

COVID-19 Evidence Update

COVID-19 Update from SAHMRI, Health Translation SA
and the Commission on Excellence and Innovation in Health

31 July 2020

International exemplars of effective COVID-19 control

Executive Summary

Success in controlling COVID-19 has been highly variable around the world. While the situation continues to evolve, some countries are persistently recognised as international exemplars. Among these countries are: **Vietnam, Taiwan, South Korea, Germany, New Zealand**. Different countries have taken different approaches to achieve their relative success.

State of evidence: The published accounts of countries' approaches are predominantly narrative accounts, some in the peer-reviewed literature, many in the grey literature.

Indicators of success: Success is predominantly measured by: total cases; total deaths; 'flattening' i.e. new cases and deaths; substantial but stable case numbers (e.g. Germany); and/or absence of community transmission.

Common features of international COVID-19 exemplar countries:

Early response – Most exemplar countries acted quickly in the face of SARS-CoV-2. For Asian countries, this is widely attributed to recognition of the potential of the pandemic in the wake of experience with SARS-CoV-1 and MERS. New Zealand (and Australia) acted quickly, compared to other Western countries. Germany is considered a later responder.

Border controls – The exemplar countries universally enacted and escalated strict border controls and quarantine of arrivals. New Zealand reports not planning to lift international border controls until a vaccine is available.

Extensive testing – South Korea had the highest testing rate in the world. Vietnam and Taiwan had very fast turnaround testing. Vietnam focussed on high risk, not population level, testing.

Extensive contact tracing – Vietnam traced up to 3rd degree contacts. Germany has 5 contact tracers per 20,000 citizens. Very thorough contact tracing is a notable feature of exemplar countries.

Surveillance and containment – Vietnam mandated hospital and government centre quarantine for cases and contacts, plus app surveillance. South Korea used credit card data and CCTV to complement surveillance. Taiwan monitored quarantined citizens via mobile phones. Germany was resistant to app use due to privacy concerns.

Health System capacity – Germany's ICU beds with ventilator capacity outstripped that of its European counterparts.

Collaboration between government and scientific public health agencies: Involvement of scientific centres for disease control and surveillance were notable for Germany, South Korea, Taiwan. Taiwan linked government data bases.

Clear communication and public engagement – Public confidence in government action and consistent effective communication by leaders is notably high in many of the exemplar countries.

Other measures:

- Physical distancing (1.5 or 2m)
- Restrictions on large gatherings
- Promotion of hand hygiene
- Mask wearing – Mask wearing in common practice in Asian countries since SARS-CoV-1. Masks were in high demand in Taiwan, and supply was government managed. Masks were mandated on public transport from April in Germany, South Korea and Taiwan. No mask wearing was required in New Zealand.
- Lockdowns – All exemplar countries have implemented some form of regional or national lockdown at different times. New Zealand is notable for its early and hard lock down which resulted in elimination of SARS-CoV-2 from the country. South Korea and Taiwan are notable for absence of lockdowns.

Summary of Key Evidence

Large International Comparisons

Kennedy et al *How experts use data to identify emerging COVID-19 success stories. Exemplars in Global Health.* (30 June 2020) [report] (1)

- The authors aimed to identify countries that were doing well, using a methodology that looked at indicators suggesting success in terms of detecting disease, containing the outbreak, and treating those who were unwell. To support comparability, they measured indicators per capita (per million) and across time, and only included countries above a certain size.
- Detection Indicators: Tests per capita, tests per confirmed case, tests per confirmed deaths
- Containment Indicators: Cases per capita, cases doubling time, deaths per capita, deaths doubling time
- Treatment Indicators: Case Fatality Rate
- Three countries were identified as exemplars: **Germany, South Korea, and Vietnam.**
- **Vietnam** and **South Korea** were able to **contain the outbreak of COVID-19** and avoid the exponential growth in cases seen elsewhere. **Germany** had more cases and deaths, but was nevertheless able to contain and **mitigate the outbreak.**
- Note: **Australia** was excluded because of its geography but was noted for its **high level of population testing.** **New Zealand** and **Iceland** were excluded because of population size, although the authors noted **Iceland's comprehensive testing** and **New Zealand's elimination strategy** and success.

2

Deep Knowledge Group. *Big Data Analysis of 200 Countries and Regions COVID-19 Safety Ranking and Risk Assessment* (date unspecified) [report] (2)

- A commercial analytics group assessed and compared 200 countries for COVID-19 safety and risk using publicly available data sources. Their composite ranking comprised of measures of: assessments of quarantine, government efficiency of risk management, monitoring and detection, COVID-19 healthcare readiness, COVID-19 regional resilience; emergency preparedness.
- Top **10 ranked countries** in order were: **Switzerland, Germany, Israel, Singapore, Japan, Austria, China, Australia, New Zealand, South Korea.**

