C. Essays

Comparative Analysis of the Best Responses to COVID-19

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1. Introduction.

On January 9th, 2020, the World Health Organization announced a mysterious virus related to Pneumonia in Wuhan, China[2]. The virus was a strain from the same coronavirus that caused Severe Acute Respiratory Syndrome in 2003 and Middle East respiratory syndrome in 2015. What made COVID-19 different from MERS and SARS is the higher infection rate and the fact that over 40% carry COVID-19 are asymptomatic[3]. The virus took the world by surprise, including developed countries and regions with advanced medical technology like the US and Italy[4]. A combination of adequate policies and advances technology are both essential for successfully managing COVID.

The states and regions chosen in this article[5] each had an excellent response because they applied a set of economic, health,

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[1]Penn State School of International Affairs (MIA expected December 2020).

[2] "WHO Statement Regarding Cluster of Pneumonia Cases in Wuhan, China." *WHO*, World Health Organization, 9 Jan. 2020, www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china.

[3] "COVID-19, MERS & SARS." National Institute of Allergy and Infectious Diseases, NIAID, 18 Aug. 2020, www.niaid.nih.gov/diseases-conditions/covid-19.

[4] MacMillan, Margaret. "Making History: How a Pandemic Took the World by Surprise." *The Globe and Mail*, Phillip Crawley, 8 May 2020, www.theglobeandmail.com/opinion/article-making-history-how-a-pandemic-took-the-world-by-surprise/.

[5] Those countries or regions selected include Taiwan, South Korea, Australia, Canada, and New Zealand. The choice was based on *Eurasia Group* assessment of best responses to COVID. More info in "ideological framework" section.

and technological strategies. Some digital strategies include a robust contact tracing system and Artificial Intelligence (AI) for more efficient data management[6]. Standard health measures include supporting science and scientists, aggressive testing, international border control, mask-wearing mandate, coordination with the World Health Organization (WHO), and protection of Healthcare Workers (HCWs).

Finally, countries and regions chosen for examination in this article applied economic plans with fiscal and monetary policies that helped the most impacted individuals and communities, empowered Small and Medium Enterprises (SMEs), and reduced international trade barriers. The first section of the research will deal with the unique challenges and experiences each of the selected states or regions had to deal with to overcome the COVID-19 pandemic. The second section will analyze the similarities and differences in their strategies. Finally, the article will conclude with a set of recommendations to transform these experiences and strategies into policies that can help nations and regions suffering from coronavirus or any other form of contagious diseases in the future.

2. Ideological Framework.

The choice to analyze Taiwan, South Korea, Australia, Canada, and New Zealand as one of the best global responses to COVID was based on Ian Bremmer and Eurasia Group Assessment. On June 12, 2020, Ian Bremmer published an article titled "The Best Global Responses to COVID-19 Pandemic[7]." Ian Bremmer is the president of Eurasia Group, a political-risk consultancy, and GZERO Media, a company dedicated to providing intelligent and engaging international affairs coverage. He teaches applied geopolitics at Columbia University's School of International and Public Affairs. Ian Bremmer and Eurasia Group assessed to find who had the best initial response to COVID and are more prepared for coming next. Eurasia Group assessment concluded that the following countries or regions (Taiwan, South Korea, Australia, Canada,

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[6] Kent, Jessica. "How Artificial Intelligence, Big Data Can Determine COVID-19 Severity." *Health IT Analytics*, Xtelligent Healthcare Media, 15 June 2020, www.healthitanalytics.com/news/how-artificial-intelligence-big-data-can-determine-covid-19-severity.

[7] Bremmer, Ian. "The Best Global Responses to COVID-19 Pandemic." Time, Time USA, 12 June 2020, www.time.com/5851633/best-global-responses-covid-19/.

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and New Zealand) had the best initial response to COVID. Eurasia Group's top experts developed a metric system based on COVID response effectiveness.

The rank ordering of effectiveness was done by Eurasia group top experts in each field. The order of effectiveness given to a national or regional response was based on qualitative and numeric metrics. Eurasia Experts developed three metrics, then allocated identified states or regions to quartiles based on those metrics. The first metric was around health measures and included mobility and testing performance scaled by population. The second metric was government effectiveness based on authorities' efforts, public cooperation, and domestic and international coordination. Finally, the third category focused on economic, fiscal, and monetary economic policies relative to financial gaps and starting position before COVID. Experts According to Eurasia Group assessment, as of June 2020, the best initial global responses to COVID are Taiwan (433 cases, seven deaths), Singapore (38,965 cases; 25 deaths), South Korea (11,902 cases, 276 deaths), Australia (7,276 cases, 102 deaths), Canada (98, 645, 8035 deaths), New Zealand (1502 cases, 22 deaths) and Singapore (38,965 cases; 25 deaths)[8]. The number of cases and death was derived from John Hopkin University and was not included as a criterion in the Bremmer model[9]. While the Bremmer model provides an excellent base for this research, combining its results with John Hopkin's data provides a better look at how well those countries and regions are doing in their responses.

Another theory used in this research is the Kluth model of contact tracing[10]. COVID-19 made it very important for the public mass to share their health condition with governing bodies. Considering this development, three main contact tracing models have surged according to Kluth: the American, the Chinese, and the German Model. In the American model for

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[8] Bremmer, Ian. "The Best Global Responses to COVID-19 Pandemic." Time, Time USA, 12 June 2020, www.time.com/5851633/best-global-responses-covid-19/.

[9] "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)." JHU, John Hopkin University & Medicine, 2020, www.coronavirus.jhu.edu/map.html.

[10] Kluth, Andreas. "If We Must Build a Surveillance State, Let's Do It Properly." *Bloomberg* , Bloomberg, 22 Apr. 2020, www.bloomberg.com/opinion/articles/2020-04-22/taiwan-offers-the-best-model-for-coronavirus-data-tracking.

collecting digital information, data is considered free by default unless the user opts. Giant tech companies collect data for research and development. The government can have the information only in case terrorism, crime, or a virus spread. In the German approach, the data is strongly protected and belongs entirely to the user. The user must actively consent to share their information. The Chinese model is more aggressive in digital data collection than the American and the German model. In the Chinese model, the data collected by private companies in China, such as Huawei and Ali Baba, assumed to belong to the government. The data include everything from face recognition, fingerprints, credit card records, and others. China ties those data to a social credit system and gives people a color based on the obligation to quarantine[11]. These three models will be used as a prototype, but that does not mean that all countries or regions use one of them exclusively. In most cases, a mixture of all these approaches were used to maximize response effectiveness, with the goal of contact tracing without losing public corporation and trust.

Another hypothesis is the Nudge theory by Richard Thaler. In his book "Nudge: Improving Decisions about Health, Wealth, and Happiness," Thaler defends libertarian paternalism and active engineering of choice architecture. The idea of libertarian paternalism is that it is possible for public and private institutions to "nudge" people's behavior toward the right decision while respecting their freedom of choice. An example Thaler brings in is organ donation. Thaler suggests that in order to increase organ donations, the government must mandate a choice program when people apply for their driver's license to choose if they want to donate organs or not. Simultaneously, the government must establish websites and marketing campaigns to nudge people to donate their organs when applying for driver licenses. In this example, people's ability to choose is still present, but they were nudged to decide to help save lives[12]. In the context of best responses to COVID,

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[11] Backer, Larry. " Automated Law and COVID-19: Data Driven Measures With National Characteristics In China and Israel and the Future of the Law-Governance Complex ." *Law at the End of the Day*, 24 Mar. 2020, www.lcbackerblog.blogspot.com/2020/03/automated-law-and-covid-19-data-driven.html.

[12] Thaler, Richard H., and Cass R Sunstein. Nudge: Improving Decisions About Health, Wealth, and Happiness. Rev. and expanded ed. New York: Penguin Books, 2009. Print.

some places applied libertarian paternalism to nudge people to participate in contact tracing or sanitize and wear a mask in public spaces. For example, New Zealand did not make downloading the contact tracing app mandatory. However, they nudged people toward downloading it by advertising, relating the app to saving lives and ending the pandemic. As of September 2nd, 2020, about 50% of New Zealanders downloaded the contact tracing app[13]. Thaler theory is critical because it could help regions or countries nudge people toward making better choices that will end the pandemic, concurrently it will not impact people's freedom of choice.

The final relative theory is regarding the effectiveness of contact tracing. On April 16th, the University of Oxford published a promising study on utilizing digital contact tracing to stop the spread of COVID [14]. The research conclusion started with a controversial statement, "Our models show we can stop the epidemic if approximately 60% of the whole population use the app and adhere to the app's recommendations.". Media and some politicians concluded that we could not achieve a functional contact tracing system without 60% of the population corporation. However, even the writers of this research admit that the research conclusion has been profoundly misunderstood. Andrea Stewart, an Oxford spokeswoman, explains that any contact tracing from 20% to 56% can significantly slow the epidemic. Stewart argued that some readers focused too much on the 60% mark and ignored the rest of the conclusions. The research concluded, "Even with lower numbers of app users, we still estimate a reduction in the number of coronavirus cases and deaths." Fraser, the research co-lead, said his research assumed a smaller percentage means little benefit. However, later simulations showed that a 20 to 56% adoption rate is also significant [15]. Fraser assured the

[13] Blake-Persen, Nita. "2.1 Million Download Covid Tracer App, but Who Is Signing in?" *RNZ*, Radio New Zealand , 2 Sept. 2020, www.rnz.co.nz/national/programmes/checkpoint/audio/2018762292/2-point-1-million-download-covid-tracer-app-but-who-is-signing-in.

[14] "Digital Contact Tracing Can Slow or Even Stop Coronavirus Transmission and Ease Us out of Lockdown." *University of Oxford*, University of Oxford, 16 Apr. 2020, www.research.ox.ac.uk/Article/2020-04-16-digital-contact-tracing-can-slow-or-even-stop-coronavirus-transmission-and-ease-us-out-of-lockdown.

[15] O'Neill, Patrick. *Technology Review*, MIT Technology Review, 5 June 2020, www.technologyreview.com/2020/06/05/1002775/covid-apps-effective-at-less-than-60-percent-download/.

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significance of the number in a recent interview and said that his team is currently working on a numerical model that could further explain it.

3. Methodological Framework.

The methodology chosen follows from the basis for selecting South Korea, Taiwan, Australia, Canada, and New Zealand; it is meant to examine the basis for the Eurasia Group's assessment that those countries and regions had among the best initial global responses to COVID. The paper does not seek to measure who had the best responses to COVID globally. Instead, this research switches the focus to understanding the policies and actions that those places applied, which made them recognized at a global level by political-risk consultancies like Eurasia. This analysis aims to compare the selected national or regional pandemic strategies and transform their experiences into lessons and policymakers' recommendations. Another reason for selecting those states or regions and not others is data availability. The selected places had government websites and other e-platform to access their strategies when this research was written (early June). Those e-platforms included various tools that aided my research, such as easy access to economic response plans and health strategies. Information availability and accessibility impacted the decision to choose these countries or regions.

The first part of this research will provide an overview of how Taiwan, South Korea, Australia, New Zealand, and Canada responded to COVID, starting with their respective responses from the initial case. Understanding each government's timeline will help later facilitate how they excelled in their Pandemic responses. In the second part of this paper, Bremmer's three categories (health, government effectiveness, economic policies) are divided and expanded upon as characteristics. In health, characteristics chosen included protecting healthcare workers, aggressive testing, contact tracing, and mask mandate. The government's effectiveness categories include transparency, centralization of decision-making, and international coordination with the World Health Organization (WHO). In

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economics, the factors chosen were economic and social support legislations and policies and utilization of infrastructure. This expansion of the Bremmer category was done to make it easier to compare and contrast these broad factors among the places chosen for examination. For example, comparing South Korea and Canada's health performance is rugged, but comparing how both protected their healthcare workers is much simpler. Finally, the last part of this paper will suggest a set of clear and concise public policies in bullet points that could be implied based on this analysis to help states and regions suffering from containing COVID-19. The research data is from scholarly journals, global and local newspaper articles, and other governmental and international organizations' websites.

4*. Section one: Historical and Policy overview of Best COVID Responses.*

A. Taiwan.

Taiwan used three main strategies to combat COVID: Surveillance, quarantine, and increased scientific research[16]. Taiwan's case is fascinating because it is only 81 miles away from Mainland China and in many ways deeply connected with the Mainland. While many health experts expected Taiwan to be the second-highest number of cases per capita[17], Taiwan proved that containing the unknown is possible with the right leadership, public corporation, and health assessments.

Taiwan used the data, knowledge, and infrastructural capabilities gained from their previous experience with Severe Acute Respiratory Syndrome SARS in 2003 to combat COVID-19. Following the SARS Pandemic, Taiwan empowered the Central Epidemic Center (CECC). CECC became the commander at the time of crisis on local, regional, and central levels. Before SARS, Taiwan had over three different health command centers at the

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[16] Cheng, Hao-Yuan et al. "Initial rapid and proactive response for the COVID-19 outbreak - Taiwan's experience." *Journal of the Formosan Medical Association = Taiwan yi zhi* vol. 119,4 (2020): 771-773. doi:10.1016/j.jfma.2020.03.007

[17] "Modeling the Spread of 2019-NCoV." *John Hopkin Writing School for Engineering*, John Hopkin University & Medicine, 26 Jan. 2020, https://systems.jhu.edu/wp-content/uploads/2020/01/Gardner-JHU_nCoV-Modeling-Report_Jan-26.pdf.

time of a crisis (Biological Pathogen Disaster, Counter-Bioterrorism, Central Medical Emergency command centers). Having CECC unify all these command centers under one umbrella helped Taiwan have more rigid policies and actions. Also, SARS established a culture of mask-wearing, sanitization, social distancing, and quarantine, in addition to better hospital Pandemic control practices. Since SARS 2003, Taiwan has brought a team of infection control experts to ensure all necessary PPE are available. When the government announced the fight against COVID-19 in January, the medical care system immediately had a responsive strategic plan with the medical task force, triage, and isolation[18].

The first documented response from Taiwan to COVID-19 was on January 2nd[19], almost 20 days before it hit their land. On January 2nd, 2020, the Taiwanese Ministry of Health and Welfare (MOHW) gathered to discuss influenza spread during the new year travel season. The conversation switched immediately to Pneumonia, like a virus that was spreading in China. The meeting concluded with a plan to provide N95 masks, scan passengers, and issue a travel notice, especially for the Wuhan people. On January 7th, Taiwan officials tightened those restrictions and imposed them all around Taiwan. Taiwanese officials reactivated CECC on January 15th, which played a vital role in crafting the policies and commands that helped stop the spread[20]. Within the next five weeks, "Taiwan rapidly produced and implemented a list of at least 124 action items to protect public health. The policies and actions go beyond border control because they recognized that that was not enough," said Jason Wang, Stanford Health Policy's associate professor[21].

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[18] Lee, Wui-Chiang,* Taiwan's experience in pandemic control: Drawing the right lessons from SARS outbreak, Journal of the Chinese Medical Association: July 2020 - Volume 83 - Issue 7 - p 622-623 doi: 10.1097/JCMA.0000000000000350

[19] Trotochaud, Marc. " Taiwan's COVID-19 Response." *Outbreak Observatory*, John Hopkin Bloomberg School of Public Health, 30 Apr. 2020, www.outbreakobservatory.org/outbreakthursday-1/4/30/2020/taiwans-covid-19-response.

[20] Trotochaud, Marc. " Taiwan's COVID-19 Response." *Outbreak Observatory*, John Hopkin Bloomberg School of Public Health, 30 Apr. 2020, www.outbreakobservatory.org/outbreakthursday-1/4/30/2020/taiwans-covid-19-response

[21] Duff-Brown, Beth. " How Taiwan Used Big Data, Transparency and a Central Command to Protect Its People from Coronavirus." *Stanford Health Policy*, Stanford University, 3 Mar. 2020,

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On January 21st, 2020, Taiwan President Tsai Ing-Wen authorized a contact tracing program that derives its data from scientific and credible resources[22]. The goal was to identify potential and current COVID cases and warn the community about them before it is too late. Taiwan's "electronic fence" application got announced on the same date with the sole goal of stopping the infection via tracking. Simultaneously, there was much controversy surrounding privacy when the contact tracing program started in Taiwan[23].

The Taiwanese model of contact tracing is a unique mixture of all the aforementioned approaches (the German, the Chinese, and the American approaches). Kluthe refers to the Taiwanese model as "participatory self-surveillance," where cell phone tracking is applied. However, people still participate by creating a network of information that flows from the people to the government and vice versa. The Taiwanese model emphasizes public engagement. For example, if an area in Taiwan has a shortage of masks, the public could report it to the authority, and the authority will solve the issue as soon as possible[24].

Taiwan emphasized "nudging" people to participate in the network by giving weight to their feedback. The Taiwanese government was extraordinarily responsive and inclusive, which nudged people to participate more. This method makes it easier to enforce contact tracing and gives citizens a sense of engagement and patriotism. The Taiwanese model also has an enforcement aspect where the app "geofence" people by tracking their cell phone and calling the police to leave their

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www.healthpolicy.fsi.stanford.edu/news/how-taiwan-used-big-data-transparency-central-command-protect-its-people-coronavirus.

[22] Li-Hua, Chung. "Virus Outbreak: Timeline of Preventive Efforts against COVID-19." *Taipei Times*, The Taipei Times, 14 Apr. 2020, www.taipeitimes.com/News/taiwan/archives/2020/04/14/2003734588.

[23] Lee, Yimou. "Taiwan's New 'Electronic Fence' for Quarantines Leads Wave of Virus Monitoring." *Reuters*, Reuters, 20 Mar. 2020, www.reuters.com/article/us-health-coronavirus-taiwan-surveillanc/taiwans-new-electronic-fence-for-quarantines-leads-wave-of-virus-monitoring-idUSKBN2170SK.

[24] Kluth, Andreas. "If We Must Build a Surveillance State, Let's Do It Properly." *Bloomberg* , Bloomberg, 22 Apr. 2020, www.bloomberg.com/opinion/articles/2020-04-22/taiwan-offers-the-best-model-for-coronavirus-data-tracking.

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range[25]. Local chiefs, the lowest elected officials, had to call quarantined people twice a day to ensure that they are not deceiving the government by leaving a keeping their phones at home[26]. Finally, Taiwan applied smart AI technology to manage data cost-effectively. The AI helped Taiwan utilizes its technological infrastructures such as cashless payments and network towers to achieve accuracy and efficiency.

To prevent the spread of a complete buying panic of sanitizers and face masks, the Taiwanese government took it into its hand to distribute medical-grade masks and tools. Furthermore, the government cooperated with private companies to ensure that employees check their temperature when entering business buildings. By the end of January, mask-wearing became a routine in Taiwan[27]. While Taiwan did not have a full lockdown, they utilized data and used contact tracing effectively to reduce cases. Finally, Taiwan expanded its research capabilities between CECC and private health and pharmaceutical companies in Taiwan in January. As a result, Taiwan had 27 laboratories that could perform up to 2250 molecular diagnostic tests for COVID-19 a day as early as February[28]. Overall, Taiwan proved that there is no need for a full economic shutdown to combat a pandemic. Despite all the challenges that faced Taiwan at the start of the pandemic due to its proximity to Wuhan, Taiwan successfully combated COVID-19 through contact tracing, data utilization, isolation when necessary, and increased laboratory and research capacity.

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[25] Ghaffary , Shirin. " What the US Can Learn from Other Countries Using Phones to Track Covid-19." *Vox*, Vox Media, LLC, 22 Apr. 2020, www.vox.com/recode/2020/4/18/21224178/covid-19-tech-tracking-phones-china-singapore-taiwan-korea-google-apple-contact-tracing-digital.

