

Health Reform Observer - Observatoire des Réformes de Santé

VOLUME 11

| ISSUE 1 |

ARTICLE 1

Comparison of COVID-19 Vaccination Rollout Approaches across Canada: Case Studies of Four Diverse Provinces

Tiffany FITZPATRICK, *University of Toronto, Toronto, Ontario, Canada*

Cheryl A. CAMILLO, *University of Regina, Regina, Saskatchewan, Canada**

Shelby HILLIS, *University of Saskatchewan, Saskatoon, Saskatchewan, Canada**

Marin HABBICK, *University of Toronto, Toronto, Ontario, Canada**

Dane MAUER-VAKIL, *University of Toronto, Toronto, Ontario, Canada*

Monika ROERIG, *University of Toronto, Toronto, Ontario, Canada*

Nazeem MUHAJARINE, *University of Saskatchewan, Saskatoon, Saskatchewan, Canada**

Sara ALLIN, *University of Toronto, Toronto, Ontario, Canada**

*Coronavirus Variants Rapid Response Network (CoVaRR-Net) affiliates

1 February 2023

Special Issue: COVID-19 Pandemic Policies and Systems Reforms

Guest Editors

Cheryl A. CAMILLO, *University of Regina*

Peter BERMAN, *University of British Columbia*

Sara ALLIN, *University of Toronto*

RECOMMENDED CITATION: Fitzpatrick T, Camillo CA, Hillis S, Habbick M, Mauer-Vakil D, Roerig M, Muhajarine N, Allin S. 2023. Comparison of COVID-19 Vaccination Rollout Approaches across Canada: Case Studies of Four Diverse Provinces. *Health Reform Observer - Observatoire des Réformes de Santé* 11 (1): Article 1. <https://doi.org/10.13162/hro-ors.v11i1.5118>

Abstract

Across Canada, there were notable differences in the rollout of provincial/territorial COVID-19 vaccination programs, reflecting diverse sociodemographic profiles, geopolitical landscapes, health system designs, and pandemic experiences. We collected information regarding underlying principles and goals, governance and authority, transparency and diversity of communications, activities to strengthen infrastructure and workforce capacity, and entitlement and access in four diverse provinces (British Columbia, Saskatchewan, Ontario, Nova Scotia). Through cross-case analysis, we observed significant differences in provincial rollouts of the primary two-dose vaccination series in adults between December 2020 and December 2021. Nova Scotia was the only province to state explicit coverage goals and adhere to plans tying coverage to the relaxation of public health measures. Both Nova Scotia and British Columbia implemented fully centralized vaccination booking systems. In contrast, Saskatchewan's initial highly centralized approach enabled the rapid delivery of first doses; however, rollout of second doses was slower and more decentralized, occurring primarily through community pharmacies. In alignment with its decentralized health system, Ontario pursued a regionalized approach, primarily led by its existing public health unit network. Our research suggests explicit goals, centralized booking, and flexible delivery strategies improved uptake; however, ongoing learning will be crucial for informing the success of future vaccination efforts.

Au Canada, le déploiement des programmes provinciaux et territoriaux de vaccination contre la COVID-19 présente des différences notables d'un océan à l'autre. Ces différences reflètent la diversité des profils sociodémographiques, des paysages géopolitiques, des conceptions du système de santé et des expériences pandémiques. Nous avons recueilli des renseignements sur les principes et les objectifs sous-jacents, la gouvernance et l'autorité, la transparence et la diversité des communications, les activités visant à renforcer l'infrastructure et la capacité de la main-d'œuvre ainsi que l'admissibilité et l'accès dans quatre provinces différentes (la Colombie-Britannique, la Saskatchewan, l'Ontario, la Nouvelle-Écosse). Grâce à une analyse transversale des études de cas, nous avons constaté d'importantes différences dans les déploiements provinciaux de la série de primovaccination à deux doses chez les adultes, entre décembre 2020 et décembre 2021. La Nouvelle-Écosse a été la seule province à énoncer des objectifs de couverture explicites et à adhérer à des plans liant la couverture à l'assouplissement des mesures de santé publique. La Nouvelle-Écosse et la Colombie-Britannique ont toutes deux mis en place des systèmes de réservation des vaccins entièrement centralisés. En revanche, l'approche initiale hautement centralisée de la Saskatchewan a permis la livraison rapide des premières doses. Toutefois, le déploiement des deuxièmes doses a été plus lent et plus décentralisé, s'effectuant principalement par le biais des pharmacies communautaires. Conformément à son système de santé décentralisé, l'Ontario

a adopté une approche régionalisée, essentiellement dirigée par son réseau existant de bureaux de santé publique. Nos recherches suggèrent que des objectifs explicites, un système de réservation centralisée et des stratégies de prestation flexibles ont amélioré le taux de participation des citoyens. Mais une culture d'apprentissage continu jouera un rôle déterminant pour assurer le succès des futurs efforts de vaccination.

Key Messages

- Sharing COVID-19 vaccination campaign lessons and promising practices across Canadian provinces and territories will support ongoing and future vaccination efforts.
- Centralized vaccination booking and delivery processes appear to decrease barriers and improve vaccine uptake.
- Providing regional and local public health units and practitioners with flexibility to add targeted booking and delivery strategies can improve uptake and equity, especially among hard-to-reach populations.
- Setting clear vaccination coverage goals may improve uptake, particularly if coverage milestones are tied to other public health measures.

Messages-clés

- *Le partage des leçons tirées de la campagne de vaccination COVID-19 et des pratiques prometteuses entre les provinces et territoires canadiens soutiendra les efforts de vaccination actuels et futurs.*
- *Les processus centralisés de réservation et d'administration des vaccins semblent réduire les obstacles et améliorer la prise vaccinale.*
- *En donnant aux unités de santé publique régionales et locales et aux praticiens la possibilité d'ajouter des stratégies ciblées de réservation et d'administration, on peut améliorer la prise vaccinale et l'équité, en particulier parmi les populations difficiles à atteindre.*
- *La fixation d'objectifs clairs en matière de couverture vaccinale peut améliorer la prise vaccinale, en particulier si les étapes de couverture sont liées à d'autres mesures de santé publique.*

ACKNOWLEDGEMENT: We acknowledge the CoVaRR-Net Pillar 8 Public Health, Health Systems and Social Policy Impact investigative team, led by Dr. Nazeem Muhajarine, Dr. Cory Neudorf, Dr. Cheryl A. Camillo, Dr. Doug Manuel, and Dr. Andrew Morris. CoVaRR-Net is funded by the Canadian Institutes of Health Research (FRN# 175622).

1 BRIEF DESCRIPTION OF THE HEALTH POLICY REFORMS

Early in the COVID-19 pandemic, Canadian public health officials and policymakers concluded that mass vaccination would be key to slowing transmission and protecting Canadians long-term. On 9 December 2020, less than a year after the virus was identified, Health Canada authorized the first COVID-19 vaccine for use in adults ages 16+ (Health Canada 2022). In May and November 2021, Health Canada extended its authorization to youth ages 12-15 and children ages 5-11, respectively (Health Canada 2022).

Authorizing a vaccine for use is just one of many steps involved in implementing a vaccination program; resources must be allocated, vaccines procured, cold chain and vaccine management systems established, health workers trained, delivery and prioritization schedules determined, administration sites identified, public awareness and promotion campaigns launched, and monitoring and evaluation systems established (World Health Organization 2014). In accordance with Canada’s pandemic preparedness plan, the federal government led the procurement and allocation of COVID-19 vaccines while provincial, territorial, and Indigenous health authorities were responsible for delivering vaccine programs within their jurisdiction (Public Health Agency of Canada [PHAC] 2018). By mid-December 2020, each province and territory (PT) had designed and begun to roll out its COVID-19 vaccination program.

As of September 2022, over 80% of the total Canadian population had received their primary vaccine series, but only 60% of adults had received one or more booster doses. Given the ongoing evolution of SARS-CoV-2 variants, waning immunity from previous doses of vaccine or infection and variant-related immune escape, increased circulation of other respiratory diseases, and growing demands on the health care system, Canada’s Chief Medical Officers of Health (CMOHs) strongly recommended individuals stay up-to-date with their vaccines, including COVID-19 and influenza vaccines (PHAC 2022a).

To identify promising strategies to support the ongoing provision of primary and booster doses of COVID-19 vaccines to Canadians, we performed a comparative case study of four provincial COVID-19 vaccination campaigns using the method laid out by Marmor and colleagues (2005). Specifically, we conducted four comprehensive case studies (Fitzpatrick et al. 2022; Habbick et al. 2022; Mauer-Vakil et al. 2022; Rowin et al. 2022) describing provincial vaccination campaigns (or vaccination “systems”) and documenting how and why they developed.

Consistent with comparative case study research (Cacace et al. 2013), we used a standardized framework—the European Observatory on Health Systems and Policies’ COVID-19 Health System Response Monitor (HSRM)—to collect, organize, and analyze information about provincial vaccination systems (European Observatory on Health Systems and Policies 2022). The HSRM framework identified standard components of health systems’ responses to the COVID-19 pandemic, such as communication and planning to ensure

sufficient infrastructure and workforce capacity. It also provided a comprehensive set of questions to guide researchers' collection of information about each component. Published studies have used information collected using the HSRM to compare the COVID-19 vaccination rollout in small European countries (Palmer, Nemer, Menne 2021) and to review Mediterranean health systems' responses during the first six months of the COVID-19 pandemic (Waitzberg et al. 2022). We focused on vaccination-related components of the HSRM, adding or revising questions to capture the Canadian context; specifically, we collected information about the following components: the governance and authority of vaccination campaigns; the campaigns' underlying principles; their communications strategies, including activities taken to combat mis- and dis-information; approaches taken to ensure sufficient infrastructure and personnel to deliver mass immunizations; and vaccine entitlement and measures to enhance vaccine access. We drew campaign information from publicly available policy documents, news releases, and reports, complemented by mainstream media sources and unpublished materials provided by local experts. We selected four provinces—British Columbia (BC), Saskatchewan, Ontario, and Nova Scotia—for their diverse sociodemographic profiles; pandemic experiences, ranging from lowest to highest prevalence of COVID-19 variants of concern (Adeyinka et al. 2022); and, public health institutions, varying from highly regionalized to highly centralized. We did not include Québec due to the inability to access comparable source documents in English.

