

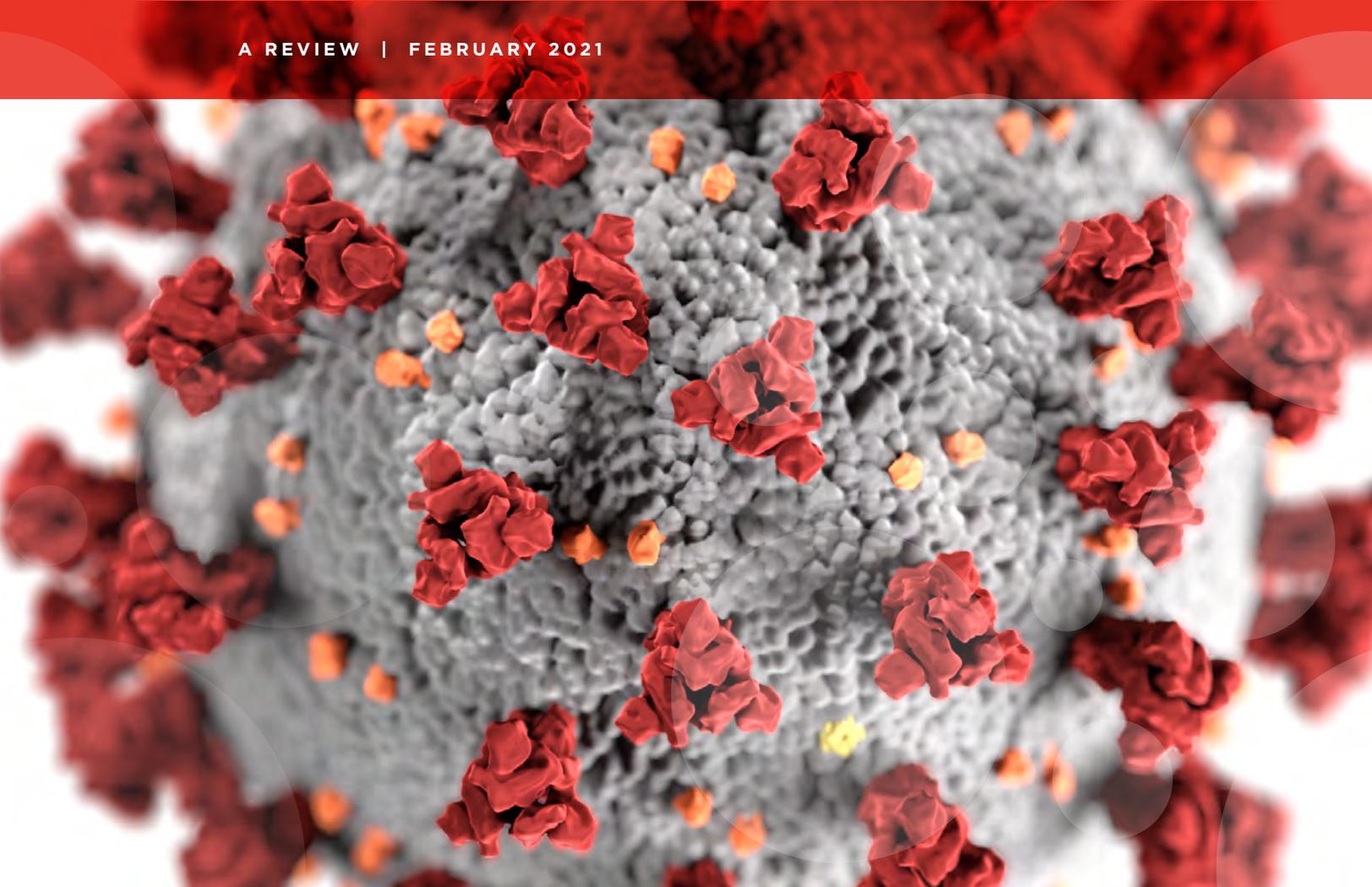


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Canada's Initial Response to the **COVID-19 PANDEMIC**

A REVIEW | FEBRUARY 2021



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Canada's Initial Response to the COVID-19 Pandemic

INTRODUCTION

On 31 December 2019, China informed the World Health Organization (WHO) of an outbreak of pneumonia of unknown etiology in the city of Wuhan, Hubei province. The cause of this infection was later identified as the SARS-CoV-2 virus, a previously unknown coronavirus (CoV) that is morphologically similar to SARS-CoV which causes Severe Acute Respiratory Syndrome (SARS). The outbreak was declared a Public Health Emergency of International Concern by WHO on 30 January 2020, the illness was named COVID-19 on 11 February 2020, and a pandemic was declared on 11 March 2020. As of 15 September 2020, the virus had infected over 29,616,346 individuals in 188 countries and caused over 936,001 deaths (mortality of 3.2%). Daily situation reports describing the progress of the pandemic at the global level are compiled by the WHO, while the morbidity and mortality of the infection is being tracked [nationally](#) and [internationally](#).

This paper was developed to review the response to the pandemic in Canada through a non-governmental, public health lens as the pandemic evolves from the first wave to the second. As such, data collection was curtailed in mid-September 2020.

A [Health Equity Impact Assessment](#) (HEIA) was conducted on the discussion paper prior to final approval by CPHA's Board of Directors using a [methodology](#) it approved in December 2019. The assessment was conducted by a group of seven CPHA volunteer members who had not participated in the development of the paper. The Association thanks these members for their work.

In response to the confirmation of the outbreak in China, the Public Health Agency of Canada (PHAC) activated its Emergency Operations Centre on January 15, 2020. The first case of COVID-19 in Canada was reported in Ontario on January 25, 2020. At the time of writing,* there were over 138,010 cases of COVID-19 in Canada resulting in over 9,179 deaths (mortality of approximately 6.7%). The majority of cases are found in Quebec (767.8 per 100,000), Alberta (361.6 cases per 100,000), Ontario (306.3 cases per 100,000), Saskatchewan (147.3 cases per 100,000), British Columbia (144.2 cases per 100,000) and Manitoba (106.4 cases per 100,000).¹ Of the total number of cases, about 9% had been found in youth 19 years of age and younger, 16.2% in persons aged 20 to 29, 14.9% in those aged 30-39, 14.9% in those aged 40-49, 14.4% in those aged 50-59, 9.4% in those aged 60 to 69, 6.7% in those aged 70-79, and 14.5% in those 80 years and over. In addition, people over 70 years of age accounted for 52.5% of hospital admissions, 34.5% of intensive care admissions and 89.5% of deaths.² The Government of Canada posts daily COVID-19 updates on the [Canada.ca website](#). The incidence of infection among First Nations People living on-reserve was 535 confirmed cases (one quarter the rate of the general

* The numbers presented in this document for Canada are from 15 September 2020 and will change as the pandemic progresses. The number of new cases reported daily was consistent or slowly decreasing between 10 May 2020 and the end of August, but have been increasing since then. By 23 September 2020, a second wave of the pandemic had begun in the more affected provinces.

population), 46 hospitalizations and 9 deaths (about one fifth the rate of the general population).³

By comparison, the 2009/10 H1N1 pandemic resulted in 45,771 cases and 505 deaths (mortality of 1.1%) in Canada,⁴ while the SARS outbreak resulted in 8,437 cases and over 900 deaths worldwide, with Canada accounting for 438 probable and suspected cases and 44 deaths (mortality of about 10%).⁵ The 2019/20 influenza season resulted in 42,541 cases, although this number was influenced by the effect of COVID-19.⁶

In June 2020, provincial and territorial governments began taking steps to re-open their economies, following a closure of over three months. This opening was taking place in stages, with close scrutiny of the epidemiological data to inform the opening and limit the likelihood of an increase in case numbers.

The goals of Canada's COVID-19 pandemic response and recovery have been identified as minimizing all serious illness and death, while limiting societal disruption, including reducing the burden on health care resources.⁷ To accomplish these goals, the Government of Canada has taken unprecedented actions to respond to the outbreak that have affected all aspects of life.⁸ A timeline of these steps is described elsewhere⁹ and highlights are presented in Appendix 1. This response includes conventional public health activities – such as surveillance and epidemiology, guidance development, testing, and providing emergency supplies to the provinces and territories (PTs) – as well as unprecedented border closures, stay-at-home and quarantine initiatives, and closures of schools, private businesses and organizations that were deemed non-essential. These actions have affected the economic and social well-being of the country. Economic and social supports have been provided to eligible citizens, landed immigrants and permanent residents, and businesses.

