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Canada's multi-jurisdictional COVID-19 Public Health response – January to May 2020

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Abstract

In late January 2020, the first COVID-19 case was reported in Canada. By March 5, 2020, community spread of the virus was identified and by May 26, 2020, close to 86,000 patients had COVID-19 and 6,566 had died. As COVID-19 cases increased, provincial and territorial governments announced states of public health emergency between March 13 and 20, 2020. This paper examines Canada's public health response to the COVID-19 pandemic during the first four months (January to May 2020) by overviewing the actions undertaken by the federal (national) and regional (provincial/territorial) governments. Canada's jurisdictional public health structures, public health responses, technological and research endeavours, and public opinion on the pandemic measures are described. As the pandemic unravelled, the federal and provincial/territorial governments unrolled a series of stringent public health interventions and restrictions, including physical distancing and gathering size restrictions; closures of borders, schools, and non-essential businesses and services; cancellations of non-essential medical services; and limitations on visitors in hospital and long-term care facilities. In late May 2020, there was a gradual decrease in the daily numbers of new COVID-19 cases seen across most jurisdictions, which has led the provinces and territories to prepare phased re-opening. Overall, the COVID-19 pandemic in Canada and the substantial amount of formative health and policy-related data being created provide an insight on how to improve responses and better prepare for future health emergencies.

Key words: **COVID-19, SARS-CoV-2, Canada, Public Health Response, Health Federalism**

Słowa kluczowe: **COVID-19, SARS-CoV-2, Kanada, działania zdrowia publicznego, federalism zdrowotny**

Introduction

In December 2019, reports emerged about an outbreak of a respiratory illness clustered in Wuhan, China, now commonly known as coronavirus disease 2019 (COVID-19) [1]. The etiological agent of COVID-19 is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel Betacoronavirus of the subgenus *Sarbecovirus* [2, 3]. The Canadian public was informed of COVID-19 on January 7, 2020, by the Chief Public Health Officer of Canada [4]. On January 25, 2020, the first Canadian case of the disease was announced in Toronto, Ontario, in a male returning from Wuhan, China [5]. The patient was placed in isolation and treated at Toronto's Sunnybrook Health Sciences Centre [6]. Most of the initial cases of COVID-19 in Canada were related to international travel from mainland China, Iran, and other destinations where outbreaks were reported [7, 8]. By March 5, 2020, the first case of community spread (i.e., the transmission of SARS-CoV-2 unrelated to travel) occurred in British Columbia [8].

This paper examines Canada's response to the spread of COVID-19 by describing the public health actions undertaken by the federal (national) and regional (provincial/territorial) governments, including the restrictions and system changes that occurred during the initial four months (January to May 2020) since the first reported case in the country.

COVID-19 in Canada

Canada's 38 million residents live in ten provinces (west to east: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland and Labrador) and three territories (west to east: Yukon, Northwest Terri-

tories, Nunavut) [9]. Over 60% of Canada's population resides in Ontario and Québec; the two provinces with 86% of Canada's COVID-19 cases [9, 10]. As of May 26, 2020, Canada has had 85,998 confirmed cases of the disease, ranking 37th worldwide in terms of cases per capita [10, 11]. Of the confirmed cases, 44,911 individuals (52%) have recovered while 6,566 individuals (8%) have died. Overall, 1,500,557 Canadians have been tested by May 26, 2020 [10]. Over the week of May 20 to 26, 2020, four provinces and territories (Prince Edward Island, Newfoundland and Labrador, Yukon, Northwest Territories) did not report any new cases of COVID-19 [10]. One territory (Nunavut) had not seen any cases of COVID-19 by the end of May 2020, with credit to territorial public health measures, such as travel restrictions [12].

Initial timeline

On January 7, 2020, the World Health Organization (WHO) informed the public that Chinese officials reported a novel coronavirus responsible for an outbreak of bilateral atypical pneumonia in Wuhan [13]. At the time, the position taken by the Canadian federal government was that of there being little evidence to indicate that there was widespread human to human transmission of the virus [4]. One week later on January 15, 2020, the Public Health Agency of Canada (PHAC) of the federal government activated the Emergency Operation Centre [1]. By January 23, 2020, it was announced that six Canadians with symptoms associated with COVID-19 were being monitored [14]. The first officially confirmed case of COVID-19 in Canada was announced on January 25, 2020, and thereafter, a relatively low number of cases were identified until early March (fifteen cases by February 29, 2020) when exponential spread occurred [1]. On February 6, 2020, the PHAC released a national case definition for COVID-19 [15]. The first death associated with COVID-19 was reported on March 9, 2020, in British Columbia [16]. The majority of Canadian provinces and territories announced their first presumptive or probable cases between March 11 and 22, 2020 (Table I) [12, 17–28].