[26] Sui, Cindy. "In Taiwan, the Coronavirus Pandemic Is Playing out Very Differently. What Does Life without a Lockdown Look like?" *NBC News*, NBC UNIVERSAL, 23 Apr. 2020, www.nbcnews.com/news/world/taiwanese-authorities-stay-vigilant-virus-crisis-eases-n1188781.

[27] Griffiths, James. "Taiwan's Coronavirus Response Is among the Best Globally." *CNN*, WarnerMedia , 5 Apr. 2020, www.cnn.com/2020/04/04/asia/taiwan-coronavirus-response-who-intl-hnk/index.html.

[28] Cheng, Hao-Yuan et al. "Initial rapid and proactive response for the COVID-19 outbreak - Taiwan's experience." *Journal of the Formosan Medical Association = Taiwan yi zhi* vol. 119,4 (2020): 771-773. doi:10.1016/j.jfma.2020.03.007

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B. South Korea

Even before its first case on January 20th, South Korea already received a viral specimen from China to develop diagnostic tools[29]. Like Taiwan, South Korea's rapid response was due to their experience with another formal coronavirus strain. Unlike Taiwan SARS 2002 outbreak, the outbreak in South Korea was much more recent and related to the Middle East Respiratory Syndrome MERS. The 2015 outbreak of MERS in South Korea included 186 cases and 38 fatalities[30].

South Korea learned many lessons from MERS 2015. First, it encouraged a culture of mask-wearing, hand washing, and social distancing. Second, it created The Korea Center for Disease Control and Prevention (KCDC) alongside four other governmental organizations. At the time of the MERS crisis, KCDC lacked the primary decision-making power needed to contain the MERS outbreak, mainly because each bureaucratic organization had some independence. However, things have slowly changed since then, and KCDC was empowered by the Ministry of Interior and became the primary epidemic control center. When COVID-19 initially appeared in South Korea, its leadership gave all the credibility and decision making to the scientific community of KCDC [31] . Finally, South Korea took COVID-19 seriously because, unlike SARS, which has a case fatality of 10%, MERS had a case fatality of 25%[32]. Later in 2015, MERS white paper was published to include all critical policies, lessons, and recommendations that South Korea must never

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[29] Ariadne Labs. "Emerging COVID-19 Success Story: South Korea Learned the Lessons of MERS." *Our World in Data*, University of Oxford, 30 June 2020, ourworldindata.org/covid-exemplar-south-korea.

[30] Oh, Myoung-Don et al. "Middle East respiratory syndrome: what we learned from the 2015 outbreak in the Republic of Korea." *The Korean journal of internal medicine* vol. 33,2 (2018): 233-246. doi:10.3904/kjim.2018.031

[31] Oh, Seung-Youn. "South Korea's Success Against COVID-19." *Regulatory Review*, University of Pennsylvania Law School, 14 May 2020, www.theregreview.org/2020/05/14/oh-south-korea-success-against-covid-19/www.theregreview.org/2020/05/14/oh-south-korea-success-against-covid-19/.

[32] Fox, Justine. "What Prepares a Country for a Pandemic? An Epidemic Helps." *Bloomberg*, Bloomberg, 18 Mar. 2020, www.bloomberg.com/opinion/articles/2020-03-18/covid-19-response-better-in-countries-with-sars-mers-coronavirus.

forget. That white paper became the blueprint that guided South Korea's response to COVID-19 Pandemic[33].

South Korea tackled COVID-19 on three pongs: protecting healthcare workers, utilizing advanced technologies, and transparent communication [34]. To start with, the government protected healthcare workers in a very comprehensive strategy. According to the Massachusetts Medical Society[35], South Korea protected healthcare workers with three key steps. First, the South Korean Ministry of Health implemented a regional reorganization of the health system. The reorganization includes a Risk Stratification system that categorizes patients based on their symptoms from a-symptomatic to critical. Suppose a patient is not in severe or critical conditions. In that case, they get isolated in community treatment centers, which reduces the load on hospital staff and decreases the likelihood of spreading the virus in the emergency hospital.

South Korea's second action to protect health care workers is to improve Emergency hospitals' environments by providing screening clinics at hospital entrances, making masks mandatory, and screening hospital staff twice a day. Third, universal testing, contact tracing, and cohort isolation have been implemented in hospitals when deemed necessary.

The second pong to explain that South Korea's success is advanced medical and contact tracing technology. In medical technology, testing for COVID was available a week after the first case[36] due to the South Korean government cooperating with private companies to advance testing before COVID-19 even hit.

[33] Moon, M Jae. "Fighting COVID-19 with Agility, Transparency, and Participation: Wicked Policy Problems and New Governance Challenges." *Public administration review*, 10.1111/puar.13214. 20 May. 2020, doi:10.1111/puar.13214

[34] Ariadne Labs. "Emerging COVID-19 Success Story: South Korea Learned the Lessons of MERS." *Our World in Data*, University of Oxford, 30 June 2020, ourworldindata.org/covid-exemplar-south-korea.

[35] Kim, June-Ho, et al. "How South Korea Responded to the Covid-19 Outbreak in Daegu." *NEJM Catalyst Innovations in Care Delivery* , Massachusetts Medical Society, Aug. 2020, www.catalyst.nejm.org/doi/full/10.1056/CAT.20.0159.

[36] Thompson, Derek. "What's Behind South Korea's COVID-19 Exceptionalism?" *The Atlantic*, The Atlantic, 6 May 2020, www.theatlantic.com/ideas/archive/2020/05/whats-south-koreas-secret/611215/.

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In contact tracing, South Korea used its technological infrastructure to trace individuals infected or suspected of being infected. The tracing also included surveillance camera footage, private mobile data, credit card transactions, and tracking bracelets for quarantine people[37]. Like Taiwan, South Korea relied on aggressive testing, social distancing, and contact tracing instead of lockdown or immigration control.

The final prong to explain South Korea's success is clear and transparent communication. South Korea learned from the lesson in MERS. In MERS, South Korea did not communicate with the public about testing kits or hospital availability. When COVID-19 hit, South Korea realized that attempting to distort, hide, or change information will distrust the government. Another aspect of improved communication in the COVID-19 pandemic is better cooperation between local and central government than in MERS 2015. A positive example of Korea's intergovernmental coordination efforts is when the central government allowed the local government to confront the Shincheonji Church of Jesus in March 2020 about their worship practices. Shincheonji Church of Jesus Christ was responsible alone for 60% of cases in March. This high percentage is due to worshippers sitting on the floor next to each other while praying. The coordination between KCDC and the local government allowed the local government to stop this practice until further notice.

Overall, South Korea did great in combating COVID-19 due to them protecting their healthcare workers, utilizing advanced medical and tracing technology, and having transparent and clear communication among local government, central government, and the Korean people.

C. Australia.

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[37] Park Y, Choe Y, Park O, et al. Contact Tracing during Coronavirus Disease Outbreak, South Korea, 2020. *Emerging Infectious Diseases*. 2020;26(10):2465-2468. doi:10.3201/eid2610.201315

The global Sustainable Development Report of 2020 gave Australia's A for their efforts in responding to COVID-19[38]. Australia ranked third in the report for their effective response to COVID (South Korea First, New Zealand 9th, and Canada 24th). Australia's strategy in combating COVID-19 could be summarized in four main points: early international border closure, harmonization of decision making, utilizing advanced technology, protecting healthcare workers, and preserving the healthcare system's function.

Starting with early international border closure, The Australian response to the COVID timeline started two days before their first case. Australia implemented a ban on Wuhan's flights on January 24th, a day before their first initial case. A week later, Australia implemented the same ban on all flights coming from China[39]. Due to Australia listening to all WHO guidelines in January and utilizing information to implement travel bans and restrictions, Australia managed to have almost no cases of COVID-19 in February 2020. After that, the number of cases started to increase again on March 5th, making Australia block Iran and Italy in early March and close their international border fully mid-March. Between March 15th to April 2nd, Australia's case curve was highest (around 400 a day) [40]. The Australian government's response at the time was very crucial in flattening their curve.

Second, Australia's centralized decision making helped them make tough and better decisions. Australia recognized the need to have a centralized leadership for decision making during a crisis. Australia knew that a system of checks and balances, while great for democracy on a day-to-day basis, will not be useful during a rapidly changing pandemic. On March 13th, 2020, Australia announced the National Cabinet's creation,

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[38] "Sustainable Development Report 2020 ." *Sustainable Development Report*, United Nations, 30 June 2020, www.sdgindex.org/reports/sustainable-development-report-2020/.

[39] Karp, Paul. " Timeline: How Australia Responded to the Coronavirus Outbreak." *The Guardian*, Guardian News & Media Limited , 3 Feb. 2020, www.theguardian.com/world/2020/feb/03/timeline-how-australia-responded-to-the-coronavirus-outbreak.

[40] Duckett , Stephen, and Anika Stobart. "Australia's COVID-19 Response: the Story so Far." *Grattan Institute*, Grattan Institute, 11 June 2020, www.grattan.edu.au/news/australias-covid-19-response-the-story-so-far/.

an intergovernmental decision-making forum that compromises the prime minister, state and territory premiers, and chief ministers[41]. Jennifer Menzies, a principal researcher at Griffith University, calls this form of leadership executive federalism and states three benefits [42] . First, executive federalism improves response time by eliminating checks and balances and reduce risk by bringing medical experts to the conversation, such as the chief medical officer. Second, executive federalism improves Australia's COVID response clarity and coherence by reducing political topics and shifting the focus to the local communities. Finally, executive federalism provides a chance for smaller states to cast their voice as big ones, which Menzies refers to as dual democracy. As of May 2020, 9 out of 10 Australians said their government handled the pandemic well[43].

Third, Australia preserved the role of the healthcare sector and protected its workers during the crisis. A week after the first case, when no one knew what COVID-19 is or how it spread, the Australian government emphasized following the WHO guidelines. Australia threw all politics aside and focused on empowering scientists to take a leading role. As an example of that is John Howard, the former Prime Minister, quote to the current Prime Minister Mr. Morrison, "there are no ideological constraints at times like this." Mr. Morrison responded, "Today is not about ideologies. We checked those at the door.[44]" The National Cabinet had scientists in every meeting. The scientists are encouraged to voice their thoughts and expert opinions during meetings.

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[41] Hitch, Georgia. "Key Moments from the Prime Minister's Latest Coronavirus Press Conference after National Cabinet Meeting." *ABC*, ABC News, 12 June 2020, www.abc.net.au/news/2020-06-12/five-key-moments-prime-minister-coronavirus-press-conference/12349584.

[42] Menzies , Jennifer. " Explainer: What Is the National Cabinet and Is It Democratic?" *The Conversation*, The Conversation US, Inc, 30 Mar. 2020, www.theconversation.com/explainer-what-is-the-national-cabinet-and-is-it-democratic-135036.

[43] Kassam, Natasha. "COVIDpoll: Lowy Institute Polling on Australian Attitudes to the Coronavirus Pandemic." *Lowy Institute*, Lowy Institute, 14 May 2020, www.lowyinstitute.org/publications/covidpoll-lowy-institute-polling-australian-attitudes-coronavirus-pandemic.

[44] Flanagan, Richard. "Did the Coronavirus Kill Ideology in Australia?" *The NY Times*, The New York Times Company, 18 May 2020, www.nytimes.com/2020/05/18/opinion/coronavirus-australia.html?searchResultPosition=17.

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Fourth, Australia applied strict lockdown measures similar to New Zealand. Australia started restricting lockdown measures from mid-March to mid-May[45]. Following that, cases began to surge again, early-June in the State of Victoria. Australia had to implement another lockdown on Melbourne and Mitchell Shire. While Australia hoped they could ease up lockdown restrictions on the State of Victoria in a month, the lockdown took over 111 days[46]. A lesson to be learned from Australia is that they prioritized health and saving people's lives over short term economy. Australia did not open the Melbourne back until there were zero cases in the city. Australia's strict and targeted lockdown measures helped them keep the pandemic under control.

Finally, Australia used advanced information, communication, and contact tracing technology to help reduce the spread of COVID. In communication and information technology, Australia Information Industry Association (AIIA) and the Federal government created the Australia Business continuity website. Business continuity offers various tools such as remote communications, workforce management, and video conferencing solution. Those tools are available to all business owners at any time and place for free[47]. Australia made a recognizable effort in providing a technological infrastructure that helped ease the transformation of businesses to virtual.

In contact tracing, Australia announced COVIDSafe App on April 26th, which was optional. Two days later, 2.33 Million Australians downloaded the app[48]. Australia did many things to reduce privacy concerns regarding its contact tracing app. First, they made the app function using Bluetooth detection

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[45] Lupton, Deborah. "TIMELINE OF COVID-19 IN AUSTRALIA." *Deborah Lupton*, Medium, 12 Aug. 2020, medium.com/@deborahalupton/timeline-of-covid-19-in-australia-1f7df6ca5f23.

[46] Oxer, Reese. "'None Of This Has Been Easy': Melbourne, Australia, Ends Its 111-Day Lockdown." *NPR*, NPR, 28 Oct. 2020, www.npr.org/2020/10/28/928793228/none-of-this-has-been-easy-melbourne-australia-ends-its-111-day-lockdown.

[47] "Australian Business Continuity." *Australian Business Continuity*, Australia Information Industry Association, www.australianbusinesscontinuity.com.au/aiia.

[48] Regan, Helen. "2 Million Australians Have Downloaded a Coronavirus Contact Tracing App." *CNN*, WarnerMedia, 28 Apr. 2020, www.cnn.com/2020/04/28/australia/covidsafe-coronavirus-tracing-app-australia-intl/index.html.

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technology instead of geolocation. Second, the Australian government passed the Privacy Amendment (Public Health Contact Information) Act on March 14th to ensure contact tracing data protection. The COVIDSafe Privacy Policy is available on the official website in 63 different languages. Third, they made the attorney general explain all these laws transparently on TV. As of July 20[th,] 2020, over 21% of Australians have downloaded the app and voluntarily use it[49]. Australia proves that a robust optional contact tracing system could be applied. A further in-depth look into the Australian contact tracing (and all the others) will be provided later in this article.

Overall, the Australian response to COVID was recognized globally for multiple reasons. They had leadership that listens to scientists and took fast and appropriate measures such as border control when deemed possible. Australia also centralized decision-making in the international cabinet's hand and applied executive federalism at the crisis time. Furthermore, Australia protected the healthcare sector and workers and empowered researchers and institutes. Finally, Australia utilized its technological infrastructure and applied a successful contact tracing program that protects Australian privacy.

D. New Zealand.

New Zealand proved that a lockdown combined with strict and appropriate measures are more than a sufficient response to stop COVID [50]. The New Zealand example is fascinating because they successfully eradicated the virus in 114 days, even though they were ranked only thirty-fifth out of 195 countries in the 2019 Global Health Security Index with a low score of 54/100 [51]. Unlike South Korea and Taiwan, New Zealand did not experience a Pandemic like MARS and SARS.

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[49] Chatterjee, Abhishek. " Australia's COVIDSafe Has the Highest Adoption Rate among Official Contact Tracing Apps ." *The Hindu*, THG PUBLISHING PVT LTD, 20 July 2020, www.thehindu.com/sci-tech/technology/australias-covidsafe-has-the-highest-adoption-rate-among-official-contact-tracing-apps/article32135390.ece.

[50] Baker, Michael G et al. "Successful Elimination of Covid-19 Transmission in New Zealand." *The New England journal of medicine* vol. 383,8 (2020): e56. doi:10.1056/NEJMc2025203

[51] Mazey, S. and Richardson, J., Lesson-Drawing from New Zealand and Covid-19: The Need for Anticipatory Policy Making. *The Political Quarterly*, 91: 561-570. (2020). https://doi.org/10.1111/1467-923X.12893

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Therefore, New Zealand was much less prepared than the US, which ranked 83.5/100 in the same Index. A direct comparison among New Zealand, South Korea, and Taiwan preparedness for the pandemic will be provided later in this research.

Backer, Kvalsvig, and Verrall argue that New Zealand's strategy in locking down provides a medium-term exit path at the cost of being more taxing economically and socially in the short-term than other alternatives (suppression and mitigation)[52]. New Zealand GDP contracted by 12.2% in the second quarter of 2020 alone [53] . However, while being in lockdown, New Zealand invested in improving their digital infrastructure and reducing international trade barriers, which attracted FDI and made them top the Doing Business Report by the WTO in late 2020[54]. New Zealand prioritized short-term health goals than economic ones but continued to plan and improve their long-term economic solutions. Besides this economic sacrifice, multiple reasons could explain New Zealand's excellence in their response to COVID: their geographic location, listening to specialists, transparent communication, utilizing advanced technology, strategic economic recovery, and the ability to adapt and learn from others.

First, New Zealand is an island in the southwestern Pacific Ocean. Their geographic location helped them control the flow of COVID much better than other countries or regions. In New Zealand, the first case of COVID was on February 28th, 2020[55], almost an entire month after the first cases started in many countries. Most cases of COVID New Zealand had been from overseas. New Zealand recorded no local transmission of COVID for three months from May to August. New Zealand has a relatively low population number (5 million) and a central

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[52] Baker, Michael G et al. "New Zealand's COVID-19 elimination strategy." *The Medical journal of Australia*, 10.5694/mja2.50735. 13 Aug. 2020, doi:10.5694/mja2.50735

[53] "Foreign Direct Investment (FDI) in New Zealand." *Nordea*, Nordea, 2020, www.nordeatrade.com/en/explore-new-market/new-zealand/investment.

[54] "Foreign Direct Investment (FDI) in New Zealand." *Nordea*, Nordea, 2020, www.nordeatrade.com/en/explore-new-market/new-zealand/investment.

[55] Smyth , Jamie. " New Zealand Reports First Locally Acquired Covid Case in Three Weeks ." *Financial Times*, The Financial Times LTD, 17 Oct. 2020, www.ft.com/content/818836c6-41e4-434b-a1b8-b8c6d01fc9fe.

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governance style without states [56] . While New Zealand's geographic location benefits should not be ignored, it would be an oversight to assume it is the only reason New Zealand successfully combatted the virus.

Second, New Zealand rushed to listen to experts as soon as the pandemic hit. On January 30th, 2020, and three days after WHO declared COVID-19 a Pandemic. New Zealand activated a flu prevention plan and increased disease prevention measures. At the start of the pandemic, it is clear that New Zealand did not recognize the severity of COVID due to their lack of experience with MERS and SARS. However, New Zealand was lucky to be able to learn and adapt to experiences from other countries. New Zealand had the COVID hit them a month after it did most countries. New Zealand witnessed how terrifying the pandemic was in Italy, the US, and Greece. New Zealand was lucky because data was available to them for use. New Zealand was also smart for utilizing that data into something specific to them. New Zealand found it easier to establish an anticipatory model based on other countries' experiences and used that model to make better decisions[57].

Another factor that later enhanced the seriousness of the initial response in New Zealand is its reliance on scientists. Jacinda Ardern, New Zealand Prime Minister, showed solidarity and friendship to New Zealand Director-General of Health, Dr. Ashley Bloomfield. In an interview, Dr. Bloomfield mentioned that New Zealand pandemic scientists coordinated with the WHO for risk assessment and technical guidance, laboratory capacity, infection prevention and control, and risk communication [58] . Listening to experts does not just include

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[56] Blackmore , Mark, and Mario Maio. "Lessons We Can Learn from New Zealand's COVID-19 Strategy." *Development Asia*, Asian Development Bank, 15 July 2020, www.development.asia/policy-brief/lessons-we-can-learn-new-zealands-covid-19-strategy

[57] Perper, Rosie. "Australia and New Zealand Have Been Able to Keep Their Number of Coronavirus Cases Low Thanks to Early Lockdown Efforts. Experts Say It's 'Probably Too Late' for Other Countries to Learn from Them." *Business Insider*, Insider Inc, 17 Apr. 2020, www.businessinsider.com/experts-australia-new-zealand-examples-how-to-slow-coronavirus-2020-4.

