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Reaching Zero:
New Zealand's Strategy in the Fight Against COVID-19

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> "Elimination is not a point in time, it is a sustained effort".[24]
>
> **Jacinda Ardern**
> Prime Minister, New Zealand

Insights

New Zealand has been timely and decisive in their decision making and has been quick to adapt to new cases.

Many different geographic, demographic, political and socioeconomic factors continue to play a role in New Zealand's COVID-19 strategy.

Geographic and demographic comparisons between New Zealand, Ireland, USA, Brazil, Italy and Sweden do not reveal consistent patterns when it comes to levels of disease control.

These differences lead us to evaluate the stringency and effectiveness of specific measures implemented in these same countries.

While specific measures had an overall positive effective in some countries, similar measures in other countries seemed to have no effect.

It is clear that New Zealand has achieved something special with their cohesive and unified approach.

Their strategy strikes a balance between public health, science and research and economics and has, for the most part, managed to keep their COVID-19 strategy free from politics.

New Zealand has shown that a balance between these things is possible and necessary; but not necessarily easy.

Painting a Picture of New Zealand's Success

In just over one hundred days, New Zealand (NZ) has done what many countries dream of doing – reach zero cases of COVID-19. With global cases continuing to rise, this has left many asking, what has NZ done differently? We explore the factors involved in NZ's success and their strategies for the management of new cases. We also begin the complicated process of analyzing the mixed successes of six countries.

What we would have hoped to be more like a paint-by-numbers is, in actuality, a masterpiece. Much of what NZ has done has been timely, unwavering and reflective of the changes in their number of COVID-19 cases. Starting on February 3rd, 2020, before any cases were reported, NZ joined a handful of countries in implementing a travel ban on travellers coming from high-risk regions. Their first case appeared over three weeks later; a traveller who was returning to NZ from Iran via Indonesia.[1] Not perfect, but in a world that has become increasingly interconnected, would we ever imagine a travel ban to be? NZ's travel ban gave them three weeks of no cases and a window of opportunity when it came to planning. Late March, a travel ban on travellers from all countries was implemented; the country had only 28 cases.[2]

Other countries who also imposed early travel bans, such as the United States and Italy, did so only after cases had already appeared – raising concerns over the effectiveness of the travel ban.[3] The effectiveness of travel bans in general is widely disputed, however some experts agree that, when implemented before local transmission occurs, they do have the potential to be effective.[3] In addition to being correctly timed, a travel ban also needs to be strict; a decision not made lightly. The early travel "ban" in the United States for example, only required travellers who had been to a high-risk region in the last 14 days to self-quarantine. This relied heavily on travellers voluntarily disclosing their travel history and following through with the quarantine themselves.[3] A full ban on travellers from high-risk regions was not implemented until early March, when the United States already had over 100 cases. A travel ban on all travellers has yet to be implemented.[1]

Other key steps outlined in Exhibit 1, were well timed transitions from each stage, or alert level, in a four-stage plan – a plan that has been commended for it's logical and clear implementation and cultural appropriateness.[2]

A TIMELINE OF EVENTS DURING COVID-19

NEW ZEALAND

February 3rd, 2020
Travel ban implemented for travelers coming from China directly

February 28th, 2020
First confirmed case of COVID-19

March 4th, 2020
First case of local transmission; total of 3 cases

March 19th, 2020
A full travel ban for all travelers begins (except for citizens and residents); total of 28 cases

March 25th, 2020
Lock down, stage 4 begins and there is a live Facebook stream from the Prime Minister's home; total of 102 cases

April 27th, 2020
After more than four weeks, lock down is moved to stage three; only one confirmed new case; total of 1122 cases

May 13th, 2020
As the number of community cases continues to decline, the country moves into stage two; three days with no cases; total of 1149

May 20th, 2020
Ministry of health releases a contact tracing app

May 22nd, 2020
One confirmed case marks the beginning of a 23 day streak with zero cases; total of 1154 confirmed cases and 22 deaths.

June 8th, 2020
The country moves to stage 1 and continues with strict border restrictions

June 9th, 2020
'Unite for Recovery' site launch

June 16th, 2020
Two new cases reported; arrivals from the United Kingdom

June 22nd, 2020
Seven new cases reported since June 16th; arrivals from India and Australia total of 1163 confirmed cases; number of deaths remains at 22.

