Canada's Decentralized "Human-Driven" Approach During the Early COVID-19 Pandemic

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Abstract

Canada’s COVID-19 response during its first 100 cases was compared to nations and jurisdictions that were affected by the Middle East Respiratory Syndrome and/or Severe Acute Respiratory Syndrome. Canada’s “human-driven” approach was decentralized and uncoordinated, while a number of Asian nations demonstrated “tech driven” approaches that were centralized, coordinated, rapid, and comprehensive. Canada’s higher mortality rate may be partially attributed to their early and inadequate approach, and public health officials should consider an early “tech-driven” approach in future pandemics.

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Viewpoint

Canada's Decentralized "Human-Driven" Approach During the Early COVID-19 Pandemic

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Abstract

A country's early pandemic response is critical for controlling the disease outbreak. During COVID-19, a number of southeast Asian countries utilized a centralized, coordinated, rapid and comprehensive approach that involved smart technology ("techno-driven"). In comparison, Canada's approach appeared to be decentralized, uncoordinated, and slow, and focused on educating citizens and enhancing social and human capital ("human-driven"). We propose that in future pandemics, early and coordinated "techno-driven" approaches should receive more careful considerations to curtail outbreaks, but must be balanced with protecting individuals' freedoms.

Introduction

On December 31st, 2019, the World Health Organization (WHO) was alerted to a pneumonia of unknown cause in Wuhan, China [1]. In January, the novel coronavirus was identified, its RNA sequenced, and a public health emergency of international concern was declared. In February, WHO announced COVID-19 as the name for the new coronavirus disease, and one month later, it characterized the outbreak as a pandemic [1].

For years, WHO has provided global leadership for pandemic preparedness and response. It has recognized that early and effective planning can attenuate social and economic disruption, threats to essential services, and difficulties with production levels, distribution and shortages of supplies [2]. Consequently, they have created a comprehensive framework that guides national actions with planning and coordination, pandemic disease surveillance, monitoring impact (i.e. medical supplies), reducing spread of disease, and communications [3]. Inherent to the framework is the capacity to determine the pathogen's effect as early as possible so that the proportionate response can be executed [4,5]. Determining disease severity and transmissibility through early identified cases is key: cases known as the first few hundred [5].

Evaluating early national responses to their first few hundred COVID-19 cases may be useful to optimize future global pandemic actions. Canada's first case was reported on January 25th, 2020 [6], and forty-five days later, its 99th case was announced. Canada's response during this critical time largely employed a "human-driven" approach, which relied on educating citizens and enhancing social and human capital [7].

In this viewpoint, we are critical of Canada's "human-driven" approach by contrasting it to key recommendations of the WHO's pandemic document [3] and "techno-driven" approaches that were effective in other countries. A "techno-driven approach" relies on top-down initiatives that mandates widespread utilization of smart technology [7], and includes measures such as contact

tracing applications and data collection surveillance.

Planning and Coordination

Ironically, one of Canada's most important global contribution was in the midst of a long overdue upgrade during the initial stages of the COVID-19 pandemic. The Global Public Health Intelligence Network (GPHIN) is an all-hazards software surveillance system developed by the federal government to provide situational awareness by collecting and analyzing new articles, incident reports and media releases from multiple sources and languages [8]. Credited with helping identify the SARS and H1N1 outbreaks, and having WHO as one of its many subscribers, its effectiveness may have been attenuated by an outdated algorithm and limited data sources [9]. Instead, a private Canadian software company called BlueDot was not only the first to warn of the new illness [10], but also predicted the next 11 cities that would be affected. As both inadequate funding and an aging network have been cited as challenges for the GPHIN, collaborating with non-governmental big data research centers may be the alternative for the future.

