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FIRST RESPONDERS:

How the Asia Pacific Region Managed the Public Health Response to COVID-19 and What Canada Can Learn from Them



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EXECUTIVE SUMMARY

Throughout the world, COVID-19 has exposed the strengths and weaknesses of public health and pandemic preparedness. In contrast to developed countries throughout Europe and North America, many Asian countries have been highly successful in managing the pandemic within their borders. For example, the exemplary responses of South Korea, Taiwan, Australia, New Zealand, and other economies of the Asia Pacific region have been characterized by superior levels of co-ordination and agility. The most definitive factor in the response of Asian economies such as Taiwan and South Korea has been the structural and institutional changes wrought by experience with past outbreaks.

In a review released in March 2021, the auditor general of Canada concluded that the Public Health Agency of Canada was not adequately prepared to respond to COVID-19. In Canada, the 2003 SARS outbreak was largely confined to health-care facilities and thus did not provide sufficient preparation or learning opportunities for the government to develop and implement a whole-of-society pandemic response. In the intervening years, the responses that were built up after SARS have languished as focus has shifted elsewhere. Canada now faces an opportunity to learn from the successes and failures of its response to COVID-19 and to incorporate those lessons into future pandemic plans. This should include looking to the Asia Pacific, as this region has shown the most effective response to COVID-19.

In this report, we evaluate the pandemic responses from seven Asia Pacific economies: Australia, Japan, New Zealand, Singapore, South Korea, Taiwan, and Vietnam, across seven broad categories: (1) governance structure, expertise, and experience; (2) pandemic preparedness; (3) public health and the pandemic response; (4) border measures; (5) case-based interventions; (6) population-based interventions; and (7) communication strategies.

We identify factors that enabled the success of the Asia Pacific region and that are relevant to the Canadian context. We then propose recommendations based on the following themes, which emerged from our research:

- Effective pandemic responses require a whole-of society approach;
- Effective pandemic responses are strengthened by structural and institutional preparations, many of which are shaped by past experiences;
- Responses need to be guided by scientific expertise using what limited data is available, and be agile enough to adapt quickly to new evidence; and
- Timing greatly affects the effectiveness of a response.

RÉSUMÉ

Partout dans le monde, la COVID-19 a mis en évidence les forces et les faiblesses des organismes de santé publique et de l'état de préparation aux pandémies. Contrairement aux pays développés de l'Europe et de l'Amérique du Nord, de nombreux pays asiatiques ont très bien réussi à gérer la pandémie au sein de leurs frontières. Par exemple, les réponses exemplaires de la Corée du Sud, de Taïwan, de l'Australie, de la Nouvelle-Zélande et d'autres économies de la région de l'Asie Pacifique ont été caractérisées par des niveaux supérieurs de coordination et d'agilité. Le facteur le plus déterminant dans la réponse des économies asiatiques comme celles de Taïwan et de la Corée du Sud a été les changements structurels et institutionnels apportés en raison de l'expérience des épidémies passées.

Dans une étude publiée en mars 2021, la vérificatrice générale du Canada a conclu que l'Agence de la santé publique du Canada n'était pas suffisamment préparée pour réagir à la COVID-19. Au Canada, l'épidémie de SRAS de 2003 a été largement confinée aux établissements de soins de santé et n'a donc pas fourni au gouvernement une préparation suffisante ou des possibilités d'apprentissage pour élaborer et mettre en œuvre une réponse à une pandémie portant sur l'échelle de la société. Au cours des années qui ont suivi, les mesures mises en place après le SRAS ont languie, car l'attention s'est déplacée ailleurs. Le Canada a maintenant la possibilité de tirer des leçons des succès et des échecs de sa réponse à la COVID-19 et d'intégrer ces leçons aux plans de lutte contre de futures pandémies. Pour ce faire, il devrait notamment se tourner vers l'Asie Pacifique, car c'est dans cette région que la réponse à la COVID-19 a été la plus efficace.

Dans ce rapport, nous évaluons les réponses à la pandémie de sept économies de la région de l'Asie Pacifique — l'Australie, le Japon, la Nouvelle-Zélande, Singapour, la Corée du Sud, Taïwan et le Vietnam —, par rapport à sept catégories générales : (1) la structure de la gouvernance, l'expertise et l'expérience; (2) la santé publique et l'état de préparation à la pandémie; (3) la surveillance des maladies infectieuses et la réponse à leur égard; (4) les mesures aux frontières; (5) le dépistage et la gestion des cas; (6) les interventions non pharmaceutiques; et (7) les stratégies de communication.

Nous déterminons les facteurs qui ont permis à la région de l'Asie Pacifique de remporter du succès et qui sont pertinents pour le contexte canadien. Nous proposons ensuite des recommandations fondées sur les thèmes suivants, qui ont été dégagés par notre recherche :

- Les réponses efficaces en cas de pandémie exigent une approche visant l'ensemble de la société.
- Les réponses efficaces à une pandémie sont renforcées par des préparations structurelles et institutionnelles, dont beaucoup sont définies par les expériences passées.
- Les réponses doivent être guidées par l'expertise scientifique en utilisant les données limitées disponibles, et être suffisamment souples pour s'adapter rapidement aux nouvelles données.
- Le choix du moment influe grandement sur l'efficacité d'une réponse.

01

INTRODUCTION

Although Canada was not unprepared for a pandemic, COVID-19 nonetheless resulted in significant loss of life and had a high economic cost. By the end of 2020, Canada had recorded 584,409 cases of COVID-19, resulting in 15,762 deaths and costing an estimated C\$240B, or C\$952M per day.¹ Many countries, most notably in the Asia Pacific region, handled the pandemic relatively better, with lower rates of transmission and deaths, fewer overall restrictions on domestic society, and a smaller decline in GDP. In this report we assess and analyze the factors that contributed to the successful pandemic response of multiple Asia Pacific countries and derive recommendations that are applicable in the Canadian context. COVID-19 is not the last health crisis that the world will face. Only by learning from our own experiences – as well as those of others – will Canada be better positioned to respond more effectively when the next pandemic arrives.

This report begins with a brief description of COVID-19 as a novel pathogen, highlighting the unique features that have made it challenging to control. We then examine the pandemic outcomes in the Asia Pacific region. Our analysis later focuses on key features of the pandemic response in select Asia Pacific countries and the lessons that can be derived for future pandemic planning in Canada.

Our findings reveal several themes that are shared between Asia Pacific countries that successfully navigated COVID-19. Previous experience with epidemics informed policy and structural reforms and also heightened the awareness of emerging infectious diseases

among the public. As Canada emerges from the initial shock of COVID-19 and begins to assess how this experience can improve its response to future pandemics, our analysis identifies several lessons from the Asia Pacific region.

02

METHODOLOGY AND SCOPE

Our analysis is restricted to the first year of the pandemic, with particular focus on the first few months. As such, an assessment of vaccination campaigns has not been included. The findings in this report are based on the experiences of seven countries. Specifically, this report provides an in-depth examination and analysis of the responses of Australia, Japan, New Zealand, Singapore, South Korea, Taiwan, and Vietnam. The criteria for their inclusion are as follows:

1. **Overall low cumulative case numbers and mortality:** The selected countries have been able to maintain comparatively low rates of community transmission throughout multiple waves of the pandemic. We did not heavily focus on those countries in South or Southeast Asia, such as India, Thailand, and Cambodia, that performed admirably throughout the first year only to experience devastating surges in the spring of 2021.
2. **Co-ordinated pandemic preparedness and response:** The success of each economy covered in our report resulted from the unique intersectionality of governance models, socioeconomic and cultural factors, and existing public health infrastructures. Hence, our approach focuses more on the policies and institutional features that allowed their effective and co-ordinated pandemic responses, despite the inherent differences between these countries. We analyzed the mechanisms used to establish response networks, from which Canada can draw contextualized lessons.

Our research and analysis relied on a mix of methods, including desk research, expert interviews, and expert roundtables.

We performed a review of policy responses to COVID-19, using a variety of sources including: (1) government websites and reports, white papers, and media briefings; (2) academic publications obtained from health science and medicine literature databases; and (3) databases compiled by international organizations and research groups.

From our desk research, we identified experts from the region and invited them to share their perspectives at two health policy roundtables or by interview. The experts included public health officers, government officials, physicians, and academic researchers. In addition to Canada, these experts represented our case study countries: Australia, Japan, New Zealand, Singapore, South Korea, Taiwan, and Vietnam. We identified areas of discussion and formulated a broad range of questions that were included in briefing materials sent to participants.

Roundtable 1 included seven participants who shared their expertise on pandemic preparedness and response, public health investment, surveillance, population-based interventions, border policies, reopening strategies, and high-risk populations. Roundtable 2 included five experts who were asked questions on case-based interventions such as contact tracing, testing, quarantine, and the application of digital technology to aid these strategies.

Additionally, we consulted several Canadian experts from academic institutions and the public sector on areas including communication, public health, data governance, and border control to help evaluate the applicability of our recommendations.

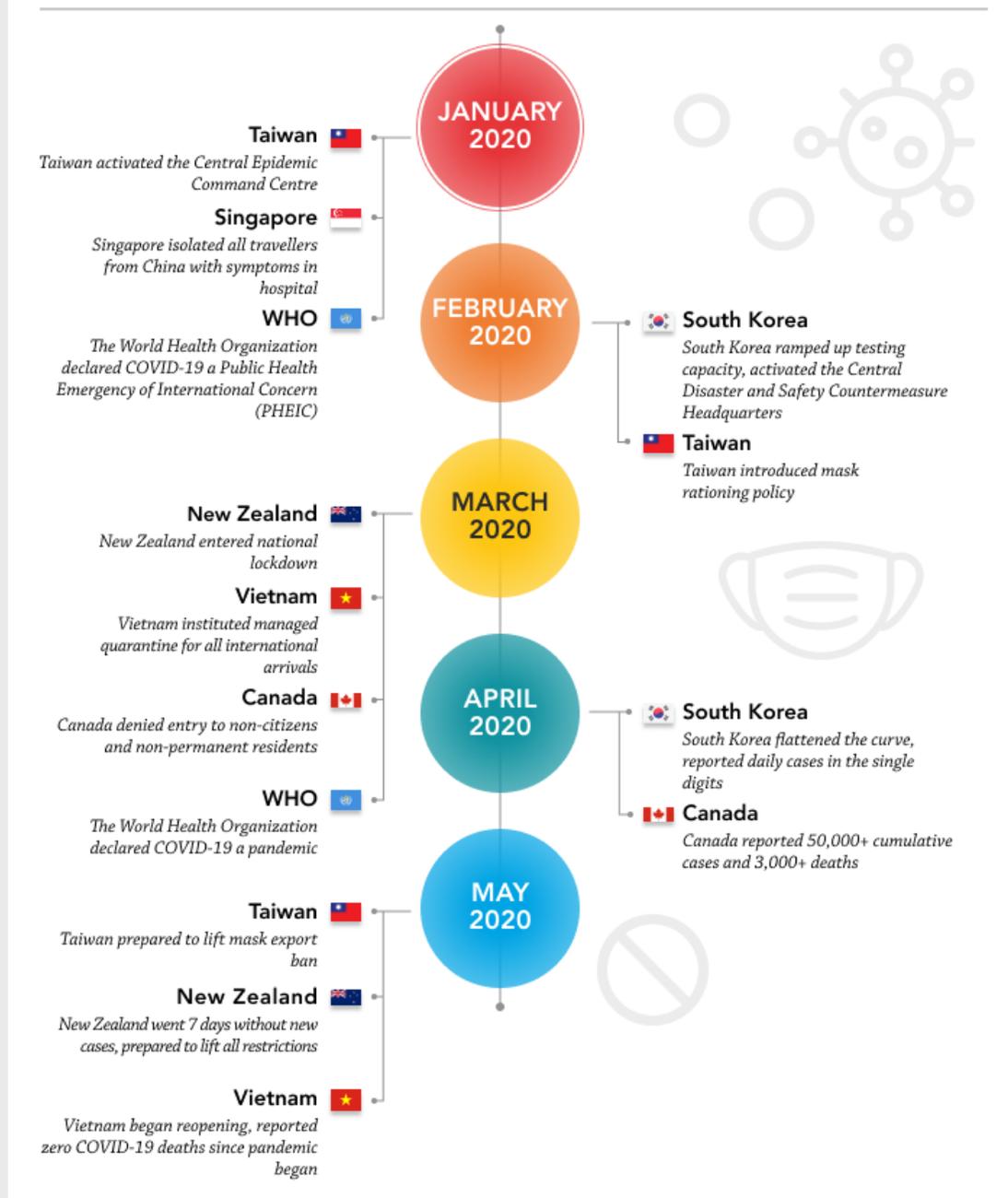
Early Timeline of COVID-19

On December 31, 2019, a cluster of pneumonia of unknown cause was described on the surveillance site ProMED.² On the same day, Chinese authorities notified the World Health Organization (WHO) of a cluster of 27 cases of pneumonia of unknown cause in Wuhan City, Hubei Province.³ On January 9, Chinese researchers identified the causative organism as a novel coronavirus, and on January 10 they released the genetic sequence of the virus.⁴ Although there was evidence as early as January 2 that person-to-person transmission was occurring,⁵ the WHO did not acknowledge this fact until January 20.⁶ Thailand identified the first case outside of China on January 13, followed by Japan on January 15. The WHO declared COVID-19 a Public Health Emergency of International

Concern on January 30. However, the organization did not declare COVID-19 a pandemic until March 12. By then, 125,260 cases had been detected in 117 countries, with 4,613 deaths.⁷

FIGURE 1

Timeline of COVID-19



In Canada, the first case was diagnosed on January 27 in a traveller recently returned from Wuhan. The first case of community transmission was recorded on March 5 in BC. Throughout the spring and early summer of 2020, the highest case counts were recorded in Ontario, Quebec, and Alberta, with fatalities being particularly concentrated among residents of long-term care facilities. By mid-summer, cases had steadily declined throughout the country, leading to a relaxation of restrictions. With the exception of the Atlantic provinces and the territories, cases began to surge throughout the country in the fall and winter of 2020, leading to the anticipated second wave. A third wave, largely driven by the novel and more-transmissible variants, developed throughout the winter/spring of 2021, leading to increased restrictions across most of Canada, including widespread lockdowns.

Transmission Dynamics

SARS-CoV-2, the virus that causes COVID-19, is primarily transmitted via respiratory droplets,⁸ although there is increasing evidence that airborne transmission can occur under certain conditions.⁹ Studies in Hong Kong and Japan have described clusters of transmission – so-called “superspreader” events – as having been responsible for the majority of new infections, estimating that 20% of cases were responsible for 80% of transmission.¹⁰ The literature on COVID-19 shows that such patterns hold true for transmission globally.