Cases by jurisdiction

The progression of COVID-19 cases per one million population over the first 120 days following the index case is shown in Figure I. On February 24, 2020 (first 30 days), Canada had 0.3 cases per million [1, 9]. Ninety days later (May 25, 2020), there were 2,230 cases per million [1, 9]. Figure II presents the epidemiology of COVID-19 during the first four months, including the total and per million counts of cases (along with 7-day rolling average plots), recoveries, deaths, and tests by jurisdictional region. Québec and Ontario have had the most cases and deaths per capita, followed by Alberta in the West and Nova Scotia in the East. The territories have had very few (Yukon: 11 and Northwest Territories: 5) or no cases (Nunavut). In terms of testing, Alberta, Québec, and the Northwest Territories have had the most tests done per capita [1].

Public health structure

Health Governance

Canada's ability to implement public health interventions and a rapid health service response to COVID-19 has been affected by the jurisdictional structure of health service administration and provision. The country has

Table I. Canadian provinces and territories by date of first presumed or confirmed case of COVID-19

Province/Territory	Date first case announced	Travel history
Ontario	January 25, 2020	China
British Columbia	January 28, 2020	China
Québec	February 27, 2020	Iran
Alberta	March 5, 2020	Cruise travel (Grand Princess)
New Brunswick	March 11, 2020	France
Manitoba	March 12, 2020	Philippines
Saskatchewan	March 12, 2020	Egypt
Prince Edward Island	March 14, 2020	Cruise travel (location not provided)
Newfoundland and Labrador	March 14, 2020	Cruise travel (Caribbean)
Nova Scotia[1]	March 15, 2020	Australia; USA; travel throughout Europe
Northwest Territories	March 21, 2020	Canada (British Columbia, Alberta)
Yukon Territory[2]	March 22, 2020	USA
Nunavut	Not applicable	Not applicable

[1] Three positive cases of COVID-19 were announced in Nova Scotia on March 15, 2020.
[2] Two positive cases of COVID-19 were announced in the Yukon Territory on March 22, 2020.

Source: [12, 17–28].

