How was effective communication between New Zealand's leadership, healthcare system, and citizens related to the success of their COVID-19 elimination strategy?

Parisa Ansari
Anika Bhatia
William Choi
Fiona Davoudi
Vandya Goel
Minji Kim
Karin Liu
Mia Raimondi
Nethra Srinivasan
Nancy Zheng

(Leland High School, San Jose, USA)

Mrs. Sarkar

Abstract

The purpose of this paper is to provide in depth information and analysis regarding New Zealand's response to the COVID-19 epidemic and how their success was closely related to effective communication that occurred between their government, healthcare system, and citizens. We have found that New Zealand's leadership took the advice of their healthcare experts and acted quickly to mitigate the pandemic before it overwhelmed their hospital system. Constant communication between the healthcare system and government allowed for plans to adapt and fit the needs of the country as the pandemic evolved. The government was also honest and clear in their communication of plans to citizens, ensuring that mitigation plans were carried out to the fullest extent in order to protect vulnerable communities. Case numbers and fatality rates have reflected New Zealand's highly effective mitigation strategy, as there have been only 1,567 cases and 22 deaths as of August 2, 2020. Cases were evenly distributed among ethnic groups, genders, and geography. The elderly and other high risk groups experienced far lower case rates compared to other developed countries due to effective government plans. As a result of strict lockdowns lasting several weeks, New Zealand's economy has suffered. However, the government has allocated $50 billion to a COVID-19 Response and Recovery fund and has also set aside several billion dollars to help small businesses that suffered during the lockdown. Several New Zealand companies are currently working on vaccine development, with bio-bead technology and mRNA vaccines being explored. They hope to develop a highly effective vaccine rather than one that will be available immediately in order to protect their citizens from another outbreak of this pandemic in the future. As is evident from our findings, New Zealand has succeeded in eliminating the COVID-19 pandemic due to effective communication that allowed for practical mitigation plans to be developed and carried out across the country. We recommend that other countries look to New Zealand's strategy as a role model in order to develop more effective plans in eliminating this pandemic.

Introduction

On December 31, 2019, the COVID-19 disease outbreak was declared by Wuhan, China, after several patients were reported to have this new form of coronavirus caused by the SARS-CoV-2 virus. COVID-19 is a disease that affects the respiratory system of a person. It spreads through droplets from the nose or mouth when a person coughs or sneezes, and through fecal shedding. Some common symptoms are headaches, fevers, sudden loss of taste/smell, coughing, sore throats, chills, and muscle pain. These symptoms take within 14 days to develop and in rare cases, kidney failure and eventual death may occur. The coronaviruses are common in animals and rarely infect humans, but when they do, mild respiratory illnesses and colds can be caused (Sauer).

As the COVID-19 pandemic hit, some countries have taken immediate and effective action to fight the pandemic, resulting in a lower number of cases and an overall smoother approach to recovery. Among these countries includes New Zealand, an island country in

Oceania. As of August 2, 2020, New Zealand has 1,567 confirmed cases and only 22 deaths (Ministry of Health). To put this into perspective, the US has 4.8 million confirmed cases with 158,000 deaths. Even though New Zealand is much smaller and more isolated than the US, the government's strong response still led to a rather successful controlling of the disease. New Zealand's prime minister, Jacinda Ardern, was quick to put the country on level 4 lockdown three weeks after the first case arose, restricting people from interacting outside their homes. In addition to strict lockdowns, Ardern has maintained constant and clear communication with the people of New Zealand, using Facebook Live to give both comforting and realistic advice: she would tell her viewers of the frank probability that the lockdown would have to be in place for many weeks, as cases were expected to keep increasing and shared facts such as that SARS-CoV-2 can last for 72 hours on surfaces (Friedman). This direct communication and unity in the country have even led to 88% of the people stating that they have faith in their government to effectively fight the pandemic (Bremmer).

We chose to research New Zealand because of the way they chose to handle the pandemic quickly and effectively. We noticed that New Zealand's leadership, especially their Prime Minister, acted sooner and more aggressively than most countries. It was also evident that they had very low cases throughout the pandemic, prompting us to explore a possible link between leadership and successful mitigation in New Zealand. Analyzing how other countries dealt with the virus is important because it can help in setting the precedent and finding any successful courses of action. New Zealand's decisions and rules during the pandemic can be applied to many other countries in order to help the world deal with the virus in the safest way possible. We also looked into the amount of information available about the country in order to ensure we could provide a full, effective, and relevant analysis.

In this paper, we looked at the various aspects of how New Zealand has been impacted by the pandemic, and what they have done in response to it. Starting with infections and fatality rates, New Zealand has maintained strong unity between the government, the healthcare system, and the people, allowing them to effectively mitigate the pandemic, as can be seen by extremely low case numbers found through extensive testing. In terms of hospital resource use and future models, the country's national healthcare coverage in addition to strong elimination strategies imposed by a New Zealand public health expert has allowed the country to maintain enough resources and continue researching future plans such as online contact tracing and symptom tracking. In mitigating the pandemic, New Zealand used a four-level alert system, where each level called for stricter restrictions such as closing borders, closing all non-essential businesses, or canceling all gatherings or events, and residents' adherence to these levels essentially helped reduce cases quickly. While strict lockdowns have had an economic toll on New Zealand with the March quarter facing a 1.6% drop in GDP, Ardern's effective communication with the help of Health Minister David Clark of COVID-19 facts and New Zealand's valuable listening has allowed the country to start working towards a quick economic recovery in addition to researching and developing potential vaccines through the collaboration of the government and

multiple biotechnology companies. Although New Zealand's response to the pandemic had some downfalls, specifically in the drop in GDP and increase in unemployment, ultimately the government's effective, timely, and strict restrictions allowed the country to successfully reduce the number of cases and deaths, maintain enough resources, quickly plan towards recovering the economy, and develop treatments and vaccines.

