Mesures de déconfinement/reconfinement ailleurs dans le monde – Veille médiatique

Information colligée du 30 octobre au 5 novembre 2020

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Comité Mesures populationnelles INSPQ

POINTS SAILLANTS

- **Augmentation des mesures de restrictions, dont pour les commerces et les rassemblements (Norvège, Nord-Est des États-Unis, Suisse, Pays-Bas, Italie).**
- **Mesures de confinement mises en place ou renforcées, souvent pour quelques semaines, pour tenter de briser la vague (Belgique, Angleterre, Pays de Galles, Irlande du Nord, France, Allemagne, Autriche, Grèce).**
- **De manière générale, les écoles demeurent ouvertes en présentiel.**
- **Manifestations contre les mesures sanitaires (Espagne, France)**
- **La Slovaquie met en place un dépistage universel de la population. L'Angleterre l'envisage pour la ville de Liverpool.**

TABLEAU DÉTAILLÉ (INFORMATION PRÉSENTÉE PAR PAYS)

Rassemblements et distanciation physique

Écoles, services de garde

Port du masque

Régions Pays	Résumé – Éléments clés	Sources / Date de publication
Amérique du Nord		
États-Unis	**Résurgence des cas dans les États du Nord-Est du pays. Massachussetts** augmente les restrictions (pour les commerces et les rassemblements) mais maintient les écoles ouvertes en présentiel. **New York exige que les voyageurs provenant des États non-voisins se fassent dépister** avant et après l'entrée (exclut New Jersey, Massachussetts, Connecticut, Vermont, Pennsylvanie de même que les travailleurs essentiels).	nytimes 4 nov
	Principales villes du Connecticut réimposent des restrictions. Réduction des rassemblements et de la capacité permise dans les commerces. Couvre-feu à Newark et fermeture des commerces non-essentiels à 20h.	nytimes 3 nov
Europe		
Espagne	**Face aux restrictions, on assiste à des manifestations et des affrontements avec la police, vandalisme, pillage.**	ledevoir 2 nov
Belgique	**Durcissement du confinement.**	ledevoir 2 nov
Pays-Bas	En plus de la fermeture des bars/restaurants et des sports amateurs pour adultes ainsi que l'encouragement au télétravail il y a 3 semaines, **le**	theglobeandmail 3 nov

	gouvernement ajoute la fermeture des cinémas, théâtres, piscines, musées pour deux semaines.	
Italie	**Le premier ministre annonce que les restrictions seront resserrées**. Pas de confinement national mais le pays sera divisé en trois grandes zones pour ajuster les mesures.	theguardian 2 nov
	Couvre-feu imposé dans plusieurs régions, fermeture des bars et restaurants à 18h, fermeture des cinémas, salles de sports et de concerts. Italie envisage un confinement de grandes villes comme Milan et Naples.	ledevoir 2 nov
France	**Confinement en place pour un mois. Les petits commerçants jugés non essentiels sont en colère face à la concurrence déloyale des grandes surfaces** qui peuvent rester ouvertes et les plateformes en ligne comme Amazon. Les grandes surfaces devront fermer leurs rayons de produits non essentiels.	ledevoir 2 nov
	En plus du confinement national, un couvre-feu sera imposé pour Paris à partir de 21h.	nationalpost 3 nov
	Manifestations à l'entrée des écoles secondaires pour contester le confinement.	theglobeandmail 3 nov
Royaume-Uni	**Reconfinement pour l'Angleterre jusqu'au 2 décembre.** **Le Pays de Galles est déjà en confinement et l'Irlande du Nord en confinement partiel.**	ledevoir 2 nov
	Confinement national de 4 semaines. Fermeture des commerces non essentiels, événements, pubs, restaurants. Les écoles, collèges et universités demeurent ouverts. On recommande aux personnes de 60 ans et plus de limiter leurs contacts sociaux mais on ne les oblige pas à les cesser complètement. **Des études en cours pour déterminer si les écoles devraient demeurer ouvertes** considérant le rôle des adolescents dans la transmission du virus.	theguardian 1 nov
	Le gouvernement envisage offrir un dépistage à toutes les personnes qui résident ou travaillent à Liverpool (ville de ½ millions d'habitants avec un taux de 410 cas par 100 000)	theglobeandmail 3 nov
Allemagne	**Confinement partiel pour le mois de novembre pour briser la 2e vague :** fermeture des bars, cinémas, théâtres, musées, centres d'entraînement, piscine. Vente pour emporter ou livraison pour les cafés et restaurants. Réunions privées max deux foyers ou 10 personnes. Écoles et garderies demeurent ouvertes.	theguardian 2 nov
	Distribuera des tests rapides dans les centres d'hébergement pour les résidents, visiteurs et employés. Pour éviter l'interdiction des visites et réduire l'anxiété.	theglobeandmail 3 nov
Norvège	**Nouvelles restrictions** : éviter les voyages entre régions du pays, rester à la maison le plus possible, limiter les interactions sociales, fermeture des bars à minuit.	nationalpos 5 nov
Portugal	**Le premier ministre demande au Président de déclarer l'État d'urgence au pays.**	theguardian 2 nov
Grèce	**Confinement partiel d'Athènes pour un mois et autres grandes villes.**	ledevoir 2 nov
Autriche	**Confinement entre en vigueur jusqu'à la fin du mois de novembre.**	ledevoir 2 nov

	Restaurants/bars pour livraison ou pour emporter seulement. Annulation des activités culturelles, sportives et de loisirs. On demande aux résidents de demeurer chez eux de 20h à 6h.	theglobeandmail 3 nov
Suisse	**Fermeture des bars, restaurants et commerces non essentiels à Genève. Port du masque obligatoire sur toutes les remontées mécaniques des montagnes suisses tout l'hiver.**	lesoleil 2 nov
Slovaquie	**Le 2/3 de la population du pays a été dépisté durant la fin de semaine** (3.6 millions de tests antigène – test rapide). 38 359 (1.06%) des tests ont été trouvés positifs. Une prochaine vague de tests prévue la fin de semaine prochaine. Objectif : dépister toute la population. Tous les cas positifs doivent faire un isolement de 10 jours.	theguardian 2 nov
Océanie		
Australie	**Aucun nouveau cas de COVID rapporté le 1er novembre au pays.**	nationalpost 1 nov
Nouvelle-Zélande	**Les gens qui veulent rentrer en Nouvelle-Zélande pourraient être déçus car les hôtels de quarantaine sont presque comblés à pleine capacité.** En effet, tous les voyageurs arrivant au pays doivent faire une quarantaine de 14 jours dans un des hôtels dédiés à cet effet par le gouvernement.	theguardian 2 nov

Sources : Veille médiatique réouverture INSPQ du 30 octobre au 5 novembre 2020, Infolettre New York Times.

Weekly COVID-19 Evidence Review – November 23rd, 2020

Version 28

1. New Evidence Reviews and Findings[1]

Title of review	Overview of the evidence	Key Findings	Conducted by:
Evergreen Rapid Review on COVID-19 Vaccine Knowledge, Attitudes, and Behaviors	Sixty-seven articles pertaining to COVID-19 vaccine knowledge, attitudes, and behaviors were identified and included in this review. Of these, 29 are preprints or reports and have not completed the peer-review process. The publications reporting on COVID-19 vaccine KABs are all observational studies, mainly cross-sectional online surveys of a target population, which are at moderate/high risk of bias and thus, are considered medium-low quality. For most of the included studies the outcomes are self-reported, which can be biased by response and social desirability biases. Other biases considered in these studies include representativeness of the sample, response rate and missing data with response sets as well as the validity of the survey tool established through formative research and pretesting. Most studies captured in this rapid review did not meet one or more risk of bias criteria either due to conduct or reporting of the study. While there are many studies that show similar trends, the conclusions could change with additional research, larger sample size, different sampling strategies, data collection tools, and progression through the pandemic. A key knowledge gap in this research are studies that monitor vaccine KABs over time. Many of the identified research was conducted in the early stages of the pandemic and only provide a cross-section of the KABs at that time. KABs are expected to change as the situation evolves, more evidence on the vaccine candidates become available, and we get closer to having a vaccine come to market. In addition, there is minimal evidence on the KABs of healthcare workers (HCWs) and high-risk populations. This research is crucial for the development of strategies to encourage vaccine uptake in these groups. Understanding the KABs of HCWs is particularly important as they will play a key role in recommending and administering the vaccine to patients.	• Research on COVID-19 vaccine KABs (n=67) was conducted in healthcare workers (HCWs), post-secondary students, high-risk populations, expert stakeholders, and the general public and mainly focus on intention to vaccinate as a vaccine for COVID-19 is not available. • Six studies were from Canada, one engaging expert opinion on who to vaccinate initially and five on the general public. Intention to vaccinate varied between 65-73%. The Atlantic had the highest intentions to vaccinate and Saskatchewan/Manitoba had the lowest. • Globally, countries with the highest intent to vaccinate in the general population include India, China, South Korea, Brazil, and South Africa. The countries with the lowest intentions include Nigeria, Poland, France, and Russia. • Intention to vaccinate has declined in multiple countries including China, Australia, Spain, Canada, and Brazil. • The most common factors positively associated with intention to vaccinate were male gender, older age, higher education, adequate knowledge or health literacy, higher socioeconomic status, and heightened worry or concern about COVID-19. • Partisanship and race were also associated with intention to vaccinate. Those who voted liberal/democrat expressed intention to vaccinate at higher rates than other parties. The intention to vaccinate varied widely by race/ethnicity with White individuals more likely to vaccinate compared to other ethnic groups such as Black, Asian, and Hispanic in studies from the USA and UK. • Concerns about vaccine safety and effectiveness were the two most cited reasons for vaccine refusal. Other commonly cited reasons include newness of the vaccine, and the belief that a COVID-19 vaccine is unnecessary. • Four studies assessed intention to vaccinate comparing those employed in the healthcare sector with the general public. Two studies demonstrated that being a healthcare worker was associated with a higher intention for getting vaccinated and the other two found there was no difference. • Compared to nurses and other healthcare professionals, doctors were significantly more likely to accept a COVID-19 vaccine.	**PHAC-ESG**

[1] Findings presented in this tracker are subject to PHAC's final review before publication

2. Previous Reviews

Title of review	Key Findings	Review conducted by:	Date released:

Evidence Brief on the Risk of COVID-19 Transmission in Flight, Update 1	Seventeen flight investigations (contact tracing or cohorts) were identified, of these five reported no secondary cases (two on repatriation and three commercial flights) and twelve reported in-flight exposure. Whole genome sequencing results were available for three investigations and aided in linking cases to an on-flight single exposure.
	• No transmission to crew has been reported on repatriation flights.
	• Most in-flight transmission events occurred on flights without mandatory face masks. On flights with mandatory mask use, some transmission events occurred either due to incorrect mask use (e.g. not covering the nose) or perhaps due to removal of mask to eat or drink.
	• Symptom and temperature checks were conducted on some flights. Lack of adherence by passengers to self-reporting symptoms lead to a transmission event in at least one flight.
	• Proximity to an index case was a risk factor in investigations where seating charts were available.
	• One survey of passengers and crew after implementation of enhanced safety measures to curb transmission indicated that both the passengers and crew felt safer and with the exception of inflight physical distancing, most enhanced public health measures were implemented e.g. enhanced cleaning, universal face mask, hand hygiene, physical distancing on embarkation and disembarkation and designated crew only areas as well as quarantine areas for unwell passengers or crew.
	
	Mitigating the risk of SARS-CoV-2 transmission during air travel was discussed directly in five reviews and risk assessments and indirectly in thirteen reviews, risk assessments, simulation experiments and in silico studies.
	• The key findings of the SARS-CoV-2 literature on transmission during flights is that multiple interventions are needed to maximally reduce the risk of transmission as no single intervention was protective, this is summarized well in the Appendix figure from the Aviation Public Health Initiative report lead by Harvard.
	  ○ Public health measures to maintain physical distancing during boarding, disembarkation and in-flight, enhanced cleaning, hand hygiene and universal mask use implemented in a layered approach significantly reduce the risk of transmission.
	  ○ Airplane ventilation systems are designed to quickly refresh cabin air and this level of ventilation substantially reduces the time particles remain in the cabin compared to other indoor environments and thus opportunity for transmission, particularly when coupled with other public health measures.
	  ○ Adherence by passengers and crew are a critical factor to the success of the public health measures to reduce the risk of transmission. This includes adherence to symptom screening guidelines and on-board procedures.
	• The indirect literature investigates the aerodynamics of droplets and aerosols to characterize high risk situations, or simulates boarding and inflight movements to suggest strategies for minimizing interaction of people and maximizing the distance between people in flight.
	  ○ Passengers who sneeze or cough while standing or moving about the cabin spread their respiratory droplets considerably further than those seated.
	  ○ Wearing a face mask significantly decreased the spread of droplets (>90%) and was less disruptive to the ventilation flow.
	  ○ Boarding an airplane by groups of related individuals, those seated in window seats first as well as other more complicated algorithms were shown to reduce the interaction with other people and decrease the time to board the plane.
	• Grouping families and strategically spacing passengers on flights that are not at capacity improves physical distance between passengers. Algorithms developed by researchers were presented to maximize this concept and demonstrated the potential performance of these algorithms compared to middle seat empty or aisle seat empty strategies. Across all of these strategies, their effectiveness decreased on fuller airplanes.
		PHAC-ESG	**28OCT2020**

Environmental Surface and Air Sampling in the Context of the COVID-19 Pandemic	• SARS-CoV-2 RNA is consistently found in environmental surface samples in hospital rooms, healthcare settings, and residential quarantine rooms. Studies seem to differ on the presence of airborne SARS-CoV-2 RNA in patient care areas, likely due to study design, air exchange, ventilation, occupancy, patient characteristics, patient shedding, and air samplers and protocols used. Some studies have attempted to isolate viable SARS-CoV-2 from environmental surfaces and air samples using cell culture, but were either unsuccessful or found weak evidence of viable virus. • While analytical methods such as RT-PCR can provide information about the presence and quantity of SARS-CoV-2 RNA in surface and air samples, the infectiousness of the viruses in the sample is unknown without culturing the virus in live cells. • Environmental sampling may be more useful for specific purposes, such as in epidemiological investigations in outbreaks or case clusters, food safety assurance in food processing plants, to validate the effectiveness of a new cleaning and disinfection protocol, to protect vulnerable populations such as seniors in long-term care facilities, or as periodic surveillance of the effectiveness of control measures.	**NCCEH**	**16NOV2020**
Outdoor Winter Dining during the COVID-19 Pandemic	• Dining out heightens COVID-19 transmission risk because it requires unmasked, face-to-face interaction, and this risk exists both indoors and outdoors. The most effective way to reduce transmission risk while visiting any public space is to avoid close contact with those outside one's own "bubble"; in this case, restricting dining parties to members of one's own household. • Single-party structures appear to be a popular and nearly ubiquitous option to prevent between-party transmission. Although use of single-party structures effectively eliminates this risk, it does not mitigate (and may slightly accentuate) the risk from those seated at the same table. Ventilating single-party structures is unlikely to eliminate the risk of close-contact transmission if one member of the party is infected, but may lessen the risk for subsequent diners by helping to clear accumulated respiratory particles. • Devices that generate heat via combustion should never be used in enclosed spaces. Operators should familiarize themselves with the risks of CO poisoning and ensure that outdoor heating devices are used safely. • Operators may also wish to consider a mix of heating strategies, including some of the personalized options like bring-your-own-blanket (which reduces the risk of fomite transmission), as well as enhancing communication with patrons to ensure that they can dress for the weather.	**NCCEH**	**18NOV2020**
What is known about whether vaccine injury-compensation programs and program elements affect vaccine acceptance and uptake and, where evaluations have been planned or conducted, how these programs are complemented	• All the studies were based on the evaluation of the U.S. National Vaccine Injury Compensation Program (VICP). Regarding vaccine acceptance, two studies (one published in 2013, and another in 2006) reported that the program's ability to address liability were associated with improved confidence among the public-health workforce and improvement environment for vaccine research and development. There were mixed findings related to the impact of vaccine uptake. The previously mentioned study from 2006 reported an association between increased immunization rates among the general population since the inception of VICP. However, an older study from 1998 reported that there was no evidence related to an increase of vaccination uptake if VICP were to include two vaccines (influenza and pneumococcal vaccines) targeting adults.	**COVID-END**	**29OCT2020**

by and timed in relation to other strategies to increase vaccine acceptance and uptake?			
What is known about anticipated COVID-19 vaccine-delivery program elements, and whether and how federated states are harmonizing these elements across constituent units of federations?	Supply • Most countries reported securing agreements for COVID-19 vaccines through a variety of mechanisms, including international alliances such as the COVAX Facility, local public-private partnerships, and country agreements with vaccine producers. • In Canada, there are signed agreements with Sanofi and GlaxoSmithKline to secure 72 million doses of COVID-19 vaccine candidates. In addition, Canada is a contributing participant of the COVAX Facility. Allocation, ordering, distribution, and inventory management within a country • Four jurisdictions (Germany, New Zealand, U.K., and U.S.) described similar vaccine-allocation rules related to their COVID-19 vaccine-delivery programs. These countries identified priority populations groups as older adults, health and social care front-line workers, essential workers from other sectors, and individuals at risk due to underlying chronic conditions. • One jurisdiction (U.S.) reported information on ordering procedures. The government developed the Vaccine Tracking System (VTrckS) as part of their comprehensive vaccine-delivery program, and the system will be used to order and distribute vaccines to jurisdictions, private partners (e.g., pharmacy chains), and other federal agencies (e.g., The Indian Health Service). • Two jurisdictions (U.S. and Germany) described distribution procedures in their vaccine-delivery program plans. The U.S. will be utilizing a federally contracted distributor (McKesson) to centrally manage and deliver vaccines. The contractor can maintain vaccine doses that require refrigeration or be kept frozen. In contrast, Germany plans to identify 60 facilities throughout the country that will be used as delivery centres. • Jurisdictions within the U.S. will be responsible for developing strategies to ensure proper inventory management and approve orders from enrolled providers within different settings in their jurisdictions (e.g., public-health clinics or federally qualified health centres, hospitals, physician clinics, mobile and/or mass-vaccination events). • In Canada, the federal government will prioritize similar population groups, including those at high risk of severe illness and death from COVID-19 and essential workers maintaining the COVID-19 response and other services. However, it diverges from other countries as it plans to include individuals with poor working or living conditions that put them at greater risk of infection. There was limited to no information about provincial and territorial plans for ordering, distributing, and managing COVID-19 inventories. Administration within sub-national units of health systems • Limited information was available about when a vaccine-delivery program will be developed or administered. In Australia, the government is preparing for vaccine distribution, with the intent to develop an immunization program once there is a safe and effective vaccine. • In terms of vaccine administration sites, Germany plans to utilize vaccination centres with mobile teams for its first phase of vaccine distribution, with a second phase including physician clinics. The U.S. will prioritize settings that meet storage and handling requirements and can reach prioritized populations within health systems (e.g., hospitals, pharmacies, long-term care, and federal agencies such as Indian Health services).	**COVID-END**	**05NOV2020**

	• New Zealand reported their commitment to engage different stakeholders, including government and related entities. The U.K. government has stated that there are no initial plans to co-administer the COVID-19 vaccine with the flu vaccine. The European Centre for Disease Prevention and Control developed guidance for the U.K. (along with other European Union countries) about the safety monitoring of adverse events following immunization at the regional-level and for specific population groups.
	• The U.S. Centers for Disease Control and Prevention's Vaccination Program Interim Playbook outlines detailed information about the administration of their vaccine-delivery program, including:
	  ○ expanding the scope-of-practice of pharmacists to give them the ability to administer vaccines;
	  ○ developing a vaccination campaign called 'Vaccinate with Confidence' as part of their vaccine communication for COVID-19;
	  ○ engaging different stakeholders in government, public-private partnerships, and related entities;
	  ○ developing reporting requirements to include information on administration (facility, type, address, date) and vaccine (product, dose number, lot number, expiration, series completion, route of administration), recipient characteristics (race, ethnicity, IIS ID number, event ID, address, date of birth, name, sex, comorbidity status, missed appointment, serology results, vaccination refusal), and vaccine administration (provider, site);
	  ○ constructing an immunization-information system to be used by jurisdictions; and
	  ○ ensuring vaccine-injury compensation for recipients and liability immunity for distributers.
	• Limited information was available about administering vaccine-delivery programs within provinces and territories in Canada.
	