SARS-CoV-2 demonstrates other characteristics that set it apart from the coronaviruses that caused severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), including both asymptomatic and pre-symptomatic transmission and a higher rate of transmission.¹¹ The rate of asymptomatic infections is difficult to accurately discern and is likely influenced by factors such as population demographics. Reports have highlighted that the asymptomatic rate ranges from 18% to 79% of cases,¹² and studies have reported that viral loads were not substantially different between symptomatic, pre-symptomatic, and asymptomatic individuals.¹³

Given the high global levels of transmission and the natural mutability of viruses, there has always been a substantial risk of genetic variants emerging that are more transmissible or more lethal. Throughout the winter of 2020-2021, novel variants of concern were detected that proved to be more transmissible than the original strain. Notably, the Alpha variant (B.1.1.7) first detected in the United Kingdom is estimated to be between 40% and 80% more transmissible than the original strain, while the Delta variant first detected in India is estimated to be 60% more transmissible than Alpha. These variants also appear to be

more prevalent in younger patients than the original strain, possibly due to lower rates of vaccination among this cohort. In June 2021, the Delta variant was the cause of the majority of new cases recorded in the United Kingdom and Australia, with infection rates highest in younger adults and older teens who had not been vaccinated.¹⁴

03

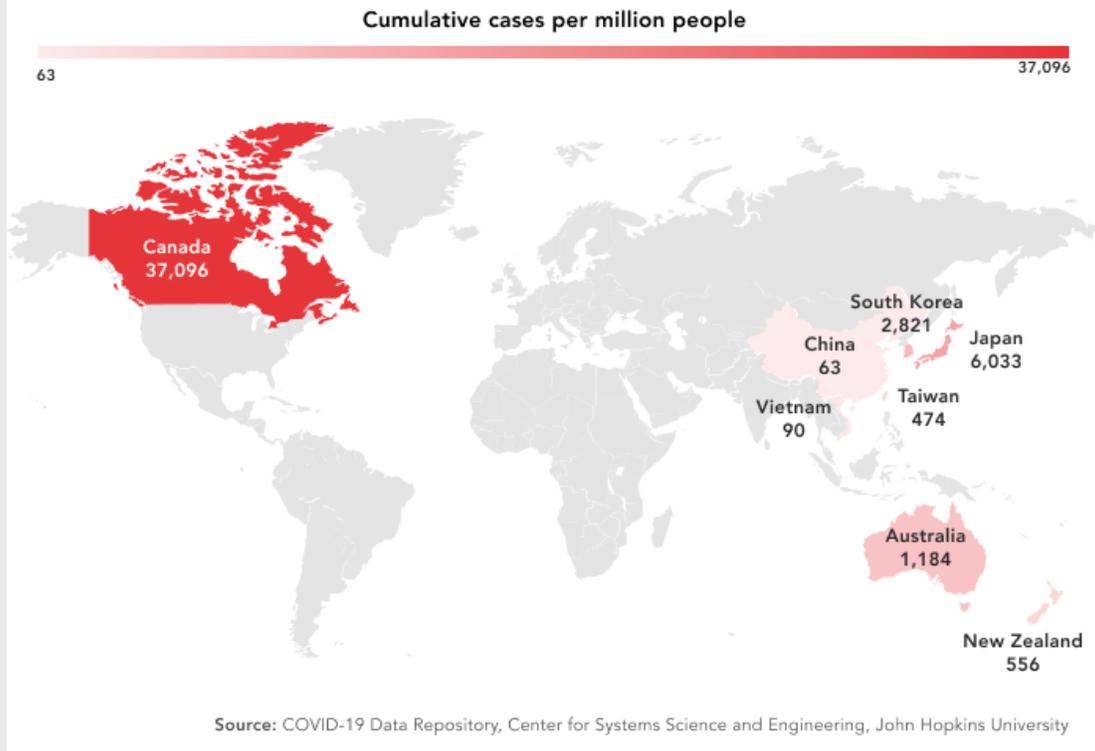
THE RELATIVE SUCCESS OF THE ASIA PACIFIC REGION

After China, other countries in Asia were the first to detect COVID-19 within their borders. Due to the proximity to the epicentre in China, there were fears that this region would be among the hardest hit by the pandemic. However, transmission throughout the Asia Pacific was on average much lower than that experienced by countries in North America and Europe. Taiwan, despite extensive connections with mainland China, had recorded only 40 cases by March 2020 and went 253 days without recording a single new case between April and December 2020. Although Singapore had recorded nearly 60,000 cases by March 2021, its response was largely successful in controlling community transmission, as nearly 90% of cases were among migrant workers living in crowded dormitories.

As our analysis reveals, the response to COVID-19 of many countries within the Asia Pacific region, most notably Vietnam, Singapore, and New Zealand, did not conform to prior indicators of success. The United States topped the Global Health Security Index (GHSI) assessment released in 2019 but struggled to mount an effective response to COVID-19, experiencing some of the highest rates of transmission and mortality in the world. Canada also scored high on the GHSI, ranking fifth overall; however, this assessment did not translate into a similarly ranked real world pandemic response. Conversely, the GHSI identified vulnerabilities in New Zealand's pandemic readiness, including an insufficient

FIGURE 2

The cumulative incidence of COVID-19 as of June 6, 2021, in Canada and the Asia Pacific



number of epidemiologists, inadequacies in the sharing and reporting of surveillance data, and failure to conduct exercises to assess pandemic readiness,¹⁵ all areas that were similarly identified by the 2010 Senate report on H1N1 as needing improvement in Canada.¹⁶ However, New Zealand overcame these challenges to mount one of the most effective responses to COVID-19.

The level of economic development also was not a determining factor in the ability of individual countries to curb the spread of COVID-19. High-income economies such as the United States and the United Kingdom struggled to contain transmission, while Vietnam, Cambodia, and Thailand, which have relatively low rates of per-capita spending in health, all reported low case numbers, recording 25, 50, and 373 cases, respectively, by March 2021.

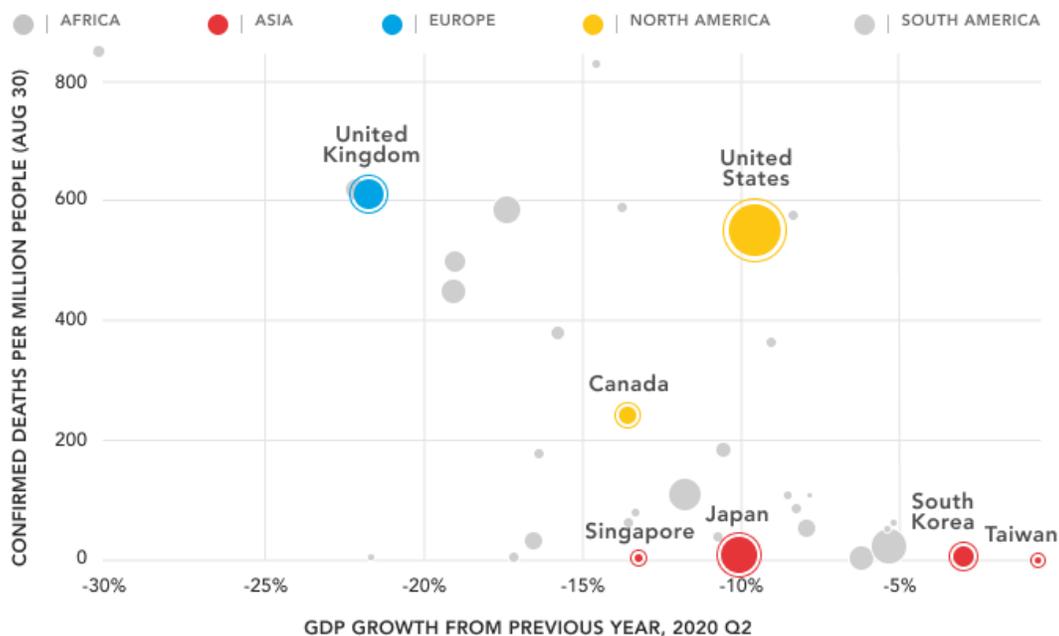
Economic Costs and Benefits of the Pandemic Response

The greater success of jurisdictions within the Asia Pacific region, such as South Korea, Taiwan, Australia, and New Zealand, is also reflected when analyzing the economic damage inflicted by the COVID-19 pandemic. Border closures, lockdowns, and other pandemic responses can cause massive economic damage. Many governments have been reluctant to implement drastic measures in a timely or comprehensive fashion. However, evidence suggests that taking a less-aggressive approach focused primarily on mitigating transmission rather than eliminating it was a more costly strategy in the long term. Despite the costs of the border restrictions imposed by Australia and New Zealand, in 2020 those countries experienced a year-over-year decline in GDP of 2.4% and 3.0%, respectively,

FIGURE 3

The relationship between the number of confirmed deaths and GDP growth from the previous year (2020 Q2) in the U.K., U.S., Canada, Singapore, Japan, South Korea, and Taiwan

The vertical axis shows the number of COVID-19 deaths per million people, as of August 30. The horizontal axis shows the percentage decline of GDP relative to the same quarter in 2019. It is adjusted for inflation.

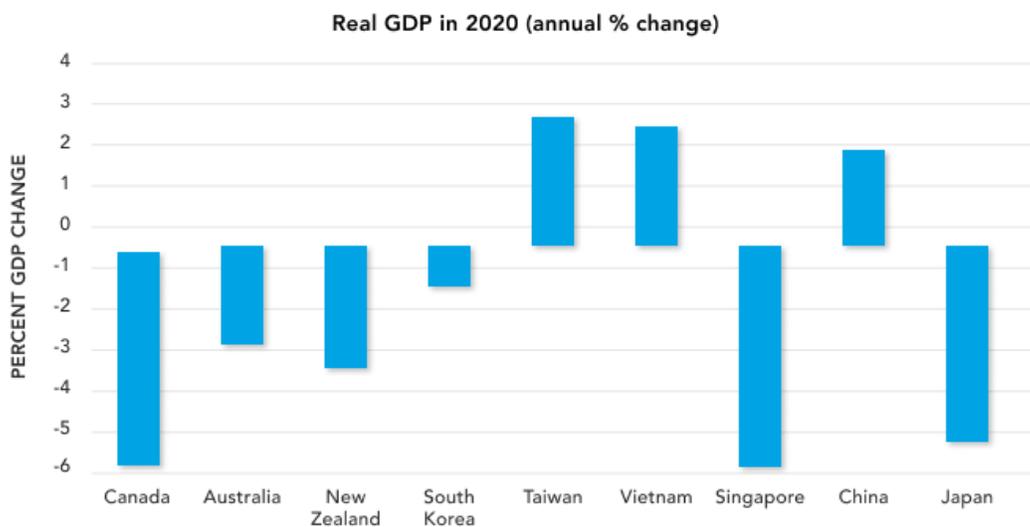


Source: COVID-19 Data Repository, Center for Systems Science and Engineering, John Hopkins University, World Bank — World Development Indicators

compared to Canada's 5.4% decline. South Korea, which pursued an ambitious testing and contact tracing strategy, experienced only a 1% decline in GDP while simultaneously avoiding border closures and mass lockdowns. Meanwhile, the early and decisive actions of Taiwan, including proactive case detection and strictly imposed quarantine, contributed to an actual gain in GDP of 3.1% in 2020. Although other factors may have been at play, this has implications for the cost-benefit analyses of future pandemic responses and supports the ethical and economic benefits of being proactive.

FIGURE 4

Percent GDP change between 2019 and 2020 in Canada, Australia, New Zealand, South Korea, Taiwan, Vietnam, Singapore, China, and Japan. Canada suffered the most economic damage compared to other countries in the Asia Pacific



Source: International Monetary Fund (IMF). 2021. World Economic Outlook: Managing Divergent Recoveries. Washington, DC

ANALYSIS

We investigated seven economies identified as having the most effective pandemic response to determine the factors that contributed to their success through an analysis across seven broad categories: (1) governance structure, expertise, and experience; (2) pandemic preparedness; (3) public health and pandemic response; (4) border measures; (5) case-based interventions; (6) population-based interventions; and (7) communication strategies. While there was no single path to success, we identified commonalities from which we derived lessons applicable to Canada.

Our findings reveal several themes that are shared between Asia Pacific countries that successfully navigated COVID-19. Previous experience with epidemics informed policy and structural reforms and also heightened the awareness of emerging infectious diseases among the public. As Canada emerges from the initial shock of COVID-19 and begins to assess how this experience can improve its response to future pandemics, our analysis identifies several lessons from the Asia Pacific region.

04

GOVERNANCE STRUCTURE, EXPERTISE, AND EXPERIENCE

A successful pandemic response is built on strong institutions and targeted policies. Our analysis of the COVID-19 response of the seven Asia Pacific economies reveals that their public health institutions underwent changes after previous experience with outbreaks, most significantly SARS in 2002-2003 and MERS in 2015. In the aftermath of these events, common reforms included improving inter-governmental and inter-ministry co-ordination, improving the definition of roles and authority among the various actors involved in a pandemic response, elevating the role of experts, and putting an emphasis on the protection of vulnerable populations. The changes brought to health governance structures and public health institutions paved the way for the successful response to COVID-19.

Effect of Governance Structure and Experience on Pandemic Preparedness and Response

COVID-19 is not the first emerging infectious disease that the Asia Pacific region has contended with. In the aftermath of previous outbreaks such as SARS, H1N1, and MERS, many of the most-affected countries have increased their focus on infectious disease outbreaks and pandemic preparedness. In addition to enacting new laws and policies, they assigned clear mandates to new or existing institutions, ensuring transparent protocols

and command structures in the case of a new outbreak. While in some instances the reform process led to a more centralized governance structure for pandemic responses, the key takeaway for Canada is how such reforms and institutions facilitated smooth co-ordination across government ministries and agencies, resulting in a more responsive, agile, and whole-of-government approach to the 2020 pandemic. The strength of effective cross-government co-ordination is exemplified by the centralized response of South Korea and Taiwan as well as by the more decentralized example of Australia.