On January 15th, while only a few cases of COVID-19 had been reported globally, the Public Health Agency of Canada (PHAC) triggered the Federal, provincial and territorial (F/P/T) Public Health Response Plan for Biological Events and activated the Health Portfolio Operations Centre [11]. The former was to facilitate efficient, evidence based, timely, consistent and coordinated approaches across jurisdictions, while the latter acted as the point of contact for operational communications and emergency management governance support [12]. As COVID-19 spread globally, its identity began to take shape: asymptomatic carrier transmission (Feb. 21st) [13], R_0 ranging from 1.4 to 3.11 (Jan. 23rd) [14,15], case fatality ratio of 3.5%, and a mean incubation period of approximately 5 days (Feb. 17th) [16].

Regardless of the GPHIN setback, it is evident that early during its first 100 cases, Canada's public health system was assembled and aware. A gradual federal stepwise response ensued (Table

1), and the Canadian Public Health Response Plan for Biological Events was heightened to Level Three – “Escalated”.

Date	Federal Government's Intervention(s)	China cases (new)	China deaths (new)	Global cases (new)	Global deaths (new)	Countries/ Territories /Areas	Canada cases (new)	Canada deaths (new)	Canada tests (per million)[b]
Jan 15	PHAC[a] activated Emergency Operations Centre	41	2 (1)	1	0	2	0	0	0
Jan 22	Screening for travellers returning from China	571 (131)	17 (11)	9	0	8	0	0	0
Feb 9	Screening for travellers returning from affected areas (10 airports 6 provinces)	40 171 (2 973)	908 (97)	382 (28)	2 (0)	26	7 (0)	0	346 (0.000001 3)
Feb 27	Escalation to Level Three Response Level (Public Health Response Plan for biologic events)	78 824 (327)	2 788 (44)	4 228 (905)	70 (14)	53	14 (2)	0	1 663 (0.00004)
Mar 13	Advised avoiding all non-essential travel outside of Canada	80 824 (11)	3 189 (13)	64 592 (10 896)	2 239 (434)	136	198 (56)	1 (0)	21 251 (0.00056
Mar 16	Advised travellers entering Canada to self-isolate for 14 days	80 881 (21)	3 226 (13)	101 533 (12 876)	3 936 (629)	160	441 (100)	4(3)	40 935 (0.0011)
Mar 18	Banned foreign nationals from all countries (except US); US Canada border closed; redirected all international passenger flight arrivals to 4 airports; announced financial help	80 928 (34)	3 245 (8)	137 816 (20 551)	5 706 (964)	177	727 (129)	9 (1)	60 845 (0.0016)
Mar 25	Quarantine Act mandated all returning travellers to isolate themselves for 14 days	81 285 (67)	3 287 (6)	389 750 (48 394)	17 995 (2 382)	198	3 409 (617)	36 (3)	138 700 (0.0037)

Table 1. Canada's Federal Government's early response to the COVID-19 pandemic.

However, despite the continuation of significant interprovincial air, train, road and marine transportation and travel, a coordinated P/T response did not follow, and public health actions were initiated on different dates, or not at all (Table 2).

