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Public health restrictions, directives, and measures in Arctic countries in the first year of the COVID-19 pandemic

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ABSTRACT

Beginning January of 2020, COVID-19 cases detected in Arctic countries triggered government policy responses to stop transmission and limit caseloads beneath levels that would overwhelm existing healthcare systems. This review details the various restrictions, health mandates, and transmission mitigation strategies imposed by governments in eight Arctic countries (the United States, Canada, Greenland, Norway, Finland, Sweden, Iceland, and Russia) during the first year of the COVID-19 pandemic, through 31 January 2021. We highlight formal protocols and informal initiatives adopted by local communities in each country, beyond what was mandated by regional or national governments. This review documents travel restrictions, communications, testing strategies, and use of health technology to track and monitor COVID-19 cases. We provide geographical and sociocultural background and draw on local media and communications to contextualise the impact of COVID-19 emergence and prevention measures in Indigenous communities in the Arctic. Countries saw varied case rates associated with local protocols, governance, and population. Still, almost all regions maintained low COVID-19 case rates until November of 2020. This review was produced as part of an international collaboration to identify community-driven, evidence-based promising practices and recommendations to inform pan-Arctic collaboration and decision making in public health during global emergencies.

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Introduction

The first positive case of COVID-19 (SARS-CoV-2) in the Arctic region was detected in January of 2020 in Saariselkä Outdoor Resort in Finland, precipitating responses across all Arctic countries and from the Arctic Council to prevent the spread of COVID-19 and control the pandemic [1,2]. At national and local government levels and across private and public sectors, all Arctic countries implemented strategies to attempt to limit COVID-19 incidence beneath case-loads that would overwhelm existing healthcare systems. To assess the positive and negative societal outcomes associated with the COVID-19 pandemic in Arctic communities,

an international research collaboration was initiated to document the range of public health restrictions, directives, and measures that were implemented in Arctic countries during the first year of the COVID-19 pandemic. Led by a team of Fulbright Arctic Initiative Alumni, the long term goal of this project is to identify community-driven models and evidence-based practices and recommendations to inform circumpolar collaboration and decision-making in public health during times of global emergencies.

The purpose of this article is to summarise and compare the various regulations, restrictions, health mandates, and transmission mitigation strategies

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imposed by governments in eight Arctic countries, including the United States (US), Canada, Greenland, Norway, Finland, Sweden, Iceland, and Russia between January of 2020 and 31 January 2021. We use reports from national governments as well as media from local communities within each country to contextualise the conditions of initial emergence of COVID-19, and the immediate government responses. Countries saw greatly varied case rates based on local protocols, governance, and population, although almost all regions maintained low COVID-19 case rates until the second wave spiked in October through December of 2020 [3]. While each country varied in their timeline of response and the types of protocols implemented, we have organised this article to focus on common themes across all regions: travel restrictions, communications, lockdowns and closures, testing strategies, and use of health technology. Because circumpolar Indigenous populations experience health inequities relative to other national groups, we provide key background information and highlight localised experiences of COVID-19 health policies and mandates throughout Indigenous communities across the Arctic [4].

Arctic countries and overall strategy during the first year of the COVID-19 pandemic

The following section introduces relevant governance of each Arctic country and summarises the overall strategy and case emergence between January 2020 and 31 January 2021. An overview and comparison of general COVID-19 prevention strategies across all Arctic countries during the first year of the pandemic is listed in Table 1.

The United States: Alaska

Governance structure and health policy administration in Alaska

The State of Alaska is the homeland of diverse Alaska Native people, including 229 federally recognised tribes, 13 Alaska Native regional corporations, and over 200 tribal village corporations [5]. These unique tribal entities administer federal and state health, housing, and education services in their respective regions [6]. In Alaska, COVID-19 mandates differed between federal, state, and local/borough issued orders. The State of Alaska and regional tribal health corporations functioned as centralised entities issuing state-wide and regional guidelines.

United States federal guidance and state of Alaska guidance on COVID-19

Former President Donald Trump declared a State of Emergency due to the COVID-19 pandemic on 13 March 2020, which allowed for increased executive power to direct emergency relief, economic aid, and policy oversight [7]. Federal efforts to mitigate COVID-19 transmission were impeded by misinformation and politicisation, rendering an absence of federal guidance during the first year of the COVID-19 pandemic [8–12]. Consequently, states and local communities developed and implemented public health protections, contributing to disparate within-country transmission mitigation strategies [13,14].

The first case of COVID-19 in Alaska was confirmed on 12 March 2020 from a foreign national aboard a cargo flight, and the State of Alaska began issuing public health orders in late March of 2020 [15,16]. Initial state mandates limited visitation to public facilities, closed all in-person public schooling, and imposed social distancing protocols. The State of Alaska enacted travel restrictions for within-state, non-essential travel and gave permissions for local communities to enact travel bans [15]. COVID-19 regulations and requirements issued by the State of Alaska were impacted by politicisation and a priority to protect commerce, creating inconsistencies between municipalities. For example, some boroughs and communities in Alaska issued mask mandates despite no state-mandated requirement [6,17]. Alaska experienced high rates of COVID-19 relative to other Arctic regions during the first year of the pandemic, particularly during November and December of 2020 [3]. From 2020 through 2021, Native Hawaiian and other Pacific Islander persons and Alaska Native persons experienced the highest rates of COVID-19 cases and hospitalisations among all racial and ethnic groups in the State of Alaska, consistent with COVID-19-related racial disparities throughout the US [18,19].

Initial Alaska Native community responses to COVID-19

To understand the initial pandemic response in Indigenous communities in Alaska, we investigated COVID-19 related policies of Nuniitnek Yupiit tribal communities in the Yukon Kuskokwim region of Southwest Alaska. A common theme of focus groups among Nuniitnek Yupiit tribal communities was a prioritisation of collective wellness and a holistic approach to protection and treatment of households impacted by COVID-19. Communities in the region initiated lockdowns and travel restrictions to mitigate the introduction of COVID-19 [20]. Some community members used traditional medicines to

Table 1. Overview of general health protocols, restrictions, and mandates across Arctic countries during the first year of the COVID-19 pandemic.

	Canada				US				Russia	
	Nunavut	NWT	Yukon	Alaska	Iceland	Greenland	Norway	Sweden		Finland
Declaration of state of emergency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Physical distancing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ban on large gatherings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Widespread testing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Travel ban	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Proof of negative COVID-19 test for travel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Internal border closures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contact tracing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mask or face covering mandate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mandatory quarantine of symptomatic individuals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mandatory quarantine period for travellers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strict lockdown	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Education institution closures (kindergarten to higher education)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Business closures (restaurants, bars, pubs, and clubs)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Postponement of elective health procedures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Recreational closures (fitness centres, swimming pools)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Business closures (hairdressers, tattoo and piercing shops, massage studios, spas)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Closure of public transport	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Work from home orders	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No visitation of elders/nursing care centres	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

“✓” denotes implementation at some point in the first year of the COVID-19 pandemic to reduce transmission.

Abbreviations: NWT=Northwest Territories. US=United States.

prevent and treat people infected with the virus, and blended Indigenous and western medical paradigms to establish transmission mitigation strategies [6,20].

Canada: Northwest territories, Yukon, Nunavut

Governance structure and health policy administration in Arctic regions of Canada

Arctic regions of Canada include Yukon, Nunavut, and Northwest Territories, each governed by their respective territorial government. Territorial governments have authority over social services, health, education, justice, and the administration of territorial laws. Each territory has a public-health act and a chief public health officer who guided the initial COVID-19 responses in each region. The first case of COVID-19 in Arctic regions of Canada was confirmed on 21 March 2020 in Northwest Territories from a Canadian citizen who had travelled domestically [21].

