KING'S
College
LONDON

PREVENTING THE NEXT PANDEMIC:
LESSONS FROM EAST ASIA

CONTENTS

AUTHORS

Dr Ramon Pacheco Pardo
Lead author
ramon.pacheco@kcl.ac.uk
Department of European & International Studies, King's College London

Professor Mauricio Avendano Pabon
Department of Global Health & Social Medicine, King's College London

Xuechen Chen
Bo-jiun Jing
Jeong-ho Lee
Joshua Ting
Department of European & International Studies, King's College London

Takuya Matsuda
Department of War Studies, King's College London

Dr Kaho Yu
Department of European & International Studies, King's College London
Verisk Maplecroft

PREVENTING THE NEXT PANDEMIC: LESSONS FROM EAST ASIA[1]

KEY FINDINGS

1 Institutional capacity developed over decades of experience with prior outbreaks is a key element in the prevention and management of new pandemics, including COVID-19.

2 Preparedness following the 2003 SARS and other pandemics has been key for East Asian countries' public health institutions to manage the COVID-19 pandemic better than their counterparts in Western Europe and the United States.

3 Institutional capacity-building involves learning lessons from previous pandemics, developing long-term public health infrastructure and, crucially, maintaining memory of those lessons to implement them in future pandemics through long-standing, non-partisan institutions.

4 Institutional capacity should pay special attention to the legal infrastructure, healthcare and public health system preparedness and operation, and the use of technology to prevent the spread of disease and contain its impact on the health care system.

5 It is possible to learn several lessons regarding how to strengthen institutional capacity from across East Asia and apply some of them elsewhere relatively quickly; other lessons will require long-term planning.

1 Introduction

As the COVID-19 pandemic continues to spread across the world, one region stands out for its comparatively effective prevention and management response: East Asia. As of early May, the number of reported deaths per capita from COVID-19 across East Asia is lower than in other regions – most notably Western Europe and the United States. In addition, with the exception of the city of Wuhan where the pandemic originated, no other East Asian country saw its entire healthcare system overwhelmed as a result of COVID-19. Furthermore, East Asian countries, other than partially in China, avoided the widespread full lockdowns prevalent across Europe and most of the United States.

What lessons can East Asia offer to prevent and manage the next pandemic – starting with a potential second wave of COVID-19? This report analyses how six countries and territories in East Asia built and have implemented a set of *institutional capacities* to use in case of (potential) pandemic.[2] The focus is on three key aspects of institutional capacity-building to address outbreaks potentially leading to pandemics: (1) the legal infrastructure providing the government with special powers, (2) the healthcare and public health system in charge of treating infected patients, and (3) the use of technology to support public health efforts to mitigate the spread of the outbreak.[3]

The reason for focusing on institutional capacities is simple: institutional capacities are, or should be, easier to adapt, or sometimes replicate, across countries. Relatively wealthy countries with the political will to adapt institutional capacities have the resources and capabilities to learn from East Asia's relative success. This is not the case for some of the other explanations given for their success in managing COVID-19. Alternative explanations include culture, social behaviour or political system. Regardless of the merits of these explanations, they would require more structural societal changes that are more difficult to replicate across countries.

The six East Asian countries and territories included in this report are China, Hong Kong, Japan, Singapore, South Korea and Taiwan. The healthcare systems in all of them were able to cope with COVID-19. With the exception of the city of Wuhan in China, none of these countries saw their healthcare system overwhelmed, as has been the case across many countries in Europe and several states in the United States.[4] Furthermore, none of them was forced to implement a countrywide, full lockdown to prevent the spread of the virus.[5] Parts of China did, but not the whole country. Critically, as contested as figures are, the number of deaths per capita from COVID-19 in each of these countries was lower than in Europe or the United States.[6] This suggests that lessons can be learnt.

Certainly, East Asia, like the rest of the world, is not out of the woods yet. As of early May, some countries are witnessing an increase in the number of reported infections – or

---

2   According to the United Nations, institutional capacity refers to the ability of an institution 'to perform functions, solve problems and set and achieve objectives'.

3   It should be clarified that the use of technology cannot replace the use of human resources during a pandemic. As we explain below, East Asian countries have actually boosted human resources to deal with COVID-19.

4   In the case of China, the country certainly failed to contain the pandemic in the early stages, when it first emerged in Wuhan. And independent reporting suggests that Wuhan's healthcare system may have become overwhelmed in January-February. Also, questions have been raised about the accuracy of the government's reporting of death numbers for Wuhan. However, independent media reports do not suggest that the healthcare system was overwhelmed outside of Wuhan, where COVID-19 is thought to have originated.

5   It should be noted that countrywide, full lockdowns across several European countries and parts of the United States have not prevented higher death rates per capita than in East Asia.

6   Questions have been raised about the accuracy of COVID-19 related figures, both in East Asia and across the rest of the world. However, the mortality rate is easier to capture compared to the infection rate and there is no evidence of cover ups in Hong Kong, Japan, Singapore, South Korea or Taiwan. In the specific case of China, questions have been raised regarding the true mortality rate in Wuhan. But independent media reports do not show a spike in the mortality rate elsewhere in China that could be attributed to COVID-19.

have not been able to reduce the number of reported new cases to zero.[7] But dealing with COVID-19 is a marathon, not a sprint. Understanding East Asia's success in dealing with the first wave is therefore useful in what will be a months- or years-long battle against this pandemic.

From the onset, it should be made clear that East Asian countries treat pandemics as crisis *management* challenges. In other words, they are a problem to be managed until a solution can be found. Hence the importance of institutional capacity. Governments are the key in the management of any nationwide issue. In the case of pandemics, they need to have the necessary capacity to compile information ex ante, prepare an actionable strategy, and execute that strategy, with the necessary flexibility, to manage the challenge that a pandemic poses. This way the burden on the healthcare system can be managed until the pandemic runs its course.

This report is based on data gathered from official government and international organisation sources, quality, independent local and international media, and peer-reviewed papers in the medical literature. Both local language and English language sources were used. The documents were analysed using content analysis.

This report addresses four key institutional capacity-building and implementation questions: (1) what previous pandemics resulted in institutional capacity-building, (2) what were the key lessons learnt from said pandemics, (3) how was institutional memory maintained so that lessons were not forgotten, and (4) how have lessons being applied throughout the COVID-19 pandemic. The report then offers a set of recommendations.

---

7   The number of infections, in any case, cannot be used to determine the success of failure of a country's COVID-19 management policies. This is due to the unreliability of infection numbers, which can vary widely according to testing capacity.

2 What previous pandemics marked a turning point in the development of institutional capacity?

East Asia has suffered from coronavirus and virus pandemics in recent years. These served as turning points in the development of institutional capacity to deal with future pandemics. Although some pandemics, such as the 2003 SARS pandemic, offered particularly important lessons, in most countries, more than one pandemic that hit the region informed the development of institutional capacity, depending on the country (see table 1).

Table 1. Key pandemics informing institutional capacity-building SARS

Pandemic	Country/territory	Year	Reported death toll[8]	Estimated case-fatality ratio
SARS	China Hong Kong Taiwan Singapore	2003	348 299 73 33	14% – 15%[9]
H1N1	Hong Kong Japan Singapore Taiwan	2009	60 203 19 51	0.005% – 0.124%[10]
MERS	South Korea	2015	38	20%[11]

The Severe Acute Respiratory Syndrome (SARS) coronavirus was identified in 2003. It first infected humans in the Guangdong Province of southern China, in 2002. The SARS epidemic affected at least 26 countries and territories, infecting more than 8,000 people and killing at least 700. Despite the low number of deaths, the mortality rate among infected patients was high. China, Hong Kong, Singapore and Taiwan were all significantly affected by the pandemic.[12] For all of them, the estimated case-fatality ratio meant that this was a key pandemic informing institutional capacity-building.

The H1N1 influenza virus caused a swine flu pandemic in 2009. The first outbreak was identified in North America. The epidemic affected at least 74 countries and territories. Over 18,000 people are estimated to have died from it.[13] Hong Kong, Japan, Singapore and Taiwan were among the affected countries. Japan engaged in institutional capacity-building as a result of it, and Hong Kong, Singapore and Taiwan reinforced their institutional capacity development.

---

8   The reported death toll of different pandemics across different countries is available through the WHO website, who.int (accessed 22 April 2020).