In this paper, we briefly summarize the four vaccination campaigns, identify key similarities and differences in campaign components, assess their delivery of primary doses of COVID-19 vaccines to adults in their first year of availability, highlight policies and approaches that may have improved adult access and uptake, and conclude by identifying promising practices and lessons to support future vaccination efforts.

2 HISTORY AND CONTEXT

On 25 January 2020, Canada's first confirmed case of COVID-19 was identified. By March 2020, community-transmitted cases were identified across Canada prompting all PTs to declare states of emergency and enact public health measures. Prior to COVID-19, the most recent significant communicable disease threats Canada faced were the 2002-2004 outbreaks of Severe Acute Respiratory Syndrome (SARS) in Toronto and Vancouver and the 2009 H1N1 influenza pandemic (Health Canada 2004; PHAC 2018). As a result of SARS having impacted Canada more than any other country outside of Asia, with a case fatality rate nearly double the global average, Canadian officials were motivated to take swift action against COVID-19 (Infection Prevention and Control Canada n.d.; Webster 2020).

In Canada, the federal and PT governments share jurisdiction over public health: the federal government provides funding and oversight while PT governments maintain responsibility for the organization and delivery of health services and public health programs (Health

Canada 2004). While the federal government also implemented focused interventions within their jurisdiction to promote the uptake of COVID-19 vaccinations, such as proof of vaccination requirements for federal employees and interprovincial travel, this analysis focuses on the activities within provincial purview. However, within the federal health portfolio, there are two key organizations of relevance: Health Canada, which regulates vaccines and therapeutics, and PHAC, which responds to public health threats and provides decision-making guidance to the PTs. The PHAC’s pre-existing *Canadian Pandemic Influenza Preparedness* (CPIP) plan provides a series of federal, provincial, and territorial (FPT) guidance documents for coordinating a consistent pandemic response. Key tenets of the CPIP include protecting population health through the implementation of public health measures and vaccinations. The CPIP heavily informed Canada’s COVID-19 response (PHAC 2018). It was considerably revised in 2018 to incorporate programmatic, ethical, and other lessons following the 2009 H1N1 influenza pandemic, including new sections in the *Public Health Measures* and *Vaccine Annexes* and *Pandemic Vaccine Prioritization Framework* describing vaccine allocation, distribution, and administration plans, and vaccine-specific roles and responsibilities (PHAC 2018). Reporting to PHAC, the National Advisory Committee on Immunization (NACI) provides recommendations related to the administration of vaccines (NACI 2020a). It is the purview of PTs how closely they follow NACI’s guidance.

Given that the causal pathogen of COVID-19, SARS-CoV-2, was a novel virus, global efforts were undertaken to quickly develop safe and effective vaccines. International cooperation, financial investments, and technological advances in genome sequencing and vaccine development facilitated rapid research and production (Ball 2021). By March 2020, human trials of COVID-19 vaccines had begun, with promising results shortly thereafter (Ball 2021). Consequently, policymakers and public health experts suggested widespread vaccination would be a viable, near-term solution to mitigate the health and socio-economic consequences of the pandemic. Countries began signing procurement agreements with potential COVID-19 vaccine manufacturers throughout 2020 (Canada 2021). By 19 November 2020, Canada had entered contracts to buy more vaccine doses per capita than any other country—enough to vaccinate its 38 million residents several times over (Canada 2020). The first doses were administered less than a month later, on 14 December 2020 (García-Ojeda 2020; PHAC 2020).

Leading up to the anticipated approval of the first vaccines by Health Canada, NACI released its first set of recommendations for COVID-19 vaccine administration (NACI 2020b). Under the assumption that logistical and supply challenges would limit Canada’s ability to administer vaccines to the general population until at least April 2021, NACI recommended Canadians at high risk of exposure or severe illness be prioritized. The goal of Canada’s COVID-19 vaccination response, as outlined in the PHAC’s *COVID-19 Immunization Plan: Saving Lives and Livelihoods* and consistent with the CPIP, was to immunize as many Canadians as quickly as possible while prioritizing high-risk populations (PHAC 2020). *The Immunization Plan* states all FPT health ministers agreed to the following principles to support the success of their vaccination campaigns: science-driven decision-

making, transparency, coherence and adaptability, fairness and equity, public involvement, and consistent reporting (PHAC 2020). In recognition of the growing challenge of vaccine hesitancy, both NACI and PHAC outlined approaches to support vaccine confidence (NACI 2020b; PHAC 2020); i.e., the Five Cs: confidence, complacency, convenience, communications, and context (Razai et al. 2021). By mid-2021, Canada had achieved one of the highest per capita COVID-19 vaccination coverages in the world (Cyr 2021); however, the degree to which these principles have guided vaccination efforts, as well as coverage and speed of vaccinations, varied across PTs, as did other components of provincial vaccination campaigns, as described in Sections 3 and 4.

3 THE POLICY-MAKING PROCESS

3.1 Governance of COVID-19 vaccination campaigns

While provincial public health authorities generally oversee vaccination activities, the scope and severity of COVID-19 necessitated the involvement of other actors, such as premiers, health ministers, CMOHs, and special committees and task forces. Provincial governance of COVID-19 vaccination campaigns was shaped by the composition of the pandemic response leadership team, the differential impacts of pandemic waves, the structure of the underlying health system, and partisan politics. Table 1 on the next page summarizes key factors that shaped campaign governance. Supplementary Tables 1 and 2 provide additional detail about contextual, institutional, and governance factors.

In Nova Scotia and Saskatchewan, the underlying health systems were highly centralized with leadership provided through a central provincial health authority; their COVID-19 responses have also been highly centralized. In contrast, BC’s and Ontario’s vaccination campaigns were shaped by their underlying health systems’ regionalization. Ontario has explicit organizational delineation between public health and health care activities, including 34 local public health units (PHUs) that provide leadership for the implementation and delivery of vaccination programs, plus various hospital and clinical care networks that provide leadership to hospital-based vaccination activities (Ontario Health 2022; PHO 2020). Guidance for PHUs was provided by Public Health Ontario (PHO), while Ontario Health provided guidance to clinical care networks (Ontario Health 2022; PHO 2020). British Columbia’s COVID-19 vaccination campaign was provincially coordinated through the Provincial Health Services Authority but implemented through its five Regional Health Authorities and a First Nations Health Authority, each overseeing both public health and health care activities (BC 2021a); the BC Centre for Disease Control (BCCDC) provided further decision-making support to vaccination efforts.

While provincial-level vaccination campaign decision-making was typically the responsibility of the Minister of Health, provincial CMOHs—or, in BC’s case the Chief Public Health Officer (CPHO)—played important advisory, management, and communication functions that varied according to their legislated roles, leadership capacity, and relationships with

Table 1: Governance of vaccination campaigns

	BC	SK	ON	NS
<i>Number of health authorities / public health units</i>	6	1	34	1
<i>Dedicated vaccine task force?</i>	No	Yes	Yes	Yes
<i>Degree of leadership centralization</i>	Highly centralized	Centralized	Decentralized	Highly centralized
<i>Leadership role of public health officials</i>	Strong	Strong local role / limited provincial role	Strong local role / limited provincial role	Strong
<i>Provincial election during pandemic?</i>	No	Yes	No	Yes
<i>Party forming government</i>	New Democratic Party	Saskatchewan Party	Progressive Conservative	Liberal; Progressive Conservative (post-election)

provincial political leadership. In all provinces, the CMOH is appointed by the premier with a mandate of working with provincial counterparts and intraprovincial partners (e.g., Minister of Health), providing leadership to public health activities, and advising government on matters of public health; however, the degree to which the CMOHs have legislated authority to manage public health activities or communicate with the public varies (Fafard et al. 2018). In BC and Ontario, the CMOH serves as “everybody’s expert” providing advice and communicating directly with the legislature and public, whereas Saskatchewan’s “technical officer” CMOH does not have legislative authority to do either. Nova Scotia’s “loyal executive” CMOH resembles a typical public servant with managerial roles but lacks formal authority to communicate directly with the public (Fafard et al. 2018).

Notably, all but BC formed dedicated COVID-19 vaccine task forces. The composition, level of technical expertise, and decision-making roles (and transparency) of the task forces varied. In Nova Scotia, a Vaccine Taskforce, chaired by the former Associate Deputy Minister of Community Services and comprised of key stakeholders like Doctors Nova Scotia and community advisory groups, has been mentioned in media updates, but there is limited public information about it (E. Smith 2021). In Saskatchewan, the key group advising the Ministry of Health (MOH) on an ongoing basis was the Clinical Expert Advisory

Committee on Immunization, which included individuals from multiple disciplines. Additionally, vaccination logistics were overseen by a multi-agency steering committee informed by the Immunization Planning Oversight Committee and other internal working groups (Saskatchewan 2021a), but relatively few steering committee guidance materials have been released. In Ontario, a COVID-19 Vaccine Distribution Task Force was established in November 2020, along with other internal and external “tables” comprised of technical experts and/or government representatives (Ontario 2020a), but the task force disbanded in August 2021 and did not reconvene to offer guidance supporting the delivery of booster and pediatric vaccines (Ontario 2021a). Within the province, some large municipalities also created task forces, such as Toronto’s Accessibility Task Force on COVID-19 Vaccines (City of Toronto 2021). In BC, we found no evidence of a dedicated vaccination advisory committee (Emergency Management BC 2021). This suggests vaccination campaign decision-making was primarily informed by internal actors, such as the CPHO and Health Minister.