Initial public health policy response to the pandemic in Arctic regions of Canada

During the first year of the pandemic response, restrictions across Canada followed federal guidance but were individually mandated by territorial governments. Guidance generally included limits to public gatherings, closure of public facilities, travel restrictions, and strict quarantine guidelines. Non-essential travel restrictions were imposed in all regions and between the United States and Canadian border. In Nunavut, a travel ban and mandatory isolation hubs were implemented in airport cities, including Ottawa and Winnipeg, to keep the virus out of the territory. In Manitoba, the provincial government implemented a Provincial Indigenous COVID-19 Collaboration, with representatives from the federal, Nunavut and provincial health care system as well as Indigenous organisations to address emergent issues (the unmet needs of new mothers expected to self-isolate in a hotel for 14 days prior to returning to Nunavut, for example) [22]. The territorial governments issued public-health orders based on current COVID-19 case counts in each respective territory. There was variation in the level of governance that dictated COVID-19 transmission mitigation strategies. For example, school closures were issued at the territory level in Northwest Territories and Yukon, though in Nunavut each individual school district had authority to determine if schools remained open or closed. Ultimately schools in all three territories were closed for at least three weeks [23,24]. Canada did not adopt a countrywide mask mandate during the first year of the pandemic, though they were strongly advised in most municipalities [23].

Iceland

Governance structure and health policy administration in Iceland

Iceland has two administrative governance levels, including the national/central government and local authorities (i.e. municipalities). Local authority responsibilities are the same across all municipalities, regardless of population size [25]. The Iceland Ministry of Health is responsible for administration of health policy in Iceland, including public health, health insurance, hospital operation, health centres, pharmaceutical centres, and health technology [26]. In the first year of the COVID-19 pandemic, the total population of Iceland was around 369,000 inhabitants, and 63% of the population lived in the Greater Reykjavík area. The municipalities range in size from 42 inhabitants to 133,000 inhabitants in Reykjavík [27].

Initial public health policy response to the pandemic in Iceland

The goals of the Icelandic authorities and measures employed to manage COVID-19 transmission were unified and constructive from the onset of the pandemic. Beginning January 2020, the focus in Iceland was on ensuring that the infrastructure of the country, particularly the healthcare system, could accommodate the anticipated caseload [28]. The first case of COVID-19 in Iceland was confirmed on 28 February 2020 from an Icelandic citizen who had travelled to

Italy, with subsequent quarantine of the affected person and declaration of alert by The National Commission of the Icelandic Police [29–31]. Iceland employed testing strategies, physical distancing recommendations, mask requirements, and travel restrictions.

As a major international tourism destination, travel safety and organisation was significant for resident protections. Iceland was one of the first countries to implement mass testing, beginning within 6 weeks of COVID-19 presence in the country [32]. Planes arriving to the country from areas with known COVID-19 events were screened and passengers were immediately placed into quarantine until they were cleared with a negative COVID-19 test [33]. Travellers arriving from COVID-19 risk areas were required to quarantine for 14 days upon arrival to Iceland, later shortened to seven days with a negative COVID-19 test [28]. During mid-March 2020, secondary schools and universities were closed and distance learning was implemented. An initial ban on public gatherings of more than 100 people was issued, with specific restrictions targeting certain businesses, pubs, and clubs that were associated with transmission events [29]. Iceland notably varied allowable gathering sizes

between 10 and 500 people throughout 2020 based on active caseload in the country. Relative to other countries in the Arctic, Iceland had more relaxed standards for gatherings. For example, in a given period, cultural and art events were permitted with a total of 30 people allowed on stage, while 50 adult and 100 children audience members were permitted in attendance if they wore face masks [34,35]. Official vaccinations began in Iceland on 29 December 2020 [29].

Greenland

Governance structure and health policy administration in Greenland

Greenland (Kalaallit Nunaat, *land of the Greenlandic people*) has a population of 56,650 people, of whom 90% are ethnic Greenlanders [36]. The population lives in 80 isolated settlements along the western, southern, and southeastern coast of the country. Communities are accessible by boat and ship in the summer, and by airplane and helicopter the remainder of the year [37]. Greenland's physical geography and settlement pattern necessitates unique logistical strategies to ensure access to health services. Greenland was under Danish colonial rule until 1953 and has been in a political and social decolonisation process, including through the Home Rule Act of 1979 and the establishment of self-government in 2009. As part of the Danish Kingdom, Greenland remains connected to Danish authority in financial and diplomacy sectors but has an autonomous Government of Greenland (Naalakkersuisut). During the first year of the COVID-19 pandemic there was a high degree of cooperation and communication between health authorities in Denmark and health authorities in Greenland.

The Greenlandic response to COVID-19 was characterised by a small and uniform group of leaders guiding restrictions. The Chief Medical Officer is the highest medical authority in Greenland and had a central role in planning, evaluating, and providing professional medical advice to the Greenlandic government and other authorities concerning the spread and containment of COVID-19 [38]. The Chief Medical Officer reports directly to the Naalakkersuisoq of Health (the Minister of Health) and is responsible for monitoring infectious disease and advising government and health-care authorities on response and prevention [37]. Restrictions to prevent or contain infectious disease in Greenland were ordered by the Epidemic Commission [39]. The Epidemic Commission consists of the Chief Medical Officer, the chief of police, the chief veterinary officer, the director of the governing body of taxes, and

three other members, two of whom are appointed by the government and one who is a regional representative.

Greenland experienced very few COVID-19 cases throughout 2020. Public awareness of the pandemic emerged gradually and largely in reaction to developments in Denmark. Greenland's major strategy to prevent the introduction of COVID-19 was to impose border closures and travel limitations from all countries. Because movement between communities necessitates air or boat travel, Greenlandic communities were able to monitor within-country travel. By June of 2020, Greenlandic borders opened to visitors from neighbouring countries with proof of a negative COVID-19 test, as a condition to be allowed to board any flight to Greenland and a retest upon five days after entry. The COVID-19 pandemic has highlighted the need to close infrastructure gaps and prioritise the protection of vulnerable Indigenous communities in Greenland.

Sweden

Governance structure and health policy administration in Sweden

The Swedish government system includes a national governing body and self-determining elected bodies at the municipal level and regional levels. At the regional level, Sweden is divided into 21 counties which are responsible for political issues within the region, including the universal healthcare systems. The local municipality level is responsible for social programmes, including schools and elder care, and there is no hierarchical relationship between the two (i.e. municipalities are not accountable to the regions). The Swedish constitution prohibits ministerial control of national government authorities and guarantees the independence of the state administration. In practice, this means that the Swedish government acts collectively and oversees national agencies with limits to national power, including in times of crisis or war.

Initial public health policy response to the pandemic in Sweden

The first cases of COVID-19 in Sweden were confirmed on 9 March 2020, from five adults who had travelled to Italy [40]. Many aspects of the Swedish COVID-19 transmission mitigation strategy closely resembled that of other countries, including the focus on increasing test capacity, contact tracing, and reducing unnecessary travel between countries. However, health authorities in Sweden did not immediately enforce strict measures to halt the spread of COVID-19 throughout the country [41]. Rather, an

alternative approach was adopted focusing on protecting the capacity of the healthcare system and mitigating COVID-19 impact through voluntary behaviours. For example, recommendations for social distancing and remote work were communicated to the public, but stay-at-home orders and mask mandates were not imposed [42]. Schools for older students transitioned to distance education, while kindergarten and schools for younger students remained open. Some restrictions were placed on public gatherings and restaurants, but public spaces, stores, and services remained accessible [42]. This was a notably different strategy relative to other Nordic countries [43]. Like many countries, Sweden experienced severe COVID-19 outbreaks among older adults in nursing homes in the early months of the pandemic, resulting in stringent policies to protect adults aged 70 years or older [44]. To mitigate COVID-19 transmission risk, the Swedish government issued an ordinance prohibiting all external visits to nursing homes for older people [44,45]. Vaccines for COVID-19 became available in Sweden in late December of 2020. The Swedish government developed an operational plan to distribute COVID-19 vaccines first to older individuals and healthcare workers, followed by people in high-risk categories, and then to the general public [46].