After SARS, South Korea created the Korea Centers for Disease Control and Prevention (KCDC) in 2003.¹⁷ South Korea learned further lessons from its failed response to MERS in 2015, when a lack of communication and co-operation between different levels of government and a lack of collaboration between agencies were identified as factors explaining the poor response.¹⁸ At the national level, it was determined that the roles and responsibilities of the health authorities were fragmented and lacked clarity.¹⁹ At the time, the KCDC was under the Ministry of Health and lacked independent decision-making authority. In the reforms that followed MERS, the head of the KCDC was subsequently elevated to the level of vice-minister and the KCDC was designated the command centre for infectious disease responses.²⁰ The Infectious Disease Control and Prevention Act was also revised in 2016 to clarify the responsibilities of the participants involved in pandemic response and to facilitate co-ordination during an outbreak of an infectious disease.²¹ The KCDC also amended its organizational structure and revised the Standard Manuals for Crisis Management to improve response co-ordination, which has been credited as a factor in its rapid and agile response to COVID-19.²² On a practical level, a round-the-clock Emergency Operations Centre was established, as were provincial-led rapid response teams under the authority of the KCDC.²³

In early March 2020, as the COVID-19 outbreak grew, there was increasing pressure from the public for the pandemic response to be led by public health experts with pandemic experience rather than by the government.²⁴ In response, on September 12, 2020, the KCDC was elevated to a stand-alone agency and renamed the Korea Disease Control and Prevention Agency (KDCA), and staffing levels were increased.²⁵ No longer merely a centre under the Ministry of Health and Welfare, the KDCA obtained independence in the administration of its workforce and budget allocations. These changes also gave the KDCA jurisdiction and enforcement authority over six health-related laws, including the newly revised Infectious Disease Control and Prevention Act, the provisions of which cover notification and reporting of infectious diseases, as well as a range of prevention and control measures.²⁶

Taiwan had also experienced co-ordination issues between the central and municipal governments during its response to SARS in 2003,²⁷ as well as problems with surge capacity.²⁸ The legacy of SARS in Taiwan was the implementation of institutional and legal foundations on which future pandemic plans were built, including changes to the Communicable Disease Control Act in 2004 and the creation of the National Health Command Center (NHCC) to facilitate cross-ministerial information exchange and co-ordination during a pandemic response.²⁹

Post-SARS reforms in Taiwan further led to the establishment of the Central Epidemic Command Center (CECC), a sub-unit of the NHCC. The CECC is headed by the minister of health and welfare, and during emergencies it is activated to co-ordinate the outbreak response. The role of the commander of the CECC is to co-ordinate and mobilize resources across multiple ministries, including interior, transportation, foreign affairs, economics, labour, education, and defence.³⁰ As COVID-19 unfolded, the CECC was effective in improving the government response time and mobilizing resources.³¹

Amendments to the public health laws, including the Communicable Disease Control Act, made after SARS and during COVID-19 have further bolstered the authority of the CECC.³² Taiwan's Communicable Disease Control Act and the Special Act on COVID-19 Prevention, Relief and Restoration provide the CECC with broad policy-making authority, including over surveillance, border control, and quarantine.³³ The Act further provided the legal authority for the integration of the National Health Insurance and Immigration databases. The CECC also has the authority to enforce any disease prevention measures deemed necessary, including the tracking of cellphone data to monitor adherence to quarantine.

Canada also experienced SARS, the legacy of which was the creation of the Public Health Agency of Canada (PHAC). However, given the decentralized governance structure in Canada, the agency does not have the same level of authority to co-ordinate a pandemic response as does the KDCA in South Korea or the CECC in Taiwan. Although Canada demonstrated initial cohesion between levels of government in the early phases of the pandemic, the presence of a public health body imbued with greater authority could facilitate increased cooperation between the federal and provincial/territorial governments and consistency in the overall response, as demonstrated by the examples of South Korea and Taiwan.

CASE STUDY:

Case Study: Australia's Co-operative Model of Pandemic Response

In an analysis of the factors that facilitate an effective pandemic response, Australia is in many ways the exception to the rule. Spared during both the SARS and MERS outbreaks, and thus not as prepared for COVID-19 as other countries in the Asia Pacific, Australia nonetheless benefited from the past experiences of nearby countries. Lacking a central public health agency analogous to the PHAC or the CDC, Australia exemplified a co-operative model of pandemic responsiveness. The Australia Health Protection Principal Committee (AHPPC), chaired by the chief medical officer and consisting of the chief health officers of the states and territories, is the main decision-making committee for public health emergency management and disease control in Australia.³⁴

One of the strengths of Australia's response to COVID-19 was the co-ordination of a unified national response, without depriving states of their autonomy and decision-

making powers.³⁵ Although structured in a decentralized manner that is similar to Canada, in Australia the states and territories and the federal government jointly developed a national COVID-19 plan. To facilitate co-ordination and co-operation between levels of government, a National Cabinet made up of the prime minister, the state premiers, and the territory first ministers was convened on March 15, replacing the Council of Australian Governments (COAG). They met as often as weekly during the pandemic as they negotiated the management of COVID-19.

Thus, despite lacking previous outbreak experience and the resultant legal and institutional reforms seen in many Asian countries, the successful Australian response emphasized co-ordination across various levels of government and acknowledged the authority of experts, similar to what was done in countries such as Taiwan and South Korea.

Australia is also an interesting case to consider, as it is structured similarly to Canada, with responsibilities for health care divided between the federal government and the states/territories, although to a different degree than in Canada. Further, the AHPPC is somewhat analogous to Canada's Pan-Canadian Public Health Network. Some differences between Australia's and Canada's responses to COVID-19 are found in the dynamics between the central and provincial or state-level governments. While in Australia the authority of the Commonwealth has gradually expanded to influence an array of issues that were originally the purview of the states/territories, in Canada the balance of power tips more toward the provinces/territories, with the federal government's role largely defined as that of funder, particularly in matters related to health.³⁶ Thus, the Canadian body most closely analogous to Australia's National Cabinet is the Council of the Federation. The Council, however, does not include the federal government, and its main objective is to co-ordinate at the provincial level and then negotiate with the federal government.

The practical effect of these differences in the balance of power among the levels of government can be seen in the response to COVID-19. As seen with the Australian approach, a more balanced sharing of power between federal and state governments facilitated a more cohesive national response. The National Cabinet agreed that each government would follow and implement AHPPC advice as necessary, a co-operative agreement that removed any need for the federal government to consider a more heavy-handed approach. In Canada, greater federal power was rejected out of hand by the provinces/territories, as illustrated by Scott Moe, the premier of Saskatchewan and then-chair of the Council of the Federation, informing the federal government on April 14, 2020, that the provinces/territories rejected any consideration that the *Emergencies Act* be invoked. The Canadian government does have an option under section 91 of the Constitution, which confers authority to maintain "peace, order and good governance," to pass legislation related to health and welfare when the failure of one province would affect other provinces.³⁷ However, it remains uncertain to what extent this power can be exerted without the consent of the provinces, a situation that the 2010 Senate commission on H1N1 recommended the federal government address in order to have a legislative backup plan if the preferred route of a collaborative approach failed.³⁸

Given the structural challenges posed by a decentralized federation such as Canada to present a harmonized national response and the inherent obstacles that any future increase in federal authority is likely to encounter, legislation endowing PHAC with greater authority, such as that enacted by South Korea after MERS, may not be the most productive avenue. Rather, strategies aimed at improving co-operation between federal and provincial/territorial governments and formulating a more cohesive national response should be included in future pandemic plans, with PHAC as the key co-ordinating agency.

Structurally, this could be through the establishment of a body modelled after Australia's National Cabinet, as Australia has demonstrated that, to be effective, any co-ordinating body has to have the authority to act. In Canada, such a body may also function most efficiently if activated only temporarily and for the purpose of pandemic response, as is the case with the CECC in Taiwan. Pandemic responsiveness would also benefit from strategies to forge a more collaborative partnership between PHAC and the provinces in the inter-pandemic period. Finally, the establishment of provincial rapid response teams under the co-ordination of PHAC, similar to the model of the rapid response teams in South Korea, could also improve the speed and efficiency of the initial outbreak response in Canada.

RECOMMENDATIONS

- Enhance the role of PHAC at the provincial/territorial level through increased collaboration and co-operation with the provinces and territories;
- Improve co-operation between federal and provincial/territorial governments to facilitate the formation of a cohesive national pandemic response, possibly structured after the National Assembly of Australia; and
- Form a provincial/territorial level pandemic-specific response apparatus under the co-ordination of PHAC to facilitate the rapid response to outbreaks of novel pathogens, in the model of the KDCA-led rapid response teams.

05

PANDEMIC PREPAREDNESS

Focus on Infectious Diseases and the Role of Experts in Pandemic Planning

In recent decades, the public health focus in many western countries, including Canada, has shifted to chronic and non-communicable diseases such as cancer, diabetes, and mental illnesses. This has reduced the level of resources committed to emerging infectious diseases (EIDs). In contrast, extensive experience with EIDs has led many Asian economies, including Singapore,³⁹ South Korea,⁴⁰ and Taiwan, to emphasize infectious disease control and to place experts at the forefront of pandemic preparedness and response.

Following SARS, Singapore committed to a six-fold expansion in the number of infectious disease physicians.⁴¹ After MERS, South Korea legally mandated an increase in the recruitment and training of epidemiological investigators, mandating a minimum of 30 officers in the central government and two in each municipal/provincial government.⁴² Practically, they more than doubled the number of epidemic intelligence service officers between 2015 and 2020 and added 360 additional infectious disease response staff at the regional level.⁴³ As a result, South Korea had more than 400 public and private epidemiologists in place at the start of the epidemic.⁴⁴ South Korea also increased the number of regional centers for disease control from one to five and substantially increased their budget for risk management over the past five years.⁴⁵ The increased funding has been largely invested in infectious disease preparedness, including new electronic

information systems and enhanced health-care infrastructure.⁴⁶ The budget for contagious diseases and quarantine systems in South Korea has risen by 182% over the past five years.⁴⁷

Taiwan has also increased its focus on infectious disease over the last two decades, particularly with respect to pandemic preparedness. During a pandemic, the island emphasizes the role of experts over that of civil servants. Recognizing the limitations of civil society organizations consisting primarily of lay people, the CECC includes an expert advisory panel to offer independent professional opinions and make policy recommendations.⁴⁸

Taiwan, whose pandemic plans include the stipulation that the response system should not be allowed to lag in the absence of a pandemic, also emphasizes the importance of institutional memory, mainly through the long-term retention of key experts and staff. Multiple government officials and public health experts responsible for managing the COVID-19 pandemic had previously been involved in responding to SARS, which informed their response to COVID-19.⁴⁹ Dr. Chen Chien-jen, the minister of health during SARS, was the vice-president at the time that COVID-19 erupted.

In the 17 years since SARS, Canada's focus on EIDs has waned, resulting in lower investment levels for infectious disease preparedness compared to that observed in much of Asia. As well, unlike the examples of Taiwan and South Korea, at the time the pandemic started, neither the health minister nor the president of PHAC had a medical or scientific background, and the role of the chief public health official is advisory rather than authoritative. This is not unusual in a consultative democracy, nor is this system incompatible with the elevation of experts, as New Zealand has credited a science-based risk assessment with the early and decisive action taken by their government,⁵⁰ and Australia's Council of Australian Governments decided on March 13, 2020, that the advice of the AHPPC would be elevated to the status of COAG advice, effectively conferring a higher level of authority on the AHPPC. Nonetheless, the theme that has emerged throughout Asia is that the countries that have achieved the best pandemic responses have maintained their focus on infectious diseases and have subsequently elevated the authority of experts in their pandemic response.

The Role of Practical Experience in Pandemic Preparedness

Having learned from previous outbreaks the value of practical experience, many Asia Pacific countries became more rigorous about conducting exercises to evaluate and update their pandemic plans. In contrast, Canada had not adequately updated the Canadian Pandemic Preparedness Plans (CPIP) or the Health Portfolio Strategic Emergency Management Plan, nor had these plans been subjected to hands-on testing, as related by the auditor general in the March 2021 review of the COVID-19 response.⁵¹ Among the other issues identified by the auditor was the lack of practical drills and experience. The benefits of such experience can be observed in the level of co-ordination and efficiency demonstrated by Taiwan and South Korea in their response to COVID-19.

Following Taiwan's experience with SARS, the executive branch of the government began undertaking epidemic drills to improve preparation.⁵² Taiwan updates its EID response handbook annually and holds quarterly training sessions and drills for health-care workers.⁵³ Government agencies and hospital systems in Singapore are required to conduct externally evaluated pandemic response simulations,⁵⁴ while contact tracing procedures were enhanced and regularly practised.⁵⁵ Although Vietnam does not have an established public health response network that regularly undergoes pandemic exercises, it instituted pop-up drills across several regions throughout the pandemic, mostly in anticipation of large-scale community transmission and potential strains on health-care systems.

In South Korea, the KCDC has facilitated outbreak simulations with local governments every year since 2010,⁵⁶ while the Emergency Operations Centre co-ordinates regular hands-on drills involving multiple departments of the central government as well as local governments and the private sector.⁵⁷ With fortuitous timing, the KCDC had performed an emergency drill in December 2019 based on a scenario of an unidentified disease emerging in China. Having practised the response to the scenario so recently, they were well prepared to deal with the real thing when COVID-19 emerged barely one month later.⁵⁸

RECOMMENDATIONS

- Review and implement measures to afford increased authority to experts (scientists/physicians) in organizational decision making;
- Increase the investment in infectious disease preparedness. This includes an increased emphasis on both the hiring and retention of epidemiologists/public health experts, to improve both institutional memory and institutional surge capacity in the event of a pandemic; and
- Implement regular drills to test pandemic plans and prepare relevant personnel.

Strategy: Elimination or Mitigation?

A significant difference between the Asia Pacific countries studied here and Canada is in the initial strategy with which they approached the pandemic. Throughout Europe and North America, as well as much of Asia, pandemic plans were largely based on pandemic influenza risk management guidelines issued by the WHO after the 2009 H1N1 pandemic. Based on these guidelines, Canada's plans assumed that the hypothetical virus would spread too rapidly to be contained and that attempts to do so would only incur unnecessary economic damage. Thus, Ottawa's plans were aimed at mitigation, also known as the "flatten the curve" model, whereby measures are gradually increased as the pandemic progresses. In contrast, many Asia Pacific countries, informed by past experience of outbreaks, achieved greater control of COVID-19 by pursuing a containment strategy, which involves the rapid escalation of control measures with the goal of eliminating community transmission.⁵⁹

A mitigation strategy relies heavily on pharmaceutical interventions such as antivirals and vaccines, interventions that did not exist for COVID-19 at the outset of the pandemic.⁶⁰ The patterns of pre-symptomatic and asymptomatic transmission displayed by COVID-19 also have strategic implications, heightening the importance of interventions such as social distancing and mask wearing. Taiwan, with its past experience of novel and emerging pathogens, had pandemic plans that were more readily adaptable to the characteristics of novel pathogens. These preparations allowed Taiwan to take early and aggressive action that led to a period of 253 days without a single new case, from April to December 2020, during which the first and second waves peaked in Canada. Australia and New Zealand, despite initially planning for a mitigation strategy, recognized the limitations of this approach as applied to COVID-19 and pivoted to elimination, a decision that resulted in these two countries successfully controlling transmission.⁶¹

The goals of mitigation strategies are to prevent overwhelming the health-care system and to protect the vulnerable.⁶² Canada never experienced the level of health-care strain seen in countries such as Italy during the initial months of COVID-19; however, the virus swept through long-term care facilities with devastating consequences despite the mitigation measures implemented by Ottawa and the provinces. Analysis revealed that levels of transmission in the surrounding communities were the primary factor in determining the risk of outbreaks in Canadian long-term care.

Indigenous people in Canada were also disproportionately affected by COVID-19. In contrast, Indigenous people in Australia and the Māori peoples of New Zealand have not been overly impacted by COVID-19 compared to the general population, thanks to low community transmission in these two countries. By driving case counts down nearly to

zero early on, countries such as New Zealand were better able to protect their vulnerable populations and also prevented the sort of dramatic surges experienced by many countries throughout the fall and winter.

