



**Drake Undergraduate Social Science Journal**

Spring 2021 Edition

# Effectiveness of Coronavirus Disease 19 Lockdowns: A Cross-Regional Comparison

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## Abstract

Corona Virus Disease 19 (COVID-19) was discovered in 2019 and quickly evolved into a global pandemic, infecting and killing millions. This research paper focused on the overall effectiveness of stringent COVID-19 lockdowns versus loose lockdowns regarding per capita infection and death rates in four different countries. COVID-19 was met with extreme measures of mitigation in China, including a severe lockdown where citizens were berated for leaving their homes. Similarly, New Zealand implemented elimination-based lockdown strategies. Sweden adopted a herd-immunity mentality, believing the death rate too small to warrant a lockdown. In the United States, decentralized implementations caused widespread disarray with no nation-wide enforced lockdown. The two countries that enforced strict lockdowns had lower per capita death and infection rates of the population in comparison to the two countries that did not. This led to the conclusion that stringent lockdowns were more effective in reducing the spread of COVID-19.

In December of 2019, a virus made its first appearance and altered the lives of millions within one year. While at first the virus seemed similar to the common flu, within its year-long debut it infected ninety-six million people and killed two million more. This novel virus, named Coronavirus Disease 19 but more aptly called COVID-19, ravaged the world, grinding everyday lives to a halt and economies to a standstill. It originated in Wuhan, China, with symptoms ranging from fever and muscle aches to difficulty breathing and loss of taste or smell. The world quickly learned about the high transmission of the virus after cases grew exponentially and spread to new countries. It became evident that harsher methods were necessary to curb the virus, and thus the introduction of lockdowns began. Lockdowns are orders for citizens to stay at home and range from incredibly strict to lax. They are used to shrink social interactions and lessen the transmission of the virus from person to person. It is up to each country to implement or abstain from implementing the lockdown they see best fit for their needs. Countries such as New Zealand and China were among those who administered stringent lockdowns, ordering all citizens to not leave their homes unless essential. Other countries, such as the United States and Sweden, chose an alternative option, opting instead to favor the economy and refuse a nationwide lockdown. These decisions ultimately impacted the per capita total cases and deaths in the countries. This cross-regional analysis of the aforementioned four countries serves to determine if stringent lockdowns are more effective at stopping the transmission of COVID-19 than loose or nonexistent lockdowns in terms of per capita total cases and deaths per capita.

COVID-19 originated in Wuhan, China, and the country went to extreme measures to keep the virus under control. Across the country, 220 cities banned public gatherings, intra-city public transport was suspended in 136 cities, and inner-city travel was prohibited by 219 cities (Tian et al. 2020). Wuhan specifically implemented an intense lockdown, as detailed by Emma

Graham and Lily Kuo. Transport to and from the city was halted within hours of the lockdown announcement. No one was allowed in or out of the city, even for personal and medical emergencies. Public transport was stopped, and private vehicles were barred from the roads. Any shops that were not selling essential items, like food or medicine, were closed. Schools and universities shut down indefinitely. Citizens were not allowed to leave their homes, with some areas even barring people from getting groceries and instead requiring them to order delivery. Officials went door to door for health checks and anyone who was ill was forced into isolation. Security guards monitored the temperatures of residents, and residential compounds were closed to everyone except those living there. Many places required masks, and drones were used to publicly chastise those seen without them in public (Graham-Harrison and Kuo 2020). Facial recognition software was also utilized. People were tracked using a mandatory phone app that color-coded people based on their contagion risk. If your risk was too high, you could be banned from entering public places such as shopping malls, subways, and cafes (Hjelmgaard, Lyman, and Shesgreen 2020). The lockdown could arguably be considered cruel and unmerciful, with some places in Wuhan welding apartment building doors completely shut to further enforce the rules, and others not allowing those with pets to leave their homes. As one Wuhan resident said, “we couldn’t go outside under any circumstance. Not even if you have a pet... those with dogs had to play with them inside and teach them to use the bathroom in a certain spot” (Hjelmgaard, Lyman, and Shesgreen 2020). In Beijing, measures just as harsh were imposed. Millions of people were forced inside, and schools were shut down. Residents were required to have a formal pass that allowed them in and out of their buildings. The city built more than a dozen temporary hospitals and deployed thousands of medical professionals to staff them. They also used these healthcare professionals to do meticulous testing and contact tracing (Hjelmgaard,

Lyman, and Shesgreen 2020). Cities in China became ghost towns, and people lived in fear and high anxiety. Still, despite these intense and drastic measures, some found fault with the Chinese response.