	Performance indicators
	Limited information was available about performance indicators across the countries reviewed and in Canadian provinces and territories. The only example identified was from European Centre for Disease Prevention and Control, which released a comprehensive guide related to COVID-19 vaccine-delivery program elements for the EU and the U.K. The guide includes the development of performance indicators such as assessing impact, safety, effectiveness, coverage, dose type, and vaccine product.		

Rapid Review: What is the effect of the COVID-19 pandemic on the use and cessation of tobacco and vaping products?	• There was no clear direction of effect of the COVID-19 pandemic on use of tobacco or vaping products. Most cross-sectional studies reported a mixed result; that some smokers increased their use during the pandemic, some decreased their use, and others did not change their use. The factors associated with an increase versus a decrease in smoking were not clearly identified in the research. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates. • There was no clear effect of the COVID-19 pandemic on cessation or cessation attempts. Studies reported cessation rates of 8-21% among smokers since the pre-pandemic period, with 36-40% of smokers making a cessation attempt. However, the comparison of these cessation and attempt rates to pre-pandemic rates is generally not reported, so it is not possible to determine whether this was an increased rate. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates.	**NCCMT**	**09NOV2020**
Living Rapid Review Update 10: What is the specific role of daycares and schools in COVID-19 transmission?	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**12NOV2020**
Rapid Review: What is known	What is known about the risk of COVID-19 transmission across different indoor settings in the community?	**NCCMT**	**04NOV2020**

about the risk of COVID-19 transmission across different indoor settings in the community such as restaurants and gyms?	• Based on the limited available evidence, it is not possible to compare an individual's risk of infection across community settings or compare the risk of outbreaks or infection clusters across settings. Certainty of evidence is very low, and findings are very likely to change as more evidence becomes available. • Since the beginning of the pandemic, household and shared accommodation settings appear to be the most prevalent settings for clusters of infections or outbreaks to occur. • Certainty of evidence is low, and findings are likely to change as more evidence becomes available. What is known about the risk of COVID-19 transmission in indoor dining settings, such as restaurants and bars/nightclubs? • Reported attack rates in indoor restaurants, bars and nightclub settings are highly variable, ranging from 1.74%-45%. Certainty of evidence is very low, and findings are very likely to change as more evidence becomes available. • Reduced/poor ventilation and lack of physical distancing have been suggested as critical drivers of transmission risk in restaurant settings, however further evidence is needed to understand how infection prevention and control (IPAC) measures (e.g., mask wearing by patrons and staff) impact risk in these settings. Certainty of evidence is very low, and findings are very likely to change as more evidence becomes available. What is known about the risk of COVID-19 transmission in indoor physical activity settings, such as gyms and fitness centres? • Attack rates, reported only in few instances of outbreaks involving indoor fitness classes, are highly variable and range from 7.3%-26.3%. Transmission appears to occur more commonly from fitness instructors to participants. Certainty of evidence is very low, and findings are very likely to change as more evidence becomes available. • Factors that have been suggested to influence transmission risk in gym exposures include number of individuals within the facility, room size, length of exposure time, ventilation type, type of fitness activity, and viral load of infected source. Certainty of evidence is very low, and findings are very likely to change as more evidence becomes available.		
Evidence Brief of Potential Health Risks of Hard-Surface Disinfectants in Environments Shared by School-aged Children	There is limited evidence on the health risks of hard surface disinfectant use in school-aged children, this review demonstrates that: • Compared with previous years, reports on calls to poison control centres in both the United States (USA) and Canada have documented an increase in calls during the COVID-19 pandemic related to disinfectants and cleaners, with exposures frequently involving children. • Based on a consumer survey in the US, people using disinfectants may lack knowledge of their safe use and potential harms. • Studies of children that reside in homes with high disinfectant use have a higher frequency of skin and respiratory effects as well as sensitization to disinfectants. • Some cross-sectional studies have shown an association between the frequency of disinfectant use around children and health effects such as asthma and wheezing in young children. • Chloroform - one of the volatile organic compounds (VOCs) that can form when bleach comes into contact with other products or organic matter - has been found at unacceptable concentrations in several early childhood education centres; most of these centres reported using bleach regularly. • Overall, there remains considerable knowledge gaps in the literature on both the short- and long-term effects that may be experienced by children as a result of the increased use of hard-surface disinfectants.	**PHAC-ESG**	**08OCT2020**
A Rapid Review of Disinfectant Chemical Exposures and Health Effects During COVID-19 Pandemic	• Surface disinfection is one of the interventions that is frequently recommended to reduce the risk of SARS-CoV-2 transmission. However, reports of acute health effects due to misuse and overexposure to disinfectants have been on the rise since early 2020. While businesses and facilities strive to implement more stringent cleaning and disinfection policies, some public health practitioners have raised concerns about the potential of disinfectants to increase the risk of asthma and wheezing. As such, there is merit for public health practitioners to provide clear recommendations about appropriate and safe cleaning and disinfection practices that would protect people from potentially harmful disinfectants while reducing the transmission risk of SARS-CoV-2.	**NCCEH**	**26OCT2020**

Rapid Review Update 9: What is the specific role of daycares and schools in COVID-19 transmission?	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, particularly when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**22OCT2020**
Evidence Brief on SARS-CoV-2 antibodies in patients that retest RT-PCR positive	• The rate of retesting positive (prevalence of RP) varied from 1.87% of discharged patients to 52.7% for an average of 16.5% from all studies (397/2412 patients). No study found a difference is sex distribution, but four of the nine studies found RP patients to be significantly younger than NRP patients. A wider review would be needed to explore this further. • Of six studies that reported on the positivity rate of patients for IgG or IgM antibodies, RP patients exhibited positivity rates that did not differ from the positivity rates of NRP patients. This indicates that the presence of IgG or IgM antibodies is unlikely to be predictive of retesting positive. • Of the four studies that reported on the level of IgG or IgM antibodies in serum, the results are mixed. One study found that the levels of IgM and IgG antibodies were significantly lower in RP patients than NRP patients. A second found no difference. The third found IgG to be significantly lower in RP patients but no difference in IgM levels. The fourth found no difference in IgG, but that IgM levels varied over time – initially RP patients had higher IgM titers (week 3 post discharge), but the levels of IgM antibodies eventually became significantly lower for RP patients compared to NRP patients (week 6-8 post discharge). This suggests that lower antibody levels might play a role in retesting positive after discharge, but the evidence is not conclusive at this point. • It is still unclear why patients retest positive. All nine studies took place in China, which enforced a mandatory 14-day quarantine following hospital discharge at separate facilities with individual rooms. Three studies that only followed patients during this period found up to 52.7% of patients retested positive. One plausible explanation for retesting positive within the two-week quarantine period is a 'reactivation' of the initial infection, following incomplete clearing of the virus. It is also possible that concentration of viral RNA in samples fluctuate during clearance of the virus resulting in two false negative results leading to discharge. In Zou et al., 2020, patients retested positive less often when required to have three negative PCR tests prior to hospital discharge, instead of the usual two. • One study demonstrated that some patients will retest positive more than once. Upon retesting positive, patients were re-hospitalized until discharged again following two consecutive negative RT-PCR tests, only to retest positive a second, third and even fourth time. Another study found that requiring three consecutive negative tests prior to discharge significantly reduced the chance of retesting positive. This indicates that false-negatives may play a role in retesting positive after discharge, although an additional review would need to uncover any additional literature on this topic.	**PHAC-ESG**	**09SEPT2020**
High-humidity Environments and the Risk of COVID-19 Transmission	This rapid review did not identify an elevated transmission risk for showers, steam rooms, or hot tubs as a result of high temperature (>30°C) and/or high humidity (>80% relative humidity). Based on the available data, high relative humidity and high temperature appear to increase airborne mass deposition and decrease the viability of virus in both airborne particles and on surfaces. However, there is uncertainty as to whether SARS-CoV-2 aerosolized in human secretions may remain viable longer than those generated artificial media. In addition, any decrease in viability does not alleviate the need to maintain physical distancing, as well as adequate cleaning, disinfection, and ventilation (where appropriate).	**NCCEH**	**16OCT2020**
Rapid Review: What risk factors are associated with COVID-19 outbreaks and	What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities? • Across studies, incidence in the surrounding community was found to have the strongest association with COVID-19 infections and/or outbreaks in LTC settings. The certainty of the evidence is moderate.	**NCCMT**	**16OCT2020**

mortality in long-term care facilities and what strategies mitigate risk?	• Several resident-level factors including, racial/ethnic minority status, older age, male sex, receipt of Medicaid or Medicare were associated with risk of COVID-19 infections, outbreaks and mortality; severity of impairment was associated with infections and outbreaks, but not mortality. The certainty of the evidence is low (GRADE) and may change as more data become available. • At the organizational level, increased staffing, particularly Registered Nurse (RN) staffing was consistently associated with reduced risk of COVID-19 infections, outbreaks and mortality while for-profit status, and facility size/density was consistently associated with increased risk of COVID-19 infections, outbreaks and mortality. The certainty of the evidence is low and may change as more data become available. What strategies mitigate risk of outbreaks and mortality within LTC? • Most guideline recommendations include surveillance, monitoring and evaluation of staff and resident symptoms, and use of personal protective equipment (PPE). The certainty of the evidence is low and may change as more data become available. Other interventions demonstrating some effect on decreased infection rates within syntheses and a small number of single studies include promotion of hand hygiene, enhanced cleaning measures, social distancing, and cohorting. The certainty of the evidence is low and may change as more data become available. • Technological platforms and tools (e.g., digital contact tracing, apps, heat maps) are being developed and show potential for decreased transmission through efficient case and/or contact identification that further informs infection control planning strategies. The certainty of the evidence is very low and may change as more data become available.		
Rapid Review: What factors may help protect Indigenous peoples and communities in Canada and internationally from the COVID-19 pandemic and its impacts?	• Indigenous peoples and communities have experience with pandemics and disease outbreaks and have learned effective ways of responding and protecting family and community members, despite socio-economic challenges and pervasive inequities resulting from historic and ongoing colonization. • Indigenous peoples and communities in Canada and internationally draw on community strengths and protective factors to reduce the risk of COVID-19 outbreaks and impacts. Indigenous community resilience in the face of the COVID-19 pandemic is exemplified through many factors, most of which can be found across evidence from Canada and the USA, Australia, New Zealand and other international jurisdictions. Prominent protective factors include: o Community strengths o Indigenous knowledges and practices o Caring for family and community members o Community-centred communication • Community-driven and controlled public health measures	**NCCMT**	**16OCT2020**
Rapid Review: What are best practices for risk communication and strategies to mitigate risk behaviours?	• The risk communication literature from a variety of topic areas emphasizes the importance of clear, repeated action-oriented messaging by a trusted leader (e.g., community leader, trusted public health professional, etc.). The certainty of the evidence is moderate. • Trust in both the message and the person delivering the message can be built by addressing uncertainty and acknowledging changing recommendations and information or previous errors. The certainty of the evidence is low and may change as more data become available. • Communications should be tailored to target audiences by both message and medium; stakeholder engagement is important to identify the most appropriate message framing and medium of the message. The certainty of evidence is moderate. • Positively framed messages emphasizing a collective vs. individual approach may be more effective. The certainty of the evidence is low and may change as new data become available.	**NCCMT**	**08OCT2020**
Evidence Brief on Ethnicity and COVID-19	• Regarding ethnicity and COVID-19, two systematic reviews with literature up to May 15 and June 15, sixty-seven individual studies published since May 15 and four of five Canadian studies or reports were identified in the grey literature and are included in this review. There were 34 studies that assessed COVID-19 risk of infection, 31 on	**PHAC-ESG**	**22SEPT2020**

	severity of disease and 22 studies on mortality. Most of the research came from the USA and UK. There were two studies from France and one study from Brazil. Studies from Canada included a prepublication of an ecological study and two cross-sectional surveys and two relevant surveillance reports were identified in the grey literature. • This is the second version of this review. The first included a systematic review that summarized studies to May 15 and primary research published May 15 -30. This update added studies published between June 1 and Sept 7 including an additional systematic review with studies up to June 15. Analysis of studies captured in the tables and the new systematic review identified 15 studies which are marked with an asterisk. • Risk of Infection o One systematic review included risk of infection and concluded across studies Blacks, Asians and Hispanics were more likely to test positive for COVID-19 compared to Whites (D. Pan, 2020). o Twenty-nine studies examined risk of infection among different ethnic groups from people tested by RT-PCR for active infection and four seroprevalence studies measured risk of exposure. Multivariable analyses with age, sex, comorbidities and socioeconomic variables attenuated associations with specific ethnicities, but in many studies the association was still significant: ▪ Among twenty studies from the USA, compared to Whites, a higher risk of infection among Blacks (six adjusted and three univariate results) and Hispanics (six adjusted and six univariate results) were reported and conflicting data on Asians (two adjusted, and one univariate association and two no association results). One USA study reported a higher risk of infection among American Indians and Alaskan natives (Hatcher, 2020). ▪ Fourteen studies from the UK, compared to Whites, consistently identify Black (nine adjusted results), South Asian (four adjusted results), Asian (three adjusted results) and more generally BAME groups (one adjusted and two univariate and one no association result) at higher risk of infection, whereas the results for other ethnicities were rarely reported. • COVID-19 Severity Outcomes o Outcomes of COVID-19 severity (hospitalization, ICU admission and mechanical ventilation) were reported in two systematic reviews and thirty one studies reported associations for different ethnicities compared to Whites. ▪ For hospitalization: The systematic review reports meta-analyses of univariate associations compared to Whites for Blacks (overall countries) and for Asians (UK only), with a significantly higher magnitude association from UK studies and the adjusted analyses (age, sex and comorbidities) reported no association. Across individual studies from the USA, Blacks were found to have higher risk of hospitalization; for Asians and Hispanics there were mixed results. Mixed results from two USA studies reported on the proportion of American Indians, Alaskan Natives hospitalized (Alvarez Retamales, 2020; Karaca-Mandic, 2020). No association with Pacific Islander hospitalizations was reported in two studies (Alvarez Retamales, 2020; McPadden, 2020). In the UK, Blacks and South Asians had a higher risk of hospitalization; for Asians, mixed ethnicity or BAME groups the findings were inconsistent. ▪ For ICU admission: The systematic review findings reported Asian and BAME ethnicities in UK studies were over-represented in the ICU, however the meta-analyses reported no association in adjusted analysis for Blacks, Hispanics and Asians (USA only). New studies in the USA had conflicting results for Blacks and Hispanics. In the UK, Blacks, South Asians and BAME had higher risk of admission. ▪ For mechanical ventilation: Eighteen studies in the systematic review reported no association for Blacks and Hispanics, however Asians (four studies) had an association with ventilation that persisted with age and sex adjusted analysis. Few recent studies looked at the risk of ventilation by ethnicity; one from the USA reported no association for Blacks and Hispanics and a study from the UK indicated Blacks and Asians were at increased risk compared to Whites. o Multisystem Inflammatory Syndrome in Children (MIS-C) and ethnicity was reported in three studies one prospective cohort (ISARIC study, (Swann, 2020)) and two small case series from the UK and France (Riphagen, 2020; Toubiana, 2020). Across these studies a disproportionate number of MIS-C cases occurred in non-White ethnicities. No further analysis was conducted in these studies. • COVID-19 Mortality		

	○ The systematic reviews reported no association with Blacks or Asians, and a protective association identified for Hispanics in univariate analyses, however the association did not persist in models adjusted for age, sex and comorbidities. An association with Asians who required mechanical ventilation due to COVID-19 was reported (4 studies). It is important to note there was high heterogeneity across studies and both reviews describe approximately 50% of studies reporting an association and the others report no association. ○ In the USA and the UK twenty-two studies analysed mortality among hospitalized patients and did not report an association with ethnicity. However, when considering a population level denominator, certain ethnic groups were more likely to acquire COVID-19 disease, so proportionally they represent a higher than expected number of COVID-19 deaths. In UK studies that identified an association across all COVID-19 cases, there was an increased risk of mortality among BAME, Blacks, South Asians and Asians compared to Whites. • Canadian studies • Despite an additional grey literature search, limited Canadian evidence was identified. Available Canadian data suggest non-White ethnicities, with the exception of East Asians, are disproportionately infected with COVID-19. The analyses largely did not adjust for comorbidities or socio-economic factors that attenuated results in other studies in this review. No Canadian data on ethnicity and hospitalizations, severity or mortality was identified. ○ A cross-sectional survey designed to compare COVID-19 impacts on Black Canadians to a representative "national" sample reported a higher likelihood of COVID-19 among Black Canadians individually and among people they know. Black Canadians had a higher frequency of risk factors such as taking public transportation and having a job that requires face-to-face interactions with people. They also had a higher frequency of severe financial impacts associated with the pandemic. These data are consistent with similar studies published in the USA. ○ Toronto Public Health dashboard shows that a higher proportion of COVID-19 cases than the representation in the community was seen for Black, Hispanic, Southeast Asian, South Asian/ Indo-Caribbean and Middle Eastern ethnic groups. ○ The ecological study analysed population data on number of COVID-19 cases and deaths in Canada by population level demographic information including proportion Black, proportion foreign-born, proportion over 65 years, population density and median income. Findings from their multivariable analysis include: ▪ A 1% increase in the proportion Black in a health unit was associated with double the case count. A 1% increase in the proportion foreign-born residents was associated with a 3% increase in the case count. • A 1% increase in the proportion of Black residents in the health region was associated with 2.1x increase in COVID-19 death rates.		
Rapid Review Update 8: What is the specific role of daycares and schools in COVID-19 transmission?	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, particularly when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**05OCT2020**
Rapid Review: Food security: What is the impact of COVID-19 and related	• In a limited number of studies that provided comparisons to pre-pandemic levels, increases in food insecurity during COVID-19 lockdown measures were reported. Three studies, in Bangladesh, the USA, and the UK, self-reported changes in rates of food insecurity from pre-pandemic to the early months of the pandemic: levels grew from 5.6% to 36.5%; 18.8% to 24.8%; and 7.6% to 16.2% in these three studies respectively. Prevalence varied across populations and settings. Two studies from the USA examined rates among populations who were food secure prior to the pandemic and reported rates of 30% having low or very low food security during the pandemic. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates.	**NCCMT**	**25SEPT2020**

public health measures?			
Rapid Review Update 3: What is known on the potential for COVID-19 re-infection, including new transmission after recovery?	• Across studies, the rates of re-detection following a previous negative test range from 3% to 30%, with one meta-analysis calculating the mean rate of re-detection as 14.8% and another at 16%, based on included studies that were generally low or moderate quality. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates. • Despite evidence of cases testing positive after having recovered, most syntheses and studies find no evidence of actual COVID-19 re-infection. The detection of re-positive cases is thought to be due to ongoing virus shedding or testing inaccuracies (such as false positives at the initial or follow-up test, or false negatives indicating that the virus had cleared). The Azam meta-analysis reported the pooled estimate of the interval from negative test to repeat positive test to be 9.76 days, and Osman reported an interval of 12 days. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates. • To date there is no evidence in the included syntheses and studies that re-positive cases can transmit the infection to contacts. Evidence that the virus is viable for a median of 9 days is in line with current isolation periods. The RT-PCR test detects the presence of viral nucleic acid, but the test does not differentiate between live (or viable) and non-infective virus. The overall certainty of this evidence is very low (GRADE), meaning that the findings are very likely to change as more evidence accumulates.	**NCCMT**	**28SEPT2020**