CASE STUDY:

New Zealand's Effective Pivot

Like Canada, New Zealand based its pandemic response plans on a mitigation approach. However, COVID-19 proved to have important distinctions from influenza, including a longer incubation period, which allowed more time for an effective testing and contact tracing strategy that could disrupt transmission chains. The WHO–China joint mission's report on COVID-19 indicated that, based on the characteristics of this novel pathogen, containment of SARS-CoV-2 was possible.⁶³ These findings were supported by emerging evidence that an intense elimination strategy based solely on non-pharmaceutical interventions, such as the one China employed

in Wuhan, could be successful in controlling transmission of COVID-19.⁶⁴ Scientific advisors also provided the government with case studies of countries who were among the first to deal with COVID-19, including Singapore, Hong Kong, and Taiwan.⁶⁵ Based on this emerging information, and on the advice of senior scientists, New Zealand demonstrated an impressive agility as it swiftly pivoted to an elimination strategy on March 23, 2020. This decision was prompted by its lack of capacity to rapidly scale contact tracing, concerns about its ICU surge capacity, and a desire to protect its vulnerable populations, including the Maori and Pacific Islanders.⁶⁶

The success New Zealand and Taiwan have experienced in their control of COVID-19 demonstrates the importance of a response that is appropriate for the characteristics of the pathogen. As such, agility is an important component of an effective pandemic response. The CPIP emphasizes that a response should focus on existing strategies. Although in the midst of a pandemic it may seem too chaotic to attempt to innovate, pursuing the wrong strategy is more costly still. Thus, future pandemic plans should be expansive enough to be adapted to a range of characteristics and scenarios, and flexible enough to readily adapt when the available evidence suggests that elimination is the most viable option.

A successful elimination approach requires the involvement of experts, adequate public health infrastructure, decisive action on the part of governments, and a social safety net to support the vulnerable.⁶⁷ The social safety net that Canada established in response to COVID-19 was rapid and comprehensive. Further, the public initially demonstrated a high level of trust and approval in both provincial and federal governments,⁶⁸ although this waned as the pandemic went on, with a Leger poll in early 2021 finding that trust in government and public health authorities had significantly eroded as a result of the pandemic.⁶⁹ Greater investment in public health infrastructure with increased focus on infectious disease surveillance and planning, including regular exercises and evaluations, and a more prominent role for the input of experts could ensure that Canada is better prepared to mount an agile and aggressive response to the next pandemic.

RECOMMENDATIONS

- Formulate future pandemic plans that are comprehensive and flexible enough to be adapted for different pathogens and that are able to readily move between mitigation and elimination strategies, with a particular emphasis on eliminating community transmission for the protection of high-risk populations.

Public Health and the Pandemic Response

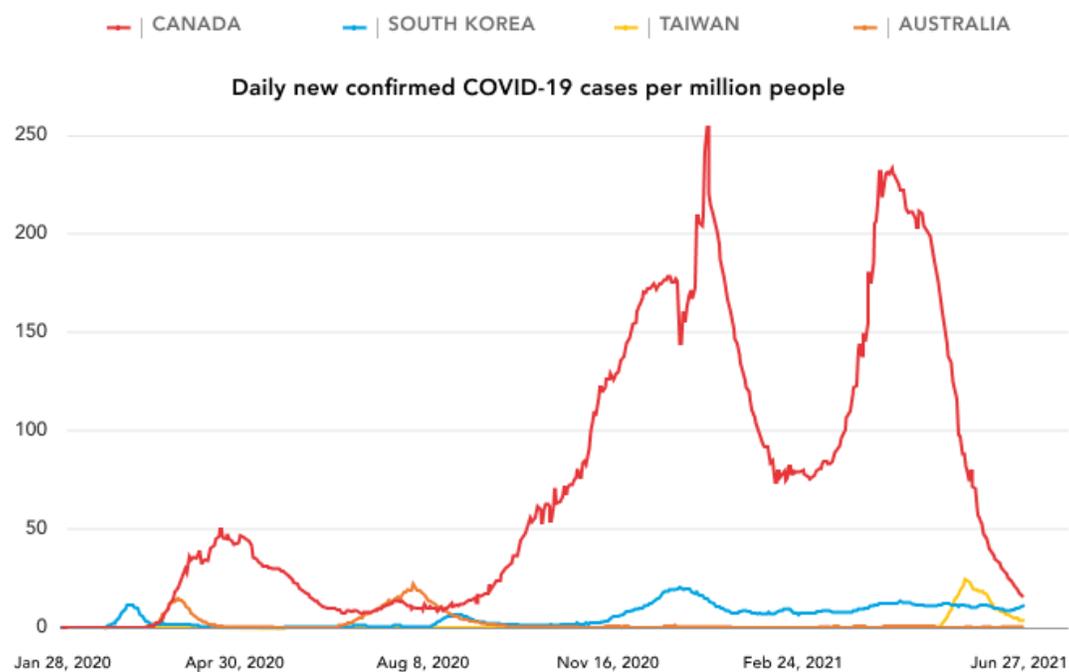
Timing is an essential component of an effective pandemic response. As the example of Taiwan shows, early 2020 represented a brief window of opportunity to prevent the establishment of community transmission. Many countries that missed this opportunity struggled to find a balance between easing restrictions and the resurgence of transmission throughout the remainder of the year,⁷⁰ a balance that was understandably complicated by a reluctance to re-impose costly restrictions until cases had risen high enough that they could not be avoided. However, by this time the required measures typically needed to be

both stringent and lengthy to effectively suppress transmission. Many Asian countries, by acting swiftly and decisively, avoided this pattern of surges and heavy public health clampdowns. These early and effective responses relied heavily on the use of early warning systems and risk assessments.

FIGURE 5

Confirmed COVID-19 cases over time

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: https://ourworldindata.org/explorers/coronavirus-data-explorer?zoomToSelection=true&time=2020-03-01..2021-06-27&pickerSort=desc&pickerMetric=new_cases_smoothed_per_million&Metric=Confirmed+cases&Interval=7-day+rolling+average&Relative+to+Population=true&Align+outbreaks=false&country=CAN-KOR-TWN-AUS

Early Warnings

Early warning systems that monitor for external threats are an important first component of an effective pandemic response. Although the Global Outbreak Alert and Response Network (GOARN), in its partnership with the WHO, was conceived for such a purpose, it

should not be considered a replacement for national surveillance strategies. Informed by previous outbreak experience, independent event-based surveillance (EBS) systems and risk assessments were a key feature of the early response of many countries in Asia.

The Taiwan Centers for Disease Control conducts real-time EBS followed by rapid risk assessment. The EBS monitoring system picks up on international and domestic public health events and initiates alerts. Revised after MERS in 2015, sources informing the EBS now include international organizations, government websites, scientific publications, news, media, and internet bulletin boards. Taiwan's EBS for China is applied not only at the national level, but also at the provincial and city levels, due to Taiwan's proximity to China and the large volumes of individuals who travel within and between China and Taiwan⁷¹. In addition to its own internal intelligence, Taiwan also subscribes to the Canadian-based AI surveillance platform BlueDot, which operates 24 hours a day and draws from over 100,000 data sources in 65 languages, including news outlets; airline ticketing; human, animal, and insect population data; climate data; and global infectious disease alerts⁷². BlueDot issued the first notification about the novel coronavirus when it alerted its clients about a cluster of cases of "unusual pneumonia" in China on December 30, a day before ProMED⁷³.

Following the inadequate response to MERS in 2015, South Korea revised and enhanced its own EBS system.⁷⁴ In 2019, it further bolstered its surveillance capacity by establishing the 24-hour Emergency Operations Centre to facilitate early detection of emergency situations. The Centre collects and analyzes information pertaining to infectious diseases from both domestic and international sources in real time.⁷⁵ South Korea also implemented active monitoring of communicable disease situations outside of the country and routine screening at airports and seaports.⁷⁶

Headquartered at PHAC, Canada's own EBS system, the Global Public Health Intelligence Network (GPHIN), is a partner of GOARN and has been lauded in the past for its early detection of emerging pathogens. However, GPHIN was not operating at full capacity before the outbreak of COVID-19. Given the speed with which viruses can transmit, particularly in the era of modern travel, advance notification of emerging infectious diseases provides valuable time to prepare and initiate a response. Further, the unpredictability of when such a threat will emerge reinforces the need for constant vigilance, as demonstrated by the rapid response of multiple countries across the Asia Pacific.

Risk Assessments

Early detection of an EID is only an asset if it is accompanied by an appropriate level of action. As COVID-19 emerged in early 2020, there were stark differences between Canada and several Asia Pacific countries in the determination of risk posed by COVID-19, as well as in the actions taken based on those risk assessments. Crucially, economies such as Taiwan and South Korea acted on the findings of their own risk assessments, while much of North America and Europe, including Canada, relied instead on the early assurances of China and the WHO that COVID-19 posed a low risk. This heightened risk awareness among Asian countries was largely shaped by their close geographic proximity to China as well as by several experiences with EIDs in recent decades.

Risk assessments in Korea are based on the following criteria: impact of the disease, risk of transmission, and risk of importation. Between January 8 and February 23, 2020, the KCDC conducted a total of eight risk assessments. Each was triggered by a new development in the outbreak and each influenced government decision-making.⁷⁷ The overall risk was assessed as high by January 20 and very high by February 23. In addition to informing the overall response, communicating the risk assessment to the general population facilitated engagement and awareness on the part of the public.

SARS taught Taiwan the value of early and continuous preparation and to err on the side of caution.⁷⁸ Risk assessments are modelled on the WHO and European Centres for Disease Control protocols. Risk of importation, risk of community outbreak, and impact on the country all contribute to the overall assessment. The Taiwan CDC commenced daily risk assessments on each province in China on January 18 and the overall risk was raised to high on January 24.⁷⁹ In retrospect, Taiwan's exclusion from the WHO, which has necessitated increased self-reliance, may have facilitated an early and aggressive response to COVID-19.⁸⁰ After receiving early reports of a pneumonia of unknown cause in Wuhan, Taiwan sent its own experts to China to investigate. Based on their findings, Taiwan also overruled the WHO's initial recommendations that travel from China not be restricted and that the general public did not need to wear masks.⁸¹ These measures would prove to be instrumental in preventing widespread community transmission from occurring in Taiwan throughout the first year of the pandemic.

Canada conducted five risk assessments between mid-January and mid-March 2020. However, they were snapshots that only considered the risk at that particular moment in time, even though the risk assessments outlined in the CPIP include considerations of future risk. They did not forecast future risk or the likelihood of a pandemic and crucially did not give sufficient weight to the existing external evidence, such as the early

transmission and mortality rates and the fact that the virus aroused sufficient alarm in China to prompt the building of two hospitals in 10 days.⁸²

Outside of Asia, many countries largely waited on the word of the WHO before taking substantial action. Canada did not raise the risk from COVID-19 to high until March 16, mainly as a result of the growing number of confirmed cases in the community, which by that date had reached 401. Thus, it was not until there was confirmation of sustained community transmission within Canada that COVID-19 was acknowledged to pose a high risk to the Canadian public. In contrast, countries such as South Korea and Taiwan, operating with the same information available to Canadian authorities, determined the risk to be high before the virus was spreading within their borders. The differences between the countries that took an independent approach to risk assessments and those that relied more heavily on the WHO is evident in both the timing and magnitude of their early responses. It is evident that the more comprehensive risk assessments of countries such as South Korea and Taiwan not only gave those countries more time to prepare, but were also the first of several crucial steps that allowed them to prevent the type of widespread surge of COVID-19 seen in countries throughout North America and Europe.

Timing of the Response

One of the most difficult tenets of responding to a pandemic is that responses are at their most effective precisely when there is the least data to support or guide them. The WHO has come under a great deal of criticism for not acting faster in reporting human-to-human transmission and declaring that COVID-19 constituted a pandemic. Although evidence-driven responses are certainly preferable, COVID-19 has shown that waiting on data to formulate a response is costly, in terms of both lives and money. In response to COVID-19, most of Taiwan's policies were adopted ahead of the possible turning point for which they were intended. This deploy-in-advance strategy, which focuses on being proactive rather than reactive, is fundamental to all CECC-driven policies.⁸³

Given the dearth of available information and the importance of timely action, responses to EIDs must be informed by the lessons of previous outbreaks, while at the same time being agile enough to adapt rapidly as new evidence becomes available. Respiratory EIDs do share some characteristics, so response plans have a certain level of interoperability. However, the most effective responses are the ones that are designed for the pathogen in question. Thus, countries that learned from those ahead of them on the transmission curve, as New Zealand learned from China, Taiwan, and Singapore, were best equipped to mount responses that were both timely and evidence-driven.

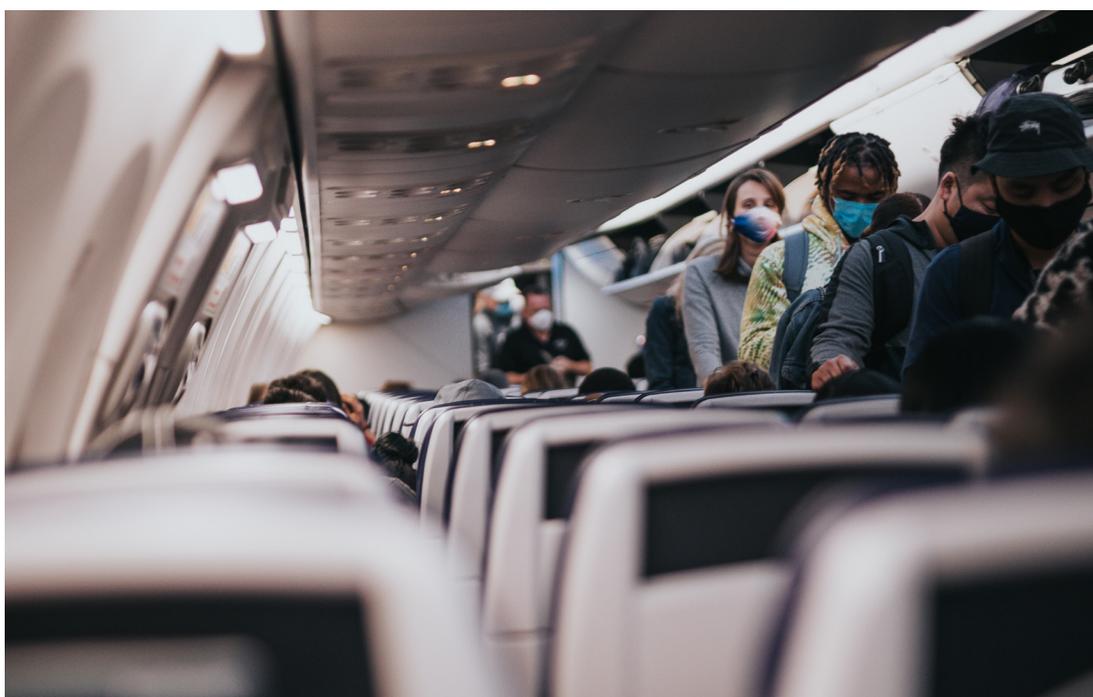
Decisions on when and how to respond should also be guided by the precautionary principle, which states that actions to address health risks should not be postponed for scientific certainty.⁸⁴ This concept has previously been enshrined in the CPIP, which states that a precautionary approach is “particularly applicable in the early stages of a pandemic when evidence-informed decision-making is not possible due to lack of data and the uncertainty of an evolving event. This means taking timely and reasonable preventive action, proportional to the threat and evidence-informed to the extent possible.” However, from January to March 2020, COVID-19 cases slipped unnoticed into the country and began to circulate undetected throughout communities while officials deliberated on a response. In contrast, a unifying factor of many of the most effective countries in Asia was an early and decisive response that acted on the available information, as exemplified by South Korea and Taiwan.