[58] "New Zealand Takes Early and Hard Action to Tackle COVID-19." *WHO*, World Health Organization, 15 July 2020, www.who.int/westernpacific/news/feature-stories/detail/new-zealand-takes-early-and-hard-action-to-tackle-covid-19

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health aspects. New Zealand also included political and economic experts in decision making by using multidimensional data to measure citizens' response to a policy or role. These data are collected using the Living Standard Dashboard established in 2018. The leading role New Zealand gave to scientists globally and nationally helped them make appropriate and rational decisions.

Third, on March 25rd, New Zealand announced a nationwide lockdown. According to Alexis Robert, the lockdown measures were "remarkable for its stringency and brevity, " indicating that the daily number of cases dropped below ten after establishing the lockdown [59]. New Zealand established strong and strict lockdown measures while working hard with the scientific community to improve the health infrastructure and eliminate the virus. New Zealand lockdown lasted for months and did not go back to level one until July 7th [60]. The government used the lockdown time wisely in preparing a capable infrastructure and advancing their medical and communication technology.

Fourth, the New Zealand leader Showed effective communication and strategic leadership during the COVID-19 pandemic[61]. Professor Suze Wilson Analyzed Jacinda Ardern's, Prime Minister of New Zealand, communication. Professor Wilson's communication analysis uses professors Jacqueline and Milton Mayfield's research on effective leadership communication. According to Wilson, Prime Minister Ardern shows all three characteristics of effective leadership: "direction-giving," "meaning-making," and "empathy." At first, she asked people to "stay home and save lives.", which made them feel like they have an impact on changing the outcome of this pandemic. Then, Ardern empathized with the citizen by sending online videos telling them not to give up. She

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[59] Robert, Alexis. "Lessons from New Zealand's COVID-19 Outbreak Response." *The Lancet Public Health*, vol. 5, no. 11, 13 Oct. 2020, pp. 569–570., doi: https://doi.org/10.1016/S2468-2667(20)30237-1.

[60] "The Latest: New Zealand to End Restrictions except in 1 City." *AP News*, The Associated Press, 19 Sept. 2020, www.apnews.com/article/virus-outbreak-australia-victoria-melbourne-scott-morrison-a38c6b2ae8f95619b63e8d5040562725.

[61] Wilson, Suze. "Pandemic Leadership Lessons in New Zealand." *US News*, U.S. News & World Report L.P., 23 Oct. 2020, www.usnews.com/news/best-countries/articles/2020-10-23/pandemic-leadership-lessons-from-new-zealands-elections.

acknowledged how hard it is for everyone to stay home and gave additional time after her speeches to hear people's concerns and complaints. Finally, lockdown rules got implemented on everyone. David Clark, the health minister, was demoted and then resigned after breaking the rules for taking his family to the beach[62]. A fair system of legislation that applies to all citizen classes helped make the COVID response deliverance more effective and sincere. New Zealanders followed lockdown rules because of government transparency, leadership, and strict adherence to policies.

Fifth, New Zealand improved its testing capabilities, contact tracing, and communication technologies to combat COVID [63]. In testing, New Zealand focused on applying aggressive testing measures and increased testing capabilities to 8,000 tests per day. In contact tracing, New Zealand established NZ COVID Tracer App. New Zealand followed the German approach and made the app download optional but made it obligatory for businesses to display their App QR code on doors so the public can scan it. The app opted out of using BlueTooth and used QR code technology instead of improving accuracy and making data collection more efficient. The app was developed with the privacy commissioner oversight and established clear guidelines that protect privacy. New Zealand provided channels, websites, and guidelines for businesses to switch online in the communication infrastructure. For example, the Ministry of Business and Innovation in New Zealand announced that VISA is working on a program, "Where You Shop Matters," which will help small businesses establish an online platform[64]. Overall, New Zealand used the lockdown time to establish better testing, online communication, and more efficient contact tracing capabilities.

Sixth, according to Blackmore and Maio[65], New Zealand managed its economy in three significant waves: Fight the virus

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[62] "Coronavirus: New Zealand Minister Resigns after Lockdown Blunders." *BBC News*, BBC, 2 July 2020, www.bbc.com/news/world-asia-53259236.

[63] Paredes, Divina. "NZ Fast Becoming the Land of Digital Opportunities: IDC." *CIO*, IDG Communications, Inc., 10 Oct. 2020, www.cio.com/article/3508398/nz-fast-becoming-the-land-of-digital-opportunities-idc.html.

[64] "Where Yoy Shop Matter." *Visa*, VISA, 2020, www.visa.co.nz/run-your-business/small-business-tools/whereyoushopmatters.html

[65] Blackmore , Mark, and Mario Maio. "Lessons We Can Learn from New Zealand's COVID-19 Strategy." *Development Asia*, Asian Development

& cushion the blow, kickstart the recovery, and rebuild the economy. Fighting the virus and cushioning the blow was done by protecting local businesses from the virus's impact. New Zealand pushed economic packages of nearly eight billion dollars to focus on small businesses, as mentioned above. The recovery stage started when New Zealand lowered their level 4 alarm and encouraged businesses to open back while following protective measures. Finally, New Zealand rebuilt its economic position by establishing a trade recovery strategy. According to Blackmore, the strategy had three goals: support exporters, reestablish trade and renew trade relationships[66]. New Zealand began reestablishing bilateral relationships with other countries to facilitate trade. New Zealand's clear and strategic economic recovery plan was why they topped Bloomberg's market crisis management index for political and economic stability in 2020[67]. According to Bloomberg Media Survey, New Zealand ranked first in the best countries for investing. New Zealand ranked higher this year than in the past due to its political stability, fast economic recovery, and social resilience.

In conclusion, New Zealand's response to COVID excelled despite the odds due to its strategic communication and leadership, technology utilization, listening to experts, a well-managed economy, and a little bit of luck. New Zealand is proof that a lockdown does work if accompanied by the right policies and charismatic leadership. New Zealand applied an anticipatory model that helped them prepare for the worse, and by preparing for it, they avoided it.

E. Canada.

Canada established a comprehensive plan to combat COVID in late March. When Canada responded to COVID, they prioritized the following: researchers and scientists, medical

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Bank, 15 July 2020, www.development.asia/policy-brief/lessons-we-can-learn-new-zealands-covid-19-strategy.

[66] Blackmore , Mark, and Mario Maio. "Lessons We Can Learn from New Zealand's COVID-19 Strategy." *Development Asia*, Asian Development Bank, 15 July 2020, www.development.asia/policy-brief/lessons-we-can-learn-new-zealands-covid-19-strategy

[67] Farrer, Martin. "New Zealand's Covid-19 Response the Best in the World, Say Global Business Leaders." *The Guardian*, Guardian News & Media Limited, 7 Oct. 2020, www.theguardian.com/world/2020/oct/08/new-zealands-covid-19-response-the-best-in-the-world-say-global-business-leaders.

workers, virtual care, economical long-term impact, indigenous community, digital infrastructure, and resource platforms[68].

To start with, Canada utilized the data they already had to make the best assessments when possible. To add some context, Canada had 44 deaths from SARS 2003 Pandemic. The public health system of Canada went through a major overhaul since then. "I would say the government of Canada responded in some concrete way to about 80% of the recommendations in the 2003 report", said Naylor, a former dean of medicine and former president of the University of Toronto[69]. One of Canada's most valuable lessons from the SARS pandemic is to avoid hospitalization when necessary because Pandemics can overwhelm the hospital very rapidly.

Another lesson that Canada learned from SARS is utilizing data and relying on scientists to craft national policies. Multiple examples during COVID-19 could show how Canada relied on academia to make policy decisions. An example would be Dr. Kelley Lee's comparative analysis project that looks at international cross-border measures and improves how countries or regions coordinate their responses to the Pandemic with Canada. Another example of data utilization is Professor Caulfield's project to understand how Canadians are searching the internet and media for COVID information and how that could be improved. By analyzing this information, Professor Caulfield plans to create a blueprint to help the government push against false and misinformation. Dr. Kelly and Professor Caulfield are just two promising examples of how the Canadian government uses academic research to make the most strategic decisions possible[70]. In summary, Canada learned two tough

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[68] McMahon, Meghan et al. "Informing Canada's Health System Response to COVID-19: Priorities for Health Services and Policy Research." *Healthcare policy = Politiques de sante* vol. 16,1 (2020): 112-124. doi:10.12927/hcpol.2020.26249

[69] " COVID-19 Pandemic Guidance for the Health Care Sector." *Government of Canada*, Canada, www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/covid-19-pandemic-guidance-health-care-sector.html.

[70] "Northern Light: How Canadian Research Offers Hope in the Fight against COVID-19 ." *Canadian Institute of Health Research*, 18 Sept. 2020, cihr-irsc.gc.ca/e/51964.html.

lessons from SARS: protect HCWs and rely on scientific experts' analysis when making decisions.

It is also worth mentioning that Canada gave priority to the Scientific Community during the pandemic. The Canadian Institutes of Health Research (CIHR) and the WHO guidelines played a vital role in combating COVID. On February 10th, CIHR announced its first research response funding opportunity. CIHR received $54.4 million following the announcement. The government increased that with an additional $115 million fund a month later.

Another example of Canada's endorsement of scientists is Dr. Bonnie Henry, a physician, and the provincial health officer of British Columbia. Henry became the health spokesperson due to her empathy and soft language. Dr. Henry became so loved in Canada that Vancouver footwear designer John Fluevog made a shoe with her name. Fluevog said he is "honored" to see Dr. Henry wear his shoe[71]. The love and support scientists and researchers received in Canada is unprecedented and could help explain why many people decided to follow their words.

Another priority to Canada during the pandemic was healthcare labor. Canada developed pandemic guidance for the health care sector on critical care settings, clinical management, and COVID health sector preparedness. Furthermore, Canada provided a public health ethical framework that aims to help healthcare labor mental health. The government assigned health strategists in big cities like Toronto to ensure PPE availability. In July, Prime Minister Justin Trudeau said that the country is reaching a self-sufficiency level in medical equipment[72].

Third, Canada prioritized virtual care to reduce the load on healthcare workers. COVID proved the importance of having

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[71] Harris, Aleesha. "John Fluevog Says Seeing Dr. Bonnie Henry Wearing His Shoes Is a 'Privilege'." *Vancouver Sun*, Postmedia Network Inc, 30 Apr. 2020, www.vancouversun.com/life/fashion-beauty/john-fluevog-says-seeing-dr-bonnie-henry-wearing-his-shoes-is-a-privilege.com

[72] Farr, Christina. "How Canada Is Fighting Covid-19: Ramping up PPE Production, Travel Ban from the U.S. and Bonnie Henry." *CNBC*, CNBC LLC, 13 July 2020, www.cnbc.com/2020/07/13/how-canada-is-fighting-covid-19-ppe-travel-ban-bonnie-henry.html.

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a virtual system for diagnoses. The Canadian government provided a website for physicians to encourage them to learn and switch to a virtual care system[73]. The system of virtual care still has its flaws, especially regarding the public adoption rate. Some of the barriers to a virtual care system in Canada include cost, privacy, and medical tools incorporation. However, the Canadian Medical Association (CMA) is very hopeful. Since Canada possesses the technology and the capability to achieve virtual medical services, some of the recommendations that CMA suggested to increase virtual meetings include developing national standards for patient information access and simplifying the physician's registration process to a virtual care license [74]. During COVID-19, About 47% of Canadians used Virtual care COVID-19, and about 91% reported satisfactory results[75].

Fourth, Canada prioritized looking forward to the long-term consequences of the pandemic. Canada made a COVID-19 Economic Response Plan that could help individuals and businesses impacted by COVID[76]. It also helps that healthcare in Canada in a single-payer system, which means that the government will pay health insurance for the unemployed. Canadians who were unemployed or impacted by COVID were given $2000 a month for four months to get back on their feet. Support tools for the public were available for the public, from mental health to spiritual healing. Finally, Canada included the last part of their economic plan for businesses. Academic research of COVID's impact on each business sector impacted the fiscal and monetary support ratios. Another part of the economic plan focused solely on women and indigenous businesses to decrease the disparity between classes. As a result of Canada's comprehensive economic package, Canada's GDP

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[73] " Virtual Care Resources During COVID-19 ." *Canada Health Infoway*, www.infoway-inforoute.ca/en/resource-centre/virtual-care.

[74] "MA-Led Task Force Releases Roadmap for Expanding Virtual Medical Services ." *Canadian Medical Association* , 11 Feb. 2020, www.cma.ca/news/demand-here-technology-exists-cma-led-task-force-releases-roadmap-expanding-virtual-medical.

[75] Zafar, Amina. "Many Canadians Used Virtual Medical Care during COVID-19, Poll Suggests." *CBC*, CBC/Radio-Canada, 8 June 2020, www.cbc.ca/news/health/virtual-care-cma-survey-1.5603713.

[76] " Canada's COVID-19 Economic Response Plan." *Government of Canada*, Canada, 2020, www.canada.ca/en/department-finance/economic-response-plan.html.

grew at an annualized rate of 48% in the third quarter of 2020[77]. In comparison, the US GDP was lower by around 16% in the same third quarter[78].

Fifth, Canada gave a special priority to the indigenous community. Indigenous communities like Inuit and Métis in Canada did exceptionally well in controlling the pandemic, with a 66% less fertility and 30% higher recovery rate [79] . The numbers were not a coincidence, but a set of public health policies combined with excellent cooperation between the indigenous community and the Public Health Agency of Canada PHAC. The coordination between PHAC the Indigenous community while preserving the indigenous tribe's independence and freedom was a vital component of Canadian success. The 2007 United Nations Declaration on the Rights of Indigenous Peoples gave the community in Turtle Island the "self-determination overall activities related to their lives and well-being.[80]" The success of the fight against COVID could not have been achieved if it was not for indigenous people corporation. When COVID hit, the Indigenous communities' leaders immediately secured funding for all the necessary medical and protective. Simultaneously, the PHAC made a comprehensive medical and economic plan to support those communities. This example is exceptional because Canada continued to protect indigenous communities' independence despite the pandemic. In return, indigenous headmen showed leadership, resilience, and commitment to help their communities' health and well-being[81].

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[77] Ghosh, Indradip. "Canadian Economic Recovery to Be Weaker as COVID-19 Cases Resurge, Reuters Poll Shows." *Reuters*, Reuters, 22 Oct. 2020, www.reuters.com/article/us-canada-economy-poll-idCAKBN2771UZ.

[78] "Gross Domestic Product, Third Quarter 2020 (Advance Estimate) ." *Bureau of Economic Analysis* , The United States Government, 29 Oct. 2020, www.bea.gov/news/2020/gross-domestic-product-third-quarter-2020-advance-estimate.

[79] Richardson, Lisa, and Allison Crawford . "How Indigenous Communities in Canada Organized an Exemplary Public Health Response to COVID." *Scientific American*, Springer Nature America, 27 Oct. 2020, www.scientificamerican.com/article/how-indigenous-communities-in-canada-organized-an-exemplary-public-health-response-to-covid/.

[80] "United Nations Declaration on the Rights of Indigenous Peoples." *UN*, United Nations, 13 Sept. 2007, www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html.

[81] Richardson, Lisa, and Allison Crawford "How Indigenous Communities in Canada Organized an Exemplary Public Health Response to COVID."

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Sixth, Canada utilized and advanced its communication and tracing technology during COVID. Canada COVID alert app was launched on July 31st [82]. Canada followed the German approach in contact tracing, which means it depends on using the app. One of the challenges Canada wanted to address before launching the app is privacy. The app included a privacy protection feature using Bluetooth without having to identify the person using the app. Another technological challenge Canada had to deal with during COVID is the disparity of internet speed between city and rural areas. The Canadian internet provider Bell Tech announced that they would rule out a plan to increase internet speed and accessibility in rural areas. The plan should reach 80,000 homes by the end of the year[83].

Finally, Canada has been giving priority to providing knowledge and resource platforms for those that need it. An example would be the ethical and work guidelines given to healthcare workers to an economic plan to help individuals and businesses during the pandemic. Another example is Coronavirus disease (COVID-19) Guidance documents, which provide ethical and technical recommendations to all audience types (community, youth, faith community leaders, death care services… etc.). The documents are also easily accessible online. The goal of having a knowledge platform is to increase awareness and help people make the right choices regarding their health and businesses.

To conclude, Canada's response to COVID can teach many lessons. Canada gave priority to physicians and scientists, which helped them make rational decisions when they needed it most. Furthermore, Canada protected health care workers by reducing the number of patients in hospitals, encouraging

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Scientific American, Springer Nature America, 27 Oct. 2020, www.scientificamerican.com/article/how-indigenous-communities-in-canada-organized-an-exemplary-public-health-response-to-covid/.

[82] " Download COVID Alert Today." *Government of Canada*, Canada, www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19/covid-alert.html#a5.5.

[83] " Bell Expanding Rural Broadband to More Locations with Faster Speeds ." *Canada NewsWire* , CNW Group, 11 Sept. 2020, www.scientificamerican.com/article/how-indigenous-communities-in-canada-organized-an-exemplary-public-health-response-to-covid/.

virtual assessments, and providing physicians' mental support. Moreover, Canada made a clear, comprehensive economic plan to support individuals and businesses in the long run. Also, Canada utilized their technology and used a knowledge-based platform to make accessing information easier for the public. Finally, Canada protected indigenous communities through extensive coordination without making them lose their independence or leadership. Canada is a shining example of an adaptive COVID response that kept getting better through trials and errors.

5. Section two: Comparative Analysis of the Best COVID Responses.

When Eurasia group experts made their assessment, they used three categories (health, government effectiveness, and economic policies) to decide what regions and countries did best in responding to COVID. This section of the paper expands those categories into something more specific. The health category was expanded to include protecting healthcare workers, aggressive testing, contact tracing, and mask mandate. The government effectiveness category was divided into transparency, centralization of decision-making, and international coordination with the World Health Organization (WHO). Finally, economic factors included economic and social support legislations and policies and utilization of digital infrastructure. The goal of the expansion is to make it easier to compare and contrast the places examined.

A. Health Category: Contact tracing.

One common theme that can be repeatedly seen in the analysis here center around contact tracing technology. According to the Pennsylvania department of health, contact tracing is the process of identifying, notifying, and monitoring people who came in contact with an individual who tested positive for COVID[84]. There are multiple challenges associated with applying a robust contact tracing system in a region or country. The first challenge relates to technology accessibility and feasibility. According to the CDC, the chance of severe illness

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[84] "Contact Tracing." *PA Health*, Pennsylvania Department of Health, www.health.pa.gov/topics/disease/coronavirus/Pages/Contact-Tracing.aspx.

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increases when a person gets older[85]. In other words, someone in their 50s is at higher risk than someone in their 40s. Contact tracing depends on cellphone technology, and the group that gets impacted by COVID the most might not have access to this technology due to their age.