Rapid Review Update 1: What is the effect of the COVID-19 pandemic on opioid and substance use and related harms?	• Minimal cohort, cross-sectional and surveillance evidence is available on the effects of the COVID-19 pandemic on opioid and substance use, including overdoses and deaths, and these findings show increases during the COVID-19 pandemic in some jurisdictions, and decreases or steady levels in others.
	• Very limited research evidence exists related to the effect of the COVID-19 pandemic on opioid and substance use and related harms. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates.
	• To date, most of the available evidence is based on previous experiences during pandemics and similar events:
	  o People who use substances may have reduced access to harm-reduction and treatment services.
	  o There may be a disruption to the supply of illicit drugs in Canada, affecting availability and cost, and increasing the risk of drug adulteration.
	• Surveillance data within Canada were identified from several jurisdictions (provincial and regional). No clear pattern of change was observed. Opioid-related overdoses and deaths are influenced by many factors, and it is not certain that changes in these outcomes that occurred during the COVID-19 pandemic are a result of public health measures to reduce the spread of the virus. The variety of indicators (e.g., naloxone administration, emergency calls for overdose, hospitalization for overdose), and the inconsistency in measurement periods and relevant comparators mean that observed trends may not be reliable.
	• Preliminary research and expert opinion are providing some direction to service providers and people who use illicit drugs, and this direction is summarized in this review. The uptake, feasibility and effectiveness of these strategies is not known. Some models exist aimed at modifying harm reduction or treatment strategies for implementation during the COVID-19 pandemic, as well as strategies to minimize the risk of COVID-19 infection among people who use substances. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates.
		NCCMT	**21SEPT2020**

Rapid Review Update 7: What is the specific role of daycares and schools in COVID-19 transmission?	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, particularly when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**23SEPT2020**

Evidence Brief of COVID-19 quarantine length reduction strategies and effectiveness	• A very limited number of publications were identified in this review (n=6). Two studies provide epidemiological data in the community (n=1) and for travellers (n=2); and four quantitative models compare alternative quarantine strategies in the community (n=1) and for travellers (n=3). • Two epidemiological studies have documented that the 14-day quarantine period for both case contacts and travellers was successful in preventing community transmission. • Quantitative models (n=4) concur that the 14 day quarantine strategy is effective and explore several alternative scenarios for quarantine and test strategies. o Longer strategies and the addition of an RT-PCR test are more effective. For travellers, this equated to a 0.1% risk that a person was infectious when released from quarantine (Steyn, et al., 2020). o Shorter quarantines (over eight days) with at least one test completed near the end of the quarantine were fairly equivalent to 14 days with no test (Quilty et al, 2020; Steyn, et al., 2020), scenarios with less than eight days showed effectiveness decrease as quarantine length decreases (5-8 days). o Testing travellers on arrival and not quarantining those with a negative result were variable, 55-90% effective, across studies. o Testing close to the end of the quarantine period was the most effective time point in most scenarios, because individuals initially in the incubation period have a longer time for virus load to increase and thus be detected. o Testing multiple times during the quarantine period resulted in minimal reduction in the risk of releasing an infectious person into the community compared to testing one time close to the end of quarantine. • Evidence from quantitative models suggests strategies of testing to reduce quarantine length are not equally effective when used for community contacts and travellers. o For example, testing travellers on arrival may identify a large proportion of infected cases, whereas testing case contacts immediately is much less effective as they are still early in their incubation period.	**PHAC-ESG**	**14SEPT2020**
Rapid Review of Infectious Period	• Overall, the best available evidence indicates infectious period for most symptomatic cases is considered to start on average 2.5 days before developing symptoms, peak around day 4 of symptoms and decrease to low levels within 8-10 days after the start of symptoms for a total of 10-13 days. The asymptomatic infectious period has been found to be similar. Longer infectious periods have been documented in more severe or immunocompromised cases (18-32 days post symptom onset). • Pre-symptomatic Infectious Period, N=25 studies o Viable virus has been cultured from respiratory samples of pre-symptomatic cases 1-6 days before symptom onset as determined by medical observation (Table 1). Viable virus has also been cultured from gastrointestinal samples; for example a rectal sample showed evidence of active SARS-CoV-2 viral replication three days prior to symptom onset (Qian et al., 2020). o Studies utilizing RT-PCR to detect viral RNA from respiratory samples also suggest that shedding occurs on average 2.5 days (1-7 range) prior to symptom onset. • Asymptomatic Infectious Period, N=25 studies o Viable virus and viral RNA detected in a cohort of asymptomatic cases was highest during the first week of infection and declined in subsequent weeks (Quicke et al., 2020). Infectious virus was not detected by plaque assay in nasopharyngeal swabs from individuals with less than 100,000 RNA copies/swab. o There has been little consensus about whether asymptomatic and mildly symptomatic infections differ in viral shedding time (Table 2). Based on the current evidence, the total infectious period of asymptomatic cases appears to be similar or shorter than that of mildly symptomatic cases. Across studies, similar viral loads have been reported for asymptomatic, pre-symptomatic, and symptomatic cases. • Symptomatic Infectious Period, N=107 studies o Viable virus, culture results, N=18 primary research studies and 2 systematic reviews: ▪ For mild cases, the best estimate for the infectious period, measured from self-reported symptom onset using virus culture from respiratory samples, is 8-10 days with a peak in viral load during the first week of illness (Table 3).	**PHAC-ESG**	**14SEPT2020**

	▪ Cases of prolonged viable viral shedding (18-32 days) have been documented using virus culture in a few studies. Many of these studies are still in preprints and include single cases or small sample sizes (Table 3). These cases are typically individuals with severe infection, who are either immunocompromised, or have multiple chronic underlying health conditions. ▪ There are a few studies that have cultured SARS-CoV-2 from the fecal/rectal samples of a confirmed case (Table 3). A recent study of inoculated ferrets has confirmed the presence of infectious SARS-CoV-2 in fecal and urine specimens from days 11, 13 and 15 of illness (Jeong et al., 2020). o Viral RNA detection, RT-PCR results, N=88 primary research studies and 6 systematic reviews: ▪ Most studies report time from self-reported symptom onset or test positive diagnosis to time viral infection has been cleared, determined via RT-PCR. Positive RT-PCR results are not proof of infectiousness. ▪ Viral RNA presence varies widely by sample type. Respiratory swabs typically become negative within 14-20 days of self-reported symptom onset, while stool samples remain positive a few days to four weeks longer than respiratory samples. Evidence of SARS-CoV-2 RNA has also been identified in eye swabs up to 22 days post onset of self-reported symptoms. ▪ Extended periods of viral RNA shedding have been reported (up to 83 days) in respiratory samples, with shedding frequently outlasting the duration of symptoms. However, concentrations of viral RNA measured in upper respiratory samples has been shown to decline after symptom onset and there has been no evidence of transmission in clinically recovered individuals with persistent detection of viral RNA nor has there been viable virus isolated from such cases. ▪ Prolonged viral RNA shedding has been shown to be positively associated with severity of COVID-19 and older age in multiple studies (Table 3). However, a recent meta-regression identified that the reported average of four days longer duration of viral RNA shedding in severe cases was not statistically significant (Byrne et al., 2020). The length of viral RNA shedding does not significantly differ between male and female. • Recurrence of Viral Shedding in Convalescent Period, N=55 studies o Recurrence of viral RNA shedding in the convalescent period after meeting discharge criteria (defined at the time as two consecutive negative RT-PCR tests) has been reported in multiple case reports and observational studies (Table 4). These cases are not thought to be re-infection with a new strain of the virus, instead are considered to have not fully cleared the original SARS-CoV-2 infection. ▪ Recurrence typically occurs within seven days of discharge. ▪ Following recurrence, patients remained viral RNA positive for approximately 1-8 days and typically remained asymptomatic. ▪ Although this is an active area of study and numerous new studies have been published, to date, only one study has provided evidence of viable virus in a recurrent case (Quicke et al., 2020). No evidence of transmission during the recurrence of viral RNA detection has been reported. o Additional research is needed to improve our understanding of RT-PCR results and how to interpret those results with respect to infectious period and risk of transmission. Particularly in cases with prolonged RT-PCR positive test results. As a result, the CDC has stopped recommending two consecutive negative RT-PCR tests to determine when to end isolation and precautions for COVID cases. • Reinfection, N=2 studies o Since August 25, 2020, good evidence that reinfection can occur has been reported (Table 5): ▪ A patient from Hong Kong was reinfected 142 days after initial infection and this was documented with compelling epidemiological, clinical, serological evidence as well as genomic analyses. (To, Hung, et al., 2020). ▪ There is also strong evidence for a case of re-infection in the United States (Tillet et al., 2020). o At this time, knowledge gaps exist on whether clinical course and epidemiological characteristics including infectious period of re-infection cases are different from the initial infection. • Additional research is needed to understand the role of immunity in protection against SARS-CoV-2 post infection.		

Rapid Review on the Risk of COVID-19 Outbreaks in the Workplace	• Outbreaks have been associated with many types of workplaces and occupations.
	  ○ In addition to the known risk to healthcare professionals, the occupations most at risk of SARS-CoV-2 infection include drivers and transport workers, service and sales workers, food industry, personal care occupations, food production workers, preschool occupations, community and social services occupations (e.g. social workers, counselors), construction and related trades occupations, and public safety workers (e.g. correction officers, police, firefighters).
	  ○ The majority of these require workers to have frequent contact with clients, work on customers' premises, or in public spaces. Many of these occupations do not allow employees to work from home.
	• Workplace clusters have occurred across a wide range of workplaces and circumstances that resulted in transmission.
	  ○ Most of the workplace clusters were traced to an asymptomatic or very mild symptomatic index case.
	  ○ Thirty-seven publications describe one or more transmission events considered to have occurred in a workplace involving workers broadly captured under the categories: office environment, meat processing facilities, other factories, migrant work, fitness centers, ships, other service related occupation, and transportation.
	  ○ Eight COVID-19 clusters in workplaces with employer-provided accommodations were identified. Shared accommodation results in close contact of workers for long durations of time.
	  ○ There is limited evidence on COVID-19 clusters resulting from transportation or commuting to the workplace. Shared transportation to and from the workplace was determined as a risk factor for exposure to SARS-CoV-2 in outbreaks at meat processing facilities.
	  ○ COVID-19 clusters resulting from work-related travel were identified in five publications. Risk factors identified related to the proximity and length of time secondary cases spent with the primary cases (e.g. sitting at the same table during a meal or meeting).
	  ○ Three COVID-19 clusters resulting from social gatherings of co-workers outside of the workplace were identified. In all three scenarios, the infections acquired during the social gathering of co-workers resulted in additional infections in the workplace.
	• Risk factors for SARS-CoV-2 infection identified in the workplace include difficulties adhering to physical distancing, lack of hand hygiene, poor ventilation/air circulation design, and crowded working, transportation and/or accommodation conditions.
	  ○ The main facilitators for SARS-CoV-2 transmission in an office setting include close contact, duration of interaction, shared common areas, and work-related travel.
	  ○ Socio-demographic factors and occupation were examined to explore determinants of SARS-CoV-2 exposure. Being female, a visible minority, and being in a low-income bracket were associated with employment in occupations associated with significantly higher risk of exposure to COVID-19 which typically do not allow working from home and involves working in close proximity to other people. Conversely, increasing age and higher education was associated with lower risk of exposure occupations.
	  ○ The risk factors for infection in meat processing facilities were identified as difficulties with physical distancing, prolonged close contact with coworkers for long periods of time, hand hygiene, shared accommodation, shared transportation to and from work, and frequent community contact with fellow workers. These risk factors were also identified for outbreaks on ships.
	  ○ In addition to SARS-CoV-2 activity in the community, the activities a worker engages in outside of the workplace will determine the individual risk that a person brings to the organization.
	  ○ Several studies report increased risk of exposure to SARS-CoV-2 proportional to the number of contacts related to the workers job. For example grocery store employees with direct customer exposure were five times more likely to test positive for SARS-CoV-2 (OR 4.7; 95% CI: 1.2-32.0). A similar finding was reported for firefighters and paramedics in a second study.
	  ○ Shared accommodation or facilities (e.g. bathroom) and a lack of preventative measures (e.g. face mask) have been suggested to contribute to several outbreaks in shopping malls, retail stores, bars, nightclubs, restaurants, concerts, and overnight camps.
	  ○ Outbreaks are more likely to occur in an indoor environment OR 18.7 (95%CI 6.0-57.9).
		PHAC-ESG	**14SEPT2020**

	• Two risk assessments explored the attributes of workplaces for their potential for SARS-CoV-2 transmission.
	  ○ In a risk assessment a 1% increase in the density of super spreading businesses (SSB - based on the frequency, duration, and square footage of businesses pre-pandemic) equated to a 5% increase in cases. The most common SSBs were full service restaurants, limited service restaurants, and hotels/motels.
	  ○ The potential health risks of SARS-CoV-2 in sewage to wastewater treatment plant workers (WWTPs) was investigated using a quantitative microbial risk assessment (QMRA). Duties close to sewage tanks were considered high risk of exposure and protection such as face mask, eye protection, and/or face shields were recommended.
	• Strategies to reduce the risk of SARS-CoV-2 transmission in the workplace were identified in 21 publications (Table 7).
	  ○ Successful prevention strategies included limiting social contact (restricting activities in the workplace, cohorting or staggering employees, and telework), policies on exclusion of sick workers from the work environment, providing workplace guidelines, and provision of personal protective equipment.
	  ○ Monitoring strategies explored the mode (worker or environmental sampling) and frequency of sampling for effective identification of transmission or circulating SARS-CoV-2 in the workplace and how the level of SARS-CoV-2 in the community impact sampling strategies.
	  ○ Lifting public health measures were explored to minimize a resurgence, while allowing the economy to slowly re-open.
	• Management of migrant workers, particularly their movement from place to place was discussed in three publications from China and India. Strategies included screening and quarantine protocols to limit the importation of SARS-CoV-2 into an unaffected area.		

Rapid Review Update 6: What is the specific role of daycares and schools in COVID-19 transmission? (Update)	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, particularly when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**14SEPT2020**

Rapid Review of COVID-19 hospitalizations and length of stay (Update)	• The average percentage of hospitalization of COVID-19 cases varied 11%-77% over the study population. Older age groups had increasing proportion hospitalized.
	• The percentage of admission to Intensive Care Unit (ICU) of COVID-19 cases varied from:
	  ○ 1% to 32% among infected patients
	  ○ 12% to 40% among hospitalized patients
	• The percentage of patients requiring ventilation varied from:
	  ○ 1% to 13% among infected patients
	  ○ 5% to 19% among hospitalized (including ICU) patients
	  ○ 28% to 94% among patients in ICU; the two recent studies were 92% and 94%
	• The length of stay (LOS) for hospitalization (including ICU) of COVID-19 cases median days across studies was 4-19 days with an interquartile range (IQR) of 3 to 27 days:
	  ○ Among survivors median LOS for hospitalization varied from 5 to 9 days with a IQR of 3 to 13
	  ○ Among non-survivors median LOS for hospitalization varied from 4 to10 with a IQR of 3 to 16
	• The median length of stay in ICU varied from 4 to 23 days with a IQR of 2 to 32 days among all patients in ICU
	  ○ Among survivors, median LOS in ICU varied from 8 to 26 days with a IQR of 5 to 46 days
	  ○ Among non-survivors, median LOS in ICU varied from 6 to 12 days with a range of 2 to 26 days
		PHAC-ESG	**11SEPT2020**

	• Median duration of ventilation for patients who required mechanical ventilation was 6 to 13 days with a range of 5 to 22 days. • In August 2020, MMWR published an analysis of pediatric COVID-19 hospitalization data from 14 states (L. Kim et al., 2020a). It found that although the cumulative rate of COVID-19–associated hospitalization among children (8.0 per 100,000 population) was low compared with that in adults (164.5), the hospitalization rates among Hispanic was eight times higher, and among black children was five times higher, than the rate in white children. An underlying medical condition was present in 42% of the children; obesity was the most prevalent underlying medical condition. o Hospitalization rate was highest for those under 2 years of age (24.8 per 100,000 population). o One third of hospitalized patients were admitted to the ICU (33.2%) o The proportion of hospitalized patients requiring invasive mechanical ventilation was 5.8% o The median LOS in hospital overall was 2.5 days with a range of 1 to 5 days • The median LOS in ICU was 2 days with a range of 1 to 5 days		
Rapid Review Update 5: What is the specific role of daycares and schools in COVID-19 transmission? (Update)	• Based on the published reports to date from both prior to COVID-19 lockdown and following re-opening, the risk of transmission from children to children and children to adults in primary school and daycare settings appears low, particularly when infection control measures are in place. The certainty of the evidence is low (GRADE), and findings may change as new data become available. • Within clusters and outbreaks, adult to adult transmission seems to be more common than child to adult or adult to child. Certainty of the evidence is very low (GRADE), and findings are very likely to change as new data become available. • Implementation of infection control measures appear to be important to limiting spread as evidenced by several outbreaks where limited or no measures were in place. Across jurisdictions reviewed, there is wide variability in policies in place limiting the ability to evaluate the impact of specific infection prevention and control measures or make best practice recommendations for daycare or school settings due to variability in measures implemented.	**NCCMT**	**08SEPT2020**
Rapid Review Update 1: Is there an increased risk of adverse maternal or fetal outcomes in women infected with COVID-19 during pregnancy?	• Maternal outcomes: Overall, the available evidence shows a low risk of adverse maternal outcomes associated with COVID-19 infection, although most studies do not compare rates to those of non-infected women. The overall certainty of this evidence related to maternal outcomes is very low (GRADE), and findings are very likely to change as more evidence accumulates. • Labour and delivery outcomes: A meta-analysis showed no difference in the rate of preterm birth among women infected with COVID-19 infection compared to non-infected women. Syntheses report rates of pre-term birth between 20-39% of cases, and a rate for cesarean deliveries among women with COVID-19 of between 48-96% (although the clinical indications for cesarean in these cases are not well described), and the limited available evidence suggests that vaginal delivery can be safe. The overall certainty of this evidence related to labour and delivery outcomes is very low (GRADE), and findings are very likely to change as more evidence accumulates. • Fetal and neonatal outcomes: A meta-analysis found no difference in rates of low birthweight for infected versus non-infected pregnant women. Rates of fetal death and stillbirth are between <1-10%. In syntheses reporting on neonatal COVID-19 infection, between 0-7% of neonates were infected, although it is not known if they were infected before or during delivery, or after delivery through exposure to infected health care workers. There is no definitive evidence of vertical transmission. The overall certainty of this evidence related to fetal and neonatal outcomes is very low (GRADE), and findings are very likely to change as more evidence accumulates.	**NCCMT**	**03SEPT2020**
Rapid Review Update 2: What is known on the potential for COVID-19 re-infection, including new	• Across studies, the rates of re-detection following a previous negative test range from 3% to 30% with one meta-analysis calculating the mean rate of re-detection as 14.8%; the overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates. • Despite evidence of cases testing positive after having recovered, most syntheses and studies find no evidence of actual COVID-19 re-infection. The detection of re-positive cases is thought to be due to ongoing virus shedding or testing inaccuracies (such as false positives at the initial or follow-up test, or false negatives indicating that the virus had cleared). The Azam meta-analysis reported the pooled estimate of the interval from negative test to repeat positive test to be 9.76 days. The overall certainty of this evidence is very low (GRADE), and findings are very likely to change as more evidence accumulates.	**NCCMT**	**28AUG2020**

transmission after recovery?	• To date there is no evidence in the included syntheses and studies that re-positive cases can transmit the infection to contacts. Evidence that the virus is viable for a median of 9 days is in line with current isolation periods. The RT-PCR test detects the presence of viral nucleic acid, but the test does not differentiate between live (or viable) and non-infective virus. The overall certainty of this evidence is very low (GRADE), meaning that the findings are very likely to change as more evidence accumulates.		
Evidence to support safe return to clinical practice by oral health professionals in Canada during the COVID-19 pandemic: A report prepared for the Office of the Chief Dental Officer of Canada	• The searches identified strong evidence for a number of conditions that increase the risk of individuals diagnosed with COVID-19 having potentially serious consequences such as hospitalization, ventilation and mortality. These conditions are hypertension, diabetes, cardiovascular and coronary artery disease, chronic respiratory diseases, kidney disease and liver disease. There is also strong evidence that people aged 65 years or older are at similar risk. The evidence concerning sex-related risk is however equivocal. Strong evidence also exists concerning the most common signs and symptoms of COVID-19, which are fever, cough, fatigue and muscle aches and shortness of breath. All these factors and others listed in the summaries below should be considered as part of the pre-treatment screening strategies used by oral health professionals. In reviewing evidence for non-treatment management of in-person care episodes during the pandemic, there was little evidence directly related to the topic in dental care settings. However, we identified evidence regarding aerosolization in health care settings, supporting the use of N95 respirators, surgical masks and eye protection by staff and showing that influenza virus is the most commonly transmitted disease in long term care facilities so good infection control measures need to be in place to prevent transmission of this and similar viruses. We also identified research raising questions concerning infection control measures in place in dental laboratories and work identifying the need for training of professionals and compliance with infection control protocols. We also highlight the possibility of using tele-dentistry for certain forms of health care as an alternative to in-person care. • With respect to the use of PPE by professionals providing care, the available evidence is of limited strength but shows that N95 respirators and surgical masks are equivalent at least in the provision of non-aerosol generating procedures and that training personnel in the donning and doffing of PPE is important in reducing contamination. The discomfort of various forms of PPE, including N95 respirators, is mentioned as contributing to them being less effective than perhaps expected. We identified good evidence that N95 respirators can be disinfected with vaporized hydrogen peroxide for one re-use but no evidence to support re-use of surgical masks. • With respect to the use of aerosol-generating procedures (AGPs), the evidence was not strong. We identified one study reporting a large increase in bioaerosol in dental clinics during the work period and a subsequent fall once that work had finished, plus other work confirming a broad range of pathogens in bioaerosols in health care settings, including dental offices. No evidence was available concerning the risk of transmission or contamination with dental AGPs. • With respect to mitigating strategies during dental procedures, the strongest evidence was identified supporting the use of chlorhexidine as a pre-procedural mouth rinse to reduce bacteria in bioaerosols prior to dental procedures. This was supported by oral chlorhexidine preventing pneumonia and other respiratory morbidity in ventilated and cardiac surgery patients. It is interesting to note that a very recently published Cochrane rapid review of international guidelines concerning AGPs and their mitigation in dental care stated: “There is a lack of evidence provided to support the majority of recommendations in the documents.” • Our review of ventilation systems found that sophisticated systems used in hospitals reduce bioaerosol levels and that ventilation systems can reduce the transmission of infectious diseases, although it is not clear what specific ventilation strategies are effective in different settings. And our review of the disinfection of inanimate surfaces demonstrated that many pathogens including viruses can remain viable on such surfaces for days if disinfection strategies are not used. Our search identified chlorine-based disinfectants as effective, although it is not clear what concentrations are required for different surface types. • Finally, as a general observation, we identified several studies that highlighted the importance and the need for training in a variety of elements of infection control. Given the provision of oral health care in Canada is concentrated in thousands of small offices with small staff numbers, and given the significant changes already incorporated, plus those that will be necessary as more research emerges, oral health professions across Canada need to give careful and urgent consideration of revised and on-going infection control training for their members and trainees.	**McGill University on behalf of the PHAC Chief Dental Officer of Canada**	**28AUG2020**
Evidence Brief on the Risk of COVID-19 and	• Two published investigations of SARS-CoV-2 outbreaks associated with recreational physical activity appear in the literature (Table 1). These transmission events were linked to indoor fitness facility settings and aerobic activities (one a Zumba class, the other playing squash) and occurred in March 2020. • An additional 10 transmission events related to sports or exercise were identified in a COVID-19 Superspreading Events database (Swinkles, 2020).	**PHAC-ESG**	**21AUG2020**