Taiwan was among the first to act when unofficial alarms about a new virus emerged. On December 31, 2019, in response to social media reports of a pneumonia of unknown origin in Wuhan, Taiwanese inspectors began boarding direct flights from Wuhan and screening passengers.⁸⁵ On January 2, 2020, the Taiwan CDC issued an alert to the health-care community to report patients with respiratory symptoms who had recently travelled to Wuhan.⁸⁶ On January 13, Taiwan sent two infectious disease experts to China to gather further information, and their report supported suspicions that the virus was capable of person-to-person transmission.⁸⁷ Taiwan activated its Central Epidemic Command Centre on January 20, 2020.⁸⁸

Throughout the early stages of the pandemic, Taiwan was also highly responsive, rapidly adjusting its measures to fit the latest information. On January 27, it integrated the databases of the National Immigration Agency with the National Health Insurance Administration, allowing health-care providers access to patients’ 14-day travel histories. On January 21, it designated Wuhan as level 3, instituting mandatory 14-day home quarantine on all passengers arriving from Wuhan. This was expanded to include all of China on January 28, South Korea on February 24, and Italy on February 27, in response to worsening outbreaks in those countries.⁸⁹ Stepwise travel restrictions were imposed, first to travellers from Wuhan on January 24, then to Guangdong on February 2, and finally to all of mainland China on February 6. In mid-February, Taiwan modified the case definition to include patients with pneumonia of unknown cause, regardless of travel history. These enhanced surveillance practices led to the detection of four local clusters over the ensuing two weeks.⁹⁰

South Korea’s response was uniquely impressive, in that they were among the earliest to experience an outbreak of COVID-19 and managed to control it without imposing

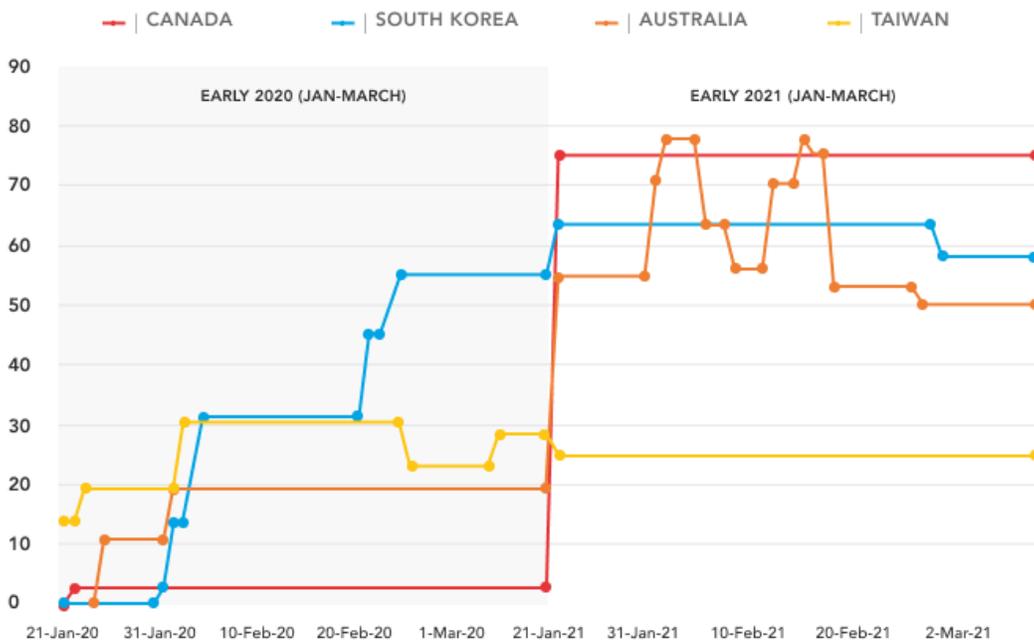
widespread lockdowns or border closures.⁹¹ In February, they had the highest number of cases outside of China, peaking at 909 on February 29. Having learned from MERS, during which it failed to adequately raise the national alert level, the COVID-19 alert level was raised to blue on January 3, yellow on January 20, orange on January 28, and to the highest, red, on February 23. This enabled the activation of the Central Disaster and Safety Countermeasure Headquarters, headed by the prime minister, to co-ordinate the response. Through the early initiation of extensive testing and contact tracing efforts, South Korea successfully flattened the curve to single-digit increases in daily cases by mid-April.



Viruses are not static, and by the time a case is detected transmission may have already occurred. Canada’s future pandemic responsiveness could benefit from greater emphasis on the importance of “timely and reasonable preventive action,” as outlined in the CPIP. The early measures adopted by South Korea and Taiwan further demonstrate the importance of a timely response. Canada eventually adopted measures that exceeded both of those countries in terms of stringency, demonstrating that the best opportunity to control spread without resorting to excessively harsh measures is in the earliest stages, before widespread community transmission occurs and contact tracing and testing systems are overwhelmed.

FIGURE 6

A comparison of the 'stringency' in policy responses between Canada and the Asia Pacific during the first quarters of 2020 and 2021



Source: Oxford COVID-19 Government Response Tracker

The stringency index on the y-axis represents a composite score based on nine response indicators, including travel bans, school closures, and workplace closures.

RECOMMENDATIONS

- Implement enhanced surveillance (e.g., GPHIN) to enable the independent evaluation of the threat posed by emerging infectious diseases;
- Emphasize the importance of an early and proactive response to minimize the damage to both health care and the economy; and
- Commit to conducting future risk assessments that are in line with established practices.

06

BORDER MEASURES TO CURB TRANSMISSION

One of the most contentious aspects of pandemic response commitments is the implementation of border measures. Before COVID-19, there was a lack of data to guide an evidence-based policy. Although the WHO specifically recommended against the implementation of any border restrictions on January 30, 2020, many countries, particularly in the Asia Pacific region, rushed to impose restrictions on travellers.

Taiwan acted swiftly to impose stepwise travel restrictions, starting with Wuhan on January 24 and culminating with a ban on the entry of all foreigners on March 19.⁹² However, Taiwan also aggressively enforced mandatory quarantines and did not rely on border restrictions alone to combat the virus.

Vietnam's national airline stopped all flights from China on February 1 and from South Korea on March 5 and ceased all international flights on March 25, 2020.⁹³ Vietnam also implemented mandatory quarantine for all international arrivals at designated facilities on March 21, one of the first countries to do so.⁹⁴

Australia also closed its borders to flights from China on February 2 before closing them to all international arrivals on March 20. However, this was not fast enough to prevent community transmission that resulted in a surge of domestic cases through to the end of April 2020, revealing the limitations of targeted border restrictions.

As a participating member of the WHO, Canada is committed to meet the obligations of the International Health Regulations (IHR). According to Article 43 of the IHR, the adoption

of restrictive border measures is prohibited if reasonable alternative measures that would sufficiently protect the population exist. In addition, any measures imposed should be based on scientific principles, evidence, and/or guidance from the WHO.⁹⁵ Canada's early decision to refrain from restrictions on international travel prior to March 16 was in line with the requirements of the IHR, despite there being no enforcement mechanism for these regulations. In contrast, other signatories, such as Australia, acted much sooner on border measures despite their own IHR commitments.

The effect of border restrictions on the spread of infectious disease has not been well researched, and what studies exist are largely based on modelling, with scarce real-world data. The limited evidence for their effectiveness has largely been based on influenza. A review of 23 studies found that domestic and international travel restrictions could delay viral transmission but not entirely contain it.⁹⁶ The impact of restrictions was diminished if implementation was delayed more than six weeks after the onset of the epidemic or until transmission levels were high.⁹⁷ It has also been suggested that border closures can be counterproductive, as they can discourage reporting of cases by both individuals and countries and cause widespread economic damage that is disproportionate to the threat posed by the virus itself.⁹⁸

However, as a novel pathogen, COVID-19 has characteristics that do not align with the cautious approach to border measures derived from studies of previous pathogens.⁹⁹ Numerous countries, including Vietnam and Australia, enacted early border measures in defiance of their IHR commitments, decisions that received some validation in subsequent studies. Analyses have shown that the severity of the first wave of the COVID-19 pandemic was primarily determined by international travel¹⁰⁰ and that national travel bans reduced cross-border spillovers.¹⁰¹ COVID-19 modelling suggests that, when implemented early, cross-border travel restrictions may lead to a reduction in the number of community cases.¹⁰² Modelling also predicted that Australia's early decision to close its border to flights from China reduced cases by 79% by March 2¹⁰³ and 86% by March 6.¹⁰⁴ The key component of the border measures that demonstrated efficacy is their early implementation, before the details of this novel pathogen were fully known.

Despite the success that island nations such as Australia and New Zealand have achieved through the implementation of strict border controls, it is unlikely that Canada can feasibly employ a comparable strategy, given the extensive land border. However, the examples from the Asia Pacific also suggest that the timing of border restrictions matters and that border restrictions on their own were not sufficient to stop the spread of COVID-19; rather, they functioned as part of a comprehensive set of measures including screening and quarantine.

Border Screening

Similar to border closures, there was minimal evidence for the efficacy of border screening measures prior to COVID-19.¹⁰⁵ Canada does not include temperature screening at airports in its pandemic plans, after spending C\$7.6M on such measures failed to detect a single case of SARS, nor would these measures detect asymptomatic cases of COVID-19 or other similar viruses.¹⁰⁶ Despite the lack of supporting evidence to support screening, Asian countries deployed a more robust approach to screening that was able to more rapidly detect, trace, and isolate travellers infected with COVID-19.

CASE STUDY:

South Korea's Screening Innovation

South Korea resisted imposing blanket restrictions on travellers arriving from China, in accordance with the IHR, despite facing domestic pressure to do so. On January 3, South Korea initiated enhanced screening and quarantine for travellers arriving from Wuhan. By mid-March, with cases among travellers increasing, the enhanced screening measures were extended to all incoming travellers. Screening measures included temperature checks and the requirement that travellers download a self-diagnosis app through which they could report their health status both on arrival as well as twice a day for the duration of their 14-day quarantine period.

Symptomatic travellers were tested at the airport, facilitating the detection of the first confirmed

case of COVID-19 in South Korea on January 20. As Europe became the new epicentre of transmission, South Korea began testing passengers arriving from Europe on March 22. This was expanded to include all international travellers in April. To test such volumes while avoiding large groups of people congregating, Korea pioneered the use of walk-through testing facilities at the airport. These were set up outdoors to allow for natural ventilation to decrease the risk of transmission. This reduced the level of disinfection required after each individual, facilitating the rapid acquisition of samples. This comprehensive set of measures effectively mitigated the risk of transmission from infected travellers while allowing South Korea to keep its borders open.

On December 31, 2019, Taiwanese health authorities began boarding planes arriving from Wuhan and screening passengers before they disembarked, thereby minimizing the infection risk to other travellers.¹⁰⁷ South Korea also acted quickly, establishing separate gates for travellers from Wuhan on January 3, 2020, in addition to temperature screening and health declarations. To further facilitate the rapid screening of inbound passengers, Taiwan and Singapore were quick to implement a mandatory online health declaration form for incoming travellers. If the declaration did not flag any indicators that the traveller was at risk of COVID-19, the traveller then received a pass (Singapore) or SMS (Taiwan) to facilitate passage through immigration.

Recent analyses suggest that screening measures for COVID-19 have demonstrated a detection rate of between 10% and 53%, depending on the measures employed, and there are suggestions that screening may delay the time to outbreak.¹⁰⁸ Pre-departure and on-arrival testing for travellers has been an important component of border screening measures in many countries in Asia, despite the lack of data to demonstrate the efficacy of such measures. South Korea expanded testing to all incoming passengers in April 2020. Hong Kong similarly began testing of all incoming travellers on April 8, 2020, while Canada only implemented testing of non-exempt passengers arriving at international borders in early 2021. One of the advantages of pre-departure testing is that, compared to other screening measures, it is not excessively labour-intensive.

Quarantine of Travellers

A comprehensive quarantine regimen vastly increased the efficacy of border measures. Studies show that border screening is far more effective when combined with quarantine, with up to 91% of cases detected, depending on the screening methods. Quarantine features prominently in the pandemic response of several countries in the Asia Pacific and is likely a major factor in their success, although the methods vary by country.

Quarantine is only as effective as the degree of adherence. Facility-based quarantine is easier to monitor, usually by paid security or hotel staff. Home-based quarantine, while less inconvenient to travelers, is more challenging to monitor. Future updates to Canada's pandemic plans could benefit from the inclusion of preparations for a mandatory quarantine order at the national level. A 14-day quarantine remained voluntary until the middle of March 2020. Once quarantine was made mandatory, the monitoring of individuals under self-isolation was still limited due to resource challenges and logistical issues.

CASE STUDY:

Taiwan's Digital Monitoring for Quarantine

Having been proactive in the detection of community transmission in the early stages of the pandemic, Taiwan has since relied on quarantine of incoming travellers to prevent the introduction of new cases. Digitally monitored home quarantine for passengers arriving from Wuhan was instituted as early as January 21, 2020, and was later extended to all incoming travellers.

Taiwan's implementation of quarantine was well planned and is detail oriented. As part of airport infection control measures, the country used special government-funded taxis to transport passengers who did not have adequate transportation plans.¹⁰⁹ In contrast with several other countries in Asia, Taiwan permits home quarantine, although optional hotel facilities are provided for individuals who do not have an adequate quarantine plan.

Monitoring and enforcement are the strengths of the home quarantine plan, consisting of electronic

location verification, known as the electronic fence, as well as daily calls to check on the traveller's health status. Once travellers have arrived at their destination, they are visited by local civil staff to set the GPS parameters on their smartphones and provide instruction, as well as to deliver a care package that includes food supplies, masks, sanitizers, and coupons for Netflix and Line TV.¹¹⁰ To facilitate compliance, staff and volunteers provide assistance such as grocery or meal delivery or child-care arrangements. Twice-weekly garbage pickup by local sanitation companies is provided to minimize contamination. As well, a 24-hour hotline is available to provide counselling and information or health-care arrangements.¹¹¹ Taiwan's experience demonstrates that stringent measures imposed early result in reduced restrictions overall. As case counts fell, quarantine periods for inbound travellers from low-risk countries were shortened to five or seven days.