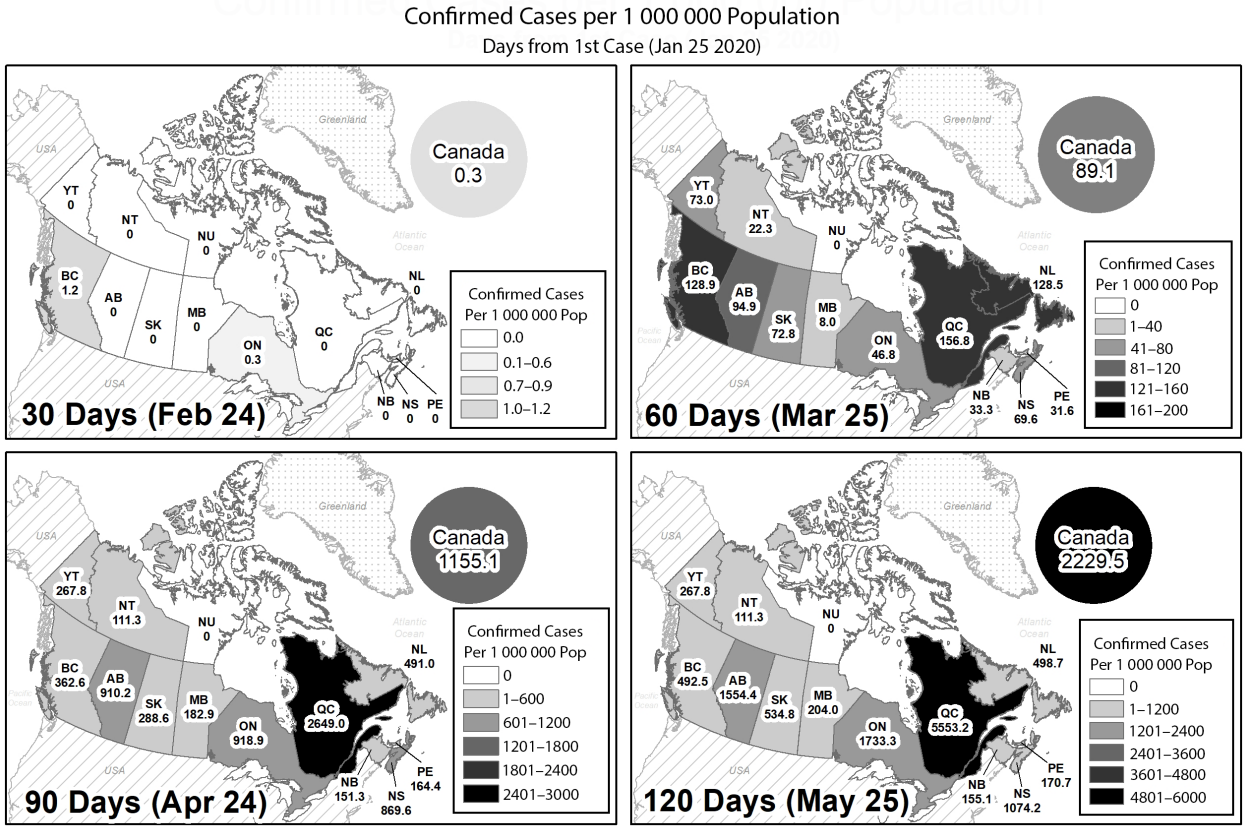


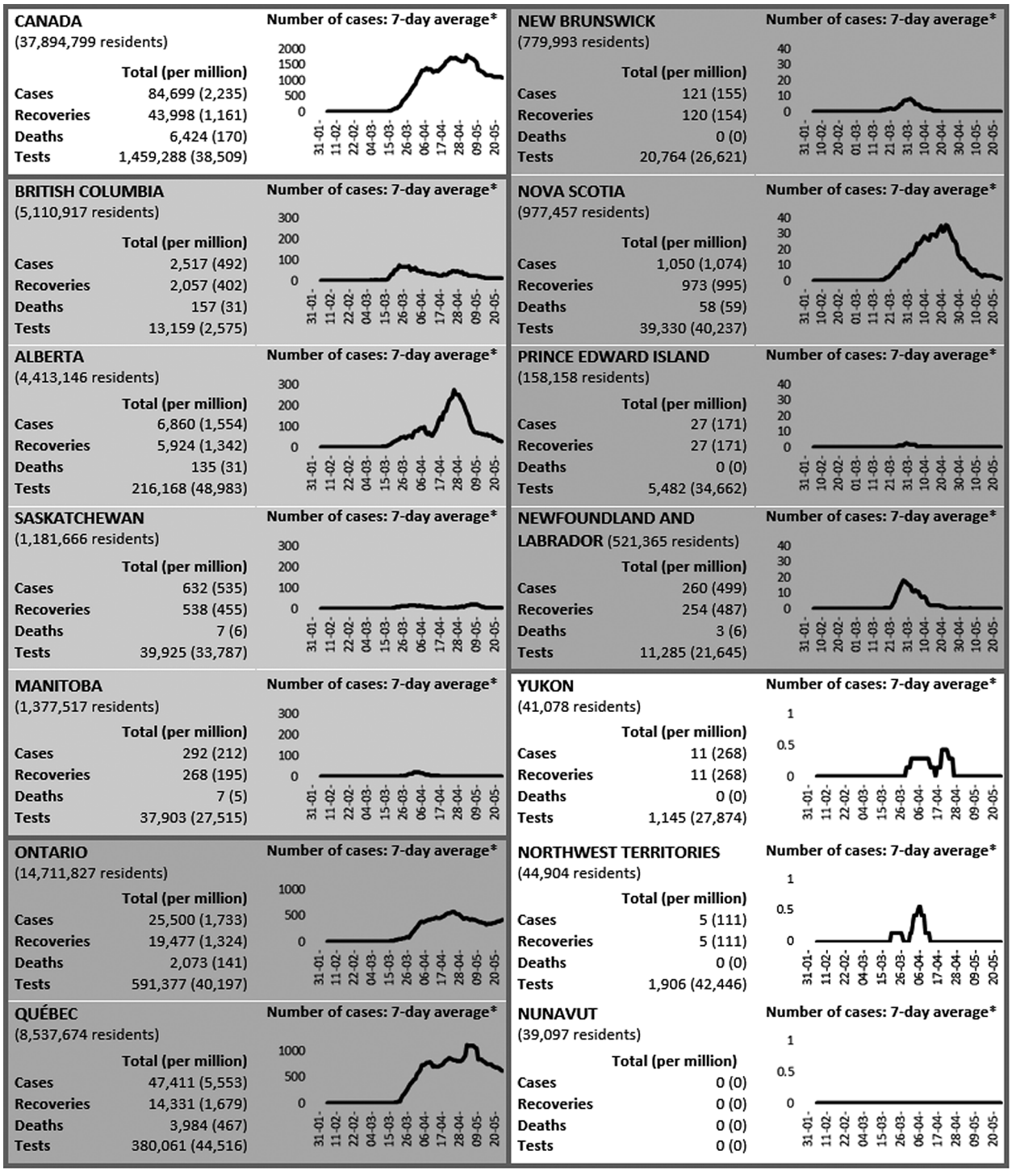
Figure I. Map of COVID-19 confirmed cases per 1,000,000 population in Canada, January 15 to May 25, 2020
Source: [1, 9, 169, 170].

a federalist system of government, meaning that the jurisdictions which make up the federation (i.e. provinces and territories) have separate responsibilities (e.g. health care) from the national government [29]. The federal government is in charge of some health issues like delivery of health services to special groups (First Nations, Inuit, Canadian Forces, Royal Canadian Mounted Police, and incarcerated people), financing, research and innovation, and population health [29]. It is also responsible for the regulation of products such as food, chemicals, medical devices, and pharmaceuticals [30, 31]. The *Canada Health Act* legislates that the federal government issues financial support to each province and territory [32]. This leaves each province and territory with its own publicly funded health care insurance plans and the responsibility for the organization and delivery of health care services for their residents. In other words, Canada does not have a single health care system but rather thirteen smaller systems that vary in the financing, management, and delivery of health care services [31].