Many critics chastise the Chinese government, saying there were coverups about the initial recognition of an outbreak and that preventative measures were not taken quickly enough. On December 30<sup>th</sup>, 2019, an ophthalmologist by the name of Li Wenliang raised the first suspicion of a new severe acute respiratory syndrome (SARS) disease. He saw seven patients before raising the alarm, all with symptoms of SARS. He messaged a group of doctors to warn them, requesting they begin wearing personal protective equipment to prepare. Days later, however, he was summoned to the Public Security Bureau in Wuhan. There, he was made to sign a statement accusing him of making false statements and disturbing the public order. He did not refrain from speaking about his concerns, however. After releasing a video in which he said he would face legal punishment for talking about the potential outbreak, Li passed away from the disease in which he so bravely spoke out against (Green 2020). Despite Li giving an early warning, the first case of COVID-19 occurred in December of 2019, tracing back to a wet market in Wuhan, China. The city has a large population of eleven million, and within weeks the virus began spreading rapidly. Wuhan officials did not implement any COVID-19 measures until 10 a.m. on January 23<sup>rd</sup>, weeks after the first case was reported (Yuan et al. 2020). The critics would be correct to say earlier measures would have prevented the further spread of the virus. In a simulation conducted by Lai et al., if “[non-pharmaceutical interventions] could have been conducted one week, two weeks, or three weeks earlier in China, cases could have been reduced by 66%, 86%, and 95%, respectively, together with significantly reducing the number of affected areas” (Lai et al. 2020).

Despite the critics, the momentous lockdown measures are effective in reducing the spread of the virus. Researchers estimated that “the Wuhan travel ban delayed the arrival time of COVID-19 in other cities by an estimated 2.91 days” (Tian et al. 2020). Cities that implemented any combination of control measures, such as shutting schools or travel bans, before reporting any COVID-19 cases saw 33.3% fewer confirmed cases during the first week of an outbreak (4). Tian et al. used an epidemic model to determine the reproduction number, 3.15, prior to any lockdown measures. This reproduction number means that for every one person infected with COVID-19, they will transmit the disease to 3.15 other people. Once interventions were 95% complete across the country, the reproduction number dropped to an average of 0.04 (5). Additionally, authors predict that without the Wuhan travel ban or national emergency response, confirmed cases would have reached 744,000 outside of the city 50 days into the epidemic. With both the travel ban and emergency response, the number of confirmed cases was reduced by 96% (5). Today (January 25<sup>th</sup>, 2021), China reports sixty-two cases per one million people and three deaths per one million. Their total case count is at 89,115, placing them 83<sup>rd</sup> in the world for total case count (“Coronavirus Update (Live)” 2020). While the massive efforts taken by China can be seen as nearly too intense, the data reported shows these measures to be incredibly effective. As a fellow at the Center for China and Globalization said, “China’s response was truly a nationwide response: systematic, comprehensive, and coordinated. This is why China was able to ‘flatten the curve’ so dramatically” (Hjelmgaard, Lyman, and Shesgreen 2020).

An interesting exception to China’s extreme response is Hong Kong. The dense city of seven and a half million people is in close proximity to Wuhan, the epicenter of the COVID-19 pandemic. Daily flights and a high-speed-train rail connect the two cities, allowing for a constant influx of passengers to and from each city. Hong Kong is a popular destination for all of