Infections and Fatality Rates (Vandya Goel and Mia Raimondi)

New Zealand's first case of COVID-19 was confirmed on February 28, 2020, although border restrictions and other precautionary measures were in place before this (Ministry of Health). New Zealand first closed their borders on February 3, after a man in the Philippines first died of COVID-19. This was the first death outside of China, they then banned travel from China. After their first case, they started placing flight bans on Iran, South Korea, Italy and any other countries with quickly rising cases (Jones). At first this strict ban came as a surprise to New Zealand citizens, but after Prime Minister Jacinda Ardern quickly closed the borders to all non citizens and residents, she explained that the reason for this decision was to lock down early and eliminate the virus before it becomes widespread in New Zealand. Prime Minister Ardern followed the advice of the World Health Organization (WHO) and New Zealand's top epidemiologists who after examining China and South Korea recommended to implement strict COVID-19 protocol and travel bans to stop an influx of cases and community transmission. The first case was detected in a person in their 60's who had recently returned to New Zealand from Iran. After this initial case, the number of COVID-19 cases remained low in early March before rising rapidly in late March and peaking in early April with a maximum of about 90 cases per day. With strict mitigation efforts and swift action, cases dropped rapidly in mid April through May and COVID-19 was completely eliminated for a few weeks in June. Since then, only about one to two new cases occur each day, with none serious enough for hospitalization. In total, New Zealand has experienced 1,219 total cases of COVID-19 and only 22 deaths from COVID-19 (Ministry of Health). With a population of over 5 million people, far less than 1% of the population contracted the virus. Of that 1% only 2.2% of New Zealand's total cases are asymptomatic, meaning the patients show little to no symptoms of COVID-19 (Daadler). This is a relatively low percentage seeing that most other major Western countries have around 40% of their cases as asymptomatic.

In New Zealand, 8% of cases were in Maori, 5% were in Pacific Peoples, 14% were in Asians, 2% were in Middle Easterns, Latin Americans, or Africans, and 69% were in Europeans (Ministry of Health). This largely lines up with the ethnic distribution in New Zealand, so no one group was disproportionately affected. This is very different than in the US, where Black and Latinx populations are being infected at nearly 3 times the rate of white people and indigenous populations lack the resources needed to deal with their outbreaks (Oppel Jr. et. al). The equal breakdown in cases points to a highly effective government strategy that took into account all communities and supported each equitably. The majority of cases were in 20-69 year olds, with

just 6% in those 70 and older and 10% in those under 20, signifying that older populations were protected even further by New Zealand's mitigation plans (Ministry of Health). In contrast, many other countries had high infection and death rates in elderly populations, often due to outbreaks in nursing homes. In the US, over 92% of deaths from COVID-19 were in those 55 and over (Berezow). The District Health Boards (DHB) with the highest numbers of cases were Waitemata, Southern, Waikato, Auckland, Canterbury, and Counties Manukau. Waitemata had 237 overall cases, and Southern had 216 cases while the rest of the regions all had case numbers under 200 (Ministry of Health).

The New Zealand strain of SARS-CoV-2 originated in Wuhan, traveled to Iran, and was then transferred to Auckland, New Zealand through overseas travel (Daadler). The major strain in New Zealand is therefore unique and has 11 mutations that make it different from the original Wuhan strain. This made it hard to identify at first since its genome had differences from the official SARS-CoV-2 genome from Wuhan. Other strains of SARS-Cov-2 in New Zealand have come from the United States and the United Kingdom. Since 41% of New Zealand's cases are imported, 29% of their cases are import related and just 25% of the cases are locally acquired (epidemiologically linked) with the remaining 6% of their cases locally acquired with unknown sources, we can see that mitigation efforts implemented within communities were extremely successful (Ministry of Health).

New Zealand has done extensive testing with a total to date of 482,929 tests. On August 5, they used 5,020 tests and had a 2,906 test average in the preceding week (Ministry of Health). This was a key part in keeping case rates low and identifying what measures needed to be taken in which areas and when they needed to be enacted, further illustrating how communication between the healthcare system and government helped protect New Zealand's communities.

Efficient communication between New Zealand's healthcare system and government allowed for effective mitigation plans to be developed and communication between the government and citizens allowed those plans to be carried out to the fullest extent. This is evident in the extremely low number of cases and high number of tests that have been distributed across the population. It is also clear that New Zealand's government and healthcare system took into account the needs of different groups in their mitigation plans, seeing as cases were equally distributed among ethnic groups and elderly people accounted for only a small portion of cases. Most importantly, New Zealand had an early response to the rising cases of COVID-19, and as soon as cases started appearing outside of China, Prime Minister Ardern quickly followed the advice of scientists monitoring the spread of COVID-19 in China and closed the borders. In spite of having no new cases, scientists advised the prime minister to shut down early and avoid the widespread coronavirus across New Zealand, and it is clear through the limited number of cases in the country that she made the right decision, saving many lives and protecting her citizens. Overall, New Zealand's case and fatality rates indicate an extremely effective mitigation plan put together by the healthcare system and government, and followed by the community.

Hospital Resource Use and Future Models (Karin Liu and Nancy Zheng)

Use of hospital resources was one aspect where New Zealand demonstrated effective communication between their leadership, healthcare system, and citizens to successfully combat the novel coronavirus pandemic. Government action on PPE shortages as well as trust in public health experts' advice on implementing the elimination strategy were key factors in New Zealand's success. Following the 1938 Social Security Act, New Zealand's government moved forward with the goal of providing for their citizens' health care needs, providing services such as inpatient, outpatient, mental health, long-term care, and prescription drugs (Gauld). Thus, the healthcare system in New Zealand is a universal health coverage system, meaning that national insurance provides all New Zealand citizens with automatic healthcare coverage; 33 percent of the population additionally pays for private healthcare insurance. The healthcare system is kept in-check by the government, specifically the Ministry of Health department. National entities that cooperate with the Ministry of Health include: NZ Health Partnerships, the Health Research Council, and the Pharmaceutical Management Agency of New Zealand (Gauld). Seventy-five percent of New Zealand's healthcare system budget goes towards the 20 district health boards (DHBs), which are responsible for planning, purchasing, and providing health services at the local level.

Initial proposed models overestimated the need for COVID-19 resources in New Zealand hospitals (Ministry of Health NZ). In the event that the elimination strategy was unsuccessful, initial estimates stated that 2700 to 4000 patients would need ventilators, yet only 334 ventilators and 534 anaesthetic machines were available (Sharpe). The implementation of the level 4 lockdown and the success of the elimination strategy averted this situation. Furthermore, in late February, New Zealand reported a national total of only 173 ICU beds. The country repurposed high dependency care and gastroenterology unit beds, cardiac care unit beds with respirators, and bed spaces in occupational therapy wards and emergency departments to serve as ICU capacity beds with the progression of the pandemic; ultimately, on March 20, the Ministry of Health stated that New Zealand's hospitals reached a total of 563 restructured ICU capacity beds (Dillane & Knox). According to the NZ Herald, New Zealand must stay under around 24,000 COVID-19 infections at any one time to ensure the ICUs are not overwhelmed with COVID-19 patients. New Zealand has a total of 1,560 COVID-19 cases; thus, the national number of ICU capacity beds and ventilators were sufficient to meet critical needs of COVID-19 patients.