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Exhibit 1. Timeline of events in New Zealand during COVID-19.[1–4]

Stages range from alert level four, which is implemented during a period of widespread outbreak (according to NZ this meant 102 cases), to stage one, NZ's current stage at zero new cases, which is implemented with the risk of isolated household transmission only. Stage four measures included strict travel restrictions, stay-at-home measures, reprioritization of healthcare services, and widespread closures, while stage one currently lowers most restrictions but continues to practice intensive testing, rapid contact tracing and strict border control.[5]

> "This message is for all of New Zealand. We are depending on you. Follow the rules and STAY HOME. Act as if you have Covid-19. This will save lives. Remember:
> Where you stay tonight is where YOU MUST stay from now on
> You must only be in physical contact with those you are living withIt is likely level 4 measures will stay in place for a number of weeks. Let's all do our bit to unite against Covid-19. Kia Kaha."[6]
>
> **New Zealand Civil Defence Alert**
> Sent March 25th, 2020

On June 16th, 2020, the confirmation of two new cases ended a 23-day streak.[7] The arrival of new cases was inevitable and was even predicted by the Prime Minister herself. Though, just how soon these cases appeared and the circumstances in which they presented likely was not. As per the normal protocol for returning citizens and residents, the two travellers, who had returned from the United Kingdom on June 6th, were sent directly into managed quarantine at one of many government facilities.[7] On June 13th, 2020, the pair were allowed to leave quarantine early to visit a dying parent. Problems arose when it was discovered the two had been allowed to leave without being tested and subsequently, tested positive days later. It was further identified that this was not an isolated incidence and that other travelers had also been allowed to leave early on compassionate grounds without being tested.[7] In response, the government was quick to admit to the failings and reassure its citizens. They quickly responded with increased testing, detailed contact tracing and new protocols that involved more stringent measures for quarantine; new arrivals will now be tested twice, on day three and day twelve, prior to being released. The current situation in NZ may no longer be one with zero cases, but nonetheless, illustrates NZ's ability to adapt and listen to expert advice.[7]

Managing a pandemic is not a simple task. There are a lot of factors that play into a country's ability to manage disease transmission and NZ's isolated geography, small and spread out population, reasonably coherent public health system, good economy, strong leadership and overall sense of unity are all things that are not so easily recreated or found in combination (Exhibit 2).

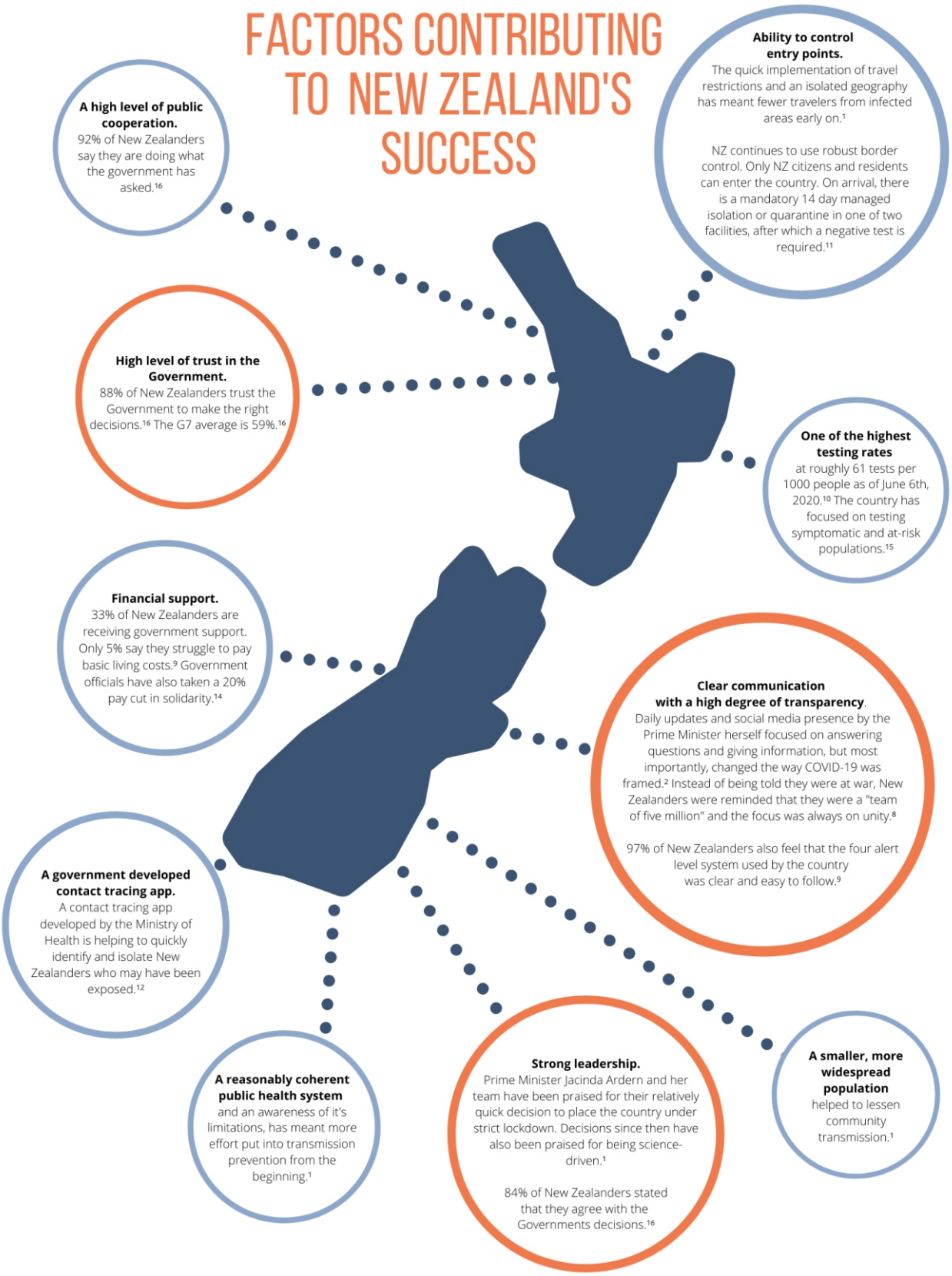


Exhibit 2: Factors contributing to New Zealand's success.