Finally, differences in political party governance seemed to influence vaccination campaign strategies, including collaborations with federal partners, although to differing extents. Throughout the first two pandemic years Ontario and Saskatchewan were led by conservative governments, and, like the federal Conservative Party leader, repeatedly deflected criticisms regarding their vaccination campaigns toward the Liberal federal government (White-Crummey 2020; K. Wilson 2021). For example, in Ontario, Premier Ford (repeatedly stated delays in vaccine shipments were the result of failed federal leadership (The Canadian Press 2021). Saskatchewan’s Premier Moe (of the centre-right Saskatchewan Party) accused the Prime Minister of “spouting off with divisive comments” rather than helping “push vaccination rates up” (Boisvert 2021a). Vaccination-related political discourse has been less apparent in BC and Nova Scotia. British Columbia’s former New Democratic Premier Horgan was appointed Chair of the Council of the Federation in September 2021, after serving as co-chair (The Council of the Federation 2021), which may have inclined him to work more collaboratively with his federal counterpart (Tutton 2021). There was limited politicization of vaccination efforts in Nova Scotia, even during the August 2021 provincial election campaign prompted by Liberal Premier McNeil stepping down and resulting in the election of Premier Houston (Tutton 2021). The state of the province’s health system was a hot topic, but both candidates supported vaccination campaigns.

3.2 Establishing and communicating principles underlying vaccination campaigns

Each province rolled out its campaign with the intention to rapidly vaccinate mass numbers of residents; however, as detailed in Table 2 and Supplementary Table 3, their specific objectives, principles, population prioritization, and communication strategies varied.

Unlike the other three provinces, Nova Scotia set a clear coverage target from the start; on 5 January 2021, officials announced plans to double-vaccinate 75% of the entire population by the end of September 2021 (Doctors Nova Scotia 2021; Nova Scotia Government

Table 2: Vaccination campaign strategies

	BC	SK	ON	NS
<i>Speed or coverage-based goals?</i>	Speed-based	Speed-based	Speed-based	Speed- and coverage-based
<i>Regionalized prioritization?</i>	Some	Some	Substantial	No

2021a). Nova Scotia’s incumbent Premier Houston remained committed to achieving his predecessor’s goal, going so far as to delay the province’s planned 15 September 2021 relaxation of public health measures until the 75% milestone was reached (Kaiser 2021). British Columbia’s vaccination campaign objective was explicitly stated in its rollout plan: to achieve the federal goal of offering vaccines to the entire adult population by September 2021; thus, it expanded eligibility to new groups without requiring specific coverage targets in the previous eligibility groups (BC 2021a). While not explicitly stated in its COVID-19 vaccination distribution plan, Ontario’s primary objective also appeared to be speed-based, meaning to deliver as many first doses to people as quickly as possible (Ontario 2020b). This is evidenced by Ontario’s early ramp-up of mass vaccination sites relative to other provinces, partnership with an expansive network of pharmacies, and innovative uses of the AstraZeneca vaccine. Saskatchewan’s plan also did not explicitly state a coverage goal, but did outline goals of protecting vulnerable populations, minimizing illness and death, protecting the health care system, and limiting transmission (Saskatchewan 2021b).

In anticipation of vaccine rollout, all four provinces released official plans for prioritizing vaccine distribution in December 2020. These plans predominantly reflected NACI’s aforementioned guidance by prioritizing residents and staff of long-term care, health care workers, older adults (e.g., ages 70+), and adults living in Indigenous communities (NACI 2020b). However, unlike the other provinces, Ontario’s PHUs had autonomy and flexibility to adapt the provincial plan to serve local needs, such as by modifying the start dates for age-specific eligibility (Ontario 2021b). Also, Ontario’s “hot-spotting” approach was a notable deviation; starting April 2021, communities with high case counts were provincially prioritized for vaccination through the reallocation of vaccine doses and accelerated eligibility timelines (Mishra et al. 2021). While regionalized distribution was less evident in the other provinces, there were examples of higher risk communities being prioritized. For example, BC implemented a targeted, time-limited hot-spotting approach by reallocating doses and lowering the age of eligibility for communities with high community transmission throughout April and May 2021 (BC MOH 2021a).

Equity frameworks guided the prioritization of high-risk groups in all four provinces. Most were guided by NACI’s *Ethics, Equity, Feasibility and Acceptability (EEFA) Framework* (Ismail et al. 2020) except Ontario, which developed its own *Ethical Framework for COVID-19 Vaccine Distribution* (Ontario COVID-19 Vaccine Distribution Task Force

2020). In BC, Saskatchewan, and Ontario, adult residents of remote, northern, and Indigenous communities were explicitly included in the initial priority groups; however, Indigenous peoples were not mentioned in Nova Scotia’s initial plan (Nova Scotia 2021a). Nova Scotia later explicitly prioritized First Nations and African Nova Scotians (Nova Scotia 2021b). Similarly, after launching its campaign, Ontario subsequently sought to increase vaccine access in racialized communities through hot-spotting (Ontario 2021b). Additional activities to support equity, diversity, and inclusivity in vaccination rollout and communications varied across the provinces. Many activities were driven by grassroots community organizations, as discussed in the following section.

4 IMPLEMENTATION AND EVALUATION

4.1 Approaches to ensure sufficient infrastructure and personnel to deliver vaccinations

As summarized in Supplementary Table 4, all four provinces took steps to ensure sufficient infrastructure and personnel to deliver vaccinations. Notably, Saskatchewan, BC, and Nova Scotia directly stated in their official immunization plans the goal of protecting the health care system (BC 2021a; Doctors Nova Scotia 2021; Saskatchewan 2021b). British Columbia specified that it planned to do so by vaccinating health care workers while Ontario’s *Ethical Framework* explicitly stated a goal of protecting critical infrastructure and individuals at increased risk of infection due to occupational (and other) factors but did not specifically name the health care sector (Ontario COVID-19 Vaccine Distribution Task Force 2020). Strategies used to varying extents by the provinces to ensure sufficient infrastructure and personnel included: expanding their list of approved immunizers and immunization delivery sites; arranging for personnel from other levels of government or sectors to assist with vaccination activities; prioritizing health care workers to receive COVID-19 vaccine; and implementing proof of COVID-19 vaccination policies for health care workers.

To support vaccine rollout, all four provinces expanded, through various policy issuances, their existing lists of approved immunizers. As examples: BC issued a public health order to legally enable more health professions to administer vaccines (BC 2021b); Saskatchewan’s *Immunization Delivery Plan* authorized international medical graduates (Saskatchewan 2021b); Ontario enabled interested health care providers to apply through its Matching Portal (Ontario 2021c; 2022); and Nova Scotia released a care directive granting authority to registered and licensed practical nurses and advanced and critical care paramedics (Nova Scotia Health & IWK Policy and Practice Committee 2020).

All four provinces leveraged the experience of pharmacies and pharmacists, who are also involved in seasonal influenza immunization efforts. Nova Scotia (9 March 2021) and Ontario (12 March) leveraged their community pharmacy networks earlier than BC (31 March) and Saskatchewan (26 April). A strength noted in both Nova Scotia and BC was the use of centralized COVID-19 vaccination booking systems to include appointments at

pharmacies. As further described in Section 4.2, Nova Scotia used a single booking system regardless of vaccination location, while BC had one booking system for its community pharmacy-run vaccinations (centralized through the BC Pharmacy Association website) and another for its provincially-run vaccinations (the “Get Vaccinated” system) (BC n.d.; Nova Scotia 2022). In contrast, in Saskatchewan and Ontario the appointment booking process varied by each individual pharmacy location/chain, which created booking barriers (Ontario 2021d; Saskatchewan 2021c).

Family physicians’ involvement in administering COVID-19 vaccines varied. In BC, they uniquely provided leadership for vaccination clinics, but provided limited vaccinations in their offices (Mauer-Vakil et al. 2022). In the other three provinces, family physicians were eventually permitted to hold vaccine clinics in their offices: as of March 2021 in Nova Scotia and Ontario, and October 2021 in Saskatchewan (Bresge 2021; Doctors Nova Scotia 2021; Saskatchewan 2021d).

To further expand immunization capacity and enable skilled personnel to deliver other types of care, three of the four provinces (excluding Saskatchewan) leveraged Canadian Red Cross or Canadian Armed Forces personnel to either administer vaccine or assist with clerical or other activities typically performed by immunizers. For example, in Nova Scotia, the Red Cross and Canadian Armed Forces ran mass immunization clinics (Nova Scotia 2021c). In Ontario, the Canadian Armed Forces were deployed to 31 fly-in communities to support *Operation Remote Immunity*, which successfully achieved its goal of double-vaccinating all willing residents by April 2021 (Ornge 2021).

Two unique approaches to ensuring sufficient vaccination-related personnel were Saskatchewan’s use of the Public Service Commission staff for data entry and BC’s redeployment of 1,400 hospitality and tourism workers, whose jobs had been impacted by pandemic-related closures, to provide administrative support to vaccination clinics (BC Office of the Premier 2021; Saskatchewan 2021b).

All four provinces prioritized health care workers for vaccination eligibility; however, the specific groups of health care workers and eligibility timelines differed. In Nova Scotia and Ontario, long-term care staff and certain frontline health care workers were among the first groups eligible to receive vaccinations (Nova Scotia 2020; Ontario 2021e). In Saskatchewan, select frontline workers in COVID-19 and emergency units were included in the first vaccine-eligible group while other frontline health care workers (high-risk and direct facing) were included in phase one of the province’s phased approach (Saskatchewan 2021b). In BC, select long-term care and frontline health care workers were among the first to receive vaccinations with other health care workers and long-term care staff following shortly thereafter in phase one of vaccine rollout (BC 2021c).