Initially, the New Zealand government followed World Health Organization's (WHO's) requirement for healthcare workers to only wear a basic surgical mask, a pair of basic goggles, a gown, and a double pair of gloves. However, these guidelines induced numerous healthcare workers to feel susceptible to COVID-19. An anonymous nurse from Burwood Hospital stated, "Staff are not being supplied with PPE to protect themselves in the 14 day incubation period of an asymptotic patient" (Canterbury DHB). Following a petition calling for the Ministry of Health to follow international PPE guidelines for all healthcare workers, ManufacturingNZ established a live national PPE register for any manufacturers that could assist in the production of PPE and

other equipment needed to fight against COVID-19. Some local businesses worked with affiliates in China to get a hold of bulk purchases of various PPE (Parker). As of April 18, the register already had 250 businesses contributing to the cause (Hogan). In April, the government declared $200 million for additional PPE purchases, ordered more imported PPE in the following weeks, and shifted to a national distribution system of face masks and other PPE (Walls). Healthcare workers in New Zealand are now required to have: a fit-checked N95 mask, goggles or face shield, an impervious gown, and gloves prior to dealing with COVID-19 patients.

As seen in the United States, failure to accommodate for necessities proposed by the healthcare system lead to devastating results, as many healthcare workers are not adequately equipped with masks, gloves, and gowns. As opposed to New Zealand's government action, President Trump accused healthcare workers of hoarding and wasting masks (Dosani), and failed to increase domestic production of PPE (other than ventilators) (Parker). Consequently, failure in reduction of cases is demonstrated from the Institute for Health Metrics and Evaluation (Institute for Health Metrics and Evaluation). Thus, the success of New Zealand in providing adequate PPE for healthcare workers can largely be credited to the effective communication between its government and healthcare system.

The Surveillance Plan (owned by the Ministry of Health) is part of New Zealand's overall response plan against COVID-19, and aims to provide more information about COVID-19 in New Zealand and evaluate the effectiveness of the country's response. According to a government-released document outlining the Surveillance Plan (May 2020), the "Health Intelligence Team in the Ministry of Health COVID-19 Response Hub, in consultation with the Office of the Director of Public Health, the Communicable Disease Team, the Population Health and Prevention Directorate, the Māori Insights Team, the Pacific Insights Team, and ESR" are in charge of managing the plan, and the Ministry of Health's COVID-19 Information Governance Group is in charge of governing the collected information and data (relating to COVID-19) to aid the country's response (Ministry of Health NZ). As NZ has reached a relatively steady trend of little or no cases daily, ongoing surveillance includes COVID-19 case reporting, SARS-CoV-2 diagnostic testing capability, and direct electronic notification of results from diagnostic laboratories to EpiSurv (a national notifiable disease database) and local Medical Officers of Health. These procedures allow for more extensive case investigation and detection, as well as contribute to strategies that enhance access to healthcare for vulnerable populations.

As part of their Surveillance Plan, New Zealand is also venturing out to utilize other forms of testing to obtain more information about the virus and track potential community spread of COVID-19. For example, the country is carrying out COVID-19 tests in wastewater to extend their tracing of the virus within communities. Development of serological SARS-CoV-2 antibody tests is also occurring in New Zealand, which may help to "identify previous infection and facilitate contact tracing and outbreak control" (Ministry of Health NZ). Additionally, COVID-19 molecular diagnostic testing (administered by risk-based prioritization) is being guided by the Ministry of Health, which will provide researchers with important data such as key

demographic characteristics. Furthermore, New Zealand released the "NZ COVID-19 Tracer" app on May 20. By scanning a QR code and signing in on the app, people are entered into the app's database; the app provides accessible information for healthcare workers (Koh). New Zealand is also urging citizens to log into flutracking.net, where they can track people with flu symptoms like fevers/coughs, which may also be symptoms of COVID-19. The data from this website has been helpful for healthcare workers combatting COVID-19 in recent times.

As part of their COVID-19 All of Government (AoG) response, New Zealand also set up a system in which all international arrivals are required a 14-day stay in a Managed Isolation Facility or Quarantine Facility. On days 3 and 12, COVID-19 tests will be taken; in order to be allowed to leave the facility on day-14, the day-12 test must be negative. When a case is confirmed, close interactions are alerted by contact tracers and are advised to isolate. On the other hand, the United States merely recommends the following to be done for 14 days after travel: staying 6 feet apart from others, wearing masks, washing hands, testing for COVID-19, and staying home (Centers for Disease Control and Prevention). Additionally, these guidelines are not mandatory, in contrast with the strict system of New Zealand's Managed Isolation or Quarantine Facility. Consequently, CDC models demonstrate a consistent increase of cases in the United States (Centers for Disease Control and Prevention), in comparison to the decreasing pattern of cases in New Zealand (Ministry of Health).

Effective March 23rd, New Zealand approached the pandemic carrying out the elimination strategy, working towards the absence of the infection with occasional outbreaks or imported cases provided that these cases were contained within a time period (Baker et. al). Proposed by public health expert Michael Baker, the strategy enforces strong measures at the start, rather than increasing action with increasing cases as New Zealand initially planned (New Scientist). Benefits to this method include fewer cases and early return to regular activities, but risks are also present as net economic benefits are difficult to estimate and disadvantaged populations are disproportionately affected (Baker et. al) The government decided to implement the elimination strategy. The government likely took Baker's advice due to his public health track record. "In the 1980s… [Baker] helped establish the world's first national needle exchange programme, which has meant that rates of HIV among injecting drug users in New Zealand are some of the lowest globally." Thus, past experience plays a role in effective communication between New Zealand's government and healthcare system.