Several Asian countries that employed home-based quarantines used technology to facilitate more stringent monitoring. Singapore uses electronic wristbands to monitor a select group of travellers who are permitted to quarantine at home rather than at a facility. The device relies on GPS and Bluetooth technology but does not store personal data or have voice or video recording functions.¹¹²

South Korea likewise monitors quarantine via its self-quarantine safety protection app. The two-way app allows health authorities to monitor compliance by verifying the device's GPS location. It also allows patients to report their health status. The use of this app is not mandatory, although it has an uptake rate of over 90%. Individuals who opt out or do not have smartphones can undergo monitoring by daily phone confirmation. Hong Kong employs quarantine wristbands consisting of a waterproof strip of paper with a serial number and a QR code to be scanned by an app on a smartphone, which then establishes a digital perimeter. Although the implementation of this protocol has not been flawless, it nonetheless provides a compromise between stringent monitoring and the privacy concerns that have accompanied other digital tools.

Many countries solved the problem of monitoring by using government-run quarantine facilities. Vietnam quarantined all confirmed cases, their direct contacts (F1), and all travellers at a government-run quarantine facility for 14 days, while contacts of F1 individuals (F2) were ordered to isolate at home for 14 days.¹¹³ Australia and New Zealand require that incoming travellers enter a managed isolation facility for 14 days. Singapore has similar requirements, although travellers from a select few countries can instead quarantine at lodgings of their choice.

In addition to ease of monitoring, facility-based quarantine also reduces household transmission, which has been a significant source of new cases, particularly with the more-transmissible variants of concern. A South Korean study reported that 11.8% of household contacts tested positive, compared to only 1.9% of non-household contacts.¹¹⁴ In the spring of 2021, as the variants of concern became dominant, Alberta reported that 40% of new cases were the result of household transmission and that living with an infectious individual was the single largest risk factor for transmission.¹¹⁵

Despite their advantages, quarantine facilities are expensive to run and are not infallible. Several countries have experienced outbreaks associated with breaches of quarantine facilities, including Vietnam and Australia. In Canada, the imposition of a three-day hotel stay on travelers arriving by air attempted to find a middle ground between inconvenience and stringency. However, particularly once the more-transmissible Delta variant became the dominant strain, these measures did not prove stringent enough to be supported

scientifically and the existence of a loophole at the land borders provided travelers with a way to circumvent them.

The timing with which travel-related quarantine measures are implemented is also important. In Canada, the mandatory measures took effect after the predicted wave of sun-seeking travellers had left for winter vacations, thereby penalizing them on their return rather than discouraging their travels in the first place, a move that would likely have slowed the importation of the variants of concern into the country. An added benefit of quarantine, particularly when implemented as stringently as in Australia, is that it can serve as a deterrent to travel, which assists in maintaining travellers at levels that are manageable for the purposes of screening and monitoring quarantine.

Interprovincial Travel Restrictions

Interprovincial travel also contributes to the spread of COVID-19. Some Canadian provinces implemented measures and blocked their borders in accordance with their individual situations, but no countrywide actions were taken, the federal government leaving the decision to individual provinces. This may have acted as a deterrent to Canadian provinces willing to undertake the costs associated with lockdowns, as the success of these sacrifices can be undone if other provinces do not commit to a similar level of pandemic control, a reality that Australia effectively addressed in its response to COVID-19.

In Australia, states can impose their own travel restrictions, including closing their borders, restricting travel into and out of the state, and requiring a quarantine period for people who have travelled between states.¹¹⁶ In addition to the restrictions on international travel, Queensland (March 24), Western Australia (March 22), South Australia (March 22), and Tasmania (March 19) all restricted entry from other regions of Australia. This allowed states to maintain relaxed restrictions even if small clusters broke out in a single state.

Although prohibitions on interprovincial travel are not legally permitted in Canada, most provinces have at certain times employed some measure of border restrictions during the pandemic. Most notably, the Atlantic provinces imposed a 14-day quarantine requirement on all travellers into the region, a measure that has been credited with their low rate of transmission relative to the rest of the country. The available evidence from COVID-19 indicates that interprovincial travel restrictions can play a valuable role in pandemic control, particularly once international borders have been breached.

Throughout the first year of the pandemic, Canada's border measures were less rigorous than those of many successful Asia Pacific countries, such as Australia, particularly in the timing and enforcement of mandatory quarantine.¹¹⁷ The countries that rapidly instituted strict border control measures, including mandatory quarantine,¹¹⁸ also recorded the lowest per-capita mortality rates. While it is understandable that a government wants to impose measures that are as minimally onerous as possible while still being effective, half measures do not typically work when trying to contain a virus such as COVID-19, a principle that the countries that have been most successful in containing the virus have understood. Future measures need to be consistently applied, scientifically guided, and deployed at a time when they can be most effective.

The other main takeaway from our case studies is that border measures are only one component of a comprehensive response. A recent review concluded that border measures alone were unlikely to significantly alter the trajectory of an outbreak without the commensurate adoption of domestic measures such as testing, contact tracing, and social distancing.¹¹⁹ Analyses have shown that a multi-layered approach of symptom-based and PCR screening combined with quarantine under observation has demonstrated the best results.¹²⁰ Although this mirrors the approach eventually adopted by Canada, it attained mixed results here, highlighting that early timing and stringent implementation are the key components for optimal success.

RECOMMENDATIONS

- Include preparations for the rapid institution and scale-up of border measures in pandemic plans;
- Apply border measures as consistently as possible to minimize loopholes that can be exploited, and minimize exemptions;
- Establish more proactive infection control measures at points of entry;
- Include measures for effectively monitoring individuals under quarantine in pandemic plans; and
- Include provisions for restrictions on interprovincial travel in extreme circumstances in pandemic plans.

07

CASE-BASED INTERVENTIONS

Surveillance

One of the most notable differences between Taiwan and Canada was in their respective approaches to case detection and surveillance in the early phases of the outbreak. Taiwan pursued a proactive case detection strategy that enabled them to more accurately track the spread of COVID-19. This approach, which required the early availability of adequate testing capacity, proved to be more effective at preventing community transmission.

There was no federal standard for testing in Canada, as each province set its own criteria. Testing criteria evolved slowly, restricting the accessibility of testing. In many regions, limited capacity meant that it was early May 2020 before testing was available for all who were symptomatic. Prior to this, many people who were only mildly symptomatic were advised to self-isolate at home and never got tested, including in BC, Alberta, Ontario, and Quebec.¹²¹ Although this prioritized limited tests for people who might require medical care, these restrictions negated the chance to contact trace mild cases. As the example of Taiwan demonstrates below, a more comprehensive approach to testing and tracing better facilitates efforts to accurately assess the magnitude of the pandemic.

Taiwan quickly employed its surveillance network to expand testing to patients with respiratory symptoms who had tested negative for influenza, as well as close contacts of infected individuals,¹²² or those exposed with a high risk of transmission.¹²³ Not only

did this strategy allow the identification and isolation of infected individuals before they were able to widely transmit the virus, it also helped in the identification of asymptomatic and pre-symptomatic individuals who may not have been identified by symptom-based testing.

CASE STUDY:

Taiwan's Surveillance Protocols and Infrastructure

A major lesson learned from Taiwan's battle with SARS was the realization that the existing respiratory syndromic surveillance systems based on passive reporting were not effective, largely because front-line doctors struggled to rapidly comply with the system requirements. Therefore, pneumonias of unknown cause were detected too late to prevent transmission of highly contagious EIDs.

To address this, the Taiwan CDC developed an automated hospital syndromic surveillance protocol that can automatically collect data from hospital emergency departments and that functions in real time.¹²⁴ Surveillance is further enhanced by the near-real-time availability of

patient data on the National Health Insurance database and the ability to rapidly scale up laboratory capacity.

As a result of these changes, Taiwan had well-established surveillance systems in place at the outset of COVID-19 that were rapidly adapted to the novel pathogen. Following the activation of the CECC, there were 27 laboratories capable of processing up to 2,250 molecular diagnostic tests for COVID-19 by February 21, 2020, enabling the activation of enhanced laboratory surveillance procedures that included testing clusters of respiratory infections and patients with influenza-like symptoms for COVID-19.¹²⁵

FIGURE 7

Description of Taiwan's emergency department-based syndromic surveillance system

User Management:

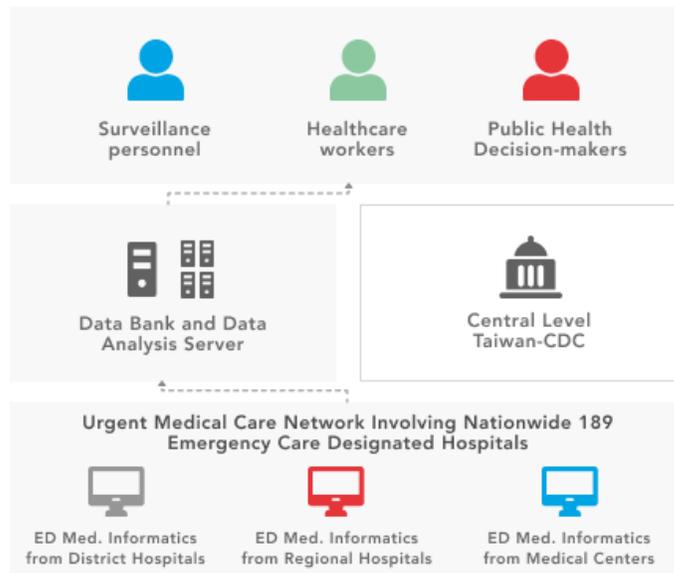
Use ID and password to allow decision-makers at different levels to obtain information important to them.

Data Analysis and Management:

Public Health personnel check the case curve and warning signal daily for each important syndrome group for further analysis or epidemiological investigation.

Data Transfer:

For individual information security, data must be transferred through the secure intranet, virtual private network (VPN), or first encrypt the file.



Source: "Establishing a nationwide emergency department-based syndromic surveillance system for better public health responses in Taiwan." Wu et al. (2008) BMC Public Health, 8(1).

On February 12, 2020, Taiwan responded to increasing awareness of asymptomatic and pre-symptomatic transmission by implementing a revised screening strategy that identified patients with respiratory symptoms who tested negative for influenza and tested them for COVID-19. Although this strategy only identified one positive case, contact tracing of that patient subsequently identified three infected family members, including the patient's asymptotically infected brother.¹²⁶

Surveillance was further strengthened by the integration on January 27 of the National Health Insurance Administration and the National Immigration Agency databases. Integrating the databases allowed health-care providers to access a patient's travel history and enabled the generation of real-time alerts based on travel history and clinical symptoms to facilitate case identification.¹²⁷ As a result, the median time to detection of imported cases was only two days.¹²⁸

Being proactive has been a recurring theme in the analysis of the COVID-19 response in the Asia Pacific region. This principle holds especially true in surveillance. Without an accurate measure of the extent of an outbreak, it is impossible to establish an appropriate response. Through surveillance strategies refined after previous outbreak experiences, Asian countries effectively tracked and contained transmission of COVID-19, a strategy that would enable Canada to respond more effectively to future outbreaks.



Testing

The ability to test a broad range of individuals – and thus to proactively identify cases before they become clusters of community transmission – relies on a high testing capacity at an early stage. Although their methodologies differed, the Asia Pacific countries that most successfully controlled COVID-19 demonstrated a rapid expansion of testing capacity that enabled authorities to cast a wider net and to proactively identify cases before they became clusters.

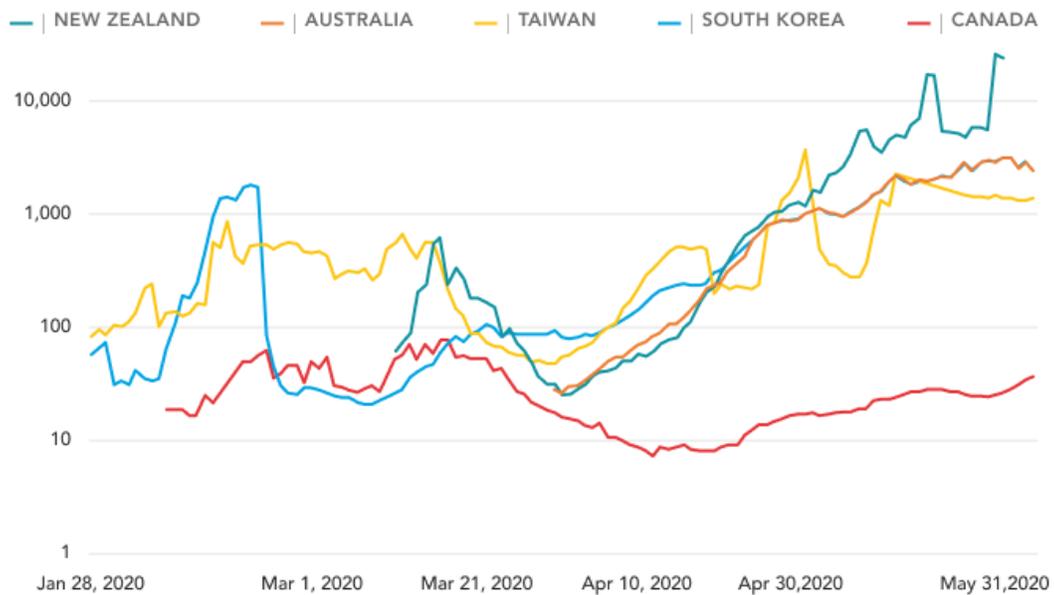
In Canada, barriers to increasing testing capacity varied by region and included shortages of test kits, reagents, and lab personnel. As of March 2021, Vietnam and New Zealand were each performing 1,000 tests for each confirmed case, while Australia was performing 500 tests and Taiwan was performing 200 tests. In comparison, Canada was performing fewer than 30 tests for each confirmed case. The use of expanded testing is supported by modelling studies that have shown that, with respect to surveillance as a means of outbreak control, test sensitivity is secondary to frequency of testing and speed of reporting.¹²⁹

The countries shown in Figure 8 all conducted more tests per confirmed case than Canada did and consistently demonstrated a lower percentage of positive tests. According to the WHO, a test positivity rate below 5% for at least two weeks is one of the metrics that can be used to determine if a country has controlled the pandemic. Canada reached a high of 14% on April 11, 2020, while the highest rate South Korea experienced was 4.9% on March 5, 2020.

FIGURE 8

Tests conducted per new confirmed case of COVID-19, comparing New Zealand, Australia, Taiwan, South Korea, and Canada

Shown is the daily number of tests for each new confirmed case. This is a rolling 7-day average.



Source: "A cross-country database of COVID-19 testing." Hasell, J., Mathieu, E., Beltekian, D. et al. (2020). *Sci Data* 7, 345.