For example, in the UK, 61% of people over the age of 65 do not have access to smartphones[86]. A challenge would be delivering a robust contact tracing to those that need it the most. Another challenge is how to increase people's participation and reduce privacy concerns. In a recent Pew Research Center Survey, 40% of Americans showed a sign of wariness when told they would speak to a public official by phone or text about the COVID outbreak. Even more impressive, while 22-27% of Americans were willing to share the location they recently visited and the people they met, almost 50% were against location sharing technology from a cellphone[87]. These issues bring up how governments managed to acquire public trust and dealt with contact tracing challenges. Here is an in-depth look:

Canada: Assessing how functional and robust the Canada contact tracing program is challenging at the time of this research for multiple reasons. First, the App (COVID Alert) was launched on July 31st, which is very recent compared to the timing of action taken by the governments of the other places examined. Second, the app is entirely voluntary, making it harder to assess its success soon after launch. Despite all these assessment' setbacks, it is clear that Canada recognized the technology and privacy challenges when they launched their contact tracing app, which made the process of adoption easier.

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[85] "Coronavirus Disease 2019 (COVID-19): Older Adults." *CDC*, U.S. Department of Health & Human Services, 2020, www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html.

[86] Gardner , Allison. " Contact-Tracing Apps: There's No Evidence They're Helping Stop COVID-19." *The Conversation*, The Conversation US, Inc, 21 Oct. 2020, www.theconversation.com/contact-tracing-apps-theres-no-evidence-theyre-helping-stop-covid-19-148397.

[87] McClain, Colleen, and Lee Rainie. "The Challenges of Contact Tracing as U.S. Battles COVID-19." *Pew Research Center*, Pew Research Center, 30 Oct. 2020, www.pewresearch.org/internet/2020/10/30/the-challenges-of-contact-tracing-as-u-s-battles-covid-19/.

According to the app website, the number of downloads as of October 29th is almost 5 million[88].

A joint statement was issued on May 7th by Federal, Provincial, and Territorial Privacy Commissioners in Canada to solve privacy concerns. The statement included 14 principles that the app must function on to be approved by the privacy commissioner. Some of those principles include consent and trust by making the app voluntarily, and legal authority by having a clear legal base on what information is shared. Other principles included being proportional to the incident, ensuring the de-identification of data when possible, destroying the data when the crisis ends, and creating a safeguard and accountability system against online hackers[89]. There might be a need for additional time to assess these policies' success. However, as of July 31[st,] 2020 (the date the app launched), 56% of the Canadian population said they are somewhat likely or very likely will download the app. Of the 44% that said that they would not download the app, almost 65% thought it was an invasion of privacy, and 45% said they did not want the government to access their location[90].

Canada is also having issues delivering contact tracing to those who need it the most. In a StatsCan survey, about 30% of seniors said they would not use the app; from that 30%, about 43% said they would not join the contact tracing program because they have no access to mobile data[91]. A solution that Canada could do to solve this issue is to get some help from Singapore. This solution is not absurd since the Western province of Alberta did adapt the Singaporean App Trace Together to stop COVID in May, two months before COVD Alert

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[88] " Download COVID Alert Today." *Government of Canada*, Canada, www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19/covid-alert.html#a5.5.

[89] " Joint Statement by Federal, Provincial and Territorial Privacy Commissioners." *Office of Privacy Commissioner of Canada*, 7 May 2020, www.priv.gc.ca/en/opc-news/speeches/2020/s-d_20200507/.

[90] Aitken, Nicole, et al. "Willingness of Canadians to Use a Contact Tracing Application." *StatCan*, Statistics Canada, 31 July 2020, www.150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00059-eng.htm

[91] Aitken, Nicole, et al. "Willingness of Canadians to Use a Contact Tracing Application." *StatCan*, Statistics Canada, 31 July 2020, www.150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00059-eng.htm

launched in Canada. Singapore provided an attractive technological solution to reach their senior citizens: The TraceTogether Tokens. Those Token are portable, use Bluetooth technology portable, and do not require any installation[92]. Canada can adapt the Token system for its elderly to ensure that they are covered and increase the adoption rate. Overall, Canada is still in the process of trial and error in applying its contact tracing technology. Canada made privacy an integral part of their app design and are still working to solve technology delivery and optimization for the elderly. It is still left to see if that could result in higher adoption rates in the future.

Australia: Australia has done a better job in contact tracing than Canada but could still learn a few lessons from the South Korean and Taiwanese contact tracing program. The Australian contact tracing system did well in adoption rates and privacy protection but could improve technical errors and efficiency.

Unlike Canada, which took till August to adopt a contact tracing system, Australia prioritized having one as early as April 14th. Australia has done so by adopting the Singaporean App Tracetogether. The early adoption of a contact tracing app gave Australia more time to increase downloads and fix many technical errors. As of June 1st, COVIDsafe is setting near the top 10 in Apple and Google stores with over 6 million downloads[93]. These numbers mean that about a fourth of the Australian population downloaded the app. Australia used many techniques and strategies to increase the number of downloads on the COVIDsafe App.

First, they ensured privacy. The app design uses Bluetooth technology to record "cryptographically-encoded handshake" between phones. The records of the handshake are kept for 21 days. The parliament passed the Privacy

[92] Guy, Jack. "No Smartphone, No Problem: Singapore Rolls out Coronavirus Contact-Tracing Device for Seniors." *CTV News*, Bell Media, 29 June 2020, www.ctvnews.ca/health/coronavirus/no-smartphone-no-problem-singapore-rolls-out-coronavirus-contact-tracing-device-for-seniors-1.5003916.

[93] "Asia Today: 6 Million Australians Download Virus Tracing App." *ABC*, ABC News, 24 May 2020, www.abcnews.go.com/Health/wireStory/asia-today-australians-download-virus-tracing-app-70854196

Amendment (Public Health Contact Information) Act and the app to ensure privacy protection. A privacy commissioner was assigned to evaluate and assess privacy risks[94].

Second, the Australian government ramped up COVIDsafe downloads by participating voluntarily and nudging its citizens to do so through motivators and advertising. The government launched a series of radio, TV, social media, and outdoor advertisements to promote the app and ensure privacy[95]. Finally, the app has easy interference and does not require constant scanning for QR codes like the App in New Zealand, making it more user-friendly.

COVIDsafe did come with its fair share of issues, mostly technical. The app consumed much battery when it launched at first. Another issue is that health expert wants the App on IOS devices to work on the background, but that would require Apple to give a unique cryptographic notification mechanism to the COVIDsafe app, which they refuse to do. The controversy between Apple and Australian health experts is a classic example of contact tracing wanting to do more while privacy experts are refusing to do so[96]. Even more vital, another issue is app efficiency. While using Bluetooth technology can be better for user interference and privacy, the QR system adopted by New Zealand is simpler to track, faster, and more accurate. While Bluetooth does offer better tracking on people individually with a less mandatory user interface, QR is more collective and relies on a consistent user interface. Data utilization and analysis in QR technology takes less time than BlueTooth because there is no need to predict who made an "electronic handshake." Instead, QR code relies on collective users reporting where they were when entering a building[97].

[94] " COVIDSafe App ." *Australian Government Department of Health*, Commonwealth of Australia , www.health.gov.au/resources/apps-and-tools/covidsafe-app#privacy.

[95] Kelly, Vienna. "Government Ramps up Advertising Push for COVID Safe App." *Mumbrella*, MumbrellaPro, 6 May 2020, www.mumbrella.com.au/revenue-for-april-drops-29-8-across-nines-broadcasting-division-627090.

[96] Taylor, Josh. "How Did the Covidsafe App Go from Being Vital to Almost Irrelevant?" *The Guardian*, Guardian News & Media Limited, 23 June 2020, www.theguardian.com/world/2020/may/24/how-did-the-covidsafe-app-go-from-being-vital-to-almost-irrelevant.

[97] Taylor, Josh. "QR Codes: How an Old Technology Could Help Contact Tracers Keep the Pandemic in Check." *The Guardian*, Guardian News &

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Overall, Australia is highly advised to consider using a QR technology system like New Zealand and make Bluetooth a supplementary technology. Despite the problematic user interference, the QR form of contact tracing has improved accuracy, efficiency, and speed.

New Zealand: New Zealand contact tracing is nothing but a success. The app has a high adoption rate (50%)[98]and uses QR technology is more accurate than the Australian and Canadian apps Bluetooth technology[99]. As of September 2nd, 2.1 million Australians downloaded NZ COVID Tracer. The app launched on May 20th, and it uses QR technology to check if a location might have an individual with COVID. Multiple reasons can explain the high adoption rate of NZ COVID. The first one is related to the demographic. The majority of New Zealand people over 18 have access to smartphones and the internet and are politically engaged[100].

Another reason could be how New Zealand forced businesses to have the QR codes on their doors, making it easier for users to scan the codes at all times. Another important reason that could explain the high adoption rate is the privacy and security of the COVID tracker. The government promised that it would delete all information within 60 days. Deleting the data is available for the user if they want to remove it before the 60 days pass. The app was developed by Rush Digital and relied on Amazon Web Services (AWS) platform using a large-scale encryption framework. Privacy Impact assessments made by

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Media Limited, 30 Oct. 2020, www.theguardian.com/world/2020/oct/31/qr-codes-how-an-old-technology-could-help-contact-tracers-keep-the-pandemic-in-check.

[98] Blake-Persen, Nita. "2.1 Million Download Covid Tracer App, but Who Is Signing in?" *RNZ*, Radio New Zealand , 2 Sept. 2020, www.rnz.co.nz/national/programmes/checkpoint/audio/2018762292/2-point-1-million-download-covid-tracer-app-but-who-is-signing-in.

[99] Retchel, Micheal. "Contact Tracing With Your Phone: It's Easier but There Are Tradeoffs." *The NY Times*, The New York Times Company, 3 June 2020, www.nytimes.com/2020/06/03/health/coronavirus-contact-tracing-apps.html.

[100] "Digital Inclusion and Wellbeing in New Zealand." *Digital Government NZ*, New Zealand Government, 2020, www.digital.govt.nz/dmsdocument/161~digital-inclusion-and-wellbeing-in-new-zealand/html#executive-summary.

the privacy commissioner could be found on the app website and are updated regularly each month[101].

The most significant criticism New Zealand's contact tracing system receive is that the user needs to actively enter the app in order for it to be effective[102]. NZ COVID app requires its user to scan the QR codes of the places they visit continually. "the more we can, the safer we will be" is the NZ COVID app slogan[103]. Some might suggest having Bluetooth replace QR technology, but that could significantly reduce contact tracing accuracy and efficiency. Another suggested solution might be to give citizens the option between Bluetooth or QR, but a concern is that most people might choose Bluetooth simply because it is uncomplicated. One final solution would be to make QR the primary contact tracing and Bluetooth method as a supplementary technology if there is a need for more information, but that might consume more mobile devices hardware and battery.

South Korea: South Korea created a robust contact tracing system that will be studied as a model for many more generations to come. South Korea adopted an aggressive information technology-based contact tracing program. According to Professor Backer, South Korea utilized the smart city infrastructure to trace people in three different methods. The first method is tracing through debit and credit card transactions. This tracing method is exceptionally efficient in South Korea since they have the most cashless transaction in the world. Second, South Korea used phone location, 4g, and 5g networks to ensure geolocation accuracy. South Korea furthered that accuracy by using smart AI technology in addition to an automated call monitoring system.

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[101] "NZ COVID Tracer App." *NZ Ministry of Health*, New Zealand Government, 2020, www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-resources-and-tools/nz-covid-tracer-app.

[102] Blake-Persen, Nita. "2.1 Million Download Covid Tracer App, but Who Is Signing in?" *RNZ*, Radio New Zealand , 2 Sept. 2020, www.rnz.co.nz/national/programmes/checkpoint/audio/2018762292/2-point-1-million-download-covid-tracer-app-but-who-is-signing-in.

[103] "NZ COVID Tracer App." *NZ Ministry of Health*, New Zealand Government, 2020, www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-resources-and-tools/nz-covid-tracer-app.

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Finally, South Korea made accumulated data available in public through websites, which increases transparency and makes those data more useful and helpful for academic scholars and the public[104]. The data availability online helped improve accuracy and public trust, a lesson that South Korea learned the hard way after MERS 2015 Pandemic. South Korea increased data transparency through the Personal Information Protection Act (PIPA) that gave citizens data ownership rights, including the right to be forgotten. In combination with the General Data Protection Regulation (GDPR), PIPA gave enhanced health data protection[105]. Overall, the South Korean contact tracing model succeeded due to its accuracy, efficiency, and transparency. It was accurate and efficient because it utilized South Korea's infrastructural technology, like cashless transactions and smartphone possession. It was also transparent because it was publicly available while protecting individual rights through the proper regulations.

Taiwan: Multiple politicians and tech experts agree that the Taiwan model of contact tracing is the best globally, with 88% accuracy for secondary contact[106]. The Taiwanese model of contact tracing succeeded because of efficiency, transparency, and public engagement.

The Taiwanese model was efficient and accurate for multiple reasons. It used an integrated data management system. The Taiwan Centers for Disease Control developed a TRACE platform in 2017 to respond to future pandemics. Taiwan spent nearly $7.5 million on TRACE funding. The data management system had an integration of both travel and health data. Taiwan used the experience they had with SARS

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[104] Backer, Larry. " Automated Law and COVID-19: Data Driven Measures With National Characteristics In China and Israel and the Future of the Law-Governance Complex ." *Law at the End of the Day*, 24 Mar. 2020, www.lcbackerblog.blogspot.com/2020/03/automated-law-and-covid-19-data-driven.html.

[105] Jagannathan , Vijay. "Learning From Seoul to Control COVID-19: Transparency, Accountability, Solidarity." *TheCityFix*, World Resources Institute, 18 May 2020, www.thecityfix.com/blog/learning-seoul-control-covid-19-transparency-accountability-solidarity-vijay-jagannathan/.

[106] Jian, Shu-Wan, et al. "Contact Tracing with Digital Assistance in Taiwan's COVID-19 Outbreak Response." *International Journal of Infectious Diseases*, vol. 101, 30 Sept. 2020, pp. 348–352., www.sciencedirect.com/science/article/pii/S1201971220322001.

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2003 as a base for their model. The data-driven system used an AI similar to South Korea that uses phone geolocation, Bluetooth, and other digital data to predict an outbreak. TRACE AI offers a more efficient way to manage data-driven systems, reduce human workload, and improve speed and accuracy. Canada, New Zealand, and Australia could improve their contact tracing system and reduce its cost in the long run by having a management tool like TRACE [107]. Taiwan proved that using artificial intelligence in data management could help leaders make the right decision fast and effectively.

The Taiwanese model of data collection was also transparent and engaging. As previously mentioned in this paper, the Taiwanese model is unique because it gave citizens an active role in decision making, which increased transparency and trust[108]. For example, when masks were running low in Taiwan in the first month of the pandemic, Taiwan's digital minister, Audrey Tang, gave a detailed plan based on the data collected on masks' real-time supplies[109]. The TRACE system was an integral part of resource allocation management. Another example of public engagement is V-Taiwan's website, where people brainstorm ideas and collaborate with the government to fight the virus. In this instance, Taiwan offers an effective solution to increase participation in optional contact tracing models like Canada, New Zealand, and Germany. The frequent communication between the public and the Taiwanese government helped establish trust, patriotism, and practical solutions.

B. Protecting Healthcare Workers.

Another common theme that selected countries and regions shared is that they made protecting healthcare workers (HCWs) a priority. HCWs are at the frontline when pandemics

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[107] Wang CJ, Ng CY, Brook RH. Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing. *JAMA.* 2020;323(14):1341–1342. doi:10.1001/jama.2020.3151

[108] Duff-Brown, Beth. " How Taiwan Used Big Data, Transparency and a Central Command to Protect Its People from Coronavirus." *Stanford Health Policy*, Stanford University, 3 Mar. 2020, www.healthpolicy.fsi.stanford.edu/news/how-taiwan-used-big-data-transparency-central-command-protect-its-people-coronavirus.

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hits. The physical and psychological state of HCWs could strongly impact their performance during a stressful pandemic. Here is an in-depth look at how each chosen government protected their HCWs.

South Korea: To begin, South Korea has one of the lowest COVID-19 infection rates among HCWs globally [110]. Ariadne Labs conducted research led by Doctor June-Ho Kim and a team of volunteers from Harvard University to analyze how South Korea achieved low infection rates in hospitals during COVID[111]. After thorough interviews and protocols, the research found five elements that South Korea used to protect HCWs. The first element is centralized triaging, defined as the effective mobilization of finite resources across the region. By mobilizing resources such as beds and medical devices, the government can lower the pressure on HCWs and provide the appropriate care level based on the condition. South Korea did not just mobilize the resources but also increased healthcare workers' capacity inside hospitals and care centers.

The second element is the prevention of cross-contamination in hospitals to preserve the healthcare system's integrity and credibility. South Korea emphasized this element after a failed experience with the MERS 2015. During the MERS outbreak, the government did not report hospital cross-contamination stories because they worried it might hurt their functionality and credibility. With COVID-19, South Korea has emphasized transparency and risk-communication because they realized that honesty is the best method to gain public trust and confidence. South Korea made all hospital data available online and increased transparent communication during COVID-19. The third element South Korea applied to protect HCWs is regular screening, testing, and applying self-quarantine when necessary. The fourth element is limiting community spread by using aggressive testing, contact tracing, and constant

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[110] Gray, Sandra. "How South Korea Protects Health Care Workers from COVID-19." *Medical Express*, Science X Network, 14 July 2020, www.medicalxpress.com/news/2020-07-south-korea-health-workers-covid-.html.

[111] "Ariadne Labs Releases Report Detailing How South Korea Is Protecting Health Care Workers During COVID-19." *Ariadne Labs* , Harvard T. H. Chan School of Public Health, 12 May 2020, www.ariadnelabs.org/resources/articles/news/ariadne-labs-releases-report-detailing-how-south-korea-is-protecting-health-care-workers-during-covid-19/.

monitoring. Even more impressive, South Korea's limited community spread by providing dorms and residential facilities for patients who need less care[112]. Finally, South Korea provided a full guideline for HCWs on prevention and sanitization and other resources such as mental health welfare centers. In conclusion, South Korea learned from the MERS outbreak and applied a strategic plan to protect its HCWs. The plan included resource mobilization, cross-contamination prevention, regular screening, aggressive testing, contact tracing, and regulatory guidance.

Taiwan: Like South Korea, the government of Taiwan was one of the few that reported almost zero cross-contamination cases among healthcare workers[113]. According to Ting-Wan Tan and others[114], Taiwan achieved effective intra-hospital prevention by following six preventative principles. The first principle is establishing appropriate control of personal protective equipment (PPE). Every hospital is given a "stock card" to fill to prevent a shortage of PPE. The second principle is updated guidance and education for all HCWs by providing free education to educate HCWs on crucial steps like wearing PPE, hand hygiene, etc. The training program extends even beyond HCWs to hospital cleaning staff and others.

Third, applying strict, standardized cleaning measures to ensure the virus will not spread. An example would be using detergent solution 5000 ppm $NaHCO_3$ with disposable clothes for disinfection. The fourth principle is using improved cameras and digital technology to observe patients in an isolated room. Having a virtual monitoring system could decrease the likelihood of cross-contamination because it will prevent

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[112] Kim, June-Ho, et al. "How South Korea Responded to the Covid-19 Outbreak in Daegu." *NEJM Catalyst Innovations in Care Delivery* , Massachusetts Medical Society, Aug. 2020, www.catalyst.nejm.org/doi/full/10.1056/CAT.20.0159.

[113] Chang , Man-Na, et al. "Intra-Hospital Preventive Principles to Protect Frontline Healthcare Workers to Overcome Pandemic COVID-19 in Taiwan." *BMC*, Springer Nature America, 11 June 2020, www.ccforum.biomedcentral.com/articles/10.1186/s13054-020-02983-7.