9   Shigui Ruan, 'Likelihood of Survival of Coronavirus Disease 2019', *The Lancet* (2020), DOI: 10.1016/S1473-3099(20)30257-7

10 There is large variability in the case-fatality rate for H1N1 by age and country. Case fatality rates by age were 0.005 per cent (0–17 years), 0.029 per cent (18–64 years), 0.124 per cent (>64 years). See Fatimah S. Dawood, A. Danielle Iuliano, Carrie Reed, Martin I. Meltzer, David K. Shay and Po-Yung Cheng, 'Estimated Global Mortality Associated with the First 12 Months of 2009 Pandemic Influenza A H1N1 Virus Circulation: A Modelling Study', *The Lancet* 12:9 (2012): 687–695.

11 Kenji Mizumoto, Masaya Saitoh, Gerardo Chowell, Yuichiro Miyamatsu and Hiroshi Nishiura, 'Estimating the Risk of Middle East Respiratory Syndrome (MERS) Death During the Course of the Outbreak in the Republic of Korea, 2015', *International Journal of Infectious Diseases* 39 (2015): 7–9.

12 World Health Organization, *SARS (Severe Acute Respiratory Syndrome)*, available at who.int/ith/diseases/sars/en (accessed 22 April 2020).

13 World Health Organization, *Pandemic (H1N1) 2009*, available at who.int/csr/disease/swineflu/en (accessed 22 April 2020).

The Middle East Respiratory Syndrome (MERS) coronavirus was identified in Saudi Arabia in 2012. The first infections in humans occurred there. The epidemic affected at least 27 countries and territories. At least 800 people were killed by it. Despite the low number of deaths, the case fatality ratio was very high, around 20 per cent. South Korea was one of the most affected countries.[14] For South Korea, this was the key pandemic leading to institutional capacity-building.

In short, the SARS, H1N1 and/or MERS pandemics served as wake-up calls to countries across East Asia. Both epidemiologists and, crucially, policy-makers understood the risks. Significantly, only SARS originated in the region. H1N1 and MERS had their origins in North America and the Middle East, respectively. They did reach East Asia, but this was not the most affected region in the world. This shows that it is possible to learn lessons and build institutional capacity, no matter the geographical origin of a pandemic or its effects on a given country.

---

14   World Health Organization, *Middle East Respiratory Syndrome Coronavirus (MERS-CoV)*, available at who.int/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov) (accessed 22 April 2020).

3 What were the key lessons?

East Asian countries learnt several lessons from the SARS, H1N1 and/or MERS pandemics.[15] These outbreaks exposed the inadequacies of existing institutional structures to prevent and manage diseases that, by definition, spread across borders and affect a large number of people.[16] In other words, institutional structures, including those that underlie the healthcare and public health system, might have been ready to deal with endemic diseases even if seasonal, such as influenza. But they were little prepared to address diseases that might have their origin in a different country and infect many people. Governments and institutions therefore had to learn lessons about how to prevent and manage pandemics. Table 2 summarises the key lessons learnt by East Asian countries.

Table 2. Main lessons from key pandemic(s)

Country/territory	Main lessons
China[17]	• Development of an adequate legal infrastructure and institutions • Reform of the healthcare system • Awareness raising and capacity strengthening of health institutions and staff • Addressing information flow problems • Identification, monitoring and isolation of cases • Closure of schools, universities and public facilities • Testing in key transport infrastructure • Building of dedicated, temporary hospitals • Reporting of daily cases by provincial governments
Hong Kong[18]	• Development of contingency planning • Establishment of centrally coordinated contingency responses • Establishment of clear lines of authority, command and control • Examination and strengthening of healthcare infrastructure • Maintenance of intensive care capacity and protection of healthcare staff • Prompt and transparent reporting of cases • Development of a centralised, real-time database of country's health records to support disease surveillance and case detection • Strengthening of international cooperation with other infected regions

15 Countries across East Asia carried out internal reviews to identify and learn lessons. In some cases, there were also public debates and enquiries.

16 Infectiousness clearly varies across pandemics. COVID-19, for example, is more infectious than SARS, H1N1 or MERS. Particularly due to infections from asymptomatic COVID-19 carriers.

17 The State Council of the People's Republic of China, 非典防治工作综述 *(Summing-up Report on the Prevention and Control of SARS)*, available at gov.cn/test/2005-06/28/content_10716.htm (accessed 22 April 2020); The State Council of the People's Republic of China, 全国非典疫情及防治措施 *(Measures for the National Prevention and Control of SARS)*, available at gov.cn/test/2005-06/28/content_10714.htm (accessed 22 April 2020; Jian Tingting and Liu Haoyang, '非典经验：中国对突发公共卫生事件的应对标准与变化' ('Lessons from SARS: changes in China's criteria for responding to public health emergencies'), *Huaxi Metropolis Daily*, 8 March 2020.

18 Center for Health Protection, *Annual Report*, available at dh.gov.hk/english/pub_rec/pub_rec_ar/pdf/0607/Annual_Report/C4f_Centre_for_Health_Protection.pdf (accessed April 22nd, 2020); National Center for Biotechnology Information, *The SARS Epidemic in Hong Kong: What Lessons Have We Learned?* available at ncbi.nlm.nih.gov/pmc/articles/PMC539564/ (accessed 22 April 2020); World Health Organization, *SARS: Lessons from a New Disease*, available at who.int/whr/2003/chapter5/en/index5.html# (accessed 22 April 2020).

Country/territory	Main lessons
Japan[19]	• Development of adequate legal systems • Flexibility of action plan • Establishment of clear decision-making structures, including the relationship between the central and local governments • Strengthening risk management systems for infectious diseases • Assistance to local governments to bolster medical capacity • Strengthening of surveillance capabilities • Development of concrete and transparent ways for information dissemination • Closure of schools and other public facilities, and development of guidelines to request businesses to voluntarily close temporarily
Singapore[20]	• Creation of a multi-agency task force bringing together all relevant authorities • Strengthening of the healthcare system to deal with disease outbreaks • Active screening and case identification, including through contact tracing, temperature measurements at hospital and travel history • Detailed case management, including isolation and physical distancing measures • Legal enforcement of the existing legal system • Strategy for the management of hospital infection prevention and healthcare workers' infections • Development of protocols for the use of personal protective equipment • Establishment of collaborations between government agencies and outside organizations • The implementation of border control measures to limit travel from affected areas • Development of a centralised, real-time database of country's health records to support disease surveillance and case detection • The role of technology and online platforms to maintain communication across medical professionals and organizations • Business continuity planning at hospitals

19 Ministry of Health, Labor and Welfare of Japan, *Report of the Review Meeting on Measures against Pandemic Influenza (A/H1N1)*, available at mhlw.go.jp/english/topics/influenza/dl/influenza.pdf (accessed 23 April 2020).
20 Dewey Sim, 'From Sars to Covid-19, what lessons has Singapore learned?', *South China Morning Post*, 25 February 2020; Ng Jun Sen, 'The Big Read:17 Years on, Singapore puts SARS lessons to the test in fight against the Wuhan Coronavirus', *Channel NewsAsia*, 3 February 2020.

Country/territory	Main lessons
South Korea[21]	• Re-structuring of existing institutions[22] • Establishment of institution to manage in-hospital infections • Clarification of lines of authority and responsibility across institutions • Activation of national protocols led by national leadership supported by population sensitization • Training of an infectious disease expert network • Preparedness to temporarily boost healthcare and administrative professionals • Strengthening of the centralised communications network system[23] • Tracing of travel histories of the infected • Establishment of diagnostic capacity • Development of a centralised, real-time database of country's health records to support disease surveillance and case detection • Development of two-track approach focused on public health and clinical response • Plan of communication to general public to minimise fear and confusion • Implementation of national isolation protocols, which did not entail closing all national borders
Taiwan[24]	• Strengthening of legal structures • Establishment of a permanent institutional framework • Training of epidemiology professionals • Development of a specialised medical network • Prevention of in-hospital infections • Establishment of a national stockpile management system • Development of stronger expert and public communication mechanisms • Establishment of airport and seaport border controls • Updating of infection control practices • Development of a centralised, real-time database of country's health records to support disease surveillance and case detection • Creation of quarantine-care centres to provide support and counselling to mitigate impacts of case isolation on individuals • Strengthening clinical and pharmaceutical research capacity

Lessons learnt by East Asian countries can be divided into five groups. Firstly, countries across the region focused on the legal infrastructure. Since pandemics are emergencies, it was necessary to develop or improve emergency legal frameworks. China overhauled its legal framework, which was deemed inadequate, and established a new Public Health Emergencies Framework including the revamped legal framework. Japan, South Korea and Taiwan, meanwhile, had to update their pre-existing emergency legal frameworks. Among others, the legal frameworks of these three countries had to clearly establish when special legislation could be implemented in case of a potential pandemic; define the special legal

---

21 Ministry of Health and Welfare of the Republic of Korea, 2015 메르스 백서: 메르스로부터 교훈을 얻다 (*2015 MERS White Paper: Learning from the MERS*), available at cdc.go.kr/board. es?mid=a20504000000&bid=0014&act=view&list_no=128379 (accessed 24 April 2020).