Lastly, three of the four provinces implemented province-wide policies requiring proof of vaccination or negative COVID test results for all health care workers, although they were differentially enforced. In August 2021, BC implemented a public health order requiring vaccination for all long-term care and assisted living facilities staff, which it extended to all health care workers in all settings effective 26 October 2021 (BC 2021d). Unvaccinated

workers were placed on unpaid leave (BC 2021d). In Saskatchewan, proof of vaccination was required for all Saskatchewan Health Authority (SHA) employees as of October 2021 (Saskatchewan 2021c). Unvaccinated employees were offered the alternative to provide a negative test 72 hours prior to each shift at their own expense; however, news sources indicate this was not enforced (Vescera 2022). In Nova Scotia, all health care workers were required to submit proof of vaccination as of 30 November 2021 (Nova Scotia 2021d). Those who did not were placed on unpaid leave and required to participate in a mandatory education program. Unlike in Saskatchewan, a negative test in lieu of vaccination was not an option. Ontario was the only province of the four that did not implement a widespread proof of vaccination policy for health care workers; however, vaccination was mandated for long-term care staff, students, and volunteers province-wide on 15 November 2021 (Ontario 2021f). Earlier, on 17 August 2021, Ontario’s CMOH had issued a directive to all public hospitals, community, and home care service organizations to implement strict vaccination requirements for frontline health care workers (Ontario 2021g) but, after heavy debate, the Ontario government failed to issue an order (Canadian Medical Association 2021).

4.2 Approaches to enhance access to vaccinations

The four case study provinces adopted a range of approaches to enable access to COVID-19 vaccination. Nova Scotia, Ontario, and BC provided vaccinations to all individuals who met the age and dosing interval requirements for the specific vaccine product; Saskatchewan uniquely required individuals to reside in province for at least two weeks before receiving any vaccine (eHealth Saskatchewan 2021). There were no out-of-pocket costs for COVID-19 vaccinations in any of the provinces.

As detailed in Supplementary Table 4, the process for booking a COVID-19 vaccine appointment online varied greatly, from a fully centralized process in Nova Scotia to a labyrinth of systems in Ontario. Unlike some provinces that opted to contract large technology and consulting firms, the Nova Scotia government contracted a small, Ottawa-based company, CANImmunize, to create a digital platform to coordinate its COVID-19 vaccine administration. The fully centralized system for use at all vaccination sites opened to the public for online booking on 1 March 2021 (Nova Scotia 2021e). Notably, this integrated system provided provincial decision-makers real-time data on the availability of vaccine doses, which enabled scheduling to reflect current supplies (Avery 2021). In stark contrast, Ontario’s online booking processes were diffuse. A provincial website launched on 15 March 2021, but not every PHU opted into the system and many individual pharmacies implemented their own varied processes, leading to great confusion as to how to find and schedule an appointment (Ontario 2021d; Stone 2021). As a result, a volunteer group, Vaccine Hunters Canada, stepped in and played an important role in notifying Ontarians about available appointments in real-time through social media. British Columbia’s booking system was moderately centralized, including centralized provincially-run and pharmacy-run booking sites; Saskatchewan’s lacked the centralization seen elsewhere, but it was less diffuse than

Ontario's.

In all four provinces, a provincial health card number was needed to book an appointment online (at one point, Ontario's system was limited for those residents with the older version of the provincial health card that lacked a photo), so alternative means to schedule an appointment were offered, including telephone. British Columbia stood out for also offering in-person booking options through Service BC (BC n.d.).

Each province also offered mass vaccination, drop-in, and mobile clinics on occasion, which individuals without an appointment could utilize. In addition, the provincial vaccination plans incorporated targeted outreach and transportation supports to reduce barriers for disadvantaged populations (Supplementary Tables 4 and 6). For example, in BC and Ontario teams traveled door-to-door to schedule appointments and/or vaccinate homebound residents (City of Toronto 2021; CPAC 2021). Some provinces held clinics in soup kitchens and shelters to support increased access among precariously housed and socioeconomically disadvantaged populations. British Columbia, in particular, held targeted clinics for precariously housed persons. Notably, BC did not operate as many dedicated vaccination clinics for recent immigrants and refugees as the other three provinces (Correia 2021).

In all four provinces, initiatives were undertaken to reduce barriers for rural, remote, and northern communities. In Saskatchewan, health care teams went door-to-door in the northern, isolated community of La Loche to vaccinate residents (SHA 2021). Other northern and remote communities were reached with the assistance of Indigenous Services Canada-Saskatchewan and the Northern Inter-Tribal Health Authority (NITHA 2022). The Government of Nova Scotia funded a \$5 Rural Rides project, which provided roundtrip transportation to and from vaccination (Rural Transportation Association 2020) for temporary foreign workers and others. In Ontario, the pre-existing Northern Ontario Travel Grants Program was used to supplement travel-related costs for remote residents to receive vaccinations (Ontario 2021h).

All provinces faced challenges with limited vaccine supply throughout the first months of 2021 and adopted innovative approaches to maximize doses. Notably, all four decided to lengthen the minimum interval between first and second doses to ensure that more individuals could receive their first dose while supply was limited (Supplementary Table 3). While NACI recommended provinces extend the second dose interval up to 16 weeks on 3 March 2021 (PHAC 2021), BC had already implemented this interval on 1 March 2021 (BC MOH 2021b). Earlier, on 25 January 2021, BC had decided to extend the second dose interval from four to six weeks (BC MOH 2021c). Saskatchewan and Ontario extended the second dose interval to 16 weeks in the week following NACI's recommendations (Saskatchewan 2021e); Nova Scotia did not make this change until 2 April 2021 (Nova Scotia Government 2021b). In addition, Ontario stood out for its strategic use of the AstraZeneca vaccine to increase the supply of first and second doses (Ontario 2021i). While most provinces (and NACI) decided to scale back their recommended use of AstraZeneca due to concerns over potential rare adverse events following immunization in younger individuals, on 10 April 2021 Ontario lowered its age limit to allow all those aged 40+ to receive AstraZeneca

at a pharmacy or primary care clinic (Ontario 2021i). Hesitancy among older populations meant Ontario had a large supply of AstraZeneca while availability of other vaccines (Pfizer-BioNTech and Moderna) remained limited until July 2021 (Ontario 2021i; 2021j). Similarly, Nova Scotia and BC strategically used AstraZeneca to vaccinate select groups, including younger individuals living in areas of high transmission (BC MOH 2021d; Nova Scotia 2021f). Saskatchewan did not use AstraZeneca, but in January 2021 immunizers started to extract a sixth dose from a vial of Pfizer to increase supply (Tasker 2021); Health Canada did not officially implement this change until 9 February (Health Canada 2021).

4.3 Other measures to promote the uptake of vaccinations

The provinces also implemented measures outside the health sector to promote the uptake of vaccinations (see Supplementary Table 5). In particular, all four provinces announced proof of vaccination policies in August-September 2021 to promote vaccine uptake in response to fourth wave surges. The announced policies were similar in nature, requiring mandatory proof of vaccination for individuals ages 12+ in various non-essential settings. While no province required proof of vaccination for essential services, these policies were still highly politicized across Canada. All four provincial governments ultimately decided to implement them, but Saskatchewan, Nova Scotia, and Ontario retained them for much shorter periods of time (Fitzpatrick and Camillo 2022).

Another common measure was the implementation of proof of vaccination policies in educational institutions (Supplementary Table 6). Unlike the policies described above, post-secondary policies were not explicitly imposed by provinces, but were implemented by individual institutions. Specifics varied but most institutions in the four provinces required some combination of proof of vaccination and/or negative test to physically access campus. Within the primary and secondary education sector, Nova Scotia was the only province of the four that implemented a proof of vaccination policy for teachers and staff (Nova Scotia 2021d). Saskatchewan and Ontario did not introduce a province-wide mandate; however, many school divisions did. For example, the two largest school divisions in Saskatchewan required staff to show proof of vaccination or provide regular COVID-19 test results as of November 2021 (Regina Public Schools 2021; Saskatoon Public Schools 2021). The Toronto District School Board, Ontario's largest school board, also required staff to be vaccinated, without the option to be tested in lieu of vaccination (C. Wilson 2021a). Several hundred unvaccinated staff were, consequently, placed on unpaid leave. In BC, there was no province-wide mandate and the first school district to implement a mandatory vaccination policy did not do so until January 2022 (Delta 2021).

All four provinces introduced temporary sick leave policies to provide paid time off for COVID-19-related reasons. As indicated in Supplementary Table 5, the policies were more generous in Nova Scotia and Ontario (four and three days, respectively) than in BC and Saskatchewan (3 hours) (BC 2021e; Nova Scotia 2021g; Ontario 2021k; Saskatchewan 2021f). While Saskatchewan's was specific to vaccination, the other three provincial policies

permitted leave for other COVID-19 reasons, such as being symptomatic or caretaking. None of the four provinces mandated vaccination for employees of private companies, but some private sector workplaces did adopt such policies.

4.4 Coverage progress

Despite myriad challenges and unexpected delays in vaccine shipments, provinces rolled out first doses relatively quickly during the first few months of 2021 (PHAC 2022b). In contrast, delivery of second doses was slower compared to other countries, such as the United States and United Kingdom; supply challenges and the decision to prioritize first doses delivery had led NACI to recommend a longer interval between first and second doses, a decision not made in many other countries (NACI 2021). As noted in Section 4.2, there were deviations across the four provinces in their second dose interval strategies; however, once supplies increased throughout Summer 2021, the delivery of second doses rapidly accelerated and the between-dose interval was shortened to align with the manufactures' recommended interval (PHAC 2022b). During Spring 2021, federal officials promoted the goal of achieving a "one-dose summer and two-dose fall." Ontario officials were eager to achieve a "two-dose summer" (DeClerq 2021). By 1 July, most PTs had successfully delivered two doses to half of their eligible populations (PHAC 2022b).