Country Case Studies

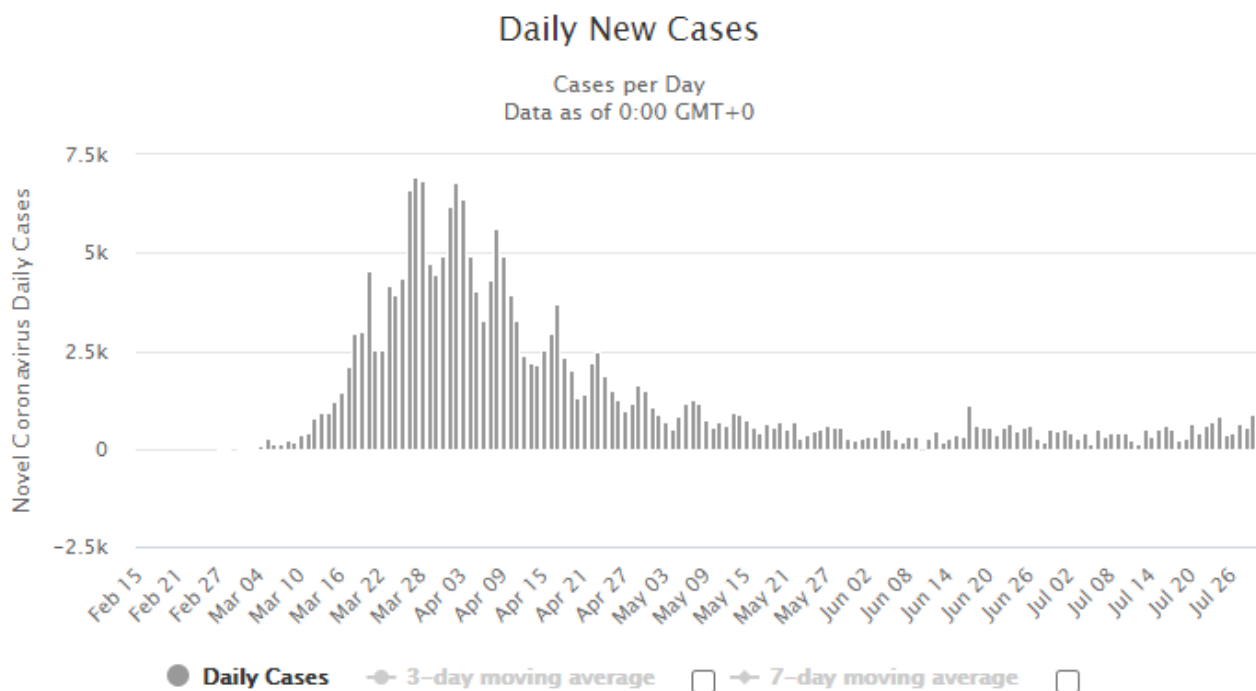
1. Germany

- Popⁿ: 83m; Cases: 207,379; Deaths: 9,205; Active cases: 6,774.
- Geographical features: Land borders with 10 European countries.
- Germany did not prevent a large outbreak but contained it and mitigated its impact.
- Notably low case fatality rate (compared to other European countries)
- Germany implemented border controls and quarantine, and very comprehensive contact tracing

Worldometers. [Coronavirus: Countries: Germany](#). (accessed: 23-07-2020)

- Like many European countries, Germany recorded a high total number of cases of SARS-CoV-2 (over 200,000) and COVID-19 deaths (over 9,000). Germany's daily case rate has fallen dramatically but not below several hundred new cases per day.
- Daily cases on 29 July 2020: 860

Daily New Cases in Germany



3

Wieler L et al. Emerging COVID-19 success story: Germany's strong enabling environment
(30 June 2020) [report] (3)

- Germany did not prevent the COVID-19 outbreak, but the prevention protocols in place facilitated the country's response to the outbreak.
- These protocols included early establishment of testing capacities, **high levels of testing** (in the European Union, Germany is a leader in tests per confirmed case), an effective **containment strategy among older people** (which may explain why Germany has a much lower case fatality rate than comparable countries), and efficient use of the country's **ample hospital capacity**.

- In April 2020, Germany began relaxing its physical distancing measures. This approach was informed by **continuous tracking of key indicators** and supplemented by findings from serological testing.
- By April 15, when new cases reported per day numbered approximately 2,000 (compared to a peak in March of 6,000), the government announced a gradual easing of physical distancing measures.
- Thus far, the relaxation of these physical distancing measures has not caused an increase in new infections. The authors conclude that Germany’s contact tracing and robust testing and treatment strategies may have brought the country through the most severe portion of the outbreak.
- Epidemiological expertise and surveillance
 - Germany is a **highly federalized country** and the responsibility for public health lies primarily with intermediate and local public health authorities in 16 federal states and approximately 400 counties. National guidelines and recommendations are adapted to local needs. National authorities facilitate nationwide exchange and negotiate standards and common procedures.
 - Germany’s national **public health institute, Robert Koch Institute (RKI)** was reportedly heavily involved in the country’s response. RKI is dedicated to the prevention, control, and investigation of infectious diseases. RKI publishes risk assessments, strategy documents, response plans, daily surveillance reports on COVID-19, and technical guidelines, and works with national and international public health authorities as channels for distributing communication. This steady flow of information has helped the government—as well as local and intermediate public health authorities, health professionals, and the population—make critical decisions during the outbreak
- Testing
 - In January 2020, scientists at Germany’s Charité hospital developed one of the first specific tests for the presence of the SARS-CoV-2 virus in patients, which is now used widely around the world.
 - As of May 11, 2020, Germany has **conducted 18.6 tests per positive case**, more than Italy (11.9), Spain (8.4), United States (7), United Kingdom (6.4), and France (6.3), but less than South Korea (68.1)
- Contact tracing
 - By using a combination of epidemiological methods such as **interviews** and **whole genome sequencing**, the contact tracing team was reportedly able to reconstruct and describe transmission events precisely. This research provided details on attack rates, incubation periods, and the serial interval, which provided critical information that enabled public health experts to estimate the potential size of the epidemic and decide on appropriate containment measures. Even when the number of cases grew exponentially in Germany, local public health and intermediate and national authorities continued to make tremendous efforts to conduct **contact tracing for every single case**.
 - The government also planned to develop a centralized **contact tracing app** that would enable health authorities to alert others who may have come into contact with people who were confirmed positive. After **pushback due to privacy concerns**, Germany decided to adopt a decentralized, anonymous approach to contact warning. It will reportedly work by asking individuals to report their positive test status via the app, and Bluetooth connections between phones trigger alerts to people who come into contact with someone who tested positive. This app is also voluntary, so its effectiveness will depend on how many people download it and whether infected patients report their positive test status.
 - The biggest need related to contact tracing is human resources at local public health facilities, many of which are understaffed. The German Federal Ministry of Health and **RKI hired and trained “containment scouts”— typically medical students—to support local authorities in tracing contacts**

- Germany moved forward with relaxing its physical distancing guidelines based on a data-driven rationale.
- **Chancellor Angela Merkel** regularly cites RKI surveillance data and uses epidemiological concepts such as reproduction rate as a driving factor behind decisions related to social distancing measures. The German government is focusing on three indicators—infection rate, disease severity, and health system capacity—to measure the quality of its response.