> "I always understood the importance of complying…The government was really good at managing people's expectations — we were told it would take at least two weeks for signs that the lockdown was having an impact on the numbers. This made the purpose of the lockdown easy to understand and accept...The New Zealand government was really transparent about what each lockdown level meant, and it wasn't afraid to redefine or clarify in more detail as the situation evolved…Most New Zealanders can verbalize the government's response to Covid-19, while the same can't be said for other countries because the response has been muddled and indecisive."[2]

Christine Nam
Wellington, New Zealand Resident

Can't We All Just Be Like New Zealand?

While there are few countries that share some of NZ's geographic and demographic characteristics, the ones that do have not shown a similar level of disease control (Exhibit 3). For example, Ireland, while not as isolated, is also an island nation and has a similar total population; and yet, it has over twenty times the amount of COVID-19 cases and over 77 times more COVID-19 related deaths.[17,18] New Zealand also has twice as many residents over 65 years of age, an age group often associated with the highest risk of developing more serious complications.[19]

	New Zealand	Ireland	USA	Brazil	Italy	Sweden
Total confirmed COVID-19 cases	1156	25,303	2,079,592	867,264	236,989	51,614
Total COVID-19 deaths	22	1706	115,484	43,332	34,345	4,874
Population (millions)	4.8	4.8	326.7	209.5	60.4	10.2
Population over 65 years of age (%)	57	19	16	9	23	20
COVID-19 cases per 1 million population	240	5124	6283	4082	3920	5111
Population density (people/km^2)	18	71	36	25	205	25
Densest city	Auckland	Dublin	New York	Sao Paulo	Naples	Stockholm
City with most COVID-19 cases	Auckland	Dublin	New York	Sao Paulo	Milan	Stockholm

Exhibit 3: Total population, population over 65, population density, densest city, total COVID-19 cases, total COVID-19 deaths, total COVID-19 cases per one million population and city with the most COVID-19 cases. COVID-19 related values are as of June 16th, 2020.[17,18]

However, Ireland also has a population density nearly four times that of NZ, and for almost all countries included in this analysis, population density seems to play a role. For example, every country, with the exception of Italy, has reported the highest number of cases in the city with the highest population density. However, this distinction is further muddled by the fact that total population density for each country does not necessarily correlate with a higher number of cases. For example, Italy has the highest population density out of all countries analyzed but does not have the highest number of cases per one million population.[17,18] Of course, the assumption can be made that controlling the spread of disease in a pandemic is not made any easier for countries with larger, denser populations.

Although NZ's current situation is captured alongside very ideal circumstances, there may be more we can take away from their success. It seems geographic and demographic barriers alone are not enough to predict success. Perhaps what makes NZ, and other relatively successful countries, most effective lies with specific measures they have taken. Afterall, aren't other countries fully capable of implementing these measures themselves?

