

# Lessons from abroad: Singapore's Covid-19 Containment Model

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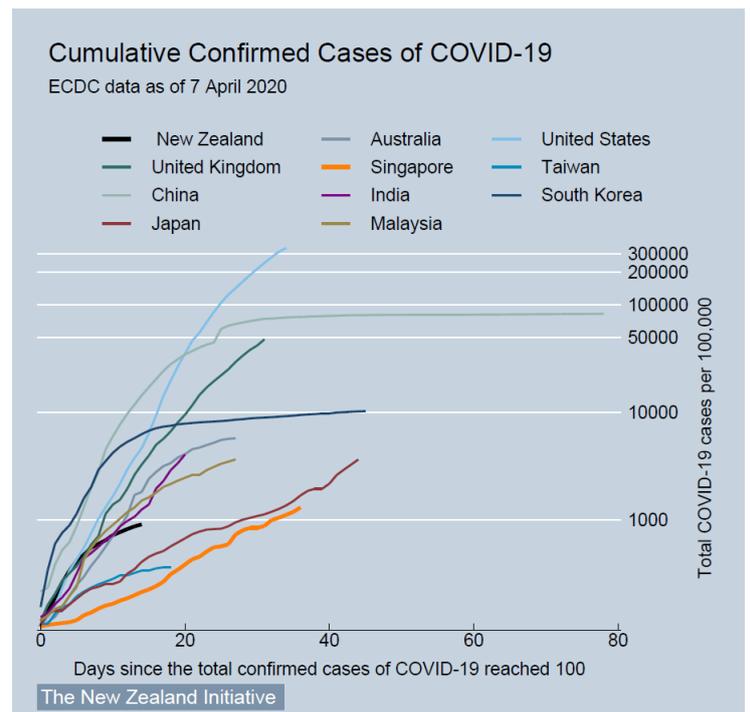
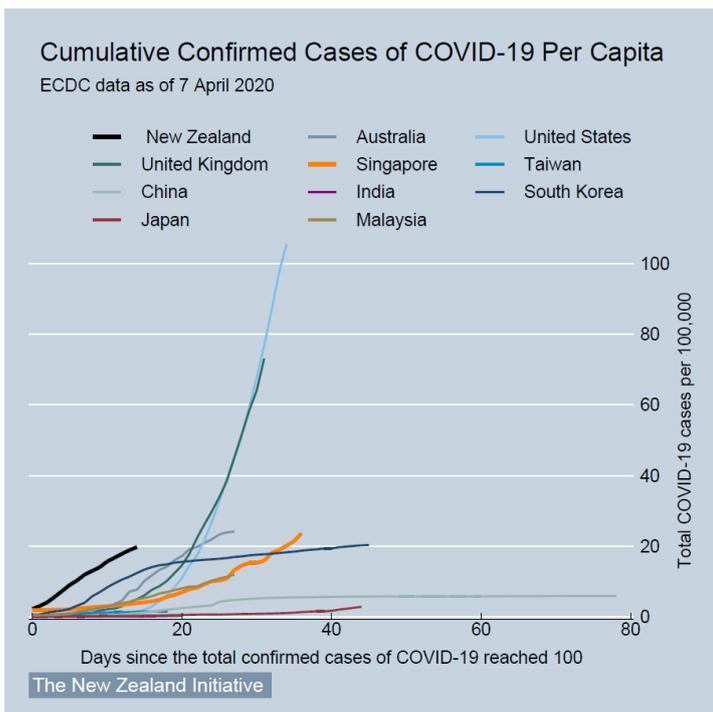
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## Introduction

The world has had mixed success containing the Covid-19 coronavirus with Singapore as a standout example during the early phases of the pandemic. As of April 7, Singapore had 1,481 confirmed cases and six deaths, with the case fatality rate (CFR) of 0.4% (its first case was on January 23). One reason for this comparatively low CFR is that only 10% of its population is above 65 years of age while Italy and Spain – two of the hardest-hit countries from the virus – have 21.7% and 18.2% respectively. On the other hand, New Zealand and the US have 15.6% and 16.0%, respectively.<sup>1</sup>

Figure 1 shows New Zealand's case numbers climbing steadily in contrast to Singapore's flatter trend line. However, twenty days since it reached its 100<sup>th</sup> case, Singapore now has a similar number of cases per capita as New Zealand, Australia and South Korea. In response, Prime Minister Lee Hsien Loong has imposed a restrictive national "circuit breaker" lockdown protocol for a month beginning on April 7.<sup>2</sup>

**Figure 1.** (Left graph) - Cumulative confirmed cases of Covid-19 per capita since confirmed cases reached 100 – (data is from the European Centre for Disease Prevention and Control).<sup>3</sup> **Figure 2.** (right graph) Cumulative confirmed cases of Covid-19 total.