Deep Knowledge Group. Germany Special Case Study Covid-19 Safety Assessment (dare not specified) [report] (4)

- Assessment: Germany's performance overall is very good. Germany assessed as lagging behind only Israel.
- Feature the authors reported that were notable for Germany:
 - considerably more 'severe sanctions' against citizens violating the legal norms of preventive isolation
 - a greater number of security force personnel per capita
 - compliance with social distancing laws has been promoted through a **reduction in working hours, economic support to citizens** and **flexibility of tax rates**, achievements by which Germany stands out from the other regions in our ranking.
 - Some of the factors that slightly worsen Germany's performance with respect to Israel: lower capacity of the state to adopt new surveillance laws (consequence of being immersed in a very different geopolitical context).
- Germany has stood out from most regions for its **efforts and investments in tracing early community transmission** of COVID-19, and this **methodical search for contagion chains** has so far resulted in some of the lowest death rates in Europe. The German monitoring model is a global example of how epidemiological chains of infection must be carefully tracked in order to interrupt them.
- Germany has tested for COVID-19 on a larger scale than most countries. Israel approximately 55K tests per million individuals, in Germany this value falls to just over **3K tests per million**
- Germany is one of the best positioned in terms of **healthcare readiness**
- Germany is conducting **nationwide testing for COVID-19 antibodies** since April, becoming the first European country to do so. The serological tests are reportedly helping officials in monitoring the infection spread.
- Germany's armed forces have been actively participating in containing the epidemiological outbreak.
- The **community is highly participatory** and **responds positively to government determinations**.
- In response to the abrupt drop in employment caused by COVID-19, the German government implemented a **short-time work scheme, known as Kurzarbeit**, to appease the consequences on family economies, and **ensure that social distancing measures are economically sustainable**. This temporal reduction of the regular working time allowed companies to reduce personnel costs, while at the same time maintaining their workforce. The **workers were partially compensated for their wage losses by a Federal Employment Agency plan that assigns financial aid proportional to the amount of lost salary**.
- Telemedicine platforms, bots and IT-systems are being widely used in Germany to guarantee medical care remotely, trace contagion routes, identify points of major risk, and allow efficient crisis management. [Telemedicine was not in place in Germany prior to COVID-19]
- The main threats to COVID-19 safety in the region: the pronounced **population aging** (a very common risk factor among European countries), and the reversal of restrictions on social distancing.

Bittman et al. J Regen Biol Med (July 2020) (5)

- In the second half of April, all [German] federal states successively decided to make it compulsory to wear masks. **Masks are generally compulsory in public transport and shops; scarves are accepted** as masks.
- What is striking is that in Germany, in comparison with Italy, but also other countries heavily affected by the pandemic such as France, Great Britain and the USA, there is a significantly lower-case mortality rate

Verulava, T. Challenges of the COVID-19 pandemic: German strategy, 25-27 June 2020 [conference paper] (6)

- Reconstruction credit bank has a special role in the history of Germany in critical situations. During the pandemic, the Reconstruction Credit Bank will issue any loans to entrepreneurs so that companies do not stop working due to lack of funds. In order to save the economy, the government is ready to take over the management of strategically important companies.
- The pursuit of **technological innovation** allows Germany to relatively reduce the negative consequences of a pandemic. Despite the adoption of restrictive measures, most of the country's factories continue to operate. The main factor in the smooth operation of German production in the face of the pandemic is the introduction of digital technology in production systems long before COVID-19. They created the "Industrial 4.0 Strategy", which involves training German companies for the fourth industrial revolution, or digital age. Germany has more ability and opportunity to protect the industry from the devastating effects of a pandemic.
- From the beginning of the spread of the infection in Germany, the laboratories already had a supply of diagnostic tests and, as a result, soon began mass testing. **Early and mass testing** has made it possible to identify patients with asymptomatic infections and mild severity in order to isolate them immediately, which has dramatically slowed the spread of the virus. The testing was particularly effective for medical personnel who had direct contact with those infected.
- The Robert Koch Institute has developed a control app that allows to collect data on the geographical distribution of Coronavirus.
- Experts attribute the success to the **public's confidence in the government**. Merkel's plan is based on the **recommendations of the Robert Koch Research Institute**.

6

Reintjes R. BMJ (25 June 2020) (7)

- Care must be taken when comparing data from different countries, and various reasons may explain the observed differences.
- But from a public health perspective, experience with SARS suggests that **Germany's intensive system of testing, contact tracing, and quarantine** were critical to successful control of the outbreak, especially given the role of super spreading events that seem to shape the current epidemic in Germany, with the most recent ones in meat plants.
- Germany is organised into 16 federal states, which hold responsibility for health. Outbreak investigation and management, including contact tracing, is the responsibility of local health authorities at city or county level, with support from state health departments and the national institute for public health, the Robert Koch Institute, when necessary.
- Civil servants were redeployed to public health from elsewhere and extra staff employed to support local contact tracing. Germany built on existing infrastructure and experience from the outset, unlike England, where local public health departments were overlooked in favour of a centralised system run by outsourced companies.
- Later, as population restrictions were being lifted, chancellor Angela Merkel and the prime ministers of the federal states agreed that local authorities should have **five contact tracers for every 20,000 citizens**

- States agreed that population infection control measures such as school closures or even “lockdowns” would be reactivated locally if infection rates reached a **threshold of 35-50 cases per 100,000** inhabitants a week in a region
- Like many other countries, Germany deployed technological solutions, including an anonymised and decentralised **contact tracing app** that was launched on 16 June. **Concerns over privacy** led to a reversal of previous plans to collect data more centrally and thus to a delay. Data protection rights are taken seriously in Germany, and data collected by the app is held only on individual phones, with no central database. Public health experts, however, have limited expectations: in a recent survey, 38% of responding public health departments had doubts about the added value of a contact tracing app or considered it potentially problematic
- Although **Germany’s lockdown was less intense and shorter** than in some other European countries, including the UK, early implementation, in combination with widespread testing, contact tracing, and quarantine, have been successful in reducing the incidence of COVID-19 and both COVID-19 specific and excess deaths. So far, the epidemic has remained stable through stepwise relaxation of control measures, although recent outbreaks in several meat plants (one including more than 1000 cases) are obvious challenges to the system. Strong measures, including a **regional lockdown**, have been taken to control these outbreaks

Dieter H. Germany in the COVID-19 Crisis: More Robust than Other European Countries? In: The Viral World [Book] (8)