[114] Tan, TW., Chang, CM. & Chang, MN. Intra-hospital preventive principles to protect frontline healthcare workers to overcome pandemic COVID-19 in Taiwan. *Crit Care* **24,** 328 (2020). https://doi.org/10.1186/s13054-020-02983-7

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unnecessary contact. Fifth, HCWs were separated into two groups to work in fixed units. HCWs and cleaning staff were not allowed to rotate their groups and shifts for at least a month to prevent the virus's spread. Constant monitoring and temperature checks were provided for each group daily. Finally, Taiwan ensured the mental well-being of HCWs through hospital broadcasting services, online resources, the LINE messaging app, and other digital health services[115]. In summary, Taiwan succeeded in protecting HCWs by establishing comprehensive strategies at the start of the pandemic. The strategies included providing PPE, educating HCWs, standardizing hospital cleaning, monitoring isolated patients with technology, aggressive testing, and providing mental health support.

Canada: While Canada could learn from both Taiwan and South Korea on how to protect HCWs, it is clear that the Canadian Ministry of Health is putting strong efforts into improving and adapting their health system to meet the pandemic demands. To start with, Canada provided regulatory guidance for HCWs following COVID. The regulatory guidance included a new infectious disease emergency leave and other helpful resources and guidelines for HCWs to prevent cross-contamination[116]. Even more impressive, Canada provided an ethical framework for HCWs to help them make the right moral decision if needed[117].

Furthermore, Canada provided a Virtual Care Resource website to emphasize virtual care services and decrease the pressure on emergency centers'[118]. About 47% of Canadians used Virtual care during COVID-19, and about 91% reported

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[115] Chang , Man-Na, et al. "Intra-Hospital Preventive Principles to Protect Frontline Healthcare Workers to Overcome Pandemic COVID-19 in Taiwan." *BMC*, Springer Nature America, 11 June 2020, www.ccforum.biomedcentral.com/articles/10.1186/s13054-020-02983-7

[116] "COVID-19: Support for Workers." *Ontario*, Queen's Printer for Ontario, www.ontario.ca/page/covid-19-support-workers.

[117] COVID-19 Pandemic Guidance for the Health Care Sector." *Government of Canada*, Canada, www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/covid-19-pandemic-guidance-health-care-sector.html.

[118] " Virtual Care Resources During COVID-19 ." *Canada Health Infoway*, www.infoway-inforoute.ca/en/resource-centre/virtual-care.

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satisfactory results[119]. Despite Canada's efforts, they could not wholly eliminate cross-contamination in hospitals the same way South Korea and Taiwan did. As of September 3rd, according to the Canadian Institute of Health Information, 19.4% of COVID-19 cases in Canada were among HCWs [120]. Physician and journalist Blair Bigham who completed medical school in Ontario, argues that there are four things Canada must do immediately to lower infection rates among HCWs. First, Bigham argues that Canada must bring around 500,000 mechanical ventilators and provide PPE. The current rate of ventilators in Ontario is 12 ventilators for 100,000 people. The second thing Bigham suggested that Canada does is to bring more soldiers to the hospitals to reduce the load on HCWs. The military possesses the feature of mobilization, which could help the government place them strategically where they are needed.

Third, Bigham states that the government must apply more regulatory flexibility and make it easier for physicians to get their practice licenses. Bigham further argues that the Emergency Act of 1985 must be used to its full extinct, and all private companies capable of producing PPE or essential ventilators must do so. Finally, Bigham suggests that more Canadians wear a face mask and stay indoors to reduce the HCWs load[121]. Based on this paper, Canada can provide a risk-stratification system similar to South Korea and Taiwan to lower the pressure on HCWs. South Korea made care centers for patients that are less or a-symptomatic to reduce the load on HCWs [122]. Canada could also learn from Taiwan how they divided HCWs into two groups to reduce hospital contamination. Another idea worth adapting from Taiwan is the "stock cards," where hospitals fill a paper on all the PPE needed daily. In

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[119] Zafar, Amina. "Many Canadians Used Virtual Medical Care during COVID-19, Poll Suggests." *CBC*, CBC/Radio-Canada, 8 June 2020, www.cbc.ca/news/health/virtual-care-cma-survey-1.5603713.

[120] " COVID-19 Cases and Deaths among Health Care Workers in Canada." *Canadian Institute of Health Information*, CIHI, 3 Sept. 2020, www.cihi.ca/en/covid-19-cases-and-deaths-among-health-care-workers-in-canada

[121] Bigham, Blair. "Four Things Canada Needs to Do NOW to Support Frontline Health Care Workers and Save Lives." *HealthyDebate*, 25 Mar. 2020, www.healthydebate.ca/opinions/four-things-canada-needs-to-do-now-covid-19.

[122] Tan, TW., Chang, CM. & Chang, MN. Intra-hospital preventive principles to protect frontline healthcare workers to overcome pandemic COVID-19 in Taiwan. *Crit Care* **24,** 328 (2020). https://doi.org/10.1186/s13054-020-02983-7

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summary, Canada did great in setting guidelines and basic principles on protecting HCWs; the next natural step now is to adapt by applying the scientific community advice and furthering HCW's protection.

Australia: Australia did slightly better than Canada in reducing hospital cross-contamination, with about 11% of contamination being from HCWs. According to Victoria State Government Health and Human Services, Australia applied four actions to ensure the safety of HCWs. The first action is data gathering and sharing of HCWs. This action is essential because it will allow the government to quickly track the virus outbreak and learn lessons.

The second action is support for infection prevention control. This action emphasizes broadening the PPE taskforce role to include senior care centers, emergency departments, and intensive care units. In senior care centers, PPE officers are deployed to support the staff and improve infection control. In hospital settings, Australia applied repeated testing and surveillance combined with "PPE spotters" that ensure that hospital staff is wearing PPE. The third action is to improve COVIDsafe workplaces by ensuring social distancing, cleanliness, and safety in aged care and hospital settings. The final action provides increased financial incentives for HCWs to limit workers' mobility, especially during an outbreak[123]. In September, a late development is Australia launching Infection Control Expert Group (ICEG) and the National COVID-19 Evidence Taskforce led by the Living Guidelines Consortium. The task force seeks to improve COVID guidelines and safety protocols by making them more scientifically consented. Another development is establishing "COVID-NET," a network of epidemiologists or "disease detectives" that can help states, upon request, detect where an outbreak began[124]. It is still left

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[123] "Protecting Our Healthcare Workers." *Health and Human Services*, Victoria State Government, 2020, www.dhhs.vic.gov.au/sites/default/files/documents/202010/Protecting-our-healthcare-workers-action-plan.pdf.

[124] Hunt, Hon Greg. "Additional Commonwealth Support to Protect Healthcare Workers from COVID-19." *Australia Ministers: Department of Health*, Commonwealth of Australia , 9 Sept. 2020, www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/additional-commonwealth-support-to-protect-healthcare-workers-from-covid-19.

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to evaluate how these two late developments will help protect Australian HCWs in the future.

New Zealand: Unlike Taiwan, South Korea, and Canada, New Zealand did not have a preemptive plan to protect HCWs during a pandemic. For example, while Taiwan applied its SARS 2003 plan to stop COVID contamination, New Zealand used their Influenza plan as a base for responding to COVID. New Zealand had no established medical infrastructure to fight COVID[125]. Most of New Zealand's actions in response to COVID were reactive instead of proactive. Luckily, New Zealand adapted very fast and did their best in protecting frontline health workers.

To start, New Zealand provided the necessary PPE for HCWs by having the Ministry of Health make deals with private companies and foreign entities. New Zealand opened registers for local companies to produce PPE. McGuinness Institute thinktank made a list of all the companies that can produce PPE in New Zealand[126]. Another thing New Zealand did was establishing guidelines for HCWs to stay safe at work. New Zealand also emphasized hospital cleanliness with strict protocols and policies[127]. Another thing New Zealand did is to provide an online educational program for HCWs and cleaning staff. Finally, a hospital entrance control system was applied, with the goal of fever screening and obtaining accurate information on all hospital visits[128]. Overall, New Zealand has done a fantastic job listening to the scientific community's advice on protecting HCWs. New Zealand's next step would be to adopt some of the more advanced strategies used in East Asia to prevent hospital cross-contamination, such as improved mobilization and constant hospital supplies evaluation.

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[125] Mazey, S. and Richardson, J., Lesson-Drawing from New Zealand and Covid-19: The Need for Anticipatory Policy Making. *The Political Quarterly*, 91: 561-570. (2020). https://doi.org/10.1111/1467-923X.12893

[126] "Getting Local Companies to Help Make Covid-19 Personal Protective Equipment." *Radio New Zealand*, Radio New Zealand, 31 Mar. 2020, www.rnz.co.nz/news/business/413057/getting-local-companies-to-help-make-covid-19-personal-protective-equipment.

[127] "COVID-19: Information for Health Professionals." *NZ Ministry of Health*, New Zealand Government, 2020, www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-information-health-professionals.

[128] Chang, Y-T, Lin, C-Y, Tsai, M-J, et al. Infection control measures of a Taiwanese hospital to confront the COVID-19 pandemic. *Kaohsiung J Med Sci*. 2020; 36: 296– 304. https://doi.org/10.1002/kjm2.12228

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C. Aggressive Testing and Mask Wearing.

Another common theme in all chosen countries and regions is that their governments prioritized aggressive testing and recommended wearing masks. According to the Central Epidemic Command Center (CECC) of Taiwan, mask-wearing can reduce the odds of transmitting COVID by up to 99%[129]. Aggressive testing strategies are essential because COVID can spread quickly and directly in close contact. Testing can help states and regions follow the spread of COVID, which could help policymakers craft the correct policies at the right time. As for mask-wearing, the CDC published a study on November 11th. The CDC study concluded that masks protect both the wearer and those around them from COVID-19. Masks act as "source control" to block virus particles exhaled by the wearer and provide "filtration for personal protection" by blocking incoming infectious droplets from others, the CDC said in its new guidance[130]. The places examined all encouraged policies of aggressive testing and mask-wearing due to their past experiences with SARS and MERS and/or their reliance on scientists at the beginning of the pandemic.

Starting with Taiwan and South Korea, these states or regions established a mask-wearing culture even before COVID-19. SARS and MERS in those two places made mask-wearing an integral part of their people's culture. Both governments also ramped up mask production by the end of January to ensure sufficient domestic resources. In Taiwan, the production of the mask went from 1.88 million units a day to 2.44 million[131]. In South Korea, manufacturers reduced their mask exports to less than 10% and shifted all their supplies domestically to ensure self-sufficiency in January[132]. The governments of both places

[129] Everington, Keoni. "Wearing Face Masks Prevented Spread of Coronavirus in Taiwan: CECC." TaiwanNews, Taiwan News , 4 May 2020, www.taiwannews.com.tw/en/news/3927810.

[130] Mascarenhas, Lauren. "CDC Now Says Masks Protect Both the Wearers and Those around Them from Covid-19." *CNN Health*, Cable News Network, 10 Nov. 2020, www.cnn.com/2020/11/10/health/masks-cdc-updated-guidance/index.html.

[131] Yi-Fong Su, Vincent et al. "Masks and medical care: Two keys to Taiwan's success in preventing COVID-19 spread." *Travel medicine and infectious disease*, 101780. 4 Jun. 2020, doi:10.1016/j.tmaid.2020.101780

[132] Lee, Hakyung. "South Korea Takes New Measures to Have Enough Face Masks Domestically amid Coronavirus." *ABC*, ABC News, 27 Feb. 2020,

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mandated masks in public with financial fines when not found wearing one. The prices of masks in both places are very affordable (around 0.17 cents), and in most cases, masks in South Korea and Taiwan are free with medical insurance.

Taiwan and South Korea also utilized technologies and private companies to improve their testing capabilities. In South Korea, the country applied rapid and widespread testing. A month after their first initial case, South Korea conducted a 15,000-laboratory test per day[133]. The high number of tests was made possible with the help of private Korean firms like Kogene Biotech. Taiwan also utilized Artificial Intelligence to test for COVID-19 aggressively and proactively. Taiwan began testing people as early as December 31st, 2019, and continued to scale their testing capacity. In late September, Taiwan tech firms developed a robot capable of processing 2000 COVID results per day[134].

Australia, Canada, and New Zealand did not have a culture of mask-wearing nor aggressive testing like South Korea and Taiwan, but they all listened to the scientists. Early in the pandemic, scientists and the WHO recommended that countries must improve their testing capabilities[135]. As of November 2020, Australia performs 360 total COVID tests per thousand; New Zealand performed 363 per thousand, and Canada 270 per thousand[136]. In all three countries, those numbers are in the upper 20 percent compared to the rest of the world. New Zealand alone has built a testing capacity of 8000 tests per day.

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www.abcnews.go.com/International/south-korea-takes-measures-face-masks-domestically-amid/story?id=69254114.

[133] Lee, David, and Jaehong Lee. "Testing on the move: South Korea's rapid response to the COVID-19 pandemic." *Transportation Research Interdisciplinary Perspectives* vol. 5 (2020): 100111. doi:10.1016/j.trip.2020.100111

[134] "Taiwan Tech Firm: Robot Capable of Processing 2,000 Coronavirus Tests Results Per Day ." *VOA*, VOA News, 28 Sept. 2020, www.voanews.com/covid-19-pandemic/taiwan-tech-firm-robot-capable-processing-2000-coronavirus-tests-results-day.

[135] "Laboratory Testing Strategy Recommendations for COVID-19." *WHO*, World Health Organization, 21 Mar. 2020, www.apps.who.int/iris/bitstream/handle/10665/331509/WHO-COVID-19-lab_testing-2020.1-eng.pdf.

[136] Hasell, J., Mathieu, E., Beltekian, D. *et al.* A cross-country database of COVID-19 testing. *Sci Data* **7,** 345 (2020). https://doi.org/10.1038/s41597-020-00688-8

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While wearing a mask was not mandated in the three countries, it was strongly encouraged. Canada, Australia, and New Zealand Governments nudged the people to sanitize, wear masks, and protect themselves and others during COVID. In Australia, the federal government allocated $30 million in early March to spend on hygiene and mask-wearing advertisement[137]. In New Zealand, scientists were given a platform and a stage in meetings and interviews, which helped encourage people to wear masks and spread a culture of awareness[138]. In Canada, the government worked hard in nudging people toward a culture of mask-wearing. As of late September, a survey conducted by the Association for Canadian Studies found 83% of Canadians believe that wearing a mask during a coronavirus pandemic is a civic duty[139], a 13% increase since July. In summary, Canada, New Zealand, and Australia did not mandate masks but continued to encourage people to wear one through advertising, transparent communication, and continued trust and reliance on scientists.

D. Government Effectiveness: Centralization of Decision-Making.

A common theme among the governments of the four places studied was their respective approaches unified decision making under one umbrella. Whether it is the CECC in Taiwan, the KCDC in South Korea, the National Cabinet in Australia, the Public of Health Agency of Canada, or the Ministry of Health in New Zealand, all chosen countries or regions centralized decision making for multiple reasons.

First, centralizing leadership could improve the clarity, coherence, and speed of the message. For example, the failure of

[137] Doran, Matthew. "Federal Government Rolls out Coronavirus Advertising Campaign after Criticism of Mixed Messages." *ABC*, ABC News, 14 Mar. 2020, www.abc.net.au/news/2020-03-14/government-coronavirus-advertising-blitz-education-campaign/12056700.

[138] Taylor, Chloe. "How New Zealand's 'Eliminate' Strategy Brought New Coronavirus Cases down to Zero." *CNBC*, CNBC LLC, 5 May 2020, www.cnbc.com/2020/05/05/how-new-zealand-brought-new-coronavirus-cases-down-to-zero.html.

[139] Berthiaume, Lee. "Majority of Canadians Say Wearing a Mask during Coronavirus Pandemic Is a Civic Duty: Poll." *Global News*, Corus Entertainment Inc, 22 Sept. 2020, www.globalnews.ca/news/7350128/canadians-support-wearing-mask-coronavirus/.

the KCDC in South Korea during the MERS was due to its lack of authority, where it had to spend more time explaining to bureaucracies than making decisions[140]. When COVID-19 hit, South Korea learned from the MERS white page to give more authority to the KCDC, which helped KCDC become more effective and precise. As of May 14th, 70% of Koreans are happy with KCDC performance[141], with Wall Street Journal calling Jung Eun-Kyong, head of KCDC, the real hero who saved South Korea from COVID-19[142].

Second, the centralization of decision-making can empower scientists when they are needed the most. In Canada, the Public Health Agency of Canada (PHAC) empowered scientists' voices early in the crisis through research funding. Scientists' voices became so dominant in the conversation that Dr. Bonnie, British Columbia's provincial health officer, became one of Canada's most endorsed and loved figures. During a crisis, scientists' empowerment is critical because they are the voice of reason, data, and accuracy. Furthermore, empowering scientists and health administrators during government meetings could eliminate political conflicts and empower minorities. At a time of crisis, the need for ensuring everyone's safety and representation surpasses the need for fair representation. In Australia, the National Cabinet has eliminated the need for checks and balances during the crisis. The National Cabinet made the voice of scientists, minorities, and indigenous populations heard more than ever. Scientists were given a seat in every meeting, and minorities were better able to represent themselves.

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[140] Fox, Justine. "What Prepares a Country for a Pandemic? An Epidemic Helps." *Bloomberg*, Bloomberg, 18 Mar. 2020, www.bloomberg.com/opinion/articles/2020-03-18/covid-19-response-better-in-countries-with-sars-mers-coronavirus.

[141] Oh, Seung-Youn. "South Korea's Success Against COVID-19." *The Regulatory Review*, University of Pennsylvania Law School, 14 May 2020, www.theregreview.org/2020/05/14/oh-south-korea-success-against-covid-19/.

[142] Walker, Sam. " Thank God for Calm, Competent Deputies ." *The Wall Street Journal*, Dow Jones & Company, Inc., 4 Apr. 2020, www.wsj.com/articles/in-the-coronavirus-crisis-deputies-are-the-leaders-we-turn-to-11585972802.

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In summary, decision-making centralization is vital for a successful response during a pandemic because it could improve accuracy and coherence. Additional benefits include science and minority representation and the elimination of political conflicts during a health crisis. It is essential for countries that politicized COVID at the beginning of the crisis to stop doing so by empowering their health ministry and scientists' voices. Turning COVID into a political disagreement could undermine its risks, and putting the response in the scientists' hands is the only way a country could ensure a proper effective response.

E. Transparent and Clear Communication.

Another common theme that best responders emphasized is transparent communication. According to the WHO, transparency is a critical component for effective communication during a pandemic because it helps build trust and credibility. Transparent communication must also extend to include communicating uncertainties, errors, failures, and misconceptions. The five best regional or national responses to COVID offer excellent examples of how transparent communication is essential to gain public trust.

Taiwan: Taiwan made transparency a vital part of its communication. Taiwan offered daily briefing since CECC was activated on January 20th. In addition to those daily briefings, Taiwan Vice President Chen, a certified epistemologist, has been posting and responding to COVID-related social media questions. Chen is committed to posting daily updates on both Facebook and Twitter. Daily interaction via social media helped increase public awareness and enhance transparency. Second, according to Ellison Laskowski[143],

Taiwan achieved further transparency and gained public trust by implementing bottom-down solutions, where citizens can witness the impact of their collaboration. An example of that would be the online "e-mask 2.0" system where the Taiwanese government coordinated with convenience store owners to develop a platform where people can order masks online for

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[143] Laskowski, Ellison. "Taiwan's Coronavirus Lesson—Technology with Transparency." *GMF*, GMF Publications , 13 May 2020, www.gmfus.org/blog/2020/05/13/taiwans-coronavirus-lesson-technology-transparency.