mainland China, seeing more than 2.5 million people from mainland China in January 2020 alone. The region relies on packed public transport to move about and there is little open public space to be used to spread out (Tufekci 2020). All of these factors would seemingly create a perfect recipe for mass contagion, but Hong Kong has seen fewer COVID-19 cases than comparable Chinese cities. This is not, however, because of strict measures taken by the government like most other areas in China. Hong Kong's success is widely attributed to the people and their efforts to slow the spread. Scarred by a SARS epidemic in 2003, Hong Kong residents were already on high alert for contagious respiratory diseases and acted quickly to stop any potential spread. While the region's chief executive, Carrie Lam, stumbled in her response, the people made up for it. Lam "dragged her feet in closing the city's borders, and never fully closed down the land border with China... Lam wavered on masks, and even ordered civil servants not to wear them" (Tufekci 2020). The people of Hong Kong were well prepared for SARS-like illness, however, and took it upon themselves to ensure their safety. Among other Asian neighbors, Hong Kong people reacted the fastest and reduced walking outside of their homes by over 40%, without any instruction from the government to do so (Wan et al. 2020). When even the World Health Organization was not recommending masks be worn, 74.5% of Hong Kong adults were using surgical masks in public areas, and by February 95% of the adult population was (2). When the city experienced a mask shortage and Lam refused to respond to the demand, the people once again took it upon themselves. District Councilors, local organizations, and shop owners supplied the public through mask sharing events (3). When Lam dismissed the idea of shutting down the high-speed railway to China or restricting incoming travelers from Wubei, the Hospital Authority Employees Alliance organized a protest demanding a complete border shutdown (5). Hong Kong citizens were wary of their government's advice

and took to online resources to find data and information about COVID-19, including how to test faulty personal protective equipment and how to make their own masks. By utilizing outside resources, Hong Kong citizens were able to lessen the socioeconomic gap between those who have access to information and those who do not (5). Despite no official lockdown, Hong Kong only has 1,339 total cases per million and 22 deaths per million, (“Coronavirus Update (Live)” 2020). Authors Wan et al. 2020 concluded that “skepticism of ineffective policies and the presence of a strong civic society driven by state society tensions may contribute positively to pandemic management. The case of Hong Kong exhibits a sharp deviation from the mainstream discourse that places a dual emphasis on capacity and accountability in effective crisis management.”

New Zealand’s stringent lockdown has led them to be a country with low deaths and cases per capita. This is due in part to their rapid response to implement a lockdown. In 2017, New Zealand published an “Influenza Pandemic Plan,” a guide for what to do if a flu-like disease were to ever infect the country. In its pages, the document detailed a six-step procedure, beginning with “plan for it” and ending with “recover from it.” The procedures were triggered by different situations, such as clusters of cases spreading out of control or sustained and substantial transmission in the population. These parameters would begin the “manage it” phase. This section of the plan includes lockdown procedures, suggesting officials “consider the value of maintaining, increasing, targeting or reducing interventions” with measures including “closure of the education sector, social distancing, advice on staying home... reduction or restriction of travel, restrictions on public gatherings and venues, and voluntary quarantine of contacts” (Ministry of Health 2017). The Influenza Pandemic Plan was the basis for New Zealand’s response to COVID-19, and it focused primarily on mitigating diseases. As Baker, Wilson, and

Blakely describe, “with a mitigation goal, the response is typically to increase stringency as the pandemic progresses and for more disruptive interventions, such as school closures, to be held in reserve to flatten the peak. By contrast, the goal of elimination rapidly escalates the stringency of control measures to extinguish chains of transmission” (Baker, Wilson, and Blakely 2020).

While this mitigating response is by no means negative, it vastly underestimated the potential of COVID-19. The virus has key mutations to its biology that allow it a longer incubation period. The mitigation-style Influenza Pandemic Plan was formatted with the influenza of 1918 in mind and was not adequate for the novel coronavirus and its epidemiological and biological differences.

New Zealand’s first case of COVID-19 was on February 28<sup>th</sup>, and exactly one month later, on March 28<sup>th</sup>, the country had its highest peak of 146 new cases (“Coronavirus Update (Live)” 2020). The country’s officials, including Prime Minister Jacinda Ardern, realized as cases increased that attempting to mitigate the virus would not be effective enough. On March 25<sup>th</sup>, with thorough analysis and input from public health officials, Prime Minister Ardern placed the country under a Level 4 COVID-19 Alert (Public Health Response Strategy Team 2020). This was the beginning of New Zealand’s stringent lockdown and marked the country’s decision to switch to an elimination strategy.