Initial Sámi community responses to COVID-19 in Sweden

The geographic boundaries of the Sámi homelands in Sweden span more than half of Sweden's northern land mass and include grazing lands for reindeer herding, though formal boundaries are not defined. Most Sámi live in the northernmost Arctic county, Norrbotten, with the Sámi population declining gradually south and towards the Gulf of Bothnia. Sweden recognises specific Sámi administrative areas in which Sámi are entitled to expanded rights, such as communicating with government authorities in their own language. Through 31 January 2021 the Sámi Parliament reported that no Sámi representatives had been invited to participate in decision-making processes on COVID-19 measures affecting the Sámi. The Sámi people were not consulted on the impacts of the national response or on needs for measures and programmes to address the situation and impacts from a Sámi perspective [47]. The Sámi Parliament reported that the most impactful COVID-19 restriction for the Sámi population in the first year of the pandemic were closed borders and travel restrictions. The border closure between Norway, Sweden, and Finland had severe negative consequences for the Sámi people, particularly related to reindeer herding. Because Sámi people are not consistently included as an ethnic category in epidemiological data related to

COVID-19, self-report surveys were used to assess COVID-19 outcomes among Sámi peoples [48]. The Sámi Health on Equal Terms (SamiHET) survey and the Health on Equal Terms (HET) survey included questions about COVID-19 in four Sámi languages [48]. Preliminary survey results showed that in comparison with the general Swedish population (8.4%) a larger proportion of Sámi people (11.5%) reported that they had tested positive for COVID-19 [48,49].

Norway

Governance structure and health policy administration in Norway

Norway has a presiding central/national government and a two-tier system of local government, the municipalities and the county authorities, which have the same administrative status [50]. The central government of Norway owns four Regional Health Authorities that employ numerous hospital trusts to provide clinical health services [50]. Regional Health Authorities were responsible for epidemic preparedness and management in the hospitals and secondary care services in their respective geographical areas. The Norwegian Institute of Public Health (NIPH) is responsible for infectious disease control, and nationally coordinated pandemic response was headed by the Directorate of Health [51]. Municipalities are responsible for detecting, reporting, and monitoring the local spread of infectious disease [52].

Norway is divided into 11 counties, each with an elected administrative council. The Sámi people live in all counties of Northern Norway, and in the southern parts of the country in Trøndelag and Femundsmarka in Hedmark [53]. To understand local context and impact on Arctic Indigenous communities, we reviewed public-health restrictions in 119 of the most northern municipalities in Norway.

Initial public health policy response to the pandemic in Norway

The first case of COVID-19 in Norway was identified in a traveller who had returned from China on 26 February 2020 [54]. COVID-19 restrictions were issued at the national level beginning 12 March 2020 which were notably the strongest and most sweeping measures Norway has seen in peacetime [55]. Under a state of crisis, the Directorate of Health was tasked with risk communication, infection control measures, and supporting activities of other public bodies to prevent negative consequences of COVID-19 [51]. National restrictions included physical distancing recommendations, closure of public facilities, quarantine and isolation rules, and strict travel restrictions [56]. Border restrictions initially

required any foreign citizens who had arrived in Norway on 17 March 2020 or earlier to quarantine in Norway, prompting public response as many travellers and workers were suddenly unable to return to their homes in Sweden or Finland [56]. By 15 June 2020 national borders were re-opened to allow travel between other Nordic countries, though strict travel bans were re-instated as the second COVID-19 wave hit in August 2020. The NIPH established COVID-19 testing facilities, initially in hospitals and later through special testing sites that delivered samples to hospital laboratories for analysis [56]. In addition to national restrictions, municipalities issued restrictions as local COVID-19 cases increased [56]. Norway's application of strict mandates and public health recommendations resulted in low COVID-19 case rates compared to other Arctic countries up through 31 January 2021.

Finland

Governance structure and health policy administration in Finland

Finland is divided into 21 regions, each governed by a regional council which serves as forum of cooperation for the municipalities of a region. The main tasks of the regions are regional planning and development of enterprise and education. The organisation of social welfare and healthcare services is the responsibility of municipalities. The system consists of 20 hospital districts and 5 university hospitals. In 2021, 8 out of the 20 districts had social and healthcare under a regional joint authority [57].

The first case of COVID-19 reported in Finland was from a Chinese tourist on 29 January 2020, though no domestic cases were identified until 26 February 2020 [1]. From March 2020, the Finnish government announced a state of emergency due to the COVID-19 outbreak and employed a hybrid strategy to issue restrictions. The hybrid strategy aimed to gradually transition from restrictive measures to enhanced management of the pandemic through COVID-19 testing, contact tracing, isolation, and treatment. Governmental and national policies were implemented and revised as conditions changed in order prevent the spread of COVID-19, especially at the beginning of the pandemic. These actions were mainly based on the Communicable Diseases Act of 2016 and influenced municipal pandemic management strategies [1]. All hospital districts and municipalities were responsible for pandemic preparedness and management in their respective geographical areas. Municipalities were responsible for funding any measures implemented in the public health system due to the pandemic. Beginning in March 2020, the national government released financial

aid to support municipalities in the COVID-19 pandemic management [1]. National policies and municipal policies in Finland included travel restrictions,

Initial Sámi community responses to COVID-19 in Finland

Lapland (Lappi) is the northernmost of the 21 Finnish regions. North Sámi, Skolt Sámi, and Aanaar Sámi are Indigenous to the region. As in Sweden, border closures in the initial stages of the pandemic challenged the movement of Sámi reindeer herders. Moreover, closed borders impacted on the life of Sámi people living in these border communities, challenging the everyday life, business, culture and communication between people and families. Later, border crossing restrictions were lifted for occupations working with livestock, which ameliorated challenges to Sámi communities and herders. During the first year of the pandemic Finland experienced lower COVID-19 case rates than other countries in the Arctic.

Russia

Geographic distribution and governance of Indigenous peoples in Arctic regions of Russia

Russia is a federative state divided into 85 regions. There are three tiers of governance in the Russian Federation: federal, regional (federative "subjects"), and local (municipalities). Russia is a multi-ethnic state with a population of 244,000 Indigenous peoples in the north, Siberia, and the far east. Arctic Indigenous peoples include the Aleuts, Koryak, Siberian Yupik, Chukchi, Evenks, Yakuts, Yukagirs, Dolgan, Selkup, Nanai, Khanty, Mansi, Nenets, Sámi, and others [58]. Administratively, Indigenous groups are encompassed in more than 20 federative regions [59]. Each region is divided into municipalities empowered to decide local issues like public health services, schools, and social services.

Federal and regional authorities began issuing regulating documents (orders, mandates, directives) beginning in late March of 2020. Regional governments were responsible for decisions about mask requirements, social isolation, testing and monitoring, and travelling. Decisions were discussed and coordinated through operational headquarters and regular meetings with public representatives [60].

Federal public health policy response in Russia

By January of 2021, the Russian federal government mobilised to develop testing, build COVID-19 specific health centres, and initiate physical distancing and quarantine efforts to reduce transmission risk. Russia established national operational headquarters under

the leadership of the Deputy Prime Minister and released a national plan to prevent the spread of COVID-19 [61]. On 11 April 2020, the Russian Health Minister indicated that the Russian population did not understand the risks and threats of COVID-19 and public authorities needed to encourage citizen compliance with anti-transmission measures [62]. In April of 2020 COVID-19 infections were recorded in all regions of Russia and by May of 2020, Russia had the third highest COVID-19 caseload in the world [63,64].