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delivery or pickup [144] . In this example, the government coordinated with the public to achieve a bottom-up solution and provide masks where they are needed the most. Overall, when designing their response to COVID, Taiwan emphasized citizens' participation in multiple instances, building a sense of trust and national pride. Taiwan combined constant, transparent communication through daily briefing, social media, and other government websites with citizens' participation and engagement to achieve a high level of public trust and collaboration[145].

South Korea: After a challenging experience with MERS 2015, South Korea adopted a transparency policy when communicating risks with COVID-19. According to MERS white paper, South Korea had the highest number of MERS cases next to Saudi Arabia, but they refrained from disclosing that information in fear of public panic. South Korea's position in MERS caused tension between the central and local governments. The tension led to the mayor of Seoul Metropolitan holding an emergency briefing where he released disclosed information and criticized the central government's lack of transparency in handling MERS[146]. A painful yet crucial lesson that the white paper concluded with is that the South Korean government should have been more transparent in their response to MERS.

The South Korean government was much more transparent in its response to COVID-19. First, South Korea used social media to increase citizens' engagement and awareness. Real-time resources could mitigate misinformation and build trust through transparency. Second, South Korea provided public websites that include real-time statistics and up to date information on cases and mortality rates. These statistics' goal is to build transparency and provide real-time data for researchers and analysts to understand how the virus spread

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[144] Kluth, Andreas. "If We Must Build a Surveillance State, Let's Do It Properly." *Bloomberg* , Bloomberg, 22 Apr. 2020, www.bloomberg.com/opinion/articles/2020-04-22/taiwan-offers-the-best-model-for-coronavirus-data-tracking.

[146] Kwaak, Jayyup. " MERS, Rumors Spread in South Korea ." *The Wall Street Journal*, Dow Jones & Company, Inc., 5 June 2020, www.wsj.com/articles/mers-rumors-spread-in-south-korea-1433484078.

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and create a strategic response. Citizens were informed instantly when the number of cases in their location has risen. Finally, South Korea used to share recommendations, statistics, and infographics to raise awareness. The high level of civil awareness was crucial in South Korea and Taiwan's successful response[147]. Overall, it could be argued that in both Taiwan and South Korea, the government's transparent communication and encouragement of citizens' engagement made the public to act more "maturely" during COVID. In the context of pandemic prevention, "maturely" means that citizens are more likely to follow health guidance due to their awareness and engagement. Citizens were more likely to participate in healthy activities such as social distancing and wearing masks because the government is actively communicating with them through phone notifications and social media. Those citizens feel like they are a part of the solution because they can see the impact of their engagement and participation[148].

Canada: Canada also prioritized transparent communication and citizens' trust during COVID-19 and while developing their COVID app. Canada made it easy for Canadians to opt-out of information collection. Canada also empowered the Access to Information Act, giving Canadians the right to access or delete their government record information. The Canadian government provided an open record on all their spending and hospital funds and expenses during COVID. Finally, Canada provided long short term economic and social recovery plans[149]. An area where Canada could improve is providing a constant update on hospitals' state of preparedness. Canada still lacks a functional website that can inform the community when there is a shortage of masks or PPE[150].

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[147] Fisher , Max, and Choe Sang-Hun. "How South Korea Flattened the Curve." *The NY Times*, The New York Times Company, 23 Mar. 2020, www.nytimes.com/2020/03/23/world/asia/coronavirus-south-korea-flatten-curve.html.

[148] Tworek, Heidi. "Lessons Learned from Taiwan and South Korea's Tech-Enabled COVID-19 Communications ." *Brooking*, The Brookings Institution, 6 Oct. 2020, www.brookings.edu/techstream/lessons-learned-from-taiwan-and-south-koreas-tech-enabled-covid-19-communications/.

[149] "Canadian Security Intelligence Service: Transparency." *Government of Canada*, Canada, www.canada.ca/en/security-intelligence-service/corporate/transparency.html.

[150] Dyer, Evan. "The Great PPE Panic: How the Pandemic Caught Canada with Its Stockpiles Down." *CBC*, CBC/Radio-Canada, 11 July 2020,

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Australia: Australia also integrated transparency into its strategic response to COVID. On April 17th, the Office of the Australian Information Commissioner OAIC published a joint statement on transparency and access to information during COVID[151]. The statement highlights Australia's early effort in channeling transparent communication and privacy protection in multiple ways. OAIC statement emphasized citizens' right to access information. OAIC recognizes that the government must take significant and impactful decisions shortly, but still believe that citizens' right to access information will be vital during the pandemic.

A dedicated government website (covid19data.com.au) was created to help inform citizens access their local cases and know hospital capacities and other vital information. Second, the OAIC statement encouraged transparent communication during the pandemic. Transparent communication could be achieved by increased protection of personal data and good record keeping[152].

Australia empowered non-profit groups such as Transparency National Australia TNA during COVID and allowed them to work with the Senate[153]. TNA provided the Senate with a list of 11 recommendations that could increase transparency, including a fair system of appointment and Establishing the NCCC conflict of interest disclosure register. In both New Zealand and Australia, Transparency National became

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www.cbc.ca/news/politics/ppe-pandemic-covid-coronavirus-masks-1.5645120.

[151] " Joint Statement on Transparency and Access to Information during the COVID-19 Outbreak ." *Office of Australian Information Commissioner*, Australian Government , 17 Apr. 2020, www.oaic.gov.au/updates/news-and-media/joint-statement-on-transparency-and-access-to-information-during-the-covid-19-outbreak/.

[152] " Joint Statement on Transparency and Access to Information during the COVID-19 Outbreak ." *Office of Australian Information Commissioner*, Australian Government , 17 Apr. 2020, www.oaic.gov.au/updates/news-and-media/joint-statement-on-transparency-and-access-to-information-during-the-covid-19-outbreak/

[153] "Covid-19 Crisis Response." *Transparency International*, Transparency International Australia, 2020, transparency.org.au/accountable-government/covid-19-response/.

the watchdog that writes reports on government transparency during COVID. Transparency National and other NGOs monitor and assess Australia and New Zealand transparency during their responses to COVID, which helped keep politicians in line. Finally, Australia applied the privacy act to create COVIDsafe and made privacy the main priority when the app was constructed. In summary, Australia continued to deliver transparent communication, protect citizens' privacy, and allow for easy access to information, which helped establish trust and build public collaboration.

New Zealand: New Zealand's example of transparency is not far from Australia. They, too, incorporated transparency into their communication by establishing legislation that protects privacy. Dr. Wiles argues that the Prime Minister put the people's health and scientists' recommendations first in her speeches, which increased transparency[154]. New Zealand also added optional features such as "leave no trace" into their COVID detection app to ensure that people can delete their information. NZ COVID App deletes information 60 days later automatically. The app also uses an advanced encryption framework designed with privacy commissioner oversight.

Like Australia, New Zealand empowered NGOs such as Transparency International to ensure oversight. NGOs like Transparency International oversight continues to track and monitor New Zealand's transparency and corruption then make the proper recommendations to improve it. Finally, New Zealand continued to lead by example, making it easier for citizens to follow strict quarantine guidelines. New Zealand health minister David Clark was stripped from his responsibilities in April. Clark drove 12 miles away from his home to take a walk on the beach with his family. Clark later resigned and called himself "stupid" for his decision[155]. Overall, New Zealand established public trust with scientific transparency, privacy protection, and leading by example.

In summary, standard policies that selected countries or regions applied to increase transparency include scientist empowerment and database building. Other policies include

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[154] "Coronavirus: How New Zealand Relied on Science and Empathy." *BBC News*, BBC, 20 Apr. 2020, www.bbc.com/news/world-asia-52344299.

[155] "Coronavirus: New Zealand Minister Resigns after Lockdown Blunders." *BBC News*, BBC, 2 July 2020, www.bbc.com/news/world-asia-53259236.

privacy protection, constant monitoring, and improved public access to information.

F. International Coordination with the World Health Organization

The World Health Organization (WHO) is the agency of the UN responsible for public health. The WHO has 194 member states, which help them coordinate a global response to an urgent health crisis[156]. The WHO is an organization with a rich history, multiple successes, and a few failures. Perhaps the WHO achieved the greatest triumph in 1980 when it completely eradicated smallpox, which killed 35% of its victims[157]. The WHO also successfully eradicated the Rinderpest virus and continue to coordinate with countries to eliminate global diseases. The WHO cannot force rules and regulations on a member state and can only collaborate and make recommendations. Moreover as a clearinghouse, its data and conclusions ae only as good as the information states and other entities chose to share—including the scope and timing of such sharing. But that can have significant effect in the context of a pandemic.

In April 2020, Donald J Trump announced that the US would withdraw their support from the WHO. Trump justified his decision by stating that: 1) the WHO failed to obtain accurate information and transparently share it. 2) During January, it promoted the idea that there is no human-to-human transmission. 3) its heavily dependent on China, and 4) they opposed travel restrictions in January[158]. While some of Mr. Trump's claims might be true, it is essential not to ignore the WHO's rich history. The WHO successfully fought pandemics eliminated diseases, and eradicated others. It is vital to recognize that most Trump claims were in the January timeframe when there was no to little information on COVID in general. The WHO is a trusted source because they use scientific methods to obtain information. The WHO must also use

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[156] "About WHO." *WHO*, World Health Organization, www.who.int/about.

[157] "Disease Eradication ." *The History of Vaccine*, The College of Physicians in Philadelphia, 2018, www.historyofvaccines.org/content/articles/disease-eradication.

[158] Reality Check Team "Coronavirus: What Are President Trump's Charges against the WHO?" *BBC News*, BBC, 8 July 2020, www.bbc.com/news/world-us-canada-52294623.

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diplomacy to coordinate with countries successfully, including China. While it could be argued that China has a strong influence on the WHO, it is in the US's best interest to corporate and coordinate with the WHO and China and restores its global positioning. Breaking ties with the WHO will not decrease China's dominance but increase it globally. Trump also ignored that by February 11th, the WHO director-general Tedros urged world leaders to prioritize containing the virus at a WHO briefing[159]. The responses of the states and regions that are the subject of this article suggest that despite the allegations and relationships between WHO and certain members coordination with the WHO could help fight the virus. Here is a depth look at how those places collaborated with the WHO:

Taiwan: Taiwan is a particular case because despite not being a member of the WHO, Taiwan had one of the best COVID responses globally. Taiwan's exceptional model on preventing COVID made it harder for the WHO to ignore them. Taiwan followed the WHO standards on testing and case definition and continued to share updates with the WHO on International Health Regulations and other global health platforms[160]. While much politics might be playing into this, Taiwan continues to offer their hand to the WHO. According to Taiwan, it is the WHO that does not share information with Taiwan [161]. Taiwan continues to provide the WHO with detailed cases and prevention methods. According to Reuters[162], Taiwan has been excluded from 70% of WHO technical meetings in the last decade. In response, both the WHO and China claim that Taiwan has been included in COVID meetings. Despite all these circumstances, Taiwan continues to coordinate, share, and follow the WHO guidelines.

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[159] Keith, Tamara. "A Timeline Of Coronavirus Comments From President Trump And WHO." *NPR*, NPR, 15 Apr. 2020, www.npr.org/sections/goatsandsoda/2020/04/15/835011346/a-timeline-of-coronavirus-comments-from-president-trump-and-who.

[160] Lin C, Braund WE, Auerbach J, et al. Policy Decisions and Use of Information Technology to Fight COVID-19, Taiwan. *Emerging Infectious Diseases*. 2020;26(7):1506-1512. doi:10.3201/eid2607.200574

[161] Chen , Yu-Jie, and Jerome Cohen. "Why Does the WHO Exclude Taiwan?" *Council on Foreign Relations*, Council on Foreign Relations, 9 Apr. 2020, www.cfr.org/in-brief/why-does-who-exclude-taiwan.

[162] "Taiwan Says WHO Not Sharing Coronavirus Information It Provides, Pressing Complaints." *Reuters*, Reuters, 30 Mar. 2020, www.reuters.com/article/us-health-coronavirus-taiwan-who/taiwan-says-who-not-sharing-coronavirus-information-it-provides-pressing-complaints-idUSKBN21H1AU.

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South Korea: South Korea's coordination with the WHO went beyond early prevention and data sharing of the virus. Like Taiwan, South Korea continued to serve as a global model for COVID. South Korea coordinated their alert with WHO recommendations and guidelines. South Korea called for giving WHO teeth and power in the face of new diseases[163]. South Korea currently is collaborating with the WHO to provide COVID-19 PCR test kits for 24 countries in the African Region[164]. The WHO has recognized South Korea's efforts in combatting COVID at a global level.

Canada: Health Canada released a statement that emphasized its membership in the WHO and the International Coalition of Medicines Regulatory Authorities (ICMRA)[165]. The stated goal was to strengthen the early collaboration among Canada, ICMRA, and the WHO. Canada stressed their commitment to promote evidence-based regulatory practices. Canada also participates in the WHO research and development (R&D) blueprint vaccines to develop the COVID vaccine. Other international organizations that helped craft the Canadian COVID response include the International Post-Market Surveillance Group, International medical device regulators, and Pan American Health Organization[166].

[163] Nebehay , Stephanie, and Emma Farge. "South Korea Calls for Giving WHO Teeth in Face of New Diseases." *Reuters*, Reuters, 18 May 2020, www.reuters.com/article/us-health-coronavirus-who-southkorea/south-korea-calls-for-giving-who-teeth-in-face-of-new-diseases-idUSKBN22U1FC.

[164] "The Republic of Korea and WHO Sign New Memorandum of Understanding, Committing US\$ 6 Million in COVID-19 PCR Test Kits for 24 Countries in the African Region." *WHO*, World Health Organization, 17 Aug. 2020, www.who.int/news/item/17-08-2020-the-republic-of-korea-and-who-sign-new-memorandum-of-understanding-committing-6-million-usd-in-covid-19-pcr-test-kits-for-24-countries-in-the-african-region.

[165] Pennington , Sarah, and Kristin Wall . "Health Canada Collaborates with International Partners to Address Pandemic ." *Pharma in Brief*, Norton Rose Fulbright LLP , 9 May 2020, www.pharmainbrief.com/2020/05/health-canada-collaborates-with-international-partners-to-address-pandemic/.

[166] "Health Canada's Regulatory Response to COVID-19: International Engagement." *Government of Canada*, Canada, 2020, www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/engaging-international-partners.html#a2-1.

Australia: While the Australian prime minister agreed with Donald J Trump that the WHO does need changes, he continued following the WHO guidelines amid the pandemic. Morrison does agree that the WHO has been influenced by China but still followed their scientific guidelines. An example was when Australia started controlling international travels in February; they continued to apply the WHO guidelines regarding sanitization and temperature checks. Schwartz argues that Australia's early international coordination efforts were a critical factor in their successful response [167] . On November 26th, 2020, the EU and Australia signed a bilateral framework to strengthen coronavirus recovery by working on a vaccine, reducing trade barriers, and supporting the WHO[168].

New Zealand: New Zealand declared COVID an outbreak three days after the World Health Organization announced it. New Zealand took China and the WHO's early reports of COVID to determine the appropriate strategy. WHO Regional Director for the Western Pacific, Dr. Takeshi Kasai, praised New Zealand's early strategy for their collaboration with WHO, in addition to their aggressive testing, strict lockdown, clinical management, and contact tracing. New Zealand continues to collaborate with the WHO. "WHO provided a valuable trove of information, collated from many sources, analyzed by WHO's experts and presented very clearly." Dr. Bloomfield, New Zealand Director of General Health, stated. In this quote, Dr. Bloomfield recognized that outbreak updates and risk assessments from the WHO played a crucial role in New Zealand's successful response to COVID. Furthermore, Dr. Bloomfield credited the WHO strategies in COVID surveillance and response, in addition to laboratory capacity, infection prevention and control, and risk communication. "The strategies were "indispensable in the current pandemic and have stood well the test of time,[169]" Dr. Bloomfield stated. In

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[167] Buchan, Patrick Gerard. "Australia Goes Hard and Goes Early on Covid-19 ." *CSIS*, Center for Strategic and International Studies, 15 Apr. 2020, www.csis.org/analysis/australia-goes-hard-and-goes-early-covid-19.

[168] "Joint Press Release: EU-Australia Leaders' Virtual Meeting ." *European Council*, Council of the European Union, 26 Nov. 2020, www.consilium.europa.eu/en/press/press-releases/2020/11/26/joint-press-release-eu-australia-leaders-virtual-meeting/.

[169] "New Zealand Takes Early and Hard Action to Tackle COVID-19." *WHO*, World Health Organization, 15 July 2020,

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summary, despite New Zealand's lack of clinical management capabilities at the beginning of the pandemic, New Zealand's reliance on the WHO guidance and recommendations helped them manage COVID successfully.

G. Economy: Economic and Social support legislations & Policies

States and regions that responded the best to COVID tried to cushion the economy's hit by providing economic and social support legislations and policies. Those policies aim to help those that were impacted by COVID the most. The following is an in-depth look at the selected national or regional economic and social support legislation and strategies:

Taiwan: The Taiwanese economy surprised the globe with a GDP growth of 3.3% compared to the third quarter from a year ago. Even more impressive, Taiwan kept GDP growth in 2020 despite all neighboring countries' decline in growth rate. During the first five months of the pandemic, Taiwan gained an economic growth of 1.7%. In comparison, China suffered an economic decline of 7.7%, and Japan's economy declined by 8.4% in the same five-month period [170]. Taiwan applied multiple strategies to maintain and improve its economy during COVID. One of the main strategies discussed multiple times in this research is that Taiwan did not shut down its economy. Instead, Taiwan decided to apply a robust contact tracing program that utilized its infrastructural and technological capabilities[171].

Taiwan combined strict testing protocols with advanced technology and aggressive quarantine measures. Due to its

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www.who.int/westernpacific/news/feature-stories/detail/new-zealand-takes-early-and-hard-action-to-tackle-covid-19.

[170] Shih-chung , Liu. "Taiwan Faces a Changed Economic Outlook in Asia Following COVID-19." *Brooking*, 29 June 2020, www.brookings.edu/blog/order-from-chaos/2020/06/29/taiwan-faces-a-changed-economic-outlook-in-asia-following-covid-19/.

[171] Duff-Brown, Beth. " How Taiwan Used Big Data, Transparency and a Central Command to Protect Its People from Coronavirus." *Stanford Health Policy*, Stanford University, 3 Mar. 2020, www.healthpolicy.fsi.stanford.edu/news/how-taiwan-used-big-data-transparency-central-command-protect-its-people-coronavirus.

effective control of the virus, Taiwan's unemployment rate stayed the same (4%) even during COVID. "Compared with other emerging economies in the region, Taiwan's labor market is relatively resilient due to the low degree of pandemic shock," said Ma Tieying, an economist with DBS Bank in Singapore[172]. Another factor that helped maintain the Taiwanese economy is the public funding to improve communication networks and environmental projects, which helped increase employment in construction and infrastructure sections[173]. Finally, the global demand for Taiwanese technologies increased during COVID, especially with computer makers like Asus and Acer. The higher demand for Taiwanese technology could be because of the high global demand for virtual jobs and communication. Taiwan Semiconductor Manufacturing alone is expected to hire 8000 people from October to December[174].