The Level 4 COVID-19 Alert implemented a clear lockdown procedure that people were expected to follow. The lockdown included restrictions on socialization within the country, limiting people to their homes and immediate household bubbles. All gatherings were canceled, all public venues were closed, and all educational facilities closed. Workplaces were required to move their business online and had a strict list of rules to follow if virtual work was impossible (“New Zealand COVID-19 Alert Levels” 2020). Furthermore, Dr. Ashely Bloomfield, New



Zealand's Director-General of Health, issued a Health Notice to ensure citizens knew exactly what was expected of them. In it she stated:

Everyone in New Zealand is to be isolated or quarantined at their current place of residence except as permitted for essential personal movement. Exercise is to be done in an outdoor place that can be readily accessed from home and two-meter physical distancing must be maintained. A child can leave the residence of one joint care-giver to visit or stay at the residence of another joint care-giver (and visit or stay at that residence) if there is a shared bubble arrangement. A person can leave their residence to visit or stay at another residence (and visit or stay at that residence) under a shared bubble arrangement if: one person lives alone in one, or both, of those residences; or everyone in one of those residences is a vulnerable person. (Bloomfield 2020)

Though seemingly harsh sentencing, New Zealanders reacted well to the restrictions. With the Prime Ministers' encouragement of "be strong, and be kind" in their minds, people did as much as possible to keep morals high and their "bubbles unpoped," a phrase that means restricting their social interactions to only a few immediate people (Donnell 2020). Every person was held accountable for their actions during the lockdown, even those in important government positions. Health Minister David Clark was among those who suffered the consequences of breaching the lockdown. In week one of the lockdown, not long after he asked all New Zealanders to stay home, he drove his family to a beach to relax for a day. After the media caught wind of his actions, he offered his resignation to the Prime Minister. She did not accept it, instead saying "right now, my priority is our collective fight against Covid-19. We cannot afford massive disruption in the health sector or to our response. For that reason, and that reason alone, Dr. Clark will maintain his role" (Ainge Roy 2020). He was not pardoned wholly, however. Prime Minister Ardern demoted him to the bottom of his cabinet and stripped him of his associate finance minister portfolio. This punishment set the tone in the first week of the lockdown; no one is above the regulations, and everyone must work together. The explicit layout of the lockdown,

paired with the people's willingness to cooperate and leadership who set, drastically changed the course of the virus' path.

The lockdown significantly reduced the presence of COVID-19 within New Zealand. On March 25<sup>th</sup> the country was put into lockdown, and three days later they experienced a peak of 146 new daily cases (Public Health Response Strategy Team 2020; "Coronavirus Update (Live)" 2020). By the end of the lockdown on June 8<sup>th</sup>, the country was reporting no new cases, and today (January 25<sup>th</sup>, 2021) they have a 0% positivity rate, with 5 deaths per million people ("Coronavirus Update (Live)" 2020). New Zealand's lockdown strategy serves as a valuable global role model, especially for countries that did not implement a lockdown.

The USA's COVID-19 lockdown response was inconsistent and patchy, with states and cities across the country implementing different regulations. There are multiple reasons for this erratic response which will aid in understanding why the USA has an incredibly high COVID-19 spread. As Drew Altman writes, "[former President Donald Trump] announced that states would have primary responsibility for containing the virus, with the federal government in a 'back-up' role" and later saying "this fragmentation resulted in extreme variation in [America's] national response to COVID-19 by and within states" (Altman 2020). Each of the 50 states had a different response to the pandemic, as detailed in a report by the Kaiser Family Foundation. As of January 25<sup>th</sup>, 2021, forty-one states have eased or lifted stay-at-home orders, despite the country having 135,182 daily new cases and the highest overall case count in the world ("Coronavirus Update (Live)" 2020). States such as Georgia, Massachusetts, and New York currently rolled back their stay-at-home order to high-risk groups only. Other states, like Arkansas, Iowa, Nebraska, North Dakota, South Dakota, and Wyoming never mandated any stay-at-home orders whatsoever. Only six states prohibit large gatherings of any sort from being held, twenty states prohibit gatherings

of more than ten people, two prohibit greater than twenty-five, four prohibit greater than fifty, and nineteen states do not have a large gathering ban (“State Actions to Mitigate the Spread of COVID-19” 2020). Additionally, political tensions fueled the flames and made implementing COVID-19 restrictions more complicated.

Interestingly, the pandemic became a political argument within the USA, with many arguing it was due in large part to former President Trump’s administration. Trump frequently went against expert advice, saying “the virus was not serious; predicted it would disappear; spent weeks questioning the need for masks; encouraged states to reopen even with large and growing caseloads; and promoted medical disinformation” (Leonhardt 2020). Some Republican governors followed his lead, insisting that the virus was not nearly as deadly or as large of an emergency as public health officials were saying. The mixed messages between public health experts, the Trump administration, and government officials led to confusion and widespread disarray. The clashing sides also led to a partisan division between the people, further impacting the effectiveness of COVID-19 regulations.