Public health restrictions and outreach among Indigenous communities of the Yamal region

To understand initial pandemic response in Indigenous communities in Russia, we investigated COVID-19 related policies in the Yamalo-Nenets Autonomous Region (Yamal). Indigenous tribes in Russia experienced conflict with regional governments due to restrictions that affected their ability to hunt, fish, and herd reindeer. In the Yamal region, basic necessities were provided for the Indigenous population isolated on the tundra including food, essential supplies and goods, and gasoline. The support was distributed through trading houses (factorii) available for the tundra reindeer herders. Special hospitals were assigned for patients with COVID-19 infections. If reindeer herders were infected on the tundra, they were provided all necessary healthcare and delivered to the nearest hospital by air ambulance [65]. Representatives of regional public authorities visited distant settlements and nomadic camps to communicate with Indigenous families explaining the situation, measures, and calming their fears and uncertainties. In the Yamal region, a working group of specialists from the Governmental Department for Indigenous Peoples took special support measures for the Indigenous population. During 2020 and winter of 2021, medical specialists visited reindeer herders' camps and visited families living on the tundra to inform local communities about COVID-19 and measures taken in the region to prevent the spread of the infection [66].

Overview of specific restrictions, mandates, and prevention strategies across the Arctic

Though response timelines and details of each intervention varied depending on local conditions, collaborative review of restrictions and protocols in each respective Arctic country demonstrated commonalities across the following arenas: Travel restrictions, communications, testing strategies, and use of health technology to track and monitor COVID-19 cases. The following section details and compares COVID-19 prevention and response strategies across all Arctic countries.

Travel restrictions

All Arctic countries and nearly all regions imposed some type of travel restriction by March of 2020. A comparison of travel restrictions in each country is listed in Table 2. The imposition and monitoring of border closures and travel bans reflected transportation patterns and geographical characteristics within each country. Island countries, including Iceland and Greenland, had increased levels of control over entry relative to regions sharing national borders, including Nordic countries and both inter-territorial and international border crossings in Canada [35,47,67–70]. For many countries national borders were never fully closed, but temporary and differing controls were adopted at the internal borders depending on the status of caseloads throughout the first year of the pandemic [1,28,29,71].

International cooperation to permit country-specific travel

Travel allowances and restrictions reflected international cooperation, accounting for factors such as international commuters and relative risk by each country's epidemiological profile. For example, border closures between Sweden, Finland, and Norway initially caused severe challenges for community members and Indigenous reindeer herders who regularly crossed international borders, but by 2021 were modified to allow commuter crossing [56]. Beginning in May of 2020, Iceland lifted travel restrictions on passengers arriving from Greenland and the Faroe Islands, which were considered low risk [29]. For all other countries, travellers to Iceland were required to observe a 14-day quarantine upon arrival. This restriction was further loosened from 16 July 2020 when travellers from Denmark, Norway, Finland, and Germany were added to the allowable travel list along with the Faroe Islands and Greenland, and were exempted from COVID-19 testing and quarantine requirements [28]. In Greenland, borders were completely closed and internal travel was discouraged from March through June of 2020. With zero cases of COVID-19 in the country, Greenland began accepting travellers from the Faroe Islands and Iceland without a negative test until August of 2020. After COVID-19 cases spiked in November of 2020, the airspace over Greenland was reclosed, and only travellers from the Copenhagen Airport were permitted to fly to Greenland [94].

Some regions of the Arctic adopted travel restrictions to protect remote communities with low access to healthcare centres relative to urban communities. In Canada, border control was enforced at the US

Table 2. Travel restrictions and regulations across Arctic countries during the first year of the COVID-19 pandemic.

	Canada			United States	
	Nunavut	Northwest Territories	Yukon	Alaska	Russia
Travel ban for foreign nationals/nonresidents	March 24, 2020. Travel ban maintained through all of 2020. Travel allowed between NWT, Nunavut, and Manitoba June to November 2020	March 18, 2020. All travel by land, air, and porty banned for non-residents.	March 20, 2020. Driving through Yukon to/from Alaska permissible if completed within 24 hours and no passengers are symptomatic.	March 25, 2020. Alaska implemented a 2-week intrastate travel ban. Alaskans permitted 24 hours to drive through Yukon.	January 30, 2020 Russia closes border to China. March 30, 2020, borders completely closed to all foreign citizens. All international flights grounded.
Limit to travel in remote communities	March 24, 2020. Individual communities restricted access to all travel at their discretion.	No formal restrictions to remote areas. Travel exemptions for Aboriginal peoples with a treaty right to harvest.	March 20, 2020. Requested by First Nations communities.	March 28, 2020. Small communities permitted by the State to issue additional travel restrictions.	March 2020. Limited charter planes to citizen homes. Remote communities encouraged to distance.
Enforced denial of non-essential travel at the border.	March 24, 2020. Only enforced by air travel.	March 18, 2020. Transport officers initiate roadside checks of vehicles at the border.	April 17, 2020. Enforcement officers deny entry to non-essential travel.	March 28, 2020. State and local law enforcement and federal border control officers enforce non-essential travel.	March 30, 2020.
Required 14-day quarantine upon entry to the country	March 24, 2020. Air passengers required to quarantine in Ottawa, Winnipeg, Edmonton, or Yellowknife.	March 15, 2020. All travellers required to self-isolate for 14 days.	Initiated March 13, 2020. Citizens of neighbouring territories exempt beginning July 1, 2020; reinstated November 2020.	Recommended March 28, 2020, requirement varied between communities. Recommendation reduced to 5 days October 15, 2020.	All tourists banned beginning March 2020; 14-day quarantine instated for travellers beginning late July 2020.
Travel exemptions for essential professions	March 24, 2020. Only critical care workers permitted to enter territory.	March 18, 2020, travel exemptions for health and other professions.	March 2020. Critical care workers permitted to work but must self-isolate for 14 days when not working.	March 28, 2020. Shipping, oil production, and commercial fishing considered essential.	March 30, 2020. Exemptions for freight trucks and Russian diplomats.
Negative COVID-19 test or letter of authorisation for travel	March 24, 2020. After 14-day quarantine residents must submit a signed letter from CPHO to return home, including medical travel.	Beginning March 18, 2020, returning residents must submit a plan for a 14-day quarantine in Yellowknife, Inuvik, Hay River, or Fort Smith.	No test requirement to travel implemented in 2020. Temperatures taken at all airports and symptomatic travellers instructed to self-isolate.	March 25, 2020. State required travel declaration of travel. September 8, 2020, proof of negative test via Alaska Safe Travels.	August 1, 2020, negative PCR test and travel registration required for travellers.
	Iceland	Greenland	Norway	Sweden	Finland
Travel ban for foreign nationals/nonresidents	March 20, 2020 through July 1, 2020, participated in travel restrictions with other Schengen states. May 15, 2020, Greenland and Faroe Islands permitted. July 15, 2020 Denmark, Norway, Finland, and Germany permitted. July 30, 2020 all tourists.	March 13, 2020. All flights cancelled. Exemption for Faroe Islands and Iceland. From November 9, 2020, airspace over Greenland closed, only travellers from Copenhagen airport were permitted. January 2021, limit to number of travellers permitted entry.	March 12, 2020. All travel banned. May 7, 2020 national borders reopen to commuter quarantine-free travel of Sweden and Finland. June 15, 2020 Nordic countries permitted entry, excluding Sweden. August 2020 ban on all travel re-instated.	March 19, 2020 temporary travel restrictions enacted with exemption for EU citizens with work/residence permit. July 4, 2020 entry reopened to EU citizens and residents of specified countries.	March 16, 2020. Restrictions to travel initiated, EU citizens permitted to travel home through Finland. Helsinki total travel ban March 28 to April 15, 2020. Reopened to EU countries beginning July 13, 2020.
Limit to travel in remote communities	No formal restrictions to remote areas.	March 19, 2020, lockdown for residents of Nuuk. April 22, 2020 travel permitted to 12 towns.	March 12, 2020. Prohibition against staying at cabins/leisure properties.	No formal restrictions to remote areas.	No formal restrictions to remote areas.
Enforced denial of non-essential travel at the border.	March 20, 2020. Airlines controlled, cruises cancelled throughout 2020.	March 13, 2020. Airlines controlled, cruises cancelled. Enforced by Air Greenland and Greenlandic police.	March 12, 2020. Border control between Schengen countries.	Border entry enforced by Swedish Police consistent with temporary restrictions.	March 22, 2020. Borders enforcement unless travelling for employment between, Finland and Sweden or Norway.
Required 14-day quarantine upon entry to the country	Required March 2020. August 19, 2020, tourists may quarantine 5 days with two negative tests.	March 13, 2020. Within-country travellers quarantine 14 days or 5 days with negative test.	March 12, 2020. Beginning 2021 travellers must quarantine 10 days.	Recommended 14-day quarantine for travellers.	March 22, 2020. 14-day required upon entry.