CASE STUDY:

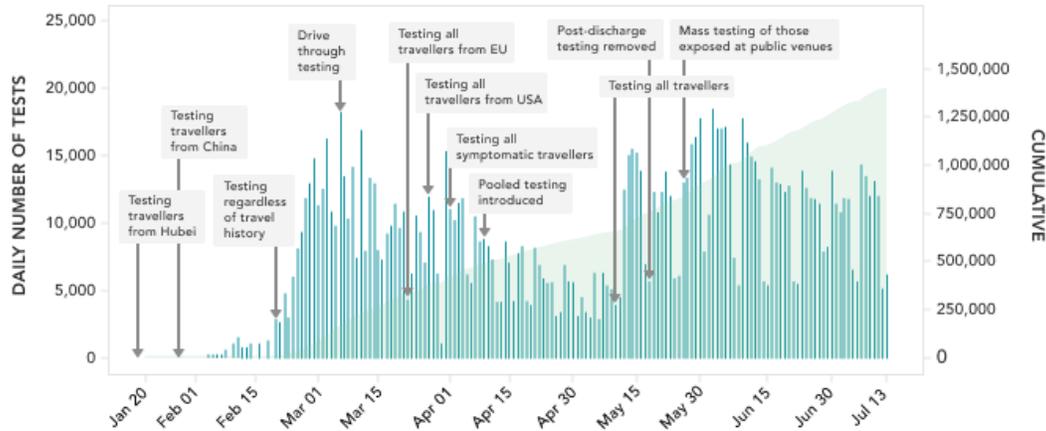
Testing Scaling in South Korea

During the MERS outbreak in 2015, South Korea experienced testing shortages that exacerbated hospital outbreaks. Experts concluded that an improved pandemic response requires an expanded testing strategy not constrained by the narrow restrictions of a case definition.¹³⁰ Thus, South Korea's response to COVID-19

was defined by a strategy of test-trace-treat. In addition to testing suspected cases, it also tested the close contacts of infected individuals and individuals in high-risk groups, regardless of symptoms. This rapid and strategic response enabled it to keep community transmission low and thus avoid the implementation of mass testing.

FIGURE 9

South Korea's ramp up of testing during the first half of 2020



Source: "Response to COVID-19 in South Korea and implications for lifting stringent interventions." Dighe et al. (2020). BMC Medicine, 18(1).

The proactive detection of cases that South Korea pursued early in the pandemic was enabled by its rapid scale-up of testing. Testing shortages during MERS were exacerbated by the lack of an emergency use authorization option at that time.¹³¹ To address shortages in diagnostic capacity, an emergency use authorization system was developed between the KCDC and the Ministry of Food and Drug Safety to expedite the authorization of diagnostic tests.¹³² Further, the Public-Private Alliance on Infectious

Disease Testing was established in 2017,¹³³ and extensive public-private partnerships were formed with a large number of biotechnology companies in the aftermath of MERS.¹³⁴ As a result, during COVID-19 the maximum daily testing capacity rapidly expanded, reaching 18,000 by March 16. This allowed South Korea to modify its testing criteria on February 16 to include anyone with respiratory symptoms, regardless of travel history.¹³⁵ By March 30, South Korea had tested more than 400,000 individuals.

South Korea also innovated drive-through testing and the phone-style testing booth as ways to increase efficiency and minimize the risks of transmission.¹³⁶ By minimizing disinfection protocols, these methods allowed the collection of up to six samples per hour or 60 samples a day, three times the

two samples per hour possible in a typical clinic setting. Further, health-care workers were better protected by the design of the testing booths, and the speed with which they could process patients meant that the risk of transmission between patients in crowded waiting rooms was greatly diminished.

Although slower in expanding testing capacity, with only approximately 15,000 tests performed by the end of March 2020, Vietnam now exemplifies the utility of a mass testing strategy. It developed a COVID-19 RT-PCR test kit through the Military Medical University on March 5, 2020. The kit has been used widely nationally in diagnostic labs since, specifically for mass testing of individuals in areas under targeted lockdowns.¹³⁷ This mass testing strategy, facilitated by the use of pooled sampling in which samples were processed in batches of 10, then individually if the pooled results came back positive, was credited with suppressing the second wave of infections that occurred in the coastal city of Danang between July and August 2020.¹³⁸

In May 2021, the city employed the same strategy again to mass-test residents of areas with suspected cases. This approach allowed city officials to identify up to 11,000 people related to a factory outbreak.¹³⁹ The Ministry of Health also instituted rapid testing of health-care workers, hospital patients, second-degree contacts, those in hotspots under targeted lockdown, high-risk essential workers, those working in hospitality and exposed to the public, workers at land borders, and factory and manufacturing plant workers on a five- to seven-day rotating basis.¹⁴⁰

The magnitude of testing within a country is influenced by the extent of transmission. Although Taiwan performed 200 tests per confirmed case, it opted not to employ mass testing because only a small portion of its cases were locally transmitted and only a small number of those could not be traced to the source.¹⁴¹ South Korea, after suppressing the initial surge early in 2020, has also reduced the amount of testing performed. Although Canada has dramatically improved its testing capacity since the early phase of the pandemic, testing capacity has still been exceeded during the worst of the subsequent

surges. The role of testing in the successful COVID-19 response of many Asian countries demonstrates the importance of including the rapid scale-up of testing in future pandemic plans.

Contact Tracing

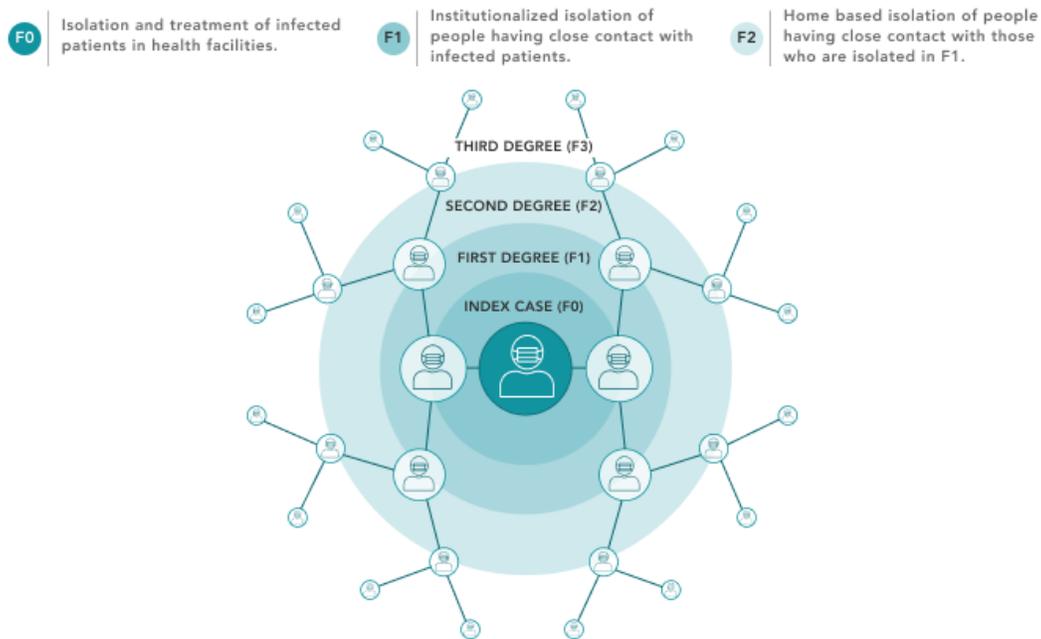
Aggressive and thorough contact tracing was also a major factor in the response of most of the countries that have successfully controlled the pandemic, particularly as the longer incubation of COVID-19 makes interrupting transmission by contact tracing and isolation more effective. The WHO standard for an effective contact tracing program is for 80% of close contacts to be traced and quarantined within three days of a case being confirmed, as it is most effective early, when case numbers are still low. A successful contact tracing strategy must be fast and thorough; however, it is affected by levels of co-operation and recall bias and is also highly labour-intensive. Among the Asian countries that have been the most successful in controlling the pandemic have been examples of less-conventional strategies as well as novel tools that have together improved the speed and reduced the labour requirements of contact tracing.

Japan's contact tracing strategy emerged from the observation that 80% of infected individuals did not transmit to anyone, while among the remaining 20% there were superspreaders who transmitted the virus to numerous others. Given this pattern, Japan used a backward contact tracing strategy that sought to identify the source of the infection, thereby enabling the identification of clusters of transmission that emanated from that source. Backward contact tracing was also adopted by South Korea and Australia as the pandemic progressed¹⁴². This process is highly labour-intensive, and in Japan it was facilitated by the existence of hundreds of public health centres. Both the centres and the model of contact tracing were already in place due to a lengthy history of tuberculosis in Japan, and they were adapted quite readily to fight COVID-19.

Vietnam employs an extensive strategy that traces to fourth-degree contacts. The index cases (F0) and their close contacts (F1 – first degree) are quarantined in government facilities, including designated hospitals if they require medical care. All direct contacts of confirmed cases, regardless of whether they were symptomatic, were also tested.¹⁴³ The second-degree contacts isolate at homes and report their health status to local authorities. Contact tracing was also performed for all passengers of any flight that had a confirmed case of COVID-19.¹⁴⁴ This strategy was facilitated by the existence of an army of 12,000 trained contact tracers at the outset of the pandemic.¹⁴⁵

FIGURE 10

Vietnam's extensive contact tracing approach that starts with the index patient case up to third-degree contacts



Source: "Proactive response and innovative approaches to SARS-CoV-2 in Vietnam." Chau NVV, Dung NT, Geskus R, et al. 2021. BMJ

Despite their efficacy, the strategies mentioned above are even more labour-intensive than traditional contact tracing methods, which can quickly become overwhelmed to the point of being ineffective. In Canada, early efforts to establish contact tracing at a scale sufficient for the pandemic involved recruiting staff from other positions throughout PHAC and Health Canada and training them as contact tracers. Establishing this process early on as part of future pandemic preparations would improve efficiency and expediency.

During the summer of 2020, several health jurisdictions across the country built up their contact tracers in anticipation of a predicted second wave in the fall. Despite these efforts, once again health authorities became overwhelmed by contact tracing across the country. During the height of the second wave, numerous health authorities throughout Canada, including in Alberta and Toronto, temporarily suspended contact tracing efforts when

their capacity was exceeded and PHAC reported that the source of infection was unknown in up to half of cases.

Speed is essential in an effective contact tracing strategy. A University of Oxford study found that delaying contact tracing by even one day after the onset of symptoms could determine the difference between controlling the virus and allowing it to spread.¹⁴⁶ Capacity limitations within Canada frequently resulted in delayed contact tracing. Between February 3 and 5, Toronto public health reached only 12% of newly confirmed cases within 24 hours of diagnosis.¹⁴⁷ Asian countries who established more rapid and efficient programs used a range of tools and approaches to support their contact tracing efforts.

The use of digital tools to support contact tracing in Singapore, South Korea, and Taiwan was associated with the low per-capita cases and mortality rates observed in those countries.¹⁴⁸ Vietnam implemented an SMS notification system on February 3 and launched an app for contact tracing and symptom reporting on February 8.¹⁴⁹

South Korea also used digital technology in its contact tracing efforts. On March 26, the KCDC launched the Epidemiological Investigation Support System, which collects and analyzes a range of data, including from GPS devices, credit cards, and CCTV, in its contact tracing efforts.¹⁵⁰ This was facilitated by public disclosure provisions that were added to the Infectious Disease Control and Prevention Act after MERS in 2015. These measures have raised privacy concerns, which the government has attempted to alleviate through the Personal Information Protection Act, a comprehensive data privacy law. The data can only be accessed by KCDC investigators and can only be accessed for the preceding 14 days. As required by law, all personal information will be destroyed once the pandemic is over.¹⁵¹ These measures have expedited what is typically a laborious process. Using these tools, investigation and tracking of confirmed cases now takes 10 minutes or less, compared with a whole day using manual tracing efforts.

Although there are many obstacles to the use of digital technology to support contact tracing in Canada, the examples from the Asia Pacific region demonstrate the importance of efficient contact tracing to an effective pandemic response. Future pandemic plans should therefore consider ways, digital or otherwise, to make the process faster and more efficient and to more rapidly scale up capacity.

CASE STUDY:

App-Based Contact Tracing in Singapore

Singapore also employs a vigorous contact tracing program. In conjunction with an effective surveillance strategy, it has been estimated that this program detects nearly three times more imported cases compared to the global average.¹⁵² In addition to digital footprint tracking similar to that employed by South Korea, in March 2020 Singapore also launched TraceTogether, a smartphone app that tracks close encounters between people using Bluetooth technology. Initial uptake did not meet the approximately 60% threshold established by researchers at the University of Oxford as being necessary to stop transmission when instituted in conjunction with other measures.¹⁵³ Thus, to increase the efficacy of the TraceTogether app, its use was made mandatory in Singapore from December 2020.

Singapore also developed and implemented SafeEntry, a cloud-based visitor registration system that requires individuals to scan QR codes on their smartphones and enter personal information before entering public places such as offices, shopping malls, cinemas, and

restaurants. This allows potentially exposed individuals to be alerted if they were in the same location as an active carrier at the same time. To cover as much of its population as possible, especially those without smartphones, the government distributed Bluetooth TraceTogether tokens with QR codes printed on them for use with SafeEntry to key populations, such as the elderly.

Despite the success of these apps in reducing transmission of COVID-19, there have been concerns raised over privacy issues associated with their use. The government has issued assurances that the TraceTogether app does not collect geolocation data nor reveal personal information to other users and that the information collected is only accessible to the Ministry of Health for contact tracing purposes. However, this was shown to be false when it was revealed that the data had been accessed by the police for a criminal investigation, validating the fears of those concerned about privacy breaches and damaging the public's trust. Similar concerns also pose a barrier to the use of this type of app in Canada.

RECOMMENDATIONS

- Establish national guidelines, standards, and benchmarks for testing and contact tracing;
- Plan to rapidly scale up testing to support surveillance activities and proactively detect cases, which could include expanding private/public partnerships and emergency use authorizations;
- Include plans to test specific populations, such as health-care workers (including long-term care facilities staff), cross-border truck drivers, and front-line workers, that may benefit most from regular testing based on evolving data;
- Plan for a rapid scale-up of contact tracing strategies, including the use of technology to increase efficiency; and
- Include adaptations of contact tracing strategies for different pathogens in pandemic plans.