At the New Zealand Covid-19 Select Committee meetings on March 31 and April 7, epidemiologist Sir David Skegg expressed his admiration for Singapore's containment policies. The report outlines six key areas of the South East Asian nation's approach to the pandemic:

- Border Controls and external restrictions
- Quarantine Requirements
- Enforcement of Covid-19 Rules
- High Level of Testing
- Contact Tracing
- Technological Sources
- Other containment measures.

## Border controls

Singapore's main point of difference was its early and aggressive border security measures. Its first line of defence restricted travel from countries profoundly affected by the coronavirus, such as China, despite the World Health Organisation not recommending travel restrictions at the time.

Singapore closed its borders 61 days after the first case was discovered in Wuhan, China. Comparatively, Spain's borders closed after 52, Germany took 49 days, Australia took 55 days and New Zealand took just 25 days. Singapore didn't completely close its border earlier because its government believed it had limited the virus' internal community transmission and could contain it. It mandated effective border measures such as thermal scanning, quarantine in government facilities and collection of information to support contact tracing. It also already had hand sanitisers and mandatory temperature checks in public spaces such as public transport and schools.<sup>4</sup>

After its first case of coronavirus on January 23, Singapore banned travel from China on January 31, then included South Korea, Iran and Italy on the list by March 4.<sup>5</sup> From March 15, the list was expanded to include the UK, Switzerland, France, Germany and Spain.<sup>6</sup> The Singapore government eventually banned all short-term visitors and effectively shut its border, except for returning student pass holders, citizens, permanent residents and long-term pass holders.<sup>7</sup> Because over 50% of its Covid-19 cases were judged to be imported from overseas,<sup>8</sup> on March 18, Minister for National Development Lawrence Wong imposed a mandatory 14-day Stay-Home Notice for all arrivals.<sup>9</sup>

At Singapore's Changi Airport, for instance, all passengers from incoming flights must be tested for coronavirus symptoms by going through a temperature screening process and must also fill out a health declaration form before proceeding to customs clearance.<sup>10</sup>

As of April 4, permanent residents, long-term pass holders or citizens who travelled or transited across unsafe countries (US, UK, ASEAN states, France, India and Switzerland) are taken from the port of entry to serve their Stay-Home Notice (SHN) in hotels.<sup>11</sup> Those with apparent symptoms are sent to a hospital's intensive care unit.<sup>12</sup> Those with minor or moderate symptoms are sent to community isolation facilities or hospitals.<sup>13</sup> Residents, long-term pass holders or citizens not associated with the 'unsafe' nations and who are without symptoms are encouraged to self-

isolate at home. The border measures isolated those potentially with the virus so public officials could identify its potential spread.

## Quarantine Requirements

**Figure 3: Distinctions between Singapore’s Quarantine Order, Stay-Home Notice and Leave of Absence.**<sup>14</sup>

	<b>Quarantine Order</b>	<b>Stay-Home Notice</b>	<b>Leave Of Absence</b>
<b>Issued To</b>	Close contacts of confirmed COVID-19 cases	Residents and long-term pass holders returning from higher-risk areas	Residents and long-term pass holders returning from mainland China
<b>Instructions</b>	Stay at home or quarantine facility at all times, food and daily essentials provided	Stay home at all times, make arrangements for food and daily essentials	Stay home, except briefly for food, groceries and important matters
<b>Leave Policy</b>	Hospitalisation Leave	Annual/Unpaid Leave, or granted by company	Annual/Unpaid Leave, or granted by company
<b>Salary Support</b>	Quarantine Order Allowance Scheme	LOA/SHN Support Programme	LOA/SHN Support Programme
<b>Legal Weight</b>	Under Infectious Diseases Act	Under Infectious Diseases Act	Advisory

Singapore has implemented one of the world’s most restrictive quarantine measures, including digital surveillance tracking systems to monitor those possibly infected with the virus. Its Covid-19 restriction measures fall into three types: Quarantine Order (most restrictive, self-isolation), Stay-Home Notice (legally binding under Infectious Disease Act) and Leave of Absence (precautionary measures, but not legally binding).<sup>15</sup>