Derived from the Ministry of Health, daily confirmed and probable cases in New Zealand demonstrate a trend of decrease after April 5, exhibiting the success of the elimination strategy (Ministry of Health). In contrast, U.S. physicians, scientists, and public health experts reported that the Trump administration neglected the healthcare force, spreading misinformation, and diluting the severity of the disease (Keshavan). An anonymous U.S. critical care physician states, "[m]any of us feel we've been put at risk by the ineptitude of leadership across the board". With ineffective communication between the leadership and healthcare system of the U.S., current models show a consistent increase of cases (Centers for Disease Control and Prevention). Thus,

New Zealand's success of the elimination strategy is largely credited to effective communication between their government and healthcare system. International-relations scholar at Victoria University of Wellington and former Defense Department official Van Jackson states that "'[New Zealand prime minister Jacinda Ardern] doesn't peddle in misinformation; she doesn't blame-shift; she tries to manage everyone's expectations at the same time [as] she offers reassuring notes,'… The success [is] also the product of an impressive collective effort by public-health institutions, opposition politicians, and New Zealanders as a whole, who have largely abided by social-distancing restrictions" (Friedman). Therefore, due to New Zealand's successful elimination strategy, future models will likely utilize similar mitigation tactics, along with increased surveillance, research, and development.

Mitigation Efforts (Anika Bhatia and Nethra Srinivasan)

Mitigation is a crucial part of the strategic response against COVID-19 and can harm society if not done correctly. New Zealand was quick to start working to protect its citizens from the pandemic. They started with an influenza epidemic plan as a baseline for learning from the past through enforcing physical distancing, increased hygiene, testing, and case detections (Baker et. al 20).

NZ looked through many different strategies to find which one would work most effectively. They first started with a suppression strategy. This included intense border control, widespread contact tracing, and lots of testing. This strategy was implemented to gain time for NZ in which they could analyze and learn from other countries. The strategy would also be used to buy time for developing treatments and vaccines.

By mid-March, no major change was seen, so NZ changed to a more extreme measure that would stop the curve. The used an elimination strategy that entails actions to exclude the virus and its ways of transmission, decreasing case numbers while protecting the vulnerable. Instead of aiming to flatten the curve, New Zealand was going to obliterate it. Even though the elimination strategy has big risks like economic and social costs as detailed in the next section, the alternative is even more disastrous (Witton 20).

On March 19, as part of the elimination strategy, New Zealand closed its borders, banning all inbound travel with the exception of returning citizens and some essential health workers (Taylor 20). These declarations were made by the Minister of Civil Defence Hon Peeni Henare in consultation with the Prime Minister Rt Hon Jacinda Ardern following advice from the Director of CDEM. There were some procedures put into place to manage the virus at the borders. They applied to any passengers that arrived internationally, from air or sea, the crew, and anyone who worked on the border (customs, shipping and port staff, cleaners, etc.) People arriving from the air were kept in a managed facility for a set period of time and were tested. Passengers who arrived from the sea were isolated on the vessel they arrived on or another onshore facility. Some passengers were allowed to self isolate somewhere else if their

application was accepted. Workers at the borders were urged to test if symptoms showed up and crews were requested to isolate and get tested if symptoms showed (Ministry of Health 20).

New Zealand entered an Alert level 3, named the "Restrict Policy" on March 23, which meant that there was a high risk the disease was not contained. The risk assessment found that community transmission might be happening and new clusters may emerge but they could be controlled through testing and contact tracing. Non-essential businesses were closed, inter-regional travel was highly limited, and all events and gatherings were canceled except for weddings, funerals, and tangihanga which had limits of up to 10 people (Taylor 20).

A State of National Emergency was declared due to COVID-19. It was in force between 12:21 pm on March 25, 2020 and 12:21 pm on Wednesday, May 23, 2020. The shutdowns then progressed into an Alert level 4 "Lockdown" dubbed the "Eliminate policy" 48 hours later on Wednesday, March 25, 2020 with only 102 recorded cases.

Prior to the lockdown being implemented, emergency text messages were sent to residents with a clear explanation of what the level 4 lockdown would entail: "This message is for all of New Zealand. We are depending on you," the message read. "Where you stay tonight is where you must stay from now on … it is likely that level 4 measures will stay in place for a number of weeks." (Taylor 20). This clear and honest communication between the society and the government to solidify expectations and having reparations for not following procedures lead to successful implementation.

The implementation of a level 4 lockdown meant that it was likely that the disease was not contained. Risk assessment for this level is that there are widespread outbreaks and new clusters. Under this policy, people were instructed to stay inside and only maintain contact with those they lived with. Citizens were prosecuted by the police for not following lockdown rules (Gledhill 20). Specifically, the reparations were NZ $4,000 or 6 months in jail (Gillespie 20). Though this method of enforcing lockdown is disputed, it made sure that people were following the rules to protect the vulnerable and keep cases low. Instead of attempting to flatten the curve, their goal was to eliminate it. Although the lockdown was extremely stringent - one of the severest in the world, the Prime Minister offered her citizens the hope, if not the promise, that the lockdown also would be short if they complied with the strictures; longer if they failed to comply (Parker 20).

New Zealand lifted some of its lockdown measures at 11.59 p.m. local time on Monday, April 27, 2020, moving back into the level 3 stage and allowing people to expand their social "bubbles" to reconnect with close family outside of their households. Residents are now allowed to travel around the country if necessary, but can "only move once, and in one direction." Some education and business have been allowed to resume.

COVID-19 Alert Level 2 came into force at 11:59 pm on Wednesday, May 13, 2020. This is the "Reduce" phase in which the disease is contained, but the risk of community transmission remains. Risk assessment includes isolated cluster outbreaks. Events, shopping malls, and businesses started to resume as normal, with 2 meters social distancing in public and

1-meter social distancing in workspaces. Individuals with COVID were encouraged to stay home.

COVID-19 Alert Level 1 also known as the “Prepare” phase was implemented at 11:59 pm on Monday, June 8, 2020 and is currently in place. This was placed when the disease was contained in New Zealand. Risk assessment is that COVID-19 is uncontrolled overseas and isolated household transmission could be happening in the country. There are some border entry measures to minimize the risk of entering COVID-19 cases. Facilities can reopen but must operate safely. Intensive testing and rapid contact tracing are continuing to occur. People are encouraged to maintain records to enable contact tracing. The continuous surveillance of SARS-CoV-2 from humans or animals is extremely important for pathogen control, especially since asymptomatically infected people, patients in incubation, or individuals recovered from COVID-19 may pose serious challenges for disease prevention and control (Chen et. al 20). There are many factors that we do not know yet, but New Zealand is one of the few countries that are keeping themselves updated to make the best choices for the people.

These decisions were based on data, new scientific knowledge about COVID-19, and information about the effectiveness of intervention measures in New Zealand and elsewhere, all of which are priorities to be considered to ensure the wellbeing of the people.