Non-Professional Sports	○ Several transmission events have been reported in gyms associated with indoor classes, bonspiels, square dancing, and football. Many of these are considered high contact activities within the reporting news articles. ○ The actual sources of infection and transmission within these clusters arising from team sports events have not been identified. For example, in two curling bonspiels and one road hockey game, social activities also occurred before and/or after the game. Similarly, the source of an outbreak in a soccer team in Japan that is on-going has not been identified. ○ Activities such as running do no appear to be at high risk of transmission, a single cluster between running partners was identified. • Computer simulations of SARS-CoV-2 aerodynamics concluded that respiratory droplets will ride a runner's slip steam and thus, one should avoid running or walking directly behind another person (Blocken, Malizia, van Druenen, & Marchal, 2020). • Wong et al., report findings from two independent investigations applicable to participation in sports and SARS-CoV-2 transmission (Wong et al., 2020). ○ Analysis of professional soccer game video footage estimates a semi-professional soccer player spends on average 20% of the game within close contact of another player. ○ Experimental simulations of physical activity among athletes found individuals who wore a face mask recorded higher heartrates and perceived exertion compared to those not wearing a face mask. • Helpful strategies to reduce the risk of SARS-CoV-2 transmission during sports can be found in World Health Organization (WHO) guidance documents, risk assessment tools, and published commentaries (Table 2). ○ WHO guidance outlines key considerations, risks, and mitigation based on the type of sport (i.e. the level of contact among players), size of the event, indoor/outdoor locations, venue facilities, demographics of competitors and spectators, and risk communication, and provides guidance on managing SARS-CoV-2 cases that may be identified at a sporting event (WHO, 2020a). The document is to be used in conjunction with the Key Planning Recommendations for Mass Gatherings in the Context of the Current COVID-19 Outbreak (WHO, 2020b), and Mass Gathering COVID-19 Risk Assessment Tool – Sports Events (WHO, 2020c). ○ Commentary by Carmody et al. proposes a risk assessment matrix to support decision makers on restarting sports events that is based on WHO guidance and consideration of local community transmission of SARS-CoV-2 (Carmody, Murray, Borodina, Gouttebarge, & Massey, 2020). ○ A technical note by Blocken et al. considers the process of reopening indoor exercise facilities while minimizing SARS-CoV-2 transmission. Based on the application of limited indirect evidence, the authors conclude deep exhalation and inhalation from exercise can increase respiratory aerosol emission and inhalation. As such, they advocate for the use of displacement (vs. mixing) ventilation systems, HEPA filters, and limited occupancy within indoor facilities where physical exercise is frequent (B. Blocken et al., 2020). Guidance for physical educators at Chinese schools reinitiating after the COVID-19 lockdown, proposes various strategies, such as the use of drills and staggered physical activity periods, that can be adopted by non-professional sports teams to mitigate transmission risks.		
Evidence Brief on Size of Gatherings and Characteristics of High Risk Transmission Events (Update)	• Fifty-five studies were identified, including modelling studies, risk assessments, ecological and epidemiologic studies and outbreak reports. • The studies showed a clear relationship between increased gathering size and risk, but there was not a consistent assessment of different gathering size thresholds (Table 1). ○ An ecological study estimated a 36% reduction in Ro if the cut-off for gathering size was 10 people, compared to 21% if it was 100 people, and a 2% reduction in Ro if the cut-off for gathering size was 1000 people (Brauner et al., 2020). Another study estimated overall 10% reduction in infections associated with gathering size restrictions (Esra et al., 2020). ○ Two models explored thresholds for epidemic collapse, one identified a gathering cut off of 23 people (St-Onge , 2020) and another identified limiting contacts to seven people per 5-day period (Zhao, 2020). • Several predictive models that employ a network structure were developed to explore the impact of different sizes, types of gatherings and whether they included people that knew each other or did not know each other (Table 1).	**PHAC-ESG**	**21AUG2020**

	○ Small closed community networks (e.g., where groups of people only interact with a chosen group of other people and there is limited interaction outside of that network) were identified as having a low risk of virus introduction. The risk increased with increasing bridges to other networks (e.g., commuting to work in another place, attending a sporting event) (Scott et al., 2020; Sneppen et al., 2020). ○ Random mixing events such as public transit, restaurants/bars and sporting events were high-risk events because people from many small networks mixed and, if transmission occurred could then take the virus back to their network (Scott et al., 2020). • There were a number of studies that evaluated the risk associated with certain activities: ○ One assessment estimated the relative risk of going to a nightclub was 200-fold higher than eating at a restaurant (Dalton et al., 2020). This was consistent with another study that found >50% attack rate in direct contacts at night clubs (Prakash et al., 2020), a qualitative risk assessment that identified nightclubs, karaoke, restaurant, gymnasiums, ski resorts and cruise ships as high risk gathering settings (Dalton et al., 2020) and a study in Hong Kong found that 30.4% of cases were linked to exposure to bars and bands (Adam et al., 2020). ○ Large gatherings are associated with the largest outbreaks. A carnival in Germany, for example, was associated with 1,700 cases (Walker et al., 2020). Sporting events were associated with approximately 50-100 cases (Leclerc et al., 2020). Small gatherings, such as interactions among household members, had the majority of documented transmission events but usually result in a small number of secondary cases (<5). ○ Other common gathering settings where transmission events were documented included family gatherings (birthday parties, meals etc.), religious gatherings, weddings, social settings, gyms, shopping facilities, shared accommodations and a variety of workplaces from office environments to factory type settings (such as food processing plants). • Non-pharmaceutical interventions, such as individual hand hygiene practices and community mask wearing and limiting the number of individual contacts, can reduce the risk of a transmission event occurring during gatherings, particularly gatherings of random individuals (Scott et al., 2020). • Super spreading events (SSEs) have been associated with large gatherings and the following characteristics (Table 3): ○ The index case is often asymptomatic or mildly symptomatic. ○ Several studies have estimated that 10-20% of COVID-19 cases cause ~80% of new infections (Adam et al., 2020; Pozderac et al., 2020, James et al., 2020, Laxminara et al., 2020). ○ The risk of transmission in closed environments is higher than in open-air environments (OR 18.7 (6.0-57.9) (Nishiura et al., 2020). ○ Most transmission events were attributed to the number of close and sustained contact; loud talking, shouting and singing have all been associated with high attack rates. These findings need to be considered in light of other individual factors that can affect transmission, such as viral load (Pfefferle et al., 2020) and that some people may have a higher Ro than others e.g., women had a higher Ro than men in Korean clusters (Kim & Jiang, 2020).		
Rapid Review: What is known about using wastewater surveillance to monitor the COVID-19 pandemic in the community? (Update)	• The virus that causes COVID-19 has been detected in untreated wastewater in a number of jurisdictions worldwide, including the USA, the Netherlands, Spain, Italy, Turkey, Chile, Brazil, Ecuador, Pakistan, India, Japan, Australia and Israel. Viral RNA has been found in wastewater treatment plants and in rivers with direct flow of sewage. In some cases, retrospective analyses of wastewater showed that the presence of the virus could be detected before community transmission had been identified. Variations in methodology may contribute to variability in findings. The quality of the evidence should be confirmed through consultation with a content-area expert. • In some studies, the concentration of viral RNA was correlated with the known number of cases in the area. Findings are consistent in the most recent studies. The quality of the evidence should be confirmed through consultation with a content-area expert. • To date, all published studies have demonstrated that wastewater-based surveillance is possible; however, there are no reports of the effectiveness or cost-effectiveness of this method for ongoing surveillance.	**NCCMT**	**14AUG2020**

Evidence brief on the use of face masks to prevent COVID-19 in community settings	• Evidence on the effectiveness of face masks to protect against COVID-19 in community settings were investigated in 12 studies, none of which were conducted in Canada (Table 1). The type of mask worn was not explored in these studies.
	• Five studies estimated a significant impact on the number of COVID-19 cases and fatalities due to mandatory face mask policies.
	• Six retrospective epidemiological studies and one case control study based on contact tracing concluded that wearing a face mask by the index case or susceptible individuals was protective.
	• Literature reviews and systematic reviews on community face mask wearing (Table 2) mainly include evidence published prior to the COVID-19 pandemic with the exception of two reviews. General public masking research prior to the COVID-19 pandemic primarily used surgical masks.
	  ○ Randomized controlled trials (not on SARS-CoV-2) on surgical face mask use in the community have not shown protective results possibly due to small sample size and variation in the implementation and adherence to the intervention.
	  ○ Observational studies of the protective effects of face masks against influenza like illness (ILI) were more significant.
	  ○ Studies on healthcare workers wearing non-medical masks (cotton or paper) demonstrated protection compared to no mask. This was the only field based evidence on non-medical masks.
	  ○ Experimental studies have been conducted on different non-medical fabrics to examine the filterability of fabric combinations for optimal homemade masks (The Royal Society, 2020). Studies conducted in the community to determine how effective different types of non-medical masks are, have not been conducted.
	  ○ Knowledge, beliefs, attitudes, and motivation have been shown to impact adherence to protective behaviours such as wearing a face mask.
	• There is no scientific evidence on any medical condition that would prohibit a person from wearing a non-medical face mask. The impact of prolonged use of an N95 mask was studied for COPD, pregnant women and healthcare workers in four studies (Table 3). No evaluations of other mask types were identified.
	• The Centers for Disease Control and Prevention (CDC) recommend that that face masks should not be worn by children under the age of two years old, anyone who has trouble breathing, and anyone who is unconscious, incapacitated, or unable to remove their mask without assistance (Centers for Disease Control and Prevention, 2020).
		PHAC	**31JUL2020**

COVID-19 summary of Heating, Ventilation, Air Conditioning (HVAC) systems and transmission of SARS-CoV-2	• SARS-CoV-2 RNA contamination in air samples and HVAC system surfaces (e.g. air grates and filters) from healthcare settings indicate it may be possible for SARS-CoV-2 to spread through the HVAC system (Table 1). The viability of isolated viral RNA has not been confirmed by cell culture in the majority of studies, with the exception of two studies that collected viable virus from air samples in COVID-19 patients' rooms.
	  ○ Lednicky and colleagues demonstrate viable SARS-CoV-2 can be found in air 2 to 4.8 meters away from patients in hospital care settings, using virus culture (RT-qPCR) (Lednicky et al., 2020). Moreover, the authors suggest virus particles becoming inactivated during sample collection to be the reason for studies failing to culture viable SARS-CoV-2 in air samples.
	  ○ Air samples from a hospital setting treating SARS-CoV-2 patients were contaminated with viral RNA. Minor indications of cytopathic effects and viral replication were observed in an air and surface sample (Santarpia et al., 2020).
	• A single study reports on the presence of SARS-CoV-2 RNA downstream of air filters in a hospital ventilation system, however the viability of the isolated virus was not evaluated (Table 1). As such, the potential for SARS-CoV-2 infection from air circulated through a ventilation system remains unestablished.
	• A small number of SARS-CoV-2 clusters has been attributed to air conditioning units and air recirculation (Table 2) at a dine-in restaurant (Lu et al., 2020), bus ride to a worship event, and a professional workshop (Shen et al., 2020). Strong air jets created by air conditioning units and the recirculation of indoor air are considered likely modes transmitting infectious respiratory particles from the index case to other susceptible individuals nearby (Yuguo Li et al., 2020).
		PHAC	**31JUL2020**

	Other investigations into SARS-CoV-2 outbreak in a cruise ship have failed to implicate the HVAC system in infection transmission (Almilaji & Thomas, 2020; Xu et al., 2020). • Transmission of other coronavirus infections (i.e. MERS and SARS) predating SARS-CoV-2 point to an association between poor ventilation (i.e. insufficient movement and clearance of contaminated indoor air) and infection transmission, this association likely extends to SARS-CoV-2 (Table 4). • Expert statements and guidance documents advocate for HVAC testing and certification to ensure properly functioning systems to minimize air contaminants in indoor settings based on local standards. • Commentaries and reviews that consider the body of evidence on the topic, and mathematical models, consistently report that increasing the flow of outside fresh air into built environments (e.g. open windows) and reducing occupancy within enclosed indoor settings, where feasible and appropriate, to be simple strategies that can mitigate SARS-CoV-2 transmission in indoor settings (Dai & Zhao, 2020; Dietz et al., 2020; Morawska & Cao, 2020).		
Rapid Review: What is known about how long the virus can survive with potential for infection on surfaces?	• There is no conclusive evidence on the length of time SARS-CoV-2 can be detected on different surfaces, and the likelihood of infectivity when the virus is detected. Study quality is moderate, and findings are inconsistent. • Findings from laboratory-based studies indicate SARS-CoV-2 can remain viable longer on smoother surfaces such as plastic or steel than cardboard or cotton. There is wide variation in the length of times reported and study quality was not assessed.	**NCCMT**	**31JUL2020**
Rapid Review: What factors increase the risk of COVID-19 outbreaks in congregate living settings? How do outcomes compare to outbreaks in community settings? (Update)	• No evidence was found to directly address the question of specific factors in congregate living settings that may increase or reduce risk of a COVID-19 outbreak. The impact of factors such as crowding and shared facilities (e.g., washrooms, dining, communal space) is assumed in the studies, based on expert opinion, but has yet to be demonstrated in evidence. • Prevalence studies show higher rates of infection in congregate settings, although many do not provide comparative rates for community settings. • Higher infection rates were reported in four studies that provided comparative rates for outcomes (i.e., cases, hospitalizations, fatalities) for congregate-living residents of shelters, prisons and group homes versus community-dwelling residents. Two Canadian prevalence studies that reported a comparator found a higher rate of COVID-19 infection in congregate settings (shelter and prison) than in the general population (2 to 18 times higher). US prevalence studies also reported higher rates for residents of prisons and a group home than for the general population. Given that many congregate settings are testing universally, the testing rate is also likely higher in these congregate settings than in the general population, potentially leading to a higher prevalence rate. Quality is high; findings are consistent. • A systematic review identified factors in prison settings that contribute to the spread of infections other than COVID-19. Recommended mitigation strategies, with relevance for COVID-19, include: health communication; reduction of overcrowding; and limiting shared spaces when possible. Recommended public health measures such as hand hygiene, screening, testing, contact tracing, and isolation are challenging to implement in a prison context. Quality is moderate; findings are consistent. • Mitigation strategies focus on infection prevention and control measures tailored to prison and shelter settings, and include: limiting visitors; limiting movement of staff and residents between locations; screening, testing, and isolating; providing on-site healthcare; enhanced sanitation; physical distancing and reduction of crowding when possible; cohorting of positive cases; and PPE and hand hygiene measures. The effectiveness of these interventions has not been studied in these contexts; implemented practices are moderately consistent.	**NCCMT**	**31JUL2020**
Evidence Brief on Age-	• Empirical evidence suggests that a low proportion of SARS-CoV-2 cases occur in children <19, a large proportion of infections may be asymptomatic, and that they can transmit the virus (Table 1).	**PHAC-ESG**	**24JUL2020**

Dependent Transmission	• Few contact tracing, or outbreak studies have reported children <19 years old as the index case (Table 1). However, there are instances where an infected child has passed SARS-CoV-2 to an adult or another child. Most studies conclude that children have not been the main drivers of t transmission of SARS-CoV-2 to date. • One study estimated the relative infectivity of children to adults to be 85% (65-110%). However, few children were the index case in the household outbreaks investigated, which resulted in the study being underpowered (Dattner et al., 2020). In a systematic review, pooled odds ratio of being an infected contact in children compared with adults for all contact tracing studies, was reported as 0.44 (0.29, 0.69) (Viner et al., 2020). • Viral load in symptomatic children was shown to be the same as adults in three studies of symptomatic COVID-19 cases (Table 2). • Six publications use mathematical models to investigate the impact of relaxing intervention measures by targeting different age groups on the epidemic (Table 1). • Re-opening schools: the most recent model examines the risk of opening schools in a low transmission vs. high community transmission scenario, indicating opening schools in low transmission scenarios along side other public health interventions did not result in a large spike in cases. Two other mathematical models demonstrate that allowing younger children (pre-school and primary school aged) to return to school would have the smaller impact on the basic reproduction number (R0) , whereas the return of secondary school grades will have the greatest impact (Di Domenico, Pullano, Sabbatini, Boëlle, & Colizza, 2020; Keeling et al., 2020). • Of the three models that analyzed lifting interventions by age groups, results suggest that relaxing measures by age group could reduce the impact of COVID-19. Specifically, releasing younger individuals (0-19) from strict lockdown can lead to lower overall fatality rates compared to the simultaneous release of all individuals after a lockdown (Castilho, Gondim, & Marchesin, 2020; Zhao & Feng, 2020).		
Evidence Brief on the Determinants of Individual Adherence to Public Health Interventions for COVID-19	• 80 studies conducted in many countries evaluated the individual adherence to protective measures against COVID-19 infection in various populations including adults, young adults, university students, children and adolescents, healthcare workers (HCWs), pregnant women, employees, and visitors to hospitals (Tables 1-5). • Most of these studies were conducted in the initial stages of the epidemic and represent initial adoption of protective behaviours. Many studies (n=28) report better compliance among females compared to males in all age groups. There were few studies on children and adolescents, and many of these noted high compliance in these age groups with a lower compliance among children of high school age. • Compliance varied across studies, sociodemographic factors and type of protective measure, and was frequently associated with individual knowledge and beliefs. • Adults > 30 years old were more likely to be compliant with recommended protective behaviors in 13 studies. Other factors positively correlated to adherence in adults include: risk perception (n=7 studies), higher COVID-19 knowledge (n=5), trust in science and government (n=4), increased anxiety levels (n=3), perceived self-efficacy to adopt protective measures (n=3) and Black or Asian ethnicity (n=3). • Non-adherence in adults was associated with psychological issues such as depression, conspiracy mentality and narcissism (n=5), as well as being a current smoker (n=3). • In children and adolescents, factors correlated with improved adherence include father's occupation, mother's educational background, location of residence and those with an immigrant background (Chen et al., 2020; Soest, Pedersen, Bakken, & Sletten, 2020). • Three rapid synthesis reviews were identified that included pre-pandemic literature on adherence to quarantine and individual preventative behaviors (IPC) by HCWS (Table 6).	**PHAC-ESG**	**24JUL2020**
Evidence Brief of Pregnancy and Severity of COVID-19	• Studies looking at severity of COVID-19 disease among pregnant women compared to non-infected pregnant women or non-pregnant COVID-19 cases present variable results that are not comparable from one study to the next due to their study design. • Prospective studies of pregnant women in the population find a low proportion of women were infected with COVID-19 during the initial stage of the epidemic (note this was not compared to infection in the general population). Many COVID-19 positive pregnant women were asymptomatic at the time of enrollment, which ranged from first trimester visits to delivery. Many of these studies report close to zero hospitalizations or severe outcomes (Table 1). • Prospective and retrospective case series report on a spectrum of COVID-19 disease severity outcomes in pregnant women, with significant heterogeneity across estimates between studies and within the systematic review meta-analyses (Table 2 & 3). Most of these studies did not indicate that the proportions reported were higher or different from the general population. A summary of the range in proportions reported across studies for each outcome is listed below: ○ Severe COVID-19 disease: 5.3% - 26.1%	**PHAC-ESG**	**17JUL2020**