1. Singapore has strict requirements for quarantine orders (QO).<sup>16</sup> These require the individual to check their temperature and report their health status to a QO agent three times each day while in self-isolation.<sup>17</sup> A quarantined individual must avoid contact with family members or others in the home, use separate bathroom facilities<sup>18</sup> and cannot go outside for the duration. Violation results in severe legal consequences. The government also monitors a person’s movement by tracking their smartphone.
  - a. Those infected by the virus are compelled to stay in the hospital and must answer questions posed by public health officials to help with the 'contact tracing' process and identify other potentially infected people.
2. Stay-Home Notices (SHN) only require individuals to self-isolate in their homes for 14 days. Similar principles of QO apply, such as limited interaction with other residents and make their arrangements for food and daily essentials. The government ensures compliance using digital surveillance and by receiving daily phone updates to the Immigration and Checkpoints Authority.<sup>19</sup>
3. Leave of Absence (LA) is similar to New Zealand’s Alert Level 4 protocol.<sup>20</sup> Individuals must stay home but can leave to get groceries and some exercise. The government does not have the legal authority to arrest or prosecute an individual on LA.

On April 4, Prime Minister Lee Hsien Loong introduced the “circuit breaker” policy to significantly heighten social distancing.<sup>21</sup> Most workplaces will be closed, and a full home-based education

system has also been introduced. The same three quarantine measures above remain active; however, everyone is now subject to the Leave of Absence rules, aside from essential services.

## Enforcement of Covid-19 Rules

The Singapore government ensures compliance with its restrictions through active surveillance and other measures. As of March 9, Singapore's Immigration and Checkpoints Authority had issued more than 7000 Stay-Home Notices requiring people to show their whereabouts using a smartphone.<sup>22</sup> About 200 Singapore police are monitoring quarantine facilities.<sup>23</sup> The Minister for Home Affairs, K. Shanmugam said those not complying may be jailed for six months or fined \$S10,000 or have their work permits repealed.

Some examples of enforcement include:

- February 27: the government repealed the permanent residencies of three Chinese nationals who broke the containment measures and deported them.<sup>24</sup>
- March 9: Nanyang Technological University terminated the student pass of an international student for violating Stay-Home Notice laws.<sup>25</sup>
- March 21: officials announced they had revoked a total of 89 work passes for breaching entry approval and Stay-Home Notice requirements.<sup>26</sup>
- March 29: the government cancelled the passport of Singapore national Mr Goh Illya Victor for violating entry approval and Stay-Home Notice requirements.<sup>27</sup>

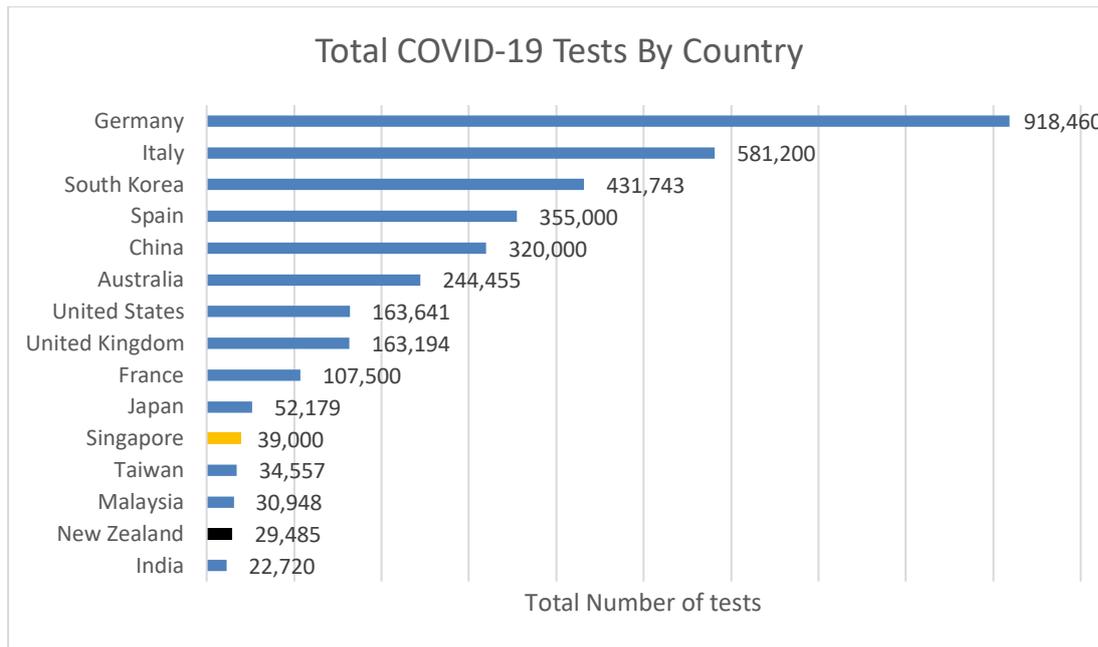
Singapore also codified its 'social distancing' policy by amending Section 21A in its Infectious Diseases Act. It states that anyone standing or sitting less than one metre from another person in public will be fined up to \$S10,000 and/or jailed for six months (similar to the breach of Stay-Home Notice enforcement).<sup>28</sup>