The available information showed that these efforts have had success in “flattening of the curve”* during the first wave, but the effects of these measures on Canada's economy will have caused an expected decrease in gross domestic production of 15–30% through the second quarter of 2020,¹⁰ while the unemployment rate was 13.7% in May 2020, up from 5.6% in February 2020. Full economic recovery in Canada has been projected to take until mid-2022.¹¹

PURPOSE

This report provides a non-governmental perspective and overview of the public health measures taken during the event, and those actions taken to address the social determinants of health in Canada. It is **not** meant to provide a detailed analysis of the actions taken.

To achieve this purpose, the post event reports of Canadian actions resulting from the terrorism events of 2001 (the World Trade Center and anthrax attacks); SARS; the H1N1 influenza pandemic; and the recent Ebola crisis in Africa have been used as a basis of comparison for considering improvements in performance. The main areas of concern identified from these responses are presented in Table 1, while a summary of the publicly available recommendations is provided in Appendix 2.

* “Flattening the curve” refers to reducing the number of daily infections while extending the duration of the wave to reduce the likelihood of overloading of the health care system.

TABLE 1: Areas identified for improving public health responses resulting from the 2001 Terrorism incidents, SARS outbreak, H1N1 influenza pandemic, and Ebola outbreak

	Collaboration	Communications	Strengthening Public Infrastructure	Increase Public Health Funding	Training and Exercises	Access to Laboratories and Research	Strengthen PPE needs
2001 Terrorism Incidents*							
SARS†							
H1N1‡							
Ebola§							

* Based upon Learning from SARS: Renewal of public health in Canada – Report of the National Advisory Committee on SARS and Public Health and Evaluation of the National Emergency Stockpile System

† Based on: Learning from SARS: Renewal of public health in Canada – Report of the National Advisory Committee on SARS and Public Health

‡ Based on: Lessons Learned Review: Public Health Agency of Canada and Health Canada Response to the 2009 H1N1 Pandemic Report

§ The Health Portfolio: Framework for Action on the 2014 Ebola Virus Disease Outbreak and Public Health Management of Cases and Contacts of Ebola Virus Disease in the Community Setting in Canada

PUBLIC HEALTH EMERGENCY RESPONSE CONSIDERATIONS

Public health’s responsibilities associated with infectious disease outbreaks cover a range of activities, from prevention (developing and implementing the measures necessary to reduce the likelihood of infectious disease outbreaks) to preparedness (maintaining the skills, competencies, materials and human resource critical mass to respond to outbreaks), response (taking the actions necessary to save lives and prevent further harmful effects during a response situation), and recovery (supporting the steps necessary to “return to normal”). This report is focused on the response phase during the first wave of the pandemic.

Overall, there was a level of success in meeting the response mandate as the morbidity and mortality caused by COVID-19 during the first wave was relatively low in comparison to other countries of similar size and affluence.¹² In general:

- there was a steady stream of cases but they had not overwhelmed the acute health care system;
- since the initial period of the response, the availability of personal protective equipment (PPE) appeared adequate with the federal government intervening to address early shortages, as is its mandate, by developing national and international supply chains to meet the demands; and
- residents and businesses did their part by largely respecting the directions provided by public health and elected officials.

The difficulty with this national viewpoint is that it does not reflect the effect of the epidemic on separate provinces, territories and regions, where substantial differences exist in populations, geographic sizes, socio-economic complexities, and health inequities that affected outbreak management. In the case of the first wave of this pandemic, Quebec was most affected, followed by Alberta, Ontario, Saskatchewan, British Columbia and Manitoba, while the remainder of the PTs had limited numbers of cases.

Responsibility for delivery of health services is primarily assigned to provinces by the *Constitution Act, 1867*, while the federal government has assumed roles concerning national coordination and leadership, international relationships, provision of health care to First Nations Peoples living on-reserve, and quarantine (at our national borders), among others. Consequently, each province (and later territory) assumed its responsibilities and tailored its responses to meet the needs of its citizens. It has resulted in PTs taking different approaches to address similar responsibilities, in spite of the efforts of the federal government to coordinate and develop consistent approaches. The result is that decision-making differs among jurisdictions, thereby resulting in the appearance of inconsistent management approaches.

Unfortunately, the limitations of these inconsistent management approaches are not without consequence. This pandemic highlighted such effects in Canada's long-term care (LTC) centres, where the majority of COVID-19-related deaths were found to be among LTC residents. Each PT devised measures to control the spread of COVID-19 both within and between facilities as national guidelines on managing cases in LTCs were not forthcoming in a timely manner. With their varying caseloads and resources, the effectiveness of PT responses differed. Subsequently, the Canadian Forces were asked to provide support to several LTC centres in Ontario and Quebec. The Force's report on that response¹³ recommended that actions be taken to address the lack of preparedness and response capacity in LTCs. The challenge is that the operation of these centres falls outside the direct responsibilities of the health care system (as defined by the *Canada Health Act*) and public health. Consequently, further discussion of this issue falls outside the scope of this paper.

Within the roles and responsibilities of public health authorities, the following issues concerning the COVID-19 response were identified.

Data Collection

Within Canada, the collection of information concerning illnesses is the responsibility of PTs, while the federal government works with PTs to develop consistent laboratory and epidemiological approaches, and to provide a national picture for reportable illnesses. While the laboratory and epidemiological approaches used reflected international standards, the challenge lay with the timely provision of data from PTs to the federal government, and the reporting of the socio-economic characteristics of those infected.

Early in the COVID-19 pandemic, the federal government recommended that PTs collect specific demographic and epidemiological data and report their findings to the Public Health Agency of Canada (PHAC).¹⁴ Unfortunately, national data collection standards do not exist, and thus there are inconsistencies in how surveillance data, including that for COVID-19, are collected and reported. This limits the quality of Canadian baseline data, the models used to predict the spread of the illness, and subsequent decision-making. A 2016 report by the Pan-Canadian Public Health Network¹⁵ outlined existing gaps in Canada's surveillance data-sharing infrastructure, pointing both to the lack of national surveillance standards as a prominent barrier to acquiring knowledge and to the need for an integrated, pan-Canadian approach to public health surveillance.

Gaps also exist in the type of data being collected for COVID-19. For example, data on factors such as the geographic location of cases (including urban versus rural locations), the number of hospital beds available, and the ages of those being tested were difficult to ascertain at the national level, although they may

be available from PTs. Similarly, the available data did not identify the socio-economic characteristics of those being tested, notably economic status and ethnicity. This lack of data limits the capacity to target programs to meet the needs of those most affected or at risk, and identify health inequities.

In Canada, a preliminary analysis by Toronto Public Health shows that low-income groups had the highest rate of COVID-19 cases (165 cases per 100,000) and hospitalizations (26 patients per 100,000) compared with higher-income groups (90 cases per 100,000 and 12 patients per 100,000, respectively).¹⁶ In addition, ethnic minorities, recent immigrants, and individuals with lower education were found to have higher rates of COVID-19 cases and hospitalizations. Similar results have been identified in reports from Montreal¹⁷ and the Region of London-Middlesex, Ontario.¹⁸ In the United States (USA), a recent report from the Centers for Disease Control and Prevention (CDC), where disaggregated ethnicity data are collected, found that 33% of individuals hospitalized for COVID-19 were Black¹⁹ and data from New York City showed that the mortality rate was highest among Black (92.3 deaths per 100,000) and Hispanic (74.3 deaths per 100,000) populations as compared with White, non-Hispanic people (45.2 deaths per 100,000).²⁰ Similar results have been identified in the United Kingdom (UK).²¹

Ongoing data collection has been providing information concerning the sex of those affected, but there has been limited discussion of COVID-19 and gender. Early commentary noted the lack of consideration of gender, and that outbreaks affect men and women differently. Consideration of gender was viewed as necessary to understanding the primary and secondary effects of health crises on individuals and communities, and for developing effective, equitable policies and interventions.²² Other research has noted that to understand how sex and gender affect disease risk and outcomes would require expanded testing

and collection of relevant data, and may be crucial to managing the pandemic.²³

Among Indigenous populations living on-reserve, there have been 535 cases of COVID-19 (as of 15 September 2020) reported across Canada, while infection rates found in the North (including Inuit communities) have been low and many of these cases were the result of imported infections. Information concerning how Indigenous communities could respond to COVID-19 (including public health principles) was provided by Indigenous Services Canada²⁴ while one article has discussed the influence of Indigenous self-determination, leadership and knowledge on protecting Indigenous communities in Canada from the pandemic.²⁵ Many Indigenous on-reserve First Nations and northern Indigenous communities appear to be successfully controlling the spread of COVID-19. There are limited data, however, on the effect of COVID-19 on First Nations living off-reserve (in both rural and urban environments) and on Métis.²⁶ These discrepancies exist as a result of differences in data collection between the federal government (that reports on-reserve First Nations data) and PT governments (that do not report data disaggregated according to ethnicity).²⁷