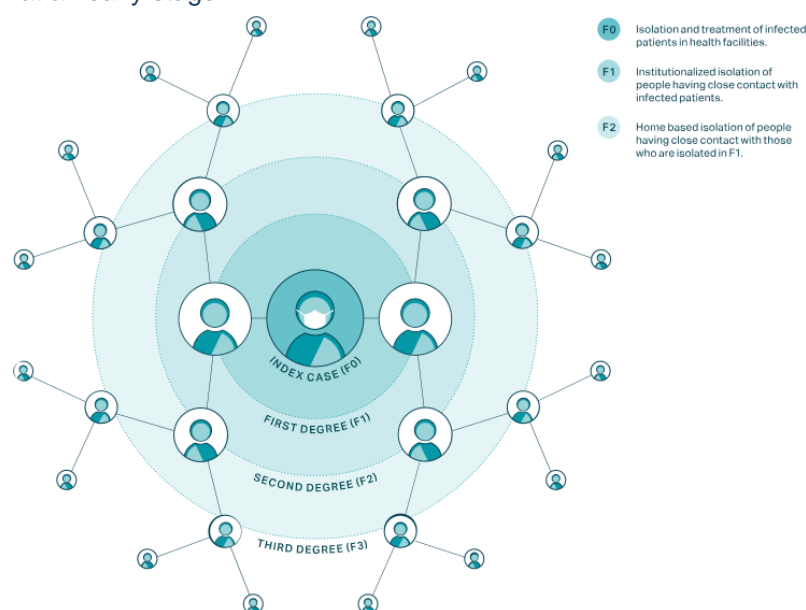
- Germany, with its enormous financial resources and a well-equipped medical sector, appears to be better placed than other economies to weather the storm [of COVID-19].
- Germans were reluctant to embrace some precautionary measures. The German government was equally reluctant in implementing comprehensive measures to stop the spread of the virus. Instead, the German federal and state governments implemented what may be labelled as an **ex-post approach**. They waited until the crisis hit and only implemented harsh measures after the infections rates skyrocketed. To be fair, that may have been the only avenue available in a democracy in general and in Germany in particular. Policies that severely curtail the freedom of individuals are always contested, but without evidence, it is incredibly complicated to convince citizens that they should alter their behaviour.
- At the same time, policymakers in Germany continued to emphasise that the country is well-prepared for a health emergency. This is true for two areas in particular: **hospital beds and laboratory capacity**. The number of hospital beds available is, indeed, remarkable. The country boasts 500,000 regular hospital beds, about five times the British figure of 100,000. Germany currently has 28,000 intensive care beds, out of which 25,000 are equipped with ventilators. France had 5,000.

2. Vietnam

- Popⁿ: 97m; Cases: 431; **Deaths: 0**; Active cases: 66.
- Geographical features: Long border with China.

Pollack et al. Emerging COVID-19 success story: Vietnam's commitment to containment. Our World in Data: Exemplars in Global Health (30 June 2020) (9)

- Testing:
 - Testing capacity ramped up quickly, from just two testing sites nationwide in late January to 120 by May.
 - The country decided on a strategy of using testing to identify clusters and prevent wider transmission. When community transmission was detected (even just one case), the government reacted quickly with contact tracing, commune-level lockdowns, and widespread local testing to ensure no cases were missed. **Vietnam has performed more tests per confirmed case than any other country in the world**, even though testing per capita remains relatively low.
 - **Very rapid testing time: 70-80 minutes.**
- Contact Tracing. The process in Vietnam worked as follows:
 - Once a patient with COVID-19 is identified (F0), local public health officials, with support from health professionals, security officers, the military, and other civil servants, work with the patient to identify who they might have been in contact with and infected in the past 14 days.
 - All close contacts (F1), defined as people who have been within approximately 6 feet (2 meters) of or have prolonged contact of 30 or more minutes with a confirmed COVID-19 case, are identified by this process and tested for the virus.
 - **If F1s test positive for the virus, they are placed in isolation at a hospital – all COVID-19 patients are hospitalized at no cost in Vietnam, regardless of symptoms.**
 - If F1s do not test positive, they are **quarantined at a government-run quarantine centre** for 14 days.
 - **Close contacts of the previously identified close contacts (F2s) are required to self-isolate at home for 14 days.**
 - One noteworthy aspect of Vietnam's approach is that it identified and quarantined suspected cases based on their **epidemiological risk of infection** (if they had contact with a confirmed case or travelled to a COVID-19 affected country), **not whether they exhibited symptoms**. The high proportion of cases that never developed symptoms (43 percent) suggests that this approach may have been a key contributor to limiting community transmission at an early stage.



- Containment:
 - As a result of its detection process, hundreds of thousands of people, including international travellers and those who had close contact with people who tested positive, were placed in **quarantine centres run by the government**, which greatly reduced transmission at both the household and community levels.
 - **Hot spots with demonstrated community transmission were locked down** immediately,
 - The government communicated frequently with citizens to keep them informed and involved in the public health response.
 - From January 23 to May 1, over **200,000 people spent time in a quarantine facility**. Those in government run quarantine centres are provided with three meals a day, sleeping facilities, and basic toiletries. Though not popular, “On-demand” quarantine facilities were also established in selected hotels for those who are willing to pay.
- Apps:
 - Vietnam implemented NCOVI, an app that helps citizens put in place a “**neighborhood watch system**” that complements official contact tracing efforts and may have helped to slow transmission of the disease, although the app has **drawn criticism from some privacy advocates**.
 - NCOVI includes a map of detected cases and clusters of infections and allows users to declare their own health status, report suspected cases, and **watch real-time movement of people placed under quarantine**.
 - Bluezone, a Bluetooth-enabled mobile app that notifies users if they have been within approximately 6 feet (2 meters) of a confirmed case within 14 days. When users are notified of exposure, they are encouraged to contact public health officials immediately
- Vietnam entered a nationwide lockdown on 1 April. Initially, the lockdown was set for 15 days, but it was extended to 21 days in 28 out of 63 provinces. Vietnam began to lift its national lockdown on 22 April. Schools opened between 4 May and 11 May. Public transportation, domestic flights, and taxis are now allowed to operate, but international flights remain grounded.
- Everyone must wear a mask in public.
- Since 16 April, Vietnam has recorded **no new cases of COVID-19 related to community spread**.
- Many lessons from Vietnam are applicable to other countries, including:
 - Investment in a public health infrastructure (e.g., emergency operations centres and surveillance systems) enables countries to have a head start in managing public health crises effectively. Vietnam **learned lessons from SARS and avian influenza**, and other countries can learn those same lessons from COVID-19.
 - **Early action**, ranging from **border closures** to **testing** to **lockdowns**, can curb community spread before it gets out of control.
 - **Thorough contact tracing** can help facilitate a targeted containment strategy.
 - **Quarantines based on possible exposure**, rather than symptoms only, can reduce asymptomatic and pre-symptomatic transmission.
 - Clear, consistent, creative public health messaging - **Vietnamese government communicated in clear, strong terms about the dangers of the illness**
 - A strong whole-of-society approach engages multi-sectoral stakeholders in decision-making process and activate cohesive participation of appropriate measures.
 - There is reportedly **high trust in government action**

Dinh et al. J Trav Med (16 April 2020) (10)

- Unlike affluent Asian countries with GDP per capita of twentyfold higher, Vietnam could not afford a community-wide testing program. Instead, Vietnam has focused on cost-effective measures. At the centre of its active case finding is **extensive contact tracing** and **health declaration for all**. In combination with **case isolation**, **mass quarantine**, and **mass mask wearing**.