Public health governance

Public health and safety legislation in the country is distinct and separate from the *Canada Health Act*. Public health is associated with several functions related to population health, including surveillance and emergency response [33]. These duties are spread amongst the federal, provincial, and territorial governments with each province/territory's efforts led by a Chief Medical Officer of Health [34]. At the federal level, the PHAC is mandated to promote health, prevent and control chronic and infectious diseases, prepare and respond to health emergencies, and be the central point of related communications [35]. The PHAC was created following the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak, which laid bare Canada's need for a national organization for coordinating responses to public health problems [29]. The PHAC is responsible for standardizing the national case definition for COVID-19, the case reporting form, and national epidemiological projections [36].

Although there are differing legislated controls, each province or territory's ministries of health allocate resources to the monitoring and management of infectious and communicable diseases [33]. The scope of public health legislation varies, which affects the policy options available to each provincial or territorial government in how to respond to a pandemic. Regardless of national recommendations, provinces and territories set their intervention strategies with respect to case management, testing criteria, gathering sizes, self-isolation requirements, essential business operations, and health service delivery [33, 37].



*Please note: the y-axes on the graphs portraying the 7-day rolling averages for cases differ by region of Canada.

Figure II. The epidemiology of COVID-19 in Canada and its provinces and territories, January 25 to May 24, 2020
Source: [1, 9].

Pandemic planning

The PHAC, along with appointed expert task forces, oversees best practices for pandemic preparedness which includes two guidelines, *The Canadian Pandemic Influenza Preparedness: Planning Guidance for the Health Sector and the Federal/Provincial/Territorial Public Health Response Plan for Biological Events*, which outline plans for identifying and tracing infectious diseases and strategies for rapid access to medical care [37, 38]. The *Canadian Pandemic Influenza Preparedness* document was published in 2018 and together with its topic-

specific annexes (i.e. Surveillance, Laboratory, Public Health Measures, Vaccine, Antiviral, Prevention and Control of Influenza during a Pandemic for all Healthcare Settings, Communications and Stakeholder Liaison, Pandemic Influenza Psychosocial Annex), it is meant to provide guidance for the coordinated response of the federal, provincial, and territorial governments to influenza pandemics [37]. Since being first published in 2004, it was updated following the H1N1 Influenza pandemic with lessons learned [38]. The *Public Health Response Plan*, published in 2017, includes four levels of health system response to a public health event, ranging from routine to emergency [38]. The major objectives of this plan are to: streamline health system responses to a public health crisis; clarify administrative and jurisdictional roles; outline approval processes; facilitate communication and situational awareness; and centralize the management of risks and delegation of tasks across the coordinated health care system [38]. This plan was developed from lessons learned during several public health crises including SARS, H1N1 Influenza, West Nile Virus, Lyme Disease, and other international travel related threats such as Ebola and Zika [38].

The capacity to respond to a public health emergency in Canada is highly dependent on preparedness planning, governance, and resources. The PHAC maintains the National Emergency Strategic Stockpile (NESS), which includes pharmaceuticals, medical supplies, and social service supplies (e.g., beds and blankets), which the provinces and territories can request during an emergency [39]. Considering the rapid global spread of COVID-19, Canada was prepared with emergency response plans and coordinated governance organization, however, much like other countries, was found questioning the national supply of medical resources given a worst-case-scenario epidemiological forecast [40, 41].

PUBLIC HEALTH RESPONSE

National response

As mentioned previously, the PHAC activated the Emergency Operation Centre on January 15, 2020, to begin preparedness plans in the event of an infectious disease outbreak [1]. On January 22, 2020, Canada enforced its first set of international travel measures in the form of screening requirements for symptomatic patients returning from China to major Canadian cities [1]. These requirements were extended on February 9, 2020, to include screening of travellers from affected countries at major airports [1]. By March 10, 2020, the PHAC began warnings against gatherings and urged planners of large events to conduct risk assessments [42]. On March 11, 2020, the WHO declared COVID-19 a global pandemic [1]. On the same day, the Prime Minister of Canada provided information on the "whole-of-government response", which included the creation of a COVID-19 Response Fund valued at $1 Billion (2020 CAD) [43].

Days following, Canada advised against non-essential international travel (March 13, 2020) and for travellers coming into Canada to self-isolate for two weeks (March 16, 2020) [1]. By March 18, 2020, Canada placed a travel ban on nationals from all countries aside from the United States of America (USA) and redirected international arrivals to four major airports: Toronto (YYZ), Montreal (YUL), Vancouver (YVR), and Calgary (YYC) [1]. In addition, it was announced that the Canadian border would be closed to non-essential travel from the USA [1]. On March 25, 2020, the federal government enacted the *Quarantine Act*, which legally required travellers to self-isolate for a period of 14 days [44]. On March 30, 2020, it was announced that all passengers flying within Canada were to be screened for COVID-19 symptoms before boarding the plane [45]. Starting on April 20, 2020, air travellers were required to wear a face covering [46]. Government briefings continued to include updates on the epidemiological findings and economic status in the country [47], as well as discouraged provincial and territorial governments from easing restrictions too quickly [48].