These inconsistencies in reporting and gaps in data collection generate an incomplete picture of the outbreak that limits an effective response for those who need it most. In recognition of this disparity and the continued need to monitor health inequalities, the Canadian Institute for Health Information (CIHI) proposed an interim standard to help facilitate the common collection of race-based data among all jurisdictions.²⁸

CPHA is committed to health equity, anti-racism and reconciliation. We have advocated for a nimble response to collaborating with and being accountable to communities that are disproportionately affected by COVID-19 to ensure the collection and responsible

use of race and socio-economic data. Such collection and analysis will enable appropriate service responses during future waves of COVID-19, as well as future pandemics and public health emergencies, while protecting the privacy concerns of individuals and communities.²⁹

RECOMMENDATIONS

- **Develop national data collection methodologies that incorporate gender, race and socio-economic data using culturally-safe methodologies.**
- **Develop and implement auditable protections to maintain the privacy of the individual and avoid stigmatization.**
- **Strengthen capacity at the local, regional, PT levels to collect race-based data.**

Testing

COVID-19 testing guidelines were developed early in the pandemic by most PTs (Appendix 3). Many, however, experienced backlogs in testing due to the magnitude of the pandemic, the need to develop new methodologies, a subsequent shortage of testing kits, delays in planning for conducting the testing, and limited analytical capacity.³⁰ The effect of these challenges was that public health authorities focused on testing those who were ill, with limited rollout of testing to those without symptoms. While there has been discussion concerning the value of testing persons who are not showing symptoms, it is also unknown whether this limitation has caused a national underestimation of the caseload, deaths and spread of the virus through the population that could have affected the public health response. As part of its reopening measures, the province of Ontario expanded testing to all those who wanted it, however, as demand increased during September, this decision was reversed as a means of reducing the demand on the province's testing capacity.

The federal government has released an interim report that recommended a more flexible and rapid approval process for medical devices, including COVID-19 test kits.³¹ While this issuance expedited approval of testing kits, concerns exist regarding their effectiveness and accuracy.³² The desire for rapid testing methodologies established a trade-off between an expedited process and the need to follow appropriate research, development and approval methodologies to assess effectiveness and safety. The purpose of the existing medical device regulations is to protect the consumer by providing tools with known capabilities and limitations to medical professionals. By expediting the process, a disservice is done to both the practitioner and the patient if the device is found to be faulty.

RECOMMENDATIONS

- **Prepare a pan-Canadian framework for testing protocols, planning for testing capacity and surge laboratory capacity as part of the national response plan.**
- **Include the basic components for testing kits within the National Emergency Strategic Stockpile (NESS).**

Contact Tracing

Contact tracing* is a cornerstone of epidemiology and foundational to Canada's COVID-19 control strategy. Guidance on contact tracing was provided by PHAC early in the outbreak and was implemented by responding public health organizations.³³ Local and provincial authorities were challenged by their lack of human resources to implement large-scale contact tracing in response to the amount of testing being conducted and, as a result, required voluntary assistance from students in the health disciplines and retired health professionals. Organizations

* Contact tracing is a system used to identify individuals who have interacted with infected persons that involves personal outreach to the potentially infected person.

also reassigned public health staff from other programs,³⁴ thereby limiting their capacity to meet core performance expectations. While the demand for services was exceptional, it also speaks to the need for the public health system to prepare for the worst by having rapid access to pools of trained personnel with the skills and competencies necessary to undertake this important activity.

A further complexity was contact tracing among First Nations Peoples. For those who live on-reserve, First Nations and Inuit Health Branch (FNIHB) is responsible for providing health services (presumably including contact tracing), while for First Nations Peoples living off-reserve the responsibility fell to the PT or municipality. Similarly, Indigenous Services Canada has provided advice to Indigenous communities on how to respond to the pandemic. One challenge is that some First Nations Peoples migrate easily from on-reserve to off-reserve status, which could result in inter-jurisdictional challenges that might delay effective contact tracing. This scenario may be further complicated should a First Nation choose to perform its own tracing.

Meanwhile, federal, provincial and territorial (FPT) governments have developed digital contact-tracing applications (apps) to track the spread of COVID-19, in order to limit its spread using fewer human resources. These applications, if used by a sufficient proportion of the population, can notify users of potential risks of exposure and direct those who may have been exposed to self-isolate.³⁵ The limitations of such applications have been identified, and include concerns regarding privacy, uptake of the application, socio-economic limitations, and possible misreporting or misuse of information. These considerations are discussed in Appendix 4. A joint statement on the principles to be applied in contact-tracing apps, including voluntary participation, transparency, and accountability, has been developed by FPT privacy commissioners.³⁶

RECOMMENDATIONS

- Develop a national framework for public health human resource capacity in times of infectious disease outbreaks.
- Establish national principles to support the future development of electronic contact-tracing applications.
- Develop protocols for contact-tracing training among on-reserve and off-reserve First Nations populations.

Personal Protective Equipment (PPE)

During the pandemic, several public health measures were undertaken to reduce the likelihood of disease transmission. These recommendations started with reminders concerning appropriate public health practice such as handwashing, physical distancing, and sneeze and cough etiquette. Within the acute health care system, emphasis was placed on infection control measures such as the use of PPE and cleaning. This emphasis affected the availability of these materials in Canada, resulting in shortages of gloves, masks, hand sanitizer, and other materials that are often obtained from international sources. These shortages were exacerbated as recommendations were made concerning the use of masks, gloves and hand sanitizer for the general public, in addition to the ongoing recommendations for physical distancing and handwashing. Eventually, supply chains were able to adjust to improve access for masks and gloves from international sources. In addition, Canadian suppliers of these products were developed to reduce reliance on international sources. The availability of limited supplies of domestically produced masks and other PPE points to a need to support further development of Canadian supply chains for such products.³⁷ It also points to a disconnect between the direction provided by officials to take public health action, and the availability of adequate supplies of needed materials to meet those directions. For example, it was noted

that conflicting advice was provided across and within provinces and territories to health care professionals concerning procedures for reducing virus transmission during aerosol-generating procedures that required the use of N-95 masks.

Concerns also have been expressed regarding the management of the National Emergency Strategic Stockpile (NESS) and its role in the response. While some questioned its preparedness and adequacy, others believed that the stockpile operated as intended, while pointing to a lack of coordination and communication between FPT governments as the reasons for PPE shortages.³⁸

NESS was established in the 1950s in response to the Cold War and a fear of nuclear attack. It is responsible for providing surge capacity in circumstances where PTs have inadequate resources to respond to emergencies.³⁹ Evaluations of the program have been conducted, each of which has provided recommendations for improvement based on an “all-hazards” approach. The most recent publicly available evaluation (2011) provided recommendations that included the development of a communication strategy for FPT roles in stockpiling supplies, and ensuring that adequate pandemic preparedness stocks were available.³⁹ In response to the 2011 recommendations, PHAC devised an action plan.⁴⁰ It remains unknown whether those recommendations were implemented, whether an evaluation was conducted, and whether the current approach continues to meet the requirements to respond to current and future needs.

RECOMMENDATIONS

- Continue to develop and maintain national supply chains to meet the demands for PPE within Canada.
- Review and adjust the composition of NESS to meet the current demands of an all-hazards approach to public health responses.

SYSTEMIC CHALLENGES*

During the pandemic, public health officials have made recommendations and taken actions to prevent illness and death of the people living within their jurisdictions. These recommendations have generally been followed by governments and individuals. They also resulted in many services provided by health care professionals (that provide early interventive/preventive services) being declared non-essential, the closure of schools and non-essential businesses, direction to work from home, stay-at-home/quarantine orders, loss of employment, and restrictions on non-essential travel, among others. There were subsequent effects on the social determinants of health and population mental wellness. The results of these decisions also highlighted the differences among the various FPT public health organizations and the differences in organization and funding of public health systems.