The government has taken a 'no-nonsense' approach when enforcing its rules by using excellent technological surveillance and harsh penalties.

### Test, Test, Test

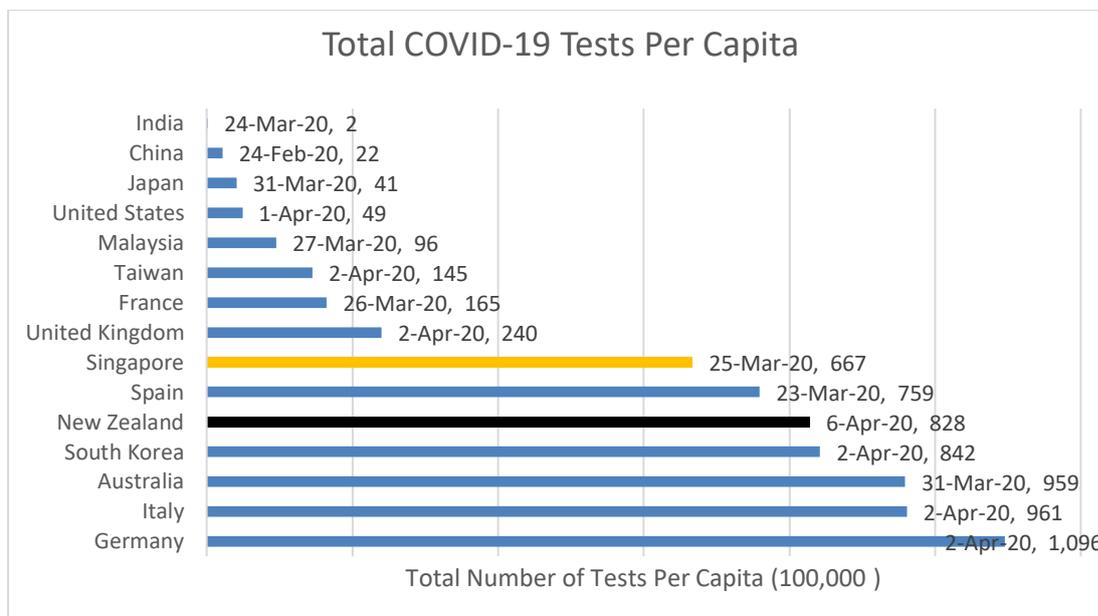
Singapore's government has experienced many infectious outbreaks, such as SARS in 2003 and the 2009 Swine flu, and learned what other countries failed to identify — *the importance of early and constant testing*. Singapore has tested 2900 people daily for four weeks.<sup>29</sup> Singapore was able to do this largely through assigned public health preparedness clinics. These private clinics — there are around 1,000 clinics across Singapore — provided the physicians with supplementary training and groundwork for outbreaks.

**Figure 4: Total Covid-19 tests by country (April 6)**



Director-General of the World Health Organisation Tedros Adhanom Ghebreyesus said the world’s response had shown a lack of urgency about the "backbone" of testing, isolation of patients and contact tracing. However, Singapore has efficiently tackled all three factors.<sup>30</sup> Collaboration between the Home Team Science and Technology Agency (HTX) and Veredus Laboratories resulted in a three-hour Covid-19 test system with a 99% accuracy.<sup>31</sup> New Zealand has identified 1,210 cases since March 22, while Singapore has 1,481 cases since its first case on January 23.