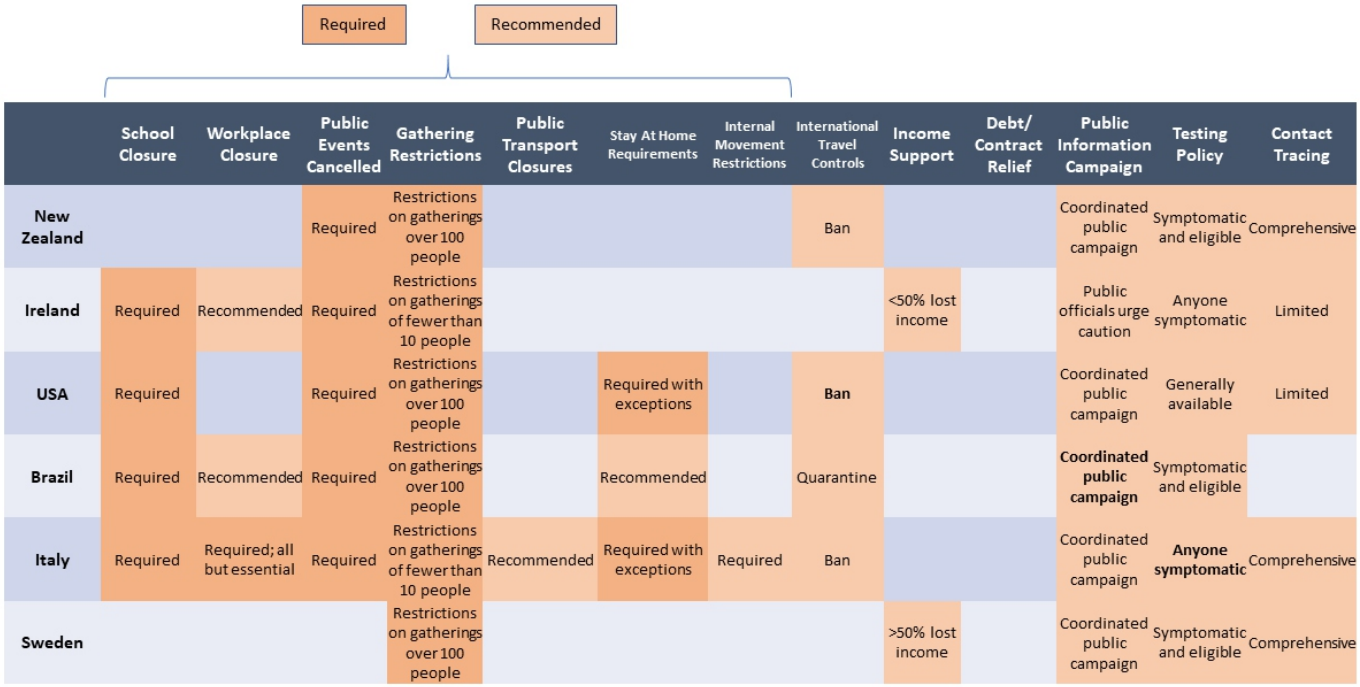
On Working More Effectively

Data provided by Hale et al. (2020) at the Blavatnik School of Government at Oxford University, provides a comprehensive look at the strategies that countries have adopted over the course of the pandemic.[20] Specific measures that were recorded include school closures, workplace closures, public event cancellations, gathering restrictions, public transport closures, stay-at-home requirements, internal movement restrictions, international travel controls, income support, debt/contract relief, public information campaign, testing policy and contact tracing. Other more economic measures were not included in this analysis as this dataset is not yet complete.[20]

Exhibit 4 through to Exhibit 8 shows the specific measures taken by New Zealand, Ireland, USA, Brazil, Italy and Sweden monthly, from February 15th, 2020 to June 8th, 2020. As of February 15th, measures for most countries were few and far between, with only a few countries implementing travel restrictions, public information campaigns, testing policies or contact tracing. For all six countries, most measures were adopted between March 15th and April 15th, which could be attributed to the growing number of cases outside higher-risk regions and also, the declaration of global pandemic by the World Health Organization on March 11th.[21] This time period makes for an interesting discussion, as almost all countries were implementing very similar measures, with the exception of Sweden, yet the overall effectiveness of these measures seems widely varied.

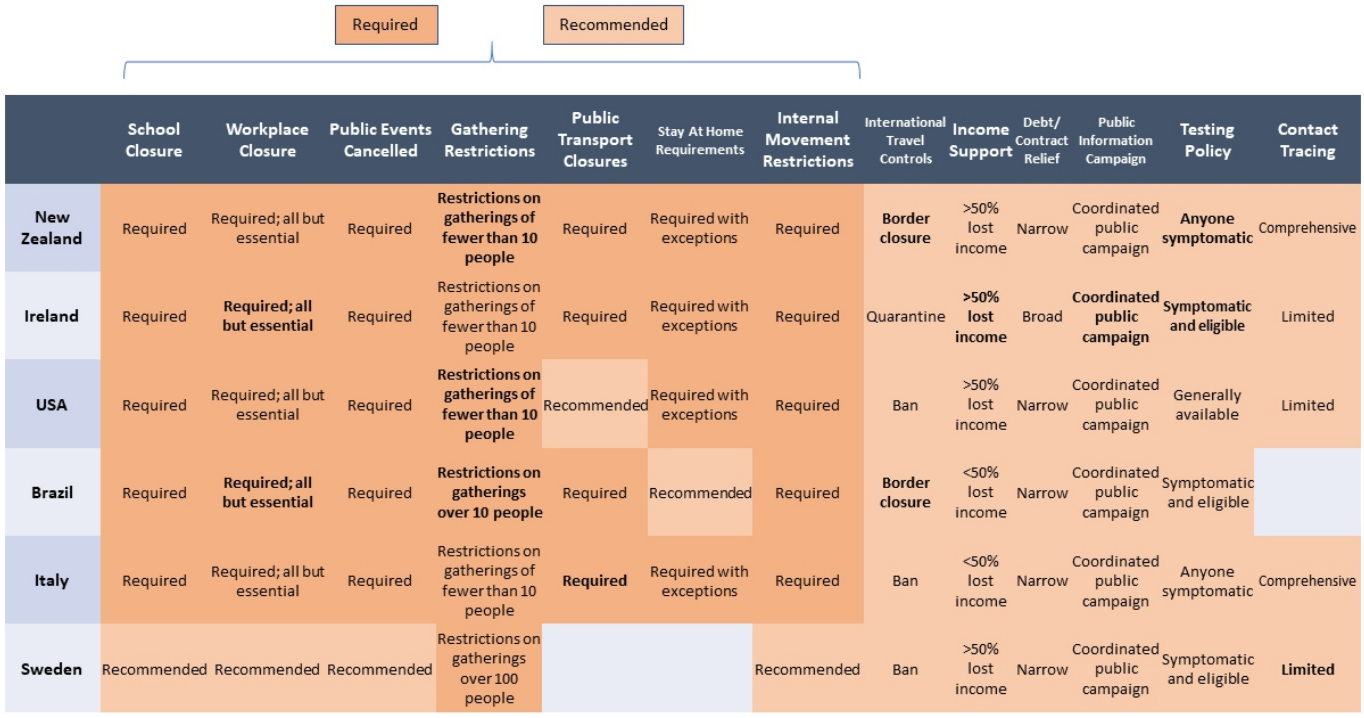
	School Closure	Workplace Closure	Public Events Cancelled	Gathering Restrictions	Public Transport Closures	Stay At Home Requirements	Internal Movement Restrictions	International Travel Controls	Income Support	Debt/ Contract Relief	Public Information Campaign	Testing Policy	Contact Tracing
New Zealand								Ban			Coordinated public campaign		
Ireland											Public officials urge caution		
USA								Quarantine					Limited
Brazil											Public officials urge caution	Symptomatic and eligible	
Italy								Ban			Coordinated public campaign	Symptomatic and eligible	Comprehensive
Sweden												Symptomatic and eligible	Comprehensive