	○ Critical COVID-19 disease: 1.4% - 5% ○ Mortality: 0 – 2.0% / ICU mortality: 15.4% ○ Hospitalized for COVID-19: 0% - 28% ○ Oxygen therapy among hospitalized COVID-19 cases: 7% - 32% ○ ICU overall COVID-19 cases: 2% -10% ○ Mechanical Ventilation overall COVID-19 cases: 2 - 3.4% / ICU: 11 - 61.5% ○ ECMO overall COVID-19 cases: 0.03% - 2.3% ○ Induction of delivery due to COVID-19 disease: 9% - 19.0% • One study based on USA surveillance data reported that the adjusted risk ratio for hospitalizations among pregnant women during the beginning of the epidemic was 5.4 times that of non-pregnant women of reproductive age (Ellington et al., 2020). This study also reported higher adjusted relative risk of ICU admission 1.5 times and mechanical ventilation 1.7 times, but no difference in the adjusted relative risk of mortality. This data could not distinguish hospitalizations for COVID-19 from other reasons for hospital admission (e.g., pregnancy-related treatment, or labor and delivery, which are common during pregnancy), thus it is unknown what proportion of the risk of hospitalization between pregnant and non-pregnant women can be attributed to pregnancy versus a possible increased risk due to COVID-19 during pregnancy. • Another large hospital dataset from New York, USA compared the hospitalization rates of weeks one and four of the epidemic between pregnant women [RR 14.81 (95%CI 2.07-107.38) N=3064] and total hospitalizations [RR 46.99 (95% CI, 36.72-60.15) N=21980] (Tekbali et al., 2020). The study concludes that the increase in risk of the general population being hospitalized was more than for pregnant women in the first month of the epidemic. However, without a measure of excess hospitalizations due to COVID-19, these results are difficult to interpret. • A study from China, documented that pregnant women were more likely to be admitted to the hospital sooner and with more mild symptoms compared to non-pregnant COVID-19 cases, which may bias outcomes such as hospitalization when comparing pregnant women to non-pregnant populations (Wang, Wang, & Xiong, 2020). • There was no association with COVID-19 status and spontaneous abortion in the first trimester (S. Cosma et al., 2020b). • There was some indication that women in the third trimester are more likely to have clinical symptoms and be diagnosed with pneumonia related to SARS-CoV-2 infection compared to those in the first trimester (Crovetto et al., 2020). • Risk factors for severe COVID-19 disease among pregnant women included age>35, comorbidities and/or obesity (Table 2 & 3) (Cohen, Vignaux, & Jacquemard, 2020; Khalil et al.; Vivanti et al., 2020).		
COVID-19 Summary of Face Shields to Prevent Transmission of SARS-CoV-2	• Face shields are a form of personal protective equipment that has been used in healthcare settings (e.g., surgical/medical, dental, veterinary) to cover the face and mucosal membranes (eyes, nose, mouth) and prevent infectious particle exposure from aerosols and body fluid spatter. A face shield is often used when performing medical procedures that increase the risk of aerosols or patient body fluid splashes, sprays or splatter and is worn with other personal protective equipment (e.g., medical masks, respirators, medical gowns) (Roberge, 2016). • All studies included in this review are experiments conducted under controlled conditions. With the exception of one study which used influenza (Lindsley et al., 2014), the studies in this review did not use virus contaminated fluids. • Studies on face shield use by healthcare workers report a protective effect particularly from patient generated splatter during specific medical procedures when used in combination with other protective equipment such as a surgical mask (Table 1 and Table 2) (Mansour et al., 2009; Mostaghimi et al., 2020; Shoham et al., 2016). Face shields have also been designed for the patient to wear when undergoing an aerosol generating procedure to contain the aerosols and protect the health care workers doing the procedure from exposure (Anon, Denne, & Rees, 2020;) • Two simulation studies reported on droplet inhalation and exposure when wearing face shields as the only protective equipment (Table 1). Both studies report 90% of the large droplets were blocked by a cough aimed at the middle of the face shield (Lindsley et al., 2014; Ronen et al., 2020), however the protective effects decreased when	**PHAC-ESG**	**10JULY2020**

	the direction of the cough was varied (higher/lower/side). Over time (30 minutes) inhalation of small droplets was only reduced by 23% by the face shield (Lindsley et al., 2014). • Three studies simulated coughing in an individual wearing the face shield and reported the level of contamination resulting from respiratory particles released (Table 1 and Table 2). Two studies report the release of droplets and aerosols from around the openings in the face shield (Anon et al., 2020; Viola et al., 2020), while the third reports that the face shield provided a good forward barrier as no droplets reached a simulator 60 cm away (Ronen et al., 2020). • The design of the face mask is reported to be important. Face shields that wrap further around the face, fully shielding the cheek area, wrap under the chin and any enhancements that minimize bioaerosol leakage/entry around the edges of the mask were more protective (Viola et al., 2020; Anon et al., 2020; Mostaghimi et al., 2020).		
Aerosolization of SARS-CoV-2	• A quantitative risk analysis using two COVID-19 clusters attributed to a restaurant and a choir practice, concludes the high attack rates observed in both outbreaks can only be possible if airborne transmission is the assumed primary mode of transmission (Buonanno, Morawska, & Stabile, 2020). • There are no studies that estimate SARS-CoV-2 infection transmission risk based on varied distance from an infectious source, or evaluate factors impacting airborne transmission on the virus. There is limited evidence on virus viability in expelled particles or the infectious dose. • van Doremalen provides experimental evidence to support the viability of SARS-CoV-2 virus particles in aerosols. The study reports SARS-CoV-2 virus can remain viable within aerosols for longer than three hours (van Doremalen et al., 2020). • Mathematical models informed by the laws of particle physics and aerodynamics predict airborne particles can remain suspended in air for long enough to be inhaled and have the potential to be dispersed some distance away from the infectious source (Feng, Marchal, Sperry, & Yi, 2020; Guerrero, Brito, & Cornejo, 2020; Vuorinen et al., 2020; Zhao, Qi, Luzzatto-Fegiz, Cui, & Zhu, 2020). • According to mathematical models, droplet size, humidity, temperature, air flow, and air turbulence all impact the travel distance and decay of virus containing airborne particles. Key findings from individual studies (Table 1). • Simulation studies find thousands of minute respiratory droplets and aerosols are generated when speaking, and these particles can remain suspended in air for periods longer than eight minutes (Anfinrud, Bax, Stadnytskyi, & Bax, 2020; Stadnytskyi, Bax, Bax, & Anfinrud, 2020). • Multiple researchers have investigated the presence of SARS-CoV-2 laden aerosols in air sampled from various healthcare environments managing COVID-19 patients (Table 2).	**PHAC-ESG**	**10JULY2020**
COVID-19 Summary of SARS-CoV-2 Transmission and Singing/Wind Instruments	• The available evidence suggests the activity of singing in indoor settings can contribute to amplified infection transmission of SARS-CoV-2 if an infected person is participating. Epidemiological reports of COVID-19 clusters with high attack rates linked to choir practice in the US, Singapore, and the Netherlands, as well as a karaoke bar in South Korea provide evidence that transmission has occurred during activities that involve singing (Tables 2 and 3). • Primary evidence on wind and brass instrument use and SARS-CoV-2 transmission could not be identified. However, one descriptive risk assessment and one grey literature study of wind instruments indicate more research should be done on the risk of SARS-CoV-2 transmission from wind instrument aerosols (Table 3). One protocol to study wind instruments and safe playing was identified (Miller, Vance, Hertzberg, & Toohey, 2020). • No evidence on mitigation strategies for musicians was identified. • Experimental evidence and modelled scenarios on droplet dispersion and aerosolization of SARS-CoV-2: • Infectious particles are commonly expelled into the surrounding air by an infected person (e.g., breathing, speaking, sneezing, singing and coughing) and these particles may transmit SARS-CoV-2 to another person when inhaled (Table 1). • Airborne SARS-CoV-2 particles can exist in the form of aerosols, droplets, droplet nuclei or other small particles containing viral RNA. One study reports SARS-CoV-2 virus can remain viable within aerosols for longer than three hours (van Doremalen et al., 2020). • No simulation studies have examined particle generation during singing or wind instrument use, but studies do report on speaking and coughing. For example, 1000s of virus containing particles are estimated to be produced during a minute of loud speaking and remain airborne for longer than eight minutes (Table 1) (Stadnytskyi, Bax, Bax, & Anfinrud, 2020).	**PHAC-ESG**	**03JULY2020**

	• Mathematical models informed by particle physics and aerodynamics predict respiratory and saliva particles can remain suspended in air for long enough to be inhaled by another individual, and has the potential to be dispersed some distance away from the infectious source (Vuorinen et al., 2020) (Guerrero, Brito, & Cornejo, 2020; Zhao, Qi, Luzzatto-Fegiz, Cui, & Zhu, 2020) (Feng, Marchal, Sperry, & Yi, 2020). According to mathematical models, droplet size, humidity, temperature, airflow and air turbulence all impact the movement and decay of virus containing airborne particles (Table 1).		

Evidence brief on age-dependent transmission	• No study estimated the transmission rate in children <19 years old or by age groups between zero and 19 years.
	• One study estimated the relative infectivity of children to adults to be 85% (65-110%). However, few children were the index case in the household outbreaks investigated, which resulted in the study being underpowered (Dattner et al., 2020). In a systematic review, pooled odds ratio of being an infected contact in children compared with adults for all contact tracing studies was reported as 0.44 (0.29, 0.69) (Viner et al., 2020).
	• The epidemiological research shows that children are a small fraction of cases.
	• Data on viral load was reported in one study and re-analysed in one review (Jones et al., 2020; Ludvigsson, 2020a). They show that viral load in children was lower than adults.
	  ○ Viral load estimates by age group: 1-10 yo= 43k, 11-20 yo= 63k, 21-30 yo=183k, 31-40 yo=164k. p=0.008.
	• Household transmission studies show that children are rarely the index case; however, there are instances where an infected child has passed SARS-CoV-2 to an adult. Thus, transmission can occur, but may be less frequent than with adults.
	• Five publications use mathematical models to investigate the impact of relaxing intervention measures by targeting different age groups on the epidemic (Table 1).
	  ○ Re-opening schools: two mathematical models demonstrate that allowing younger children (pre-school and primary school aged) to return to school would have the smaller impact on R, whereas the return of secondary school grades will have the greatest impact (Di Domenico, Pullano, Sabbatini, Boëlle, & Colizza, 2020; Keeling et al., 2020).
	  ○ Of the three models that analyzed lifting interventions by age groups, results suggest that relaxing measures by age group could reduce the impact of COVID-19. Specifically, releasing younger individuals (0-19) from strict lockdown can lead to lower overall fatality rates compared to the simultaneous release of all individuals after a lockdown (Castilho, Gondim, & Marchesin, 2020; Zhao, Feng, Castillo-Chavez, & Levin, 2020).
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Evidence brief on SARS-CoV-2 virus dispersion distance	• The body of evidence suggest particle speed, evaporation, air flow, humidity, temperature, all play a role in the distances virus laden respiratory particles can travel after being released by an infectious individual. As such, the protective effects of physical distancing at different distances also depend on the conditions in which they are practiced.
	• The available empirical and modeled evidence suggests in some circumstances respiratory droplets and aerosols expelled from infectious individuals may travel distances greater than 2 meters (Table 1), but face coverings are effective at limiting dispersion distances to less than 0.5 meters (Table 2).
	• According to mathematical models and fluid dynamic analysis, droplet size, humidity, temperature, air flow, and air turbulence all impact the movement and decay of virus containing airborne particles (Table1).
	  ○ Some models predict small droplets and aerosols can travel distances as far as ten meters when generated by coughs or sneezes, and frequently conclude social distance of two meters is not always sufficient to negate airborne SARS-CoV-2 transmission (Feng, Marchal, Sperry, & Yi, 2020; Guerrero, Brito, & Cornejo, 2020; Zhao, Qi, Luzzatto-Fegiz, Cui, & Zhu, 2020).
	  ○ Low temperature and high humidity are found to facilitate respiratory droplet transmission and dispersion. High temperature and low humidity are found to promote the rapid loss of respiratory droplet mass (from evaporation) thereby reducing droplet travel distance (Feng et al., 2020; Zhao et al., 2020).
	  ○ A multidisciplinary research consortium applied evidence based Monte-Carlo models and 3D simulations to investigate the physics of SARS-CoV-2 aerosol dispersion (Vuorinen et al., 2020). The investigators use computer simulations to demonstrate SARS-CoV-2 aerosols can travel distances up to ten meters, and the inhalation of
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	sufficient concentrations of aerosols (100 virus laden particles was assumed to be infectious) is possible within one second to one hour depending on the surrounding conditions. ○ Results from an agent based model reported a decreasing risk of a transmission event within indoor settings (e.g. supermarket) when the distance between individuals are increased from 30 cm to 2 meters (Hernandez Mejia & Hernandez-Vargas, 2020). ○ Speed of movement also impacts droplet travel distance. Computer fluid dynamic simulations find, distances greater than 1.5 meters are necessary when two individuals are running or moving fast as inertia of expelled droplets also impacts droplet spread although a distance of 1.5 meters may be sufficient when standing still (Blocken, Malizia, van Druenen, & Marchal, 2020). • Laboratory simulation studies report human and manikin generated cough droplets can travel distances between one to two meters, and a maximum of four meters in some simulations (Loh et al., 2020; Rodriguez-Palacios, Cominelli, Basson, Pizarro, & Ilic, 2020; Viola et al., 2020). • Two simulation studies investigated the effects of face covers on expelled particle dispersion distance. Both studies find the inclusion of face covers, such as face shields, filtering face piece respirators, surgical face masks, and homemade masks, reduced the dispersion of expelled droplets to less than 0.5 meter, even when coughing. • A recent systematic review by Chu et al., quantifies the relative risk of beta-corona virus infection based on distance (Chu et al., 2020). The authors report transmission of viruses to be lower with physical distancing of 1 m or more, compared with a distance of less than 1 m (n=10 736, pooled adjusted odds ratio [aOR] 0·18, 95% CI 0·09 to 0·38; risk difference [RD] −10·2%, 95% CI −11·5 to −7·5; moderate certainty); protection was increased as distance was lengthened (change in relative risk [RR] 2·02 per m; *p* interaction=0·041; moderate certainty). There appears to be some ambiguity in the measurement of physical distance for some of the evidence included in this review. Therefore, it may be premature to quantify the relative risk of SARS-CoV-2 infection based on incremental differences in physical distance, due to the lack of sufficient evidence. • Presently there are no observational studies that estimate SARS-CoV-2 infection transmission risk based on varied distance from an infectious source.		
What is known about best practices for infection prevention and control in inpatient psychiatric facilities?	• There is very little evidence on effective infection control practices specific to inpatient psychiatric facilities and no evidence-informed guidelines are available. Quality of available studies is low, and recommendations are very likely to change as more evidence becomes available. • In response to COVID-19, several organizations have produced interim guidance documents with recommendations specific to inpatient psychiatric facilities. Recommendations (based on expert opinion) generally suggest following established guidelines for other inpatient hospital settings (not included in data tables), and several factors specific to inpatient psychiatric facilities were identified: ○ There are complex ethical considerations surrounding enforcement of physical distancing measures if patients are non-compliant (e.g., use of restraints). ○ There is a need to adapt rather than suspend activities (for example, group therapy, family visits, etc.) to ensure adequate mental health care support. ○ There is the potential for certain conditions (e.g., anxiety, paranoia, obsessive compulsive disorder) to be worsened by the experience of the pandemic. • Many patients have other medical comorbidities that may place them at increased risk of more serious COVID-19 complications.	**NCCMT**	**26JUNE2020**
What factors increase the risk of COVID-19 outbreaks in congregate living settings? How do outcomes compare to outbreaks in	• No evidence was found to directly address the question of specific factors in congregate living settings that may increase or reduce risk of a COVID-19 outbreak. The impact of factors such as crowding and shared facilities (e.g., washrooms, dining, communal space) is assumed in the studies, based on expert opinion, but has yet to be demonstrated in evidence. • Very limited evidence was found that compared outcomes (i.e., cases, hospitalizations, fatalities) for congregate-living residents to community-dwelling residents. Two Canadian prevalence studies that reported a comparator found a higher rate of COVID-19 infection in congregate settings (shelter and prison) than in the general population (2 to 18 times higher). Given that many congregate settings are testing universally, the testing rate is also likely higher in these congregate settings than in the general population, potentially leading to a higher prevalence rate. Quality is high; findings are consistent. • Prevalence studies appear to show higher rates of infection in congregate settings, although most do not provide comparative rates for community settings.	**NCCMT**	**26JUNE2020**

community settings?	• A systematic review identified factors in prison settings that contribute to the spread of infections other than COVID-19. Recommended mitigation strategies, with relevance for COVID-19, include: health communication; reduction of overcrowding; limiting shared spaces when possible. Recommended public health measures such as hand hygiene, screening, testing, contact tracing, and isolation are challenging to implement in a prison context. Quality is moderate; findings are consistent. • Mitigation strategies focus on infection prevention and control measures tailored to prison and shelter settings, and include: limiting visitors; limiting movement of staff and residents between locations; screening, testing, and isolating; providing on-site healthcare; enhanced sanitation; physical distancing and reduction of crowding when possible; cohorting of positive cases; PPE and hand hygiene measures. The effectiveness of these interventions has not been studied in these contexts; implemented practices are moderately consistent.		