**Figure 5: (As of April 6<sup>th</sup>) Total Covid-19 tests per capita (100,000).<sup>32</sup>**



In the initial phase of the virus, Singapore’s surveillance system was enhanced and liberal testing opened up to anyone (even non-travellers) showing acute respiratory symptoms.<sup>33</sup> So far, it has conducted 39,000 tests which Health Ministry Director of Medical Services Associate Professor Kenneth Mak said is more than 7000 tests per million people.<sup>34</sup> By comparison to other countries

dealing with Covid-19, Singapore's test numbers were higher on March 25 than the 6500 in South Korea and 1000 per million in Taiwan.<sup>35</sup> However, according to *Figure 4*, if measured on a per-100,000 people basis, Singapore only tests 667, while New Zealand tests 828 and South Korea tests 842.

## Contact Tracing

Singapore's speedy contract tracing efforts have won commendation from across the globe, including the World Health Organisation. After the first 100 days since the first Covid-19 case, Singapore published its contract tracing guidelines for the world to analyse and adapt.

A subsequent report by Harvard's T.H. Chan School of Public Health said Singapore already had an excellent track record in disease surveillance and monitoring due to experience with SARS in 2003. On top of its normal PCR testing (throat swab), Singapore developed a new serological testing system using patients' antibodies to map the route of transmission and identify the presence of Covid-19 even after a person has recovered. The Harvard researchers calculated that Singapore was three times more effective in detecting imported cases than the global average through contact tracing.<sup>36</sup> Hospitals, Ministry of Health, Police and the Singaporean Civil Defence Force each took drastic measures to identify, track and isolate individuals to contain the virus.

The Ministry of Health oversees Singapore's contact tracing system which begins at the hospital:

1. Once the patient is confirmed to have Covid-19, the healthcare team traces the patient's movements in the last two weeks. The activity map data is then collected and reported to the Contact Tracing team.<sup>37</sup>
2. The Contact Tracing team consists of experts in infectious diseases and epidemiology, along with volunteers from different departments and legislative boards. They aim to completely chart a patient's activity map within 24 hours of diagnosis through CCTV cameras, the Digital Footprint system, collaboration with airlines, security companies and logistic firms.<sup>38</sup>
3. Once a potential contact is located, the Singaporean Police Force and Armed Force authorise quarantine. Police analytics, team and field teams make between 1000 to 2000 daily calls to assist with contact tracing and check-up compliance with Stay-Home Notices.<sup>39</sup>

Minister of Health Gan Kim Yong said Singapore has twenty contact tracing teams that can trace up to 4000 contacts per day.<sup>40</sup> In contrast, New Zealand traces up to around 700 per day – a total of 4909 as of April 6.<sup>41</sup> Singapore's ability to trace and quickly identify cases during the epidemic is a key reason why the World Health Organisation's Tedros Adhanom Ghebreyesus said Singapore was "leaving no stone unturned" and is continually pushing to "find every case, follow up with contacts and stop transmission."<sup>42</sup>

## Technological Sources

The Singaporean government released a new public contact-tracing software called TraceTogether. SGUnited, GovTech and the Singaporean Ministry of Health created the technical method of containing the virus,<sup>43</sup> which flags when a user is in proximity to high-risk people. Since the end of March, the open-source application was downloaded 620,000 times and will soon be made available to other countries,<sup>44</sup> including New Zealand.<sup>45</sup>

## Other containment measures

### Effective healthcare system

Singapore's healthcare system is highly regarded as a model for public health despite only spending about 3% of its GDP on healthcare – well below the OECD level of 6%. With a top-down cooperative healthcare system, the testing threshold is low and simple: anyone with symptoms (including mild symptoms for hospital workers) are immediately tested for Covid-19.<sup>46</sup> As a result, since March 28 only 41 healthcare professionals have contracted the virus. Singapore's healthcare system was well-prepared with enough healthcare personal protective equipment such as N95 masks. Doctors at the Singapore General Hospital are also split into teams to prevent transmission within hospitals along with physical separations for patients. All sorts of seemingly small systematic changes make a difference.<sup>47</sup>

By contrast, 5,400 healthcare Spanish healthcare workers have been infected, or 14% of Spain's total Covid-19 patients.<sup>48</sup> Italy, Spain and the UK all face huge pressure on their healthcare facilities and many hospitals are running out of personal protective equipment. Singapore's disciplinary healthcare performance can be emulated.