Figure 1 shows the dates of the provinces' key eligibility expansions and achievement of significant vaccine coverage milestones. Saskatchewan double-vaccinated 50% of residents aged 18+ years slightly earlier than the other three provinces (the week of 3 July 2021), but subsequently fell behind them. As of 25 December 2021, 84.8% of Saskatchewanians aged 18+ were double-vaccinated, the second lowest rate in the country. Of note, Saskatchewan was the only province of the four that had double-vaccinated half of its population before reaching the 75% first-dose milestone. In contrast, BC and Nova Scotia were the last of the four to deliver two doses to half of their eligible populations (17 July, compared to 10 July in Ontario), but they subsequently picked up their pace. Despite its slow start, Nova Scotia has consistently led the other provinces since mid-Summer 2021; as of 25 December 2021, 90.8% of Nova Scotians aged 18+ were double-vaccinated, Canada's third highest rate behind Atlantic counterparts Newfoundland and Labrador (95.8%) and Prince Edward Island (92.7%). Throughout its vaccination campaign, Ontario has remained consistently in the middle of the pack and, since Summer 2021, BC has similarly been an average performer. As of 25 December 2021, 87.4% and 88.2%, respectively, of Ontarians and British Columbians aged 18+ were double-vaccinated compared to 87.8% nationally (PHAC 2022b).

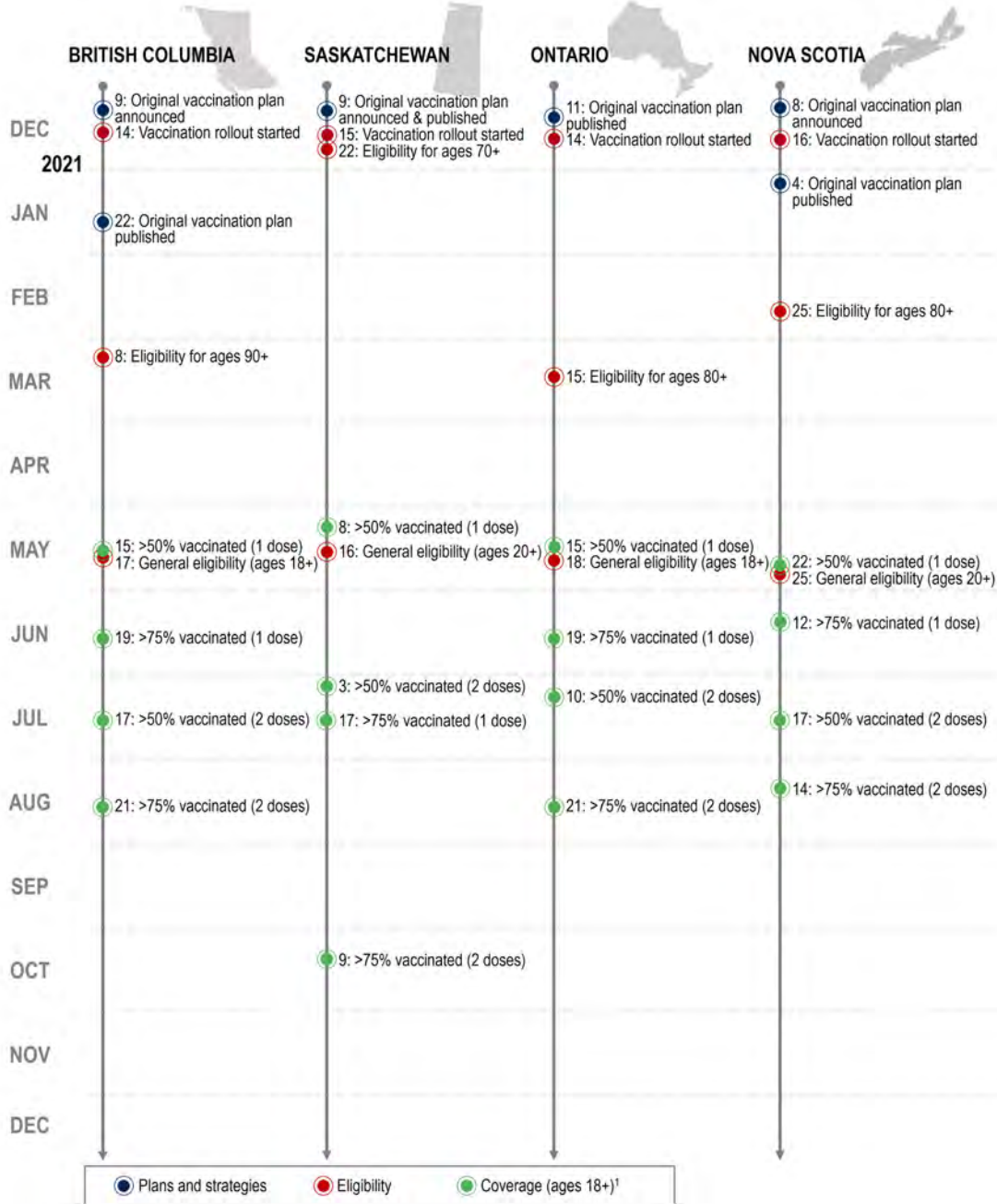


Figure 1: Timeline of provincial COVID-19 vaccination coverage

Source: PHAC. 2022b. Canadian COVID-19 vaccination coverage report. Ottawa: Public Health Agency

of Canada.

Figure Note: Vaccination coverage is reported weekly by PHAC, so does not reflect the exact day the milestone was reached.

5 ANALYTICAL COMPARISON

By documenting and comparing the policy-making process and implementation of the vaccination rollout across the four provinces, we identified two key areas of divergence that may hold promise for policy learning. Specifically, centralization of the governance and implementation of COVID-19 vaccine programs and explicit statements of vaccine coverage goals may have improved the speed and accessibility of vaccination campaigns. In addition to these two points of divergence, we also observed a common theme—the limited role that primary care practices and providers played in the governance and administration of vaccines in all four provinces. Expanding this comparative research to additional jurisdictions in Canada and internationally would help test the impacts of these features, as well as to identify others that hold promise.

5.1 Level of centralization

The level of centralization of vaccine campaigns varied due to the underlying health system organization and vaccination policy choices. All aspects of Nova Scotia’s campaign were centralized: decision-making, communication, booking, and delivery (Avery 2021; Habbick et al. 2022). Additionally, the Pharmacy Association of Nova Scotia and Nova Scotia Department of Health and Wellness provided centralized leadership and coordination for pharmacy vaccine rollout (NS College of Pharmacists 2021). In Saskatchewan, although the SHA initially established a centralized delivery strategy and booking platform, vaccine rollout became more decentralized once individual pharmacies began to take appointments and deliver vaccinations (Rowein et al. 2022; Saskatchewan 2021c). In contrast, when BC enlisted community pharmacies, its vaccination program remained relatively centralized as pharmacy-based appointments were booked through the BC Pharmacy Association’s website. Overall, Ontario’s approach was complicated and highly decentralized due in part to its uniquely decentralized public health system (Smith et al. 2021). With its labyrinth of booking systems, processes, and eligibility criteria, the Ontario’s approach proved the most challenging to navigate of the four provinces and, possibly, the country (Boisvert 2021b). While the approach allowed PHUs flexibility to adapt vaccination plans to meet local needs, it was also confusing (Teitel 2021). The booking process was often compared to “The Vaccine Hunger Games” in the media (Mongu 2021). Vaccine Hunters’ efforts to notify residents about available vaccination appointments in real-time through social media (Pope 2021) resulted in disparities with more affluent individuals, as opposed to those at higher risk of COVID-19, being notified of available appointments (Borden King 2021). Consequently, Ontario’s decentralized process resulted in major barriers and reduced public

trust in the fairness and transparency of vaccine allocation (Jeffords 2021; Teitel 2021; C. Wilson 2021b).

5.2 Vaccine coverage goals

As observed within the European context (Rajan et al. 2022), clear, coordinated vaccination rollout plans that outline explicit goals, such as coverage targets for the relaxing of public health measures, may be imperative for achieving high-levels of vaccine uptake. Vaccination coverage goals differed across the provinces—Nova Scotia was the only province of the four to set an explicit coverage goal from the start of its campaign. Despite changes in government, the province remained steadfast in achieving this goal and delayed its “re-opening” plan to relax public health measures until the 75% milestone was reached (Nova Scotia 2021h). Notably, Nova Scotia double-vaccinated 75% of its entire population faster than the other four provinces (4 October 2021). Ontario reached this milestone on 24 October 2021 and BC on 30 October 2021 (PHAC 2022b); Saskatchewan had yet to achieve 75% coverage as of the end of 2021. In May 2021, Ontario, Saskatchewan, and BC tied their re-opening plans to vaccination coverage milestones (BC 2021a; Ontario 2021i; Saskatchewan 2021g). Ontario and BC tied relaxation of public health measures (such as masking and social gathering restrictions) to uptake and other epidemiological and health care indicators, including hospitalizations and incidence, and adhered to their plans, gradually reopening in Summer 2021 having met their coverage targets several weeks early (Ontario 2021m, 2021n, 2021o). In contrast, while Saskatchewan’s plan stated all public health measures would be relaxed three weeks after 70% of adults received their first dose, public health measures were lifted on 11 July 2021 with only 62% coverage having been achieved (Saskatchewan 2021h).

6 CONCLUSION

The Canadian federation’s decentralization provided provinces flexibility to design their COVID-19 vaccination campaigns; however, this flexibility resulted in stark differences in vaccination access, barriers, and, ultimately, uptake. Centralization of vaccination booking within provinces may have decreased overall barriers to access and vaccination uptake, although, as observed with the addition of an expansive network of pharmacies in Ontario, some level of decentralization may also support more convenient and accessible vaccination options. These lessons could assist provinces as they continue their campaigns to increase rates of primary and booster doses in all approved age groups (BC MOH 2022; CPAC 2022). Additionally, these conclusions might inform provincial vaccination campaigns against other diseases in non-urgent contexts.