Ha et al. Int J Env Res & PH (30 Apr 2020) (11)

- The repeated communication on the prevention of COVID-19 (wearing masks, hand washing), and the promotion of social distancing (stay home and keep distance from others at 2 m minimum), was helpful in changing people's behaviour toward the epidemic more seriously.
- Transparent information on positive cases helped to convey the image of government action towards COVID-19. Furthermore, the Ministry of Health created an official account on social media (Zalo), **sent SMS to all citizens**, and **changed waiting ringtones to a voice message to remind about COVID-19 protection measures**.
- Vietnam was the first country in the world to apply medical declarations on entry to the country.
- Vietnam enforced the implementation of social distancing with standing at least 2m apart in public and avoiding gatherings in large numbers
- In Vietnam, a stronger emphasis was made on the central management and leadership by the MOH [Ministry of Health] and the government. However, in other contexts with more diverse political environments this approach may need adapting, for example, in the multi-party political context perhaps more liberal approaches may be more appropriate. The introduction of reporting of personal and family health status needs to consider issues of individual privacy and data confidentiality, which are often a source of large public discourse, for example, in European contexts.

Huynh J. Global Hlth (June 2020) (12)

- Vietnam became the first country to halt the SARS spread successfully. Vietnam is of interest as a case study of successful epidemic containment.

Pham TQ. medRxiv [pre-print] (19 May 2020) (13)

- Amongst those quarantined, many were second degree contacts (F2); to our knowledge, no other country has implemented quarantine in this manner
- The majority of **imported cases were less than 30 years old** (many were university students returning from studies abroad), and most of those that **acquired the infection domestically were under 40 years**, which may explain the **low numbers with severe disease and absence of deaths**
- The majority of cases (60%) in Vietnam were imported among those arriving from COVID-19 affected countries; first from China and then from countries in Europe and the USA.
- The high proportion of cases that developed symptoms after isolation (73.9%) or **never developed symptoms (43%)** highlights one of the major challenges of controlling SARS-CoV-2 and the strengths of Vietnam's approach. Suspected cases were identified and quarantined based on their epidemiological risk of infection (recent contact with a confirmed case or travel to a COVID-19 affected country), rather than on exhibiting symptoms. Without the implementation of strong control measures and meticulous contact-tracing, it is likely such cases would have silently transmitted the virus and undermined other control efforts.

Trevisan M. AJPH (Aug 2020) (14)

- The government made it **compulsory** for people to declare their health status and travel history through a **mobile app, NCOVI, which was designed to screen for high-risk cases**.
- Hanoi developed a public app, Ha Noi Smart City,¹ where cases F0 and their F1 contacts are mapped. In addition to that, the contacts of F1 (or F2) and their contacts F3 and sometimes even F4 were tracked down and followed up.

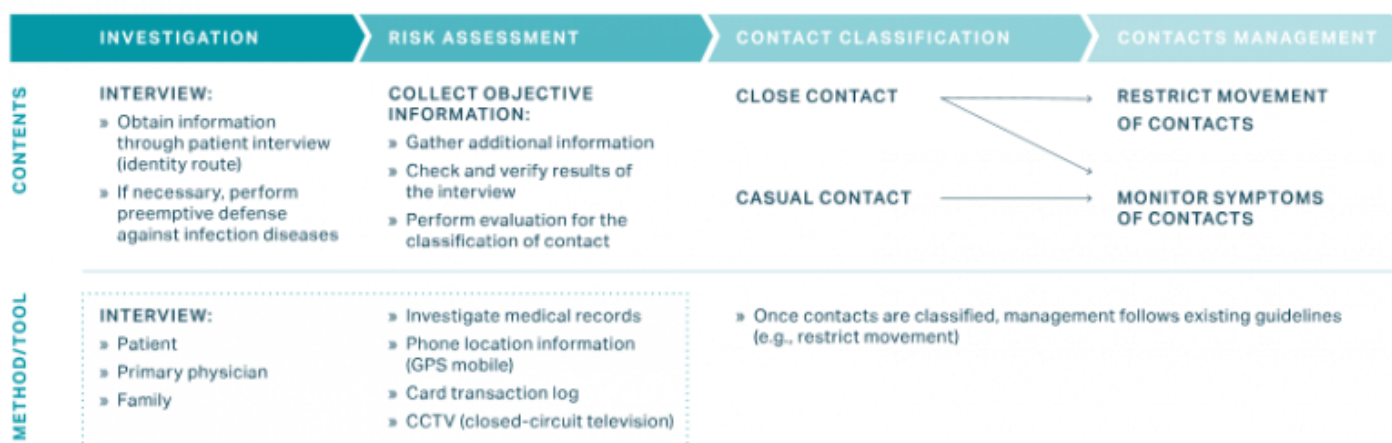
3. South Korea

- Popⁿ: 51m; cases: 14,175; deaths: 299; active cases: 971
- Geographical features: South Korea, which is separated from China by North Korea, is effectively an island with respect to border travel and access. The population is highly urbanized (over 80%).
- Reduced numbers from a peak of 900 cases per day in February to single digits by late April, via intensive tracking and testing.
- No lockdowns reported, but rather relied on compliance with physical distancing.
 - Experienced an outbreak of cases from nightclubs after a holiday weekend.
 - Cases linked to the church cluster at one point accounted for about half of South Korea's total.
 - All churches in South Korea were shut. Officials limited public gatherings. Churches reopened, but worshippers are required to keep a distance and wear masks.

Labs A. Emerging COVID-19 success story: South Korea learned the lessons of MERS. Exemplars in global health Our World in Data: Exemplars in Global Health (30 June 2020).