Exhibit 4: Stringency measures on February 15th, 2020.[20]



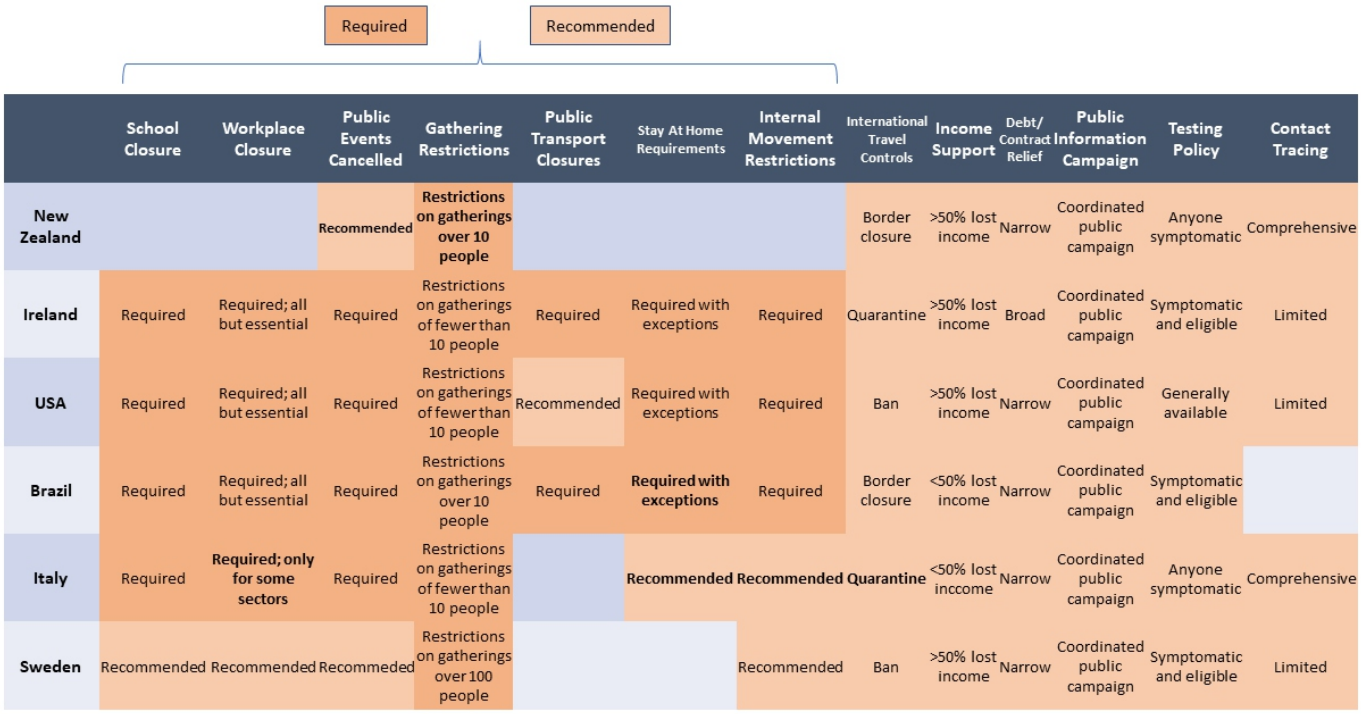
	School Closure	Workplace Closure	Public Events Cancelled	Gathering Restrictions	Public Transport Closures	Stay At Home Requirements	Internal Movement Restrictions	International Travel Controls	Income Support	Debt/ Contract Relief	Public Information Campaign	Testing Policy	Contact Tracing
New Zealand			Required	Restrictions on gatherings over 100 people				Ban			Coordinated public campaign	Symptomatic and eligible	Comprehensive
Ireland	Required	Recommended	Required	Restrictions on gatherings of fewer than 10 people					<50% lost income		Public officials urge caution	Anyone symptomatic	Limited
USA	Required		Required	Restrictions on gatherings over 100 people		Required with exceptions		**Ban**			Coordinated public campaign	Generally available	Limited
Brazil	Required	Recommended	Required	Restrictions on gatherings over 100 people		Recommended		Quarantine			**Coordinated public campaign**	Symptomatic and eligible	
Italy	Required	Required; all but essential	Required	Restrictions on gatherings of fewer than 10 people	Recommended	Required with exceptions	Required	Ban			Coordinated public campaign	**Anyone symptomatic**	Comprehensive
Sweden				Restrictions on gatherings over 100 people					>50% lost income		Coordinated public campaign	Symptomatic and eligible	Comprehensive