7 REFERENCES

- Adeyinka DA, Neudorf C, Camillo CA, Marks WN, Muhajarine N. 2022. COVID-19 vaccination and public health countermeasures on variants of concern in Canada: evidence from a spatial hierarchical cluster analysis. *JMIR Public Health and Surveillance* 8(5): e31968. <https://doi.org/10.2196/31968>
- Avery S. 2021. Different paths of pandemic protection: a comparative case study on vaccine rollouts in Nova Scotia, Quebec and Ontario. *Public Policy Forum*. <https://ppforum.ca/publications/different-paths-of-pandemic-protection-a-comparative-case-study-on-vaccine-rollouts-in-nova-scotia-quebec-and-ontario/>
- Ball P. 2021. The lightning-fast quest for COVID vaccines—and what it means for other diseases. News Feature, 18 December. *Nature* 589(16–18). <https://www.nature.com/articles/d41586-020-03626-1>
- BC. n.d. How to get vaccinated for COVID-19. <https://www2.gov.bc.ca/gov/content/covid-19/vaccine/register>. Retrieved 20 September 2021.
- BC. 2021a. COVID-19 immunization plan. <https://www2.gov.bc.ca/gov/content/covid-19/vaccine/plan>
- BC. 2021b. Regulated and unregulated health professionals SARS-CoV-2 immunization order. Order of the Provincial Health Officer, 23 February. <https://www2.gov.bc.ca/assets/gov/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/covid-19/archived-docs/covid-19-pho-order-ruh-immunization-february-23-2021.pdf>
- BC. 2021c. B.C. takes next steps to protect people with COVID-19 vaccine rollout plan. *BC Gov News*, 22 January. <https://news.gov.bc.ca/releases/2021PREM0005-000119>
- BC. 2021d. Plans further protect people living, working in long-term care. *BC Gov News*, 12 August. <https://news.gov.bc.ca/releases/2021HLTH0150-001598>
- BC. 2021e. Leave for COVID-19 Vaccination—Act Part 6, Section 52.13—Province of British Columbia. <https://www2.gov.bc.ca/gov/content/employment-business/employment-standards-advice/employment-standards/forms-resources/igm/esa-part-6-section-52-13>
- BC MOH. 2021a. Community partnerships provide new opportunities to get vaccinated in Surrey. *BC Gov News*, 16 May. <https://news.gov.bc.ca/releases/2021HLTH0102-000927>
- BC MOH. 2021b. Joint statement on B.C.’s COVID-19 response, latest updates, 1 March.
- BC MOH. 2021c. Joint statement on B.C.’s COVID-19 response, latest updates, 25 January. <https://news.gov.bc.ca/releases/2021HLTH0006-000134>

- BC MOH. 2021d. Vaccine program accelerating, people aged 40+ to book next week. *BC Gov News*, 6 May. <https://news.gov.bc.ca/releases/2021HLTH0031-000864>
- BC MOH. 2022. Fall booster doses, bivalent vaccine available soon. *BC Gov News*, 6 September. <https://news.gov.bc.ca/releases/2022HLTH0179-001343>
- BC Office of the Premier. 2021. Tourism, hospitality industry supports B.C. immunization efforts. *BC Gov News*, 24 March. <https://news.gov.bc.ca/releases/2021PREM0022-000539>
- Boisvert N. 2021a. Blasting “pointless” election, premiers press Trudeau for greater autonomy, more health-care funding. *CBC News*, 21 September. <https://www.cbc.ca/news/politics/premeirs-federal-election-reaction-1.6184399>
- Boisvert N. 2021b. Ontario pharmacies facing an “administrative nightmare” when booking 2nd vaccine doses. *CBC News*, 4 May. <https://www.cbc.ca/news/canada/toronto/ontario-pharmacy-second-doses-1.6012285>
- Borden King A. 2021. Lessons in health care equity with Vaccine Hunters. *Healthy Debate*, 3 May. <https://healthydebate.ca/2021/05/topic/equity-vaccine-hunters/>
- Bresge A. 2021. ‘This is what we do’: Ontario family doctors join COVID-19 vaccine campaign. *Global News*, 13 March. <https://globalnews.ca/news/7694707/ontario-family-doctors-covid-19-vaccinations/>
- Cacace M, Ettelt S, Mays N, Nolte E. 2013. Assessing quality in cross-country comparisons of health systems and policies: towards a set of generic quality criteria. *Health Policy* 112 (1): 156-162. <https://doi.org/10.1016/j.healthpol.2013.03.020>
- Canada. 2020. Public Services and Procurement Canada has signed agreements with 7 companies to secure access to 7 COVID-19 vaccine candidates. 19 November. <https://www.tpsgc-pwgsc.gc.ca/medias-media/2020-11-19-00-eng.html>
- Canada. 2021. Procuring vaccines for COVID-19. <https://www.canada.ca/en/public-services-procurement/services/procuring-vaccines-covid19.html>
- Canadian Medical Association. 2021. CMA reacts to decisions by Quebec and Ontario to not require mandatory vaccine requirements for health workers. 4 November. <https://www.cma.ca/news-releases-and-statements/cma-reacts-decisions-quebec-and-ontario-not-require-mandatory-vaccine>
- City of Toronto. 2021. Toronto’s Accessibility Task Force on COVID-19 Vaccines to address equity gaps in vaccine access for people with disabilities. 14 April. <https://www.toronto.ca/news/torontos-accessibility-task-force-on-covid-19-vaccines-to-address-equity-gaps-in-vaccine-access-for-people-with-disabilities/>
- Correia C. 2021. Vancouver health authority rolls out COVID-19 vaccine on downtown eastside. *CBC News*, 31 January. <https://www.cbc.ca/news/canada/british->

- columbia/vancouver-health-authority-rolls-out-covid-19-vaccine-on-downtown-eastside-1.5895158
- CPAC. 2021. British Columbia update on COVID-19 [Video]. *YouTube*, 6 May. <https://www.youtube.com/watch?v=-DRBq8Ekjf8>
- CPAC. 2022. Québec annonce une nouvelle campagne de vaccination contre la COVID-19 [Video]. *YouTube*, 16 août. <https://www.youtube.com/watch?v=S6ox5k5HLrY>
- Cyr A. 2021. To avoid 15,000 daily COVID-19 cases next month, Canada urged to increase vaccination rates, uphold public health measures. *The Globe and Mail*, 3 September. <https://www.theglobeandmail.com/canada/article-to-avoid-15000-daily-covid-19-cases-next-month-phac-recommends/>
- DeClerq K. 2021. Ontario shortens gap between COVID-19 vaccine doses with majority of residents fully vaccinated by end of summer. *CTV News*, 28 May. <https://toronto.ctvnews.ca/ontario-shortens-gap-between-covid-19-vaccine-doses-with-majority-of-residents-fully-vaccinated-by-end-of-summer-1.5446393>
- Delta. 2021. Delta Board of Education implements proof of vaccination requirement for its employees. Delta School District, 12 January. <https://www.deltasd.bc.ca/news-events/news/delta-board-of-education-implements-proof-of-vaccination-requirement-for-its-employees/>
- Doctors Nova Scotia. 2021. COVID-19 immunization plan. <https://doctorsns.com/sites/default/files/2021-02/COVID-webinar-presentation-slides-4Feb2021.pdf>
- eHealth Saskatchewan. 2021. COVID-19 vaccine eligibility and procedure for non-residents & residents immunized out of province. <https://www.ehealthsask.ca/services/Manuals/Documents/COVID-19-Vaccine-WS-Eligibility-Non-resident.pdf>
- Emergency Management BC. 2021. Coordination during emergency activations—Province of British Columbia. <https://www2.gov.bc.ca/gov/content/safety/emergency-management/emergency-management/emergency-activation>
- European Observatory on Health Systems and Policies. 2022. *COVID-19 Health System Response Monitor (HSRM)*. <https://eurohealthobservatory.who.int/monitors/hsrm/overview>
- Fafard P, McNena B, Suszek A, Hoffman SJ. 2018. Contested roles of Canada’s Chief Medical Officers of Health. *Canadian Journal of Public Health—Revue Canadienne De Sante Publique* 109(4): 585-589. <https://doi.org/10.17269/s41997-018-0080-3>
- Fitzpatrick T, Allin S, Camillo CA, Habbick M, Mauer-Vakil D, Muhajarine N, Roerig M, Rowin S. 2022. COVID-19 vaccination rollout: Ontario. *COVID-19 Vaccination Rollout Monitor*. CoVaRR-Net and North American Observatory on Health Systems and Policies. <https://covarrnet.ca/covid-19-vaccination-rollout-ontario/>

- Fitzpatrick T, Camillo CA. 2022. The impact of provincial proof of vaccination (POV) policies on age-specific first dose uptake of COVID-19 vaccines in Canada. Urban Public Health Network (UPHN) / Public Health Physicians of Canada (PPHC) Biannual Meeting, Toronto, ON, 14 October.
- García-Ojeda ME. 2020. What needs to go right to get a coronavirus vaccine in 12-18 months. *The Conversation*, 8 May. <http://theconversation.com/what-needs-to-go-right-to-get-a-coronavirus-vaccine-in-12-18-months-136816>
- Habbick M, Allin S, Camillo CA, Mauer-Vakil D, Fitzpatrick T, Muhajarine N, Roerig M, Rowen S. 2022. COVID-19 vaccination rollout: Nova Scotia. *COVID-19 Vaccination Rollout Monitor*. CoVaRR-Net and North American Observatory on Health Systems and Policies. <https://covarnet.ca/covid-19-vaccination-rollout-novascotia/>
- Health Canada. 2004. Learning from SARS: renewal of public health in Canada. Report of the National Advisory Committee on SARS and Public Health, 8 November. <https://www.canada.ca/en/public-health/services/reports-publications/learning-sars-renewal-public-health-canada.html>
- Health Canada. 2021. Health Canada issues label change authorization for Pfizer-BioNTech COVID-19 vaccine, 9 February. <https://www.canada.ca/en/health-canada/news/2021/02/health-canada-issues-label-change-authorization-for-pfizer-biontech-covid-19-vaccine.html>
- Health Canada. 2022. Drug and vaccine authorizations for COVID-19: list of authorized drugs, vaccines and expanded indications. <https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/authorization/list-drugs.html>
- Infection Prevention and Control Canada. n.d. SARS-CoV (Severe Acute Respiratory Syndrome). <https://ipac-canada.org/sars.php>. Retrieved 11 March 2022.
- Ismail SJ, Hardy K, Tunis MC, Young K, Sicard N, Quach C. 2020. A framework for the systematic consideration of ethics, equity, feasibility, and acceptability in vaccine program recommendations. *Vaccine* 38(36): 5861-5876. <https://doi.org/10.1016/j.vaccine.2020.05.051>
- Jeffords S. 2021. Nearly 100,000 Ontarians book vaccine appointments despite technical issues. *The Toronto Star*, 15 March. <https://www.thestar.com/news/gta/2021/03/15/ontarios-vaccine-booking-system-launches-today-for-those-aged-80-and-up.html>
- Kaiser L. 2021. N.S. will not move into Phase 5 until COVID-19 vaccine goal is reached: five new cases Thursday. *CTV News Atlantic*, 2 September. <https://atlantic.ctvnews.ca/n-s-will-not-move-into-phase-5-until-covid-19-vaccine-goal-is-reached-five-new-cases-thursday-1.5570981>