- South Korea's response to COVID-19 stands out because it **flattened the epidemic curve quickly without closing businesses, issuing stay-at-home orders**, or implementing many of the stricter measures adopted by other high-income countries. The country has shown early success across three phases of the epidemic preparedness and response framework: **detection, containment, and treatment**. From the outset, decision making in South Korea has been a **collaboration between the government and the scientific community**.
- Detection:
 - South Korea built hundreds of innovative, high-capacity screening clinics and worked closely with the private sector to ensure an adequate supply of tests. As the outbreak escalated, **approximately 600 testing centres** were established to screen people efficiently and outside of the health system, with testing capacity reaching **15,000 to 20,000 tests per day**. [Note: testing rate per million is similar to that of Australia]
- Containment:
 - South Korea **isolated infected patients, supported those in quarantine to increase compliance** and, most importantly, traced contacts with **exceptional thoroughness**.
- A workforce of hundreds of epidemiological intelligence (EIS) officers was deployed for these tracing efforts and empowered to use a **wide variety of data sources**. The work of the EIS officers was further facilitated by legal changes that followed the 2015 MERS outbreak. When necessary, the officers were permitted to draw on four major types of information in addition to patient and doctor interviews:
 - Facility visits, including pharmacies and medical facilities
 - **Cellular GPS data** from cell phones
 - **Credit card transaction logs**
 - **Closed-circuit television**
- Reportedly, the painful memory of **MERS** inspired an **early, aggressive government response** - and a willingness among people to wear **masks, cooperate with contact tracers**, and otherwise **listen to public health officials**. For example, wearing a mask in public spaces, already common because of air pollution, became a social norm early in the pandemic. A recent poll showed that more people adhered to public prevention protocols during the COVID-19 outbreak than during the MERS outbreak.

Approach and Data Used to Monitor Contacts of COVID-19 Patients in South Korea



- The Korean government transformed public facilities and retreat centres owned by private corporations into **temporary isolation wards [for positive cases]**.
- Meanwhile, staff at local public health centres **closely monitored people who self-quarantined** because they had been in contact with a confirmed case, had travelled internationally, or suspected they might be infected. A **public health officer checked in with them twice daily and delivered food and toiletries**.
- South Korea defined seven groups as being at **higher risk for severe illness from COVID-19**:
 1. people ages 65 and older;
 2. people with underlying chronic conditions such as diabetes, chronic kidney, liver, or heart disease, and HIV;
 3. people with blood cancer;
 4. cancer patients receiving chemotherapy;
 5. people taking one or more immunosuppressive medications;
 6. pregnant women, extremely obese people, those undergoing dialysis, transplant recipients, and smokers; and
 7. people with a blood oxygen saturation level below 90 percent.

4. Taiwan

- Popⁿ: 23m Cases: 462; Deaths: 7; Active cases: 15
- Estimates indicate that approximately 80% of confirmed cases were imported.
- **Less emphasis on lockdowns**
- Features of Taiwan's control efforts, and reported reasons for their current success:
 - Daily press briefings and announcements about when and where to wear masks, the importance of handwashing and the effects of hoarding masks for frontline workers.
 - **National Health Command Centre** established in response to experience of SARS-CoV-1 in 2003.
 - The **Central Epidemic Command Centre** which coordinated efforts by a number of ministries (e.g. economics labour, education etc) and banned export of surgical masks (one month before South Korea did the same).
 - Early border controls (January)
 - Health insurance and immigration **data was combined** with individuals' identification cards. Individuals identified as high risk because of travel in affected areas (under home quarantine) were monitored electronically through their mobile phones
 - All hospitals, clinics and pharmacies had access to patients' travel histories
 - Masks mandatory on public transport (1 April)
 - Social distancing alerts over text messaging
 - Limitations on gatherings (100 indoors and 500 outdoors)
 - Limits on mass gatherings.

Hwang T.J. Int Psychogeriatr (22 Jul 2020) (15)

- The Taiwan government established the National Health Command Center (NHCC) one year after the severe acute respiratory distress syndrome (SARS) outbreak in 2003. The NHCC acts as the operational command point for direct communications among central, regional, and local authorities

13

Hsieh C-C. Int J Env Res & PH (6 Jul 2020) (16)

- This paper presents evidence that spread prevention involving mass masking and universal hygiene at the early stage of the COVID-19 pandemic resulted in a 50% decline of infectious respiratory diseases, based on historical data during the influenza season in Taiwan.
- These outcomes provide potential support for the effectiveness of widely implementing public health precaution measures in **controlling COVID-19 without a lockdown policy**.
- Universal Hygiene
 - Cleaning surfaces and removing fomite in the environment - places that people may accidentally touch.
 - Widespread distribution of hand sanitizer.
- Mass masking – medical masks.
 - The government has encouraged the public, since late January 2020, to choose more effective masks available on the market.
 - In addition, the government has released clear instructions of mask-wearing, e.g., its function, how to wear it properly, and maintaining mask hygiene via government websites, social media apps, and TV broadcasting.
 - Health ID card are produced to purchase a pre-defined number of medical masks for himself/herself and a family member at USD 17 cents each (exchange rate, 12 May 2020). After early March, the government further launched pre-ordering systems online, and people could order their weekly allocations and pick up the masks at local convenience stores.
 - Wearing masks in public has been commonly seen everywhere: although it is not enforced by the government, it was highly recommended.

- Since 1 April, it has become compulsory for people taking public transportation in response to a mildly continuing increase in infected numbers.
- There is a perception that Asian people tend to wear masks at greater levels and have a higher acceptance rate. This was not the case before SARS 2003
- Since the introduction of universal hygiene and mass masking, significant positive outcomes are seen in the statistics recorded by the Taiwanese Centers for Disease Control. Notably, Taiwan has not had to lock down any areas, and people continue to maintain their ordinary lives.
- Compared to other success stories, such as New Zealand and Vietnam, there has not been a lockdown in Taiwan.

Lin et al. Emer Inf Dis (July 2020) (17)

- Notes the presence and involvement of Taiwan Centers for Disease Control (Taiwan CDC). Learned from SARS
- Rapid testing: 24 hour then 4 hour test kits.
- Early border controls
- GPS tracking of home quarantined individuals
- Social Norms and Mask Shortages
 - After the 2003 SARS outbreak, persons in Taiwan, Japan, and several other countries in Asia began wearing medical face masks during influenza season or in crowded public spaces, such as on subways.
 - Wearing a mask also is considered good practice for persons with a cold, and persons with allergies or a weakened immune system are expected to wear a mask.
 - Taiwan CDC advising that healthy persons did not need a mask, except when visiting hospitals or crowded, enclosed places.
 - Taiwan had a consumer rush on masks and had to place controls in place.