(Continued)

Table 2. (Continued).

	Canada			United States	
	Nunavut	Northwest Territories	Yukon	Alaska	Russia
Travel exemptions for essential professions	National borders never fully closed, permissible travel for critical infrastructure.	November 9, 2020. Only emergency flights allowed to land in Greenland.	March 12, 2020. Healthcare professionals prohibited from travelling.	March 19, 2020. Exemptions for travellers with work permit.	Allowed for livestock movement and certain professions between Finland, Sweden, Norway.
Negative COVID-19 test or letter of authorisation for travel	Requirements varied. July 30, 2020 tourists from risk areas must test twice. January 15, 2021, all entering Iceland must have 2 negative tests with 5-day quarantine in-between, or vaccination.	Requirements varied. June 2020, travellers must have negative test within 5 days of arrival. September 8, 2020, travellers re-tested 5 days after arrival. January 2021, application needed.	Beginning November 7, 2020 negative COVID-19 test required within 72 hours of arrival. By 2021, travellers may quarantine for 10 days or 7 days with PCR test.	June 2020, citizens over age 18 of certain countries permitted entry with proof of negative COVID-19 test within 24 hours.	Beginning September 11, 2020 negative COVID-19 test within 72 hours of arrival required for entry, as well as quarantine. Quarantine reduced with 2nd negative test.

Abbreviations: NWT=Northwest Territories. CPHO=Chief Public Health Officer. EU=European Union. *See References:* 21, 29, 38, 57, 71, 75, 80 [72–76], [77–92]; [93].

border between Yukon and Alaska beginning in March of 2020 [95]. Regions of Alaska and Canada adopted restrictions on travel in remote communities to protect vulnerable populations with low access to health services. The Government of Yukon also limited nonessential travel into Yukon's more remote communities [96]. By the end of March of 2020, at least 17 Alaska Native villages in the Yukon-Kuskokwim Delta had suspended all non-resident travel to protect elders and overcrowded homes [97]. By contrast, the State of Alaska never imposed interstate border closures, though driving from Alaska to lower states necessitated admission through highly restricted Canadian border crossings [98].

Norway had some of the most strict internal travel restrictions of all Arctic countries. In an extraordinary ministerial meeting on 15 March 2020, the government adopted regulations regarding quarantine, isolation, and a legal basis for a ban on holiday property stays. This meeting introduced a quarantine obligation for everyone who arrived in Norway between 27 February 2020, meaning travellers or workers from Sweden and Finland who came to Norway before 17 March 2020 would be held in 14-day quarantine in Norway [99]. The border was closed to any foreign nationals without a Norwegian residence permit, and travellers found in violation of the required quarantine were subject to a fine of 20,000 Norwegian kroner (\$2,000 USD) [56,99,100].

By the winter of 2020, the governments of Iceland, Sweden, Norway, Finland, and Greenland had adopted a scaled-back system of international travel with proof of a negative COVID-19 test (taken within 72 hours), proof of vaccination, or proof of a COVID-19 diagnosis [1,28,38,72,101,102].

Testing strategies

All countries in the Arctic initiated testing strategies by April of 2020 to identify COVID-19 cases in people with flu-like symptoms, travellers from high risk areas, or contacts to confirmed or suspected COVID-19 cases. By the end of the 2020, most Arctic countries allowed testing for all individuals, regardless of criteria such as flu-like symptoms, recent travel, or exposure to a confirmed COVID-19 case. Early in the pandemic, Nunavut and Iceland stood out in their broad criteria to allow testing, making COVID-19 testing available to people who were asymptomatic and did not have a known contact to a COVID-19 case [33,103]. Iceland was one of the first countries to begin mass-testing of residents returning from abroad. Planes arriving to the country from high-risk areas were screened and passengers were immediately placed into quarantine until they were cleared with a negative COVID-19 test [25]. DeCODE genetics, a biopharmaceutical company based in Reykjavik, Iceland, carried out sequence analysis of all positive cases of the virus to identify mutations of the virus, which was described as having a low mutation rate relative to the scale of its spread. In 2020, Iceland was the only country in the world in which every positive case was analysed in this manner [27]. Nunavut's early testing criteria included contacts to COVID-19 cases as well as asymptomatic individuals and individuals with mild symptoms, so the territory could immediately identify the possibility of COVID-19 [26]. The Swedish testing strategy was to ensure large-scale testing for COVID-19 throughout the country, as directed by the regions, county administrative boards, other authorities, and private actors throughout Sweden [28]. However, through 31 January 2021, only symptomatic or contact screening was advised in Sweden.

Definitions of qualifying timelines for contact tracing and testing of contacts to a suspected or confirmed COVID-19 case varied between regions. For example, in Greenland the Chief Medical Officer defined a contact as an infected person with symptoms, from 48 hours before the person's symptoms started and until 72 hours after the person's symptoms stopped [104]. In Yukon, contacts to confirmed or suspected cases of COVID-19 were informed of exposure and asked to monitor symptoms for 14 days, and the contact-tracing window was defined as 48 hours prior to any onset of symptoms consistent with COVID-19 [28].

Communications

Communications about COVID-19 information, risk factors, restrictions, case rates, travel bans, and associated services differed depending on local, regional, and national conditions. In most Arctic countries a national-level taskforce of multi-disciplinary health and governmental leadership was initiated to advise on pandemic response and communications to the general public. In Nunavut, Yukon, and Northwest Territories, information was communicated directly from territorial governments, following recommendations of national guidelines and adapted to local conditions. In Greenland, the Chief Medical Officer and Epidemic Commission were responsible for issuing advisories, which were communicated to the public through press conferences [39]. In Alaska, lack of federal and state guidance in many arenas of COVID-19 protections encouraged a more robust local reaction to communicate information. Local city and tribal governments reported on individual community protocols, as advised by regional healthcare providers. The Norwegian government held press conferences three times a week through 15 June 2020, and for the remainder of 2020 they were held once a week and on an as needed basis [102]. Norwegian municipalities communicated using daily web-based press releases, local newspapers, radio, and Twitter [102]. Health authorities in all countries used social media (Facebook, Twitter) at the national and local levels to communicate COVID-19 health messaging such as handwashing, recommendations against public gatherings, and symptoms. Many countries, including Sweden, communicated information through government websites.

For example, the State of Alaska communicated all advisories and infection rates through a COVID-19 Summary Dashboard via the Alaska Department of Health [105]. In Iceland daily press conferences were streamed through all main media outlets. These conferences were headed by the Chief Epidemiologist, the

Director of Health, and the Chief Constable of the Civil Protection Department of the National Commissioner of the Icelandic Police [28,106]. Iceland's first wave of COVID-19 infections subsided in May of 2020 and conferences were held less frequently but were essential for public communications. In addition, information about the pandemic were available in various languages through a dedicated website, www.covid.is [29].