22 The sinking of the *MW Sewol* in April 2014, in which 304 people died, also informed this lesson. The sinking took place only a year before the 2015 MERS outbreak.

23 The sinking of the *MW Sewol* also informed this lesson.

24 Taiwan Centers for Disease Control, *SARS* 十年–生聚與教訓 (*A Decade After SARS: Lessons Learned and Preparedness*), available at cdc.gov.tw/En/InfectionReport/ Info/9YUAXbFsmorP5T10V8qvMA?infoId=Va9rrx4D3QhQsfEicW_kXg (accessed 20 April 2020); Taiwan Centers for Disease Control, *H1N1* 新型流感大流行工作紀實 (Taiwan's Response to the H1N1 Influenza), available at cdc.gov.tw/En/InfectionReport/Info/9YUAXbFsmorP5T10V8qvMA?infoId=X8iBArrcBbqBDABGFH-pVA (accessed 20 April 2020).

powers that the government would have when the special legislation was implemented; and determine which authorities would receive the special legal powers.

Secondly, East Asian countries centred on the development of clear decision-making and implementation structures. That is, to know who is in charge of what. Authorities have to act quickly in the case of a potential pandemic. Thus, it was necessary to have clear lines of command. In the case of larger countries with a multi-layered governmental framework, such as China, Japan, South Korea and Taiwan, it was necessary to define the responsibilities of central governments and local authorities.[25] In general, the framework of these countries now puts the central government in charge of decision-making and local authorities in charge of decision implementation. In the case of Hong Kong and Singapore, decision-making structures are clear as well, with the central government firmly in charge – since neither Hong Kong nor Singapore has regional or local governments.

Furthermore, and also in the area of decision-making and implementation, all these countries now have permanent agencies to coordinate the decision-making and implementation process. These agencies, in general, are also in charge of 'sentinel surveillance' ex ante; ie, they cross-check and analyse data provided by GPs and specialists to detect potential domestic outbreaks. This responsibility also boosts their capabilities to act as coordinators if a pandemic indeed breaks out.

Thirdly, countries across East Asia focused on the preparedness of public health institutions and the healthcare system. Adequate preparedness was considered essential so that public health institutions and the healthcare system do not have to play catch-up once a pandemic is in full swing. All of them strengthened or reformed pre-existing public health and disease control institutions. Japan, for example, consolidated the capacity of the National Institute of Infectious Diseases (NIID). South Korea, meanwhile, reformed the Korea Centers for Disease Control and Prevention (KCDC), and enable the latter to use information in epidemiological research to contain and prevent infections, while establishing comprehensive management systems of infectious disease control.[26] As for Hong Kong, it set up the Centre for Health Protection (CHP). In the case of Taiwan, it launched the National Health Command Center (NHCC), which is a disaster management centre focused on large-outbreak response, and acts as command point for communication across central, regional and local authorities.[27] With regards to the public health systems, countries across East Asia established advanced technological systems involving nationwide public health networks that centralised systems of information for surveillance and case detection; installed checkpoints and border quarantine procedure at country entry points; increased clinical and pharmaceutical research capacity including rapid strengthening of diagnostic capacity; and scale-up of measures to prevent community transmission. Regarding healthcare system, countries in East Asia focused on the training of medical professionals specialised in infectious diseases; the stockpiling of personal protection equipment (PPE) and other necessary materials for hospitals and medical professionals; and the building of intensive care units and/or negative-pressure isolation rooms and other facilities across hospitals for the infected patients.[28]

Fourthly, East Asian countries concentrated on the operation of the healthcare system during the pandemic, largely reflecting lessons from prior epidemics on the potential impact of pandemics on the healthcare system. Above all, the focus was on the prevention

---

25 In the case of China's management of COVID-19 during its early stages, the problem was not that the lesson had not been learnt. Rather, the problem was that it was not implemented. Thus, Wuhan's local government initially did not pass on the information that medical professionals had gathered for the central government to lead the response to COVID-19 as established. This was the result of a general tendency not to pass on bad news and Wuhan's local government fear of hurting the local economy. See James Kynge, Sun Yu and Tom Hancock, 'Coronavirus: the cost of China's public health cover-up', *Financial Times*, 6 February 2020.

26 Korea Centers for Disease Control and Prevention, 'Contact Transmission of COVID-19 in South Korea: Novel Investigation Techniques for Tracing Contacts', *Osong Public Health and Research Perspectives* 11:1 (2020): 60-63

27 Cheryl Lin, Wendy E. Braund, John Auerbach, Jih-Haw Chou, Ju-Hsiu Teng, Pikuei Tu and Jewel Mullen, 'Policy Decisions and Use of Information Technology to Fight 2019 Novel Coronavirus Disease, Taiwan'. *Emerging Infectious Diseases* (2020), DOI: 10.3201/eid2607.200574.

28 Juhwan Oh, Jong-Koo Lee, Dan Schwarz, Hannah L. Ratcliffe, Jeffrey F. Markuns and Lisa R. Hirschhorn, 'National Response to COVID-19 in the Republic of Korea and Lessons Learned for Other Countries', *Health Systems & Reform* 6:1 (2020), DOI: 10.1080/23288604.2020.1753464.

of in-hospital transmission of the disease. In other words, making sure that the healthcare system did not contribute to the spread of a pandemic. There was an awareness that in-hospital transmission could reduce the public's willingness to go to medical facilities even if symptomatic – or to treat other illnesses. In-hospital transmission could also result in the infection of medical professionals, thus reducing their numbers just as they were most needed. South Korea, Singapore and Taiwan, in particular, focused on this aspect. For example, Taiwan increased stockpiles of PPE for healthcare workers, allowed designated isolation wings in hospitals, and created an inventory of intensive care and negative-pressure isolation rooms, which could be increased if necessary during a pandemic.[29] During the MERS and SARS outbreaks in Singapore, 18 per cent of MERS cases occurred in healthcare workers, while 21 per cent of SARS occurred in this population.[30] This led to a strong emphasis on measures to control transmission within hospitals, prioritising the availability of PPE. In South Korea, all clinical staff in health centres and hospitals were equipped with PPE level D, eg, mandatory coveralls, gloves, steel toe, safety glasses, etc.[31] More generally, all countries across the region felt that their healthcare systems would be able to cope well with a pandemic as long as there was sufficient preparedness, clear guidelines, and good communication structures.

Finally, countries across the region focused on preventing the transmission of the disease through active public health measures. This is based on the principle that the only way to stop a pandemic is to ensure that there are no new cases. Key lessons learnt were the need for transparent information sharing so that institutions and the general public are aware of the spread of the disease;[32] the social norms around the use of masks and other protective equipment in public places; the potential of closure of schools and other public facilities to slow down disease spread; and very aggressive contact tracing of the infected to identify new cases. Some countries also emphasised other measures, such as testing (China, Singapore, Taiwan), international cooperation (Hong Kong, Singapore), the establishment of guidelines for businesses (Japan), legal enforcement (Singapore), temporary boosting of administrative professionals (South Korea) or border controls (Japan, Singapore, Taiwan).

---

29 Lin et al., op. cit.
30 Noah C Peeri, Nistha Shrestha, Md Siddikur Rahman, Rafdzah Zaki, Zhengqi Tan, Saana Bibi, Mahdi Baghbanzadeh, Nasrin Aghamohammadi, Wenyi Zhang and Ubydul Haque, 'The SARS, MERS and Novel Coronavirus (COVID-19) Epidemics, the Newest and Biggest Global Health Threats: What Lessons Have We Learned?', *International Journal of Epidemiology* (2020), DOI: 10.1093/ije/dyaa033.
31 Oh et al., op. cit
32 The exception was China, where there was no transparency throughout the early stages of the COVID-19 pandemic.