Provincial and territorial responses

Although most Canadian jurisdictions did not have a case of COVID-19 until mid-March 2020, provinces and territories began preparing for the emerging pandemic around the time the virus arrived in the country (i.e. late January 2020). Health officials of all provinces and territories issued public statements or took part in interviews with local media [5, 49–60]. Provincial and territorial health officials across Canada were largely consistent and often recommended simple preventative measures, such as hand hygiene, coughing etiquette, as well as staying home from work or school if sick [51, 53, 61]. Many governments recommended that residents who recently travelled to Wuhan, China, or had contact with someone with such travel history, and who were experiencing symptoms (initially defined as a new onset cough and/or fever >38°C) to contact their health care provider, the local public health office, or the local non-emergency health line [53–56, 58].

Also, in late January and early February 2020, provinces and territories added COVID-19 to their list of reportable conditions under their local public health legislation, which allowed for stronger provincial, territorial, and national disease surveillance [56, 62–64]. In addition to public statements and public health initiatives, some provincial and territorial governments were quick to launch a dedicated website on COVID-19, where they would provide health information to the public [5, 49, 50]. Figure III provides a visual representation of the public health measures and restrictions that were put into place until the end of May 2020 in the jurisdictions.

Health system capacity and supplies

Canada's medical resource supply and medical workforce prior to COVID-19 has been documented. With respect to ventilators, a 2015 cross-sectional survey of 286 acute-care hospitals across Canada identified 3,170

intensive care unit (ICU) beds and 4,982 ventilators [65]. This study cited considerable variation in ICU beds and ventilator availability across Canada with a mean of 10 ICU beds per 100,000 people (range of 6–19 beds per 100,000 people) and 15 ventilators per 100,000 people (range of 10–24 ventilators per 100,000 people) [65]. In terms of medical personnel, in 2018, Canada had 89,911 physicians equating to 241 physicians per 100,000 people, of whom 92% were located in urban areas [66]. A report of Canadian nurses released in 2019 revealed that there were 439,975 nurses in total [67].

National action was taken to ensure that adequate health human resources and medical supplies were available in the country during the COVID-19 pandemic. To prepare for a worst-case scenario, retired clinical staff were called to be redeployed in health facilities across Canada [68]. Furthermore, industry was mobilized to manufacture necessary equipment, including ventilators and personal protective equipment (PPE) [69]. On March 18, 2020, procurement of supplies included a federal bulk-purchase of COVID-19 testing kits [70]. On March 31, 2020, it was announced that the government was making a $2 Billion (2020 CAD) investment in the expansion of diagnostic testing and procurement of health equipment, such as ventilators and PPE [71]. This national purchase was done in coordination with the provinces and territories, which also placed their own orders for health supplies throughout the pandemic [72–74].

By mid-April 2020, hospitals across the country reported not having been overcapacity [75, 76]. One study from British Columbia indicated that Vancouver hospitals did not meet the projected surge capacity of ICU beds [77]. However, numerous community care services such as long-term care facilities became overwhelmed with COVID-19 outbreaks and were marked as one of the major sources of cases of disease across Canada [78]. In response, the Canadian Armed Forces were deployed to facilities within Québec (April 20, 2020) and Ontario (April 28, 2020) at the request of the provincial governments to assist with crisis management [79].

Testing and surveillance

When Canada's first COVID-19 case was publicly announced in late January 2020 in Ontario, nasopharyngeal samples were sent to the Public Health Ontario Laboratory for testing [6]. This case was also confirmed by the PHAC's National Microbiology Laboratory (NML) located in Winnipeg, Manitoba [80]. Samples