South Korea: South Korea is currently experiencing long term economic growth despite COVID early impact. In the latest OECD projection, South Korea's economy is predicted to have one percent GDP contraction, the second-best globally, China being the first [175] . South Korea attributes its success in cushioning the pandemic economic impact on multiple attributes. According to Google Mobility Data, South Korea did not overhaul its economy when the pandemic hit; instead, South Korea relied on contact tracing and AI technology to predict and respond to the virus. Second, after it ensured self-sufficiency, South Korea grew back its export market. In September 2020, South Korea grew its exports to 23.3% in the US and 15.4% in

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[172] Jennings , Ralph. " Taiwan's Job Market Outlook Gets Top Marks Due to Island's Effective Control of Coronavirus ." *The Coronavirus Pandamic*, South China Morning Post , 25 Sept. 2020, www.scmp.com/economy/china-economy/article/3102865/taiwans-job-market-outlook-gets-top-marks-due-islands

[173] " Taiwan Government and Institution Measures in Response to COVID-19." *KPMG*, KPMG International Limited, 18 Nov. 2020, home.kpmg/xx/en/home/insights/2020/04/taiwan-government-and-institution-measures-in-response-to-covid.html.

[174] "Taiwan's Has the Most Dynamic Post-COVID-19 Economy in the World." *Asia News*, Fondazione PIME Onlus, 25 Sept. 2020, www.asianews.it/news-en/Taiwan%E2%80%99s-has-the-most-dynamic-post-COVID-19-economy-in-the-world-51137.html.

[175] Larsen , Morten. " COVID-19 Has Crushed Everybody's Economy—Except for South Korea's." *Foreign Policy*, The Slate Group, 16 Sept. 2020, www.foreignpolicy.com/2020/09/16/coronavirus-covid-economic-impact-recession-south-korea-success/.

Europe compared to a year prior[176]. Finally, South Korea applied a $12.2 Billion fiscal response to COVID while keeping the tap open for additional stimulus packages for long term economic impact. The OECD mentioned that South Korea's fiscal response was vital in their successful economic response to COVID due to its adaptability and flexibility. According to Morten Larsen[177], a Foreign Policy journalist, South Korea utilized its stimulus package better than other countries in two different ways. First, businesses were open, making citizens consume more and save less, which helped stimulate the Korean economy. Second, some South Korean provinces used unique and creative solutions to ensure the stimulus spending will enrich the economy. For example, Gyeonggi province's governor made it that the stimulus uses a non-cash payment technology, where the currency can only be used in local shops and over the next three months. These methods ensured that stimulus packages would not be hoarded and used to enrich and revive the Korean economy. "We used the [money] to eat out at local restaurants; we ate out more often than usual to use the emergency funds,[178]" said Lee Jong-Hyang, a mother in her 50s who lives in Gyeonggi province.

Canada: One of Canada's most significant achievement is that they managed to strategize a long-term economic plan that recovered the Canadian economy from COVID in 6 months. Canada's economic response to COVID is nothing shorter than success. Canada suffered an 8% and 39% contraction in the first and second quarter of 2020. Then, they did grow at an annualized rate of 48% in the third quarter[179]. In comparison, the US GDP was lower by around 16% in the same third

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[176] "Taiwan's Has the Most Dynamic Post-COVID-19 Economy in the World." *Asia News*, Fondazione PIME Onlus, 25 Sept. 2020, www.asianews.it/news-en/Taiwan%E2%80%99s-has-the-most-dynamic-post-COVID-19-economy-in-the-world-51137.html.

[177] Larsen , Morten. " COVID-19 Has Crushed Everybody's Economy—Except for South Korea's." *Foreign Policy*, The Slate Group, 16 Sept. 2020, www.foreignpolicy.com/2020/09/16/coronavirus-covid-economic-impact-recession-south-korea-success/.

[178] Larsen , Morten. " COVID-19 Has Crushed Everybody's Economy—Except for South Korea's." *Foreign Policy*, The Slate Group, 16 Sept. 2020, foreignpolicy.com/2020/09/16/coronavirus-covid-economic-impact-recession-south-korea-success/.

[179] Ghosh, Indradip. "Canadian Economic Recovery to Be Weaker as COVID-19 Cases Resurge, Reuters Poll Shows." *Reuters*, Reuters, 22 Oct. 2020, www.reuters.com/article/us-canada-economy-poll-idCAKBN2771UZ.

quarter[180]. Even more impressive, economic analysts predict that Canada's economy will not be impacted as hard by the second COVID wave, with a projection of 5.1% and 5.2% growth in the fourth quarter of 2020 and the first quarter of 2021. Canada cushioned the economic impact of COVID by doing the following:

First, On March 18th, Canada offered a detailed economic response plan to stabilize the economy during COVID. The Canadian government was one of the first global advocates for economic relief. The Canadian economic plan included economic benefits totaling $107 billion for Canadians. The Canadian response plan was loved by Canadian and endorsed by economists due to its attention to detail, flexibility, and inclusivity. The economic plan included minorities, children, indigenous groups, students, and women. It also included individuals, businesses, sectors, organizations, provinces, and territories. Economic benefits included policies to prevent layoffs, such as Canadian Emergency Wage Subsidies covering up to 75% of an employee wage until late August 2020. Other benefits include tax reliefs for businesses and rent assistance programs[181].

Second, Canada kept the employment rate high despite the economic impact of COVID. The Canadian assistance program, also known as the Canadian Economic Recovery Benefit (CERB), was accessed by approximately 9 million people when COVID hit. Canadians received $2000 for four months starting from March to help them cope with the pandemic and stay home. When the economy opened back up in May, Canada created 290,000 new jobs. The employment rate went up 6.3% in May alone. "Fiscal stimulus programs should be on standby, ready to be deployed or increased in order to combat another shutdown," said Kristina Hooper, global market strategist at Invesco Canada[182].

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[180] "Gross Domestic Product, Third Quarter 2020 (Advance Estimate) ." *Bureau of Economic Analysis* , The United States Government, 29 Oct. 2020, www.bea.gov/news/2020/gross-domestic-product-third-quarter-2020-advance-estimate

[181] " Canada's COVID-19 Economic Response Plan." *Government of Canada*, Canada, 2020, www.canada.ca/en/department-finance/economic-response-plan.html.

[182] Olives, David. "The Numbers Don't Lie: Why the Canadian Economy Is Already in Much Better Shape than It Looks." *The Star*, Toronto Star Newspapers Ltd, 19 June 2020,

Third, Lindeman argues that Canada's safety nets helped them cope with COVID faster than the US[183]. Lindemen argues that even without CERB, Canada made safety nets in the health care and labor force, which helped Canadians feel secure and stay at home from March to May. Lindemen supports her theory with data from the Urban Institute that shows that adults within a family that lost a job were about three times more likely to become uninsured within states that did not expand Medicare. While tough to imitate, Canada's availability of safety nets helped Canadians cope with the virus and stay home.

Finally, Canada prioritized Small and Medium-sized Enterprises SMEs. SMEs are an essential component of the Canadian economy because they employed 69.7% of Canadians as of 2017[184]. The Canada Emergency Business Account (CEBA) provides $40,000 interest-free loans for SMEs impacted by COVID [185]. Other tools include The Canada United Small Business Relief Fund (CUSBRF), which is directed toward relieving small local businesses and adopting digital technology[186].

In summary, Canada Economic Plan was a success because it was inclusive, flexible, and detailed. Canada's Economic plan also prioritized SMEs and local businesses, which are the Canadian economy's backbone. Finally, Canada had safety nets in healthcare and the labor force, which helped it decrease unemployment and recover faster.

Australia: The Australian economy was heavily impacted by COVID, which came while Australia was still struggling with

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https://www.thestar.com/business/opinion/2020/06/20/from-employment-to-deficits-heres-where-the-economy-stands-and-where-were-headed.html

[183] Lindeman, Tracey. "What Canada's COVID Response Can Teach the U.S. about Social Safety Nets." *Fortune*, Fortune Media IP Limited, 23 Oct. 2020, www.fortune.com/2020/10/23/canada-unemployment-cerb-economy-growth-coronavirus/.

[184] "Key Small Business Statistics ." *Government of Canada*, Canada, Jan. 2019, www.ic.gc.ca/eic/site/061.nsf/eng/h_03090.html.

[185] " Managing Your Business during COVID-19." *Government of Canada*, Canada, 2020, www.canada.ca/en/services/business/maintaining-your-business.html.

[186] "Canada United Small Business Relief Fund." *OCC*, Ontario Chamber of Commerce , www.occ.ca/canada-united-small-business-relief-fund/.

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the worst wildfires it has witnessed in decades[187]. COVID hit Australia While Mr. Morrison was focused on applying a 12-month plan to return the economy to a budget surplus for the first time in a decade[188]. COVID lowered the Australian GDP by 0.3% and 7% in the second quarter, respectively. Despite all that, the Australian economy is showing signs of recovery in the third quarter of 2020. According to ABC News, Australians' unemployment fell from 9.3% to 7.2% in October alone[189]. Westpac-Melbourne Institute Index of Consumer Sentiment recorded 35.3% from late August to mid-November[190]. The Reserve Bank estimates an increase of 1.4% and 1.5% in the third and fourth quarters. According to Gareth Aird, Commonwealth Bank's (CBA) Head of Australian Economics, Australia's economic policies and strategies will pay off 2021. "We believe the metaphorical 'bridge' has been built very well and sets Australia up for a prosperous next two years[191]."

As a start, an overview of Australia's Economic Recovery Plan is vital to understand how Australia managed its economy during COVID. According to the Australia Budget for 2020-2021, The Australian economic plan emphasized employers' and employees' support[192]. Special attention was also given to SMEs. Small and Medium Enterprises Guarantee Scheme supports up to $40 billion in lending. Under the same scheme, the

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[187] He, Laura, and Angus Watson. "Australia's Economy Had Its Worst Quarter on Record. Now It's in a Historic Recession." *CNN*, Cable News Network, 2 Sept. 2020, www.cnn.com/2020/09/02/economy/australia-gdp-recession-intl-hnk/index.html.

[188] Scott, Jason. "After Taming The Pandemic, Australia Tries to Save Its Economy." *Bloomberg*, Bloomberg L.P, 30 Sept. 2020, www.bloomberg.com/news/articles/2020-09-30/australia-lays-out-rescue-plan-for-economy-stung-by-covid-19.

[189] Speers, David. "After a Rollercoaster 2020, Australia's Economy Is Showing Signs of Recovery." *ABC*, ABC, 21 Nov. 2020, www.abc.net.au/news/2020-11-22/rollercoaster-2020-australias-economy-showing-signs-recovery/12905820.

[190] Koukoulas, Stephen. "6 Promising Signs the Worst Is over for Australia's Economy." *Yahoo Finance*, Verizon Media, 12 Nov. 2020, www.au.finance.yahoo.com/news/positive-economic-indicators-193645276.html.

[191] Mehta, Dhwani. "Australia: Economic Recovery 'Faster and Stronger' than Expected – CBA." *FXStreet*, FX Street, 16 Nov. 2020, www.fxstreet.com/news/australia-economic-recovery-faster-and-stronger-than-expected-cba-202011160615.

[192] Bembrick, Peter. "A Brief Overview of Australia's Economic Response to COVID-19." *HLB*, HLB International , 12 Mar. 2020, www.hlb.global/a-brief-overview-of-australias-economic-response-to-covid-19/.

government guarantees up to 50% to SME lenders to encourage them to provide credit. Australia also applied tax-free cashflow and lowered the cash rate target to 0.1%, which helped businesses and industries rely on trade[193]. Second, Australia applied a unique JobKeeper and JobMaker Hiring credit program. The JobKeeper program helps businesses impacted by COVID pay employees' a biweekly payment of $1500. The JobMaker program financially incentivizes businesses to hire additional adults aged 16-35[194]. Finally, Australia spends over $14 billion to improve its infrastructural capabilities to combat COVID and other viral diseases in the future. The money spent on infrastructure improvement is going to provide 40,000 jobs in the next four years[195].

In summary, Australia's economic plan focused on lowering the interest rate, increasing employment, and incentivizing businesses. While it is tough to predict the future, it seems that Australia's fiscal and monetary support has paid off. Australia's October jobs surpassed the economists' forecast, which predicted 8% unemployment when 7.2%[196]. It is still left to see if Australia's long-term economic plan will help the economy revive further in 2021 like economists predicted[197].

New Zealand: Despite having one of the longest lockdowns globally, followed by 12.2% GDP contraction in the second quarter, New Zealand ranked first in the Doing Business Report published by the World Bank[198]. A 2020 Bloomberg survey of 700 global business leaders found that, on average,

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[193] "Supporting the Economy and Financial System in Response to COVID-19." *RBA*, Reserve Bank of Australia, 2020, www.rba.gov.au/covid-19/.

[194] " Supporting Australians through the Crisis." *Budget 2020-21*, Government of Australia , 2020, www.budget.gov.au/2020-21/content/covid-19.htm

[195] "Australian Government's Economic Response to Coronavirus." *H&R Block*, H&R Block Australia National Office, 2020, www.hrblock.com.au/tax-academy/australian-governments-economic-response-to-coronavirus.

[196] "Australia's October Jobs Surpass Forecast, Unemployment Ticks Up." *CNBC*, CNBC LLC, 18 Nov. 2020, www.cnbc.com/2020/11/19/australias-october-employment-soars-jobless-rate-ticks-up-.html.

[197] Bembrick, Peter. "A Brief Overview of Australia's Economic Response to COVID-19." *HLB*, HLB International , 12 Mar. 2020, www.hlb.global/a-brief-overview-of-australias-economic-response-to-covid-19/.

[198] "Foreign Direct Investment (FDI) in New Zealand." *Nordea*, Nordea, 2020, www.nordeatrade.com/en/explore-new-market/new-zealand/investment.

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they feel the most confident in investing in New Zealand[199]. Business leaders gave the score based on political stability, economic recovery, virus control, and social resilience [200]. Economist analysts expect New Zealand to witness a GDP increase of 5.9% in 2021[201]. Multiple reasons could explain how New Zealand excelled in enhancing its economic resilience post-COVID:

First, and perhaps most impactful, the New Zealand government aimed to eliminate COVID instead of cushioning its blow. Backer, Kvalsvig, and Verrall argue that New Zealand's successful elimination strategy provided them with a medium-term exit path that can help businesses operate without COVID-19 constraints [202]. Their argument mentions how the New Zealand elimination strategy might have been more taxing socially and economically in the short term than the alternatives (suppression and mitigation). However, the alternatives could be far more harmful to the economy in the long run because of the need to continuously apply restrictive measures until a vaccine is available. The New Zealand elimination strategy's most significant advantage is that it reduced market uncertainty by completely controlling the flow of COVID in the country.

Second, New Zealand offered a $9-12 billion economic response package to revive the economy post-COVID. The economic package offers wage subsidies, leave and social isolation support, reemployment packages, and tax reliefs. New Zealand put a particular emphasis on SMEs. Almost half the economic package ($6.25 billion) was dedicated to the Business Finance Guarantee scheme for small and medium-sized businesses. Further support to SMEs includes a $3.1 billion tax loss carry-back scheme, flexibility in tax obligation, and

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[199] Smyth, Jamie. "New Zealand Inc Reaps Benefit of Hard and Fast Covid Lockdown." *Financial Times*, The Financial Times LTD, 6 Nov. 2020, www.ft.com/content/912d28d1-b233-4e18-9af4-7fa84ea3b927.

[200] Pullar-Strecker, Tom. "Bloomberg Business Survey Puts NZ's Covid Response out in Front." *Stuff*, Stuff Limited, 8 Oct. 2020, www.stuff.co.nz/business/123019858/bloomberg-business-survey-puts-nzs-covid-response-out-in-front.

[201] "Foreign Direct Investment (FDI) in New Zealand." *Nordea*, Nordea, 2020, www.nordeatrade.com/en/explore-new-market/new-zealand/investment.

[202] Baker, Michael G et al. "New Zealand's COVID-19 elimination strategy." *The Medical journal of Australia*, 10.5694/mja2.50735. 13 Aug. 2020, doi:10.5694/mja2.50735

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consultancy support. The economic package's other benefits include renter and landlord protection, six-month mortgage principal, interest payment deferral, and better allocation for infrastructural and resource management[203].

Third, New Zealand created The Trade Recovery Strategy to enrich its trade and recover from the impact of COVID-19. Trade is an essential component of the New Zealand economy, with one of four New Zealander jobs being dependent on exports[204]. The Trade Recovery Strategy comes in two phases. The first phase was from March to July, when the pandemic was at its peak in New Zealand. In the first phase, the focus was on protecting the supply chain and trade flow, in addition to ensuring that New Zealanders can access essential goods and PPE. In the second phase, New Zealand aims to adjust its global positioning and global trade strategies in a new international environment. New Zealand's global trade strategy has three pillars: Retooling support for exporters, reinvigorating international trade architecture; and refreshing key trade relationships. New Zealand also intensified the Ministry of Foreign Affairs and Trade Economic Diplomacy program to support exporters and SMEs facing trade barriers[205]. Besides, New Zealand and other APEC countries signed a commitment to stabilize food exporters' trading environment[206]. Furthermore, New Zealand provided improved exporter tools, such as improving the trade barrier portal, providing international market updates, air freight support, webinars, trade shows, and events[207].

Fourth, New Zealand coordinated with International Organizations to ensure better global positioning. According to

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[203] " COVID-19: Economic Response Package ." *Beehive*, New Zealand Government, 15 Apr. 2020, www.beehive.govt.nz/feature/covid-19-economic-response-package.

[204] "NZ Trade Policy." *New Zealand Foreign Affairs and Trade*, New Zealand Government, www.mfat.govt.nz/en/trade/nz-trade-policy/.

[205] "Trade Recovery Strategy." *New Zealand Foreign Affairs and Trade*, New Zealand Government, 8 June 2020, www.mfat.govt.nz/en/trade/trade-recovery-strategy/trade-recovery-strategy-overview/.

[206] " COVID-19: Economic Response Package ." *Beehive*, New Zealand Government, 15 Apr. 2020, www.beehive.govt.nz/feature/covid-19-economic-response-package.

[207] "COVID-19 and Trade." *New Zealand Foreign Affairs and Trade*, New Zealand Government, 2020, www.mfat.govt.nz/en/trade/covid-19-and-trade/.

their trade recovery strategy [208], New Zealand believes that multilateral and plurilateral trade systems are the best method to increase international investors' confidence. New Zealand joined the new World Trade Organization Multiparty Interim Arbitration Arrangement, which enforces international trade among its members. New Zealand also kept having Free Trade Agreement and Regional Comprehensive Economic Partnership (RCEP) virtually with the EU to indicate that New Zealand is still open for businesses. New Zealand also is working with APEC to build global consensus and improve trade. Finally, New Zealand established multiple Concerted open plurilateral agreements that are open to other partners to join. Examples of open plurilateral agreements include The Digital Economy Partnership Agreement (DEPA) and the Agreement on Climate Change, Trade, and Sustainability (ACCTS).

In summary, multiple reasons could explain why investors felt the most confident in the New Zealand economy. A reason could be that New Zealand aimed to eliminate the virus instead of cushioning the blow. Another is that New Zealand offered a comprehensive economic plan that includes fiscal and monetary policies that helped the economy show recovery signs. Finally, New Zealand emphasized reviving global trade by establishing Trade Recovery Strategy and coordinating with international organizations such as WTO, Free Trade Agreement, and APEC.

H. Utilization of digital infrastructural capabilities.

According to the New South Whale's government, Digital infrastructure is the technology, equipment, and systems that connect people and communities with data, products, and services[209]. Every country's or region's economic, health, social, and technological advancement is unique. A successful response to COVID requires countries or regions to understand their position, apply digital infrastructure to utilize their strength, and cope with their weaknesses. Common themes among

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[208] " Trade Recovery Strategy." *New Zealand Foreign Affairs and Trade*, New Zealand Government, 8 June 2020, www.mfat.govt.nz/en/trade/trade-recovery-strategy/trade-recovery-strategy-overview/.