14

Wang CJ. JAMA (14 April 2020) (18)

- Taiwan leveraged its national health insurance database and integrated it with its immigration and customs database to begin the creation of **big data for analytics**; it generated real-time alerts during a clinical visit based on travel history and clinical symptoms to aid case identification.
- Border Control, Case Identification, and Containment
- Those identified as high risk (under home quarantine) were monitored electronically through their mobile phones.
- These announcements included when and where to wear a mask, the importance of hand washing, and the danger of hoarding masks to prevent them from becoming unavailable to frontline health workers.
- Daily communication to the public.

5. New Zealand

- Popⁿ: 4.9m; Cases: 1557; Deaths: 22; Active cases: 21.
- New Zealand has international border controls similar to Australia.
- Government's Lockdown approach of 'go early-go hard', and went into nationwide *Alert Level 4 Lockdown* at 11:59pm on Wednesday 25 March.
- On 8 June NZ declared it had eliminated the virus and lifted all restrictions on movement and distancing (Alert Level 1 – Prepare).
- NZ System emphasises: stay home when sick; personal hygiene (handwashing, covering sneezes and coughs); personal and organisational record keeping to enable contact tracing; plus intensive testing, contact tracing and border restrictions.
- No restrictions on personal movement, domestic travel, workplaces or services.

New Zealand Ministry of Health (7 April 2020) [policy document] (19)

- Elimination of COVID-19 (or any disease) means reducing new cases in a defined geographical area, in this case Aotearoa/New Zealand, to zero (or a very low defined target rate).
- The two primary aims of a COVID-19 elimination strategy are:
 - to eliminate transmission chains in Aotearoa/New Zealand
 - to prevent the emergence of new transmission chains originating from cases that arrive from outside the country.
- The transition from successful COVID-19 containment to a maintenance phase involves:
 - ongoing intensive surveillance and monitoring to detect any breaches, linked to capability and capacity to respond in a timely way that limits transmission
 - staged lifting of control measures within Aotearoa/New Zealand - ideally from the least risky transitioning through to the most risky [this has occurred]
 - intense and sustained border restrictions, as these would now be Aotearoa/New Zealand's primary defence
 - the **ultimate end of this strategy, allowing lifting of border controls, would be through population vaccination** to obtain herd immunity.

15

Henrickson M. Int J Comm Soc Dev (June 2020) (20)

- NZ has been commended because it closed its borders (to non-nationals); lockdown; traced; tested contacts; told people to pick a 'bubble' (immediate and usual family or household) and stay within that bubble; and promoted clear public messages.
- Government assistance was available for employers to retain staff, and additional support was provided for businesses and individuals.
- A strong and empathetic Prime Minister communicated regularly with the public and developed a sense of common national purpose.
- NZ is a gateway to the Pacific Island nations and territories, which puts a significant responsibility on NZ, for transport, international development aid and for public health. The memory of the 1918 influenza epidemic brought to Samoa by a NZ ship is very much alive in the political and public consciousness.
- Despite strong representations from the NZ tertiary education sector, the exclusion was also applied to Chinese and other international students enrolled in NZ courses of study. This was a particularly unwelcome decision as international students are considered essential for the economic well-being of the NZ education sector.

- Prime Minister Jacinda Ardern, announced the establishment of a four-stage ‘alert’ level system: Level 1 (Prepare), Level 2 (Reduce), Level 3 (Restrict); Level 4 (Eliminate) is the highest risk, requiring a compulsory ‘lockdown’ of individuals and businesses.
- At Level 4, the entire population was instructed to remain in their homes and associate only with those in their ‘bubbles’ (i.e., their immediate and usual family or household). All public gatherings of any size, including funerals and tangihanga (Māori cultural funeral rituals), were banned; all nonessential businesses, educational institutions, bars and restaurants (including takeaways), liquor stores, gyms and pools, and personal care (e.g., hairdressers) services were required to close. Essential workers (who included health, pharmacy, residential care workers, first responders, public safety, grocery store and food distribution workers, veterinary services, and the media, among a limited group) were permitted to work under strict protocols governing personal interactions.
- There were a few violations of Level 4 restrictions, and police had the authority to enforce and prosecute where necessary. Communities with high numbers of Māori residents saw impromptu checkpoints and blockades staffed by Māori volunteers on their roads preventing non-residents from entering those communities. These blockades became a point of tension because although they were not strictly legal, police were reluctant to confront or dismantle them since sovereignty over land is guaranteed to Māori by the Treaty of Waitangi.
- Prime Minister Ardern became the focus of global media coverage when she announced that NZ had ‘eliminated’ transmission of COVID-19, and she said ‘We can say with confidence that we do not have community transmission in New Zealand’. Ardern and her staff also warned that residual pockets of virus would need to be managed as the country emerged out of its complete lockdown.
- During the COVID-19 crisis, she has empathised with the difficulties of lockdowns and encouraged a mutuality of response across all sectors of the country.
- She and her ministers have popularised the term ‘physical’ rather than ‘social’ isolation, recognising that socialising safely was an essential way of gaining the trust and collaboration of the nation for the restrictions placed on them.
- It is a fairly remote island nation with clearly defined and monitored borders. COVID-19 was a relatively late arrival in NZ, and so officials had the advantage of watching the Chinese, Korean, Iranian and Italian experiences, as well as the spread of the pandemic in Europe.
- NZ is a small country, with a relatively low population density (except in the major cities), although there are strong cultural, social and relational networks. Much of the country trusts a strong central government in times of crisis and adheres to public health and safety messages that have been clearly explained and make sense.
- An analysis by overseas media (BBC News) found that NZ has done a number of things right in its national response to COVID-19: It closed its borders (to non-nationals); It had a quick and clear lockdown; It traced and tested contacts; It told people to pick a ‘bubble’ and stay within that bubble; There were clear public messages.
- In addition to these measures, early in its response, the government announced a package of support worth NZ\$5.3 billion in wage subsidies that would support businesses to pay workers up to 80 per cent of their normal wages or salary rather than making staff redundant. Additional business support was made available through banks on guaranteed loan schemes, deferred tax and tax compliance relief, and special support for Māori businesses and iwi responses. Banks, insurance companies and utilities (e.g., power companies, telcos) also made support available through mortgage holidays, lifting data caps and other measures (Carroll, 2020b).
- NZ relies heavily on tourism (21% of NZ’s export goods and services, nearly 10% of GDP)
- Noted: Very high public trust

Other International Comparisons

Bremmer I. Time: [The Best Global Responses to COVID-19 Pandemic](#). (12 June 2020)

- Singapore was the initial winner with an aggressive approach to contact-tracing (which included scanning people's IDs at supermarkets) and widespread testing.
- 2nd outbreak in overcrowded foreign worker dormitories.