Evidence brief of size of gatherings and characteristics of high risk transmission events.	• The agent-based model developed by V. Ng at the Public Health Agency of Canada is being adapted to explore the impact of gathering size restrictions. Results will be available soon.
	• The evidence largely does not provide estimates of the size or threshold size for high-risk gathering.
	  ○ One Canadian model suggested under one scenario that gatherings of 23 people and below was a threshold under which the epidemic would collapse.
	• Several predictive models that employ a network structure were developed to explore the impact of gatherings and different types of gatherings. These are generally divided by gatherings, with various sizes, of random people that do not know each other and gatherings of people that do know each other (Block et al., 2020; Scott et al., 2020; P. J. Zhao, 2020).
	  ○ Small closed community networks (e.g. where groups of people only interact with a chosen group of other people and there is limited interaction outside of that network) are considered in these models to be relatively protective and have a low risk of virus introduction into the closed network. The risk increases with increasing bridges to other networks (e.g. commuting to work in another place, attending a sporting event).
	  ○ Random mixing events e.g. public transit, restaurants/bars and sporting events were high-risk events because people from many small networks mix and risk taking the virus back to their network (Scott et al., 2020).
	• A quantitative risk assessment developed in the US estimated the median probability of COVID-19 infection transmission is one infection per 3836 (Range: 626 to 31,800) unprotected community-level contacts (e.g., without social distancing, wearing of masks, hand hygiene, etc.) (Bhatia & Klausner, 2020).
	• Several studies demonstrate the impact on the epidemic of decreasing or restricting individual's contacts. As well as studies that measured the normal vs. restricted number of contacts per individual.
	• Other non-pharmaceutical interventions e.g. individual hand hygiene practices and community mask wearing can augment the risk of a transmission event occurring during gatherings, particularly gatherings of random individuals (Scott et al., 2020).
	• Transmission dynamics and risk associated with social gatherings is not well documented and there is likely a lot of under-reporting. Several cluster investigations were analysed for common characteristics (Table 3).
	  ○ Many transmission events occur when the index case is asymptomatic or mildly symptomatic.
	  ○ Most transmission events are small clusters, however, the occasional larger cluster (>10 people) have been reported. The likelihood of observing transmission at a gathering event is context dependant (meaning it depends on situation, population density, cultural practices etc.). For COVID-19, a study looking at clusters in Hong Kong, Japan and Singapore early in the epidemic estimated the risk of a transmission event occurrence with >4 secondary cases was 0.106 to 0.215 (On Kwok et al., 2020). Similarly, in Hong Kong, it was estimated that 20% of the cases caused 80% of the infections early in the epidemic (Adam, Wu, Wong, & et al., 2020).
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	○ The majority of documented transmission events are among household members. Other common gathering settings where transmission events were documented included family gatherings (birthday parties, meals etc.), religious gatherings, weddings, social settings, gyms, shopping facilities, long-term care facilities and a variety of workplaces from office environments to factory type settings (Table 3). ○ Most transmission events were attributed to the number of close contacts and duration of contact during the gathering event. ○ Type of contact is likely important although this has not been formally evaluated and characterized. Outbreaks in social settings where there is a lot of talking or singing have resulted in high attack rates (Prakash, 2020). The risk may be different in non-social crowds (e.g. public transportation), however this has not been studied. • The available data indicates that large transmission events associated with gatherings have not been the primary driver of transmission during this epidemic; although there is evidence they occur and can spark a long transmission event. They often occur when the index case is asymptomatic or mildly symptomatic, which makes them more difficult to prevent. Additional interventions, such as hand hygiene and community facemask use are predicted in some of the models (Table 1) to augment some of the risk of transmission during gatherings.		
Evidence brief of de-escalation of social bubbles	• One preprint was identified that directly models social bubbles and real world options using the UK as the case study. The study reports that single family bubbles are estimated to have reduced the number of cases by 17%. In their model they explore relaxing the single household bubble to different scenarios of multiple households using three different secondary attack rates and Ro as the outcome. Ro is shown to increase as restrictions are relaxed, but some of the limited options appear to have minimal increase in risk. • Three social network models also provide some evidence to support that larger, but still closed and segmented networks offer a protective effect against introduction of SARS-CoV-2. The larger a segmented network and the more contacts outside of that network, the higher the risk of virus introduction. • There are many studies that look at the impact of social distancing more generally and in combination with other interventions. They have not been summarized in this evidence brief, but are available upon request as they are collected within the Public Health Intervention evergreen review. • One protocol for a systematic review on physical distancing interventions was also identified, but it will not be conducted until October 2020.	**PHAC-ESG**	**22JUNE2020**
Evidence brief of aerosol generating procedures in dental care settings	• No published reports of COVID-19 transmission, clusters, or outbreaks in dental care settings could be identified. • SARS-COV-2 aerosolization: ○ Air samples collected from hospital care settings treating COVID-19 cases have demonstrated SARS-COV-2 RNA contamination, likely from aerosols and small respiratory droplets (Guo et al., 2020; Liu et al., 2020; Santarpia et al., 2020). SARS-CoV-2 is found to remain viable in aerosols for up to 4 hours, but neither the infectiousness or the infectious dose of these particles has been established (van Doremalen et al., 2020). ○ Dental procedures can induce gag reflexes leading to increased saliva secretion and coughing in patients. High speed dental instruments can create high volumes of aerosols containing water, saliva, blood, microorganisms and other debris (Ather, Patel, Ruparel, Diogenes, & Hargreaves, 2020; Jamal et al., 2020; Sales, Sales, & Da Hora Sales, 2020). ○ A recent publication by Workman et al., reports on cadaver simulations where aerosolization risks linked to endonasal procedures were assessed (Workman et al., 2020). The study concludes high-speed surgical drill procedures resulted in substantial aerosol contamination in all tested conditions. These findings may be extended to dental drills and procedures that are considered aerosol generating. • Guidance Documents: ○ Published guidance indicates confirmed and suspected COVID-19 patients should NOT be treated in routine dental practice settings, and only be managed in negative-pressure infection isolation rooms (AIIR). (Ather et al., 2020; Jamal et al., 2020)	**PHAC-ESG**	**12JUN2020**

	○ Reviews of multiple COVID-19 dental guidance documents indicate that some procedures and equipment used are associated with increased risk of aerosol generation and should be either avoided or modified during the COVID-19 pandemic (Table 1). Specific guidance linked to aerosol generating procedures and instruments from these publications are summarized below. ▪ Intraoral Radiographs should be avoided and replaced with extraoral imaging such as panoramic radiography or cone-beam computed tomographic imaging when intraoral imaging is unavoidable (Ather et al., 2020; Jamal et al., 2020; Meng, Hua, & Bian, 2020). ▪ Use of a rubber dam to minimize splatter generation is the standard of care for nonsurgical endodontic treatment. Recommendations suggest it may be advantageous to place the rubber dam so that it covers the nose (Ather et al., 2020; Jamal et al., 2020; Sales, Sales, & Da Hora Sales, 220). Also, when the rubber dam is applied, extra high-volume suction for aerosol and spatter is recommended along with regular suction (Peng et al., 2020). ▪ Ultrasonic instruments such as triplex syringes, high-speed hand pieces, ultrasonic scalers, air abrasion devices, and intra-oral sandblasters are identified to be associated with increased aerosolization risk that should be avoided or the use minimized (Ather et al., 2020; Jamal et al., 2020; Meng et al., 2020; Sales et al., 220). If the use of such equipment is unavoidable, the application of high volume saliva ejectors are recommended alongside applicable instruments (Ather et al., 2020; Jamal et al., 2020; Meng et al., 2020). ▪ To minimize the risk of dental aerosols, it is recommended that hand instruments, low-speed hand pieces, instruments without water spray and hand piece with an anti-retraction valve or other anti-reflex technology are used where possible (Ather et al., 2020; Jamal et al., 2020). ▪ Peng et al., suggest the use of dental hand pieces without anti-retraction function should be prohibited during the epidemic period of COVID-19. Instead, anti-retraction dental hand piece with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross-infection. It is important to note these recommendations are based on previous evidence from Hepatitis B infection transmission in dental care settings (Peng et al., 2020). **Available at: https://drive.google.com/file/d/1QyiGqwqeOGYJcvAks6tRRN7seIC9-n8m/view?usp=sharing** •		
Evidence brief on the risk of COVID-19 outbreaks in the workplace	• Risk factors for SARS-CoV-2 infection identified in the workplace include difficulties adhering to physical distancing, lack of hygiene, poor ventilation, and crowded working and transportation conditions (Table 1 & 2). ○ Overall, close contact with others was the main risk factor identified in the workplace. Examples of close contact situations that lead to transmission include business meetings, interactions with colleagues or clients, or close proximity to others for long durations. • Strategies to reduce the risk of SARS-CoV-2 transmission in the workplace were identified in 12 publications (Table 3). These include limiting social contact (restricting activities in the workplace, scheduling or staggering employees, and telework), quarantining sick workers, providing workplace guidelines, and screening employees and migrant workers. • Outbreaks have been associated with many types of work places and several key studies highlight the findings in the literature to date: ○ The occupations most at risk of SARS-CoV-2 infection include healthcare professionals, drivers and transport workers, service and sales workers, cleaning and domestic workers, production workers, education occupations, community and social services occupations (e.g. social workers, counselors), construction and extraction occupations, and public safety workers (e.g. police, firefighters) (Baker, Peckham, & Seixas, 2020; Lan, Wei, Hsu, Christiani, & Kales, 2020). ▪ The majority of these are low or middle-skilled occupations that require workers to have frequent contact with clients, work on customers' premises or public spaces. Many of these occupations do not allow employees to work from home. ▪ A study in the UK found that of 817 individuals tested for SARS-CoV-2 infection, 206 had a positive test in a hospital setting. Compared to non-essential workers (occupations other than healthcare workers, social and education workers, and police and protective service), healthcare workers (RR 7.59, 95% CI: 5.43-10.62) and social and education workers (RR 2.17, 95% CI: 1.37-3.46) had a higher risk of testing positive for SARS-CoV-2 in the hospital (Mutambudzi et al., 2020).	**PHAC-ESG**	**12JUN2020**

	• A risk assessment scored businesses for their potential to be super-spreading business (SSBs) based on the frequency, duration, and square footage of businesses pre-pandemic across 8 US states (O'Donoghue et al., 2020). A positive association between SSBs and the cumulative weekly cases of COVID-19 was reported where a 1% increase in SSB equated to a 5% increase in cases. The most common SSBs were full service restaurants, limited service restaurants, and hotels/motels.
	• Workplace clusters have been identified in healthcare settings, long term care facilities, cruise ships, retail, tourism industry, transportation (taxi, bus, trains and planes), factories, and to a lesser extent restaurants/food establishments (Table 2).
	  ○ Most of the workplace clusters were traced to an asymptomatic or very mild symptomatic index case.
	  ○ A few clusters were identified in an office or factory setting and all cases had close contact with infected individuals. The common element across these outbreaks were time spent in close contact in an enclosed environment (e.g. a meeting room, processing facility etc.)
	• Poor ventilation, individual air conditioners and fans, have been instrumental in increasing the dispersion of SARS-COV-2 from infected to susceptible individuals in several outbreaks (Koh, 2020; Lan et al., 2020; Qian et al., 2020; Shen et al., 2020; Yang et al., 2020).
	
	Available at: https://drive.google.com/file/d/19YPSZ0pUXVo29Pr4kJZmNXS5yvSddRN3/view?usp=sharing		

Rapid review: what is known about the efficacy and cost-effectiveness of copper materials to reduce transmission of viruses?	• A comprehensive search of the literature found no evidence on the efficacy or cost-effectiveness of copper-treated PPE in hospital or public settings to reduce transmission of any viruses, and no reports were found of hospitals using copper-treated PPE to protect against COVID-19 or other viruses. • One high quality synthesis of seven randomized controlled trials found that use of copper-treated surfaces and textiles resulted in a 6-43% reduction in risk of hospital-acquired infections (which included both bacterial and viral infections). • Among the studies that compared several viruses, responses differed by the type of virus tested. This suggests that findings from the most commonly studied viruses (HIV, influenza, norovirus) may not be applicable to the virus causing COVID-19. • One moderate quality study found no difference in the risk of viral infections during an outbreak in two long-term care wings that did and did not have high-touch surfaces treated with copper. • Several laboratory-based studies suggested that viral infectivity over time decreases faster after exposure to a copper-treated textile or surface compared to a control. • Study quality is low; findings are consistent. It is very likely the results will change with more evidence. • This question should be reexamined as more information becomes available. **Available at: https://www.nccmt.ca/uploads/media/media/0001/02/b4c91fef9983c643188fce24796fb547b40f0841.pdf**	**NCCMT**	**12JUN2020**
Rapid review: what is the effectiveness of cohorting virus-positive residents to shared rooms in care facilities?	• No research evidence was identified related to the effectiveness of cohorting COVID-19 virus-positive residents to shared rooms in long-term care facilities. • Guidance documents are consistent in recommending isolation of positive cases in single rooms, and cohorting when single rooms are not available, based on past practice, recommendations related to control of other infections, and expert opinion. **Available at: https://www.nccmt.ca/uploads/media/media/0001/02/d95f846845fea8022e1d9704ef1a9db909c4f8fd.pdf**	**NCCMT**	**12JUN2020**
Evidence brief on infection risk from eye exposures to inform contact	• No studies to date have specifically investigated or reported COVID-19 infection due to SARS-CoV-2 exposure of ocular surfaces due to interactions with asymptomatic and pre symptomatic cases. Key evidence that support the use of eye protection by healthcare workers to minimize infection transmission of coronaviruses is outlined below (and in Table 1) ○ A systematic review and meta-analysis by Chu et al., examine the available evidence from observational studies on coronavirus (SARS-CoV-2, MERS-CoV, SARS) transmission risk from physical distancing, facemask and eye protection.[13] Based on the pooling of primary study data on SARS and MERS the reviewers conclude	**PHAC-ESG**	**8JUN2020**

and droplet precautions	eye protection used in conjunction with surgical mask/ respirator further mitigates coronavirus infection transmission risk compared to face protection alone (risk difference and adjusted odds ratio between eye protection vs. no eye protection is estimated to be -10.6% 95% CI -12.5 to -7.7 and aOR 0·22, 95% CI 0·12 to 0·39 respectively). The summary of findings on eye protection are reported to be of low certainty based on the application of GRADE. ○ ACE-2 receptors, a cellular receptor for SARS-CoV-2 virus attachment are found in human eye tissue. Numerous studies, including a systematic review, provide molecular biological evidence that SARS-CoV-2 can use optical tissues (i.e. the eye) as a portal of entry to infect human hosts.(14-18) ○ SARS-CoV-2 viral RNA has been identified from ocular swabs and during autopsy of COVID-19 cases with and without ocular manifestations.(19) ○ Exposure data from multiple hospitals during the SARS outbreak in Ontario, Canada provide observational data that reported eye protection reduced the incidence of SARS infections among responding healthcare workers.(20) • Available guidance for healthcare worker precautions indicate: ○ Infection prevention and control (IPAC) guidance recommend the use of contact AND droplet precautions (i.e. use of gloves, masks, face shields, and goggles) when healthcare workers 1) interact with symptomatic COVID-19 patients, or 2) are in proximity to any aerosol generating procedure - regardless of acute respiratory infection symptom presentation in the patient.(6-8) ○ IPAC best practices specific to COVID-19 also recommend a point of care risk assessment be applied (based on the patient, the interaction, and the task) to determine additional precautions necessary for ALL patient and visitor at this time.(6) • Emerging evidence suggests the absolute risk of exposure of healthcare worker contact with a SARS-CoV-2 infected person increases with the prevalence in the community. ○ Serological testing of hospital workers in Italy revealed healthcare IgG positivity to be associated with the geographical prevalence of COVID-19 infections in the region.(11) • COVID-19 Outbreak data from Ontario's nursing homes also find associations between outbreaks and the incidence of COVID-19 infections in the surrounding health regions and nursing home bed-size.(12) **Available at: https://drive.google.com/file/d/14Za-h2epWrXSe9zFMsTPrOuq7Mz_rQIT/view?usp=sharing**		
Evidence brief on infectiousness and symptom onset	• Literature from healthcare settings highlight that transmission of COVID-19 is complex and related to the situation, duration of exposure, and individual factors ○ Potential asymptomatic transmission has been documented in healthcare settings among facility residents healthcare workers, and visitors (9,10). One outbreak in a skilled nursing facility in Washington State found that over half of residents who had positive results were asymptomatic at time of testing and that viable virus was cultured from pre-symptomatic cases up to 6 days prior to symptom development (9). ○ Another study was unable to demonstrate that asymptomatic transmission occurred among close contacts and in healthcare settings (8). This study had low power, which may not have been sufficient to estimate a risk of transmission. • Asymptomatic transmission has been shown to occur and may be linked to time spent in close contact with an infected person and other attributes of the scenario under which transmission occurred. ○ In a meta-analysis of mild (n=8) and asymptomatic cases (n=36), high rates of transmission were observed in situations of close quarters such as meals/family events, talking while travelling in car, private meetings, and prayer service (1). It is likely that in such situations, asymptomatic spread is facilitated via contact (contamination of hands and fomites) as well as droplet generation via talking and singing. • The estimated viral load in aerosols emitted by patients while breathing normally was on average 0.34-11.5 copies/cm^3 while the corresponding numbers for patients exhibiting respiratory symptoms were much higher at 10,900-366,00 copies/cm^3 per cough (2). An individual spending time in a room with a person breathing normally (i.e. not exhibiting respiratory symptoms) was still likely to inhale tens to hundreds of copies of the virus. • The proportion of transmission events from pre- and asymptomatic individuals in epidemiological investigations are highly variable (range <10-73%), Table 1. Predictive models estimate 40-80% of transmission events occur from pre- and asymptomatic individuals (3-5).	**PHAC-ESG**	**8JUN2020**

	• Transmission probabilities for symptomatic and asymptomatic cases may be very similar: ○ An analysis reported no significant difference in transmission rates between symptomatic and asymptomatic patients (6.3/100 and 4.1/100, respectively) (6). • Similar SARS-CoV-2 upper respiratory viral loads have been reported among asymptomatic and symptomatic patients (7). **Available at: https://drive.google.com/file/d/14Za-h2epWrXSe9zFMsTPrOuq7Mz_rQIT/view?usp=sharing**		

Summary of the evidence on asymptomatic infections and transmission of SARS-CoV-2	• The median proportion of cases who were asymptomatic was 45% (range 23% to 89%) amongst cases identified in population-based/screening studies. This summary estimate was lower in case series 15.5% (range 1% to 56%) and in outbreak/cluster investigations 20.0% (range 0% to 100%).
	• The median estimate of the fraction of asymptomatic cases who remain persistently asymptomatic through infection 50% (range 4% to 92%). There is a lot of variation across studies due to variable follow-up time, intensity of follow-up and symptoms considered.
	• The median prevalence estimates depends on SARS-COV-2 in circulation within the community, the range across studies 0% to 15.5%.
	• Evidence of transmission by asymptomatic cases:
	  ○ The limited evidence to date demonstrates that asymptomatic cases do transmit the infection. The proportion of asymptomatic cases that produce secondary cases is heterogeneous across studies, however the majority of cases do not result in onward transmission and a minority of asymptomatic cases produce many secondary cases. Super spreading events have occurred in many settings, secondary cases from asymptomatic transmission accounted for 64-69% of cases on a long term care facility and a cruise ship respectively[64, 95]. Evidence from active case findings and contact tracing indicates that the secondary attack rates are similar, although slightly lower for asymptomatic vs symptomatic cases[70, 96].
	  ○ Most studies on asymptomatic transmission are descriptive evidence from case studies and outbreak investigations.
	  ○ Asymptomatic transmission has occurred in a variety of settings (communities, households, nursing homes, hospital inpatients).
	  ○ Viral loads and dynamics (Ct values on qRT-PCR) are similar between asymptomatic and symptomatic cases.
	  ○ Viable virus has been retrieved from a large portion of specimens from asymptomatic cases.
	• Asymptomatic cases show large variation in viral dynamics [6]. The duration of the infectious period has been estimated by RT-PCR only. Few studies estimated the time from exposure through to clearance of the virus. Typically, the included studies estimated the time from RT-PCR testing positive/diagnosis to the first of two consecutive negative test; and some estimated the time from exposure to testing positive.
	  ○ Median and min-max infectious period estimated by presence of viral RNA from RT-PCR results among asymptomatic cases across the studies was 22 (10-32) days.
	  ○ Median and min-max time from exposure to detection among asymptomatic cases across the studies was 10 (1-29) days.
	  ○ Median and min-max time from detection to clearance among asymptomatic cases across the studies was 13.5(2-<63 days) days.
	• Long periods of viral RNA detection have been recorded in asymptomatic cases. Although there is evidence of viable virus in the samples from asymptomatic cases, infectious period using virus culture has not been undertaken. The virus viability in individuals with persistent positive RT-PCR tests requires more investigation to parameterize the relationship between infectiousness and RT-PCR positive results.
	