Communications for Indigenous communities

In Nunavut, Northwest Territories, Yukon, Alaska, and Greenland, health messaging and advisories were translated into multiple languages and included local Indigenous dialects. The Public Health Agency of Sweden provided general COVID-19 information online in three Sámi languages: Northern-, Lule- and Southsámi. Some Swedish municipalities also disseminated localised information in Sámi languages on their websites due to a national legal obligation to communicate in the five recognised minority languages (in which Sámi languages are included). The public Sámi broadcaster (*Sameradion*) provided news in the Sámi languages in Sweden. In both Finland and Norway, local regions and municipalities translate information on COVID-19 into the Sámi languages.

Multi-level risk advisories and restrictions

In some areas, like the US, a formal state of emergency declaration allowed access to federal funding to support pandemic prevention efforts. In March of 2020 Finland, the US/Alaska, Nunavut, Yukon, Northwest Territories, and regions of Russia formally declared a state of emergency in response to COVID-19. Several countries adopted multi-level risk advisories to reflect changing national epidemiological conditions. Iceland did not issue a formal state of emergency declaration until October of 2020, but the Civil Protection Department employed a national risk alert system that alerted *uncertainty* (January 2020), *danger* (February 2020), and *emergency* (March to May 2020) alert status, but a colour-level system was implemented in December 2020 [28,29]. Finland initiated a hybrid strategy that classified risk level based on the incidence of COVID-19 infections. The Finnish government action plan divided the epidemiological situation into three general stages: *base* level, *accelerating* stage (greater than 10–25 COVID-19 cases per 100,000 persons over a period of 14 days), and *spreading* stage (greater than 18–50 COVID-19 cases per 100,000 persons over 14 days) [1]. Norway qualified municipality-specified restrictions and recommendations, such as the closing of public institutions, via a colour-level system, with *red*, *yellow*, and *green* levels declared depending on the

infection rate within a municipality [107]. For example, in January of 2021 Rana municipality notified residents that care homes were at *red* level and unnecessary visitation to care home residents was prohibited [107]. The Federal Service for Supervision of Consumer Rights Protection Russia employed a similar three-tiered staging system to determine restrictive measures against COVID-19, though decisions on the stages, prevention, and monitoring were transferred to regional governments [108]. In Sweden, the Pandemic Act was established in January 2021, to allow governmental authorities to interfere to a higher extent in societal areas previously governed locally, such as lock-down of local public facilities [109].

Lockdowns and closures

Most countries/regions initiated a period of strict lock-down to attempt to curb the spread of COVID-19 in the first 6 weeks of the COVID-19 pandemic, beginning March of 2020. Sweden, Iceland, Finland, and Greenland did not initiate a country-wide lockdown, though they implemented restrictions on gatherings and other measures to reduce transmission risk.

Characteristics of COVID-19 lockdown and closures in each country are listed in Table 3. Closure of non-essential businesses, schools, and services were advised in most countries, and all regions encouraged or required limitations to gatherings throughout the first year of the pandemic. In many regions, changes to the number of allowable people gathered reflected the temporal threat of COVID-10 caseloads. For example, in Iceland gatherings were initially limited to 100 people and then reduced to 20 people as a COVID-19 wave hit the country in April of 2020 [29]. However, by June of 2020 the COVID-19 caseload declined and gathering limitations were increased to 500 people. Like other countries, when the second wave of COVID-19 cases affected Iceland in November of 2020, gatherings were reduced to 10 people.

In Iceland, Sweden, Yukon, and parts of Alaska, bars and restaurants primarily remained open with restrictions, such as limits to the number of patrons, mask requirements, and seating requirements. However, bars and restaurants were connected to COVID-19 transmission. Provision of food services varied, for example, restaurants in Nunavut were closed for in-person dining and open for takeout only since end of March 2020, though food-providing centres (such as food banks) could remain open [132].

In many regions, strict restrictions on gatherings necessitated the cancellation of arts and cultural events, sporting events, and closure of public entertainment

arenas such as theatres. In Iceland and Russia arts and cultural events remained allowable with attendance restrictions and precautions throughout 2020. In Sweden, events remained permissible though age restrictions were imposed in December of 2020. Cultural and sporting events reopened in June of 2020 in Finland.

School closures

All countries and regions initiated school closures and distance learning. However, in Sweden this only applied for upper secondary school and above, while other schools remained open throughout the pandemic. In March of 2020, distance learning became mandatory across Russia and the northern regions were most successful with implementation, partially because families were already adapted to remote education during severe frosts [133]. Indigenous families in the Yamal region were happy to have children back on the tundra. So-called “school helicopters” cancelled their flights at the end of May of 2020 [134]. This measure reduced the risk of reindeer herders becoming infected. School closures in the Yukon Kuskokwim region of Alaska were challenging for families with working parents, as well as in households without reliable internet access. In Iceland schools and universities were closed as a first response, but childcare and primary schools were permitted to remain open with limitations. In NWT, Yukon, and Nunavut schools were closed for the remaining 2019–2020 academic year, as initiated by territorial governments and local school districts. In Finland, local closures were recommended based on the pandemic level (*base, accelerating, or spreading*). However, in March 2020, all schools were closed nationally for three weeks, excluding younger children (grades 1. to 3.) and children with a parent in a working position that was crucial in handling the pandemic. During the Finnish national lockdown children and youth studied remotely and adults worked remotely. After this period of national school closure, local decisions for closures took precedence in Finland [135].

Funeral exceptions

Conditions around COVID-19 safety and allowable gathering numbers for funerals generated varying responses between countries. In Norway all events were postponed if gathering people from several municipalities, with the exception of funerals [102]. In Sweden, from 23 November 2020 a maximum of eight people were allowed to gather for public and private events in premises outside one’s own home, except for funerals where 20 persons were allowed to participate [136]. In Iceland the gathering restriction limits rules also affected the number of people who were allowed to attend

funerals at any given time [29]. The Yupiit tribes in Alaska have protocols and follow traditional and religious rituals when loved ones die. The COVID-19 pandemic interfered with cultural responses to grief and loss and required loved ones to take on mortician duties, (i.e. body preparation for burial) because the typical caretakers could not risk exposure to the infection [137].

Use of health technology for monitoring/tracking

Most countries developed new health technology via websites and phone apps to aid in contact tracing and symptom assessment. Nunavut, Yukon, and Northwest Territories created a self assessment online tool for citizens to identify symptoms of COVID-19 [138]. Iceland released the *Rakning C-19* tracking app to improve contact tracing [26]. In August of 2020, Iceland implemented a COVID-19 online chat on www.covid.is, to improve the provision of public information [28]. Greenland used the Danish app *smitte|stop*, a Bluetooth-based contact tracing tool designed to track and notify phone users detected within range of confirmed COVID-19 cases [139]. In Norway, *smitte|stop* app was initially used to help trace COVID-19, but was suspended by the Norwegian Institute of Public Health in June of 2020 due to data privacy concerns related to sharing individual's locations [140]. In Finland, *Koronavilkku* was launched in August of 2020 as a private contact-tracing app produced by the Finnish Institute for Health and Welfare [141]. If a user tested positive for COVID-19, they could use the app to anonymously notify close contacts and prompt them to seek testing [141]. The Finnish symptom checker website *Omaolo* offered advice on when to seek professional medical care [142]. In Sweden the *COVID-19 Symptom Tracker* app helped map the spread of infection and share knowledge of the virus. The goal of the app was to assess regional and behavioural factors associated with risk of infection, and how quickly the virus was spreading in different parts of Sweden [143].

Context of Indigenous communities and prevention strategies in the first year of COVID-19

During the first year of the COVID-19 pandemic Arctic Indigenous communities had varying levels of inclusion and control over COVID-19 restrictions and protocols depending on their level of governance, health infrastructure, and inclusion in national level health decisions. Tribal governance in Alaska Native communities allowed for localised control and leadership to establish COVID-19 safety directives. By comparison, Sámi Parliament of Sweden experienced exclusion from important decisions on COVID-19 that affected Sámi communities. In this section,

we outline some specific characteristics of COVID-19 restrictions and directives in Arctic Indigenous communities during the first year of the pandemic.