08

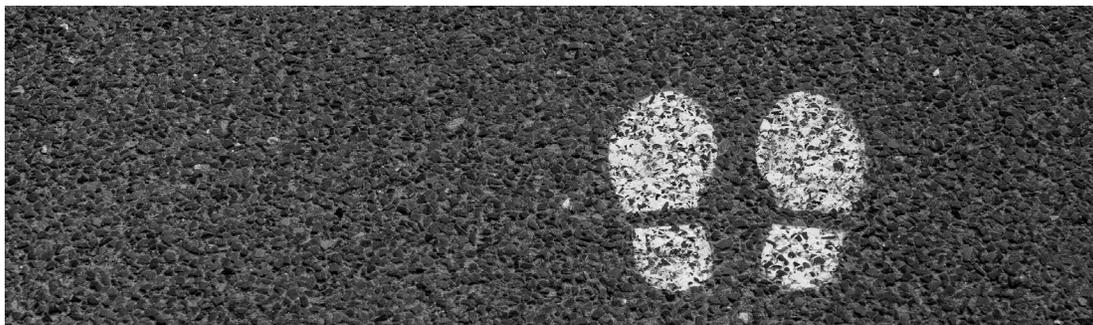
POPULATION-BASED INTERVENTIONS

Case-based interventions such as contact tracing are not sufficient on their own to control a virus such as COVID-19, particularly given the patterns of asymptomatic and pre-symptomatic transmission.¹⁵⁴ The effective deployment of population-based interventions, such as social distancing and masking, in addition to case-based interventions, has been credited with the success of Taiwan's pandemic response.¹⁵⁵ Studies in Europe and Central Asia have shown that the early implementation of population-based interventions in response to COVID-19 was associated with lower mortality and better economic outcomes.¹⁵⁶

Social Distancing and Mobility Restrictions

Social distancing has been widely used to reduce transmission, although the timing and details have varied by country and even by region. South Korea began urging social distancing as early as February 2020, and modelling suggests that strong social distancing measures played a key role in South Korea's ability to contain transmission without instituting a lockdown.¹⁵⁷ As of June 2021, Vietnam has yet to enter a nationwide lockdown aside from a two-week national social distancing order during the first wave, instead relying on targeted lockdowns of affected areas, coupled with mass and sometimes mandatory testing to manage clusters. In Japan, the COVID-19 task force developed the

“avoid the three Cs: closed spaces, crowded places, and close-contact settings” model of risk mitigation.¹⁵⁸ The purpose of the model was to prevent the emergence of clusters from these settings, which could often escalate to widespread community transmission.



CASE STUDY:

Alternatives to Lockdowns in South Korea

South Korea has not imposed large-scale lockdowns and to date there have been no mobility restrictions at the city or provincial level. Instead, the country relied on mass testing, contact tracing, and quarantine to manage clusters. Such measures are legally supported by the Infectious Disease Control and Prevention Act amended in the aftermath of MERS and again during COVID-19. Following an outbreak in the city of Daegu linked to the Shincheonji church, the government tracked down up to 200,000 members and ordered testing and isolation of all those who were affected.

Authorities enacted Articles 47(1) and 49(2) of the Act to shut down 400 Shincheonji facilities in Gyeonggi province, as well as prohibiting their religious services for two or more weeks.¹⁵⁹ In May 2020, after outbreaks associated with restaurants and nightclubs, the government of the city of Seoul ordered closure of those businesses indefinitely and contact traced attendees. Similarly, health-care facilities with outbreaks such as Daenam Hospital in Cheongdo and Asiad Hospital in Busan were kept under cohort isolation.¹⁶⁰

Although widely deployed, the efficacy of lockdowns in controlling a pandemic remains somewhat controversial, with some public health experts arguing that lockdowns can do more harm than good. As well, circuit-breaker type closures are likely to be less effective for COVID-19, since multiple generations of transmission can occur as a result of asymptomatic transmission.¹⁶¹

Generally, lockdowns are a last resort to be used when less-stringent measures have failed. Many of the countries that immediately deployed robust public health measures, such as South Korea, have successfully managed the pandemic without instituting widespread lockdowns. In New Zealand and Australia, where the initial pandemic plans called for mitigation rather than containment, initial lockdowns were considered necessary to acquire the time needed to deploy an adequate response, with New Zealand locking down on March 26 and gradually lifting restrictions until none remained on June 8, 2020.¹⁶² Australian states and territories assessed their own situation and implemented measures as necessary, with the epicentres such as Victoria remaining under lockdown for as long as four months, from early July to the end of October 2020.¹⁶³

In Canada, the provinces and territories similarly employed lockdown strategies of varying lengths and stringencies in the early months of the pandemic, a necessity given that community transmission was already established. Although most regions relaxed their measures once transmission had been reduced, many re-imposed them when cases rose again throughout the fall/winter of 2020/2021. As evidenced by the examples of Australia and New Zealand, which kept their measures in place until transmission had been reduced to nearly zero, employing a more consistent approach not only reduced the number of cases and deaths, it also proved to be economically less costly overall.

This approach proved beneficial in the long run, as they were able to relax restrictions within their borders and did not experience the subsequent waves that caused much of Europe and North America to keep shutting down every time they reopened. Although there were isolated incidents of transmission that occurred after reopening, short lockdowns of three to five days in a defined Australian or New Zealand region were sufficient to keep the virus contained on these occasions. The effectiveness of this model should guide future pandemic planning in Canada.

Personal Protective Equipment

Personal protective equipment (PPE) is a relatively low-cost yet highly effective method to prevent the transmission of communicable diseases. In Canada, early recommendations

regarding masks were in line with those of the WHO, which advised against mask wearing among the general public, citing a lack of evidence and global supply shortages.

A comparative analysis suggests that the early adoption of mask wearing is one of the factors associated with lower death rates due to COVID-19, as exemplified by South Korea, Taiwan, and Singapore.¹⁶⁴ In the early days of the pandemic, governments in Asia either recommended the use of masks (rather than mandating them) or took action to prevent shortages and price gouging. Public adoption of masks was voluntary and a greater cultural acceptance of mask wearing, largely the result of experience with past outbreaks, meant that many members of the public had already adopted mask use before the WHO changed their guidelines in June of 2020.

Vietnam was among the earliest countries to mandate masks, on March 16, 2020.¹⁶⁵ In South Korea, a mask mandate did not come into effect until October 13, 2020, even though the public had been wearing face coverings for months without the need for enforcement.¹⁶⁶ As well, the demand for masks was very high in Singapore in early February 2020, with the government urging people to only use them when necessary and distributing 5.2 million masks to 1.1 million households by February 19.¹⁶⁷ Japan banned the sale of masks for profit on March 15, and similarly promised to deliver them to households to assuage public anxiety.¹⁶⁸

Although Canada did not have a culture of mask wearing prior to COVID-19, once they became the subject of public health orders across the country, the Canadian public demonstrated a high level of compliance. A Statistics Canada survey showed that 84% of respondents reported wearing masks or other PPE in July 2020. In June 2020, when an indoor mask mandate was not yet widely implemented, “65% of Canadians reported that they would wear a mask in public places where physical distancing is difficult.”¹⁶⁹ As a result, the Canadian public may be more likely to adopt mask wearing early and voluntarily in response to the next emerging infectious disease.

A similar trend was observed in South Korea, where a survey found that citizens reported higher levels of adherence to the prevention protocols recommended by the KCDC during the COVID-19 pandemic than they did during the MERS outbreak five years earlier.¹⁷⁰ The greater acceptance of masks by both governments and the public in several Asian countries clearly contributed to the success of those countries in controlling transmission of COVID-19 compared to Canada, where more skeptical attitudes toward mask wearing prevailed.

RECOMMENDATIONS

- Include more detailed social distancing measures, including plans to sustain measures until transmission is near zero, in future pandemic plans;
- Include the use of masks among healthy individuals in pandemic plans; and
- Promote the use of PPE as a cheap and effective way to prevent communicable disease transmission early to maximize public buy-in.

09

COMMUNICATION: THE ART OF TALKING TO THE PUBLIC ABOUT HEALTH SCIENCE

Effective communication relays important information to the general public to help them make informed decisions and protect their health. In the early stages of the pandemic, several countries in Asia demonstrated strong communication strategies that were clear, consistent, and effective, overcoming the absence of evidence and disparities between levels and regions of government that were hampering communications in many other countries, particularly with respect to issues such as mask wearing.

Public Health Communication Strategies

Many economies in the Asia Pacific region, as well as Canadian provinces such as BC, made health officials the forefront of communication campaigns to build trust and promote public buy-in. Taiwan in particular benefited from having Chen Chien-jen, an epidemiologist by training, as its vice-president at the time the pandemic erupted. Novel, creative, and effective communication strategies significantly contributed to the successful management of COVID-19 in the Asia Pacific.

Since the first case of COVID-19 was diagnosed in Singapore, the government has used a broad range of media, including print, broadcast, websites, and social messaging platforms such as WhatsApp, Twitter, Telegram, and Facebook on a daily basis to inform and advise the population.¹⁷¹ Singapore also engaged a popular comedian named Uncle Phua in its

public service campaign series. The comedian used Singlish (an English-based language commonly spoken in Singapore) to humorously address the public about issues such as social distancing, hoarding, respecting front-line workers, and vaccination.¹⁷² Singapore also involved public figures during its experience with SARS in 2003.

In Vietnam, the government sent regular updates via SMS and released the NCOVI app in March 2020 for the dissemination of information and health recommendations.¹⁷³ The app can also be used to facilitate contact tracing efforts by enabling citizens to provide a daily update of their health status¹⁷⁴. Like Singapore, Vietnam launched a public service campaign in collaboration with several public figures. One creative output was the rewrite of a famous pop song by two local singers, titled Ghen Co Vy (jealous coronavirus), that delivers a uniting message to combat COVID-19. The song became popular across social media channels like TikTok and had 88 million views on YouTube as of June 2021.¹⁷⁵

Maintaining Trust and Credibility

Appeals based on emotions, narratives, and shared values will help build trust, especially when tailored to existing social and political circumstances. For example, Taiwan framed social distancing as an act of civic love: “the greater the love, the greater the distance you keep.”¹⁷⁶

Officials at the forefront of communication campaigns must be clear, consistent, and comprehensive in their messaging to be credible. Displays of compassion and vulnerability have proven to be remarkably effective; for example, New Zealand’s Prime Minister Jacinda Ardern held regular briefings through Facebook livestream to directly address citizens’ questions, and she took a 20% salary cut along with Cabinet in solidarity with the country’s citizens.¹⁷⁷ The director of the KCDC, Jung Eun-kyeong, conducted the daily briefings and served as the face of the pandemic response, a measure that increased public acceptance of various pandemic control measures. Dr. Jung has received praise for her straight talk and calm demeanour that inspires trust.¹⁷⁸

Demonstrating concern for the public’s well-being and best interests through concrete actions will prove to be beneficial in establishing trust early and maintaining long-term buy-in, especially given the ever-changing, unprecedented nature of a pandemic, which requires flexible and adaptable communication.

RECOMMENDATIONS

- Make health officials the forefront of future communication campaigns, rather than politicians;

- Use creative tools for different demographics, such as social media for young people and printed handouts at community centres for families and older people;
- Ensure that messages are available in multiple languages, and effectively deliver them to diverse populations through relationships with communities;
- Engage public figures with great influence;
- Form partnerships with other sectors to help deliver messages (e.g., telecommunication companies for SMS message delivery, emergency alerts on smartphones); and
- Use emotional appeals to craft messages rather than shame or blame, highlight common goals and values, and ensure messages are appropriate to cultural contexts.

10

CONCLUSION

This report analyzed the successful COVID-19 responses of seven economies in the Asia Pacific and highlighted seven broad categories of factors that contributed to their success. Although the responses of the Asia Pacific region have been highly cohesive compared to that of Canada, a feature that undoubtedly contributed to their effectiveness, our analysis shows that a central system of government is not a prerequisite for a cohesive national response, as demonstrated by Australia. This report recognizes the challenges of staging a national-level pandemic response within the context of a federated health-care system and suggests strategies to close such gaps at the federal and provincial levels, using the role of PHAC as a national public health agency.

Canada now faces the challenges of adapting its policies and institutions to facilitate a better pandemic response in the future. The changes should occur sooner rather than later, as emerging pathogens will undoubtedly appear again. In addition to learning from previous mistakes, Canada can and should learn from the countries that handled the pandemic better, including those highlighted in this report.

From our analysis, we observed that experience was the most valuable teacher in many COVID-19 success stories, most notably South Korea and Taiwan, with robust public health infrastructure and decision-making hierarchies established following SARS and MERS. The prompt activation of these response networks facilitated effective control measures, including large-scale testing and extensive contact tracing. Innovative technological tools

were used in both contact tracing and quarantine monitoring, as seen in Singapore and Taiwan. These structural changes take time to build, and COVID-19 should serve as the momentum for Canada to review the feasibility of institutional shifts to enhance the country's future pandemic response.

Countries without the advantage of previous experience and relatively underprepared health-care systems, such as Vietnam and New Zealand, relied on more stringent measures, including strict border restrictions and institutionalized quarantine. These measures, when implemented in a timely manner, helped to curb community transmission and avoid the need for lengthy, economically damaging lockdowns. Japan followed a cluster-based approach for preventing clustered outbreaks and backward contact tracing for cases arising from clusters. In this way, the country was able to avoid blanket lockdowns and kept its community spread at a manageable level.

Australia was an interesting case study due to several similarities with Canada in its governance structure. Like New Zealand, Australia did not have a centralized public health response agency. However, the Australian Health Protection Principal Committee, the highest decision-making body made up of health experts from all states and territories, gained significantly more influence over the course of the pandemic and was able to provide expert advice directly to the National Cabinet. Australia's success highlighted the importance of elevating the role of health officials in infectious disease emergencies.

What is notable about our analysis is that the most effective features of the pandemic response were not novel practices but rather swift and decisive action guided by an appropriate level of risk awareness. Canada did not go into COVID-19 unprepared; however, as the countries highlighted in this report demonstrate, just as important as preparations are a sense of urgency and the willingness to take early and decisive action. Future pandemic plans should emphasize a cohesive response that is guided by science, co-operation, and co-ordination between levels of government, and an institutional capacity to benefit from the experiences of other countries. As well, the adaptation of these strategies must align with Canadian values of autonomy, democracy, and freedom.

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APPENDIX

Roundtable Participants

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- Dr. Chang-yup Kim – School of Public Health, Seoul National University, South Korea;
- Dr. Caroline Miller – School of Public Health, University of Adelaide, Australia;
- Dr. Paul Glasziou – Institute for Evidence-Based Healthcare, Bond University, Australia;
- Dr. Amanda Kvalsvig – Department of Public Health, University of Otago, New Zealand;
- Dr. Chang-Chuan Chan – College of Public Health, National Taiwan University, Taiwan; and
- Dr. Irving Yi-Feng Huang – Department of Public Administration, Tamkang University, Taiwan.

ROUNDTABLE 2:

- Dr. Danish Ahmad – Global Health Fellow, University of Canberra, Australia;
- Dr. Reiko Miyahara – National Centre for Global Health, Japan;
- Dr. Li Yang Hsu – School of Public Health, National University of Singapore, Singapore;

- Dr. Hyukmin Lee – Yonsei University College of Medicine, South Korea; and
- Ms. Hyunjin Kang – Seoul National University, South Korea.

List of Interviews

- Professor Kelley Lee - Tier 1 Canada Research Chair in Global Health Governance, Faculty of Health Sciences, Simon Fraser University
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- Katie Greenwood – Director, Strategic Planning and Policy, Public Health Agency of Canada
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