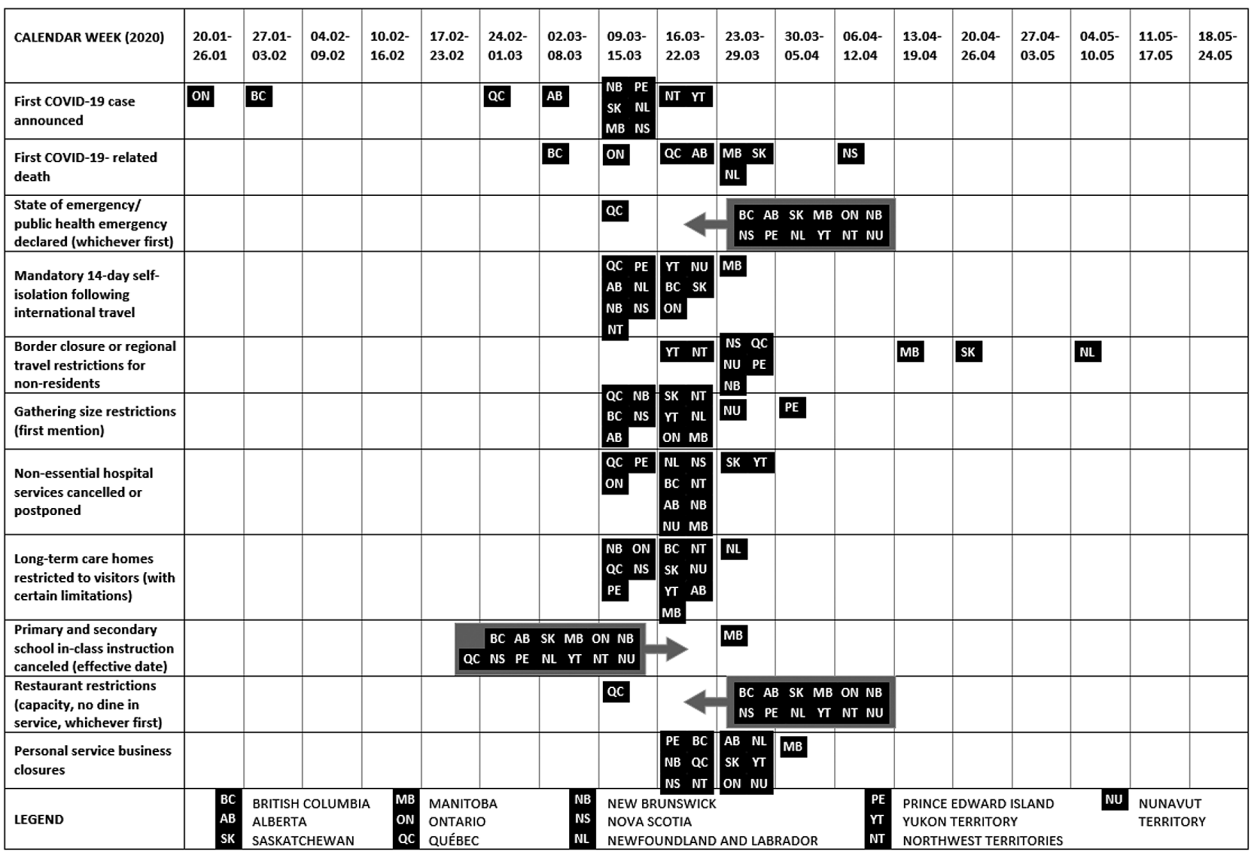


Figure III. Timeline of critical moments, public health measures, and restrictions in Canadian provinces and territories by calendar week, January 20 to May 24, 2020

Source: [17–19, 21–23, 25–28, 76, 171, 171–199, 199–214].

from Canada's second case from British Columbia were sent to the British Columbia Centre for Disease Control with confirmation of positivity by the NML [81]. It was at this time that the NML assisted with determining what assays were needed for the detection of SARS-CoV-2 and then helped to validate the laboratory developed tests used by the provincial public health laboratories [80, 82]. During the first month, cases were tested at the provincial laboratories with confirmation by the NML until the regional testing facilities could establish laboratory developed tests for patients [83, 84]. Many of these assays were validated using proficiency panels developed and sent out by the PHAC. As COVID-19 is a notifiable infection, all positives were reported on a daily basis to the provincial or territorial health departments and then to the PHAC to be used in modelling algorithms and to guide government policy [84, 85]. Many provinces and territories rolled out an online COVID-19 self-assessment tool and COVID-19 assessment centres to increase screening and to reduce the burden on hospitals with test results available for patients on online portals [86–89]. Health Canada approved commercial assays to help increase testing capacity [90].

To assist with the documentation of past infections and to carry out sero-surveillance studies, the NML and its provincial partners, such as the Canadian Public Health Laboratory Network, performed detailed evaluations of the performance characteristics of various commercial serological platforms [84]. As of late May 2020, the NML was in the process of developing in-house serological assays for COVID-19 as part of an ongoing collaborative effort with intergovernmental and academic groups to validate non-commercial assays [91]. The NML also generated a number of serological reference panels key in carrying out cross validation of both commercial and in-house assays [91]. On May 12, 2020, Health Canada approved the first serological test in the country, which will be administered to one million Canadians over the next two years [92, 93].