Many governments placed lockdowns, but only a few were successful - one of which is New Zealand’s. There are certain strategies that the New Zealand leadership took to ensure that the lockdown would be followed. In addition to clear communication outlining exactly what is allowed and what is prohibited during lockdowns and prosecuting perpetrators, Prime Minister Jacinda Ardern appealed to the people’s shared sense of civic purpose and the promise of a short duration through her regular Facebook Live chats. According to American political scientist Van Jackson, who lectures at New Zealand's Victoria University of Wellington, communicating is Ardern's "superpower." She created a comfortable atmosphere, sympathizing with families in isolation and “assuring children the tooth fairy is still on the job”. Especially during strict stay-at-home orders, she urged people to "be strong and be kind." This leadership style helped to maintain a sense of mutuality in society creating trust with the leader. In fact, collectivist societies around the world are faring better and more efficiently than individualist societies much like the U.S. Without trust from the people, regulations cannot be implemented and the virus cannot be eliminated. This unique method appeared to have received immense public support, specifically 80% approval, and an unexpectedly high level of compliance in New Zealand (Julie McCarthy 20).

Table 1
Visits to Public Gathering Sites During Lockdown in the U.S. and New Zealand (as a percent change from baseline visits)

Country/Date	Retail and recreation	Grocery and pharmacy	Parks	Transit stations	Workplaces
New Zealand- April 15	-88%	-36%	-76%	-86%	-73%
United States- April 15	-36%	-13%	-16%	-49%	-49%
New Zealand- April 18	-91%	-45%	-77%	-84%	-57%
United States- April 18	-45%	-15%	-20%	-47%	-33%

Source: Google COVID-19 Community Mobility Reports

The table above compares the rates of change in mobility in the US and in New Zealand. Both country's leaders have taken different paths to approach the people and enforce the lockdown. Clearly, New Zealand's citizens have shown a larger change, contributing to the significantly lower case count and death count compared to the U.S.

There was excellent communication within the medical system as well. New Zealand processed 8,000 tests a day and as soon as a person tested positive, the lab, nurse, or doctor would contact the medical officer of health. All testing and reporting results were given to the decision-makers so that they could analyze and work on the correct source of action.

NZ used vigilant surveillance such as sentinel surveillance and sewage testing to trace where the virus may be transmitted from. They looked over communities and if anyone tested positive their details were taken so that source could be identified and anyone close to the patient could also be tested for safety. In many cases, close contacts of the patients were tested and then retested, if any symptoms appeared, in order to decrease any risks. There was a COVID-19 expert working group that provided support and guidance to the Health Board. Some of the duties of the group include analyzing the information about the virus, modeling the spread of the disease, test results, and any new testing method.

Something interesting about the mitigation efforts in NZ is that healthy people are not forced to wear face coverings (Ministry of Health 20). Since the number of active cases as of July 30th is 24 cases, face masks are only required to be worn by those who show symptoms. Since, in the current state of the country, the need of wearing a face mask is not outweighed by the benefits, it is not required to wear one. However, if an increase in the transmission of the virus and its cases is seen in the future, this decision will be changed.

Economic Impacts (William Choi and Minji Kim)

When discussing the complications of a nation's future based on the implications of the coronavirus, the economic direction of that nation is often the frontrunner for conversation and controversy. With the economic sector for almost every country taking a hit and depreciating in value, one should evaluate the government's interaction with business and industry not through the initial predictions and forecasts, but through its actions and plans for eventual recovery.

As mentioned previously when discussing mitigation methods, New Zealand enforced four Alert Levels, detailing the extent of restrictions placed on the country during the pandemic.

Each Alert Level restricts several sectors of the economy, leading to drops in New Zealand's Gross Domestic Product (GDP). According to the International Monetary Fund (IMF), Alert Level 4, which is the highest level, requires schools and non-essential businesses to close and domestic flights and gatherings to be canceled (IMF), predicted to have a 37% reduction on the GDP, which equates to approximately $10 billion lost in four-and-a-half weeks. In Alert Level 4, the most impacted sectors of the economy include accommodation and food services (contributing 11% of its usual production) (Stannard et al.). Holistically, the GDP of New Zealand has already faced downfall, although less than other countries. In the March quarter, the largest fall in GDP in nearly 30 years occurred in New Zealand with a 1.6% fall (Stats NZ). On the other hand, the US faced a 4.8% drop in GDP—following a notable expansion streak—during the first quarter of 2020 and there was even a larger 32.9% drop from April to June (Cox). This already drastic drop in the US GDP compared to New Zealand's indicates greater economic stability and control led by New Zealand's government, which is allowing them to focus more on recovering from the pandemic's impact at an earlier time than other countries.

While strict government restrictions were beneficial for safety, it was not as much for the economy, especially in tourism. According to data collected for 2019, $16.2 billion (5.8%) of New Zealand's GDP came directly from tourism and New Zealand's foreign exchange earnings had 21% of its value coming from the industry. Along with the added value of indirect contributions of tourism ($11.2 billion), international tourism ($17.2 billion), and revenue from the goods and services tax (GST) of tourists ($3.8 billion), tourism contributes greatly to the GDP (New Zealand Tourism). However, due to strict border closures, daily departures remaining under 1,000 people starting in May 2020 (Stats NZ), and all travelers being required to quarantine for two weeks when entering New Zealand, its economy is bound to continue facing large declines. As of right now, New Zealand has $0.4 billion of its FY2020-21 budget set aside for recovering this industry. Continuing border closures may lead to "tens of millions of dollars" lost, but the government continues to consider options such as possibly re-accepting Chinese students into the country so that they can continue their studies. Either way, according to *Time*, the government's strict strategy helps New Zealand start focusing on economic recovery much earlier than other countries can (Gunia), proving the effectiveness of the country's administration of the lockdown. On the other hand, in the US, 2.8% (U.S. Department of Commerce) of the 2018 GDP came directly from tourism and travel and in total, approximately 7.8% (Knoema). With regards to the pandemic, the US may lose $505 billion from lack of travel. However, a report from August 6 does show signs of slow recovery. In the last week of July, $11.9 billion came from travel. Even though this indicates slow improvements in the economy, it is still much lower than in previous years (48% lower), showcasing how much more work the US has to improve its economy from the pandemic (U.S. Travel Association). To slowly recover, the US plans to allow more traveling with safer health requirements, continue educating the public on safety protocols, and continuing to make plans on how to recover and improve tourism (OECD).

Neither country has set very specific plans on how to recover tourism, but due to New Zealand's effective and strict elimination strategy, they are able to put more attention on recovery, rather than on reducing the number of cases and rebuilding the economy as the US has to.