4 How was institutional memory maintained so that lessons learnt survived?

Institutional memory is essential. It serves to detect the early signals of a possible pandemic. Also to make sure that lessons learnt have not been forgotten and can be deployed. Both in democratic and authoritarian countries, political leaders can or will eventually change. New governments will make their own appointments at the highest levels. This includes healthcare-related appointments; for example, ministers of health. It is thus necessary to have depoliticised, expert-led agencies. It is also necessary to have a regularly updated playbook with guidelines on how to detect, prevent and manage potential pandemics. Ministries, specialised agencies, and playbooks serve to ensure that lessons survive across administrations (see table 3). There also needs to be appropriate mechanisms in place to maintain institutional memory.

Table 3. Key ministry, specialised agency and playbook to maintain institutional memory

Country/territory	Ministry (or equivalent)	Specialised agency	Playbook
China	National Health Commission	National Health Commission,[33] Chinese Center for Disease Control and Prevention[34]	*Public Health Emergency Plan[35]*
Hong Kong	Department of Health	Centre for Health Protection (CHP)[36]	*Preparedness and Response Plan[37]*
Japan	Ministry of Health, Labor and Welfare	National Institute of Infectious Diseases (NIID)[38]	*The National Action Plan for Pandemic Influenza and New Infectious Diseases[39]*
Singapore	Ministry of Health and Welfare	National Centre for Infectious Diseases (NCID)[40]	*Ministry of Health Pandemic Readiness and Response Plan for Influenza and Other Acute Respiratory Diseases[41]*

33 National Health Commission of the People's Republic of China, available at en.nhc.gov.cn (accessed 22 April 2020).

34 Chinese Center for Disease Control and Prevention, available at chinacdc.cn/en (accessed 22 April 2020).

35 The State Council of the People's Republic of China, 国家突发公共事件医疗卫生救援应急预案 *(National Emergency Response Plan for Public Health Emergencies)*, available at gov.cn/yjgl/2006-02/26/content_211628.htm (accessed 22 April 2020).

36 Centre for Health Protection, available at chp.gov.hk/en/index.html (accessed 22 April 2020).

37 Centre for health protection, *Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance* available at chp.gov.hk/files/pdf/govt_preparedness_and_response_plan_for_novel_infectious_disease_of_public_health_significance_eng.pdf (accessed 22 April 2020).

38 National Institute of Infectious Diseases, available at niid.go.jp/niid/en/ (accessed 23 April 2020).

39 Cabinet Secretariat of Japan, *The National Action Plan for Pandemic Influenza and New Infectious Diseases*, available at cas.go.jp/jp/seisaku/ful/keikaku/pdf/national%20action%20plan.pdf (accessed April 23rd, 2020).

40 National Centre for Infectious Diseases, *About Us*, available at ncid.sg/About-NCID/Pages/default.aspx (accessed 23 April 2020).

41 Ministry of Health, *MOH Pandemic Readiness and Response Plan for Influenza and other Acute Respiratory Diseases*, available at moh.gov.sg/docs/librariesprovider5/diseases-updates/interim-pandemic-plan-public-ver-_april-2014.pdf (accessed 23 April 2020).

Country/territory	Ministry (or equivalent)	Specialised agency	Playbook
South Korea	Ministry of Health and Welfare	Korea Centers for Disease Control and Prevention (KCDC)[42]	*Infectious Disease Disaster: Crisis Management Standard Manual*[43]
Taiwan	Ministry of Health and Welfare	National Health Command Center (NHCC),[44] Centers for Disease Control (CDC)[45]	*National Influenza Pandemic Preparedness Plan,*[46] *Influenza Pandemic Strategic Plan*[47]

Countries across East Asia have long-running specialised agencies within their ministries of health, or equivalent, that have survived changes in political leadership. These institutions act as focal points for institutional memory. They have collected, analysed, and kept the lessons learnt from previous pandemics. They are engaged in surveillance to detect potential pandemics. They can draw on playbooks updated when new pandemics occur, even if these pandemics do not hit their own country. Institutional memory also involves mechanisms to ensure that the lessons learnt survive across the years, and can thus be deployed when a new outbreak or pandemic strikes.

The agencies in charge of maintaining institutional memory across East Asia have three things in common. Firstly, and most obviously, they are all agencies specialised in surveillance and health emergency management. In the case of Hong Kong's CHP, Japan's NIID, Singapore's NCID, South Korea's KCDC and Taiwan's CDC, these agencies focus on diseases specifically. Importantly, disease control for these agencies is exercised through infectious disease prevention activities that enable maintaining institutional memory. For example, Taiwan carries mass influenza vaccination campaigns annually, which not only enable mitigating the consequences of seasonal influenza, but serve as 'functional exercises' for maintaining memory and building capacity to effectively address large-scale epidemics. Such actions enabling identification of providers; maintaining relationships between health officials, government agencies and the private sector; and raising public awareness of epidemics.[48]

Secondly, all of these agencies fall under the remit of the country's ministry of health or its equivalent. This means that they are health focused. For example, the CDC in Taiwan takes leadership of public and health providers, local governments and health departments, enabling them to look for guidance in the central government regarding preparedness and response. In South Korea, the Government developed national response protocols to ensure a common approach across Government and non-government actors to contain the pandemic, with a unified system of information on progress.

42 Korea Centers for Disease Control and Prevention, *Korea Centers for Disease Control and Prevention*, available at cdc.go.kr/cdc_en (accessed 24 April 2020).
43 Ministry of Health and Welfare of the Republic of Korea, 「감염병 재난」 위기관리 표준매뉴얼 *(Infectious Disease Disaster: Crisis Management Standard Manual)*, available at t1.daumcdn.net/cfile/tistory/991A36475E37EE0335?download (accessed 24 April 2020).
44 National Health Command Center, available at dc.gov.tw/En/Category/MPage/gL7-bARtHyNdrDq882pJ9Q (accessed 23 April 2020).
45 Taiwan Centers for Disease Control, available at cdc.gov.tw/En (accessed 23 April 2020).
46 Taiwan Centers for Disease Control, 我國因應流感大流行準備第二期計畫 *(National Influenza Pandemic Preparedness Plan. Phase II)*, available at cdc.gov.tw/En/InfectionReport/Info/9YUAXbFsmorP5T10V8qvMA?infoId=oaHMwA8mKx2qL_EUthcw5Q (accessed 27 April 2020); and Taiwan Centers for Disease Control, 我國因應流感大流行準備第三期計畫 *(National Influenza Pandemic Preparedness Plan. Phase III)*, available at cdc.gov.tw/File/Get/d48wzzeKvrbNfgZQ6TbmTA (accessed 27 April 2020).
47 Taiwan Centers for Disease Control, *Influenza Pandemic Strategic Plan – Third Edition*, available at cdc.gov.tw/En/Category/ListContent/Otpn7pDwnMd2UoVG-QEzdw?uaid=kQ1UozX6HgnY7R51exRzlw (accessed 27 April 2020).
48 Diane Meyer, Matthew P. Shearer, Yi-Chien Chih, Yu-Chen Hsu, Yung-Ching Lin and Jennifer B. Nuzzo, 'Taiwan's Annual Seasonal Influenza Mass Vaccination Program—Lessons for Pandemic Planning', *American Journal of Public Health* 108:S3 (2018): S188-S193.

Thirdly, these agencies are run and staffed by experts who often have practical experience in dealing with previous pandemics. This helps with depoliticization and expertise-building. For example, South Korea's KCDC and Taiwan's CDC were able to establish comprehensive management plans that were in place across based on a wide range of expertise in public health and epidemiology within the unit.

The playbooks developed by East Asian countries are fairly similar among them. They tend to include sections on a combination of planning and coordination, surveillance, investigation and control measures, laboratory support, infection control measures, provision of medical services, antiviral stockpiling, vaccination, transport network and border management measures, and/or communication. Crucially, these playbooks are generally updated when new pandemics, or even epidemics, break out. For example, the 2009 H1N1 pandemic, 2014–16 Ebola virus epidemic, 2015–16 Zika virus epidemic, and 2015 MERS pandemic served to update pandemic playbooks across East Asia.