Safety disagreements between state and tribal governance in Alaska

The COVID-19 pandemic underscored a variety of pre-existing vulnerabilities of the healthcare system for residents in remote parts of Alaska, such as provider shortages, limited material resources, and dependence on air travel [144]. During the first year of the COVID-19 pandemic, state and tribal governance in Alaska experienced incidences of conflict. For example, in April of 2020 the State of Alaska announced it would allow commercial fishing to continue, acknowledging fishermen as critical infrastructure to the state's economy despite the expressed opposition of coastal tribal communities [145,146]. Tribal members and other residents expressed concern that an influx of thousands of non-resident fishery workers from out-of-state and country could overwhelm the low-capacity healthcare system in the region [6]. Cultural attitudes about individual right-to-privacy versus group protection contributed to disputes about COVID-19 transmission tracking approaches for some tribal communities in Alaska. Individual rights to healthcare privacy are protected by the US federal government, meaning individuals who tested positive for COVID-19 did not have their status disclosed in their place of residence [147]. This approach created an ethical conflict for some Nuniitnek Yupiit tribal members who emphasised the need for transparency of individual COVID-19 cases in order to track and prevent the spread of cases into small communities.

COVID-19 exposed healthcare infrastructure gaps for Kalaallit communities in Greenland

The Greenlandic health system is based on a Danish framework and the governance structure in Greenland is not adapted to include local Inuit community in decisions. The Inuit Circumpolar Conference (ICC) has urged the government to acknowledge the challenges that Inuit communities face [52]. The ICC warned that rural, remote communities of Greenland were at higher risk of severe consequences related to epidemics due to the chronic lack of basic infrastructure, including lack of sewer and running water in many communities [52]. The ICC called on governments to close the infrastructure gaps throughout Kalaallit Nunaat through major investments in communities, prioritising basic infrastructure such as housing, water, and sewer. This is identified as part of the path forward to create social and economic

Table 3. Lockdowns, closures, and limits to gatherings regulations in Arctic countries in the first year of the COVID-19 pandemic.

	Canada			United States	
	Nunavut	NWT	Yukon	Alaska	Russia
Observed initial lockdown	March 17, 2020, initial territory-wide lockdown through June 2020. Second lockdown November 18, 2020.	Territory-wide lockdown not initiated.	Territory-wide lockdown not initiated.	March 28, 2020, shelter-in-place order issued. Individual communities extend lockdown at their discretion. All State of Alaska mandates lifted May 19, 2020.	March 30, 2020, nationwide stay-at-home order for 6 weeks. To protect economy, no federal restrictions issued during second wave in Fall 2020. Regional restrictions varied throughout 2020.
Work from home advisory	March 14, 2020, government employees sent home. November 18, 2020 businesses instructed employees work from home.	March 17, 2020 municipal programs close and work from home advisory issued.	March 18, 2020, government issue work from home directive.	March 28, 2020, shelter-in-place and work from home initiated. State of Alaska employees return to work May 22, 2020.	March 30, 2020, Federal government enforces non-work days for 6 weeks.
School closures	March 17 & 18, 2020 schools, daycares, and college classes close for 3 weeks. April 17 & 24, 2020 all schools and college classes suspended until Fall 2020. June 1, 2020 daycares reopen.	March 16, 2020, CPHO orders closure of schools.	April 7, 2020 in-person classes cancelled until August 2020.	March 13, 2020. Public schools close. Certain communities maintain closures through 2020 and into 2021.	March 2, 2020 schools closed, reopened July 13, 2020.
Closures of services (restaurants, bars, theatres, salons, etc.)	March 17, 2020, bars and restaurants takeout only. Lines cannot exceed 10 people. Food banks and soup kitchens remain open.	March 22, 2020. Tours, bottle depots, gyms, bars, restaurants, salons, etc. closed.	March 22, 2020 all services close. March 29, 2020 restaurants can reopen with submission of a health plan. July 1, 2020 restaurants and bars open to 50% capacity.	March 18, 2020, food and bar services restricted to take out and delivery. Gyms and entertainment venues close. May 19, 2020 state allows all businesses to operate at full capacity. Individual communities maintain restrictions.	March 28, 2020, restaurants and non-essential services to close through June 2020.
Limits to gatherings and public events	March 17, 2020, public events cancelled and gathering discouraged. November 18, 2020 gatherings limited to 5 people.	March 22, 2020 all public events and gatherings cancelled. April 10, 2020 all private and public gatherings between different households banned. Maximum 10 people from a household permitted to gather.	March 18, 2020, gatherings limited to 10 people. Healthcare workers, essential services, and people over 65 are not to gather. August 26, 2020 10 people indoors or 50 people outdoors permitted.	March 18, 2020, limited to 10 people. State of Alaska mandate lifted May 19, 2020. Individual communities maintain limits to gatherings.	March 19, 2020, regional authorities limit gatherings from 50 to 1,000 people at their discretion.
Visits to elderly care homes and hospitals	April 2020, restrictions to visits. June 15, 2020, all Elder's homes closed to visitation for remainder of 2020.	March 17, 2020, visitations to long-term care homes and older programs restricted. Acute-care limited to 1 visitor.	March 25, 2020, seniors to stay home and all nursing home visits prohibited.	March 18, 2020, visitations to hospitals, nursing homes, skilled nursing facilities, and residential care prohibited.	April 6, 2020, Federal guidance issued to limit outside visitors to nursing facilities.
Special funeral permissions	No special permissions for funerals.	No special permissions for funerals.	August 26, 2020, 50–100 people permitted for outdoors celebration of life.	Funeral and mortuary services suspended in some Alaska Native communities. Families provided materials to conduct burial. Church services suspended.	April 20, 2020, regional variations on funeral size limit. Special regulations for funeral service operators and for Muslim burials.
Arts, cultural, sporting events	March 17, 2020, all events cancelled. October 26, 2020 sports, recreation, gyms, fitness centres reopened with restrictions. Harvest and outdoor activities permitted.	March 22, 2020, theatres and museums close.	March 18, 2020, events cancelled. August 26, 2020 contact sport guidelines released for ice, field, and court sports.	March 2020, festivals, fairs, theatre, and cultural events cancelled. Numerous cultural and dancing events performed via online streaming platforms.	Limits to events, museums, theatres, concerts, but were not completely closed. August 1, 2020 cinemas and concerts reopen. Gyms and recreations centres reopen June 23, 2020.

(Continued)

Table 3. (Continued).