Exhibit 5: Stringency measures on March 15th, 2020 (**Bolded** items are measures that have changed in the last month). [20]



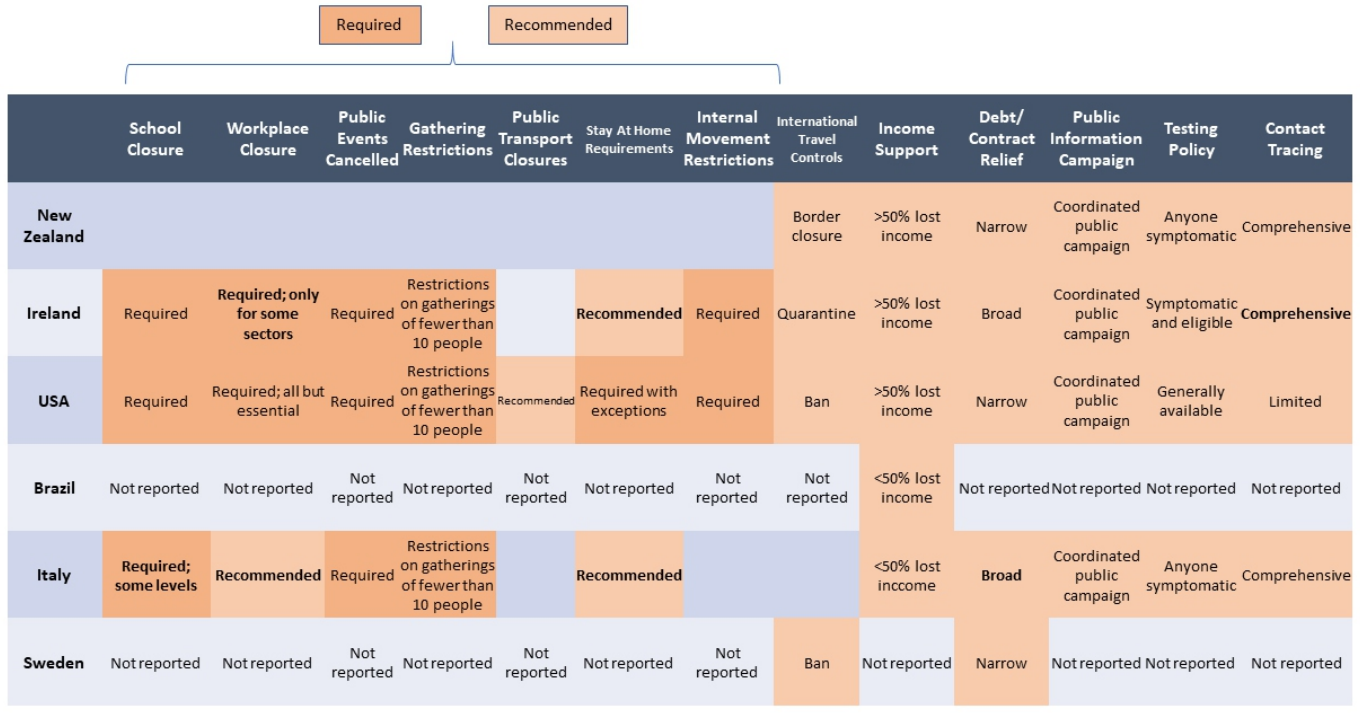
	School Closure	Workplace Closure	Public Events Cancelled	Gathering Restrictions	Public Transport Closures	Stay At Home Requirements	Internal Movement Restrictions	International Travel Controls	Income Support	Debt/ Contract Relief	Public Information Campaign	Testing Policy	Contact Tracing
New Zealand	Required	Required; all but essential	Required	**Restrictions on gatherings of fewer than 10 people**	Required	Required with exceptions	Required	**Border closure**	>50% lost income	Narrow	Coordinated public campaign	**Anyone symptomatic**	Comprehensive
Ireland	Required	**Required; all but essential**	Required	Restrictions on gatherings of fewer than 10 people	Required	Required with exceptions	Required	Quarantine	**>50% lost income**	Broad	**Coordinated public campaign**	**Symptomatic and eligible**	Limited
USA	Required	Required; all but essential	Required	**Restrictions on gatherings of fewer than 10 people**	Recommended	Required with exceptions	Required	Ban	>50% lost income	Narrow	Coordinated public campaign	Generally available	Limited
Brazil	Required	**Required; all but essential**	Required	**Restrictions on gatherings over 10 people**	Required	Recommended	Required	**Border closure**	<50% lost income	Narrow	Coordinated public campaign	Symptomatic and eligible	
Italy	Required	Required; all but essential	Required	Restrictions on gatherings of fewer than 10 people	**Required**	Required with exceptions	Required	Ban	<50% lost income	Narrow	Coordinated public campaign	Anyone symptomatic	Comprehensive
Sweden	Recommended	Recommended	Recommended	Restrictions on gatherings over 100 people			Recommended	Ban	>50% lost income	Narrow	Coordinated public campaign	Symptomatic and eligible	**Limited**