Technology and research

Shift to virtual care

The use of virtual care, specifically telemedicine, has been around since the 1970s in Canada to aid residents of remote and rural areas in receiving medical care [94]. Despite the availability of this technology in the country, the scale up of virtual care innovation leveraging videoconferencing and other internet-based technologies had been slow prior to COVID-19 [94, 95]. Many of the challenges were related to policies pertaining to privacy of information, the quality of virtual care, and varying systems across providers and organizations [94, 95]. During the COVID-19 pandemic, increased integration of virtual care services was swiftly implemented to ensure that patients could be treated remotely to reduce transmission within communities and within health care settings (e.g., community health clinics, outpatient hospital departments) [97]. To support this, every province and territory in Canada issued statements and changes to the regulations to encourage the use of virtual care [98]. In many jurisdictions across the country, physicians were previously not remunerated for consultations provided via virtual care but during the early days of the pandemic, specific billing codes were introduced [98]. Certain provinces (e.g. Ontario, Alberta) issued further billing codes for virtual mental health related physician services [99, 100]. These changes led to a dramatic shift towards virtual care. By the end of May 2020, 80% of all patient appointments were being conducted virtually in primary care practice and 89% of patient communication was done by telephone, virtual consult, e-mail, or text [101].

Global Public Health Intelligence Network

The Global Public Health Intelligence Network (GPHIN) was created in 1997 by the Government of Canada in collaboration with the WHO and maintained by the Centre for Emergency Preparedness and Response of the PHAC [102–104]. The GPHIN sorts through thousands of articles daily in ten languages, which are then translated into English [105, 106]. The analyzed articles are from national and local newspapers and select newsletters worldwide [102, 107]. Besides local headlines, the GPHIN also overviews the sports, finances, and travel sections of publications as they may indicate a significant public health occurrence [108]. The GPHIN database contains the articles that are deemed highly relevant based on an automatic scoring algorithm, whereas articles with lower relevancy scores are manually assessed by analysts [102]. The GPHIN issued early alerts during previous outbreaks such as SARS, H1N1 Influenza, and MERS [108, 109]. Post-SARS, numerous countries increased their surveillance through the use of the GPHIN outputs [108]. In regards to the COVID-19 pandemic, the GPHIN system was instrumental in alerting the WHO and the ministries of health in Canada and in 85 countries with an initial report going out on December 31, 2019, to 800 subscribers [110].

Contact tracing

Traditionally, most contact tracing in Canada has been carried out by trained professionals from public health authorities [111]. Given the large scale of the COVID-19 pandemic, there has been an increase in the development of contact tracing apps to automate the process [112]. These apps have the potential to inform individuals of their risk of infection and to allow governments to make decisions about closures or restrictions in specific locations, instead of carrying out mass lockdowns [113]. The first province to launch one of these apps was Alberta through ABTraceTogether [114]. Using Bluetooth technology, the app determines which users have been within two metres of each other for a minimum of 15 minutes during a 24-hour period of time [114, 115]. This technology is being used to supplement the routine Alberta Health Services manual con-

tact tracing process whereby if an infected individual has the app downloaded, the tracer will ask for consent to obtain the history of encounters from the app [115]. However, by May 22, 2020, only about 4% of Alberta's population had downloaded the app [116]. Furthermore, in a telephone survey conducted by Mainstreet Research in early May 2020, 57% of the 1,404 residents surveyed disapproved of the mandatory use of contact tracing apps [117]. Hence, even though the technology could help hasten the contact tracing process, its success is dependent on the majority of the population using it, which some experts suggest is 60% [118]. Other Canadian jurisdictions that provide or are planning to offer contact tracing apps for their residents include British Columbia, Québec, New Brunswick, and Newfoundland and Labrador [113, 114, 119].

National research funding

On March 6, 2020, the Canadian federal government announced $27 Million (2020 CAD) in funding for COVID-19-related research [120]. Five days later, a further $275 Million (2020 CAD) investment in research and development, including the Canadian development of a vaccine, was made [43]. This was followed by an announcement on April 23, 2020, of more than $1 Billion (2020 CAD) going towards a national strategy for COVID-19 medical research [121]. As of April 2, 2020, a total of 99 COVID-19 research projects have been funded, spanning the fields of vaccine research, therapeutics, epidemiology, and public health measures [122].

Public opinion

Crisis management, particularly a society's reaction towards the actions taken by the executive branch, can become a defining moment for the government, or in cases of blunder and mistakes, a period of loss in popular support. In Canada, 67% of respondents polled by the Angus Reid Institute expressed satisfaction with the federal government's handling of the COVID-19 pandemic in late May 2020, which was up from 49% in early March 2020 [123]. A similar result was indicated via another poll conducted by Nanos Research, which found that 54% of the respondents felt satisfaction or optimism towards the federal government in April 2020, up from 30% in June 2019 [124]. In terms of federal leadership, 38% of the respondents chose the Prime Minister of Canada, Justin Trudeau, as the preferred choice for Prime Minister in early May 2020 compared to 31% in late March 2020 (Nanos Research) [125, 126]. Over the same time period, this metric declined from 21% to 17% for the leader of the Official Opposition, Andrew Scheer [125, 126]. In another poll conducted between late February 2020 and late May 2020, Prime Minister Trudeau saw a rise in approval rating from 33% to 55% (Angus Reid Institute) [123]. Furthermore, support for the Liberal Party of Canada increased from 26% to 37%, while that for Her Majesty's Loyal Opposition, the Conservative Party of Canada, saw a decline from 34% to 31% [123]. Taking into consideration that Canada has a first-past-the-post electoral system, an increase of this size in preference of the Liberal Party of Canada, amidst the outbreak, holds significant value, when evaluating the society's political reaction to the virus.