Action	British Columbia[17]	Alberta[18]	Saskatchewan[19]	Manitoba[20]	Ontario[20]	Quebec[22,23]	New Brunswick[25]	Nova Scotia[24]	PEI[26]	Newfoundland and Labrador[27]	Yukon[28]	Northwest Territories[29]	Nunavut[30]
Self-isolation advised if returning from China	Feb 4th	Feb 6th	Feb 13th	Feb 7th	Feb 6th	Feb 8th	Feb 7th	Feb 6th	Feb 28th	Feb 6th	Feb 7th	March 10th	NA
Self-isolation advised if returning from cruises	Feb 19th	March 5th	NA	NA	NA	March 10th	NA	NA	NA	NA	NA	March 10th	NA
Self-monitoring of symptoms if travelled anywhere	Feb 24th	March 6th	March 11th	Feb 27th	March 10th	March 11th	March 1st	March 9th	March 9th	March 6th	March 13th	March 14th	March 4th
Self-isolation advised if returning from Iran and China	March 3rd	March 2nd	March 5th	March 5th	March 3rd	March 3rd	March 9th	March 13th	NA	NA	March 13th	March 10th	NA
Self-isolation advised if returning from Italy	NA	March 12th	March 9th	March 12th	March 13th	March 10th	March 11th (HCW only)	March 13th	NA	NA	March 13th	March 14th	NA
Self-isolation advised if returning from outside of Canada	March 12th	March 12th	March 14th	March 15th	March 14th	March 12th	March 19th	March 15th	March 13th	March 14th	March 16th	March 15th	March 15th (announced March 18th)
Screening event participants (symptoms, international travellers)	March 3rd	March 10th	March 16th	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Social distancing recommended	March 7th	March 13th	March 11th	March 12th	March 15th	March 12th	March 12th	March 13th	March 13th	March 13th	March 16th	March 17th	March 13th
Testing announced – travel to at-risk areas & local transmission	Jan 21st	Feb 26th	Feb 13th	Jan 28th	Jan 24th	Jan 22nd		Feb 6th	Feb 28th	Feb 6th	Jan 14th	February 5th	*NA*
Testing expanded to any international traveller with symptoms & contacts	Feb 25th	March 6th	March 11th	Feb 27th		March 8th	March 1st	March 9th	March 9th	March 6th	March 16th	March 14th	*NA*
All resp specimens tested for COVID-19	NA	March 12th	NA	March 12th	March 5th	NA	NA	NA	NA	NA	NA	NA	NA
First testing centre(s) opened	March 13th	March 15th	March 13th	March 12th	March 13th	March 9th	March 16th	March 11th	March 11th	March 21st	March 26th	March 23rd (drive-through)	-

Table 2. Early Response from provincial and territorial governments.

HCW – health care workers; PEI – Prince Edward Island

Pandemic Disease Surveillance

WHO recommends a comprehensive assessment of the earliest cases, with the documentation of geographical spread, trends, and impact to better inform the public health response [3]. Canada prioritizes the protection of individual privacies, collected volunteered data, and relied on the coordination between national and P/T departments [7]. On February 10th, PHAC provided interim surveillance guidelines with COVID-19 case definitions to guide P/T legislation, regulations and policies [31]. This included reporting cases nationally to PHAC within 24 hours of notification, P/T case interviews to identify close contacts, and monitoring health status. Identified close contacts were categorized based on risk exposure, with high risks requiring intermittent public health monitoring only.

During the first 100 cases which concluded on March 10th, Canada performed approximately 11,023 tests, with significant variation between P/Ts. Testing was initially processed at Canada's National laboratory in Winnipeg; an inefficient process that led to delayed reporting. By February 25th, only provincial labs in Ontario and British Columbia were ready for independent testing, but routine COVID-19 testing for respiratory specimens was not implemented until later. CBC news reported on testing variations, and noted P/T differences in rate of testing, groups that were "targeted", and frequent changes to policies [32]. Together, these actions led to large exclusions of asymptomatic and even symptomatic patients outside the "targeted" groups [32].

Buoyed by lessons learned from previous pandemics, South Korea launched an expansive and organized surveillance program that could objectively verify contact investigations. Recognizing that interviews would result in omitted or erroneous information, the importance of evaluating between-person risk and the elimination of infection exposure in contaminated places

were prioritized. Interviews, medical facility records, credit card transactions, closed-circuit television and medical facility records were utilized to determine case location, exposure risk evaluation, and contact classification [33]. Social media apps were employed that informed of potential contacts with infected persons. During their first 100 cases, 13 302 tests were conducted over a 30-day period [34]. Commercial test kits were rapidly developed, and drive through screening centers were created early. This allowed for increased testing capacity and prevention of cross-infection of testees by eliminating public waiting spaces [35].