Exhibit 6: Stringency measures on April 15th, 2020 (**Bolded** items are measures that have changed in the last month). [20]



	School Closure	Workplace Closure	Public Events Cancelled	Gathering Restrictions	Public Transport Closures	Stay At Home Requirements	Internal Movement Restrictions	International Travel Controls	Income Support	Debt/ Contract Relief	Public Information Campaign	Testing Policy	Contact Tracing
New Zealand			Recommended	**Restrictions on gatherings over 10 people**				Border closure	>50% lost income	Narrow	Coordinated public campaign	Anyone symptomatic	Comprehensive
Ireland	Required	Required; all but essential	Required	Restrictions on gatherings of fewer than 10 people	Required	Required with exceptions	Required	Quarantine	>50% lost income	Broad	Coordinated public campaign	Symptomatic and eligible	Limited
USA	Required	Required; all but essential	Required	Restrictions on gatherings of fewer than 10 people	Recommended	Required with exceptions	Required	Ban	>50% lost income	Narrow	Coordinated public campaign	Generally available	Limited
Brazil	Required	Required; all but essential	Required	Restrictions on gatherings over 10 people	Required	**Required with exceptions**	Required	Border closure	<50% lost income	Narrow	Coordinated public campaign	Symptomatic and eligible	
Italy	Required	**Required; only for some sectors**	Required	Restrictions on gatherings of fewer than 10 people		**Recommended**	**Recommended**	**Quarantine**	<50% lost inccome	Narrow	Coordinated public campaign	Anyone symptomatic	Comprehensive
Sweden	Recommended	Recommended	Recommeded	Restrictions on gatherings over 100 people			Recommended	Ban	>50% lost income	Narrow	Coordinated public campaign	Symptomatic and eligible	Limited

Exhibit 7: Stringency measures on May 15th, 2020 (**Bolded** items are measures that have changed in the last month). [20]



	School Closure	Workplace Closure	Public Events Cancelled	Gathering Restrictions	Public Transport Closures	Stay At Home Requirements	Internal Movement Restrictions	International Travel Controls	Income Support	Debt/ Contract Relief	Public Information Campaign	Testing Policy	Contact Tracing
New Zealand								Border closure	>50% lost income	Narrow	Coordinated public campaign	Anyone symptomatic	Comprehensive
Ireland	Required	**Required; only for some sectors**	Required	Restrictions on gatherings of fewer than 10 people		**Recommended**	Required	Quarantine	>50% lost income	Broad	Coordinated public campaign	Symptomatic and eligible	**Comprehensive**
USA	Required	Required; all but essential	Required	Restrictions on gatherings of fewer than 10 people	Recommended	Required with exceptions	Required	Ban	>50% lost income	Narrow	Coordinated public campaign	Generally available	Limited
Brazil	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	<50% lost income	Not reported	Not reported	Not reported	Not reported
Italy	**Required; some levels**	**Recommended**	Required	Restrictions on gatherings of fewer than 10 people		**Recommended**			<50% lost inccome	**Broad**	Coordinated public campaign	Anyone symptomatic	Comprehensive
Sweden	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Ban	Not reported	Narrow	Not reported	Not reported	Not reported

Exhibit 8: Stringency measures on June 8th, 2020 (**Bolded** items are measures that have changed in the last month). [20]

The Oxford University team then used all measures to produce a specific Stringency Index value. These values, along with the total number of cases from February 15th to June 8th, 2020 are listed in table 7. The stringency index values have also been plotted against total cases in Exhibit 9.