In terms of mechanisms to maintain institutional memory, four stand out: regular mandatory pandemic plans or reports; regular tabletop emergency exercises, even if not necessarily focused on pandemics; regular issue-specific reports compiled by expert groups; and training and international cooperation. For example, in the case of Taiwan CDC issues an annual report covering its activities, one disease of special focus, domestic prevention and control measures, international health, and scientific research and development.[49] In Hong Kong, CPH manages a database of publications including activities reports, guidelines, factsheets, training materials.[50] In Japan, NIID publishes an array of relevant and specific weekly, monthly and annual reports.[51] In Taiwan, annual influenza vaccination campaigns enable building capacity and maintaining memory of procedures, procedures and relationships between relevant actors.[52]

As for regular tabletop exercises, South Korea is a case in point. Last December, KCDC led a tabletop exercise to manage the case of a mysterious pneumonia contracted by a South Korean family coming back from China. This was just a few weeks before COIVD-19 hit the country.[53] This tabletop exercise has been a very useful template for South Korea's response to the COVID-19 pandemic. But it should be stressed that South Korea has applied the template with flexibility, since no two pandemics spread in the same way – even though some elements such as the need for testing and contact tracing apply in any case.

Regarding regular reports compiled by expert groups, two examples include Japan's *Report of the Review Meeting on Measures against Pandemic Influenza (A/H1N1)*,[54] issued in 2010, and China's upcoming report on a 'joint prevention and control working mechanism' following from COVID-19.[55] These reports are not necessarily published by the agency leading on institutional memory maintenance. Bureaucratic politics means that often an agency at a higher level of authority will publish the more comprehensive report (eg, a ministry).

In the case of training and international cooperation, these agencies share their knowledge and exchange best practice with relevant domestic stakeholders and international partners. At the domestic level, these agencies are involved in the training of medical professionals, briefing of ministers and other government leaders, communication with laboratories, information sharing with schools, etc. In other words, they engage with

49 Taiwan Centers for Disease Control, CDC *Annual Report*, available at cdc.gov.tw/En/InfectionReport/List/BAkN3lDoa6hdrimSerBQyQ (accessed 22 April 2020).

50 Centre of Health Protection, *Publications*, available at chp.gov.hk/en/resources/29/index.html (accessed 22 April 2020).

51 National Institute of Infectious Diseases, *Annual Report*, available at niid.go.jp/niid/en/annual-report.html (accessed 24 April 2020); National Institute of Infectious Diseases, *Infectious Agencies Surveillance Report*, available at niid.go.jp/niid/en/iasr-e.htm, (accessed 24 April 2020); National Institute of Infectious Diseases, *Infectious Diseases Weekly Report*, available at niid.go.jp/niid/en/idwr-e.html (accessed 24 April 2020).

52 Meyer et al., op. cit.

53 Hyonhee Shin, 'South Korea's emergency exercise in December facilitated coronavirus testing, containment', *Reuters*, 30 March 2020

54 Ministry of Health, Labor and Welfare of Japan, *Report of the Review Meeting on Measures against Pandemic Influenza (A/H1N1)*, available at mhlw.go.jp/english/topics/influenza/dl/influenza.pdf (accessed 23 April 2020).

55 SCMP Reporters, 'China calls in top Sars experts as State Council Takes charge of emergency coronavirus response', *South China Morning Post*, 24 January 2020.

a variety of stakeholders so that their institutional memory can be disseminated. In terms of international cooperation, for example, the Chinese Center for Disease Control and Prevention, Japan's NIID and South Korea's KCDC hold an annual Communicable Disease Control and Prevention Forum.[56] This type of regular and ad-hoc forums, exchanges and visits between two or more agencies are common across East Asia – both with partners in the region and beyond.

An important mechanism to maintain institutional memory comes from the interaction between individual countries and the WHO. In particular, in 2007, the international system of infectious disease control was overhaled in response to the 2003 SARS epidemic, and the fact that due to globalisation, infectious diseases can spread rapidly. As a result, 194 country members of the WHO signed up to the International Health Regulations (IHR), which requires countries to report any potential threat to global health instantly to the WHO.[57] The latter, in turn, is in charge of coordinating an early warning and rapid response. This system underscores the importance of co-operation, but it also obliges countries to implement and maintain the necessary public health infrastructure to report global health threats to the WHO and the international community, so that early action can take place. There are several obstacles for the functioning of this system, including a lack of investment by some countries to set up the necessary system. Yet, it would seem as if several East Asian countries faired particularly well and their institutional memory of collaboration with the WHO during the SARS pandemic may have contributed to their level of international cooperation and effective response during the COVID-19 pandemic.

East Asian countries apply all or a mixture of these mechanisms to maintain institutional memory. They are not always necessarily led or applied by the main agencies in charge of institutional memory. But often they are. And even when these agencies do not take the lead, they are involved in the development and implementation of the mechanism. This underscores the importance of having a key, specialised agency with an institutional memory function.

---

56 National Institute of Infectious Diseases, *The 1st–12th Japan-China-Korea Forum on Communicable Disease Control and Prevention*, available at niid.go.jp/niid/en/jck-forum.html (accessed 24 April 2020)
57 World Health Organization, *About IHR*, available at who.int/ihr/about/en (accessed 1 May 2020).

5 How have lessons been applied throughout the COVID-19 pandemic?

East Asian countries have applied the lessons learnt from previous pandemics during the current outbreak of COVID-19. They have done so successfully, as evidenced by their relatively low death rate per capita, the fact that their healthcare systems have been less overwhelmed, and the absence of countrywide, full lockdowns. Many countries across the world continue to see a high death toll or grapple with the problem of how to ease lockdowns

without an immediate surge in COVID-19 cases. Also, many experts believe that more waves of COVID-19 are very likely until there is an effective vaccine. In any case, future pandemics are almost inevitable. Therefore, it is necessary to understand how East Asian countries have applied the lessons from the past during the current wave of COVID-19.

There are areas of institutional capacity that can be easily replicated if there is political will. They concern the legal infrastructure giving governments special powers in time of crisis, the preparedness and operation of the healthcare system and public health, and the use of technology to support public health measures. East Asian countries have developed institutional capacity across these three areas, and used it throughout the COVID-19 pandemic (see tables 4, 5 and 6).

Table 4. Lessons applied in the area of legal infrastructure

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Application of existing legislation	✓	✓	✓	✓	✓	✓
Establishment of central government task force	✓	✓	✓	✓	✓	✓
Approval of emergency legislation/ measures	Urgent Notice by General Office of the State Council of Effectively Organizing the Resumption of Operation and Production of Manufacturers and the Scheduling of Key Supplies for Epidemic Prevention and Control[58] ⎯⎯⎯ State Council's Guiding Opinions on Precise and Differentiated Epidemic Control Strategies[59]	Approval of Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance[60] ⎯⎯⎯ Passing of Prevention and Control of Disease (Requirements and Directions) (Business and Premises) Regulation[61] ⎯⎯⎯ Passing of Prevention and Control of Disease (Prohibition on Group Gathering) Regulation[62]		Infectious Diseases (COVID-19 – Stay Orders) Regulation[63] ⎯⎯⎯ Infectious Diseases (Measures to Prevent Spread of COVID-19) Regulation[64] ⎯⎯⎯ COVID-19 (Temporary Measures) Act 2020[65]		Special Act for Prevention, Relief and Revitalization Measures for Severe Pneumonia with Novel Pathogens[66]

58 The State Council of the People's Republic of China, 关于组织做好疫情防控重点物资生产企业复工复产和调度安排工作的紧急通知 (*Urgent Notice by the General Office of the State Council of Effectively Organizing the Resumption of Operation and Production of Manufacturers and the Scheduling of Key Supplies for Epidemic Prevention and Control*), available at gov.cn/zhengce/content/2020-01/30/content_5473087.htm (accessed 22 April 2020).

59 The State Council of the People's Republic of China, 关于科学防治精准施策分区级做好新冠肺炎疫情防控工作的指导意见 (*The State Council's Guiding Opinions on Precise and Differentiated Epidemic Control Strategies*), available at gov.cn/zhengce/2020-02/18/content_5480514.htm (accessed 22 April 2020).

60 Centre for Health Protection, *Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance*, available at chp.gov.hk/files/pdf/govt_preparedness_and_response_plan_for_novel_infectious_disease_of_public_health_significance_eng.pdf (accessed 27 April 2020).

61 Hong Kong e-legislation, *Prevention and Control of Disease (Requirements and Directions) (Business and Premises) Regulation*, available at elegislation.gov.hk/hk/cap599F (accessed 27 April 2020).