	Canada			United States	
	Nunavut	NWT	Yukon	Alaska	Russia
	Iceland	Greenland	Norway	Sweden	Finland
Observed initial lockdown	Country-wide lockdown not initiated.	Country-wide lockdown not initiated. Nuuk residents lockdown for 3 weeks beginning March 18, 2020.	March 12, 2020, lockdown announced for two weeks.	Country-wide lockdown not initiated.	March 16, 2020, no formal lockdown initiated, though Finnish government releases emergency measures for daily activities.
Work from home advisory	Companies and institutions responsible for following gathering restrictions. Remote work encouraged.	March 13, 2020, work from home advisory issued.	March 2020, advisory to work from home if possible.	March 2020, advisory to work from home if possible.	May 5, 2020, work from home encouraged in public and private sector if possible.
School closures	March 13, 2020, Universities close, nursery and primary programs have limited openings. May 4, 2020 primary schools reopen. August 4, 2020 secondary schools reopen with restrictions.	March 13, 2020, all schools close. Schools outside of Nuuk reopen April 14, 2020.	March 12, 2020, daycares, primary schools, upper education and universities closed. Exceptions for children in daycare with parents who perform critical duties.	March 18, 2020, primary and secondary schools and universities closed. Online learning extended through remainder of 2020.	May 5, 2020, schools and other learning facilities advised to close according to the pandemic level (base, acceleration, spreading level).
Closures of services (restaurants, bars, theatres, salons, etc.)	May 25, 2020 pubs, clubs, and gaming allowed to open until 11:00 pm with capacity restrictions. September 18, 2020 pubs in urban areas close, reopened with seating restrictions September 27, 2020.	March 18, 2020, restaurants and pubs closed. Reopened April 8, 2020.	March 12, 2020, restaurants, bars, pubs, and social establishments closed with exception for places that can maintain 1 metre distance between patrons, such as canteens.	Restaurants and bars remain open through 2020 with restrictions on capacity, operable hours, and alcohol sales.	March 28, 2020, restaurants and bars only open for takeaway. June 22, 2020 restrictions eased. October 8, 2020 restrictions to hours of operation and alcohol sales.
	Iceland	Greenland	Norway	Sweden	Finland
Limits to gatherings and public events	March 13, 2020, gatherings restricted to 100 people. March 22, 2020 reduced to 20 people. April 21, 2020 increased to 50 people. During low infection period May/June up to 500 people permitted to gather. Some communities reduce gathering limits to 5.	March 13, 2020, gatherings limited to 1,000 people.	March 12, 2020, limit to 10 people indoors or 20 people outdoors. Maximum allowable gatherings of 100 people indoors with fixed seating arrangements, or 3 × 200 attendants at outdoor public events with fixed seating.	March 11, 2020, events limited to 300 people. March 27, 2020 private gatherings restricted to 50 people. November 23, 2020, gatherings limited to 8 people.	March 16, 2020, public gatherings limited to 10 people. June 1, relaxed to 50 people. Permitted gatherings shifted based on pandemic level.
Visits to elderly care homes and hospitals	August 14, 2020, nursing homes, and healthcare centres may determine their visitation restrictions. Restrictions vary throughout 2020.	No specific restrictions. Can anybody in Greenland confirm this?	March 12, 2020, visitations to nursing care facilities restricted.	April 1, 2020, elder care homes encouraged to determine their own visitation restrictions.	March 16, 2020, visits to elderly homes prohibited. June 2020, facilities advised to determine visitation restrictions.
Special funeral permissions	December 10, 2020, Funerals allowed up to 50 attendants.	No special restrictions on funerals, attendance permitted in accordance with 1,000-person gathering restriction.	Events gathering people from multiple municipalities cancelled with the exception of funerals.	November 23, 2020, funerals permitted 20 attendants.	No special permissions for funerals.
Arts, cultural, sporting events	April 21, 2020, sporting events permitted without restrictions. Arts and cultural events allowed with precautions and limits to number of people performing and in audience. October 31, 2020 sports and arts events cancelled.	Sporting and cultural events permitted throughout 2020 based on low COVID-19 case load.	March 12, 2020, Cultural events and organised sporting activities, both indoors and outdoors, were prohibited.	Sporting events permitted with certain restrictions for athlete contact, outdoor competitions mandated, and events postponed. December 2020, participation restrictions for children born after 2001.	March 16, 2020, museums, theatres, cultural venues, pools, sports clubs, and other centres closed. June 1, 2020 sports and cultural activities begin to reopen with restrictions.

Abbreviations: NWT=Northwest Territories. CPHO=Chief Public Health Officer.

Abbreviations: NWT=Northwest Territories.

See References: 29, 57, 58, 81, 94 [110–114], [115–131].

equity, support population health, and reduce vulnerability to virus and disease. When designing local, regional, and national responses and preparedness to the coronavirus and other infectious diseases, governments must acknowledge the challenges faced by Inuit communities [52,148].

Sámi communities of Sweden and consultation in national COVID-19 prevention strategy

In June of 2020 the Sámi Parliament in Sweden released a report on the impact of COVID-19 on Indigenous peoples that stated no Sámi representatives had been invited to participate in decision-making processes on COVID-measures affecting the Sámi [47]. The Sámi people had not been consulted on the impacts of the Swedish national response or on needs for measures and programmes to address COVID-19 from a Sámi perspective [47]. Within the first 6 months of 2020, Sámi Parliament in Sweden was not able to identify any initiatives by hospitals and healthcare or test facilities collecting and analysing information/data on COVID-19 health impacts on Sámi individuals [47]. Furthermore, no information-sharing or awareness-raising initiatives were directed at Sámi society or communities [47].

Reindeer herding and national border closures in Sápmi

The Sámi Parliament of Sweden assessed that one of the most impactful COVID-19 restrictions for the Sámi population was the initial closing of the borders between Norway, Sweden, and Finland and travel restrictions between March and June 2020. Sámi homelands cross the nation state borders, and border closures did not account for the movement of the Sámi in pursuit of traditional livelihoods. Reindeer herding necessitates free-range movement between grazing lands in Norway, Sweden, and Finland. Family members within a Sámi family often reside in different countries depending on the seasons following the cycles of the reindeer. Restrictions on border crossings into Finnish Lapland included limited operational hours of certain border crossing points on the western and eastern borders in Lapland. The objective of the Finnish health authorities was to guide all people crossing the Finnish border to a COVID-19 test [149]. In June 2020, restrictions were lifted for essential occupations, including the care of livestock between Sweden, Norway, and Finland [150].

The Sámi Parliament of Sweden conducted a survey on the financial impacts on Sámi business with a focus on reindeer herding. The survey found a decrease in demand for reindeer meat (mainly from the restaurant sector), which was expected to result in lower sales volumes and lowered prices next year [151]. The

cumulative economic effect of COVID-19 aggravated the conditions for reindeer herding, as pasture lands are already under pressure due to competing land use (natural resource exploitation, wind power, infrastructure) and impacts of climate change [47].

Compromise between state and tribal (regional) governance in Russia

In the Arctic territories of Russia, local communities highlighted the importance of responsible behaviour during the pandemic. Communication with the federal representatives and public opinion helped to implement preventive measures. Public authorities in Indigenous-populated regions made compromises with Indigenous peoples to allow fishing, hunting, and reindeer herding during the pandemic conditions. Reindeer herders were allowed to hunt and to herd reindeer if they stayed on the tundra, away from the villages [134]. The restrictions had little impact on the Indigenous peoples of the remote Arctic settlements of the Russian regions. In spring 2020, almost all reindeer herders moved their herds to summer pastures, far from densely populated areas to reduce the risk of COVID-19 outbreaks. Regional authorities understood that reindeer need constant care, and herders couldn't be isolated completely; these requirements were more easily complied with.

Conclusions

Each Arctic country detailed in this article conducted case studies in their respective region to investigate positive and negative societal outcomes related to the COVID-19 pandemic, with a special interest in the experiences of rural communities and Arctic Indigenous communities. In subsequent publications, we describe each of the seven country case studies (Greenland, Iceland, Finland, Norway, Sweden, Canada, and US/Alaska) and the evidence-based health policy recommendations that each case study elicited.

Arctic countries and communities implemented a diverse array of measures at multiple levels to protect their populations from the spread of COVID-19. The most common measures included travel restrictions, quarantine/isolation protocols, lockdowns/closures, and testing. At times regional, national, and municipal decision-makers either clashed or worked together, most often the latter. Special allowances were made for Indigenous community harvesters and herders to continue their practice when a more detailed picture of COVID-19 began to emerge through the spring of 2020. Furthermore, Indigenous communities demonstrated a strong desire to keep

the virus out to protect Elders and vulnerable members of communities and took precautions to prevent transmission. Ultimately, the Arctic did not see the same levels of transmission in the first 10 months of pandemic as other parts of the world, which would indicate that the adopted measures were successful for the first year of the COVID-19 pandemic.

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