		New Zealand	Ireland	USA	Brazil	Italy	Sweden
February 15th, 2020	Stringency Index	19.44	5.56	5.56	5.56	19.44	0
	Confirmed Cases	0	0	15	0	3	2
March 15th, 2020	Stringency Index	36.11	48.15	52.31	42.31	85.19	16.67
	Confirmed Cases	6	169	1714	121	24747	992
April 15th, 2020	Stringency Index	96.3	90.74	72.69	74.54	93.52	43,52
	Confirmed Cases	1078	11479	578268	23430	162488	11445
May 15th, 2020	Stringency Index	36.11	90.74	72.69	81.02	66.67	46.3
	Confirmed Cases	1148	23827	1382362	188974	223996	28582
June 8th, 2020	Stringency Index	22.22	72.22	72.69	77.31	48.15	46.3
	Confirmed Cases	1154	25201	1915712	672846	234998	44730

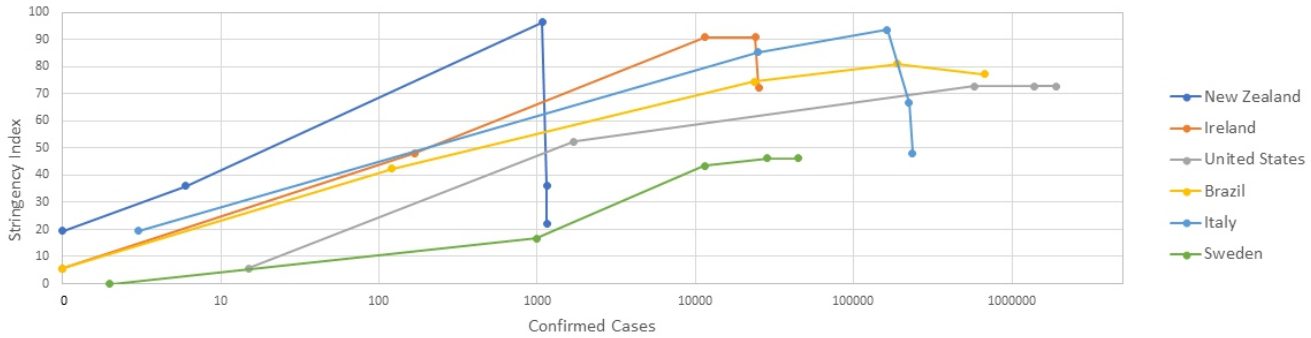


Exhibit 9: Stringency measures compared to cumulative confirmed COVID-19 cases from February 15th - June 8th, 2020.[17,20]

As of May 15th, 2020, NZ was already starting to remove restrictions as they entered alert level two and had already experienced a few days with zero new cases. Sweden on the other hand, who up until this point had yet to enforce any measures, reported double the amount of cases.[17,18] On June 8th, 2020, NZ moved to alert-level one and declared itself COVID-free. Ireland and Italy also saw a drastic decrease in the number of new COVID-19 cases. But what is happening in the United States, Brazil and Sweden? Despite steady stringency index scores that suggest the countries continued to implement measures to combat the disease, the total number of COVID-19 cases continued to rise.

Recently, Sweden has experienced record-breaking daily increases in cases. This increase has been explained by Swedish Public Health officials as being in connection with expanded testing efforts that now extend to individuals with mild symptoms and comes after the effect of increased testing became increasingly clear.[22] However, Sweden still continues to report one of the highest death rates per capita.[22] Andrew Tegnell, a top Swedish epidemiologist, has stood by the countries strategies, but admits that "If we were to run into the same disease, knowing exactly what we know about it today, I think we would end up doing something in between what Sweden did and what the rest of the world has done."[22]

The United States and Brazil also represent list topping figures. They both currently hold the top two positions for total number of cases.[17] Interestingly, both countries have had similar struggles when it came to the creation of a coherent country-wide strategy. Economic politics have become a focus for both countries' federally, but as death tolls rise, this approach has been widely disagreed upon at the local government level and has likely contributed to growing distrust in leadership overall.[3,23] This unrest also seems to have had an effect on how measures are followed. In Brazil in particular, poverty and unequal access to essential resources has made it especially vulnerable. Low testing rates also suggest that most recent numbers for total COVID-19 cases and deaths could be drastically underestimating the current situation.[23]

The Takeaway

It is difficult to compare statistics between countries for even the most fundamental of measures, the total number of cases, as reports can vary due to differences in testing policies. Even still, the discussions that result from comparing what information we do have, not only helps to reflect on what has been done and is being done in the current pandemic, but also helps to outline a path forward.

New Zealand may have had a bit of a head start, given an outright advantage by things like its isolated geography and smaller, more spread out population. However, by no small feat, the country has achieved something that every country has the potential to achieve – a cohesive and unified approach. Specifically, an approach that is driven equally by public health, science and research and economics. NZ has shown that a balance between these things is possible and necessary; but not necessarily easy. This idealist way of thinking is, perhaps, less suited for our current situation and more for the general direction we implore countries to head when this is all over.

Contributors

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