Federal, Provincial and Territorial Responsibilities

In an effort to establish a coordinated national response, the [FPT Public Health Response Plan for Biological Events](#)⁴¹ and the Health Portfolio Operations Centre (HPOC) were activated, and a Special Advisory Committee (SAC) was implemented as a means for developing guidance, facilitating communication, providing governance, and coordinating FPT public health activities and responses. The challenge with implementing a national response is the current delegation of authority for managing health activities. While some aspects of public health are within federal jurisdiction (e.g., the Quarantine Act, International Health Regulations, provision of health services to on-reserve First Nations Peoples, and management of NESS), the majority of activities lie within PT and subsequently regional/municipal mandates. This

* Throughout the response, emphasis has been placed on the use of technology to respond to the business and emotional requirements of the population and might be considered a systemic consideration. This topic is the subject of Appendix 4 on the use of technology during the response.

division results in barriers to achieving effective, consistent, national public health responses. While there is a need to respect PT authorities, the varying approaches among neighbouring provinces demonstrates that steps are required to improve the consistency of the national response.

RECOMMENDATION

- **Develop a response framework that provides a consistent national approach to outbreak management, including communications and decision-making responsibilities.**

Social Determinants of Health

The unprecedented measures to limit infection resulted in loss of employment, reduction of income, increased stress related to working from home, the effect on familial and social relationships, and pressures related to the home-schooling of children or lack of daycare facilities. To respond to the financial effects, governments have provided financial supports to individuals and businesses that focused on meeting the needs of those who lost jobs or had employment curtailed, as well as to businesses that lost revenue (e.g., were deemed non-essential or had increased costs). These benefits are listed in Appendix 1. They have cost (as of 12 June 2020) \$797 million for 2019-2020 and \$169.2 billion for 2020-2021,⁴² and will raise the federal debt to 30.6% of gross domestic product (GDP) for 2019-2020 and 44.4% of GDP for 2020-2021.* Further extension of the Canadian Emergency Response Benefit (CERB) will add additional costs.⁴³ CERB, a benefit of \$2000 per month, has helped many who have lost work remain financially stable;⁴⁴ however, many continue to struggle, especially in larger cities. Students were also able to apply for a Canada Emergency Student Benefit (CESB) of \$1250

* On 8 July 2020, the current government provided an economic update which identified an expected deficit of \$343 billion for the current fiscal year. Of this amount, the COVID-19 response accounted for \$227.9 billion in direct spending and tax benefits, while declines in tax revenues accounted for \$71.9 billion.

per month,⁴⁵ but the requirement for accessing the program is that the student prove that s/he/they is/are actively searching for work.⁴⁶ This causes a gap for those who have jobs but are unable to work.⁴⁷ Despite these financial supports, there is increased food and housing insecurity.⁴⁸ The demand at food banks has risen by 20%, and could climb to 40%.⁴⁹ The federal government has allocated funding to food bank organizations but the amount may be insufficient to meet the current demand by the end of the year.⁴⁹ Some claim that while food banks offer some support, they are not an effective solution to the current challenge.⁴⁹

The current income security benefits help address the needs of the employed, but they will have limited effect for those at the lower end of the social gradient, particularly those experiencing housing insecurity and the homeless.⁵⁰ Challenges among this group include difficulty isolating from others,⁴⁴ a lack of access to hygiene products, and difficulty applying public health guidelines. Data from the USA show that these factors exacerbate any existing physical and mental health issues experienced by the homeless population.⁵¹ As a result, in the USA, those of lower socio-economic status have a disproportionately higher rate of infection. It is not possible to draw a similar conclusion for Canada due to the limited amount of information available that disaggregates infection rate data based on SES. The federal government has dedicated funds to address homelessness during the pandemic.⁴³

Other social determinants of health exacerbated by the pandemic include, among others: increased rates of alcohol and substance consumption; family and intimate partner violence; anti-Asian racism; opioid poisoning and limited access to safer consumption sites; decreased access to educational opportunities; and reduced social connectedness.

RECOMMENDATIONS

- Develop response plans to address all aspects of the social determinants of health.
- Conduct research to determine the effect of public health response events on the social determinants of health and on individuals with low socio-economic status (SES).

Mental Wellness*

Public health measures such as self-isolation, physical distancing, stay-at-home orders, bans on large public gatherings, and quarantine have affected the mental health and well-being of people living in Canada.⁵² While these public health directives are critical to reduce the transmission of the virus, they have short- and long-term consequences that may be positive (e.g., strengthening closeness among families⁵³) or negative (e.g., exacerbating underlying tensions or family violence⁵⁴). A public online questionnaire (active from 24 April to 11 May 2020) showed that most respondents still reported excellent or very good mental health.⁵⁵ However, this result was 22% lower than findings from the 2018 Canadian Community Health Survey (CCHS).⁵⁶ Canadians between the ages of 15 and 24 were most likely to report poorer mental health, while those aged 65 and older were less affected.⁵⁵ The survey also found that participants who reported worse mental health also reported higher stress levels,⁵⁵ while women were more likely than men to experience higher anxiety and worry. These stressors have affected all aspects of society,[†] including:

- Teens through the loss of social circles, cancellation of sports activities and part-time work, and participation in milestones;

* The WHO describes mental wellness as the ability to cope with daily stresses, work productively, and contribute to the community. It encompasses a population-based approach that is influenced by a range of activities including education, community participation, employment, and justice.

† The Canadian Psychological Association has prepared [a series of fact sheets](#) on the effect of COVID-19 stressors on various aspects of society that can be found here.

- University students;
- Parents with children in school, as a result of school closure and the balancing of work, home and school demands;
- Individuals in long-term care facilities due to restrictions on visitors and the loss of other residents due to COVID-19;
- Individuals with pre-existing medical and mental health conditions;
- Health care and essential workers who were required to report to work; and
- Those who have lost loved ones and their inability to come together in times of bereavement.

Of particular concern is the effect of these measures on children, who have suffered loss of connectedness with their friends and extended families as well as access to play and the outdoors, loss of educational opportunities, and anxiety associated with returning to school.⁵⁷ Of these measures, the closure of schools has disproportionately affected children of lower SES and children with special needs. The challenges facing these children include lack of access to digital learning, interrupted learning, lack of school meals, and effects on child development, as well as long-term social and economic outcomes. The lack of access to technology or a fast, reliable internet connection can exacerbate pre-existing inequities among children from differing socio-economic circumstances. School closures also have a differential effect on women, who provide a disproportionate level of childcare. This result can cause stress for both parents and children, and points to the need for reliable early learning opportunities and childcare.

Literature concerning mental well-being in Canada during the pandemic is scarce, however studies from other outbreaks (e.g., SARS) have demonstrated an association between the outbreak and increases in Post Traumatic Stress Disorder (PTSD) and substance use disorder, decreased access to

supervised consumption sites, and limited provision for medical management in mandated isolation spaces, as well as a broad range of other mental and behavioural disorders, domestic violence, and child abuse.⁵⁸ In Canada, during this pandemic, there have been reports of increased alcohol consumption and cannabis use,⁵⁹ higher levels of anxiety and loneliness,⁶⁰ and fear of domestic violence, particularly among women aged 15 to 24.⁶¹ The pandemic has also increased rates of family violence by as much as 20-30% in certain Canadian regions.⁶²

The federal government has made investments in new platforms for mental healthcare and primary care, as well as the expansion of existing virtual healthcare services,⁶³ including an online portal that provides self-assessment, free resources, and professional counselling services for mental health and substance use disorders.⁶³ While these tools are effective for much of the population, they may not be accessible to those of lower SES, those who live in rural and remote communities and on-reserve, and/or those who lack access to high-speed internet connections (digital divide). Concerns are also noted regarding the cultural sensitivity of some of these tools, and/or their accessibility for newcomers.

Funding also has been provided for mental health support and counselling services for children and youth, and to address family violence.⁶⁴ These investments may improve the immediate situation; however, pandemic-related mental health effects are expected to persist beyond the duration of the pandemic, and additional supports for mental wellness at the personal and population levels will be required.

It should be noted that many individuals affected by the pandemic have found alternative approaches to maintaining contact with others, and supporting student learning and work performance through the

use of electronic technologies. Appendix 4 provides a brief review of these uses and their potential effects.