According to a Kaiser Family Foundation health tracking poll, 70% of Democrats said they would wear a protective mask when leaving their homes or having potential contact with others. Only 19% of Republicans said the same. These political lines applied to the 2020 election as well, with 29% of Democratic voters saying the coronavirus pandemic in the U.S. is the most important issue in deciding their vote for president and only 6% of Republican voters saying the same (Hamel et al. 2020). Heated arguments regarding mask-wearing and debates about the severity and importance of the pandemic were abundant. Many people questioned the deadliness of the virus and were deeply concerned about America’s economy. This division made implementing COVID-19 regulations incredibly difficult. Any restrictions put in place met

backlash from those who believed their freedoms were being infringed upon. This can be seen with the Wisconsin lockdown protest. Thousands gathered around Wisconsin's State Capitol in April after Governor Tony Evers declared businesses would remain closed and social distancing to continue until late May (Epstein and Nolan 2020). As Epstein and Nolan reported, few in the large crowd wore masks, and all resented the idea of a longer lockdown. Speakers, such as Madison Elmer, at the protest said statements such as, "you're being told to sit down and shut up because your opinion does not matter and you have to listen to the professionals" (Epstein and Nolan 2020). Others chose to share their grievances, like Dr. Timothy W. Allen, who said "staying indoors and worrying about the epidemic is more dangerous than going outside... According to the evidence, you're more likely to die by staying at home. You need to look at all lives, not just Covid lives" (Epstein and Nolan 2020). These protests against COVID-19 regulations made it difficult for any city or state to implement rules that the people would cohesively follow.

Overall, the USA's decentralized approach to COVID-19 and political division enabled COVID-19 to take hold of the country. Currently, America has 76,833 COVID-19 cases per million and 1,285 deaths per million. The total case count is double that of the next highest country, India, with the U.S. having 25,515, 557 total cases ("Coronavirus Update (Live)" 2020). This extreme infection rate is due in large part to a decentralized government attempt at COVID-19 mitigation, political division, and confusing messages to the public. It cannot be said that the United States had an effective lockdown procedure because a nationwide response was never seen. Left up to the states, lockdowns were inconsistent and differed from state to state. Political division, and arguably an individualistic national mindset, meant lockdowns that were

implemented were difficult to enforce. Still, a few attempts were made to “flatten the curve,” more so than other countries.

The Swedish government took a de facto herd immunity approach under the guidance of head epidemiologist Anders Tegnell. While not explicitly stated, it was presumed to the citizens, and a vast majority of the world, that the goal of the government’s lax approach was to achieve between 50-90% of the population developing immunity to the virus. This is achieved when a person’s immune system develops antibodies to fend off future attacks from the virus, whether that be from being exposed to the virus and recovering or through vaccination. Some argued that this approach would be more sustainable than other countries, with less “lockdown burnout” than countries that implemented strict measures (Habib 2020). Tegnell argued that “[COVID-19] is not a disease that can be stopped or eradicated, at least until a working vaccine is produced. We have to find [a] long-term solution that keeps the distribution of infections at a decent level” (Paterlini 2020). Additionally, many believed avoiding a lockdown would have a lesser negative economic impact. So, instead of locking down, Sweden relied mostly on common-sense, trust-based measures. This included advising older people to avoid social contact, asking citizens to work from home, practicing hygienic measures such as hand-washing frequently, and avoiding non-essential travel. The government did not shut down businesses like restaurants or bars and allowed schools for under-16s to stay open, however, they did impose a ban on gatherings of more than fifty people (Paterlini 2020; Savage 2020). Unfortunately, these measures did not prevent the spread of the virus.

When compared to similar countries, Sweden has fared worse in COVID-19 infecting the population. Sweden’s per capita death rate is 1,086 per million people, with a large contributor to the number being people in elderly-care homes. Denmark has 342 per million deaths, and

Finland has 116 per million. Both Denmark and Finland implemented more restrictive measures than Sweden. In looking at total cases per million, Finland has 7,678 and Denmark has 33,542. Sweden has 53,988 total cases per million (“Coronavirus Update (Live)” 2020) neighboring countries have been much more successful in reducing the spread of the virus and saving lives in doing so. Despite this evidence, Tegnell still insists avoiding a lockdown was the best approach.