Generally, Canadians overwhelmingly supported a lockdown, as shown in a poll conducted in late March 2020 (DART & maru/BLUE Voice Canada Poll) [127]. Overall, 90% of the respondents felt that the restrictions should continue until the health care system was able to manage the infections or there was a solution to stopping the spread of the coronavirus, given that there was governmental financial support [127]. In terms of approval for the lockdown at the expense of the economy, 70% of Canadians strongly or somewhat disagreed with reopening businesses if the virus had not been fully contained, as found in an Ipsos poll conducted in mid-April 2020 [128]. In contrast, more than 50% of respondents from Russia, China, Italy, India, and Germany showed preference in opening the economy [128]. Anti-lockdown protests have occurred in Canada but they were limited in size, not attracting crowds greater than 500 people [129, 130].

The Canadian federal and provincial/territorial governments have commended Canadians on their efforts to physically distance, despite the economic and social costs felt by many [131, 132]. This may be attributed to uniform messaging and communication presented about COVID-19 across the country, as documented in a study from April 2020 [133]. The research indicated that there was agreement across political parties in messaging to the public with respect to public health measures, such as physical distancing, staying home, avoiding socializing, keeping a distance of two metres, and avoiding travel [133]. Furthermore, a survey of Canadians evaluated their perceptions and knowledge of COVID-19 and found an overall low level of misconceptions regardless of political ideologies [134].

Further considerations

Governance and pandemic preparedness

The federal government, through the PHAC's Centre for Emergency Preparedness and Response, provides guidance to the provincial and territorial health sectors for pandemic preparedness and response to prevent outbreaks, minimize serious illness and deaths, and mitigate societal disruption [38]. The provinces and territories, however, have jurisdiction over their public health actions during a pandemic (including COVID-19), resulting in diverse responses across Canada. Each province or territory's approach to health governance varies with the primary difference being whether the health authority is centralized or regionalized. A decentralized health governance approach (i.e. a regionalized approach) structures the health system such that regional areas are responsible for the delivery and administration of health services in specific geographical areas [33]. Additionally, the vast majority of physicians in Canada work as independent contractors, further decentralizing health service deliv-

ery [33, 135]. Four out of the ten provinces in Canada (Alberta, Saskatchewan, Nova Scotia, Prince Edward Island) take a highly centralized approach to clinical service delivery [136, 137]. With respect to the pandemic response, the structure of the health authority does not have a relation with the existence of a central pandemic preparedness plan, as all of the provinces and territories have such documents [138–150].

Reopening strategies

Every province and territory has established a pandemic exit strategy to provide guidance for when restrictions around interpersonal interactions and business closures would ease [151–163]. The majority of the strategies took a phased or staged approach, stipulating the safety and risk assessment criteria that must be met before progressing to the next phase or stage. Although there are jurisdictional differences in the reopening plans, each phase or stage roughly corresponds to:

(1) Expanding interpersonal connections, allowing small group gatherings, and opening certain non-essential businesses and services;
(2) Allowing larger group gatherings, opening outdoor spaces, easing restrictions on business requirements;
(3) Removing restrictions on non-essential travel; and
(4) Resuming all indoor and outdoor businesses and activities, reopening borders and allowing provincial/territorial travel.

Due to certain geographic areas having greater levels of COVID-19 infections, Alberta, Québec, and Ontario took a regionalized approach to reopening in some communities [164]. As of May 26, 2020, British Columbia, Alberta, Saskatchewan, Manitoba, Québec, New Brunswick, Prince Edward Island, and Newfoundland and Labrador were the furthest ahead with their reopening plans, allowing for the resumption of some retail and personal services, as well as the loosening of restrictions around social gatherings [151–154, 156, 157, 159, 160].

Improving responses to future health emergencies

The variation between the provincial and territorial responses to the COVID-19 pandemic and the limited role of the federal government in the provincial and territorial responses has led many politicians and media outlets to question whether Canada needs a more centralized and unified response to national public health emergencies [165–168]. Some of these criticisms may be politically motivated, however, the strengths and weaknesses of Canada's current public health governance structure will be a focus of research and policy analysts in preparation for transitioning out of the pandemic and for dealing with future emergency states.

The COVID-19 outbreak provides researchers and policy-makers a case-study on how to improve responses to future health emergencies where there is a substantial amount of formative health and policy-related data being created for both real-time and historical public health service research and quality improvement endeavours. As was the case with the SARS outbreak leading to the inception of the PHAC in 2004 [29], the COVID-19 pandemic may lead to a renewal of the public health infrastructure in Canada in order to better harmonize the federalized governance of the public health system in the country. Improved communication between jurisdictions and increased support for routine and surged operations can help create a robust system of public health resources across Canada for the future.

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