[209] " Public Digital Infrastructure ." *NSW Government*, State of New South Wales , 29 July 2020, www.digital.nsw.gov.au/transformation/public-digital-infrastructure.

selected countries or regions are using existing technological infrastructure and continuous improvement to their digital infrastructural capabilities during the COVID pandemic. The following section examines how the COVID response from their governments was targeted and resourceful.

South Korea provides some excellent examples of utilizing existing technology and space. Professor Larry Backer mentions in an article on automated Law and COVID-19 how South Korea utilized transaction tracking and mobile phone data to achieve an aggressive testing program[210]. Transaction and phone tracking work in South Korea more effectively than other countries because South Korea has the highest cashless transaction rate and one of the highest phone ownership rates. South Korea continues to improve its digital infrastructure. "We plan to focus our investment on building digital infrastructure, including the Data Dam project," Deputy Prime Minister and Finance Minister Hong Nam-Ki said. Data Dam project of 2025 aims to collect public and private information and integrate them using the 5G network and AI technology to fuel growth. The name "Data-Dam" is derived from Hover Dam, which helped the US overcome the great depression[211]. Data-Dam project is expected to help improve the economy, education, farming, and medicine in 2025 [212]. Overall, Artificial intelligence in South Korea helped them analyze data, monitor people in quarantine, watch over the lonely elders, and help the government make resourceful decisions during COVID-19[213]. More information on how South Korea's digital data management helped them respond to COVID could be found in the "South Korea Contact Tracing" section of this paper.

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[210] Backer, Larry. " Automated Law and COVID-19: Data Driven Measures With National Characteristics In China and Israel and the Future of the Law-Governance Complex ." *Law at the End of the Day*, 24 Mar. 2020, www.lcbackerblog.blogspot.com/2020/03/automated-law-and-covid-19-data-driven.html.

[211] Min-kyung, Jung. "S. Korea to Focus on Digital Infrastructure Investment, 'Data Dam' Project: Minister." *The Korea Herald*, Herald Corporation, 11 Sept. 2020, www.koreaherald.com/view.php?ud=20200911000726.

[212]   http://koreabizwire.com/s-korea-kicks-off-data-dam-project-to-fuel-growth-create-jobs-govt/168319

[213] Zhang, Frank. "South Korea Has Digital Infrastructure in Place to Deal with COVID-19." *Healthcare IT Review*, 18 Sept. 2020, www.healthcareitnews.com/video/emea/south-korea-has-digital-infrastructure-place-deal-covid-19.

Ezekiel Emanuel and others from the University of Pennsylvania share four ways Taiwan's digital infrastructure response was unique [214]. First, the Taiwan contact tracing system effectively registered all Taiwanese citizens using their unique medical id and online record. This factor alone helped register all people with pre-existing conditions. Second, when COVID hit, the Taiwanese government merged the health records with the immigration and customs database, improving accuracy and identifying high-risk people. Third, Ezekiel Emanuel's team analysis found that among 11 countries, no other country besides Taiwan had an effective real-time health record system[215]. Taiwanese health record management system and AI is more advanced and faster than most other countries. Fourth, Taiwan's rapid response and ability to track risk in real-time helped people become more cooperative and less distasteful to the idea of constant monitoring. In this case, Taiwan applied unique solutions that no one but Taiwan can do. Taiwan used its technological capabilities to effectively predict real-time cases, which helped it gain public trust and cooperation.

Canada also used existing digital health infrastructure to respond better to COVID. Canada prioritized "virtual care first" during the pandemic. Clinics were provided with virtual solutions that can help them work remotely. The online solutions go beyond being a platform to include guides, instructions, and resources to help clinics move to virtual care[216]. Canada also is working on improving its existing digital health infrastructure. National Research Council Canada announced a project with the Centre for Addiction and Mental Health (CAMH) that seeks to provide 24/7 mental health counseling for those affected by being isolated by COVID. The app should have a prototype in early 2021 and uses gaming technology to add more realism to virtual mental health counseling. The app should help those who suffered from

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[214] Emanuel, Ezekiel, et al. "Learning from Taiwan about Responding to Covid-19 — and Using Electronic Health Records." *STAT News*, STAT, 30 June 2020, www.statnews.com/2020/06/30/taiwan-lessons-fighting-covid-19-using-electronic-health-records/.

[215] Emanuel, Ezekiel, et al. "Learning from Taiwan about Responding to Covid-19 — and Using Electronic Health Records." *STAT News*, STAT, 30 June 2020, www.statnews.com/2020/06/30/taiwan-lessons-fighting-covid-19-using-electronic-health-records/.

[216] " Virtual Care Resources During COVID-19 ." *Canada Health Infoway*, www.infoway-inforoute.ca/en/resource-centre/virtual-care.

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loneliness or isolation due to COVID. Another project Canada National Research Council entered the testing phase in October 2020 is a one that uses contactless technology for better virtual care. Contactless technology uses sensors or cameras to identify a patent's temperature, heart rate, oxygen levels, and respiratory rate [217] . Canada's investment in digital health infrastructure is making Canada stronger against viral diseases in the future.

Australia and New Zealand also showed multiple examples of adapting and improving digital health infrastructural capabilities in multiple ways. First, Australia and New Zealand utilized existing traveling data to make better border control and management decisions. Second, both counties used Mathematical and theoretical modeling to predict COVID cases and achieve better contact tracing. Third, both New Zealand and Australia emphasized digital health and virtual care to decrease the pressure on HCWs. Finally, both Australia and New Zealand showed commitment to improving their digital health infrastructure.

In Australia, the government announced that they would allocate $796.5 million for "Digital Business Plan in their next four-year business plan." The Digital Business Plan includes four categories: The establishment of modern digital infrastructure, the reduction of digital regulatory barriers, the introduction of enterprise support for SMEs, and a more efficient electronic way to deal with the government [218] . Australia followed this announcement with another program, "Be Connected Program," to help Australians over 50 participate in the digital economy. To reduce trade barriers, Australia spent $11 million on the "Regtech Commercialization Initiative" to simplify the digital regulatory compliance and make it easier for SMEs to transfer online[219].

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[217] "COVID-19 Response: Digital Health and Analytics." *Government of Canada*, Canada, 2020, www.nrc.canada.ca/en/covid-19-response-digital-health-analytics

[218] Flammang , Eric. "Federal Budget 2020-21 & The Digital Economy." *William Buck*, William Buck , 24 Nov. 2020, www.williambuck.com/federal-budget-2020-21-the-digital-economy/.

[219] Flammang , Eric. "Federal Budget 2020-21 & The Digital Economy." *William Buck*, William Buck , 24 Nov. 2020, www.williambuck.com/federal-budget-2020-21-the-digital-economy/.

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In New Zealand, a recent International Data Corporation report[220] showed that 28% of CEOs find that building a stable technological infrastructure for their company is their number one priority. Of the same respondents, 38% think they will generate 38% of their revenue from digitally-enabled products and services. New Zealand does realize the potential of improved digital infrastructure. The technology sector in New Zealand is the third largest sector is the third-largest exporter, and has the fastest growth rate[221]. New Zealand also has the second-fastest fiber subscription growth rate in OECD[222]. New Zealanders can run their businesses anywhere, even in rural towns. Another digital infrastructure achievement in New Zealand is the first fully online passport renewal service. New Zealand continues to improve virtual government services to reduce the load on governmental facilities. According to Divina [223], New Zealand developed the Data Investment Framework (DIF) for a more efficient and consolidated approach to data infrastructure investments. DIF made it easier for New Zealanders to find information on one government page.

Overall, the digital infrastructure investment helped combat COVID in multiple ways: it improved the accuracy and efficiency of contact tracing. It also provided online services that lowered the pressure on HCWs and government facilities. Moreover, digital infrastructure helped governments manage data and use them in much more efficient ways. Finally, digital infrastructure helped ease trade barriers and enabled international investments, especially for SMEs.

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[220] Wingrove , Gary. "Australian CEOs Are Reorganising Their Priorities." *KPMG*, KPMG International Limited, 2020, home.kpmg/au/en/home/insights/2020/09/global-ceo-outlook-2020.html.

[221] Morgan, Sarah. " Technology Is Now New Zealand's Third Largest Export Sector ." *NZ Story*, New Zealand Story , 20 May 2019, www.nzstory.govt.nz/news/technology-is-now-new-zealands-third-largest-export-sector/.

[222] Paredes, Divina. "NZ Fast Becoming the Land of Digital Opportunities: IDC." *CIO*, IDG Communications, Inc., 10 Oct. 2020, www.cio.com/article/3508398/nz-fast-becoming-the-land-of-digital-opportunities-idc.html.

[223] Paredes, Divina. "NZ Fast Becoming the Land of Digital Opportunities: IDC." *CIO*, IDG Communications, Inc., 10 Oct. 2020, www.cio.com/article/3508398/nz-fast-becoming-the-land-of-digital-opportunities-idc.html.

6. Recommended Policies.

This section of the paper will provide policies that could help countries or regions suffering from a viral outbreak. Those policies will be based on the national or regional experiences and strategies examined in this article. The recommendations will be written in bullet points, followed by a brief explanation, reasons for selection, and other implementation concerns.

A. Length of the Response.

Before discussing the recommended policies, it is essential to discuss how long an excellent response to COVID takes:

Short Term: With cases surging to up to a thousand confirmed infections daily in the US, the incoming Biden Administration began debating whether they should apply another short-term lockdown[224]. Based on this analysis, there is no short-term solution for COVID. Biden COVID-19 advisor says U.S. lockdown of 4 to 6 weeks could control pandemic and revive the economy[225]. Unless the Biden Administration can apply a vaccination program that can completely eradicate COVID in the short term, it is highly advised that the Biden administration consider **medium-term solutions**.

Recent research by the University of Minnesota revealed that short-term lockdown might do more harm than good and could lead to devastating spikes[226]. This paper provides two examples to support the need for medium-term lockdown

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instead of a short term one. The first example is New Zealand. New Zealand applied a comprehensive and strict 102 days lockdown, one of the longest lockdowns globally[227]. After the lockdown was over, New Zealand still found it necessary to increase Auckland's lockdown to 12 more days[228]. In order to eliminate COVID, New Zealand had to apply a total of 114 days lockdown. During the lockdown, the New Zealand government applied a robust contact tracing system and required businesses to have QR codes at their doors[229]. Another example from this paper is Australia. Australia had to apply almost a 3-month total lockdown to fight COVID. After the lockdown was over, cases in the State of Victoria (Melbourne) began to increase. Australia had to apply a total of 111 days of lockdown to have better control over the virus[230]. It is also important to note that the US population is much bigger than New Zealand and Australia. The US also uses a federalism system, making applying a short-term solution to COVID uniformly even more impossible[231].

Another thing to note is that both New Zealand and Australia experienced a GDP contraction in the first and second quarters of 2020, Australia by 7% and New Zealand by 12.2%[232]. Lockdowns could hinder economic growth in the short run. Despite its short-term economic impact, a medium-term solution is still much better in the long run than a short-term solution. After 114 days, New Zealand announced that they

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eliminated COVID. New Zealand's medium-term strategy paid back in the long run. According to the Doing Business Report by The World Bank, New Zealand's strategy helped them eliminate COVID, which made them the most attractive place to invest in 2020. In summary, it is highly advised for states r regions suffering from COVID to consider medium- and long-term solutions because short-term lockdowns might be devastating.

Long Term: Taiwan and South Korea are great examples of successful long-term responses to COVID . Taiwan and South Korea were hit hard by SARS[233] or MERS-[234] , creating long-term solutions that helped them combat the current pandemic. Taiwan and South Korea continued improving their pandemic response protocols and digital infrastructure. Taiwan and South Korea are tough to imitate in the short term because it took both governments years of trial and error to achieve comprehensive responses. Both South Korea and Taiwan emphasized building AI-enhanced technology to improve digital tracking, data management, and contact tracing[235]. Both governments also applied early and comprehensive economic, social, and health responses that were already planned based on lessons learned from MERS and SARS. For example, both governments provided PPE to HCWs at the early stage of the pandemic because they cut exports to reach self-sufficiency[236]. Another example is the culture of mask-wearing, where people in South Korea and Taiwan began wearing masks in public as early as January[237]. Overall, sates and regions post-COVID needs to emphasize

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building their digital health infrastructure in the long term and raising awareness of personal health and hygiene.

B. Health Category: Contact Tracing

1. It is highly advised for a country suffering from COVID-19 to apply the New Zealand contact tracing strategy in the short term. NZ contact tracing app uses Q.R technology, which has proven to be more useful, accurate, and efficient than Bluetooth technology[238]. Having Q.R codes at businesses' doors is essential for this contact tracing system to work. The only downside of the NZ contact tracing app is that it requires constant user interference.

2. There must be a strong emphasis on data security and protecting people's privacy to increase the participation rate.

3. While reaching a 60% adoption rate among the population could be great, it is not necessary. An Adoption rate from 20% to 56% can significantly slow down the pandemic spread [239]. Instead, policymakers should focus on nudging people to use the contact tracing app through incentives, advertisements, and by raising awareness on how the app could help save lives.

4. In the long term, a better solution would be enhancing digital infrastructure and utilizing AI for even more accurate and efficient data management. States and regions like South Korea and Taiwan used border data, health records, GPS, and cashless payments to understand the virus spread and detect it[240]. Unfortunately, having a complex digital system capable of

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heavy data management is not an easy task, and it requires years of preparation and implementation.

5. Cybersecurity must be an integral part of the contact tracing app, especially in countries or regions that made the app optional. Enhancing app security could increase public trust in the application.

C. Protecting Healthcare Workers

Frontline HCWs are vital for a successful COVID response. Some of the notable strategies implemented to help HCWs include:

1. Apply a risk stratification system where people with fewer symptoms or asymptomatic are sent to care centers instead of emergency centers[241]. The mobilization of medical resources helped the selected countries respond better to COVID.

2. Taiwan applied two interesting (and relatively feasible) solutions to enhance the protection of Health care workers. The first is that every hospital is given a stock card to fill to prevent a PPE shortage. The second one divides HCWs and hospital staff into groups, preventing those groups from rotating shifts and wards for at least a month[242]. By doing so, hospitals can reduce the likelihood of an all-out hospital outbreak.

3. Standardized and strict cleaning measures, in addition to testing, monitoring, and quarantining HCWs when necessary.

4. States like Canada provided easy-to-access online guidelines for HCWs on how to prevent COVID spread. Canada also provided Public health ethics framework to help HCWs

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analyze and weight situations and options during stressful situations[243].

5. Improve the accessibility and interference of virtual care, then nudge people to use it.

6. Provide mental health resources and guidance for frontline workers.

D. Empowering the Voice of Science and Reason.

1. States and regions chosen in this particle sought to make sure that their responses are based on scientific research and data; it is imperative to prioritize scientists' opinions during a pandemic.

2. Provide a public physical and online platform for scientists to cast their opinions, recommendations, and concerns during the pandemic.

3. Include scientists in policymaking and ensure that their efforts are being recognized and endorsed nationally.

E. Aggressive Testing and Mask-Wearing.

1. According to the CDC, a mask can protect the wearer and those around them from COVID[244]. States and regions with successful experiences against COVID promoted mask-wearing or mandated it early in the pandemic.

2. If mask-wearing cannot be mandated, it is highly recommended to nudge people to wear a mask through advertising, promotions, and raising awareness.

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3. Aggressive testing helped the countries selected in this paper respond early and proactively to COVID. Improved testing capabilities were achieved by collaborating with private local media companies early in the pandemic.

F. Government Effectiveness; Centralization of decision making

1. Unify health scientists' voices under one umbrella, improving the government message's coherence, clarity, and speed.

2. Consider easing the check and balance principle during COVID and applying a system of executive federalism. Executive federalism in Australia helped them improved their response speed and efficiency. It also allowed scientists, minorities, and the indigenous population to voice their concerns and respond to the pandemic as efficiently as bigger states[245].

G. Transparent and Clear Communication

1. Transparency must extend to the communication of failures, uncertainty, and errors.

2. Apply daily briefings and extend the pandemic response communication to digital forms and social media.

3. Provide the public with a physical and online platform to cast their concerns in the government pandemic response, then address these concerns in the daily briefings. Engaging citizens in the conversation could increase their trust and awareness.

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4. Provide comprehensive economic and social response plans, then ensure constant monitoring and evaluation of the plans.

5. Follow Transparency International and other NGOs' guidance on how to improve transparency and prevent corruption during COVID[246].

H. International Coordination with the WHO

1. Follow the WHO health guidance on how to respond to COVID. The WHO successfully eradicated viruses like small box and Rinderpest virus[247]. Global international coordination and listening to scientists are shared among the countries that responded well to COVID.

I. Economy—Economic and Social support legislations & Policies

1. A solution to enrich the economy during a pandemic is to avoid lockdown. South Korea and Taiwan were able to maintain a low infection rates despite not having lockdowns[248]. However, those two places also applied a contact tracing system that utilized digital infrastructure capabilities that they only possess. Therefore, it is challenging for any country or region to imitate the South Korean and Taiwanese economic response models quickly.

2. Design a comprehensive economic plan that includes fiscal and monetary support to help those impacted by COVID the most.

3. Reduce global and virtual trade barriers on local businesses and SMEs.

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4. South Korea used a unique digital currency to help local businesses and ensure that the fiscal stimulus would not be hoarded.

5. Canada created a social safety net in the employment force and health care sectors. This made citizens less stressed about losing healthcare or jobs and more likely to stay home and follow scientists' guidelines.[249]

6. Australia applied for JobMaker and JobKeeper programs. JobKeeper helped businesses impacted by COVID, especially SMEs, pay employee salaries. JobMaker incentives businesses to hire adults aged 16-35[250].

7. To incentivize global investors, New Zealand applied multilateral and plurilateral trade systems and coordinated with international organizations[251]. As a result, New Zealand is the most favorable country to invest in, according to a Bloomberg survey of 700 global business leaders[252].

J. Utilization of digital infrastructural capabilities

1. Heavily invest in digital infrastructure because it will attract FDI and help create a better data management system that is more efficient and accurate.

7. Conclusion

This comparative analysis found that Australia, Canada, New Zealand, Taiwan, and South Korea responses to COVID required a set of health, political, and economic strategies. In

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health, contact tracing, healthcare workers' protection, endorsement of scientists, aggressive testing, and mask-wearing were shared among the selected countries. In government effectiveness, common themes included centralization of Decision-Making, transparency, international coordination with the World Health Organization. Finally, this analysis's chosen countries had comprehensive economic and social support plans that utilized or invested in digital infrastructure during the crisis.

The examination came with its fair share of challenges. A big challenge was choosing appropriate states and regions. The second was the fluidity of the global situation caused by the pandemic itself and the responses that followed. Therefore, it could be argued that this effort focused more on the short-term initial responses than the long-term impact these responses had. An area of improvement to the research would be to use annual assessments from the UN, the WTO, and the WHO to make a long-term comparative analysis to best responses to COVID. Understanding the long-term economic, social, and mental impact of COVID-19 takes more than an initial six month-period response. Another task for policymakers would be transposing the article's recommendation to local context, and adjusting to local capabilities. Imitating the experience of another state or region without recognizing the difference in capabilities will decrease the effectiveness of the response. Nonetheless, the examination undertaken here suggests at least the broad parameters of what may work and what remains a challenge when a state or region faces pandemic.

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