Alshammari medRxiv. [preprint] (18 July 2020) (21)

- Singapore – among the first countries to apply a travel ban from China in late January.
- Germany and Switzerland did better than Italy and Spain – potentially due to later arrival of the virus plus more prepared health systems

Hsieh L & Child J [The Conversation. What Coronavirus Success of Taiwan and Iceland has in common](#) (29 June 2020)

- Taiwan's success can be explained by the government's quick action in activating the National Crisis Coordination Center on 31 January to coordinate the country's response to COVID-19 through mass testing, quarantine and tracing close contacts of infected citizens.
- The governments of both Taiwan and Iceland have secured high levels of public trust for their responses to coronavirus.
- A combination of transparency and effectiveness may explain polling in April which suggested that 84% of Icelanders were willing to sacrifice some human rights if it helps to prevent the spread of the virus.
- The example of these two countries shows how trust can be promoted by speedy government action to activate a crisis management and command centre which is headed by medical experts rather than politicians. Its purpose should be to coordinate cooperation between government and business and to communicate transparently with the public.

Baniamin et al. Asia Pac J of Pub Admin (Jul 2020) (22)

- To deal with a pandemic, a country may use two general types of strategies: preventive and mitigating. Preventive strategies are those by which a country tries to prevent any outbreak of the disease; and mitigating strategies are those that help to control the spread of the disease after an outbreak.
 - Preventers: Singapore and South Korea
 - [Strategic/deliberate] Non-preventers: UK, Netherlands, Sweden
- Better performing countries such as **South Korea, Singapore, and Japan** were prompt in their **preventive actions**. At the start of the outbreak, they tested people widely, and if necessary, they isolated and quarantined people; thus, they suppressed the transmission of the virus. These countries quarantined people with mild symptoms as well and thereby were successful in preventing community transmission.
- Asian countries that are **neighbours of China, such as Hong Kong, Taiwan and South Korea** successfully prevented the outbreak of coronavirus. These countries were affected by earlier epidemics of SARS. From that experience, they learned lessons and they were quick to adopt different measures such as travel bans, closing their borders to non-residents and 14-day

quarantines. They also started to take travel and exposure histories from patients who had fever and acute respiratory symptoms and isolated those patients

- In contrast, **Germany** conducted large-scale tests as the outbreak unfolded. Hence, Germany was able to map the infected more efficiently and was more successful in containing it.
- Germany was able to map the infected more efficiently and was more successful in containing it. Like Germany, better performing countries such as South Korea, Singapore, and Japan were prompt in their actions. At the start of the outbreak, they tested people widely, and if necessary, they isolated and quarantined people; thus, they suppressed the transmission of the virus. These countries quarantined people with mild symptoms as well and thereby were successful in preventing community transmission.
- State-centric factors such as policy learning and implementation structure, and technological and administrative readiness have influenced success.
- Capacity and preparedness to “test and trace” One of the major factors for the success of the different countries was early detection of the existence of the diseases. For this, state capacity played a significant role. For example, at the beginning of the problem, the UK was only using eight laboratories while Germany had more than 100 labs ready. By 27 March 2020 Germany tested 1,096 per 100,000 citizens, while as of 1 April 2020 the UK had tested 348 per 100,000 of the population. Like Germany, another successful country is South Korea, which has a slightly smaller population than the UK; it also has been able to test far more widely than the UK has (842 per 100,000 for South Korea). USA has tested 348 per 100,000 Vox (Ward, 2020) reported that large hospitals in Spain, including hospitals in Madrid, could not process more than 400 tests a day.
- Despite lots of similarities among the Scandinavian countries, they have adopted different measures to deal with the COVID-19 crisis. Denmark and Norway were quick to take stricter approaches such as lockdown and closing borders.
- Ability to be innovative and to use technology Artificial intelligence, drones, data science and other technologies are being deployed in many countries to fight the pandemic. The Israeli government, for instance, has decided to use technology to track people suspected or confirmed to have been infected with the coronavirus. They approved emergency measures to track people by monitoring their mobile phones. South Korea is another country that is successfully using technology. South Korea uses data analytics; their artificial intelligence-powered warning
- Contextual factors such as a country’s demographic profile (e.g., age), family structure (multigenerational family), and cultural attributes (e.g., kissing and hugging to greet) also shape the effectiveness of policies for controlling the pandemic.
- **Concern for economic consequences** have led to delays. Not wanting to interfere with practice of religion and **popularity of football** are also factors in countries’ decision making.
- Institutional trust and civil disobedience vary by country.
- Attitude towards personal safety measures - Hong Kong, Seoul and Tokyo embraced wearing facemasks more readily than western countries like the US and UK.
- In contrast, in some parts of Asia (mainland China, Hong Kong, Japan, Thailand and Taiwan) everyone is using masks. They are considered as part of safe and considerate behaviour towards others. The assumption is that “anyone could be a carrier of the virus, even healthy people”.

Lu et al. American Journal of Infection Control (23)

- Compares 5 Asian countries
- **Singapore** – High performer (initially) despite being expected to be 2nd worst in the world due to exposure to cultural proximity to China. Besides imposing travel restrictions on passengers

coming from China, within 2 hours of an infection case, contact tracers created a detailed activity log of the patient's movements and interactions in the prior 14 days to infection. Those who have been in close contact with the infected were identified, quickly isolated, and their contacts were tracked again. The accuracy and effectiveness of tracking and contact-tracing were enhanced by a smartphone app that allowed authorities to identify individuals who have been in close contact or exposed to infected patients, and trace their movements

- **Japan** - initiated border control regulations. As the number of cases from community spread increased, Japan prioritized its policy on restricting large-scale clusters. Appealing to cultural norms, successfully promoted social distancing and no handshaking. Mask wearing was widespread.
- **South Korea** - Along with early testing, South Korea implemented contact-tracing programs that consisted of official interview, GPS tracking, and video surveillance to trace the travel history of a COVID-19 case.
- Singapore and Taiwan learned from the 2003 SARS outbreak. South Korea, learned from MERS outbreak in 2015, and implemented its well-planned and well-organized widespread testing to identify and isolate infected cases effectively.

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