In relation to tourism, one main concern is rising unemployment rates. In fact, 8.4% of workers in New Zealand were employed through the tourism industry in 2019 (New Zealand Tourism). As tourism is declining, this takes a rather large hit on unemployment; rates rose from 4.1% in the December 2019 quarter to 4.2% in the March 2020 quarter. However, by the June 2020 quarter, New Zealand's successful management of COVID-19 and focus on economic recovery has caused unemployment to drop again to 4% (Stats NZ). In response to those who have lost jobs, New Zealand includes plans to provide money for unemployed residents under their FY 2020-21 budget. According to the IMF, New Zealand plans on providing $14.9 billion for wage subsidies for 12 weeks and $3.1 billion has been set aside to provide "income relief payment" for unemployed people (IMF). Additionally, New Zealand has Job Seeker Support, ranging from providing $175.48 weekly to single 18-19-year-olds (capped at a weekly income,e of $341.00) to $428.06 weekly to married couples with children (capped at a weekly income of $702.00) (Work and Income). Similarly to New Zealand, many people in the US are also employed by the tourism industry—according to the U.S. Department of Commerce, in 2018, the tourism and travel industry provided around 7.8 million people with jobs. Holistically, in three months, unemployment increased from 6.2 million (3.8%) to 20.5 million (13%) with April facing a 14.4% rate, which is especially significant considering that before the pandemic, the US economy was doing rather well (Pew Research Center). To help with US citizens, the US has the Coronavirus Aid, Relief, and Economic Security (CARES) Act, costing approximately $2.2 trillion. The CARES Act is only a one-time payment, providing a maximum of $1,200 for each adult with an income under $99,000. For couples, it is required for them to have an income under $198,000 and each child (less than 17-years-old) is allowed to receive $500 (U.S. Department of the Treasury). Unlike New Zealand, the US has been consistently facing poor management of the pandemic, with less cooperation for social distancing and less unity among citizens and the government. Both countries have programs to relieve unemployment rates, but due to the poor management in the US, even more focus and money to recover from the pandemic is needed, showcasing how effective New Zealand's initial strong approach helped the country be much more effective in quickly working towards economic recovery.

Indigenous groups in New Zealand (the Maori) in particular have been severely affected by the restraints that COVID-19 has placed on the economy in terms of employment and overall well being. A study from the *Guardian* observing clumped populations of the indigenous communities within New Zealand revealed that these populations have been disproportionately affected by the virus; indigenous tribes such as the Maori have been subject to discrimination throughout history, suffering from cycles of alcoholism and a lack of education, accounting for the high unemployment rates (10.8%) facing these tribes (Ministry of Business, Innovation, and Employment). These already staggering figures have become exacerbated through COVID-19, as

one in five New Zealand natives reports unemployment, filing for unemployment benefits, or the inability to pay monthly dues among themselves or their family members. Studies of Maori populations report that they were more likely to experience economic consequences (job loss, unemployment benefits) and lack of medical care compared to European New Zealanders (Roy). Recent activism regarding the historic mistreatment of indigenous people—paralleling nationwide advocating for discriminated groups—has led to slow, but meaningful plans for the future to uplift such groups. New Zealand tourism minister Kelvin Davis announced a $50 million plan for regional events, some of which would undoubtedly go into tribal cultural events, one of the main interests for the indigenous people. Although other governments such as the US' have been controversial in regards to their initiatives to help such groups, which has been seen time and time again through the history of racial discrimination against minority groups such as blacks and latinos, New Zealand's leaders have prepared well for the long term to uplift local populations; this is comparative to the US' efforts to deal with such economic and opportunity disparity between ethnic groups, where failed quarantine policies have left minority communities with disparaging COVID-19 contraction rates. On the other hand, New Zealand's effective leadership has been circulating in recent news, where Prime Minister Ardern and her executives displayed their altruism through taking a 20% pay cut and introducing major steps to rejuvenate the economy; a new budget plan—valued at 17% of the GDP—has been introduced to keep unemployment rates at bay as the number of infected patients considerably reduces (McKeever).

As New Zealand continues to maintain its low COVID-19 case rates, a large amount of its focus is now going to recovering the economy and alleviating businesses of the pandemic's impacts. According to the IMF, New Zealand's FY2020-21 budget included a total of $62.1 billion set aside for fiscal measures; although not many details are set yet, $50 billion in total is to be provided to the COVID-19 Response and Recovery Fund. To support smaller businesses, New Zealand is planning on providing $5.2 billion to small businesses (50 or fewer employees), having the government take care of 80% of small and medium-sized enterprises' (SMEs) loan credit risks, and allocating $6.25 billion to SMEs with the Business Finance Guarantee Scheme. Moreover, hygiene and medical imports are temporarily free of tariffs to help support COVID-19 response. Another program, the COVID-19 Innovation Acceleration Fund, plans to innovate and alleviate the already lowering rates of COVID-19 victims by funding research-based projects that could provide any leverage against the virus, such as medical products that will detect or treat the virus, products for containment of the virus, or even rejuvenate circulation of goods that have been slowed due to the virus (Ministry of Business, Innovation, and Employment). On the other hand, to start recovering the economy from the pandemic, the US uses the previously mentioned CARES Act. However, as of right now, according to Bartik et al., the CARES Paycheck Protection Program (PPP) has around $349 billion, and if the businesses that stated they would sign up for the CARES PPP all took the maximum loan of "2.5 months of expenses," it would cost around $410 billion, which is much greater than what is available, proving the ineffectiveness of current US government plans to recover the economy compared to New

Zealand (Bartik et al.). Ultimately, while both countries have their own economic plans to alleviate the impacts of the pandemic, New Zealand has a greater focus on helping small businesses and has a more realistic approach to provide funds. Focusing on recovering small businesses is important because with much fewer employees and less funds, they need more assistance and access to greater relief funds. This is why many argue against the CARES Act PPP's current approach to providing funds, as it is mainly based on business' payrolls rather than how much assistance they actually need (MacBride). It is also beneficial to help SMEs because according to Oberlo, SMEs play a valuable role in improving economic growth globally. More than 90% of businesses are SMEs, so they help offer jobs, support innovations, and "[promote] sustainable industrialization" (Mohsin). In fact, the last two values are part of the United Nations' Sustainable Development Goals, making New Zealand more progressive and effective in economic plans. Overall, New Zealand's strong leadership during the strict lockdown may not have prevented a negative impact on the GDP, but it is their strong leadership through Jacinda Ardern, their Prime Minister, and prioritization of surviving the pandemic that is allowing the country to already work towards recovering its economy through strong fiscal measures, budget plans, and more.

