated rapid review that have large (+) or very large (++) associations with severe COVID-19 outcomes and the corresponding level of certainty in the association (population: people with confirmed COVID-19)

Risk factor	Outcome of interest	Magnitude of risk* (certainty in association†)
Age		
60-69 vs. <60 years	Hospitalization	+ (moderate)
	Mechanical ventilation	+ (low)
	Severe disease	+ /++ (low)
	Mortality	+/++ (moderate/low)
Pre-existing conditions		
≥2 vs. no pre-existing conditions	Hospitalization	+ (moderate)
	ICU admission	+ (low)
	Mechanical ventilation	+ (low)
	Mortality	+ (moderate)

Occupational exposure		
Healthcare workers (vs. non-healthcare workers)	Hospitalization	+ reduction (low)
	ICU admission	+ reduction (low)

* Magnitude of associations are shown as large (+; adjusted odds ratio, hazard ratio or relative risk: 2.0-3.9 [or <0.5 for reduction]) or very large association (++; adjusted odds ratio, hazard ratio or relative risk: ≥4.0).
† Certainty in the magnitude of the associations was determined by considering primarily consistency in findings across studies, relevance of the setting and risk factors (e.g., type of healthcare system, uncertainty about risk factor clearly matching review criteria), and precision (e.g., confidence intervals indicating possibility of little to no association). Low certainty indicates that there may be an association and moderate means that the evidence indicates that there probably is an association of the magnitude stated.

Table 4 summarizes findings from Canadian data on social risk factors. Among people with COVID-19, there is probably a large association between living in long-term care and increased mortality, and the association may be very large for those ages 60-80 years. Living on a First Nations reserve may be associated with lower rates of hospitalization and mortality compared to those living off-reserve among people with COVID-19, although the evidence did not account for other covariates, such as age. Among the general population, there was uncertain evidence that being a member of a visible minority population may be associated with increased mortality. Evidence on homeless persons and homeless shelter workers was uncertain and no conclusions could be drawn about the magnitude of the associations.

Table 4: Risk factors identified by an updated rapid review of Canadian data that have may have associations with severe COVID-19 outcomes and the corresponding magnitude of association

Equity Risk factor	**Association**	**Magnitude of association**
Long-term care vs. not (among people with COVID-19)	*Increase* in mortality	Large, highest for those in their 60s and 70s.
General population (off-reserve) vs. First Nations on-reserve (among people with COVID-19)	*Increase* in hospitalization	Uncertain. Evidence did not account for other important covariates.
	Increase in mortality	
Race/ethnicity (general population)	*Increase* in mortality	Uncertain. Evidence relied on ecological data and did not account for other important covariates.

Generalization of findings from other countries to Canada should be made with caution, as high-risk groups may differ by population. Furthermore, because of differences in methodology, the list of important risk factors identified in this rapid review may differ from other sources. Updated evidence syntheses on other risk factors, including various pre-existing medical conditions, will inform future NACI decisions.