In an interview with Marta Paterlini, Anders Tegnell stated, “we do not need to close down everything completely because it would be counterproductive” (Paterlini 2020). In the same interview, he also claimed that not much is known about COVID-19 and “closedown, lockdown, closing borders- nothing has a scientific basis, in my view.” The epidemiologist was the main advisor to the government in how to respond to the pandemic, as well as the main proponent for a herd immunity approach. Studies have shown that herd immunity is not a widespread phenomenon, and therefore not realistically tangible for countries to attempt. One such study found that only “7.3% of Stockholm residents had developed COVID-19 antibodies by late April” (Habib 2020). This is far from the roughly 50-90% required for herd immunity to be effective enough to stop the virus from having exponential infection rates. As for the economy, which many believed would do better than countries that shut down businesses, Sweden’s attempts were futile. It is predicted that Sweden’s economy will shrink by 5% (Savage 2020). While this is less than other countries who are suffering great economic losses, it is similar to other countries in Scandinavia. It can be concluded that the economy did not fare any better, nor worse, than its neighboring countries that imposed harsh lockdowns. Tegnell, the man behind the “common sense” approach, has seemingly had conflicting feelings about whether or not it was the best plan. In June, he told reporters that there was “quite obviously a potential for improvement in what we had done,” but in a separate interview said he does “not see what we

would have done completely differently... based on the knowledge we had then, we feel we made the appropriate decisions” (Habib 2020). It appears that his only regret in not locking down was the high death toll on the elderly populations.

The purpose of this paper was to analyze the effectiveness of COVID-19 lockdowns. Specifically, this cross-regional analysis of China, New Zealand, the United States of America, and Sweden aimed to determine if loose or nonexistent lockdowns were more ineffective at reducing the spread of COVID-19 than countries with stringent lockdowns. China and New Zealand implemented strict lockdowns that contained people within their residencies. In China, people were not allowed outside of their homes without consequences. Drones chastised those in public not wearing masks and doors in some areas were welded shut to further enforce people staying inside. Facial recognition software alerted others about a person’s contagion risk. Officials went door to door doing health checkups, forcing anyone with COVID-19 symptoms to go into isolation. In New Zealand, similar approaches were taken, though perhaps with a more consensual collective approach than in China. The country chose an elimination approach in contrast to mitigation, seeking to not only reduce the viral presence but eradicate it. Their lockdown included strict stay-at-home orders that even government officials were held to. Businesses moved online and schools shut down, yet the public had a positive reaction to the restrictions, focusing on the collective good. In opposition, the USA did not impose a nationwide lockdown. Former President Trump chose to decentralize the response efforts, asking states to take lead on implementing procedures. This led to inconsistent and confusing regulations, with rules differing in every state. The patchy response to COVID-19 in tandem with political division led to soaring case counts and deaths. Similarly, Sweden chose a herd-immunity approach and suffered from a similar fate. The country’s head epidemiologist insisted that there

was not enough scientific evidence to warrant a complete lockdown, and many believed his decision would help spare the economy from collapsing. Unfortunately, Sweden was met with widespread infection and an economic position similar to neighboring countries who imposed harsher lockdowns. An outlier to these findings is Hong Kong, where the government did not implement harsh restrictions, but previous experience with SARS pandemics aided the people in taking their own measures to protect their community. China and New Zealand have the following respective per capita total cases and per capita total deaths: 62, 3 and 457, 5. The United States and Sweden are as follows: 77,392 , 1,293 and 53,988 , 1,086 (“Coronavirus Update (Live)” 2020). Averaged, China and New Zealand had 259.5 per capita total cases and 4 per capita deaths. In contrast, Sweden and the United States had and averaged 65,690 and 1,189.5. When comparing the two different approaches, the USA and Sweden underestimated the virus’s potential and put thousands of more lives at risk. Stringent lockdowns have been shown to reduce the transmission of COVID-19 and are more effective than insubstantial lockdowns. It would benefit countries avoiding lockdowns to admit humility and learn from those who are executing regulations that have saved lives.



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