South Korea's techno-driven approach allowed for a wider spectrum of societal surveillance and the capturing of cases well beyond Canada's human-driven approach that focused on interview and testing of hospitalized patients, health-care workers, residents in long term facilities, or other "clusters". Interestingly, while the approaches were somewhat polarizing on individual privacy versus public safety priorities, as the COVID-19 pandemic progressed in Canada, discussions around implementing techno-driven measures began to intensify.

Reducing the Spread of COVID-19

Individual/Household Level Measures

Individual/household level measures minimize interactions within and outside the home at the onset of symptoms [3]. During Canada's first 100 cases, only self-isolation recommendations of positive cases, close contacts and those returning from high-risk travel regions prevailed. Later, as COVID-19 cases intensified, an Emergency Order under Canada's Quarantine Act legally mandated self-isolation after international travel with violators facing significant financial penalties and/or imprisonment.

In contrast, Singapore's experience of rapidly containing the SARS outbreak led to the quarantine of 425 close contacts at home or designated government facilities, after only 36 cases

from three clusters were identified [36]. “Close contacts” were identified as individuals who had spent a prolonged period of time within 2 meters of the confirmed case. “Other contacts”, or those with some interactions with the confirmed cases, were also followed. The health and location status of the contacts were routinely monitored via video conferencing or phone surveillance, clear directives were provided in lieu of becoming unwell, and quarantine violators were tagged with continuous tracking devices. These actions were deemed necessary to document early community transmission and facilitate containment efforts [36].

Societal Level Measures

Societal level measures include social distancing with a focus on school suspensions, working pattern adjustments, reduction of crowding in public transportation and cancellation, modification or restriction of mass gatherings [3]. Only two provinces recommended social distancing during Canada’s first 100 cases; all the aforementioned social level measures were employed later.

In contrast, Hong Kong’s experience with SARS demonstrated the importance of early community measures to reduce population contacts [37]. Within days of their first reported case, theme parks were closed, cross border bus services were suspended, school reopening was postponed, and civil servants adopted flexible working arrangements including options from home [38]. These restrictions, together with other non-pharmaceutical interventions were associated with reduced COVID-19 transmission [38].

International Travel Measures

International travel measures have been very contentious during the pandemic as WHO recommended implementing exit screens and advice to travellers [3], but not border closures. The Canadian government did create a basic contact information form with the Canadian Border

Security Agency, but 31 of 2 226 travellers from the Hubei province were referred to PHAC, and of these, only three were medically examined [39]. Travellers from affected areas were also screened, (Table 1), although more than half of infected people would be undetectable and missed because of unknown exposures or lack of symptoms [40]. Self- isolation after travel was also advised by most P/Ts in an incremental fashion, but sizable discrepancies of initiation dates could be noted (Table 2). On February 27th, an open letter from 23 Chinese-Canadian doctors urged for stronger measures that included a 14-day quarantine for travellers returning from COVID-19 hotspots [41]. Such measures, including escalation to closed international borders and restricted domestic travel would be realized well after the first 100 cases.

In contrast, Taiwan's national command center, a response to the SARS outbreak, rapidly implemented border control measures [42]. Passengers completed a health questionnaire upon arrival, and by integrating big data from national health and immigration registries, officials were able to quickly classify infectious risk status based on flight origin and travel history [42]. Those with minimal risks received a mobile pass that facilitated faster immigration clearance, while others identified as high risk were screened for 26 viruses, placed on home quarantine, and monitored electronically for compliance [42]. Further action including flight and visitor visa restrictions would ensue, but they cannot underscore Taiwan's early border response that began on the day China disclosed its first case.

Continuity of Health Care and Provision

Infection Control and Personal Protective Equipment (PPE)

According to WHO, enhancing infection control practices and distributing personal protective equipment (PPE) are important actions during an early pandemic response [3]. During the first 100 cases, PHAC evaluated domestic supplies of PPE, and began to conserve and

coordinate supplies due to mounting market pressures [39]. Only later, after recognizing that their stockpile was not adequate, Canadian companies were asked to adjust their production lines to begin manufacturing PPE.