	Available at: https://drive.google.com/file/d/1SXT5tquoawAGPdrq0r-ruhBBiFohGdri/view?usp=sharing
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Are any jurisdictions using isolation periods other than 14 days in	• The majority of jurisdictions recommended or required a 14-day quarantine for people exposed, or thought to have been exposed, to COVID-19. • Among jurisdictions with a 14-day quarantine or self-isolation period, the number of cases ranges from 58 to 6125 per million. • Three jurisdictions have quarantine guidance other than for a 14-day period: Switzerland and Norway require a 10-day quarantine period; Sweden does not recommend a period of quarantine for people who may have been exposed to COVID-19. Two of these jurisdictions have a higher total number of cases per million than Canada (for 3 June 2020, Canada: 2448 cases/million; Norway: 1557 cases/million; Switzerland: 3557 cases/million; Sweden: 3820 cases/million.) In addition to different quarantine or self-	**NCCMT**	**8JUN2020**

response to COVID-19? If yes, what is their rate of COVID-19 cases?	isolation periods, jurisdictions vary in their application of other public health measures and the timing of the implementation of public health measures relative to the occurrence of cases. • There is variability in the prescribed self-isolation period for people who are infected and able to self-isolate at home, ranging from 5-14 days post-symptom onset and/or 1-7 days after the end of fever or other symptoms. Available at:		
What is known about the duration from exposure to symptoms or diagnosis for COVID-19?	• Across studies, estimates of mean or median incubation period were typically between 4 and 6 days. The quality of the evidence is moderate, findings are consistent. • Within included studies, the range of incubation periods for individuals varied widely from 1 to 14 days; in one study researchers estimated that 1% of cases may have an incubation period more than 14 days however the precise number is not known. • Little is known about factors that may contribute to variation in incubation periods. One study found those 64-86 years old had a longer incubation period than those 18-64 years; another study found that younger adults had a longer incubation period than older adults. Study quality is low, findings are inconsistent. • Precise calculation of the incubation period was more feasible early in the pandemic, when cases were limited, and a precise exposure time was known. With widespread community transmission, accurate identification of exposure is difficult if not impossible. Given this, new evidence is unlikely to change these estimates.	**NCCMT**	**8JUN2020**

Evidence brief of SARS-CoV-2 super spreading events	• Individuals who have been identified as the index case in superspreading events (SSEs) do not have any unique attributes.
	  ○ Many of the SSEs occurred while the index case was still asymptomatic or had very mild symptoms. (This is different than SARS where all superspreaders were symptomatic.)
	  ○ Children have not been the index case in any SSE.
	• There have been several SSEs reported for SARS-COV-2, many of which occurred in the early phase of the epidemic within the country of occurrence.
	  ○ Most SSEs were small clusters, however the occasional larger cluster (>10 people) have been reported.
	  ○ The majority of SSEs occurred in closed environments as opposed to open-air environments.
	  ○ SSEs were attributed to gathering and close contact. The size of the SSE depends on the number of close contacts and duration of contact.
	  ○ Type of contact may also be important although this has not been formally evaluated. SSEs in social settings where there is a lot of talking or singing have resulted in high attack rates. The risk may be different in non-social crowds' (e.g. public transportation), however this has not been studied.
	  ○ The likelihood of observing an SSE is context dependant (meaning it depends on situation, population density, cultural practices etc.). For COVID-19, a study looking at clusters in Hong Kong, Japan and Singapore early in the epidemic estimated the risk of SSE occurrence with >4 secondary cases was 0.106 to 0.215. Similarly in Hong Kong it was estimated that 20% of the cases caused 80% of the infections early in the epidemic.
	  ○ More SSEs in general public settings (e.g. work, recreational, religious, cruise ship) and private setting (e.g. family gatherings) have been reported than in healthcare settings.
	• Prevention and Control of SSEs for SARS-COV-2.
	  ○ Strict cleaning protocols for fomites in public places is recommended. Although there are no SSEs unequivocally related to transmission from fomites, shared bathrooms were a likely point of transmission.
	  ○ Behavioural factors are likely the most important driver of SSEs at the moment. Thus, individual hygienic practices, their health seeking behaviour and attitude towards self isolation. Ultimately their adherence to public health guidance (e.g. staying home, avoidance of public gatherings and community mask wearing) has significant impact on prevention of an SSE.
	  ○ Non-pharmaceutical Interventions implemented within the community have a large impact on reducing the risk of an SSE. This may be particularly true for COVID-19 where many SSEs have occurred prior to the index case developing symptoms. Social distancing interventions and reductions in the number of contacts per person prevent SSE occurrence.
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	▪ Interventions related to timely testing of cases, contact tracing and quarantine are also crucial in the identification and containment of an SSE. ▪ *Additional information on Public Health Interventions is compiled in an evergreen review maintained by the Emerging Sciences team.* ○ The predictive models captured in this review largely look at the role that SSEs play in the epidemic and the likelihood that they occur under varying levels of non-pharmaceutical interventions. SSEs have large impact on the trajectory of the epidemic initially and under all scenarios where interventions to control the epidemic have been implemented.		
Evidence brief on potential COVID-19 resurgence and its impact on influenza season	• No research has been identified on the interaction between COVID-19 and influenza for the current 2020 influenza season in the southern hemisphere. • Researchers at PHAC and in academia have predicted that under the current scenario in Canada, a second peak is predicted to occur in the fall of 2020 (October-November). Public health interventions will determine the magnitude and timing of this peak. ○ Canada remains vulnerable to resurgences as long as a critical fraction of the population remains susceptible to disease. ○ With stronger public health interventions, the peak of the second wave will be pushed back to winter/spring and will be smaller. • Based on the end of the 2019/2020 influenza season, which over lapped with the beginning of the pandemic, public health interventions implemented to control COVID-19 were also effective at also reducing the burden of influenza. ○ 8 studies demonstrated large reductions in influenza cases in the 2019/2020 influenza season in China, Taiwan, Hong Kong, Singapore, Japan, US, and Italy. • Co-infections between SARS-CoV-2 and influenza A and B have been document in 26 cases. However, it is likely that co-infections are infrequently detected due to the indistinct early manifestations of COVID-19 and influenza. • The association between coinfections of SARS-CoV-2 and influenza and disease severity and mortality is currently unclear. There is almost no evidence on this topic. ○ Multiple case reports describe the clinical course of the co-infection and conclude that they are similar to COVID-19 disease. ○ A comparison between COVID-19 and co-infected cases was conducted in one study, a retrospective cohort in Wuhan of 273 patients with SARS-CoV-2 and influenza IgM test results, 151 (55.3%) were considered co-infected with influenza. Patients with co-infection had a significant reduction in fatality when compared to those with only SARS-CoV-2 infection (OR 0.470, 95% CI: 0.239-0.923) and decreased risk of severe disease. • A protective association with influenza vaccination status and COVID-19 infections, severity, and mortality was reported in three studies, two of which were ecological studies. These studies overall present very low quality research, but they indicate the potential protective effects of the flu vaccine warrant further investigation. ○ A Canadian predictive model explores the impact of a mass influenza vaccination strategy implemented prior to the start of influenza season combined with moderate quarantine to effectively control the COVID-19 outbreak and minimize influenza cases. • To prepare for the potential overlap between COVID-19 and influenza season, Australia has recently implemented a massive influenza vaccination strategy. Over a 3 week period in late March-early April, ~66% of their population received the vaccine.	**PHAC-ESG**	**29MAY2020**
Evidence brief on aerodynamic analysis of SARS-CoV-2 virus	• In this evidence brief SARS-CoV-2 aerosols refer to either an aerosol particle or suspension of liquid droplets, droplet nuclei or particles in the air. Aerosol particles can remain in ambient air for long enough to be inhaled and has the potential to be dispersed over long distances by air flow.[(1)] Infectious aerosols can be exhaled into the air by an infected person (e.g. breathing, speaking, sneezing, singing, and coughing) and these particles may transmit an infection to another person when inhaled. • van Doremalen provides primary evidence to support the viability of SARS-CoV-2 virus particles in aerosols. The study confirms SARS-CoV-2 virus can remain viable within aerosols for longer than 4hrs.[(2)] • A recent publication by a multidisciplinary research consortium apply evidence based Monte-Carlo models and 3D simulations to investigate the physics of aerosol dispersion of SARS-CoV-2. The investigators use simulations to demonstrate SARS-CoV-2 aerosol transmission over long distances (up to 10 meters), and inhalation of sufficient concentrations of aerosols (100) are possible within 1 second to 1 hour in public indoor spaces.[(1)] • A number of researchers have investigated the presence of SARS-CoV-2 laden aerosols in air sampled from various healthcare environments treating COVID-19 patients. This evidence is variable. The majority of air samples are SARS-CoV-2 negative, suggesting air ventilation and filtration strategies employed by hospitals to maintain high air quality effectively reduce airborne transmission risk in healthcare settings. Relevant findings from these studies are outlined in Table 1.	**PHAC-ESG**	**29MAY2020**

	• Epidemiological investigations of COVID-19 clusters in public settings, including department stores, airplanes, buses and restaurants have attributed infections, at least partially, to airborne transmission of COVID-19 seems likely. A number of these clusters are described in Table 2. • In the commentaries by Anderson and colleagues, Morawska and Cao, Setti and colleagues the authors discuss the potential rationale and existing evidence on aerosol/airborne transmission of SARS-CoV-2.[3-5] These authors generally conclude airborne transmission of infection is possible and the topic warrants immediate attention and research.		
What is known on the potential for COVID-19 re-infection, including new transmission after recovery?	• There is very limited evidence on the occurrence of COVID-19 re-infection. Evidence quality is low; findings are inconsistent. • Two recent syntheses found the percentage of patients discharged from hospital following a negative RT-PCR test who subsequently tested positive during routine follow-up, usually in self-isolation or quarantine, to range from 2-21%; study quality is low and findings are inconsistent. • Most patients who test positive following a previous negative test are asymptomatic; study quality is low and findings are consistent. • A variety of tests have been used, which raises the question as to whether any noted re-infections are false positives at the initial or follow-up test, or a false negative indicated that the virus had cleared, study quality is low and findings are inconsistent. • There is no evidence to date that addresses the question as to whether those who may have been re-infected may be able to transmit the virus.	**NCCMT**	**29MAY2020**
How have affected jurisdictions handled previously positive cases in the context of re-exposure/re-infection?	• Very few jurisdictions have described policy approaches related to previously positive cases who are considered recovered and subsequently test positive. • Evidence from South Korea shows that 're-positive' cases resulted in no transmitted infections. They suggest that these cases do not reflect a 're-positive' status, but only that a previous negative result was in error. As policy, they do not treat 're-positive' cases as re-infections, and consider these cases to be discharged from isolation. • Other jurisdictions note that there is currently no evidence of re-infection and have not developed policy to address the management of potential re-infection in previously positive cases. • The concept of an 'immunity passport', which could certify previous infection and current immunity, is being considered, but no jurisdictions have developed policy to move in this direction. Given that there is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection, the assumption behind an immunity passport is not supported.	**NCCMT**	**29MAY2020**
What serological tests are available, and what are the sensitivities and specificities?	• There are many serological tests available from many different manufacturers for the detection of antibodies to the virus that causes COVID-19. • Overall, the sensitivity of these tests is highly variable, with a wide range of estimates from as low as 18.4% to as high at 100.0%. Results were inconsistent; quality of evidence was low-moderate. • The reported specificity of tests is higher, ranging from 84.3% to 100.0%. Results were consistent; quality of evidence was low-moderate.	**NCCMT**	**29MAY2020**

Evidence brief on gastrointestinal symptoms associated with COVID-19	• GI symptoms occur in 15% (10–21; range: 2–57; I^2=96%) of cases. The frequency is similar in pediatric cases. (*Results are from a recent meta-analysis, others are available below and are comparable*.)
	  ○ diarrhea 9% (95% CI 6–12; range 1–34; I^2=89%),
	  ○ nausea or vomiting 7% (5–9; range 1–22; I^2=88%),
	  ○ loss of appetite 21% (9–44; range 1–79; I^2=98), and
	  ○ abdominal pain 3% (2–5; range 1–4; I^2=31%)
	• GI symptoms are the presenting symptom in 10% (95% CI 4–19; range 3–23; I^2=97%) of COVID-19 cases.
	• SARS-COV-2 is readily identified and has been isolated from feces. Fecal RT-PCR positive results has NOT been associated with GI symptoms (p=0.45) or disease severity (p=0.6), but was positively associated with antiviral treatment (p=0.025).
		PHAC-ESG	**22MAY2020**

	○ High frequency of fecal RT-PCR positive tests 54% (95% CI 44–64; I2=28%) may persist after symptoms resolve and nasophayngeal swabs are negative (range 1-33 days) or 27.9 days (SD 10.7) after symptom on set in a single study. ○ SARS-COV-2 has been cultured from feces in two studies, 1 case report and 2/44 viral RNA positive samples had detectable live virus. • Severe COVID-19 cases had higher odds of GI symptoms (diarrhea, vomiting, anorexia, abdominal symptoms) OR=1·60 [95% CI 1·09–2·36; p=0·0020; I2=44%] compared to mild cases. This association is strongest when only abdominal pain is considered (7·10 [1·93–26·07]; p=0·010; I^2=0). ○ A single study (preprint) from England indicates GI symptoms may indicate a significantly higher risk of hospitalization [adjusted OR 4.84 95% CI: 1.68-13.94] ▪ Diarrhea was associated with a seven-fold higher likelihood for hospitalization [adjusted OR=7.58, 95% CI: 2.49-20.02, P <0.001] ▪ nausea or vomiting had a four times higher odds [adjusted OR 4.39, 95% CI: 1.61-11.4, P = 0.005] • In the past couple weeks abdominal pain has been one of the main presenting symptoms along with prolonged fever for children presenting with a multi inflammatory syndrome in children (MIS-C) that appears to be temporally related to SARS-COV-2 exposure. This syndrome has been noted in pediatric centers in many countries and while there are few publications to date, CDC hosted an informative webinar this week. • One autopsy was identified: GI results showed segmental dilation and stenosis in the small intestine.		
Evidence brief of smell or taste disorders	• The average prevalence of COVID-19 cases presenting symptoms of smell/taste disorders across the included studies is approximately 50%, with a large range of 13%-80%. ○ Systematic review meta-analyses support the reported average prevalence calculated in this evidence brief, specifically reporting a prevalence range between 30%-80%, and pooled values of 55.2% and 52.7%. • There was no consistent evidence that there are demographic differences between those who experience smell/taste disorders and those who do not. ○ The association between smell/taste disorders and severity of COVID-19 infection was inconsistent. Two studies found that anosmia was not predictive of severe COVID-19 manifestation and a large study reported it predicted less severe COVID-19 infection. This difference may be attributed to the differing populations and the larger sample size, further research is needed. ○ The association between COVID-19 related smell/taste disorders and age is inconsistent. Of four studies, one study compared individuals <18 years versus 18 years or older, finding no significant differences in reporting smell/taste dysfunction symptoms. In contrast, one study that used higher age cut offs (<60 years versus 60 years or older) reported that experiences of smell/taste disorders were significantly higher in those <60 years. Two other studies agreed with this finding, concluding that those who reported smell/taste disorders were significantly younger than those who did not. This difference may be attributed to a difference in age used to create two subgroups. ○ The association of smell/taste disorders and gender of the COVID-19 case was reported in one study as no association and in another that this symptom was significantly more common amongst females. As these are both observational studies, additional research is required to confirm this association. • The literature is conflicting on the magnitude and direction of self-reported loss of taste and smell compared to using a validated test or instrument. One study reported a large overestimation (36.64% versus 86.60%) using a non-validated instrument. • Multiple studies reported on the predictive capacity of loss of taste/smell disorders in identifying COVID-19 cases. ○ The average reported positive predictive value in the literature was approximately 80% (range 77%-88.1%). ○ The average sensitivity and specificity were found to be approximately 53.5% and 92% respectively. ○ Several studies vaguely reported the presence of smell/taste disorders as a strong predictor of COVID-19. ○ This symptom may serve as an early indicator of COVID-19 in some cases, with three studies reporting the presence of smell/taste dysfunctions as the first symptom in approximately 20% (range 10%-26.6%) of cases. • One study reported the presence of smell/taste disorders was higher in COVID-19 patients (39.2%) compared to influenza (12.5%). • Suggested underlying mechanisms of the manifestation of smell/taste disorders in COVID-19 patients is not well-established. Presently, some studies support that the SARS-CoV-2 virus is neurotropic, while other argue that the expression of key elements in non-neuronal regions suggest interaction with other sites.	**PHAC-ESG**	**22MAY2020**

Evidence brief on cutaneous manifestations associated with COVID-19	• This brief only contained articles that reported findings from confirmed COVID-19 cases.
	Epidemiology:
	• One article estimated the prevalence of cutaneous manifestation at 4.9%, among 103 cases of COVID-19
	  ○ There is no age preference for the cutaneous manifestations; it can occur in the elderly and pediatric patients
	  ○ There is no clear gender preference, as the cutaneous manifestations can occur in both males and females.
	Types of lesions:
	• Skin rash were identified in patients with confirmed COVID-19, with maculopapular rash being the most common presentation (~50% of cutaneous manifestations).
	• There is evidence of skin vascular involvement.
	Location of lesions:
	• Cutaneous lesions can affect all parts of the body: face, trunk and limbs. Many reports indicated that the lesions eventually disseminate in a craniocaudal pattern (i.e. vertically, staring from the top and going down)
	Onset:
	• The cutaneous manifestations can occur before, simultaneously with, or after the onset of the systemic manifestations of COVID-19.
	• There is no agreement on whether cutaneous manifestations are linked to the severity of the underlying COVID-19.
	• There are reports of skin rash developed in patients treated with hydroxychloroquine and azithromycin.
	• More research is needed to understand the cutaneous manifestations of COVID-19 better.
		PAHC-ESG	**22MAY2020**

Evidence brief on the association of COVID-19 with stroke among young cases	• Only three case reports and case series have examined the association of COVID-19 disease and risk of cerebrovascular disease among young people (defined as people <50 years old). There is insufficient data to address the question of whether cerebrovascular disease is occurring at a higher rate in this age group.
	• Across all age groups the only systematic review on CVD reported 2.55-fold increased odds of CVD in severe COVID-19 [OR: 2.55 (95% CI: 1.18 to 5.51), I^2 = 29%] across 4 studies.
	• Among all cases reported, those with acute cerebrovascular disease were more likely to be older (> 50 years old), and more likely to have cardiovascular risk factors.
	• Several literature review and primary studies have examined the mechanisms of SARS-COV-2 and biochemical profiles of COVID-19 cases to better understand and identify those at higher risk of CVD.
	  ○ Strokes and other cerebrovascular diseases such as pulmonary embolisms (PE), and deep vein thrombosis (DVT) are being reported as a complication of COVID-19. The pathophysiology is not clear, however evidence suggests possibility of hypercoagulation state, platelet activation, and artery vasoconstriction promoting clotting changes and resulting stroke.
	  ○ Elevated D-dimer laboratory findings are consistently found to be present among patients with severe COVID-19 disease. Elevated fibrin degeneration products, prothrombin time elongation, and activated partial thromboplastin time are also suggestive characteristics of severe COVID-19 disease.
	  ○ Viral infiltration of vascular tissue via ACE2 is also suspected to result in endothelial dysfunction and potentially causing thromboembolic complications. Additionally, activation of the complement system is also suspected to play a role in the high rates of thrombotic complications observed in COVID-19 patients. Further research is needed to understand how COVID-19 infection leads to the various disturbances on coagulation.
		PHAC-ESG	**22MAY2020**

Impact of COVID-19 on Indigenous communities in Canada	Indigenous communities and populations around the world are vulnerable to the effects of COVID-19 pandemic in a variety of ways, including poverty, migration, current health status, and lack of access to information, resources, and health care services. The certainty of the evidence is moderate, given that most sources are expert opinion. The findings are consistent, with some variability that reflects local context.	**NCCMT**	**22MAY2020**