- Marmor T, Freeman R, Okma K. 2005. Comparative perspectives and policy learning in the world of health care. *Journal of Comparative Policy Analysis: Research and Practice* 7(4): 331-348. <https://doi.org/10.1080/13876980500319253>
- Mauer-Vakil D, Allin S, Camillo CA, Fitzpatrick T, Habbick M, Muhajarine N, Roerig M, Rowen S. 2022. COVID-19 vaccination rollout: BC. *COVID-19 Vaccination Rollout Monitor*. CoVaRR-Net and North American Observatory on Health Systems and Policies. <https://covarrnet.ca/covid-19-vaccination-rollout-bc/>
- Mishra S, Stall N, Ma H, Odutayo A, Kwong J, Allen U, Brown K, et al. 2021. A vaccination strategy for Ontario COVID-19 hotspots and essential workers. Ontario COVID-19 Science Advisory Table. <https://doi.org/10.47326/ocsat.2021.02.26.1.0>
- Mongu T. 2021. It's vaccine Hunger Games, pharmacy prof says of 2nd COVID-19 shot rollout. *CBC News*, 8 June. <https://www.cbc.ca/news/canada/kitchener-waterloo/ontario-rollout-chaos-2nd-vaccine-say-pharmacists-1.6056487>
- NACI. 2020a. National Advisory Committee on Immunization (NACI): membership and representation. 2 November. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/naci-membership-representation.html>
- NACI. 2020b. Archived: preliminary guidance on key populations for early COVID-19 immunization, 3 November. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/guidance-key-populations-early-covid-19-immunization.html>
- NACI. 2021. COVID-19 vaccine extended dose intervals for early vaccine rollout and population protection in Canada: NACI recommendations. 9 April. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/extended-dose-intervals-covid-19-vaccines-early-rollout-population-protection.html>
- NITHA. 2022. COVID-19 vaccine. Northern Inter-Tribal Health Authority. <https://www.nitha.com/covid-19-vaccine/>
- Nova Scotia. 2020. COVID-19 vaccine to arrive next week. News Releases, 8 December. <https://novascotia.ca/news/release/?id=20201208004>
- Nova Scotia. 2021a. COVID-19 immunization plan. https://www.nshealth.ca/sites/nshealth.ca/files/covid-19_immunization_plan.pdf
- Nova Scotia. 2021b. COVID-19 immunization plan update. News Releases, 2 March. <https://novascotia.ca/news/release/?id=20210302003>
- Nova Scotia. 2021c. Province ramps up rollout of vaccines. News Releases, 22 June. <https://novascotia.ca/news/release/?id=20210622002>

- Nova Scotia. 2021d. Vaccination mandate covers healthcare, long-term care workers, paramedics, teachers, others. News Releases, 29 September. <https://novascotia.ca/news/release/?id=20210929007>
- Nova Scotia. 2021e. COVID-19 community vaccine clinics open in March. News Releases, 19 February. <https://novascotia.ca/news/release/?id=20210219005>
- Nova Scotia. 2021f. People aged 40 to 54 now eligible to book AstraZeneca vaccine. News Releases, 30 April. <https://novascotia.ca/news/release/?id=20210430001>
- Nova Scotia. 2021g. Access to paid sick leave for Nova Scotians. News Releases, 12 May. <https://novascotia.ca/news/release/?id=20210512003>
- Nova Scotia. 2021h. Phase 5 of reopening delayed. News Releases, 14 September. <https://novascotia.ca/news/release/?id=20210914004>
- Nova Scotia. 2022. Coronavirus (COVID-19): book your vaccination appointment. <https://novascotia.ca/coronavirus/book-your-vaccination-appointment/>
- Nova Scotia Government. 2021a. Update COVID-19 for Nova Scotians: Tuesday, January 5 [Video]. 5 January. <https://www.youtube.com/watch?v=iZ0ShQXd6ys>
- Nova Scotia Government. 2021b. Update COVID-19 for Nova Scotians: Tuesday, March 23 [Video]. 23 March. <https://www.youtube.com/watch?v=TMn-an5VwUI>
- Nova Scotia Health & IWK Policy and Practice Committee. 2020. Public health care directive. http://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=82869
- NS College of Pharmacists. 2021. Registrar’s advisory: community pharmacy involvement in COVID-19 immunization. https://www.nspharmacists.ca/wp-content/uploads/2021/03/RegistrarsAdvisory_Vaccine_Final.pdf
- Ontario. 2020a. Ontario appoints members of the minister’s COVID-19 Vaccine Distribution Task Force, 4 December. <https://news.ontario.ca/en/release/59475/ontario-appoints-members-of-the-ministers-covid-19-vaccine-distribution-task-force>
- Ontario. 2020b. Ontario’s vaccine distribution implementation plan. <https://files.ontario.ca/moh-covid-19-vaccine-distribution-implementation-plan-en-2020-12-11-v3.pdf>
- Ontario. 2021a. Ontario salutes work of province’s COVID-19 Vaccine Distribution Task Force. 27 August. <https://news.ontario.ca/en/release/1000768/ontario-salutes-work-of-provinces-covid-19-vaccine-distribution-task-force>
- Ontario. 2021b. Ontario ready to rollout phase two of COVID-19 vaccine distribution plan. 5 March. <https://news.ontario.ca/en/release/60568/ontario-ready-to-rollout-phase-two-of-covid-19-vaccine-distribution-plan>

- Ontario. 2021c. O. Reg. 9/21: Controlled Acts. <https://www.ontario.ca/laws/regulation/r21009>
- Ontario. 2021d. How to book a COVID-19 vaccine appointment. <https://covid-19.ontario.ca/book-vaccine/>
- Ontario. 2021e. Ontario's COVID-19 vaccination plan. <https://covid-19.ontario.ca/ontarios-covid-19-vaccination-plan>
- Ontario. 2021f. Ontario taking additional steps to protect long-term care home residents. 1 October. <https://news.ontario.ca/en/release/1000917/ontario-taking-additional-steps-to-protect-long-term-care-home-residents>
- Ontario. 2021g. Ontario makes COVID-19 vaccination policies mandatory for high-risk settings. 17 August. <https://news.ontario.ca/en/release/1000750/ontario-makes-covid-19-vaccination-policies-mandatory-for-high-risk-settings>
- Ontario. 2021h. Northern Health Travel Grants. Ontario Health Insurance (OHIP). Government of Ontario, Ministry of Health and Long-Term Care. <https://www.health.gov.on.ca/en/public/publications/ohip/northern.aspx>
- Ontario. 2021i. Ontario safely expands age eligibility for AstraZeneca COVID-19 vaccine to 40+. 19 April. <https://news.ontario.ca/en/statement/61204/ontario-safely-expands-age-eligibility-for-astrazeneca-covid-19-vaccine-to-40>
- Ontario. 2021j. Ontario accelerates rollout of second shots targeting a two-dose summer. 28 May. <https://news.ontario.ca/en/release/1000217/ontario-accelerates-rollout-of-second-shots-targeting-a-two-dose-summer>
- Ontario. 2021k. Ontario to introduce paid COVID-19 leave. 28 April. <https://news.ontario.ca/en/release/1000024/ontario-to-introduce-paid-covid-19-leave>
- Ontario. 2021l. Ontario ready to rollout phase two of COVID-19 vaccine distribution plan. 5 March. <https://news.ontario.ca/en/release/60568/ontario-ready-to-rollout-phase-two-of-covid-19-vaccine-distribution-plan>
- Ontario. 2021m. Ontario to move to step one of roadmap to reopen on June 11. 7 June. <https://news.ontario.ca/en/release/1000279/ontario-to-move-to-step-one-of-roadmap-to-reopen-on-june-11>
- Ontario. 2021n. Ontario moving to step two of roadmap to reopen on June 30. 24 June. <https://news.ontario.ca/en/release/1000399/ontario-moving-to-step-two-of-roadmap-to-reopen-on-june-30>
- Ontario. 2021o. Ontario moving to step three of roadmap to reopen on July 16. 9 July. <https://news.ontario.ca/en/release/1000501/ontario-moving-to-step-three-of-roadmap-to-reopen-on-july-16>