In contrast, Taiwan was active to bolster medical supplies very early in the pandemic. Specifically for PPE, authorities halted their exports, acquired assembly lines to boost domestic production, mobilized military personnel to assist manufacturers, and established a central distribution system. Using a cloud computing system, it also developed a rationing system based on national health insurance data [43] so that hoarding PPE could be avoided. This was no small task. In order to ensure that the new application would not overwhelm the cloud, which normally stored medical records, twenty new servers were set up by engineers in one day.

Mobilizing the Health Care System

Pandemic contingency plans that mobilize health systems, facilities and workers [3] may be more complicated in countries like Canada, where the federal government has limited authority for the management, delivery and organization of services. The federal PHAC did trigger a P/T public health response plan. However, what resulted over the first 100 cases was a patchwork of decentralized P/Ts responses, rather than quick, decisive and cohesive actions that could have mitigated risk [44].

In contrast, Singapore's Ministry of Health coordinated their COVID-19 activities through centralized systems. At the onset of their response, they activated a crisis system that enabled daily text messaging to the country, two-way communication channels with hospital executives, epidemiologists and operational workgroups, and facilitated cross-hospital information sharing [45]. Their hospital systems were prepared through routine mass infectious crisis simulations that involved staff at every level [45].

Communications

Finally, communications with the public on disruptions, sources and resources for medical needs, and COVID-19 itself [3] was conducted largely by PHAC and P/T authorities. Early in the pandemic, frequent press conferences often lacked clarity, problems of uniform messaging between provinces and the federal government were noted, and releases of aggregate case statistics were inconsistent in timing and details [46]. When questioned whether the federal government should take a more proactive role in messaging and publishing data, Deputy Prime Minister Chrystia Feeland responded that “Canada is not a highly centralized country” [46].

Singapore recognized social media’s contribution to information flow during SARS, through its volume of utilization and ease of creating false narratives [47]. Since its first case, Singapore’s government has provided daily updates from traditional platforms such as print, broadcasts and town hall meetings, and more importantly, websites and social messaging (WhatsApp, Twitter, Facebook, Telegram) [47]. WhatsAPP - due to high penetration – was upgraded with artificial intelligence translation, easy sign up, fast updates and end-to-end data encryption, to manage its increased demand and need to rapidly deploy information.

Beyond the First 100 Cases

As the pandemic progressed beyond the first 100 cases, Canadian officials began to look towards more “techno-driven” approaches to control its spread. For example, one app named “COVID Alert” was developed to inform citizens of possible exposures [48], but despite protecting privacy its adoption was not widespread. Testing became more streamlined, with many jurisdictions providing drive through facilities. International and provincial borders closed, PPE production and supplies were bolstered, and societal measures were amplified. Canada’s

later actions mimicked the very early interventions from southeast Asian countries, but continued to be largely uncoordinated between provincial entities.

Implications

Canada's early decentralized "human-driven" approach resulted in inefficient testing, suboptimal disease containment and an inadequately mobilized health care system. These observations have also been noted in other Western democracies who value protection of individuals' privacy, consensus building, and information sharing [7]. A coordinated "techno-driven" approach offers several pragmatic advantages, but concerns about freedom and individuals' rights must be considered. For future pandemics, the challenge may be to intentionally develop "techno-driven" approaches to assist with coordinated national responses while protecting individuals' privacies and freedoms.

Conclusions

Canada's COVID-19 response during its first 100 cases could be characterized as decentralized, uncoordinated, slow, and "human-driven". In contrast, a number of southeast Asian nations and jurisdictions that had wrestled with significant and recent pandemics demonstrated early responses that were centralized, coordinated, rapid, comprehensive and "techno-driven". Although they shared borders with China, received high volume travel from Wuhan, and/or became involved in the pandemic very early, their mortality rates miniscule to Canada's. To optimize future action, an early coordinated approach that is "techno-driven" could be considered by Canadian public health officials.

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Supplementary Files