RECOMMENDATIONS

- **Develop and implement population-based approaches for addressing mental wellness during an infectious disease outbreak.**
- **Develop and implement plans for improving mental health and mental wellness during the recovery phase of the outbreak.**
- **Fund mental health and wellness programs so that they can provide coverage similar to that of the health sector.**

LOOKING TO THE FUTURE

COVID-19 has exacted a toll on Canada. The illness has directly affected over 100,000 individuals, and the measures taken to control its spread have affected everyone in the country. The measures taken to combat the first wave of the illness appear to have achieved the goal of managing the spread of the disease in Canada during that period, but have caused economic contraction, a spike in unemployment, interruptions in education, and added stress and worry. In general, the various levels of government have addressed the challenges that have arisen, although areas have come to light that require additional work.

A National Approach

Of significant concern are the differing approaches used by FPT governments to manage the pandemic response. They have resulted in inconsistencies among PTs in all aspects of the response, including the availability of human and material resources to meet the needs of residents and responders alike. These differences result from the assignment of responsibilities for health by the *Constitution Act, 1867*, so that each province and now territory can

meet the needs of their respective populations. This assignment has resulted in PTs developing separate public health acts with varying roles and responsibilities that meet their presumed needs. On the other hand, the federal government has not developed a public health act that clearly defines its own roles and responsibilities and its expectations of PT governments and other stakeholders. The response to the COVID-19 pandemic has highlighted the weaknesses of the current governance model for public health, as described in a previous position statement.⁶⁵

The pandemic has also highlighted the financial and human resource limitations that exist within public health organizations across the country. The genesis of this limitation lies in the funding model for health among FPT governments. The *Canada Health Act* and related health accords provide the federal share of health funding, which is augmented by PTs to meet their needs. Federal funding is directed to the provision of health care services as is the bulk of PT health funding, with only limited funds provided to meet public health's prevention, protection and promotion responsibilities.*

The challenge is to develop a more unified structure that provides a national approach to public health while respecting PT responsibilities. This goal could be achieved through the development of a national framework or legislation for public health with clear roles and responsibilities defined for all governments and stakeholders. Such a framework or legislation would require a supporting national funding accord, incorporating performance measures, for the delivery of public health services according to national standards.

* The challenge with estimating the funds allocated to public health organizations lies in the complexity of the systems which undertake public health roles and responsibilities, the complexity of the systems which fund those activities, and the differences in roles and responsibilities that exist at each level of government.

RECOMMENDATION

- Develop and implement federal legislation and a funding accord to identify and support public health roles and responsibilities.

Basic Income

Over the short term, the pandemic has caused a contraction in the economy with its subsequent effects on income, food and housing security for a portion of the population. While the current governmental response to these challenges has helped stabilize the economic well-being of many for a period of time, those benefits have a fixed duration. They have also resulted in increased government indebtedness.

The economic fallout from the response actions is expected to continue for two years or more, and additional economic supports may be necessary. It is also recognized that many of the benefits were targeted to those who were employed, with smaller amounts available to those at the lower end of the social gradient. However, it was those of lower SES and racialized communities, as well as seniors, who have been disproportionately affected by the pandemic. As such, it is time to consider alternatives to current social support funding. One alternative is the development of a minimum basic income for Canadians. Basic Income has been the subject of experiments in Ontario (2017) and Manitoba (1970s) with positive results for those who were in need, but with significant expense. Given the current and anticipated financial costs arising from the provision of social services in response to the pandemic, it is time to reconsider the fragmented approach to income supports with a view to establishing a basic income to support those in need, based on a negative income tax model.[†]

[†] Basic income refers to a government program that provides an income that is unconditionally granted and could be used as a replacement or complement to other social programs. Two models have been described: a universal demogrant model where everyone receives the same payment; and a negative income tax model where the amount of payment is based on need.

RECOMMENDATION

- Investigate and evaluate the development of a basic income model approach to social services supports.

A Public Health Approach to Population Mental Wellness

Another effect of the pandemic has been a reduction of the mental wellness of the country. Many people are suffering from the ongoing effects of social isolation, concerns over lost wages, fear resulting from the morbidity and mortality of the illness, and grief over the loss of normalcy or their loved ones. These effects appear similar to those that are resulting from climate change and its increasing effect on our current way of life.⁶⁶ A recent position statement from the UK highlighted the need to address the psychological, social and neuro-scientific aspects of the pandemic.⁶⁷ Similar considerations are required for the development of a population-based approach to mental wellness for Canada.

RECOMMENDATION

- Develop and implement a population-based approach to mental wellness for Canada.

SUMMARY

Public health organizations have a history of responding to infectious disease outbreaks with the skills, competencies and professionalism that are the hallmark of the public health profession. Following every outbreak response, efforts are made to look back at their actions and learn from them, so that the response can be improved for the next event. With the COVID-19 response, it is similarly appropriate to look back at the actions that were taken to date and their influence on Canadian society and economy, so that governments and responders can be better prepared for future outbreaks of this and other infectious diseases.

The current response has resulted in extreme steps being taken to slow the spread of the virus, with a view to reducing the economic damage the pandemic might have caused in the immediate term. These steps are also having economic and social tolls that will resonate over the mid to long term, and that may be difficult to overcome. These steps have also brought to light the influence that such actions can have on the social determinants of health, as well as the strengths and weaknesses of existing government and social structures. The result is that the limits of the existing emergency response mechanisms and associated governmental supports have been exposed. It is time to take the steps necessary to better prepare for future events.

APPENDIX 1

Summary of Initial Events during the COVID-19 Response

DATE	EVENT
31 December 2019	The WHO receives news of outbreaks of pneumonia of unknown etiology in Wuhan, China
7 January 2020	Confirmation of SARS-CoV-2 virus is received from China
15 January 2020	PHAC activates the Emergency Operation Centre in its response against SARS-CoV-2 virus
22 January 2020	Canada implements screening measures for people coming back from China in airports in Toronto, Vancouver, and Montreal
25 January 2020	First case of illness from SARS-CoV-2 virus confirmed in Canada
11 February 2020	WHO names illness caused by SARS-CoV-2 virus COVID-19
20 February 2020	Canada enforces screening measures in 10 airports within 6 provinces
9 March 2020	First death related to COVID-19 is confirmed in Canada
11 March 2020	The WHO declares COVID-19 a pandemic
13 March 2020	Canada recommends that Canadians abstain from non-essential travel
16 March 2020	Canada recommends 14 days of self-isolation for travelers entering Canada
18 March 2020	Apart from the USA, Canada shuts down its borders to all countries, and the Canada-US border officially shuts down for non-essential travel Canada announces financial measures to support Canadians and businesses during the COVID-19 pandemic
23 March 2020	Canada introduces measures dedicated to support local farmers, agri-food businesses, researchers, and life science companies
25 March 2020	Canada announces the Canada Emergency Response Benefit (CERB), providing \$2000 a month, for four months, to eligible Canadians
27 March 2020	Canada announces financial support for small businesses
29 March 2020	Canada announces support for vulnerable Canadians in efforts to alleviate the health, social and economic impacts of COVID-19
31 March 2020	Canada allocates \$2 billion towards diagnostic testing and the purchase of ventilators and PPE
2 April 2020	Canada releases the <i>Canada COVID-19 app</i> , designed to keep Canadians updated on news related to the pandemic and to better help/enable Canadians to self-assess their symptoms
3 April 2020	Canada allocates \$100 million towards making food more accessible for those facing hardships related to COVID-19
8 April 2020	The Prime Minister announces changes to <i>Canada Summer Jobs</i> to help young people in Canada find work during the COVID-19 pandemic
11 April 2020	Canada expands access to the COVID-19 Emergency Response Act to better support businesses
15 April 2020	Canada expands access to the CERB and announces better support for essential workers <i>Wellness Together Canada</i> is launched by the Government of Canada to support mental wellness
22 April 2020	Canada announces the Canada Emergency Student Benefit (CESB), providing \$1250 a month, for four months, to eligible post-secondary students and new graduates
29 April 2020	Canada releases <i>ArriveCAN</i> , an app designed to limit points of contact for travelers entering Canada
3 May 2020	Canada invests \$175.6 million in antibody discovery technology
12 May 2020	Health Canada approves serological test to detect COVID-19 antibodies
15 May 2020	Canada increases the Canadian Dairy Commission's borrowing capacity by \$200 million to support the dairy industry during the COVID-19 pandemic
16 May 2020	Canada invests \$15 million into the Women's Entrepreneurship Strategy (WES) to support woman entrepreneurs affected by the COVID-19 pandemic
22 May 2020	Canada announces an online resource, <i>Find Financial Help</i> during COVID-19, to help Canadians decide to which government benefit they should apply
25 May 2020	Canada announces the launch of the <i>Business Resilience Service</i> , a four-week national hotline designed to support small businesses with financial planning
27 May 2020	Health Canada amends the process of clinical trials to accelerate access to health products
29 May 2020	Transport Canada announces cruise ships providing overnight services with more than 100 passengers are prohibited from operating in Canadian waters until October 31, 2020
2 June 2020	Canada proposes funding to the small projects component in the <i>Enabling Accessibility Fund</i> to support people living with disabilities
5 June 2020	Canada defers changes to the Divorce Act until March 1, 2021 due to the COVID-19 pandemic
6 June 2020	Health Canada recalls hand sanitizers made with industrial-grade ethanol