62 Hong Kong e-legislation, *Prevention and Control of Disease (Prohibition on Group Gathering) Regulation*, available at elegislation.gov.hk/hk/cap599G> (accessed 27 April 2020).

63 Ministry of Health, *Infectious Diseases (COVID-19 – Stay Orders) Regulation 2020*, available at moh.gov.sg/docs/librariesprovider5/pressroom/press-releases/annex-a---id-(covid-19).pdf (accessed 24 April 2020).

64 Ministry of Health, *Infectious Diseases (Measures to Prevent Spread of COVID-19) Regulations 2020*, available at moh.gov.sg/docs/librariesprovider5/pressroom/press-releases/annex-b---id-(covid-19).pdf (accessed 24 April 2020).

65 Singapore Statutes Online, *COVID-19 (Temporary Measures) Act 2020*, available at sso.agc.gov.sg/Act/COVID19TMA2020 (accessed 24 April 2020).

66 Working Group of the R.O.C. Laws & Regulations Database, *Special Act for Prevention, Relief and Revitalization Measures for Severe Pneumonia with Novel Pathogens*, available at law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=L0050039 (accessed 24 April 2020).

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Amendment of existing legislation			Act on Special Measures for Pandemic Influenza and New Infectious Diseases Preparedness and Response [67]		Infectious Disease Prevention and Control Act (IDPCA)[68] Quarantine Act[69] Medical Act[70]	
Stricter entry procedures	✓	✓	✓	✓	✓	✓
Domestic travel restrictions	✓					
Other					Full authority to KCDC to centralise control	Activation of Central Epidemic Command Center (CECC)

Table 5. Lessons applied in the area of healthcare system and public health

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Application of existing guidelines and procedures	✓	✓	✓	✓	✓	✓
Temporary capacity increase	Building of two temporary hospitals in Wuhan, use of temporary isolation facilities to free up capacity	Use of temporary isolation facilities to free up capacity	Planning for cooperation with private hospitals to increase capacity, planning for potential establishment of temporary medical facilities	Cooperation with private hospitals, use of temporary isolation facilities to free up capacity	Securing of healthcare specialists, cooperation with private hospitals, use of temporary isolation facilities to free up capacity	Use of temporary isolation facilities to free up capacity
Mobilisation of healthcare professionals to specific location	To Hubei Province				To Daegu	
Testing for possible cases	✓	✓	✓	✓	✓	✓
Development of indigenous test kits	✓	✓	✓	✓	✓	✓

---

67 e-Gov Japan, 新型インフルエンザ等対策特別措置法 *(Act on Special Measures for Pandemic Influenza and New Infectious Diseases Preparedness and Response)*, available at elaws.e-gov.go.jp/search/elawsSearch/elaws_search/lsg0500/detail?lawId=424AC0000000031 (accessed 27 April 2020).

68 Ministry of Government Legislation of the Republic of Korea, 감염병의 예방 및 관리에 관한 법률 *(Infectious Disease Prevention and Control Act)*, available at law.go.kr 법령/감염병의예방및관리에관한법률 (accessed 24 April 2020).

69 Ministry of Government Legislation of the Republic of Korea, *Quarantine Act*, available at elaw.klri.re.kr/kor_service/lawView.do?hseq=46420&lang=ENG (accessed 5 May 2020).

70 Ministry of Government Legislation of the Republic of Korea, 의료법 *(Medical Act)*, available at law.go.kr/lsInfoP.do?lsiSeq=202930&efYd=20200328#0000 (accessed 5 May 2020).

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Increasing PPE stockpile	✓	✓	✓	✓	✓	✓
Increasing surgical mask stockpile	✓	✓	✓	✓	✓	✓
Targeted measures in different cities and regions	✓		✓		✓	
Other	Publication of National Health Commission's Prevention and Control Protocol for COVID-19	Publication of Department of Health's special healthcare guidelines			Use of phone and by proxy medical services	Use of phone hotline for suspicious symptoms reporting

Table 6. Lessons applied in the area of use of technology to support public health measures

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Surveillance and case detection		Centralised, real-time database of the country's health records		Centralised, real-time database of the country's health records	Centralised, real-time database of the country's health records	Centralised, real-time database of the country's health records
Diagnosis	Alibaba Global MediXchange for Combating COVID-19 platform		Online platform		Self-Diagnosis app, mobile phone	
Quarantine enforcement		Location tracking wristbands Stay Home Safe app		Text messaging with GPS logging	Self-quarantine Safety Protection app Phone/video calling	Phone calling Text messaging Disease Containment Expert chat bot
Contact tracing	Alipay Health Code app Tencent Tracking app Provincial, local and district apps			TraceTogether app SafeEntryQR code-based app	Satellite-based smartphone tracking Corona 100m app	'Electronic fence' smartphone tracking
Treatment supervision and/ or support	Robots			Robots	Coronavirus 119 telemedicine app	
Disinfection and/ or food delivery		Robots				

	China	Hong Kong	Japan	Singapore	South Korea	Taiwan
Information sharing	Ding Xiang Yuan website and app — Online medical questionnaires	Hong Kong Anti-Epidemic Information Channel app — Interactive Map Dashboard app	First National Survey on Novel Coronavirus Countermeasures app	OneService app for incident reporting	Self-Quarantine app for self-isolation registration	Epidemic Cloud platform
Information dissemination	National Health Commission website	Latest Situation of Novel Coronavirus Infection in Hong Kong website	Ministry of Health, Labor and Welfare website	Ministry of Health website — Flu Go Where website for medical facility search — Mask Go Where for website for mask collection facility search	KCDC website — Infectious Disease Portal website — Public Distributed Mask Information system for mask availability	CDC website — Disease Manager app — Timely Face Mask Map app
Public warning		Safeguard HK[71] app			Cell Broadcasting System[72] text messaging	Cell Broadcast Service[73] app
Inter-agency communication and coordination	Public Health Surveillance and Information Services[74]	Emergency Response System[75]			National Disaster and Safety Communication Network (Korea Safe-Net)[76]	Decision Support System for Disaster Response[77]

71 Security Bureau, *Safeguard HK*, available at sb.gov.hk/eng/news/mobileapp/index (accessed 27 April 2020).

72 Ministry of the Interior and Safety of the Republic of Korea, 국민재난안전포털 *(National Disaster Safety Portal)*, available at safekorea.go.kr/idsiSFK/neo/main/main.html (accessed 27 April 2020).

73 National Communications Commission, *Cell Broadcast Service*, available at ncc.gov.tw/english/news_detail.aspx?site_content_sn=603&is_history=0&pages=0&sn_f=3551 (accessed 27 April 2020).

74 Chinese Center for Disease Control and Prevention, *Public Health Surveillance and Information Services*, available at chinacdc.cn/en/aboutus/orc_9349/ (accessed 27 April 2020).

75 Security Bureau, *Emergency Response System*, available at sb.gov.hk/eng/emergency/cp.html (accessed 27 April 2020).

76 Ministry of the Interior and Safety of the Republic of Korea, *Disaster and Safety Communications Network (Korea Safe-net)*, available at mois.go.kr/eng/sub/a03/bestPractices7/screen.do (accessed 24 April 2020).

77 National Science and Technology Center for Disaster Reduction, 災害情資網 *(Disaster Information and Intelligence Network)*, available at eocdss.ncdr.nat.gov.tw/web (accessed 5 May 2020).

Legal infrastructure

In general, East Asian countries have relied on their pre-existing legal frameworks during the COVID-19 pandemic – but with the flexibility to introduce new legislation or amendments to existing legislation as necessary. Applying existing legislation has been possible thanks to the development of a pandemic-specific legal framework that could be activated as soon as news about COVID-19 started to emerge. Surveillance is key to decide when to activate the legal framework, since it allows to detect a pandemic before it hits a country. This legal framework had been updated and amended over the years.

At the same time, however, some countries have passed new legislation. In the case of China, it has passed legislation to increase production of PPEs and other medical equipment to prevent potential shortages. China has also passed legislation to allow regional governments to adapt their responses according to conditions in their own region. As for Hong Kong, it has passed two pieces of legislation to maintain social distancing – a key measure to prevent the spread of the pandemic, which Hong Kong can now enforce with fines. In the case of Singapore, the government has passed legislation to enforce quarantines, social distancing and other measures to halt the transmission of COVID-19, including through the use of fines. As for Taiwan, new legislation has introduced mechanisms to enforce quarantines or prevent the hoarding of essential materials, making use of fines if necessary. In other words, these governments have identified potential weak spots in their responses to COVID-19 and swiftly passed legislation to address them.