Treatment and Vaccine Development (Parisa Ansari and Fiona Davoudi)

The need for an effective vaccine in New Zealand is proven by New Zealand's economy suffering from strict border restrictions that are needed to prevent another wave of infections. Since only a small fraction of the population got sick there is low herd immunity and New Zealand is depending on a vaccine to be developed to keep their citizens safe when the border opens again. In order to open the border soon, there needs to be an accessible vaccine and with the fear that other countries will get the vaccine well before New Zealand, the government needs to make sure they can produce their own vaccine. This is a plausible fear since in June 2019 Pharmac, the pharmaceutical management agency in New Zealand, could not secure enough flu vaccines because the northern hemisphere was already stocking up (Ussher). Pharmac is working now to reach out to other countries and suppliers in order to ensure that a vaccine is attainable (Pharmac).

In addition to Pharmac, New Zealand's government has outlined a COVID-19 vaccine strategy that enables the country to have access to a successful vaccine as soon as possible (Ministry of Business, Innovation, and Employment). The government set aside a total of $37 million and set up a task force consisting of the Ministry of Business, Innovation and Employment, the Ministry of Health, Medsafe, Pharmac, and the Ministry of Foreign Affairs and Trade. New Zealand has divided the $37 million so that $10 million goes to New Zealand research, $5 million for manufacturing, $15 million for international research, and $7 million to Gavi, the vaccine alliance. The New Zealand budget is about $7.67 per capita while the US's investment in the vaccine ($9 billion) is about $24. Although the US investment is significantly higher, one must take into account how the US is a global superpower and has the size and

power to invest a lot in various vaccine companies. Since New Zealand is a much smaller country their vaccine budget is reasonable since they don't need the same quantity of vaccines as the US does. New Zealand has also joined the COVAX pillar of Gavi which combines the efforts of Gavi, the World Health Organization (WHO), and the Coalition for Epidemic Preparedness Innovations (CEPI) to ensure the "rapid, fair and equitable access to COVID-19 vaccines worldwide." (WHO) This action supports the fact that the New Zealand government is driven to help in the vaccine process and cares that the world sticks together to combat this global pandemic. On the other hand, the US has announced its withdrawal from the WHO (Huang) and is not a part of COVAX. The US's refusal to partake in the global vaccine effort makes it seem like the US is only concerned with themselves, whereas New Zealand understands that the world must stick together to effectively end this pandemic. The government is ready to cooperate with companies and other countries on a vaccine by giving them money, which shows how New Zealand is proactive in dealing with problems.

There is already a strong biotech industry in New Zealand, but they still have to overcome some obstacles to obtain a vaccine. New Zealand needs to scale up its production capability, organize licensing arrangements that require main components of an international vaccine to be provided from off-shore, and obtain the right health accreditations to make a human vaccine (Daalder). Although New Zealand is not currently ready to produce a COVID-19 vaccine, the present collaboration between the government and private and international biotech companies will ensure that a vaccine is available in the future. New Zealand's government is helping ensure that companies in New Zealand have the capability to produce a vaccine by setting aside funding. In sum, New Zealand's four-part plan is to develop a national vaccine or help other countries, create a program to evaluate vaccines, build up production capability, and plan how to roll out the vaccine.

In regards to the effort to develop a vaccine, one Kiwi company, COVID-19 Vaccine Corporation (CVC) has stepped up to the plate. CVC is a collaboration by four Life Science New Zealand (LSNZ) members; Dr. Robert Feldman (global biotech expert), Dr. Andy Herbert (expert in pharmaceutical development and manufacturing), Tara Craven-Carpasso (biotech expert) and Helen Teale (global clinical trial management expertise) (Teale). LSNZ is a team of consultants with expertise in transforming life science opportunities into commercial reality. The CVC is not aiming to develop the first successful COVID-19 vaccine but aims for their developed vaccine to be better, with a high response rate and more cost-effective production. CVC aims to complete its first human Phase I trial by the end of 2021. The funding for the production of a vaccine comes from the Ministry of Business and Employment (MBIE) COVID-19 Innovation Acceleration Fund ($488K) and private investment ($1 million - from investors who also have the option to fund an additional $7 million to complete a clinical trial). MBIE is a government-based public agency which contributes to New Zealand's economic productivity, and the fact that this agency is contributing to CVC shows that the government is supportive of the research being done for a vaccine. CVC will use New Zealand based expertise

and resources wherever possible in order to create a cost-effective vaccine. For example, CVC is collaborating with a New Zealand innovation agency, Callaghan Innovation, specifically the Bioprocessing and Fermentation group. The Callaghan Innovation group is using its bioprocessing expertise and specialist equipment in order to help CVC develop fermentation protocols for the production of a vaccine (CVC). Additionally, the vaccine will be created using a unique New Zealand developed bio-bead technology, and no traditional egg-culture or animal cells will be used in its manufacture (Scoop).

The bio-bead technology was developed by Polybatics in 2009 at Massey University in New Zealand (McNabb). The beads are made of polyhydroxyalkanoate (PHA, polyester) which is a biodegradable material that is made by certain bacteria. In *Ralstonia eutropha*, PhaC, a type of PHA synthase, combines (R)-3-hydroxybutyryl-CoA monomers into poly(3-hydroxybutyrate) (PHB) which is a type of PHA granule. The PHB granule is a hydrophobic polyester core that has an outer layer of proteins, including PhaC and PhaP proteins. Other proteins of interest such as the SARS-CoV-2 spike protein can be attached to the PhaC and PhaP proteins on the PHB granule to create a vaccine.

The phaCAB genes from *R. eutropha* can be expressed in *E. coli*, *L. lactis*, or other bacteria to produce PHB beads. Unfortunately, *E. coli* and other gram-negative bacteria cannot be used to create bio-beads for vaccines because of the lipopolysaccharide (LPS) endotoxins in their outer membranes (Draper). CVC plans to attach the receptor-binding domain of the SARS-CoV-2 spike protein and various T cell epitopes in order to induce antibodies and a cytotoxic immune response. Collaboration with Ardigen makes it possible to use artificial intelligence to select viral epitopes that will best boost the immune response, which will also result in less time needed to design the vaccine (CVC). Having both the spike protein and T cell epitope will induce a humoral and cellular immune response which should be more effective than vaccines that only create antibodies.