APPENDIX 2

Summary of Public Health Recommendations Resulting from Recent Infectious Disease Outbreaks

The World Trade Center and Anthrax Attacks

11 September 2001

The terrorist events of September 11, 2001 (9/11) and the release of anthrax spores during the fall of 2001 resulted in a profound change in how Canada responds to public health crises, as was highlighted by the urgent need for local, regional, and national preparedness for emergencies.⁶⁸ It is important to note that there were no direct incidents in Canada, however, these events consolidated the role and responsibilities of public health in a terrorist event and forced the Canadian government to rethink its response to emergencies.

In October 2001, federal, provincial, and territorial ministers of health established a *Special Task Force on Emergency Preparedness and Response* that provided its report in March 2002. Recommendations were made concerning leadership, coordination, surge capacity, training and education, surveillance and detection, infrastructure, supplies, and communication, and the FPT Network for Emergency Preparedness and Response was established to incorporate public health practices into a national emergency system.

9/11 also shifted the original mandate of the National Emergency Stockpile System (NESS) from one of facilitating a medical and social service response to a nuclear disaster, to one that addressed increased concern about chemical, biological and radio-nuclear threats and stockpiling equipment and medical supplies based on those concerns. The report of the special task force provided the following recommendations:

1. Develop a Canadian adaptation of the US Centers for Disease Control approach to strengthen coordination of public health;
2. Conduct the first review of the NESS program;
3. Establish a FPT Network for Emergency Preparedness and Response;
4. Expand information sharing among different agencies;⁶⁹ and
5. Continue to collaborate among all levels of government in emergency management.

Severe Acute Respiratory Syndrome (SARS) Response

23 February 2003 – 30 June 2003

SARS is a viral respiratory illness of zoonotic origin caused by the SARS-CoV coronavirus. It was introduced to Canada by a visitor to Hong Kong who returned to Toronto on 23 February 2003. The WHO reports that the SARS outbreak resulted in 8,437 probable cases worldwide. Of these, there were over 900 deaths. In Canada, there were 438 probable cases and 44 deaths.

A large number of cases and all deaths in Canada were centred in the Greater Toronto Area (GTA) where 25,000 people were placed in quarantine. The SARS outbreak in Ontario was predominantly nosocomial, putting health care workers at an increased risk for contracting the disease, and highlighted the need to strengthen hospital-based infection control. The outbreak put stress on the public health system and revealed the strengths and weaknesses of existing local and FPT capacities.

The SARS outbreak had economic repercussions. The majority of administrative costs dealt with establishing public health infrastructure to conduct contact tracing, information and surveillance, and tracking of quarantined individuals.⁷⁰ It also resulted in many Canadians losing their source of income and some their jobs for complying with quarantine orders. It had detrimental effects on the tourism industry, resulting in millions of dollars of lost revenue.⁷¹ The Province of Ontario also spent \$945 million on their health care system to provide PPE for health care workers and construct clinics and isolation rooms dedicated to SARS.

Canada's primary public health response consisted of isolation and infection control precautions in hospitals and application of contact tracing. The FPT Network for Emergency Preparedness and Response, established in response to 9/11, focused on coordination, surge capacity, surveillance, training, education, and communications within emergency management. The SARS outbreak also underscored the need to integrate communicable disease control within the Network activities and highlighted the need for clear information-sharing protocols among governments, more timely access to laboratory results, adequate response capacity in hospitals and public health systems, and better communication between public health and health care.

Recommendations from the report on the response to the SARS outbreak included:⁷²

1. Establish a national strategy for surveillance and enable timely access to laboratory testing and results;
2. Prepare and implement guidance documents in public health and health care systems outlining SARS and SARS surveillance;
3. Develop real-time alert systems for SARS and similar respiratory illnesses:
 - a. Develop effective communication methods for informing Canadians of developments in other jurisdictions and evolving scientific data;
 - b. Develop effective communication methods between the Government of Canada and Health Canada;
4. Establish a new Canadian agency to increase collaboration across FPT governments;
5. Establish the role of a Chief Public Health Officer; and
6. Increase federal funding to public health infrastructure and systems to foster FPT collaboration and communication.

H1N1 Response

12 April 2009 – 27 January 2010

H1N1 is a droplet-spread respiratory illness caused by a type A influenza virus.⁷³ The virus entered Canada within weeks of the confirmation of cases in Mexico. By the end of the pandemic, the WHO reported that 214 countries confirmed cases of H1N1, with over 18,000 deaths worldwide. In Canada, the outbreak resulted in 45,771 cases and 505 deaths. Canada's public health response to H1N1 was based upon the lessons learned from the SARS outbreak. The Public Health Agency of Canada (PHAC) and Health Canada were better prepared to respond, as PHAC identified and monitored the H1N1 virus by using effective surveillance mechanisms, established networks and systems to enable timely communication, improved collaboration among FPT governments, undertook planning to enhance the availability of antivirals and the vaccine, and effectively communicated with those living in Canada the developments of the pandemic. Although the majority of the H1N1 response was a success, the virus illustrated the lack of standardization in Canada's response to public health events, as Canada only established responses based on the current public health event.⁷⁴

During H1N1, there was an ongoing tension between managing the outbreak and successfully hosting the 2010 Olympic Games in Vancouver. PHAC played a role in making that event a success as it deployed medical personnel and resources on site and expanded the physical capacity of the Emergency Operations Centre.⁷⁵

Recommendations stemming from the post-event review of H1N1 included:

1. Continue to strengthen FPT capacity to prepare and respond to influenza
 - a) Improve and update the Canadian Pandemic Influenza Plan by emphasizing:
 - i. Development of adaptable plans to handle different pandemic scenarios;
 - ii. Improved collaboration mechanisms and guidance documents;
2. Enable the Health Portfolio to communicate science to different types of organizations and people in an effective and efficient manner
 - a) Communicate multifaceted scientific findings and evolutions in plain language for:
 - i. People in policy, program, communications, and operations;
 - ii. The media;
 - iii. The public;
 - iv. Decision-makers;
3. Consolidate and define the role of federal government emergency management
4.
 - a) Further strengthen training in emergency management;
 - b) Establish adequate activation and escalation measures in accordance with the nature of a public health event.

Ebola Response

2014 Ebola Outbreak in West Africa

Ebola Virus Disease (EVD) is an acute viral illness that is caused by ribonucleic acid viruses that belong to the genus *Ebolavirus*.⁷⁶ The viruses that cause EVD mainly occur in areas of sub-Saharan Africa, making the risk of exposure low in Canada. There have been no cases of EVD in Canada, but in case of an outbreak, a collaborative response among all levels of government would have been activated. PHAC worked with national and international partners and stakeholders to monitor EVD activity, evaluate the risks of EVD and assess its implications to Canadians. Canada also offered diagnostic services for EVD in collaboration with provincial public health laboratories.⁷⁷

This outbreak triggered PHAC to amplify its surveillance activities and prepare for a potential EVD outbreak.⁷⁸ The Health Portfolio's main response was based on collaboration among all levels of government, the health community and emergency response workers; and between international stakeholders and the Department of Foreign Affairs, Trade and Development.

Recommendations from the post-event review included:⁷⁹

1. Conducting detailed health screenings on people who have travelled to Guinea, Liberia, and Sierra Leone in accordance with the Quarantine Act;
2. Assessing EVD activity to evaluate the potential risk of EVD transmission in communities;
3. Communicating information regarding disease prevention to the public;
4. Coordinating the public health response should EVD present in Canada; and
5. Strengthening PPE needs for front-line workers in First Nations health facilities.