### Transparent communication with the public

The Singapore government was widely commended for its regular and transparent communication with the public. There has been strong emphasis on public health communication and awareness. The objectives of 'flattening the curve' were made clear to the public which then confidently cooperated with the government's decisions. The Prime Minister's Office provides press conferences to inform the public while the Ministry of Health provides daily updates and details of each Covid-19 case. The government also set up digital initiatives through Telegram and WhatsApp groups to share essential clinical and logistical information along with websites to counter false information on social networks with approved data.<sup>49</sup>

### A gradual path to 'circuit breaker'

While in the early days of the pandemic the government restricted the movement of many Singaporeans, it kept the country broadly open. At the time, it was confident in its healthcare system, testing for Covid-19 was simple and the public was generally compliant on quarantine orders and Stay-Home Notices.<sup>50</sup> The government also wanted to keep the economy active and engaging in international trade. Minister of Finance Heng Swee Keat said the Singapore economy is "very open and connected" and a "major business and financial hub" which would be at severe risk from a quick shut down.<sup>51</sup> However, Singapore has now introduced the 'circuit breaker' lockdown policy following the second wave of Covid-19 cases caused by internal community transmission, some of which have not been identified until later.<sup>52</sup> With two foreign dormitories identified as Covid-19 clusters, the country has now imposed a mandatory quarantine on 20,000 of their migrant workers.<sup>53</sup>

New Zealand's government decided to enact a lockdown on similar criteria, 26 days after its first case on February 28. By comparison, Singapore took 75 days since its first case on January 23 to enact its 'circuit breaker' phase potentially showing that some of its earlier measures for containment were effective.

### Previous Experience with SARS 2003

The SARS outbreak of 2003 was a wake-up call for Singapore to develop an effective “whole of government” response which was a key factor for its measured response early in the Covid-19 crisis. Alongside Singapore, mainland China, Taiwan, Hong Kong and South Korea were also prepared for similar scenarios. The SARS experience incentivised Singapore to promote aggressive testing and take swift interventions to promote and impose social distancing with frequent public health communication.<sup>54</sup>

Post-SARS, Singapore built multiple virus research institutions, improved intergovernmental coordination and expanded medical and healthcare facilities for infectious diseases.<sup>55</sup> It also built isolation hospitals, extra negative pressure rooms and created additional legal frameworks.<sup>56</sup> For example, well before the outbreak of Covid-19, on January 16, 2019, the government opened the National Centre for Infectious Diseases as a specific epidemiological medical centre.<sup>57</sup> They invested in the large facility specifically because of SARS 2003. The key factor was the country’s ability to immediately stimulate a unified government response with coordination and cooperation with the scientific community.

In February 2020, Prime Minister Lee Hsien Loong said the SARS epidemic made the island nation “much better prepared” to deal with Covid-19.<sup>58</sup> Such previous experience was a common thread across South Korea, Taiwan, Singapore and Hong Kong which were all deemed model nations dealing with this novel coronavirus. By contrast, the pandemic was unprecedented for many countries in Europe which made containment difficult.

### Masks

During the announcement for the Circuit Breaker policy, Prime Minister Lee said the government is reviewing its advice on face masks.<sup>59</sup> In the earlier phase of the coronavirus, Singapore allocated four surgical masks per household as a precaution in case someone in the house got sick.<sup>60</sup> During this time, Singapore did not experience a community outbreak so it was unnecessary to enforce mask-wearing similar to Taiwan and Hong Kong. Now as internal community transmission occurs, the government will distribute free reusable masks to all households. This is because there is growing evidence of a high rate of asymptomatic cases of coronavirus in Singapore.<sup>61</sup> In South Korea, the number of asymptomatic cases is 20%.<sup>62</sup> Many experts in Taiwan, Hong Kong and South Korea credit mandatory face masks for their lower virus transmission rates.

### Conclusion

Singapore’s early containment policies were a model for the world that the right policy decisions could make significant differences to the problems of Covid-19. Despite staying as an open economy for two months, its total cases remained lower than in many countries. But, since then, Singapore has entered effective lockdown after internal transmission from foreign workers’ dormitories was identified.<sup>63</sup> New Zealand has emulated some of Singapore’s policies such as extensive border and travel restrictions for non-residents, mandatory 14-day self-isolation, extensive contact tracing activities, and vigorous testing.

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## END NOTES

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