- Ontario. 2022. Ontario matching portal. https://healthcloudtrialmaster-15a4d-17117fe91a8.force.com/matchingportal/s/?language=en_US
- Ontario COVID-19 Vaccine Distribution Task Force. 2020. Ethical framework for COVID-19 vaccine distribution. 1.
- Ontario Health. 2022. Our story, Ontario Health. <https://www.ontariohealth.ca/our-story>
- Ornge. 2021. Ornge—Operation remote immunity. 6 May. <https://www.ornge.ca/news-articles/2021/may/operation-remote-immunity>
- Palmer K, Nemer L, Menne B. 2021. How has the COVID-19 vaccination been rolled-out in small countries within the European Region? 1 July. *COVID-19 Health System Response Monitor (HSRM)*. <https://eurohealthobservatory.who.int/monitors/hcrm/analyses>
- PHAC. 2018. Canadian pandemic influenza preparedness: planning guidance for the health sector. <https://www.canada.ca/en/public-health/services/flu-influenza/canadian-pandemic-influenza-preparedness-planning-guidance-health-sector/table-of-contents.html#a3c2>
- PHAC. 2020. Canada’s COVID-19 immunization plan: saving lives and livelihoods. 18 December. <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/canadas-reponse/canadas-covid-19-immunization-plan.html>
- PHAC. 2021. Statement from the Chief Public Health Officer of Canada on March 3, 2021. 3 March. <https://www.canada.ca/en/public-health/news/2021/03/statement-from-the-chief-public-health-officer-of-canada-on-march-3-2021.html>
- PHAC. 2022a. Statement from the Council of Chief Medical Officers of Health (CCMOH) on vaccination programs for Fall 2022. 7 September. <https://www.canada.ca/en/public-health/news/2022/09/statement-from-the-council-of-chief-medical-officers-of-health-ccmoh-on-vaccination-programs-for-fall-2022.html>
- PHAC. 2022b. COVID-19 vaccination coverage in Canada. <https://health-infobase.canada.ca/covid-19/vaccination-coverage/>
- PHO. 2020. Our organization. <https://www.publichealthontario.ca/en/about/our-organization>
- Pope S. 2021. “They’re heroes”: How COVID-19 “vaccine hunters” help Canadians find appointments. *National Post*, 21 April. <https://nationalpost.com/news/canada/theyre-heroes-how-covid-19-vaccine-hunters-help-canadians-find-appointments>
- Rajan S, McKee M, Hernández-Quevedo C, Karanikolos M, Richardson E, Webb E, Cylus J. 2022. What have European countries done to prevent the spread of COVID-19? Lessons from the COVID-19 Health System Response Monitor. *Health Policy*. <https://doi.org/10.1016/j.healthpol.2022.03.005>

- Razai MS, Oakeshott P, Esmail A, Wiysonge CS, Viswanath K, Mills MC. 2021. COVID-19 vaccine hesitancy: the five Cs to tackle behavioural and sociodemographic factors. *Journal of the Royal Society of Medicine* 114(6): 295-298. <https://doi.org/10.1177/01410768211018951>
- Regina Public Schools. 2021. Proof of vaccination or test status to be required. 29 September. <https://www.reginapublicschools.ca/vaccination%20status>
- Rowein S, Allin S, Camillo CA, Fitzpatrick T, Habbick M, Mauer-Vakil D, Muhajarine N, Roerig M. 2022. COVID-19 vaccination rollout: Saskatchewan. *COVID-19 Vaccination Rollout Monitor*. CoVaRR-Net and North American Observatory on Health Systems and Policies. <https://covarnet.ca/covid-19-vaccination-rollout-saskatchewan/>
- Rural Transportation Association. 2020. Have you booked your COVID-19 vaccination? RTA can get you there. Find a Ride. 23 April. <https://ruralrides.ca/find-a-ride/>
- Saskatchewan. 2021a. Saskatchewan COVID-19 vaccine delivery plan. <https://www.saskhealthauthority.ca/sites/default/files/2021-06/Saskatchewan%20COVID-19%20Vaccine%20Delivery%20Plan.pdf>
- Saskatchewan. 2021b. COVID-19 immunization delivery plan. 22 October. <https://publications.saskatchewan.ca/#/products/111951>
- Saskatchewan. 2021c. COVID-19 vaccination. <https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/covid-19-vaccine/vaccine-booking>
- Saskatchewan. 2021d. Stick it to COVID Campaign. 26 October. <https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/covid-19-vaccine/stick-it-to-covid-campaign>
- Saskatchewan. 2021e. Accelerating COVID-19 vaccination in Saskatchewan. 4 March. <https://www.saskatchewan.ca/government/news-and-media/2021/march/04/accelerating-covid-19-vaccination-in-saskatchewan>
- Saskatchewan. 2021f. Phase 2 of vaccine delivery plan launches, special vaccination leave introduced. 18 March. <https://www.saskatchewan.ca/government/news-and-media/2021/march/18/phase-2-of-vaccine-delivery-plan-launches-special-vaccination-leave-introduced>
- Saskatchewan. 2021g. Re-opening roadmap: government sets vaccination threshold for removal of gathering size limits, mask order. 1 June. <https://www.saskatchewan.ca/government/news-and-media/2021/june/01/reopening-roadmap-government-sets-vaccination-threshold-for-removal-of-gathering-size-limits-mask-or>

- Saskatchewan. 2021h. Living with COVID-19: re-opening Saskatchewan step three guidance. 7 July. <https://www.saskatchewan.ca/government/news-and-media/2021/july/07/living-with-covid-19--re-opening-saskatchewan-step-three-guidance>
- Saskatoon Public Schools. 2021. School division will require staff to show proof of vaccination or test status. https://www.spsd.sk.ca:443/Pages/newsitem.aspx?ItemID=348&ListID=bd4dad7-6f25-477b-9a8e-e04294db3fa9&TemplateID=Announcement_Item
- SHA. 2021. Successful-to-door vaccine clinic in La Loche. 16 June. <https://www.saskhealthauthority.ca/news-events/news/successful-door-door-vaccine-clinic-la-loche>
- Smith E. 2021. N.S. vaccine rollout making big strides but experts urge caution as province reopens. *CBC News*, 23 June. <https://www.cbc.ca/news/canada/nova-scotia/vaccine-rates-1.6077614>
- Smith R, Allin S, Rosella LC, Luu K, Thomas M, Li J, Pinto AD. 2021. Profiles of public health systems in Canada: Ontario. National Collaborating Centre for Healthy Public Policy. <https://ccnpps-nchpp.ca/docs/2021-Profiles-of-Public-Health-Systems-in-Canada-Ontario.pdf>
- Stone L. 2021. Confusion over rollout persists days after Ontario pledged to vaccinate all adults in COVID hot spots. *The Globe and Mail*. <https://www.theglobeandmail.com/canada/article-confusion-over-rollout-persists-days-after-ontario-pledged-to/>
- Tasker J. 2021. Health Canada says Pfizer’s vaccine vials can be stretched to 6 doses. *CBC News*, 9 February. <https://www.cbc.ca/news/politics/health-canada-label-change-pfizer-1.5906879>
- Teitel E. 2021. Doug Ford insists signing up for a vaccine is ‘very, very simple.’ He should try it some time. *The Star*, 14 April. <https://www.thestar.com/opinion/star-columnists/2021/04/14/doug-ford-insists-signing-up-for-a-vaccine-is-very-very-simple-he-should-try-it-some-time.html>
- The Canadian Press. 2021. Trudeau pushes back against Premier Ford’s criticism of federal COVID-19 vaccine procurement. *The Globe and Mail*, 31 March. <https://www.theglobeandmail.com/canada/article-trudeau-pushes-back-against-premier-fords-criticism-of-federal-vaccine-2/>
- The Council of the Federation. 2021. Premier John Horgan to Chair the Council of the Federation. 16 September. <https://www.canadaspremiers.ca/premier-john-horgan-to-chair-the-council-of-the-federation/>
- Tutton M. 2021. Tories surge to upset majority win in N.S. election with a campaign focused on health. *CTV News*, 18 August. <https://atlantic.ctvnews.ca/tories-surge-to-upset-majority-win-in-n-s-election-with-a-campaign-focused-on-health-1.5550988>

- Vescera Z. 2022. Vaccine, testing mandate for Sask. Health care goes unenforced. *Saskatoon StarPhoenix*, 25 January. <https://thestarphoenix.com/news/saskatchewan/vaccine-testing-mandate-for-sask-health-care-goes-unenforced>
- Waitzberg R, Hernández-Quevedo C, Bernal-Delgado E, Estupiñán-Romero F, Angulo-Pueyo E, Theodorou M, Kantaris M, et al. 2022. Early health system responses to the COVID-19 pandemic in Mediterranean countries: a tale of successes and challenges. *Health Policy* 126(5): 465-475. <https://doi.org/10.1016/j.healthpol.2021.10.007>
- Webster P. 2020. Canada and COVID-19: learning from SARS. *The Lancet* 395(10228): 936-937. [https://doi.org/10.1016/S0140-6736\(20\)30670-X](https://doi.org/10.1016/S0140-6736(20)30670-X)
- White-Crummey A. 2020. Moe attacks federal throne speech and blames NDP if Trudeau survives. *Regina Leader Post*, 23 September. <https://leaderpost.com/news/saskatchewan/moe-attacks-federal-throne-speech-and-blames-ndp-if-trudeau-survives>
- Wilson C. 2021a. More than 300 TDSB staff members placed on leave as vaccine policy comes into effect. 22 November. <https://toronto.ctvnews.ca/more-than-300-tdsb-staff-members-placed-on-leave-as-vaccine-policy-comes-into-effect-1.5675858>
- Wilson C. 2021b. “We’ll iron it out,” Ont. Premier says after long wait times, error messages on vaccine booking portal. *CTV News*. 15 March. <https://toronto.ctvnews.ca/we-ll-iron-it-out-ont-premier-says-after-long-wait-times-error-messages-on-vaccine-booking-portal-1.5347279>
- Wilson K. 2021. “Doug Ford continues to play politics,” Trudeau says as both leaders trade barbs over border rules. *CTV News*, 13 May. <https://toronto.ctvnews.ca/doug-ford-continues-to-play-politics-trudeau-says-as-both-leaders-trade-barbs-over-border-rules-1.5426199>
- World Health Organization. 2014. Principles and considerations for adding a vaccine to a national immunization programme: from decision to implementation and monitoring. <https://apps.who.int/iris/handle/10665/111548>