	Proposed plans to address the impact of COVID-19 emphasize the importance of collaborative responses that are culturally appropriate and locally sensitive. Many Indigenous communities have cultural and traditional practices that involve collective living, enclosed spaces, and shared foods and medicines, which are impacted by physical distancing and other standard infection control practices. An emphasis on prevention before cases are identified, followed by proactive case management, is suggested. Mental health concerns may be exacerbated given COVID-19 restrictions and stresses. The isolation of some Indigenous communities can be an asset if movement into and out of the community can be limited, and supports to maintain isolation are provided. Addressing the larger context of inequity is also considered to be paramount in responding to the COVID-19 pandemic and other health concerns. Learning from responses to tuberculosis among the Inuit population may hold promise for addressing COVID-19.		
What is known about stigmatization related to COVID-19 in Canada	No studies conducted in Canada specifically related to stigma were found. Discrimination and stigma associated with COVID-19 infection is a concern for those infected and those with infected family members. However, the certainty of the evidence is very low, and further evidence may change and enhance the current understanding. One study of Asian medical students in Poland reported discrimination in public and professional settings, especially while wearing facemasks. One study of health care workers in Italy found that those with discriminatory attitudes and fear about COVID-19 patients had lower satisfaction with their ability to provide care, higher burnout, and higher compassion fatigue, potentially affecting patient care. The use of discriminatory terms related to COVID-19 on Twitter increased when used by a prominent US figure, with the potential to increase stigma for Asian Americans.	**NCCMT**	**22MAY2020**

Rapid review of symptom-based screening, including temperature as screening tool	• Airport symptom-based screening estimates <50% of SARS-CoV-2 infected travelers would be detected. Traveller sensitization aims to trigger rapid self-isolation and reporting of symptom onset resulting in SARS-CoV-2, which would initiate contact tracing to contain the virus. This intervention delayed the outbreak by ~1 day.
	• Symptom-based screening in targeted or high risk of COVID-19 situations have been shown to be ineffective for epidemic control.
	  ○ Evacuees from Wuhan to Germany were screened (n=126) and 7 symptomatic passengers were SARS-COV-2 negative. Two passengers without symptoms tested positive by RT-PCR.
	  ○ Three studies of a single long term care facility in WA, USA analyzed the adequacy of symptom-based screening to identify infections in residents or staff during a COVID-19 outbreak. Results indicate that the symptom-based identification and control strategies in this facility were not sufficient to prevent transmission.
	• Community symptom-based screening can be more effective if a high proportion of symptomatic individuals are tested. These interventions rely on symptomatic people self identifying and gaining access to testing or intense contact tracing and testing programs.
	  ○ Results from a model conclude that the most effective and feasible strategy involves exhaustive testing of patients presenting with fever and cough in primary care. To do this, ~2,000 tests/million population per week using 1/16 pooling of samples would be required to screen all fever and cough primary patients.
	  ○ A mathematical model demonstrated that Contact Tracing (CT) was more effective than Random Symptomatic Testing (RST) in reducing the maximum number of cases. A Location Based Testing Policy (LBT), which gives priority for testing to symptomatic individuals belonging to localities and workplaces with higher infection was shown to be comparable to CT and is operationally less intensive.
	  ○ In a COVID-19 DriveThrough Test Site (DTTS) in Alabama, 70/2216 patients self-reporting symptoms suggestive of SARS-CoV-2 infection tested positive. The number of cases identified by the DTTS represented 33% of the statewide cases reported to the Alabama Department of Public Health as of March 21, 2020.
	• The type of instruments used to measure temperature (eg. handheld infra-red thermometers, tympanic or oral thermometers, and thermal scanners) were not reported in these studies. There is limited evidence on the efficacy of non-contact thermometers for detecting fever such as handheld infra-red thermometers and thermal scanners.
	Likely compliance to a zero tolerance policy on entering gathering places if symptomatic has not been directly studied for SARS-COV-2. Borrowing from compliance to social distancing and self-isolation interventions, results in some areas were very high and much lower in others for a variety of reasons. Generally compliance has been lower in certain age groups populations and has been impacted by religion, personal beliefs, and risk-taking behaviors
		PHAC-ESG	**15MAY2020**

Evidence brief on virus stability on currency	According to information from the Royal Canadian Mint, the majority of coins currently in circulation in Canada are composed of steel, whereas two-dollar coins are mainly comprised of a nickel outer ring and a copper middle. Bank of Canada banknotes in circulation are printed on a synthetic substrate polypropylene, a thermoplastic. Through the application of in-vitro experiments van Doremalen and colleagues, confirm novel SARSCoV-2 virus can remain viable and infectious up to 48 hrs on plastic surfaces, 24 hrs on cardboard and stainless steel surfaces, and up to 8hrs on copper surfaces. To our knowledge, this is the only primary evidence to date on SARS-CoV-2 virus stability on inanimate surfaces. Two recent literature reviews summarize the available evidence on coronavirus survival on various surfaces. All reviewed studies were conducted before 2019, when novel SARS-CoV-2 was first identified. Although somewhat variable, evidence from multiple studies suggests high concentrations of SARS-CoV virus can remain infectious on plastic surfaces up to 5 days, 1-2 days on stainless steel surfaces, and 1-4 days on paper surfaces. A single study investigating coronavirus inactivation by different metals found nickel and stainless steel do NOT possess viral inactivation properties and the virus could remain infectious for up to 5 days upon these surfaces. While copper alloys containing 70% or more copper could permanently inactivate the virus within one hour. No peer-reviewed literature on coronavirus stability on paper or synthetic currency could be identified. However, a study reporting on Influenza virus viability on Swiss banknotes (composed of paper and a middle polymer layer) reports some Influenza subtypes can remain infectious on banknote surfaces up to 1-3 days. Furthermore, the study found respiratory secretions (e.g. mucous) greatly increased infectiousness duration of viruses contaminating paper currency to as long as 2 days under natural conditions.	**PHAC-ESG**	**15MAY2020**
Asymptomatic infections and transmission of SARS-CoV-2 (Updated bi-weekly)	Small or individual case studies; larger case series, contact and cluster investigations and population studies continue to demonstrate that asymptomatic cases occur; that the asymptomatic population is large, and the range between studies continues to vary widely. ○ Small (<10 cases) or individual case studies this week demonstrated the presence of asymptomatic cases in small familial clusters; returning travellers; pediatric, including newborn patients; and patients presenting for medical care for other indications such as oncology appointments. ○ Larger case series this week of hospitalized SARS-CoV-2 positive patients, fatal cases, and hospitalized special populations (e.g., pregnant, pediatric) who are SARS-CoV-2 positive reported proportion asymptomatic ranging from 0.6% (amongst fatal cases) to 65% (pregnant cases). ○ Population-based studies this week reported asymptomatic proportions of 18.1% (returning travellers) to 87.9% (pregnant women attending for delivery to New York hospitals). In the latter study, 13.7% of all admissions for delivery were asymptomatic SARS-CoV positive patients indicating that where community circulation is observed to be high, so is the number of asymptomatic cases. ○ Follow-up studies of asymptomatic cases reported this week that often the large majority of asymptomatic cases (two-thirds to three quarters) remain so. Tanaka in a study this week using branching processes in Japan estimate that before and after the emergency declaration, the ratio of undiagnosed symptomatic: undiagnosed asymptomatic patients: diagnosed patients was 1.9: 4.7:1.0 (pre-declaration) and 0.77: 2.4:1.0 (post-declaration). Thus even with the improved case finding and testing post declaration for every 100 diagnosed cases there are an estimated 240 undiagnosed asymptomatic cases and a further 77 undiagnosed symptomatic cases. Transmission studies provide estimates of transmission probabilities in asymptomatic and symptomatic – these are roughly the same. A reanalysis this week reported no significant difference in transmission rates between symptomatic and asymptomatic patients (6.3/100 and 4.1/100, respectively). Several cluster investigations this week estimated much higher attack rates in close contacts of asymptomatic index cases of 33% to 75%. Similarly, studies of exposure history of cases continued to indicate large proportions reporting no known exposure to ill individuals. Finally, investigations of transmission chains with asymptomatic/pre-symptomatic cases point to transmission 2-9 days into the incubation period. • As more convalescent/recovered cases accumulate, studies are emerging that examine recurrent intermittent detection of viral RNA in these asymptomatic/post-symptomatic patients. It will be important to monitor emerging research on the transmissibility within the recovered/convalescent population still testing positive, persistent viral shedding and the size of the infectious convalescent population. One case study this week reported on the intermittent recurrence of viral RNA detection in an asymptomatic/post-symptomatic patient through post-discharge/recovery quarantine, re-hospitalization and re-discharge/recovery.	**PHAC – ESG**	**15MAY2020**

Rapid Review of vitamins and other micronutrients in relation to outcomes of COVID-19	VITAMIN D
	• Vitamin D has been widely studied for its role as a secosteroid that has a wide spectrum of immunomodulatory, anti-inflammatory anti-fibrotic, and antioxidant actions. Many of the publications that have currently completed a journal peer-review are reviews, letters and editorials. All primary research on COVID-19 and vitamin D is still in preprint form.
	• Retrospective observational studies done in the USA (n=3), Southeast Asia (n=1) and the UK (n=1) analysed data to determine if vitamin D deficiency indicated a higher risk of COVID-19 positive test (n=2) or higher risk of more severe COVID-19 outcomes (n=3).
	  ○ Conflicting evidence on whether people are more likely to COVID-19 if vitamin D deficient. The preprint study from Chicago was more convincing as their data represented individuals with vitamin D status in the previous year and the vitamin D supplementation they had followed, those that were not treating their deficiency with sufficient supplementation were at higher risk of becoming infected with COVID-19.
	  ○ The other three studies were in agreement that vitamin D deficiency is associated with COVID-19 disease severity, risk of ICU and mortality.
	• There was consistency across the eight ecological studies presenting relationships between latitude, UV exposure, vitamin D index and even C-reactive protein indexes and the number of cases, mortalities and recoveries in various COVID-19 affected countries.
	• General population supplementation with vitamin D was widely discussed across papers and is considered the reason that many northern European countries do not have a lot of vitamin D deficiency.
	• Vitamin D as a therapy for COVID-19 has not been directly studied. Within the vitamin D literature there are studies where high doses of vitamin D (250 000-500 000 IU) were safe, decreased hospital stay and resulted in improved hemoglobin levels on mechanically ventilated patients.
	VITAMIN C
	• Vitamin C (L-ascorbic acid) has been evaluated for its protective effects (high dose IV therapy) as a treatment for acute respiratory distress syndrome ARDS.
	• Despite there being a systematic review protocol registered, studies on COVID-19 cases and vitamin C have not been completed. We identified one RCT trials registered to evaluate the clinical efficacy of vitamin C to improve the prognosis of severe COVID-19 cases. One *in silico* study that indicated vitamin C may be part of a promising therapy.
	ZINC
	• One retrospective observational study at hospitals in New York compared the addition of zinc sulphate (220 mg capsule containing 50 mg elemental zinc twice daily for five days) to hydroxychloroquine (400 mg load followed by 200 mg twice daily for five days) and azithromycin (500 mg once daily). The cases that received zinc had a significantly higher discharge to home and the non-ICU cases had a lower odds of mortality of discharge to hospice compared to the other non-ICU cases. Supplementation is not addressed.
	SELENIUM
	• There is one review article and one ecological study on selenium and COVID-19. Together these articles propose a role in the human immune response for selenium, where deficiency results in higher susceptibility.
	OTHER MICRONURTIENTS
	Reviews and letters published on micronutrient research related to viral diseases indicated there is evidence for protective effects from vitamin A, B and E, selenium, zinc, iodine, iron. omega3s and supplementation in deficient populations may be beneficial.
		PHAC-ESG	**15MAY2020**

Review of hospitalization and length of stay	The average percentage of hospitalisation of Covid-19 cases varied 26-77% over the population. Older age groups had increasing proportion hospitalized. The percentage of admission to Intensive Care Unit (ICU) of covid-19 cases varied from o 4% to 11% among infected patients o 12% to 33% among hospitalized patients o The percentage of patients in ICU requiring ventilation varied from 17% to 78% The length of stay (LOS) for hospitalisation (including ICU) of Covid-19 cases median days across studies was 6-7 days with a range of 3 to 23 days o Among survivors the median LOS in ICU varied from 8 to 17 days with a range of 4 to 44 days o Among non-survivors the median LOS in ICU varied from 7 to 12 days with a range of 5 to 17 days Median duration of ventilation for patients who required mechanical ventilation was 5 to 13 days with a range of 7 to 19 days.	**PHAC-ESG**	**15MAY2020**
Role of indirect transmission in the pandemic	Based on the current data, there is insufficient evidence to support the role of facemasks on their own to reduce indirect/community transmission of COVID-19. As of 11 May, 2020, only one modelling study has been conducted specific to COVID-19 to address the question of whether facemasks reduce the spread of the virus in the community. This study suggests that mask wearing may reduce disease transmission; however, the certainty of the evidence is very low and further evidence may very likely change these estimates. Several reviews and studies have explored the role of facemasks to reduce community spread of other influenza-like illnesses and there is little to no evidence to suggest that mask wearing on its own reduces community spread. The quality of the evidence is low to moderate, findings are consistent. There is some suggestion that mask wearing may be more effective if initiated early in a pandemic, and mask wearing must be combined with other infection-control procedures such as hand hygiene.	**NCCMT**	**15MAY2020**
Evidence on potential for COVID re-infection	There is very limited evidence on the occurrence of COVID-19 reinfection. Evidence quality is low; findings are inconsistent. A small study suggested that a proportion of recovered COVID-19 patients could reactivate; a modelling study using data up to March 27, 2020 found no evidence to suggest recovered patients become re-infected with COVID-19. Evidence from two human studies of people infected with SARS-CoV show that initial high levels of IgG among those infected were not maintained beyond 1-2 years following infection. Evidence quality is low; findings are consistent.	**NCCMT**	**15MAY2020**
Adverse maternal or fetal outcomes and COVID-19	There is little to no evidence of adverse outcomes associated with pregnancy among women with COVID-19. Evidence quality is low to moderate; findings are consistent. Several reviews and studies report a high rate of cesarean deliveries among women with COVID-19, although the clinical indications for cesarean in these cases are not well described, and the limited available evidence suggests that vaginal delivery can be safe. Evidence quality is low to moderate; findings are consistent. Some reviews report rates of pre-term birth between 21-39% of cases. The extent to which this rate is elevated compared to non-COVID-19 rates is not reported. Evidence quality is low to moderate; findings are consistent. There is no evidence of vertical transmission. Evidence quality is low to moderate; findings are consistent.	**NCCMT**	**15MAY2020**
Role of daycares, primary schools in COVID-19 transmission	The effect of school closures to prevent the spread of COVID-19 is not known as it has not been possible to separate the effect of school closures from other physical distancing and quarantine measures. The quality of evidence is low, findings are consistent across reviews. Analysis of infection clusters in China prior to school closures revealed that for children who were infected, transmission was traced back to community and home settings rather than daycares or schools. The quality of this evidence is low, findings are consistent across reviews. Overall, low quality evidence suggests that children are not significant vectors for transmission. This evidence is based on limited case series and should be interpreted with caution. There is some evidence suggesting that transmission from children to caregivers is possible and the virus may be transmitted through fecal matter, although this evidence is low quality and further research is needed to confirm	**NCCMT**	**15MAY2020**

Impact of physical distancing on mental health	Outbreaks prior to COVID-19 show an association between adverse mental health effects and quarantine. Evidence quality is low to moderate; findings are consistent. One review of moderate quality found that the negative effects of quarantine were exacerbated by longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma. Evidence quality is low to moderate. One review of moderate quality recommended that to mitigate the negative effects of physical distancing, quarantine should be implemented for no longer than required, clear rationale and information should be provided and sufficient supplies should be ensured. Appealing to altruism by emphasizing the benefits of quarantine rather than legislating quarantine may also be favourable. Evidence quality is low to moderate.	**NCCMT**	**15MAY2020**
What is the evidence on the role of children in the transmission of COVID-19?	As of April 20, 2020 there is little evidence about the role children play in transmission of SARS-COV-2. Most evidence is related to household cluster investigations. Children were not the index case in most of these investigations (<10%). COVID-19 cases <19 years old were typically exposed by a close relative or family member. This is opposite to what we typically see with influenza, for example among H5N1 avian influenza household clusters the index case was children >50% of the time (Zhu et al., 2020). Evidence that supports children do not play a important role in SARS-COV-2 include: o Probability of infection from a contact was lower in children than adults in one study (Hua et al., 2020) and was lower for children of an infected parent compared to the spouse in one study (W. W. Sun et al., 2020). o The proportion of cases that are <19 years old is 1.2-6.3% across studies, which is significantly less than the proportion of older age groups. o One study captured from Iceland reported "healthy population screening" using RT-PCR and they did not detect any SARS-COV-2 RNA among children <10 years, whereas among adults the prevalence was 0.8%. o Cohort studies that followed up on children with long periods of detecting viral RNA by RT-PCR in feces after recovery did not identify any COVID-19 cases among their family contacts. This is weak evidence that there is little transmission risk from convalescent stage cases despite detection of vial RNA. Predictive models show school closures have an impact on the size and speed of the epidemic, although this is not as effective as for influenza given that children appear to play less of a role in transmission. Epidemiologically children <19 have a lower incident risk and mortality across studies and clinically are consistently reported be at lower risk of severe outcomes compared to adults.	**PHAC-ESG**	**20APR2020**
What evidence exists on the occurrence of SARS-CoV-2 transmission in the workplace (indoor settings)	Workplace clusters have been identified in healthcare settings, long term care facilities, cruise ships, retail, the tourism industry, transportation (taxi, bus, trains and planes) and to a lesser extent restaurants/food establishments. There were a few clusters identified in an office setting and all cases had close contact with the infected individuals. Similar to other indoor outbreaks, there was time spent in an enclosed environment (e.g. a meeting room). Most of the professions identified in clusters have a high rate of contact with people and were also ranked as being at higher risk of exposure. Most of the workplace clusters were traced to a symptomatic index case.	**PHAC-ESG**	**20APR2020**
What evidence exists on the occurrence of SARS-CoV-2 transmission in outside settings	There is weak evidence of outdoor transmission, the frequency or importance of outdoor transmission has not been assessed. Among cluster investigations in two studies, 1/138 clusters were attributed to an outdoor conversation and the other concluded that COVID-19 was 18.7 times (RR 95%CI: 6.0-57.9) more likely to be transmitted in closed environments compared to open air environments. SARS-COV-2 RNA has been found in particulate matter for 3 weeks at an industrial site in Italy. Detection of RNA does not mean viable virus, but further research is needed to characterize what these results mean for public health. The research that examined potential impacts of UV on SARS-COV-2 and the COVID-19 epidemic were weak studies and the conclusion are likely to change with further research	**PHAC-ESG**	**20APR2020**

Rapid literature review and international scan of practices on the topic of "Immunity post-infection"	Distinguishing people in the population that are immune to SARS-COV-2 is being considered as a part of risk-based de-escalation plans in several countries according to the recent news and there are some predictive models looking at this as a strategy. Post exposure immunity has not been demonstrated in humans. Several studies provide evidence of antibody response and immune response in COVID-19 cases during infection and in convalescent phases. The assumption that the antibodies developed during infection may provide protection is reasonable based on current early evidence. This will need to be confirmed with evolving state of knowledge on this particular topic. o SARS-COV-2 was used in a non-human primate challenge trial that demonstrated the reinfection challenge, 2 weeks after symptoms resolved, was unsuccessful (Bao et al., 2020). o Sera from convalescent COVID cases were able to neutralize SARS-CoV-2 in an in vitro plaque assay, suggesting a possible successful mounting of the humoral responses (Zhou et al., 2020). o Studies of SARS cases detected IgG antibodies for approximately 3 years (Wu LP, 2007). Currently, most nations are initiating serological surveys to start evaluating and understanding who in the population has been exposed. There is a lot of work being done on developing serological tests, however validation of these tests is lagging behind as it takes time to develop serological panels for validation of the serological tests.	**PHAC-ESG**	**06APR2020**
Prevalence of GI symptoms and fecal shedding	Diarrhea in cases range from 2%- 31% across studies. Larger studies and the meta-analyses place the proportion of cases reporting diarrhea between 5-10%. Vomiting was less frequently reported, but had a similar proportion to diarrhea. The proportion of cases that have a fecal positive RT-PCR were highly variable ranging form 17% - 100% of cases in the study. Fewer studies with less observations have been able to investigate viral persistence in feces and frequently fecal samples were taken days after the first respiratory positive test. Of note, several studies report a long duration of fecal shedding, this continues past the resolution of symptoms and past when respiratory samples start to test negative.	**PHAC-ESG**	**20MAR2020**