In the case of Japan and South Korea, they have relied on amendments to existing legislation. Starting with Japan, it has amended the Act on Special Measures for Pandemic Influenza and New Infectious Diseases Preparedness and Response to, for example, request people self-isolate or prevent mass gatherings. As for South Korea, amendments to the IDPCA now allow the government to use all necessary means to provide masks to vulnerable groups and to offer medical treatment to the infected patients. The amendment also allows for the imposition of fines. Amendments to the Quarantine and Medical acts allow, respectively, to prevent the entry of foreign nationals from at-risk locations and request healthcare professionals to report patients with suspicious infectious diseases. Thus, Japan and South Korea have also acted swiftly to adapt their legal framework to the realities of dealing with COVID-19.

Furthermore, East Asian countries have made quick use of one of the lessons learnt from previous pandemics: making use of pre-existing or setting up an inter-departmental task force bringing together all relevant agencies to deal with a pandemic and, when necessary, different layers of government. This has been essential to have a clear command structure, but also to avoid groupthink by allowing local government officials and medical professionals involved in the implementation of decisions to feed into the decision-making process. Tasks forces have been led by the head of government, as befits the urgency of dealing with COVID-19.

In terms of legal infrastructure, one other measure swiftly introduced across East Asia has been the imposition of stricter entry procedures into the country. Depending on the country, this has included travel bans from specific countries or regions were COVID-19 is prevalent, quarantines for new arrivals in government facilities or private residences, testing of new arrivals, deportation of foreign nationals refusing to comply with quarantines, and other measures that have restricted who can come into a country and under which conditions. As the number of imported COVID-19 cases has grown across several East Asian countries, while the number of domestic cases has stabilised or decreased, entry procedures have become stricter.

Healthcare and public health system

East Asian countries have swiftly activated pre-existing protocols and procedures. In other words, preparedness over the years has been key. These cut across two different yet equally important areas: 1) public health measures to prevent and detect further infections, including increasing diagnostic capacity and the scale up of prevention measures, and (2) the clinical response to manage infections.

Across East Asia, the following measures have been prioritised: isolation, separation of suspected and confirmed COVID-19 patients, provision of PPE, masks and other necessary equipment to healthcare professionals, provision of masks to the general public, and the identification or opening of suitable government quarantine facilities. Countries such as China and South Korea have also mobilised health professionals to their COVID-19 hotspots; i.e., Hubei Province and the city of Daegu, respectively. And countries such as Japan, Singapore and South Korea have prepared for or boosted cooperation with private hospitals to free up capacity to treat COVID-19 patients while also maintaining the provision of regular medical services. Similarly, China, Hong Kong, Singapore, South Korea and Taiwan set up temporary isolation facilities to free up capacity in hospitals. In other words, across East Asia there has been an all-out effort to support the healthcare sector so that it did not become overwhelmed, to prevent in-hospital transmissions, and to protect medical professionals from infection.

Across most of East Asia, the mantra of 'test, test, test' has been applied.[78] Tests allow to identify, treat and isolate cases, and trace other potential cases. In order to boost the number of tests, countries across the region have not limited themselves to testing in medical facilities. Tests have been carried out in transport hubs, especially airports, and in ad-hoc facilities such as temporary testing sites in China or drive-thru and walk-thru clinics in South Korea. The rationale has been that the healthcare system is already operating at near maximum capacity, so conducting tests elsewhere can reduce the burden on them. It can also be more convenient and less intimidating for people to use.

In addition, countries across East Asia have developed their own indigenous test kits. China shared the genome sequence of the coronavirus with the WHO on January 10th. Countries across East Asia immediately brought together public laboratories and private biomedical firms to develop a reliable test kit. Within weeks, the countries in the region were rolling out their kits. This boosted testing capacity at a time when global demand far exceeded production capacity. Indeed, countries such as Singapore and South Korea are now exporting their test kits.

Across East Asia, building up stockpiles of PPE and other medical equipment has been prioritised from the onset of the COVID-19 pandemic as well. China or Taiwan, for example, passed new legislation specifically designed to ramp up production of PPEs or ban their export. The thinking is that even stockpiles built over the years can become depleted during a pandemic. Especially, as is the case with COVID-19, if a second wave is highly likely. Therefore, building up stockpiles was prioritised from the beginning in anticipation that global demand would outpace production, as has been the case.

Use of technology

Technology has been a crucial component of East Asia's response to COVID-19, with a combination of Information and Communication Technology (ICT), Artificial Intelligence (AI) and big data. It has been used mainly for contact tracing, quarantine enforcement, and information dissemination, but also to understand the epidemic more broadly and identify courses of action, as in the case of Taiwan. In terms of contact tracing, apps such as Alipay Health Code, TraceTogether and Corona 100m serve users to learn whether they may have been in contact with someone carrying COVID-19. Adoption has varied from country to country. In the case of Alipay Health Code, adoption has been almost universal as many facilities now require to see the results provided by the app, which uses a traffic light-type system, to grant entry. In contrast, TraceTogether has not been widely used in Singapore. In the case of South Korea, contact tracing has also involved the use of satellite-based

---

78 World Health Organization, *COVID-19*, available at who.int/docs/default-source/coronavirus/transcripts/who-audio-emergencies-coronavirus-press-conference-full-16mar2020.pdf?sfvrsn=7c0c37bf_2 (accessed 27 April 2020).

phone tracking. This is more precise than app-based systems but, according to critics, it can be too intrusive on people.[79]

Regarding quarantine enforcement, the use of technology has varied from country to country. Hong Kong is making use of location tracking wristbands, which critics also consider to be too intrusive, linked to the Stay Home Safe app. South Korea has developed the Self-Quarantine app and Taiwan the Disease Containment chat bot. Both allow users to register if they go in self-isolation. Singapore, meanwhile, uses text messages to enforce compliance with quarantines. South Korea and Taiwan, the latter with its 'electronic fence', use smartphone tracking to make sure that quarantined people comply. Taiwan has also implemented twice-daily calls to ensure compliance, and border quarantine procedures whereby all incoming passengers are screened using a video-recordable infrared thermometer installed during the SARS outbreak. In other words, East Asian countries have used a range of technologies in relation to quarantine enforcement.

An important technological innovation comes from the use of patient records databases. Of particular importance was the use of a centralised, real-time database. This includes the cases of Hong Kong's Electronic Health Record Sharing System,[80] Singapore's National Electronic Health Record System,[81] South Korea's Integrated Disease and Health Management System,[82] and Taiwan's National Health Insurance Research Database.[83] They are only possible due to single-payer, national health insurance systems that cover almost the entire population.[84] These systems are believed to have effectively helped containing community transmission.[85] Across these countries, the system works similarly. Take the case of Taiwan. All providers in the country submit their claims to the platform, which is updated within 24 hours, offering real-time information and enabling clinicians and the CDC to track and trace doctor visits. The records include entire health histories, underlying health conditions, progress of symptoms, treatments, hospitalisation and respiratory symptoms. This data was used to identify high-risk patients and those likely to have been in contact with identified cases. The systems have strict security and privacy policies that enable sharing of information across departments within the health system.[86] In the specific case of Taiwan, data from the database was also then linked to the Customs and Immigration database, which offered information about travel history to China within the previous three months. The system flagged records so that medical providers would be aware of a patient's travel history when they came.[87] In addition, across these countries all cases reported to the CHP, KCDC, NCID and CDC, respectively, were also added to the database. These systems thus enabled a unique use of technology to identify and treat cases potentially infected with COVID-19.

In the case of information dissemination, countries across East Asia have launched apps and websites or made use of pre-existing ones. Some of them provide general information

---

79 Questions have been raised regarding the balance between privacy and data protection on the one hand and the need for governments to collect information on the other. Some feel that technology is too invasive on civil liberties and does not respect data protection. Others contend that information gathering for the public good on a temporary basis is more important. In general, and with the exception of Japan, proponents of the need for governments to collect information have the upper hand across East Asia. This report does not take a position on this debate. It informs about these measures introduced in some East Asian countries that other countries may consider.

80 Hong Kong Special Administrative Region Government, *Electronic Health Record Sharing System*, available at gov.hk/en/residents/health/hosp/eHRSS.htm (accessed 4 May 2020).