APPENDIX 3

Initial Interprovincial Differences in Testing for COVID-19 in Canada (as of August 2020)

Province/ Territory	Testing Guideline	Daily Testing Targets	Notes
Alberta	As per the Government of Alberta: ⁸⁰ <ul style="list-style-type: none"> • Symptomatic persons • Asymptomatic close contacts of confirmed COVID-19 cases • Asymptomatic workers and residents at specific outbreak sites such as health care facilities 	9,000 ⁸¹	
British Columbia	As per the BC Ministry of Health: ⁸² <ul style="list-style-type: none"> • Symptomatic persons 		Priority testing for higher risk* persons. ⁸²
Manitoba	As per the Government of Manitoba: ⁸³ <ul style="list-style-type: none"> • Symptomatic persons 		
New Brunswick	As per NB's chief medical officer of health: ⁸⁴ <ul style="list-style-type: none"> • Persons exhibiting two or more symptoms 		
Newfoundland and Labrador	As per the Government of NL: ⁸⁵ <ul style="list-style-type: none"> • Persons exhibiting two or more symptoms • Persons with "small red or purple spots on your hands and/ or feet" 		
Nova Scotia	As per the Government of Nova Scotia: ⁸⁶ <ul style="list-style-type: none"> • Symptomatic persons 		
Ontario	As per Ontario's Ministry of Health: ⁸⁷ <ul style="list-style-type: none"> • Hospital inpatients – Symptomatic patients/residents and transfers • Residents Living in Long-Term Care and Retirement Homes – Symptomatic patients/residents • Residents of Other Congregate Living Settings and Institutions – Symptomatic persons and asymptomatic transfers • Persons Working in Congregate Living Settings and Institutions – Symptomatic persons • Healthcare Workers/Caregivers/Care Providers/First Responders – Symptomatic persons • Persons Living in Same Household of Healthcare Workers/ Care Providers/First Responders/ Emergency Child Care Centre Workers – Symptomatic persons • Remote/Isolated/Rural/Indigenous Communities – Symptomatic persons • Specific Priority Populations – Symptomatic persons • Essential Workers – Symptomatic persons • Cross-Border Workers – Symptomatic persons 	16,000 ⁸⁸	These recommendations changed on 24 September as a result of a resurgence of COVID-19 cases and an increase in the demand for testing. ⁸⁹
Prince Edward Island	As per the Government of PEI: ⁹⁰ <ul style="list-style-type: none"> • General public – Symptomatic persons and contacts of cases • Hospitalized individuals – Symptomatic patients • Health care workers – Symptomatic persons • Long-term and community care residents and staff – New admissions, symptomatic residents, all staff and residents who are close contacts of a positive case, and staff who work at multiple sites. • Inter-facility transfers – Transfers between health facilities • Temporary foreign workers – "Prior to the end of their 14 day self-isolation" • Essential workers (non-health care) who travel outside of PEI 		

* Residents and staff of long-term care facilities; individuals requiring admission to hospital or likely to be admitted, such as pregnant individuals near term, patients on hemodialysis, or cancer patients receiving radiation or chemotherapy; health care workers; individuals with a higher probability of being infected with COVID-19, such as contacts of a known case of COVID-19 and travellers just returned to Canada; residents of remote, isolated, or Indigenous communities; people living in congregate settings such as work-camps, correctional facilities, shelters, group homes, assisted living and seniors' residences; people who are homeless or have unstable housing; essential service providers, such as first responders.

Province/ Territory	Testing Guideline	Daily Testing Targets	Notes
Quebec	As per Santé Montréal: ⁹¹ <ul style="list-style-type: none"> Persons exhibiting symptoms of “flu, gastroenteritis or COVID-19 symptoms (fever, cough, difficulty breathing)” Persons in “close contact with someone who has received a positive COVID-19 test result” 	14,000 ⁹²	
Saskatchewan	As per the Government of Saskatchewan: ⁹³ <ul style="list-style-type: none"> Immunocompromised asymptomatic individuals – Prior to immunosuppressive procedures Hospital inpatients – Stays greater than 24 hours Homeless or precariously housed – Symptomatic persons First Nations and Métis communities – Symptomatic persons “All health care workers caring for certain immunocompromised patients.” Anyone currently working or returning to work outside the home, or working in high volume settings can request a test Long-term care – admissions/readmissions and all residents and staff if an outbreak occurs 	1,500 ⁹⁴	
Nunavut	As per the Government of Nunavut: ⁹⁵ <ul style="list-style-type: none"> Symptomatic persons Persons travelling from out of province Persons in close contact with an individual who was tested for COVID-19 		
Northwest Territories	As per the Government of Northwest Territories: ⁹⁶ <ul style="list-style-type: none"> Symptomatic persons 		
Yukon	As per the Government of Yukon: ⁹⁷ <ul style="list-style-type: none"> Symptomatic persons and close contacts of symptomatic persons Travellers and close contacts of travellers 		

APPENDIX 4

Digital Technology and the COVID-19 Response

Introduction

Digital technologies are revolutionizing health and health care at the individual and population levels,^{98,99} as well as affecting how people manage their lives and relationships. During the COVID-19 pandemic, their influences are seen from both public health practice (surveillance systems and contact tracing) and social determinants (where videoconferencing applications and online education have changed the way people approach connectedness, work and education) perspectives. In spite of these benefits, there are also complex challenges concerning security, privacy, accessibility, uptake, and equity. The purpose of this Appendix is to consider four approaches that have been used during the COVID-19 response.

Digital Epidemiology

Digital epidemiology is the use of data generated outside the public health system for epidemiological purposes.^{100,101} These sources include mobile phone network data, sensor-generated data, analysis of social media posts, call centre generated data, search term use and webpage access logs.^{102,103,104} Information sources from digital systems such as ProMED-Mail¹⁰⁵ and HealthMap¹⁰⁶ have supported early detection and provided information to professionals and the public,⁹⁸ and continue to be used during the outbreak.

The Global Public Health Intelligence Network (GPHIN) represents an innovative governmental system that supports decision-making. In 1997, Health Canada (now PHAC) in collaboration with the World Health Organization developed GPHIN. The network is a secure outbreak alert system that is based on the analysis of articles from local newspapers and newsletters (to capture localized phenomena) and national newspapers.^{107,108} Headlines, sports, financial and travel sections are analyzed.¹⁰⁹ Currently, GPHIN

reviews approximately 10,000 articles daily in 10 languages.^{110,111} The algorithm is able to continuously monitor outbreaks using situational awareness, such as scanning for cancellation of flights or cruises, new travel advisories, health screening procedures at border crossings or trade bans.¹⁰⁶ There are 800 subscribers, including the WHO, and health ministries in Canada's provinces and 85 other countries. While the system meets its operational expectation, it requires routine updating to meet continually changing sources of information.¹¹²

One opportunity for GPHIN is to integrate artificial intelligence (AI) and machine learning capabilities into the network to monitor social media data for health trends. Social media (e.g., Twitter, Facebook) is used as a means of expressing personal situations, and AI tools are being developed to tap these data-rich resources.¹¹³ For example, tweets and blogs have been analyzed to assess public perception of the Ebola outbreak (2014), as well as vaccine hesitancy.^{114,115,116} Limitations associated with these approaches include, among others, timely access to data, interpretation and use of words, the assessment of sources in multiple languages, and machine learning limitations. Several Canadian universities are conducting research to develop these analytical approaches and address the underlying challenges. In addition, the use of social media data raises ethical and legal considerations, including de-identification of data, and consent for its use.¹¹⁷ There is also unequal distribution of the use of the internet and social media, based on age and socio-economic status (SES),¹¹⁸ which could lead to an unrepresentative data set. In spite of these limitations, GPHIN should consider integrating the capability to use social media data to assist with detection of outbreaks,¹⁰⁶ and monitoring the response to outbreaks in real time.¹¹⁵

Contact-tracing Applications

Contact tracing is a procedure used to identify those individuals who are in contact with a person who has become ill during an infectious disease outbreak, and is foundational to the COVID-19 response. The procedure is time-consuming and labour-intensive. It also lacks scalability and is subject to notification delays and recall errors.¹¹⁹ To address this challenge, certain provinces and the federal government have developed electronic applications (apps) to identify and contain the spread of the coronavirus.¹²⁰

There are two main approaches to contact-tracing apps. Alberta's TraceTogether app is based on a centralized approach. Bluetooth technology is used to exchange anonymous data from nearby mobile devices and the list of encrypted digital IDs is then uploaded to public health authorities so that they can notify and track those who have been in contact with an infected person.¹²¹

Apps developed by Switzerland, Finland, and Ireland, as well as the Canadian federal government's app, use a decentralized data-collection framework in which data remain on individuals' devices. Should a user test positive for COVID-19, health officials will provide them with a unique code with which they can share their condition anonymously to a national network. Suspected contacts will receive a warning directly that they may have been in contact with a positive case. The national app launched in early July and its use is voluntary.¹¹⁷

Each approach has their respective strengths and weaknesses, but both have common concerns with their use, including:

- *Privacy:* the Personal Information Protection and Electronic Documents Act (PIPEDA) establishes industry codes of privacy, policy and practice but does not discuss the use of personal data collection for public health purposes. Similarly, a

recent survey showed that privacy concerns and potential abuse of civil liberties were barriers to an app's uptake,¹¹⁸ suggesting that successful use of an app depends on the establishment of sustained and well-founded public trust and confidence. Various technological solutions, such as the use of cryptographic protocols¹²² and peer-to-peer AI tracing,¹²³ have been suggested to address these concerns.