In contrast to CVC's bio-bead vaccine, Moderna, the biotech company leading in the COVID-19 vaccine effort, is using an mRNA vaccine. The mRNA vaccine works by injecting mRNA that codes for the spike protein into human cells that produce the protein and displays it so that the immune system can recognize the spike protein and create antibodies (Moderna). The bio-bead vaccine is different from the mRNA vaccine since the spike protein is already on the vaccine and doesn't have to be produced in the human and the bio-bead has the T cell epitopes as well. Another positive to the bio bead is that the bead resembles a virus and can be easily recognized by the immune system.

The surplus of collaboration with other biotech companies has allowed for CVC to continue refining their methods for making the vaccine. Since New Zealanders take pride in their country and work together, CVC is able to receive support from the government and other investors to ensure they have enough money to develop their vaccine. Sticking with CVC's goal to create a reliable vaccine, they are still learning from other vaccines' clinical trials in order to create a great bio-bead vaccine in the near future.

As far as the treatment of COVID-19 is concerned, antiviral therapies such as lopinavir–ritonavir (HIV antiviral), Koletra, and remdesivir are undergoing evaluation, and the role of anti-cytokine therapies such as tocilizumab for severe infections is under exploration. Hospitals have been practicing social distancing measures, quarantine, and visitor limitations. To make up for the lack of interaction available to patients, hospitals have facilitated video and telephone contact. Furthermore, trials to find potential treatments for coronavirus, including giving frontline healthcare workers and those with coronavirus a variety of antiviral drugs, have been launched in New Zealand. At first, anti-malaria drug hydroxychloroquine (HCQ) was going to be tested. However, due to the lack of evidence surrounding the efficacy of HCQ, New Zealand has decided to abandon the use of this controversial drug in the clinical trials (Deguara). The Medical Research Institute of New Zealand will lead three clinical trials testing a variety of drugs which have gained attention for their potential use or to see which treatment - or combination of treatments - would reduce the risk of death or the need of ventilator support among Covid-19 patients (Martin). 2 of 3 trials are already underway, including one involving between 4000 and 6000 patients admitted to intensive care units worldwide with COVID-19-related pneumonia. Another similar clinical trial, led by Middlemore Hospital clinical microbiologist and infectious diseases physician Dr. Susan Morpeth would test the use of those same antivirals in people unwell enough to need hospital admission, but not intensive care support. The second trial - which began just this week - will see patients in the community who have tested positive for Covid-19, but do not require hospital treatment. Patients would be given either the drug or a placebo, and have their symptoms monitored for 28 days. The drug could also be used as a potential preventative treatment among healthcare workers, in a third trial, which is not yet underway. As these clinical trials progress, more information is being found on the efficacy of various drugs, and New Zealand’s approach for the treatment of COVID-19 is being further developed.

Conclusion

As is abundantly evident, New Zealand has had a very successful outcome for the coronavirus pandemic. Effective communication between New Zealand's leadership, healthcare system, and citizens has thus far resulted in the success of their elimination strategy.

New Zealand’s government quickly worked alongside their scientists and advisors to help protect all its citizens, regardless of gender, status, or race. This is clearly shown by the fairly even number of cases among different groups in New Zealand. By enforcing a strict lockdown from the very first reported case, the virus did not have a drastic overall impact on the population and cases have dramatically decreased down to just 1 or 2 new cases per day over the last few weeks. New Zealand’s government prioritized the needs of its citizens and strictly followed the advice of medical professionals to combat COVID-19 and that is clear based on its low overall number of cases and fatality rates.

The Ministry of Health, along with the rest of the New Zealand government, values the research of scientists, enabling the general public to trust their decision of combating the COVID-19 pandemic in the way that they proposed. Unlike initial models that overestimated the need for resources, the healthcare system was not overwhelmed with COVID-19 patients, due to the success of the elimination strategy. It is likely that the country will resort to similar tactics if a second wave hits, along with increased surveillance and extensive research and development. Evident in examples such as the government's response to healthcare workers' PPE concerns and the citizens' cooperation with the contact-/symptom-tracing systems, a major facet of New Zealand's successful COVID-19 efforts was the effective communication between the healthcare system, government, and citizens.

Mitigation was particularly successful as a result of communication between the leadership, healthcare facilities, and the people. The leadership took control of the situation by communicating with healthcare to start rapid testing and contact tracing. They also imposed strict lockdown, outlining detailed procedures for the people to follow without doubts. Through placing repercussions for not following lockdown and gaining the trust of the people, the New Zealand government was able to ensure that people would follow the guidelines. This resulted in a very successful response that protected the lives of thousands of people.

Due to strict lockdown, the economy has been facing many downfalls. However, the strict restrictions the government imposed has allowed New Zealand to have limited cases and deaths. This has essentially allowed the country to start focusing more on how to recover the economy. New Zealand has set aside billions of dollars just for COVID-19 Recovery and Response in addition to billions being funded towards smaller businesses and also those who suffered economically from the pandemic. The country's next step during this pandemic is to essentially keep their cases low and start working towards an expanding economy again by specifying how they are exactly going to distribute their COVID-19-specific funds. Communicating how New Zealand will handle this year's budget essentially allows its government to continue gaining its people's trust and prospering as a united country.

When experts began mentioning how essential a vaccine is in order to return to normal, New Zealand's government stepped forward with funding to help the vaccine project. The government is collaborating with private companies like CVC who are also working with various other companies to get as much information as they can. The open collaboration between scientists and government officials in New Zealand allows for a lot of communication and the government can make educated decisions on reopening their economy based on how the vaccine is coming along. Once a vaccine does become available to New Zealand, the immense cooperation between government and biotech companies will allow for an efficient distribution of the vaccine across New Zealand.

New Zealand's response to COVID-19 was effective since its leaders listened to the scientists who knew how a pandemic would play out. New Zealand wasted no time in responding to the outbreak and implemented an elimination method with strict lockdown while other

countries spent valuable time debating what to do, ultimately costing lives. New Zealand also took the novel approach of getting the public to trust their decisions, which resulted in plans implemented in reality. Following New Zealand's lead, other countries like the US and Italy, who responded poorly to the outbreak, can identify an effective action plan against any new pandemics. COVID-19 was, in a way, a test to see how leaders and their people can respond to a world crisis. By reflecting on what strategies worked or did not work, we can more effectively prepare for future global pandemics that will inevitably occur.

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