81 Integrated Health Information Systems, About *NEHR*, available at ihis.com.sg/nehr/about-nehr (accessed 4 May 2020)

82 Integrated Disease Health Management System, 질병보건통합관리시스템 (*Integrated Disease Health Management System)*, available at is.cdc.go.kr (accessed 4 May 2020).

83 National Health Insurance Research Database, *Background*, available at nhird.nhri.org.tw/en (accessed 4 May 2020).

84 Cheng-Yang Hsieh, Chien-Chou Su, Shih-Chieh Shao, Sheng-Feng Sung, Swu-Jane Lin, Yea-Huei Kao Yang and Edward Chia-Cheng Lai, 'Taiwan's National Health Insurance Research Database: Past and Future', *Clinical Epidemiology* 11 (2019): 349–358.

85 Government of the Republic of Korea, *Flattening the curve on COVID-19: How Korea responded to a pandemic using ICT* (Seoul: Government of the Republic of Korea, 2020); Lin et al., op. cit.

86 Lin et al., op. cit.

87 Lin et al., ibid.

and may act as a gateway to further, more specific information. Examples include China's Ding Xiang Yuan and Hong Kong's Anti-Epidemic Information Channel. Other apps and websites have specific information. Examples include Mask Go Where, Public Distributed Mask Information system or Timely Face Mask Map for mask availability information or Flu Go Where, for medical facility search. The rationale behind information dissemination using technological solutions is to increase transparency and avoid possible panic outbreaks due to rumours about, for example mask shortages. In short, the use of technology was informed by 'the right to know'.

Technology has also been used for patient diagnosis, treatment and social care. To begin with, this includes the use of robots. China, Hong Kong and Singapore, for example, are using robots to deliver food to COVID-19 patients. China has also introduced robots to check patient's temperature and to clean hospitals. Hong Kong, for its part, has introduced robots for public transport network cleaning and disinfection. In the case of Singapore, robots are being used for volunteers to talk to patients.

Meanwhile, Japan is using online diagnosis for all types of conditions, Singapore is employing teleconsultation for COVID-19 patients, and South Korea is making use of mobile phone COVID-19 self-diagnosis. In the case of Japan and South Korea, confirmed cases can then go to a medical centre for further treatment. In South Korea, there is also the option to use a COVID-19-specific telemedicine app. The use of technology for diagnosis and treatment helps to reduce face-to-face interactions between medical staff and COVID-19 patients, as well as between medical staff and suspected or confirmed patients with other conditions. This supports efforts to halt the spread of COVID-19, while also providing treatment to people with milder conditions.

It should be stressed out that the use of technology has come together with a surge in human resources. Countries across East Asia have boosted the numbers of contact tracers, callers and information gatherers for the purposes of contact tracing, quarantine enforcement and information gathering and dissemination, respectively. Furthermore, countries across East Asia have focused on cluster surveillance and management. This requires extensive use of human resources to gather data, track, trace and, if applicable, isolate. In addition, the use of robots or online or mobile phone diagnosis, or treatment, still requires medical professionals to talk to patients, as well as engineers to service these technologies. ICT, AI and big data facilitate all these processes significantly and should be employed. But they are insufficient and human resources are paramount to maximising the benefits of technology.

Some East Asian countries have also used pre-existing public warning systems to remind the public about how to behave to prevent infection (eg, social distancing or wearing a mask) or inform people who may have been in contact with infected patients. This has happened in Hong Kong, South Korea and Taiwan. In all of them, the public warning system had already been set up and tested prior to the COVID-19 crisis. Thus, it did not have to be rushed during the pandemic.

Some East Asian countries have also employed technology for agencies in charge of managing COVID-19 to communicate and coordinate among themselves. China's Public Health Surveillance and Information Services, Hong Kong's Emergency Response System, South Korea's Korea Safe-Net and Taiwan's Decision Support System for Disaster Response are intranets that allow secure communications. Government officials at different levels, medical services, and public services people such as police people and firefighters have access to the intranet. It may make use of wireless communication systems and/or text messaging and phone calling. These services provide real-time communication. This strengthens a single channel for command and control. In all cases, these networks already existed and have been used during the COVID-19 pandemic.

6 Recommendations: preventing the next pandemic

As soon as news of a new coronavirus started to emerge from Wuhan and China first reported a new type of pneumonia of unknown origin to the WHO on December 31st, 2019, countries across East Asia started to prepare for a worst-case scenario. They did not wait for the WHO to declare a Public Health Emergency of International Concern on January 30th – never mind for COVID-19 to be declared a pandemic in March 11th. The result has been that East Asian countries have fared relatively well during the first wave of COVID-19 – especially compared to Western Europe and the United States. The main reason which is easily replicable across other regions, or at least those at the same stage of development as East Asia, is institutional capacity. Some recommendations from this analysis of East Asia's institutional capacity now follow.[88]

1. Preparedness is key: Governments need to start preparing for the next pandemic as soon as the COVID-19 pandemic is over or becomes manageable. A reason for this is that the speed and effectiveness of the response in the first days and weeks of a pandemic are critical. They have to identify and then learn lessons from the COVID-19 pandemic, identifying the weaknesses (and strengths) in their response. Government should prioritise, or at least not ignore, lessons regarding the preparedness of the legal infrastructure, the healthcare and public health system, and the use of technology.

2. Institutional memory is crucial: Governments need to identify the agency that will lead on the maintenance of institutional memory so that lessons learnt are not forgotten, as well as the mechanisms to maintain readiness. They also need to develop a playbook including the lessons learnt that can be updated with new information, coming from both their country and from other countries, and that can be applied when a potential new pandemic breaks out. It is also important to regularly perform disease control exercises through infectious disease prevention activities that enable maintaining institutional memory of procedures and protocols, relationships among actors, and public awareness of epidemics.

3. The legal framework should be robust and flexible at the same time: Governments need to establish a robust legal framework that can be activated in case of (potential) pandemic. This legal framework should establish a clear, centralised command structure. At the same time, governments need to understand that there may be a need for new legislation or amendments to existing legislation when a new pandemic breaks out, and have the flexibility to introduce either quickly.

4. The healthcare and public health system needs to be well resourced: Governments need to build ex ante the necessary resources to a) implement public health measures to prevent the spread of an epidemic and identify and isolate cases effectively, and b) improve the clinical response and prevent that the healthcare system becomes overwhelmed during a pandemic. Public Health includes, among others, establishing advanced technological and centralised systems of information for surveillance and case detection; installing checkpoints and border quarantine procedure at country entry points; increasing clinical and pharmaceutical research capacity, including rapid strengthening of diagnostic capacity; and scaling up of measures to prevent community transmission. Healthcare system measures include training of medical professionals specialised in infectious diseases; the stockpiling of personal protection equipment (PPE) and other necessary materials for hospitals and medical professionals; and the building of intensive care units and/or negative-pressure isolation rooms and other facilities across hospitals for infected patients.

---

88 It should be made clear that it is too early to known which of these recommendations would be most effective. Thus, this report does not suggest the adoption of all of them. Instead, each country should decide which recommendation(s) might be easier to replicate and/or be more suitable to existing domestic conditions.

5. The healthcare system needs to receive support during the pandemic: Governments need to understand that the healthcare system can easily reach or even exceed maximum capacity during a pandemic. To address this issue, they need to provide the necessary support. This includes, among others, building new temporary facilities, boosting the number of healthcare professionals, testing to identify the infected, increasing medical equipment stockpiles as soon as a potential outbreak is identified, and using indigenous production capacity. If necessary, this should involve cooperation with the private sector.

6. The use of technology is important: Governments need to develop the necessary technologies to identify and trace infected cases, enforce quarantines, disseminate information. This requires finding a balance between privacy and data protection, on the one hand, and the need for governments to obtain information, on the other. Two types of technology are critical: a) apps and websites for tracing, enforcing and information; and b) centralised, real-time databases of insurance claims or patient records that enable clinicians and public health agencies to identify cases and trace related contacts and recognise patients at highest risk, eg, those with underlying health conditions. Secured record linkage across databases (eg, insurance claims and travel histories) are a critical technological resource that will likely prove critical to the control of future pandemics. These systems should be supplemented with human resources in charge of tracing, phone calling, and information gathering and dissemination. Governments should also consider the benefits and risk of smartphone tracking.