- *Uptake of the App:* To be effective, more than half the population should adopt and use a contact-tracing app. This uptake may be difficult to achieve as people may be unwilling or unable to use the app. During the first weeks of release, the ABTraceTogether app was downloaded by approximately 11% of Albertans.¹²⁴
- *Socio-economic Considerations:* Older populations, ethnic minorities and lower SES individuals appear disproportionately affected by the outbreak; they are also less likely to have access to the necessary technology. This situation is further complicated by the variable access to broadband internet services among those living in rural and urban areas. As such, reliance on an app may misrepresent the extent of the outbreak and result in further inequities. Despite an overall high uptake of mobile internet subscriptions in Canada, internet and broadband adoption rates differ by household income and educational attainment.¹²⁵
- *Case Identification:* Errors such as missing exposures or reporting of false positives are possible with an app and could have psychological, financial, and social implications. In addition, use of an app may cause a false sense of confidence, prompting a more relaxed attitude toward physical distancing and other public health guidance.^{116,126}

A mobile contact-tracing app may be helpful to mitigate the COVID-19 pandemic as its use could expedite contact tracing thereby slowing viral

spread.¹²⁷ A recent survey also revealed that 80% of respondents would support the use of an app, while 65% thought it should be mandatory.¹²⁸ However, accuracy, security, and privacy are key factors to the app's success. As an extension of the app, researchers are developing AI-based approaches that aim to provide users with information on their individual risk level to guide future actions (such as going to work, getting tested, and what precautions they should take).¹²⁰

Videoconferencing Technology

The public health measures implemented to contain the COVID-19 outbreak have resulted in the use of videoconferencing tools as an alternative to face-to-face meetings in personal, work, and healthcare settings.¹²⁹ Using this technology, people can connect with their business colleagues, friends and family while decreasing person-to-person contact. Videoconferencing allows participants to see the nonverbal signals used during a conversation, identify them and determine the focus of the speaker.¹³⁰ In addition, most web-based videoconferencing software (i.e., Google Hangouts, Microsoft Teams, Zoom, Skype) are affordable and easy to use, have high-quality video and audio, have additional features such as text chat and screen sharing, and can be used on various web browsers and operating systems.¹³¹

Similarly, videoconferencing tools in health care settings help improve accessibility, efficiency, and patient satisfaction. Randomized trials have shown that clinical consultations through video link are likely to result in high satisfaction among patients and staff, while lowering costs compared to conventional approaches.¹³² Similarly, videoconferencing could further support the needs of rural and remote areas should they have access to broadband internet services. Telemedicine programs and research on virtual healthcare have demonstrated promising results concerning its feasibility, patients' acceptance, efficacy, and cost effectiveness.^{133,134} The Canadian Medical

Association released findings from a national poll in May 2020 showing that Canadians see virtual care as a positive option and would like to use it in the future.¹²⁶

Users, however, report that videoconferencing can be mentally and physically exhausting due to physical strain on the eyes, neck, and back and the quality of attention required, as online meetings require greater attention to spoken words.¹³⁵ Multi-person screens magnify this problem. Having multiple interactions on one screen can be "a stimulus-rich environment" that challenges the brain's central vision and forces it to decode many people at once. As a result, no one comes through meaningfully. In addition, videoconferencing apps are increasing people's self-awareness as social beings by showing a small preview of their own camera feed as a chat interface. Seeing oneself in a video chat can be disconcerting and distracting, and greatly increases the amount of cognitive processing being used.¹³⁶

Cyber security risks and vulnerabilities may put videoconferencing users at risk of malicious attacks. For example, the cyber security intelligence firm Cyble discovered that over 500,000 Zoom accounts have been sold on hackers' forums and that hundreds more have been compromised, including those of health care providers, banks, software vendors, and educational institutions.¹³¹

Despite its weaknesses, videoconferencing has become indispensable during this pandemic, and its use is expected to expand after the pandemic, particularly in relation to employment. For example, Facebook has announced it will allow its current workforce to continue to work remotely, as will other tech companies such as Shopify and Coinbase.¹³⁷

Online Education

There are over 5.5 million students currently enrolled in either primary or secondary education in Canada, all of whom have been out of classes since the beginning of the first wave of the pandemic.¹³⁸

Children were required to participate in online education to support their academic performance (an indicator for education attainment) during the first wave.¹³⁹ To achieve this, most provinces/territories shifted to grade-specific online education or used a mixture of videoconferencing technologies and phone calls. Others have developed their own learning platforms, or have added links to pre-existing online learning modules and television. Some have delivered learning materials to students' homes.^{140,141}

The move to online education appeared seamless as 94% of Canadians have internet access at home, while only 1.2% of households with children under the age of 18 do not have internet access.^{142,143} Classroom activities could also be facilitated through online methods, including sharing project data, annotating learning materials in real time and having class discussions through videoconferencing technology.¹⁴⁴ Students who have access to a smartphone may participate in more independent learning as they can access materials at their own pace.^{145,146}

A 2015 report, however, noted that the use of computers and online resources for reading and mathematics follow a hill-shaped curve (i.e., that moderate use leads to the best outcomes).¹⁴⁷ Randomized trials conducted in Peru and California have shown that online learning has no effect on grades, test scores (mathematics and reading), credits earned, school engagement and cognitive skills.^{148,149} Alternatively, face-to-face instruction with a teacher is needed to support development of working memory used to problem solve when faced with new scenarios.^{150,151} Students may face other difficulties – such as organization, self-regulation, understanding the learning material, and motivation – that can be addressed by face-to-face education.¹⁵²⁻¹⁵⁴ The pandemic is also associated with stressors such as fear of infection, frustration and boredom, inadequate information, lack of in-person contact with classmates, friends and teachers (which can be addressed through face-to-face education), as well as

lack of personal space at home, and family financial loss that can limit learning.¹⁵⁵

These situations are exacerbated for those at the lower end of the social gradient. About 4.2% of households with children under the age of 18 in the lowest income quartile do not have access to the internet, as opposed to 0.2% in the highest income quartile.^{139,140} Additionally, the devices available to access the internet vary by quartile. In the lowest income quartile, 24.1% of households can access the internet only through a mobile device (i.e., a smartphone), while 75.9% have access to a personal computer (with or without mobile devices). Similar limitations on access to the internet and digital devices exist for First Nations communities living on-reserve. While smartphones can aid in receiving information, there are limitations to its production, as well as the technical limitations of phones such as less storage, smaller screen size and difficulty using the keyboard.^{142,156} Some other barriers to internet access are the cost of the service and equipment, and the lack of availability of internet service.¹³⁹

In addition, parents from lower-income households may be less involved in their children's education than parents from higher-income households.¹⁵⁷ Reasons for this include jobs that require longer working hours, holding multiple jobs, and having less flexibility in work hours compared with higher-income households.^{154,158,159} Such limitations disproportionately affect racialized peoples as 20.8% of individuals living on lower income are people of colour.¹⁶⁰ School closures also exacerbate food insecurity,¹⁶¹ while long-term absences from school, as seen with summer holidays, disproportionately affect low SES children's mental health and well-being.^{162,163}

While removing students from schools was necessary to limit the transmission of COVID-19, the implementation of online learning has had mixed results that need to be fully understood.

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